SIEMENS

TELEPERM M

Automation System
AS 235 System Software
Variant G

Description
Volume 2/3

Bestell-Nr. C79000-G8076-C416-02

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9 Standard Function Blocks

The write–protected system RAM contains the fundamental software for the automation system in the form of basic programs and function blocks. There are well over 100 standardized blocks for data acquisition, closed–loop control, open–loop control, calculation, supervision, logging, display and operation and monitoring – these are the **standard function blocks**.
This chapter explains the block list which appears in an equivalent manner in all standard function blocks. Chapter 9.2 briefly lists the standard function blocks accoriding to their characteristics, and Chapter 9.3 describes the theory of operation of the individual standard function blocks in detail and in alphabetical order.

9.1 Block List Description

The block list, which is required for system configuration, specifies the individual data elements in a block.

The block list can be output by code word input:

- Keyswitch on process communication keyboard in position 2 or 3.

  `A,tname,bname;`

  This entry will output all data significant for system configuration, i.e. all inputs and outputs of a block, without internal variables.

  `NEDA;` = leading code word
  `A,tname,ORPA;`
  `A,tname,bname;`

  This entry will output all data elements of a block, including internal variables.

  The block list may only be defined and output with code word D in authorization level 3 of the process communication keyboard (see Chap. 5.3.1).

The **block list** contains the following information:

- Header line

  – Block type
  – Block name
  – Internal type number (for NEDA only)
  – Internal block number (for NEDA only)
  – Highest element number (for NEDA only)
  – CHECK group identifier ”C” (for NEDA only)
  – Date/time (for printer only)
  – Page number
  – Code for next page

• Data element lines

- Number of input/output
- Data type

AB	=	Binary output (not configurable)	
AA	=	Analog output	2 words/floating point format (not configurable)
AAD	=	Analog output	3 words/floating point format (not configurable)
AT	=	Time output (not configurable)	Counter variable = byte integer + binary variable
EB	=	Binary input	
EBV	=	Binary input/managed (cannot be interconnected)	
EA	=	Analog input	2 words/floating point format or format of interconnection target
EAD	=	Analog input	3 words/floating point format/managed (cannot be interconnected)
EAV	=	Analog input/managed	2 words/floating point format/managed (cannot be interconnected)
EDV	=	Analog input/managed	3 words/floating point format (cannot be interconnected)
PB	=	Binary input (can only be parameterized)	
PA	=	Analog input (can only be parameterized)	2 words/floating point format
PAD	=	Analog input (can only be parameterized)	3 words/floating point format
ETV	=	Timer input/managed	Counter variable = 2–byte integer + binary variable
PGT	=	Timer input/managed	Counter variable = 2–byte integer + binary variable
I	=	Analog input	1 byte/integer
ID	=	Analog input	2 bytes/integer
S	=	Character string	1 character
S2	=	Character string	2 characters
S4	=	Character string	4 characters
S16	=	Character string	16 characters
S:x	=	Character string designed as field with x times 1 character $x \leq 255$	

- Elementname (process–related short term)
- Value
  Analog value/floating point representation (0.0000 – 99999)
  Analog value/exponential representation (...... E + ...)
  Analog value/integer representation (32.768)
  Binary value
  Address representation (typeno. blockno. paramno.A)
  Character string
  A blinking display of a value means: The value has not been assigned (assignment code violated).
  Interconnection address (for NEDA: also reference to managed variable).
  Incorrect interconnection has been detected if ???? (blinking) is displayed; e.g. the block to which interconnection was attempted has been deleted.
- Variable identifiers
  \# = Fault code, variable is faulty (arithmetic execution with result fault code)
  S = Inhibit code/write protection (write access comands will not be executed)

P = Variable is stored in the system RAM
A = Variable is block basis address (MUX/SET command permitted)
! = Alarm code (write access commands start acyclic alarm level)
? = The source identifiers are valid if the inputs have been interconnected.
No identifiers are displayed here.

– Data attributes
  Q = Data element can only be interconnected
  C = Use CHECK block to check the data element. (A check is not made if the variable is changed using a TML command or an EAR/EBR block).
  N = Data element cannot be configured
  B = Data element can be process–controlled (can be displayed on the process communication keyboard)
– Element number
  Consecutive numbers correspond to the data element definition (internal data management).
  Use configuration (P/Q) or language (TML/STEP/image log statements) to access the block list. The memory requirements depend on the respective data type.

Memory requirement of data types:

a) Function blocks

Data type	P,...	Q,...	Memory requirement in bytes	
			Block	SAV/SBV/GAV (see Chap. 5.2.1.8)
AB	–	–	2	1
AA	–	–	2	4
AAD	–	–	2	6
AT	–	–	2	4
EB	x [1)]	x	4	1 [2)]
EA	x [1)]	x	4	4 [2)]
EAD	x [1)]	x	4	6 [2)]
I	x	–	1	–
ID	x	–	2	–
S	x	–	1	–
S2	x	–	2	–
S4	x	–	4	–
S16	x	–	16	–
EDV	x	–	2	6
EAV	x	–	2	4
EBV	x	–	2	1
ETV	x	–	2	4
PGT	x	–	4	–
PA	x	–	4	–
PAD	x	–	6	–
PB	x	–	1	–

1) if data element does not contain a Q attribute
2) For parameter assignment. No additional memory requirement for interconnection.

If elements are designed as data field, the memory requirement multiplies in dependance of the data type.
z. B.: S:x occupies x byte(s) in the block

b) Data blocks

Data type	P,...	Q,...	Memory requirement in bytes	
			Block	SAV/SBV/GAV (see Chap. 5.2.1.8)
GA(=PAD)	x	–	6	–
GB(=PB)	x	–	1	–
GM(=PB)	x	–	1	–
GT(=PGT)	x	–	4	–
FA(=PAD)	x	–	6	–
FSA(=PA)	x	–	4	–
FB(=PB)	x	–	1	–
FC(=S)	x	–	1	–

9.2 Arrangement according to Characteristics

- Blocks for analog and digital processing

Type	Designation	Function
SUM	Adder	Y = X1 + X2 – X3 – X4
MUL	Multiplier	Y = X1 · X2
DIV	Divider	Y = X1 / X2
RAD	Square–root extractor	$Y = \sqrt{X}$ oder $Y = K \cdot \sqrt{X}$
LN	Logarithm extractor	Y = KF · ln |X|
EXP	Exponential value	$Y = e^{x}$
ABS	Absolute value	X = |X|
INT	Integrator	Y = K · ∫Xdt, K = 1 / T
DIF	Differentiator	Y(s) / X(s) = (T · s) / (1 + (T · s / v))
PT	Delay	Y(s) / X(s) = 1 / (1 + T · s)
TOZ	Dead time	$Y(s) / X(s) = e^{-s \cdot T}$
MIN	Minimum–value selector	Y = Minimum von X1, X2, X3
MAX	Maximum–value selector	Y = Maximum von X1, X2, X3
TOB	Dead band	Y = X – TOBU für X < TOBU 0 für TOBU ≤ x ≤ TOBO X – TOBO für X > TOBO
PLG	Function generator	Linear interpretation between 6 pairs of turning points
GW	Limit monitor	Limit check between 2 switching points
ASL	Analog–value switch	X1 for S = "0" X2 für S = "1"
SPEI	Analog–value store	Storage of up to 256 analog values
APRO +PROB	TML connection (connection of PROBLEM blocks)	For "inserting" a use–specific TML program into the sequence list

- Blocks for binary processing

Type	Designation	Function
VU	AND	A = E1 $\wedge$ E2 $\wedge$ E3
VO	OR	A = E1 $\vee$ E2 $\vee$ E3
VN	Negation	A = $\overline{E}$
VM	Flag	Flag of binary input signals (flip–flop)
VZ	Time delay	Switch–on and switch–off delays
VS + STEP	STEP M Block	Freely programmable in STEP M
MPX	Multiplexer	For supplying the STEP commands in the following VS/KS block
BW	Binary selection	Selection of status combination from up to 3 binary signals
INKU	Incremental converter	Converts analog value into an open or close pulse
BCE	BCD input	Conversion of a BCD signal into an analog value
BCA	BCD output	Conversion of an analog value into a BCD signal
KA KAK	Sequence start Sequence start, power plant	Marks the start of an ON/OFF branch of a subgroup control Same as KA, but with additional functions
KB KBK	Sequence Sequence end, power plant	Conditions of a control step Same as KB, but with additional functions
KS	Sequence step	Same as KB, for process plants
KV	Sequence branch	Branch of a sequence into a max. of 6 branches, for process plants
KE KEK	Sequence end Sequence end, power plant	Last block in a sequence Same as KE, but with additional functions
HA	Auxiliary oil automatic unit	Controls electric auxiliary oil pumps for oil supply to generator sets
HUP	Horn block	For triggering signal equipment (optical and audible)
EAR	Single analog–value allocator	To allocate an analog value (from block output) to an analog data element
EBR	Single bit allocator	To allocate a binary value (from block output) to a binary data element
UBR	Universal binary allocator	To allocate 16 binary values (from block outputs) to GB/GM data blocks

- Blocks for processing with standardized operation and monitoring

Type	Designation	Function
R	Closed–loop controller	PID controller, e.g. for: – Disturbance variable feedforward – Tracking of setpoint, manipulated variable – Limit formation
RN	Closed–loop controller, new	Same as R, but with additional functions
RNAM	Change in name	Modification of type or block name
M	Measured–value monitoring	– Monitors a measured value for 3 pairs of limits – Extension of a closed–loop control block for limit monitoring – Limitation of measured value at the error limits
V	Ratio	– Generation of a ratio, e.g. with a ratio control – Proportional adjuster, e.g. with synchronization control or to influence the command variable of a cascade
B	Operation block	– Display of analog values (internal results of calculations, ...) – Modification of analog and binary values (input of constants, ...)
S	Control unit	Operation and monitoring of a sequence in process plants
G	Subgroup control	Operation and monitoring of sequences in power plants
GK	Group control	Same as G, but with additional functions
A	Output for binary values	Display and modification of a binary value
F	Window block	Display of 5 measured values; each of the 5 values is monitored for a pair of limits
FN	Window block	Display and limit monitoring of 5 measured values; Input of 5 pairs of limits, each with an associated hysteresis, as well as 5 ranges for the data display
T	Trend	Output of trend of 2 measured values as bar display; time base between 1.625 s and 36 h
SR	Recorder	Summary of up to 4 data series, displayed as line curves on the screen: 4 pairs of limits to monitor the measured values
C	Selector	To switch over binary signals, e.g. manual/automatic mode
PKM	Message acquisition	Acquires configured messages from binary input module/GB block
PKF	Message sequence display	Output of PKM messages; display of message history and new messages of FKM blocks

- Data blocks

Type	Designation	Function
GA	Data block for global analog values	Storage of 256 analog values with an error of 10^{-9}; storage of process image, historical values etc.
GB	Data block for global binary values	Storage, scanning and linking of 256 binary values; preferably for binary process inputs and outputs
GM	Data block for global flags	Storage, scanning and linking of 256 internal binary statuses
GT	Data field block for global timers	Storage and generation of times for execution of time–dependent functions
FA	Data field block for analog values	Storage of internal/external analog values with an error of 10^{-9}; preferably for internal events; extension of GA block
FSA	Data field block for analog values	Storage of internal/external analog values with an error of 10^{-4}; preferably for internal events
FB	Data field block for binary values	Storage of internal/external binary values; extension of GB/GM blocks
FC	Data field block for characters	Storage of alphanumeric characters (texts)

- Blocks for signal exchange via the CS 275 bus system

Type	Designation	Function
AKS	Analog coupling and transmitter block	Transmission of up to 28 analog values and abbreviated time (minutes and seconds) from an AS system to the AKE blocks or other bus participants (up to 6 with DI coupling)
AKE	Analog coupling and receiver block	Reception of up to 28 analog values via the bus system from the data set of an AKS block of another bus participant
BKS	Binary coupling and transmitter block	Transmission of up to 128 binary signals and abbreviated time from an AS system to the BKE blocks or other bus participants (up to 6 with DI coupling)
BKE	Binary coupling and receiver block	Reception of up to 128 binary signals via the bus system from the data set of a BKS block of another bus participant
ZKS	Character coupling and transmitter block	Transmission of up to four S16 strings from an AS system to the ZKE blocks of other bus participants (up to 6 with DI coupling)
ZKE	Character coupling and receiver block	Reception of up to four S16 strings from another AS system
MKS	Message coupling and transmitter block	Transmission of 32 binary signals as a message (with the time a signal changes from “0” –> “1” or “1” –> “0”) to other bus participants (up to 6)
MKE	Message coupling and receiver block	Reception of 32 binary signals of an MKS block sent from another bus participant and the time of transmission via the CS 275 bus system
SKS	Status coupling and transmitter block	Transfer of status information to higher–level systems (OS systems, computers)
PLPS	Read and write parameters	Read or write up to 20 parameters of a bus–coupled AS 230 or AS 235 system

- Driver blocks for I/O modules

Type	Designation	Function	For modules with Order No.
AE	Analog input	Acquisition of a peripheral analog value via a channel of an analog input module (0 to 20 mA, 4 to 20 mA, 0 to $\pm$ 10 V; Pt 100 resistance thermometers, thermocouples) or an analog input module of the SIMATIC S5 programmable controllers (instrument range U)	6DS1 700–8BA/–8BB 6DS1 730–8AA 6DS1 731–8AA/–8BA/ –8EA/–8FA/–8RR + 6DS1 703–8AB/–8RR 6DS1 321–8AA 6DS1 701–8AA/–8AB
AR	Analog input allocator	Acquisition of 8 analog process variables, conversion into physical variables; storage in GA blocks or direct linking	6DS1 700–8BA 6DS1 730–8AA 6DS1 731–8AA/–8BA/ –8EA/–8FA/–8RR + 6DS1 703–8AB/–8RR 6DS1 701–8AA/–8AB
AA	Analog output	Output of an analog value via a channel of an analog output module or an output module of the SIMATIC S5 programmable controllers (instrument range U)	6DS1 702–8AA/–8RR 6DS1 321–8AA
BEI	Binary input	Acquisition of binary signals via a binary input module; storage of binary signals in the GB block	6DS1 601–8BA 6DS1 602–8BA 6DS1 615–8AA
BRA	Binary allocator	Acquisition of 8 binary signals via a binary input module; allocation of signals to defined linking addresses	6DS1 601–8BA 6DS1 602–8BA 6DS1 615–8AA
BAU	Binary output	Output of up to 32 binary signals to a binary output module	6DS1 603–8BA/–8RR 6DS1 604–8AA 6DS1 605–8BA
RZ	Input block for 2–channel controller	Acquisition of analog values and binary signals from a channel of a 2–channel controller module	6DS1 402–8BA 6DS1 403–8CA/–8CB
RZA	Output block for 2–channel controller	Transfer of manipulated variable increment ΔY or setpoint increment ΔW from a closed–loop control block R or RN to a channel of a controller module	6DS1 402–8BA 6DS1 403–8CA/–8CB
BU8	Binary transmitter monitoring block	Acquisition and monitoring of 8 binary signals via a binary input module	6DS1 620–8AA 6DS1 621–8AA
BU16	Binary transmitter monitoring block	Acquisition and monitoring of 16 binary signals via a binary input module	6DS1 600–8AA
DR	Input/output for speed controller	Acquisition of signals from the interface module and transfer of signals to the interface module	6DS1 303–8AA

Type	Designation	Function	For modules with Order No.
ZE	Metered pulse input	Acquisition of a channel of a metered pulse input module	6DS1 607–8AB
E110	Binary input, also for SIMATIC S5 input modules	Input of 16 binary values with standard binary input modules or input modules of SIMATIC S5 programmable controllers (S5–110 or instrument range U) via interface module	6DS1 600–8AA 6DS1 601–8BA 6DS1 615–8AA 6DS1 602–8BA
			6DS1 310–8AA/–8AB 6DS1 321–8AA
A110	Binary output, also for SIMATIC S5 output modules	Output of 16 binary values with standard binary output modules or output modules of SIMATIC S5 programmable controllers (S5–110 or instrument range U) via interface module	6DS1 603–8BA/–8RR 6DS1 604–8AA 6DS1 605–8BA
			6DS1 310–8AA/–8AB 6DS1 321–8AA
S5KE	Coupling to SIMATIC S5programmable controllers	Acquisition of signals from interface module	6DS1 333–8AB
S5KS	Coupling to SIMATIC S5 programmable controllers –Receive–	Transfer of signals to interface module	6DS1 333–8AB
AEF	Analog input (field multiplexer)	Driver for acquisition of analog values via the field multiplexer analog input modules	6DS1 706–8AA 6DS1 708–8AA 6DS1 710–8AA
AAF	Analog output (field multiplexer)	Driver for output of analog values via the field multiplexer analog output modules	6DS1 712–8AA
BEF	Binary input (field multiplexer)	Driver for acquisition of binary signals via the binary signal input modules of the field multiplexer and for acquisition of fault signals from the binary I/O modules of the field multiplexer	6DS1 610–8AA 6DS1 611–8AA
BAF	Binary output (field multiplexer)	Driver for output of binary signals via the binary signal output modules of the field multiplexer	6DS1 612–8AA
PKM	Alarm acquisition	Acquires planned alarms from binary input module/ GB block	6DS1 601–8BA 6DS1 602–8BA

- Driver blocks for I/O modules of the TELEPERM ME process control system

Type	Designation	Function	For modules with Order No.
RSK	Closed–loop control module driver	Acquisition of signals from single–channel and two–channel configurable controller modules	6DS1 408–8BB 6DS1 410–8BB 6DS1 411–8AA 6DS1 412–8AA
RSKB	Operation block for RSK block	For operation and monitoring of configurable closed–loop control modules, together with RSK block	—
MSB	Motor/valve and actuator control	Acquisition and transfer of binary signals to the binary calculation module	6DS1 717–8AA/ –8RR
TVB	Preselection or subloop control	Acquisition and transfer of binary signals to the binary calculation module for operation and monitoring of a preselection or sub–loop control	6DS1 717–8AA/ –8RR
BRBK	Organization and binary input/ output block	Acquisition of binary signals from the flag area of the binary calculation module, coordination together with ABR, MSB or TVB	6DS1 717–8AA/ –8RR
ABR	Analog input and output	Acquisition and transfer of analog values to the binary calculation module to the analog extension module	6DS1 717–8AA/ –8RR + 6DS1 720–8AA
REN	Analog/binary input and output	Acquisition and transfer of analog values and binary signals of the analog calculation module	6DS1 715–8BB
PBE	Testable binary input	Acquisition of binary signals via a testable binary input module and transfer of binary signals to binary–value fields	6DS1 618–8CA
PRA	Testable relay output module	Output of binary signals, testable relay output module	6DS1 606–8BA

- Driver blocks for I/O modules with standardized display

Type	Designation	Function	For modules with Order No.
RE	Closed–loop controller, single–channel	Acquisition of signals from single–channel closed–loop control modules; transfer of commands and standardized increments to the closed–loop control modules	6DS1 400–8BA (S–type controller) 6DS1 401–8BA (K–type controller)
RK		Same as RE, but with additional functions	
EM	Individual control drive, motor	Acquisition of signals from individual control drive modules and application of signals to the binary outputs, e.g. for a subgroup control; transfer of commands to the individual control drive module	6DS1 500–8BA 6DS1 502–8BA
EU		Same as EM, but with additional functions	
EV	Individual control drive, valve	Same as EM, but for the corresponding modules	6DS1 501–8BA/–8BB 6DS1 503–8BA
EK		Same as EV, but with additional functions	
DZ	Proportioning counter	Acquisition of signals from proportioning counter module (2/4 channels), connection of these signals to the block outputs; transfer of commands and standardized analog values	6DS1 613–8BB
EG	Individual control drive modules (4 to 8 channels)	Acquisition of signals from individual control drive modules, connection of these signals to the binary outputs; transfer of commands	6DS1 504–8AA 6DS1 505–8AA
FM	Field multiplexer	Acquisition of signals from a channel of the interface module for the FM 100 field multiplexer; transfer of signals to the module	6DS1 304–8BB

- Output blocks for printer and process monitor

Type	Designation	Function
GP	Group display	Design of display hierarchy: area display and group display
MEL	Message output	Output of configured plain text messages with time (resolution 1 s); standard blocks such as e.g. M also generate messages
BILD + LAYO	Display output	Output of plant–specific displays
PROT+ LAYO	Log output	Output of plant–specific logs on PT 88/PT 89 printer
PKF	Process coupling/ message sequence display	Output of PKM messages

- Organization blocks

Type	Designation	Function
XB	Processing, cyclic	To disable/enable a group of function blocks and to enable every n–th cycle
XA	Processing, acyclic	To disable/enable one single sequence of function blocks. When installed in the alarm level (ZYK 1) as ALARM block: single execution of following block sequence
XZ	Time start	For time–dependent switching on/off of blocks and block sequences
FUTA	Function keys	For switching on/off of block sequences via the process operation keyboard

- Test blocks

Type	Designation	Function
TANZ	Test display	Monitoring of binary and analog variables; selective operation of variables is possible (max. 16 analog variables and 16 binary variables within a stationary display)
TUEB	Test monitoring	For sequence monitoring of TML programs: – Cyclic sequence monitoring – Single monitoring of program execution (up to 248 TML programs can be monitored)
SYST. WART	Test and main-tenance	Menu–controlled calling of test and maintenance functions (e.g. XB switchover, status of coupling block, setting of transmission rates, activation of error messages, saving, TML)

9.3 Method of Functioning

A

Output block for binary values

Application

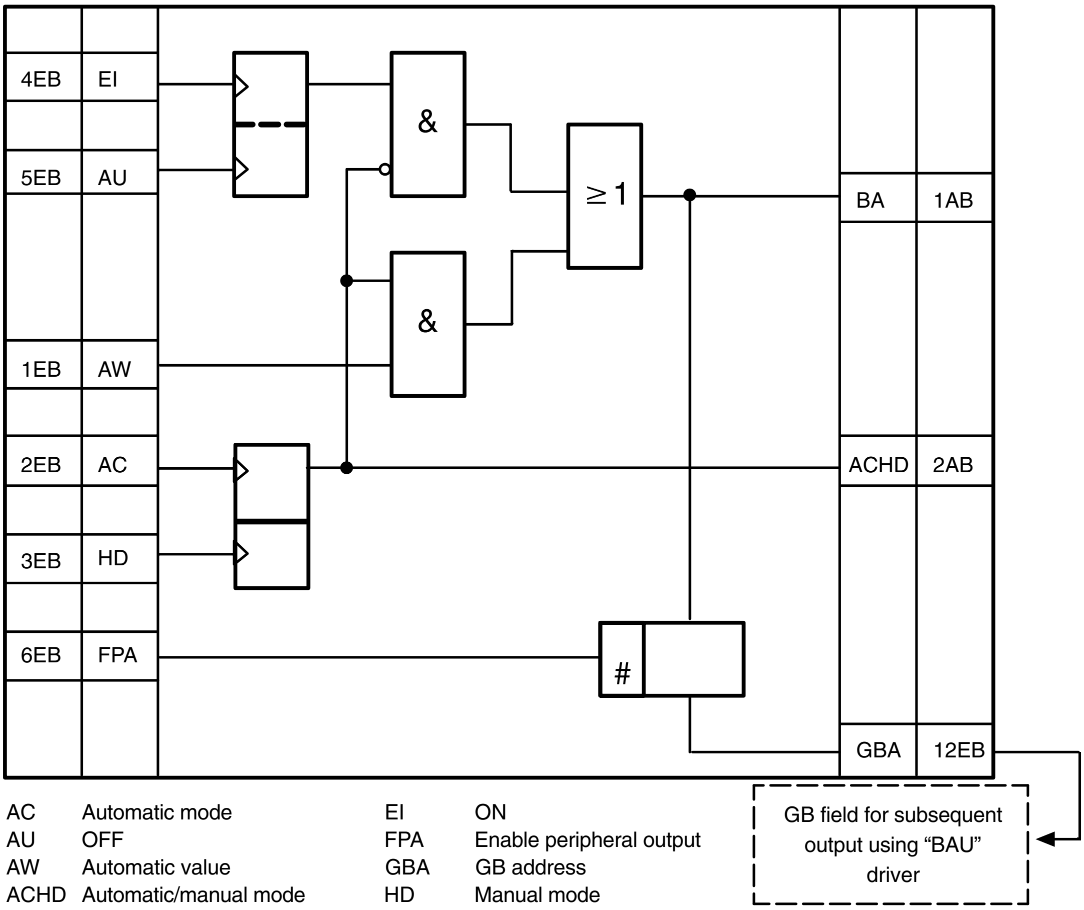
This block is used to display and manipulate a binary value.

Method of operation

Use the PBT (process communication keyboard) to select either “AUTOMATIC” (AC) or “MANUAL” (HD) mode. The selected mode is present as a signal (AC/HD = 1/0) at the binary output ACHD.

In automatic mode, the automatic value (AW) coming from a different block is routed through. The automatic value is accepted when the system is changed from automatic to manual mode. In manual mode, the manual value coming from the PBT operator input keys (EI and AU) is routed through.

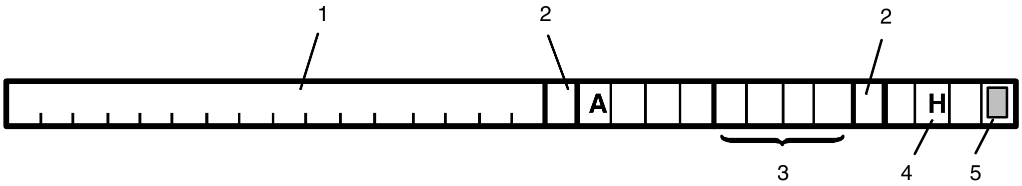
If the GBA input (12EB) is interconnected with the corresponding GB cell, the input “Enable Peripheral Output” (FPA) can be used to feed the block output value to a channel of a binary output module. The driver “BAU” then performs the output.



AC	Automatic mode	EI	ON
AU	OFF	FPA	Enable peripheral output
AW	Automatic value	GBA	GB address
ACHD	Automatic/manual mode	HD	Manual mode
BA	Binary value output		

Fig. 9.1 Logic diagram of output block

- Normalized representation in a group display



1 Process–related name of the output block, as in loop display
2 Separating blank
3 Name of output block
4 H for manual operation
5 Blinking mark if alarm signal "External Fault" is active

Fig. 9.2 Output block; normalized representation in a group display

The block is represented by 30 characters at a specific location of a group display. This requires the following parameterization of input 13 (group display: no./location no.):

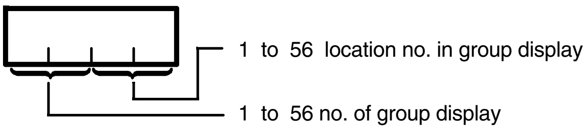


Fig. 9.3 Output block; parameterization of input 13

Set input 13 to "0" if the normalized representation of the block in a group display is to be suppressed.

- Normalized representation of the loop display

The following loop display (Fig. 9.4) contains the below mentioned static and dynamic data:

Static data
1 Mnemonic name and name of the output block for binary signals
2 Process–related name of the output block
3 Mnemonic name "Automatic value" 1)
4 Modes (AC, HD) 1)
5 Mnemonic name for ON (EI) 1), OFF (AU) 1)
6 Mnemonic name of adjacent binary values (B1, B2, B3, B4) 1)
7 Mnemonic name "External Fault" (F) 1)

Dynamic data
8 Status of "Automatic Value"
9 Mode states
10 Status of "Manual Value"
"0" the mode related to this value is OFF
"1" the mode related to this value is ON
11 States of adjacent modes
12 Status of "External Fault"

1) Pre–defined mnemonic names

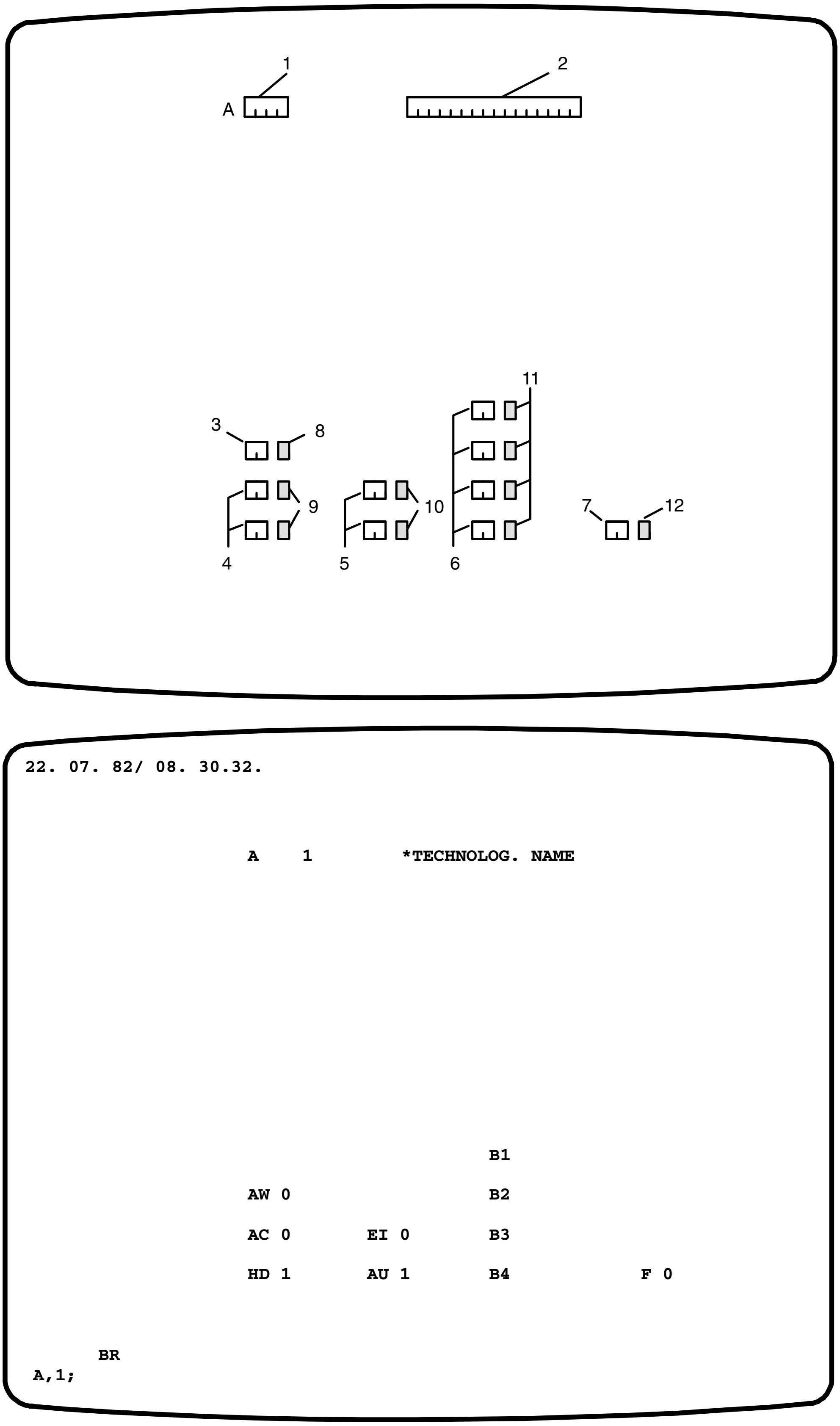


Fig. 9.4 Loop display of the A block, example

- Operator input using the process communication keyboard

  Four function keys (AC = 1, HD = 1, EI = 1 and AU = 1) will be assigned after the loop display has been selected and the operator input keys (BE) depressed.

  All function key inputs (AC = 1, HD = 1, EI = 1 and AU = 1) must be terminated by pressing the execute key (◈).

AC =1	HD = 1	EI = 1	AU = 1				

AC Automatic mode
AU OFF
EI ON
HD Manual mode

Fig. 9.5 Output block, automatic assignment of the process communication keyboard

- Data structure (designation of inputs and outputs)

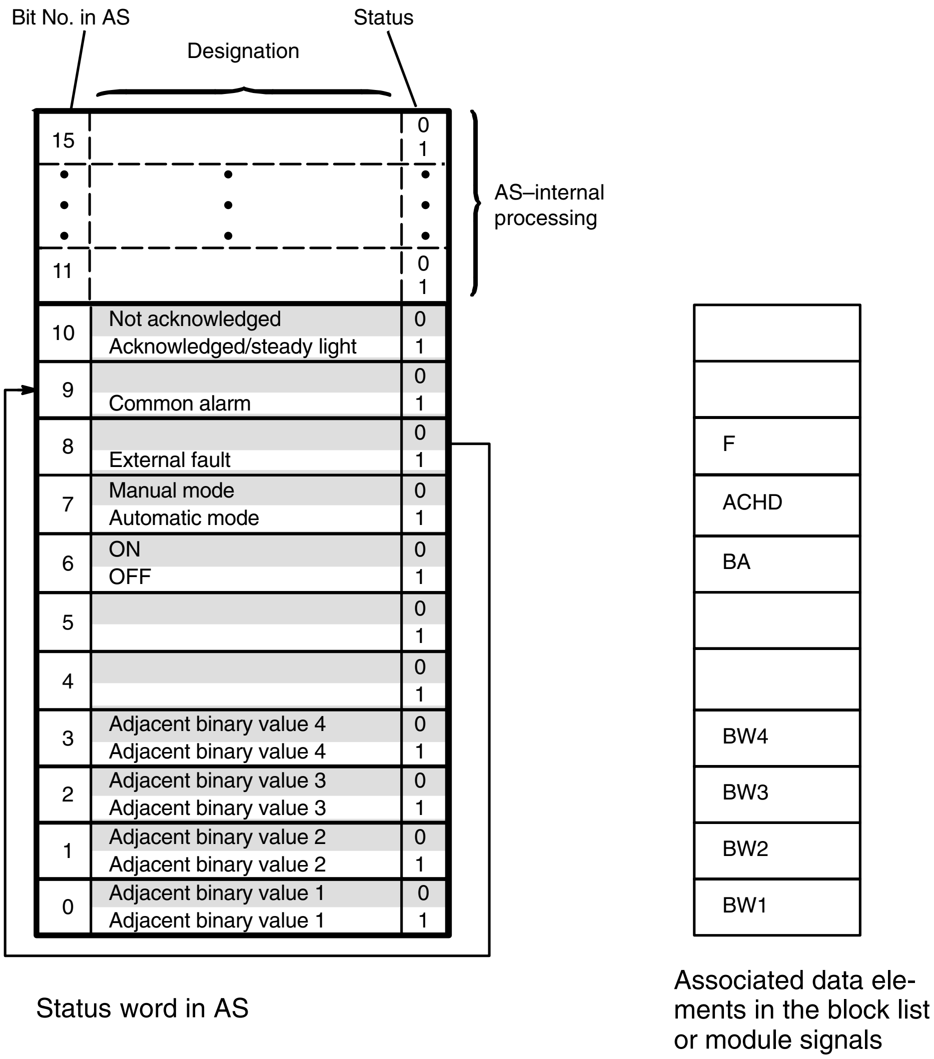
Meaning	Mnemonic name	Input / output No.	Type
Output value (binary)	BA	1	AB
Mode (AC = 1, HD = 0)	ACHD	2	AB
”Automatic value”	AW	1	EB
Automatic ”1”	AC	2	EBV
Manual ”1”	HD	3	EBV
ON ”1”	EI	4	EBV
OFF ”1”	AU	5	EBV
Enable peripheral output ”1”	FPA	6	EB
Adjacent binary value 1	BW1	7	EB
Adjacent binary value 2	BW2	8	EB
Adjacent binary value 3	BW3	9	EB
Adjacent binary value 4	BW4	10	EB
External fault	F	11	EB
GB address	GBA	12	EB
Group display: no./location no.	NRPL	13	ID
Cf. loop display	TAW	14	S2
Cf. loop display	TAC	15	S2
Cf. loop display	THD	16	S2
Cf. loop display	TEI	17	S2
Cf. loop display	TAU	18	S2
Cf. loop display	TBW1	19	S2
Cf. loop display	TBW2	20	S2
Cf. loop display	TBW3	21	S2
Cf. loop display	TBW4	22	S2
Cf. loop display	TF	23	S2
Cf. loop display	AT	24	S16

- Block list

```
   A       1                03. 03. 83/ 08. 00. 06. P:     1

 1 AB   BA     0                                    N     24
 2 AB   ACHD   0                                    N     25
 1 EB   AW     0                  P                        1
 2 EBV  AC     0                                    B      2
 3 EBV  HD     1                                    B      3
 4 EBV  EI     0                                   CB      4
 5 EBV  AU     1                                   CB      5
 6 EB   FPA    0                  P                        6
 7 EB   BW1    0             A    P                        7
 8 EB   BW2    0             A    P                        8
 9 EB   BW3    0             A    P                        9
10 EB   BW4    0             A    P                       10
11 EB   F      0                  P                       11
12 EB   GBA                       P                 Q     12
13 ID   NRPL      0                               C       13
14 S2   TAW    AW                                         14
15 S2   TAC    AC                                         15
16 S2   THD    HD                                         16
17 S2   TEI    EI                                         17
18 S2   TAU    AU                                         18
19 S2   TBW1   B1                                         19
20 S2   TBW2   B2                                         20
21 S2   TBW3   B3                                         21
22 S2   TBW4   B4                                         22
23 S2   TF     F                                          23
24 S16  AT     * TECHNOLOG. NAME      16                  30
```

- Status word



ACHD	Automatic/manual mode
BA	Output value (binary)
BW 1 ... 4	Adjacent binary value 1 ... 4
F	External fault

Fig. 9.6 Status word for the A block

A110

Binary output block for S5–110A link

Application

This block is used as a driver block for the output of 8 or 16 binary values to an interface module for SIMATIC S5 peripheral devices or to TELEPERM M standard binary outputs.

See Chap. 9.2 for interface and binary output modules.

Method of Operation

The A110 driver block transfers 8 or 16 binary values, starting at a parameterized start address (KNR), to the S5–110A interface module or to a standard binary output module (linking signal converter, see Figs. 9.7 and 9.8). The number of binary values to be output depends on the BA1 and BA2 parameters:

BA1 = 0,	BA 2 any value	: The whole block is switched off.
BA1 ≠ 0,	BA 2 = 0	: 8 binary values (A1 to A8). Odd channel numbers are permitted.
BA1 ≠ 0,	BA 2 ≠ 0	: 16 binary values. Only even channel numbers are permitted.

The module number can be selected in the range from 0 to 60 or 100 to 145. Up to four S5–110A controllers can be connected to one S5–110A interface module. Each S5–110A controller can be equipped with

– 7 modules with 8 binary values each (= 56 binary values) in a 1–tier structure
– 15 modules with 8 binary values each (= 120 binary values) in a 2–tier structure

The interface module can be cyclically monitored by the driver (jumper setting). The driver block of the interface module specifies a monitoring time in this mode. The interface module can switch the binary output modules of the S5–110A controller to latched operation, or reset them (jumper setting) if the driver has not accessed the interface module within the specified monitoring time. The channel number (KNR) is used to select two adjacent modules in the S5–110A controller by BA2 ≠ 0 (channel number = even module number in the S5–110A controller), if 16 binary values are transferred.

- Channel number (KNR) for S5–110A (1–tier)

1. S5–110A: Channel number	0 :	binary value 1 – 16	module	0 + 1
	2 :	binary value17 – 32	module	2 + 3
	4 :	binary value33 – 48	module	4 + 5
	6 :	binary value49 – 64	module	6 + ü
2. S5–110A: Channel number	8 :	binary value65 – 80	module	0 + 1
	10 :	binary value81 – 96	module	2 + 3
	12 :	binary value97 – 112	module	4 + 5
	14 :	binary value113–128	module	6 + ü
3. S5–110A: Channel number	16 :	binary value129–144	module	0 + 1
	18 :	binary value145–160	module	2 + 3
	20 :	binary value161–176	module	4 + 5
	22 :	binary value177–192	module	6 + ü
4. S5–110A: Channel number	24 :	binary value193–208	module	0 + 1
	26 :	binary value209–224	module	2 + 3
	28 :	binary value225–240	module	4 + 5
	30 :	binary value241–256	module	6 + ü

The last eight binary values of each S5–110A controller are reserved for the specification of a monitoring time.

- Channel number (KNR) for S5–110A (2–tier)

1. S5–110A: Channel number	0 :	binary value 1 – 16	module	0 + 1
	2 :	binary value17 – 32	module	2 + 3
	4 :	binary value 33– 48	module	4 + 5
	6 :	binary value 49– 64	module	6 + 7
	8 :	binary value 65– 80	module	8 + 9
	10 :	binary value 81– 96	module	10 + 11
	12 :	binary value 97– 113	module	12 + 13
	14 :	binary value113–128	module	14 + ü
2. S5–110A: Channel number	16 :	binary value129–144	module	0 + 1
	18 :	binary value145–160	module	2 + 3
	20 :	binary value161–176	module	4 + 5
	22 :	binary value177–192	module	6 + 7
	24 :	binary value193–208	module	8 + 9
	26 :	binary value209–224	module	10 + 11
	28 :	binary value225–240	module	12 + 13
	30 :	binary value257–275	module	14 + ü
3. S5–110A: Channel number	32 :	binary value257–275	module	0 + 1
	34 :	binary value276–291	module	2 + 3

⋮

etc. to

⋮

4. S5–110A: Channel number 62 : binary value 496 – 512 module 14 + m

m = monitoring time

The last eight binary values of each S5–110A are reserved for the specification of a monitoring time.

Output BGF will be set if an incorrect module number has been set on the module or in the S5–110A block, or if more than one module replies to the same module number.

One or two bytes are written, each corresponding to a group of 8 binary values. In accordance with the group mode (BA1 or BA2), these binary values can be transferred either from a binary field (GB block) which has been interconnected with A1 or A9 (see Fig. 9.7) or from individual binary variables (see Fig. 9.8) which are interconnected with A1 to A8 or A9 to A16. The number of bytes transferred and the related channel address depend on the parameters BA1, BA2 and KNR.

BA1 = 0, BA2 any	:	Whole block de–activated
BA1 ≠ 0, BA2 = 0	:	1 byte is transferred to address = KNR. KNR may be odd or even.
BA1 ≠ 0, BA2 ≠ 0	:	2 bytes are transferred to the even address KNR and the subsequent channel address. The next smaller even address is used if KNR is odd.

There are two points in which the mode BA2 = 3 differs from the modes BA2 = 1 and BA2 = 2:

1. The driver only monitors the interface module for failure if mode BA2 = 3 has been selected. The driver then reads the transfer buffer prior to writing. Error message S 321 will be issued if the value differs from zero in two consecutive readings. In normal operation, the interface module sets the transfer buffer to zero between two write access operations of the A110 driver.

2. The inputs A9 ... A16 are inactivated if mode BA2 = 3 has been selected. Instead of these inputs, the monitoring time

   $m = 4 * T + 1$ (T = period of cyclic driver processing),
   which is used for monitoring the S5–110A driver by the interface module, is transferred to the module.

Specifying a monitoring time is only expedient if

KNR = 6, 14, 22, 30 (for 1–tier S5–110A)
KNR = 14, 30, 46, 62 (for 1–tier S5–110A)

and if the associated jumpers on the interface module have been set.
In modes BA2 = 1 or BA 2 = 2, the inputs A9 to A16 can be used to select the monitoring time. The following significance of the bit positions then applies:

128 / 64 / 32 / 16 / 8 / 4 / 2 / 1
A16 / A15 / A14 / A13 / A12 / A11 / A10 / A9

e.g. m = 37: A14 = A11 = A9 = 1
A16 = A15 = A13 = A12 = A10 = 0

The selected value m represents the monitoring time in seconds. For firmware versions before A2 the monitoring time is m/2 seconds.

A parameter in the GB.ORPA (GB29) block can be used to suppress the output of faulty binary values. Error message S 322 will be issued if faulty binary output values are detected.

An E110 driver block may be used to read flags from the A110 driver, e.g. shut–down due to driver failure during driver monitoring (cf. E110 for flags). For this purpose, an E110 driver must be parameterized such that it uses the same channel in the S5–110A controller for access as does the A110 driver to transfer the monitoring time. The module number of this E110 driver must be identical to the module number at the receiver end of that interface module whose transmitter end is assigned to the A110 driver. (Two module numbers for transmitting and receiving on one interface module.) The channel numbers of the communicating A110 and E110 drivers must be identical.

- Meaning of the parameters

BA1	= 0	:	no processing, block switched off
	= 1	:	interconnection of A1 is considered as a field address
	≥ 2	:	interconnection of A1 to A8 is considered as an individual address
A1		:	binary value 1
A2		:	binary value 2
A3		:	binary value 3
A4		:	binary value 4
A5		:	binary value 5
A6		:	binary value 6
A7		:	binary value 7
A8		:	binary value 8
BA2	= 0	:	2nd group connected
	= 1	:	interconnection of A9 is considered as a field address
	= 2	:	interconnection of A9 to A16 is considered as an individual address
	= 3	:	cycle definition
	> 3	:	same as BA2 = 2
A9		:	binary value 9
A10		:	binary value 10
A11		:	binary value 11
A12		:	binary value 12
A13		:	binary value 13
A14		:	binary value 14
A15		:	binary value 15
A16		:	binary value 16

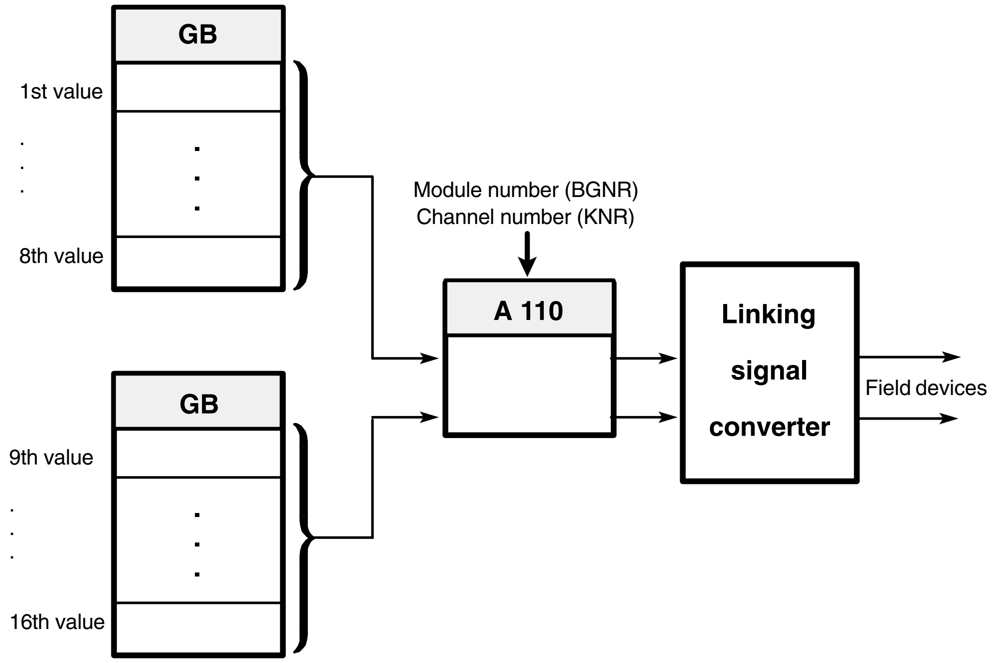


Fig. 9.7 Binary output block for S5–110 A communication, logic diagram: BA1/BA2 = 1

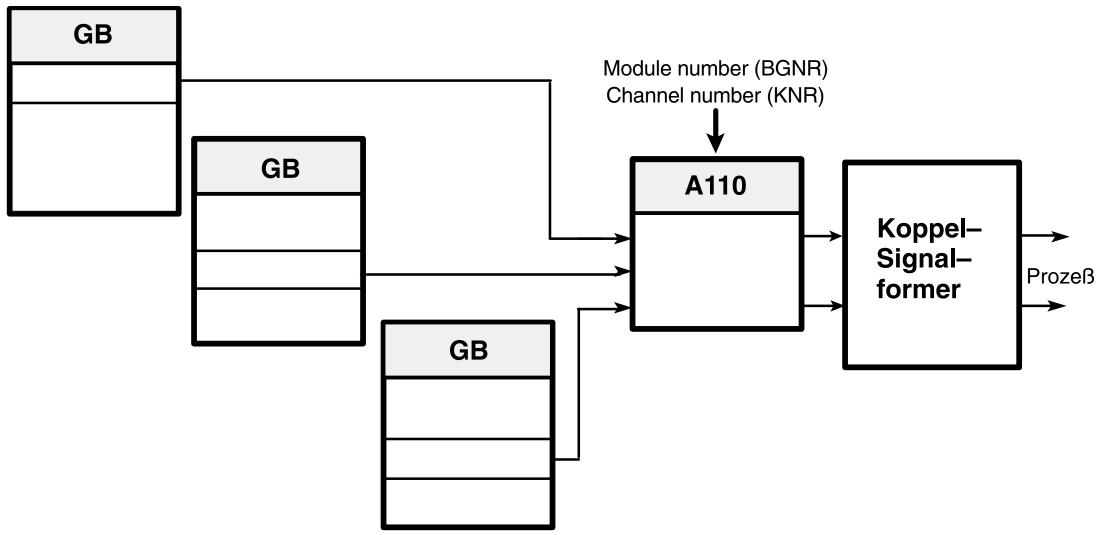


Fig. 9.8 Binary output block for S5–110 A communication, logic diagram: BA1/BA2 = 1

- System messages

S 304: Address error in block
S 305: Time–out from external devices
S 313: Multiple addressing from external devices
S 321: Module malfunction
S 322: Fault bit has been detected in the output value

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Module fault	BGF	1	PB
Mode 1	BA1	1	I
Binary value 1	A1	2	EB
" 2	A2	3	EB
" 3	A3	4	EB
" 4	A4	5	EB
" 5	A5	6	EB
" 6	A6	7	EB
" 7	A7	8	EB
" 8	A8	9	EB
Mode 2	BA2	10	I
Binary value 9	A9	11	EB
" 10	A10	12	EB
" 11	A11	13	EB
" 12	A12	14	EB
" 13	A13	15	EB
" 14	A14	16	EB
" 15	A15	17	EB
" 16	A16	18	EB
Module number	BGNR	19	I
Channel number	KNR	20	I

- Block list

```
     A110    1                   03.03.83 /  08.01.15. P:      1

 1   PB   BGF     0                                        N     21
 1   I    BA1         0                                           1
 2   EB   A1      0             P                                 2
 3   EB   A2      0             P                                 3
 4   EB   A3      0             P                                 4
 5   EB   A4      0             P                                 5
 6   EB   A5      0             P                                 6
 7   EB   A6      0             P                                 7
 8   EB   A7      0             P                                 8
 9   EB   A8      0             P                                 9
10   I    BA2         2                                          10
11   EB   A9      0             P                                11
12   EB   A10     0             P                                12
13   EB   A11     0             P                                13
14   EB   A12     0             P                                14
15   EB   A13     0             P                                15
16   EB   A14     0             P                                16
17   EB   A15     0             P                                17
18   EB   A16     0             P                                18
19   I    BGNR        0                                  C       19
20   I    KNR         0                                  C       20
```

AA

Analog output block

Application

This block is used to output an analog signal via an interface module (6DS1 321–8AA) and a channel of an analog output module or a SIMATIC S5 analog output module (6DS1 702–8AA).

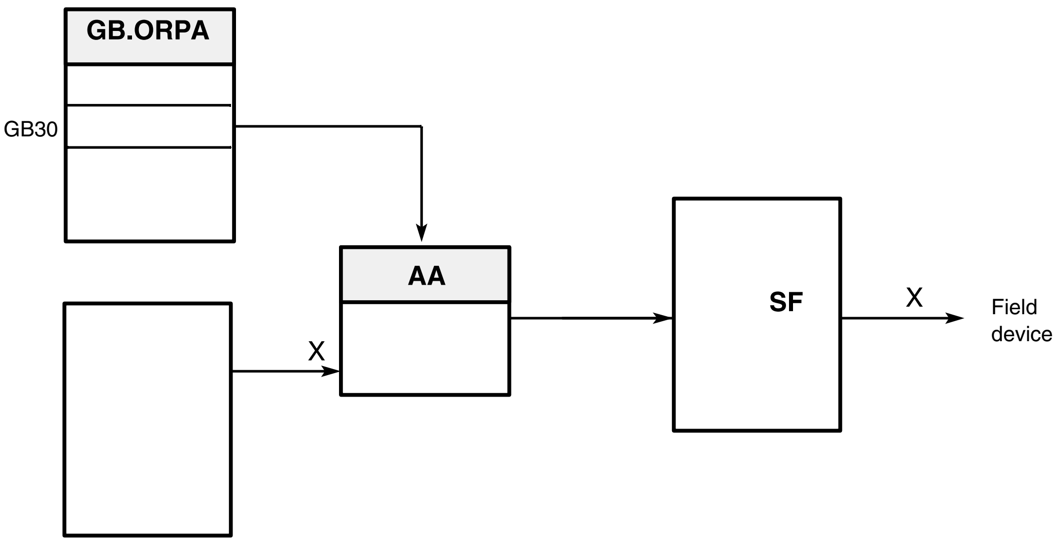
Method of Operation

This block converts an analog value from the internal floating point representation into an output signal which is adapted to the respective analog output module. The analog value entered via input 1 (X) is first normalized and limited according to the measuring range (XE, XA), and then fed to the channel of an analog output module which has been parameterized via input 4 (module number)

The driver should be removed or the associated XB switched off, as it should be inactive if the BG number or KNR change.

Always use the figures 0 to 31 to select and address the channels of all modules. It figures between 100 and 131 or 200 and 231 are used, the program will be set to SIMATIC modules which will then be addressed with channel numbers between 0 and 31 (without offset 100 or 200).

Error message S 322 will be issued if, during output, the fault bit has been set in the X value. Output will be performed if GB.ORPA.30 = 0. Output will be disabled if GB30 = 1. The output “BGF” will be set if a hardware fault occurs during output.



AA	Analog output block
GB.ORPA	System interface
SF	Signal converter
x	Analog value

Fig. 9.9 Logic diagram

- Parameterization

  Channel number 0 ... 31 TELEPERM M standard
  Channel number 100 ... 131 SIMATIC S5 bipolar
  Channel number 200 ... 231 SIMATIC S5 unipolar (4 ... 20 mA)

- System message

  S 322: Fault bit detected in output value

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Module fault	BGF	1	AB
Analog value	X	1	EA
Upper range value	XE	2	EA
Lower range value	XA	3	EA
Module number	BGNR	4	I
Channel number on module	KNR	5	I

- Block list

```
  AA     1                03. 03. 83/ 08. 01. 15.   P:  1

1 AB   BGF    0           #                      N      6
1 EA   X      0.0000        P                           1
2 EA   XE     100.00        P                           2
3 EA   XA     0.0000        P                           3
4 I    BGNR       0                            C        4
5 I    KNR        0                            C        5
```

AAF

Analog output block for field multiplexer

Application

This block is used to output analog signals via the FM analog output modules (see Chap. 9.2).

Method of Operation

This block can only be used together with a higher–order FM block (input 8). It converts analog values from internal floating point representation into normalized output signals suitable for analog output modules.

The analog values entered via input 2 (X1) or input 5 (X2) are first normalized and limited according to the measuring ranges (XE1, XA1 or XE2, XA2) and then fed to the FM analog output which has been parameterized via input 9 (KADR). The type selected via input 7 (TYP) defines whether one channel (X1) or two (X1, X2) channels will be serviced.

- Parameterization

  The output of the second analog value (X2) can be switched off via input 7 (TYP), (0 = output X1 and X2, 1 = output X1 only).

  The FM header block is interconnected via input 8 (FMX).

  The number of the FM output module within the field multiplexer is selected via input 9 (KADR). The FM analog output module 6DS1 712–8BA occupies two consecutive module addresses, the first of which is always an even one. If the input KADR is assigned an even number as parameter, the inputs X1 and X2 are switched to the first two outputs of the module. The next two outputs are addressed with an odd module address in the input KADR.

- System messages

  Failure of an analog output will be signalled at the output S1 or S2. These fault outputs indicate common alarms of the respective channel.

Alarm number	Meaning
S 7xy	Module number of the defective peripheral board (0–29) The common alarm includes the following malfunctions: – Module is missing or defective – Wrong FM module type installed – Multiple use of an address (Alarms of the FM central unit are described with the FM block)

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Configuration details
Analog value X1 disturbed	S1	1	AB	
Analog value X2 disturbed	S2	2	AB	
Upper range limit	XE1	1	EA	
Analog value	X1	2	EA	
Lower range limit	XA1	3	EA	
Upper range limit	XE2	4	EA	
Analog value	X2	5	EA	
Lower range limit	XA2	6	EA	
Module type	TYP	7	PB	
Interconnect FM header block	FMX	8	EA	
Module no./board address	KADR	9	I	1)

1) Board address 0 ... 29

- Block list

```
  AAF    1                  15. 08. 84/ 10.26.23. P:  1

1 AB   S1     0              #                         10
2 AB   S2     0              #                         11
1 EA   XE1    100.00             P                      1
2 EA   X1     0.0000             P                      2
3 EA   XA1    0.0000             P                      3
4 EA   XE2    100.00             P                      4
5 EA   X2     0.0000             P                      5
6 EA   XA2    0.0000             P                      6
7 PB   TYP    0                               C         7
8 EA   FMX    0.0000             P            C   Q     8
9 I    KADR       0                           C         9
```

ABR

Analog input/output block for binary arithmetic module

Application

This block is used as a driver block to output one and to input up to six analog signals to the analog extension module (see Chap. 9.2) via the binary arithmetic module.

Up to four ABR blocks can be assigned to each module. Each block can output one and read up to six analog values. One BRBK block, which performs the management of central module–related data, is required for each arithmetic module. The ABR driver reads the block number from the BRBK block, and cannot be executed without this block.

Method of operation

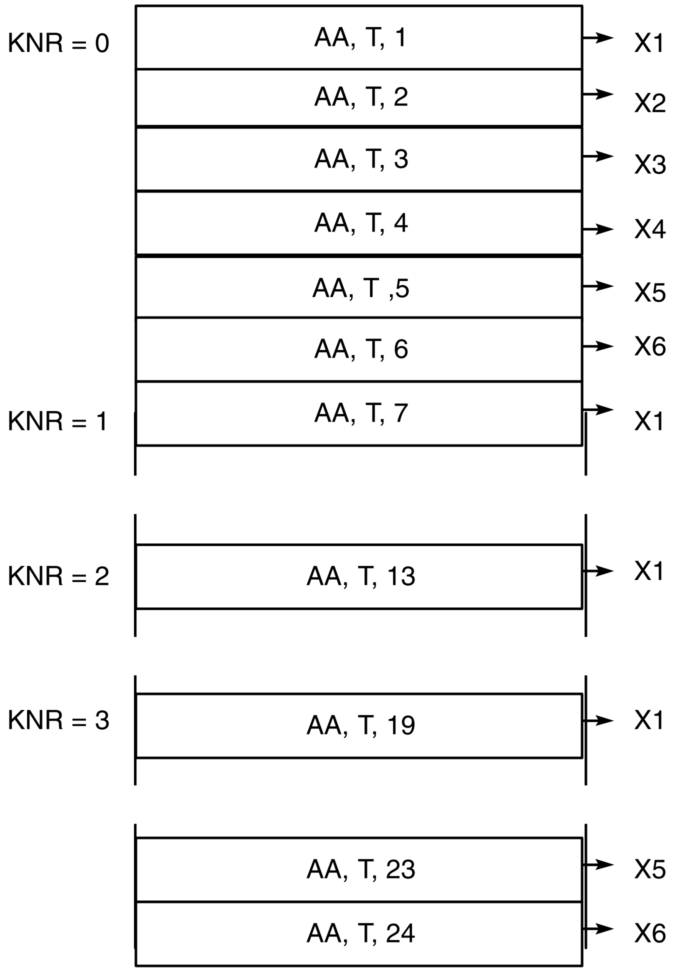
The number of analog values to be transferred is parameterized via input 2 (ANZ). ANZ = 0 means that no execution takes place, ANZ = 1 to 6 specifies the number of analog outputs. Input 1 is always transferred to the module if a value between 1 and 6 has been selected for ANZ. Selectable limits of the analog inputs are not monitored. Non–availability messages and channel–related alarms are provided as output.

ANZ	X1	X2	X3	X4	X5	X6	X7
0	–	–	–	–	–	–	–
1	X	–	–	–	–	–	X
2	X	X	–	–	–	–	X
3	X	X	X	–	–	–	X
4	X	X	X	X	–	–	X
5	X	X	X	X	X	–	X
6	X	X	X	X	X	X	X

The channel number is selected at input 3 (KNR) according to the table:

KNR = 0 = AA, T, 1 to AA, T, 6 and EA, T, 1
1 = AA, T, 7 to AA, T, 12 and EA, T, 2
2 = AA, T, 13 to AA, T, 18 and EA, T, 3
3 = AA, T, 19 to AA, T, 24 and EA, T, 4

☞ The element must be parameterized (even in the case of parameterization with 0) since the acceptance of the parameter KNR in internally used addresses takes place during parameterization of KNR.



The analog values 1 to 19 (KNR = 0–2) are defined as analog values acquired via the hardware inputs or as arithmetic values by user configuration on the module. As the modules features a maximum of 18 analog hardware inputs, only arithmetic values may be transferred for the analog values 19 to 24.

Selectable limits of the analog values are not monitored. Non–availability messages and channel–related alarms are provided at the outputs X1 to X6. A status signal providing information regarding the fault–free states of the associated analog signals is issued via the outputs KF1 to KF6.

KFx is present if

– the analog value is not available
– the module cannot be addressed

The block name of the higher–order BRBK block only is indicated at input 4 (BRBK). Interconnection to the ABR block is performed in the higher–order BRBK block. The module number is read in the BRBK block.

- System messages

S 305: No acknowledgement from module (incorrect address, incorrect jumper setting or module defective)
S 311: Incorrect module code (wrong module has been installed)
S 313: Multiple use of an address (jumper setting)
S 321: BGF detected in BRBK block or non–availability NV1 to NV6 has been set or incorrect check byte when reading analog output values on the module.
S 324: BRBK block cannot be executed
S 325: BRBK block cannot be found

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Analog output	X1	1	AA
Analog output	X2	2	AA
Analog output	X3	3	AA
Analog output	X4	4	AA
Analog output	X5	5	AA
Analog output	X6	6	AA
Module fault	BGF	7	AB
Non–availability for X1	NV1	8	AB
Non–availability for X2	NV2	9	AB
Non–availability for X3	NV3	10	AB
Non–availability for X4	NV4	11	AB
Non–availability for X5	NV5	12	AB
Non–availability for X6	NV6	13	AB
Channel fault X1	KF1	14	AB
Channel fault X2	KF2	15	AB
Channel fault X3	KF3	16	AB
Channel fault X4	KF4	17	AB
Channel fault X5	KF5	18	AB
Channel fault X6	KF6	19	AB
Analog input 1	X7	1	EA
Number of analog values (0, 1–6)	ANZ	2	I
Channel number (0, 1–3)	KNR	3	I
Number of BRBK block	BRBK	4	S4 [1)]

1) Only block name is displayed

- Block list

ABR	1					09. 03. 89/ 09. 09. 03. P:			1
1	AA	X1	0.0000	#				N	1
2	AA	X2	0.0000	#				N	2
3	AA	X3	0.0000	#				N	3
4	AA	X4	0.0000	#				N	4
5	AA	X5	0.0000	#				N	5
6	AA	X6	0.0000	#				N	6
7	AB	BGF	0	#				N	7
8	AB	NV1	0	#				N	8
9	AB	NV2	0	#				N	9
10	AB	NV3	0	#				N	10
11	AB	NV4	0	#				N	11
12	AB	NV5	0	#				N	12
13	AB	NV6	0	#				N	13
14	AB	KF1	0	#				N	14
15	AB	KF2	0	#				N	15
16	AB	KF3	0	#				N	16
17	AB	KF4	0	#				N	17
18	AB	KF5	0	#				N	18
19	AB	KF6	0	#				N	19
1	EA	X7	0.0000		P				20
2	I	ANZ	0				C		21
3	I	KNR	0				C		22
4	S4	BRBK						N	23

ABS

Absolute value block

Application

This block is used to yield the absolute value of an input variable.

Method of Operation

This block follows the equation:

$$Y = |X| \qquad \text{for } X \geq 0 \rightarrow Y = X$$

$$\text{for } X < 0 \rightarrow Y = -X$$

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Output value	Y	1	AA
Input value	X	1	EA

- Block list

```
  ABS     1                03. 03. 83/ 08. 02. 57.P:  1

1 AA  Y     0.0000         #                      N    2
2 EA  X     0.0000           P                         1
```

AE

Analog input block

Application

This block is used to measure an external analog signal via the interface module (see Chap. 9.2) and a channel of an analog input module (basic module which may be extended) or a SIMATIC S5 analog input module.

Method of Operation

The block converts a normalized input signal from an analog input module into an analog value of internal floating point representation.

The output value is made available at output 1 (X) as a physical quantity within the parameterized range (XE, XA). If the analog value is outside this range, a message is sent to output 2 (XF). Output 3 (BF) is used to signal a malfunction of the associated analog input module.

The fault bit in “X” is set if a fault indication occurs during measurement. The old value is retained. A faulty input signal (overrange, open–circuit) initiates output of XF = 1 and the error number S 320. A faulty channel initiates output of the error number S 321. “BFG” is set and the error number S 305 issued if the module is defective.

The analog values from SIMATIC modules are monitored for violation of limit values. Permissible values are 3 to 22 mA for unipolar signals and –55 to +55 mA for bipolar signals. An error code (#) in the analog value and the fault indication XF are only set if the measured value is higher or lower than these limits. The last permissible value is then indicated.

The module number (input 9) and the number of the channel on the module (input 4) are parameterized separately.

If either of the parameters BGNR or KNR change, the effects on the subsequent process section must be taken into account, e.g. switch off the XB block for the subsequent process section.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Analog value	X	1	AA
Analog signal disturbed ”1”	XF	2	AB
Module defective ”1”	BGF	3	AB
Upper range limit	XE	1	EA
Lower range limit	XA	2	EA[1]
Module number	BGNR	3	I
Channel number on module	KNR	4	I

1st analog value: KNR = 0 or KNR = 32 or KNR = 100 or KNR = 200
KNR = 0 – 31 : TELEPERM–M–standard (see Chap. 9.2)
KNR = 32 – 63 : 6DS1 701 with NAMUR limits [2]
KNR = 100 – 131: SIMATIC S5 (0 ... 20 mA or –50 ... +50 mA);
SIMATIC module must transfer 2’s complements)
KNR = 200 – 231: SIMATIC S5 (4 ... 20 mA (life zero)

1) If TELEPERM M modules are used, the variable “start of scale” of a bipolar signal should be parameterized with the mean value of the range and not with the lower range limit.

2) The current module indication is still indicated on output X after an overflow (beginning with revision level G01.03)

- Block list

```
  AE      1               03. 03. 93/ 08. 04. 24. P: 1

1 AA  X      0.0000       #                   N    5
2 AB  XF     0            #                   N    6
3 AB  BGF    0            #                   N    7
1 EA  XE     100.00         P                      1
2 EA  XA     0.0000         P                      2
3 I   BGNR       0                          C      3
4 I   KNR        0                          C      4
```


AEF

Analog input block for field multiplexer

Application

This block is used to measure an external analog signal via the FM analog input modules (see Chap. 9.2).

Method of Operation

The block can only be used together with a higher–order FM block (input 14).

It converts normalized input signals from a FM analog input module into analog values of internal floating point representation.

The analog input values are made available at outputs X1 to X4 as physical quantities within the parameterized ranges (XE1, XA1, ..., XE4, XA4). The status of the associated limit value signals is indicated at outputs 9 and 10 if FM limit indicator modules are used.

- Parameterization

  The module type is selected via input 13 (TYP):

TYP	Module	Signals
0	4–channel analog input, 6DS1706–8AA and 6DS1707–8AA	X1 ... X4
1	2–channel limit value indicator, 6DS1710–8AA	X1, X2, G1, G2

  The FM header block is interconnected via input 14 (FMX). Input 15 (KADR) is used to select the module number inside the field multiplexer.

  Code numbers for linearization of measuring characteristics are parameterized via inputs 9 to 12. A separate code number is assigned to each measured value.

- Linearization table

Sensor type	Phys. range (°C)	Sensor voltage	Code number
Linear	–	see FMZT	0
PT 100	– 200 ... + 600	37.06 ... 627.20 mV	1
FeKo	– 200 ... + 700	– 8.15 ... 39.70 mV	2
NiCr–Ni	0 ... 967	0 ... 40.0 mV	3
PtRh–Pt	0 ... 1600	0 ... 16.7 mV	4

- System messages

  Failure of an analog output will be signalled at the outputs S1 to S4.

Alarm number	Meaning
S 321	Incorrect check byte in input value
S 7xy	Module number of the defective peripheral board (0 ... 26) The common alarm includes the following malfunctions: – Module cannot be found or is defective – Overrange (open–circuit) – Multiple use of an address

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Configuration details
Analog value 1	X1	1	AA	
Analog value 2	X2	2	AA	
Analog value 3	X3	3	AA	
Analog value 4	X4	4	AA	
Analog value X1 disturbed	S1	5	AB	
Analog value X2 disturbed	S2	6	AB	
Analog value X3 disturbed	S3	7	AB	
Analog value X4 disturbed	S4	8	AB	
Limit value signal X1, G1	G1	9	AB	
Limit value signal X2, G2	G2	10	AB	
Upper range limit	XE1	1	EA	
Lower range limit	XA1	2	EA	
Upper range limit	XE2	3	EA	
Lower range limit	XA2	4	EA	
Upper range limit	XE3	5	EA	
Lower range limit	XA3	6	EA	
Upper range limit	XE4	7	EA	
Lower range limit	XA4	8	EA	
Linearization code	LIN1	9	I	1)
Linearization code	LIN2	10	I	1)
Linearization code	LIN3	11	I	1)
Linearization code	LIN4	12	I	1)
Module type	TYP	13	PB	
FM header block interconnection	FMX	14	EA	
Module no./board address	KADR	15	I	2)

1) Linearization code: 0...4
2) Board address: 0...26

- Block list

```
   AEF     1               15. 08. 84/ 10. 27. 02.  P: 1

 1 AA  X1   0.0000         #                           16
 2 AA  X2   0.0000         #                           17
 3 AA  X3   0.0000         #                           18
 4 AA  X4   0.0000         #                           19
 5 AB  S1   0              #                           20
 6 AB  S2   0              #                           21
 7 AB  S3   0              #                           22
 8 AB  S4   0              #                           23
 9 AB  G1   0              #                           24
10 AB  G2   0              #                           25
 1 EA  XE1  100.00           P                          1
 2 EA  XA1  0.0000           P                          2
 3 EA  XE2  100.00           P                          3
 4 EA  XA2  100.00           P                          4
 5 EA  XE3  100.00           P                          5
 6 EA  XA3  0.0000           P                          6
 7 EA  XE4  100.00           P                          7
 8 EA  XA4  0.0000           P                          8
 9 I   LIN1     0                             C           9
10 I   LIN2     0                             C          10
11 I   LIN3     0                             C          11
12 I   LIN4     0                             C          12
13 PB  TYP  0                                 C          13
14 EA  FMX  0.0000           P                C    Q     14
15 I   KADR     0                             C          15
```

AKE

Analog linking receiver block

Application

This block is used to receive 28 analog values from the data record of a different bus device's analog linking transmitter block (AKS) via the bus subsystem.

Method of Operation

The analog linking receiver block AKE is used to receive up to 28 analog values transmitted by an AKS block in a different bus device. For the definition of the block names, only figures between 1 and 4095 are valid.

The transmitting device/block and the mode (direct communication DI or common data communication CD) are specified in the configuration instruction

– **`KD,busno,deviceno,AKS,bname;`** (Direct communication DI)
– **`KC,busno,deviceno,AKS,bname;`** (Common data communication CD)

The parameterization will only be accepted without error message if the transmitter block has previously been defined. The definitions (bus/device number and/or block name) are stored in parameters BUSX and/or BSTX respectively. The received analog values are stored in a contiguous area of a GB block.

The block should only be incorporated in a cyclic processing sequence if the parameter UEBW has been used to configure link monitoring. The maximum number of block cycles after which communication (transfer or value) should be performed is then defined. (UEBW = 0: no monitoring; other values 1 to 32,000 cycles.)

If the number of cycles selected has been reached without the value having been updated, the fault output FKOP will be set to "1". FKOP will be cleared when the next values arrive.

Each updating sets the AKT output to "1". AKT is reset to "0" via the input RESE (or by interconnecting AKT with an XA block).

The input GAA, which may be interconnected, is used to specify the start address from which the analog values will be stored in the GA area.

AAD1, EAD1, AAD2 and EAD2 can be used to define two windows by their start and end addresses. These windows can be used to address two different areas from the maximum of 28 analog values. From the starting address GAA, the two windows are joined together without a gap in the GA block.

☞ An AKS block only transmits to one AKE block per coupled bus/participant number. If a second AKE block is coupled to the same AKS block in one AS system, only the AKE block which was coupled last receives data from the AKS block.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Communication fault: no updating during selected monitoring time	FKOP	1	AB
Code “Values updating” (set for each incoming message)	AKT	2	AB
Code “Mode” (0 = CD/1 = DI)	BA	3	AB
RESET input: “AKT” will be cleared each time the block is executed	RESE	1	EB
Monitoring time in processing cycles. Is restarted with each message (—> FKOP)	UEBW	2	ID
Target address for message frame data (GAx specifies starting address for storage)	GAA	3	EA
Bus/device no. of transmitter block (bus no. * 100 + device)	BUSX	4	ID
Transmitter block number	BSTX	5	S4
Show window 1 (no. of value in message frame)	AAD1	6	I
End window 1 (no. of value in message frame)	EAD1	7	I
Start window 2 (no. of value in message frame)	AAD2	8	I
End window 2 (no. of value in message frame)	EAD2	9	I

- Block list

```
  AKE      1                  15. 08. 84/ 10. 27. 02. P:1

1 AB  FKOP 0                                      N    10
2 AB  AKT  0                                      N    11
3 AB  BA   1                                      N    12
1 EB  RESE 0                 P                          1
2 ID  UEBW    0                                 C       2
3 EA  GAA   15   0      0A   P                  C  Q    3
4 ID  BUSX    0                                   N     4
5 S4  BSTX                                        N     5
6 I   AAD1    0                                 C       6
7 I   EAD1    0                                 C       7
8 I   AAD2    0                                 C       8
9 I   EAD2    0                                 C       9
```

AKS

Analog linking transmitter block

Application

This block is used for the transfer of up to 28 analog values from an AS subsystem to up to 6 (DI mode) or all (CD mode) bus devices.

Method of Operation

The analog linking transmitter block (AKS) is used to transfer between 1 and 28 analog values to other bus devices. The receiver may be an OS, a process computer or another AS containing an AKE receiver block. Depending on the mode selected (DI or CD), the following number of receivers may be connected:

– in a DI link up to 6 bus devices or
– in a CD link up to the total number of bus devices with the same bus number.

This function block is incorporated in an acyclic [1] or cyclic sequence cascade (cf. XA–/XB block) in the same manner as any other block. Only numbers between 1 and 4095 are valid for the definition of the block names.

CD mode is only permitted for function blocks with the numbers 1 to 16 in the bus devices 0 to 31. In CD mode, a block number may only be assigned to either an AKS, BKS or ZKS block for the same bus device. The mode is specified (configuration instruction KC,... or KD,...) whilst the receiver blocks are linked together.

Output STOE = 1 indicates that the transmission request has not been accepted by the local bus interface [2]. Output ANZ indicates the number of receivers (AKE) connected. Output BA indicates the mode.

– BA = 0 means CD communication
– BA = 1 means DI communication

The channel number (1 = slow channel, 0 = fast channel) can be selected via input KANR if DI communication has been chosen. This selection specifies whether or not there will be repetitions on transfer level. This input is irrelevant for CD communication.

☞ The maximum number of AKS blocks which are installed in a processing sequence under the same scan parameters should be limited to 10.

⚠ An AKS block only transmits to one AKE block per coupled bus/participant number. If a second AKE block is connected to the same AKS block in one AS system, only the AKE block which was coupled last receives data from the AKS block.

⚠ A communication over bus coupler with a participant on another bus must be made through the slow channel (KANR = 1).

[1] Output STOE must be evaluated in acyclic mode to ensure that data has actually been transmitted.

[2] The AKS block does not detect a fault on the bus (e.g. bus connector has not been plugged in). The cyclic message trafic is monitored at the receiver end.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Code “Mode” (0 = CD/1 = DI)	BA	1	AB
Number of logged–on devices	ANZ	2	AA
Fault output message could not be transmitted	STOE	3	AB
1st value to be transmitted	AW1	1	EA
2nd value to be transmitted	AW2	2	EA
.	.	.	.
.	.	.	.
.	.	.	.
28th value to be transmitted	AW28	28	EA
Channel identifier for DI communication (0 = fast/1 = slow channel)	KANR	29	EBV
Number of values to be transmitted	ANZW	30	I
Bus/device no. of logged–on receivers 1 to 6 (DI communication only)	BUS1	31	ID
	.	.	.
	.	.	.
	.	.	.
	BUS6	36	ID
Block no. of logged–on receivers 1 to 6 (DI communication only)	BST1	37	S4
	.	.	.
	.	.	.
	.	.	.
	BST6	42	S4

- Block list

```
   AKS     1              01. 01. 81/ 00. 00. 43. P:  1

 1 AB  BA   1                                  N    43
 2 AA  ANZ  0.0000                             N    44
 3 AB  STOE 0                                  N    45
 1 EA  AW1  0.0000          P                        1
 2 EA  AW2  0.0000          P                        2
 3 EA  AW3  0.0000          P                        3
 4 EA  AW4  0.0000          P                        4
 5 EA  AW5  0.0000          P                        5
 6 EA  AW6  0.0000          P                        6
 7 EA  AW7  0.0000          P                        7
 8 EA  AW8  0.0000          P                        8
 9 EA  AW9  0.0000          P                        9
10 EA  AW10 0.0000          P                       10
11 EA  AW11 0.0000          P                       11
12 EA  AW12 0.0000          P                       12
13 EA  AW13 0.0000          P                       13
14 EA  AW14 0.0000          P                       14
15 EA  AW15 0.0000          P                       15
16 EA  AW16 0.0000          P                       16
17 EA  AW17 0.0000          P                       17
18 EA  AW18 0.0000          P                       18
19 EA  AW19 0.0000          P                       19
20 EA  AW20 0.0000          P                       20
21 EA  AW21 0.0000          P                       21
22 EA  AW22 0.0000          P                       22
23 EA  AW23 0.0000          P                       23
24 EA  AW24 0.0000          P                       24
25 EA  AW25 0.0000          P                       25
26 EA  AW26 0.0000          P                       26
27 EA  AW27 0.0000          P                       27
28 EA  AW28 0.0000          P                       28
29 EBV KANR 0                                       29
30 I   ANZW    28                            C      30
31 ID  BUS1     0                              N    31
32 ID  BUS2     0                              N    32
33 ID  BUS3     0                              N    33
34 ID  BUS4     0                              N    34
35 ID  BUS5     0                              N    35
36 ID  BUS6     0                              N    36
37 S4  BST1                                    N    31
38 S4  BST2                                    N    32
39 S4  BST3                                    N    33
40 S4  BST4                                    N    34
41 S4  BST5                                    N    35
42 S4  BST6                                    N    36
```

APRO

TML connecting block

Application

This block is used for the installation of a TML program in the sequence list.

Method of Operation

The APRO block is installed in the sequence list and calls, when activated, the TML program which is interconnected with its PROB input. This program is supplied with the variables (GA, .GB, .GT, .GM area, data record) which are interconnected with its inputs.

A TML–PROBLEM can be called by various APRO blocks and thus be supplied with various data records.

```
TML–PROBLEM:  D,PROBLEM,name;
                  TAKE LA1,LA2,LA3,LA4,LA5;
                  GIVE;
                  .
                  .     (TML instruction)
                  .
                  e.g.  MUX GA.LA1;1)     These data records
                  e.g.  SET R.LA5;        can then be used by
                  .                       the TML program
                  .     (TML instruction)
                  .
                  DE;
```

Contents of LA	1:	GAX	(GA area)
	2:	GBX	(GB area)
	3:	GMX	(GM area)
	4:	GTX	(GT area)
	5:	DSX	(data record of a different block)

[1] Mode MPX = 0: PROBLEM uses fixed multiplex areas (GA, GB, block data records), such as **SET P.300; MUX GA.3;**

MPX = 1: Multiplex mode
PROBLEM uses the data records transferred by the APRO block.
SET R.LA5;, for example, is only possible in this mode.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
TML–PROBLEM	PROB	1	EA
GA area	GAX	2	EA
GB area	GBX	3	EB
GM area	GMX	4	EB
GT area	GTX	5	EA
Block data record	DSX	6	EA
Multiplex switch	MPX	7	PB

- Block list

```
   APRO    1              03. 03. 83/ 00. 02. 45. P:  1

 1 EA  PROB                 P                 C  Q     1
 2 EA  GAX                  P                 C  Q     2
 3 EB  GBX                  P                 C  Q     3
 4 EB  GMX                  P                 C  Q     4
 5 EA  GTX                  P                 C  Q     5
 6 EA  DSX                  P                 C  Q     6
 7 PB  MPX   0              P                          7
```

AR

Analog input routing block

Application

The AR blocks are used for measuring up to 8 analog process variables, converting these variables into physical quantities and storing them in GA blocks for further processing/interconnection or interconnecting them directly (see Chap. 9.2).

Method of Operation

The block converts up to 8 normalized input signals of an analog module into analog values of internal floating point representation. The stored analog values are available in GA blocks for further processing/interconnection or can be directly interconnected.

Setting of the base value:

Channel no. ”KNR = 0”: 0th analog value is base value;
i.e. the analog values 0,1, ..., 7 will be read.

Channel no. ”KNR = 1”: 1st analog value is base value;
i.e. the analog values 1,2, ..., 8 will be read.

Channel no. ”KNR = 2”: 2nd analog value is base value;
i.e. the analog value 2, 3, ..., 9 will be read.

.
.
.

Channel no. ”KNR = 24”: 24th analog value is base value;
i.e. the analog values 24, 25, to 31 will be read.

Using a value for KNR which differs from zero is only expedient if analog input modules are used which feature more than eight analog inputs.

If a hardware fault occurs, output “BGF = 1” is set, all interconnected targets supplemented by a fault bit and the old values retained. If a channel alarm (MU fuse tripped) occurs, the individual value is marked by a fault bit.

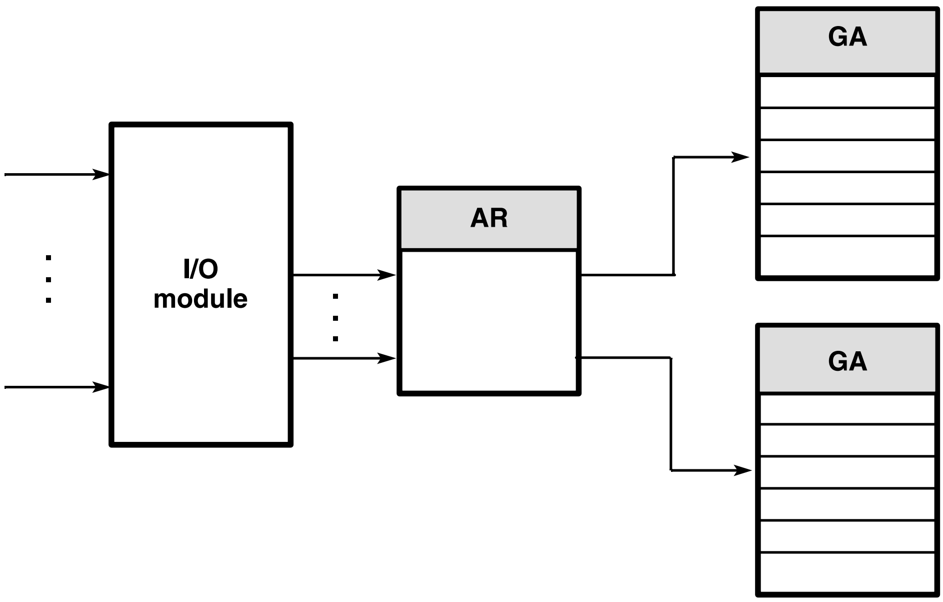


Fig. 9.10 Block diagram

- System messages

S 305 Time–out from external devices
S 320 Open–circuit, overrange
S 321 Module faults

- Data structure

Meaning	Mnemonic name	Input/Output No.	Type
Module fault	BGF	1	AB
Upper range limit 1	XE1	1	EA
Lower range limit 1	XA1	2	EA
Upper range limit 2	XE2	3	EA
Lower range limit 2	XA2	4	EA
Upper range limit 3	XE3	3	EA
Lower range limit 3	XA3	6	EA
Upper range limit 4	XE4	7	EA
Lower range limit 4	XA4	8	EA
Upper range limit 5	XE5	9	EA
Lower range limit 5	XA5	10	EA
Upper range limit 6	XE6	11	EA
Lower range limit 6	XA6	12	EA
Upper range limit 7	XE7	13	EA
Lower range limit 7	XA7	14	EA
Upper range limit 8	XE8	15	EA
Lower range limit 8	XA8	16	EA
GA address 1	GAA1	17	EA
GA address 2	GAA2	18	EA
GA address 3	GAA3	19	EA
GA address 4	GAA4	20	EA
GA address 5	GAA5	21	EA
GA address 6	GAA6	22	EA
GA address 7	GAA7	23	EA
GA address 8	GAA8	24	EA
Module number	BGNR	25	I
Channel number	KNR	26	I

- Block list

```
   AR      1                01. 01. 81/ 00. 00. 43. P:  1

 1 AB  BGF  0               #                     N    27
 1 EA  XE1  100.00            P                          1
 2 EA  XA1  0.0000            P                          2
 3 EA  XE2  100.00            P                          3
 4 EA  XA2  0.0000            P                          4
 5 EA  XE3  100.00            P                          5
 6 EA  XA3  0.0000            P                          6
 7 EA  XE4  100.00            P                          7
 8 EA  XA4  0.0000            P                          8
 9 EA  XE5  100.00            P                          9
10 EA  XA5  0.0000            P                         10
11 EA  XE6  100.00            P                         11
12 EA  XA6  0.0000            P                         12
13 EA  XE7  100.00            P                         13
14 EA  XA7  0.0000            P                         14
15 EA  XE8  100.00            P                         15
16 EA  XA8  0.0000            P                         16
17 EA  GAA1                   P                     Q   17
18 EA  GAA2                   P                     Q   18
19 EA  GAA3                   P                     Q   19
20 EA  GAA4                   P                     Q   20
21 EA  GAA5                   P                     Q   21
22 EA  GAA6                   P                     Q   22
23 EA  GAA7                   P                     Q   23
24 EA  GAA8                   P                     Q   24
25 I   BGNR      0                              C       25
26 I   KNR       0                              C       26
```

ASL

Analog value switching block

Application

This block is used for switching analog values

Method of Operation

The block can be used to connect one out of two analog input variables to an output (relay), depending on the status of a control input (S).

Y = X1 for S = 0
Y = X2 for S = 1

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
Input value	X1	1	EA
Input value	X2	2	EA
Control input	S	3	EB

- Block list

```
   ASL    1              03. 03. 83/ 00. 04. 21. P:  1

 1 AA  Y    0.0000       #                     N    4
 1 EA  X1   0.0000         P                        1
 2 EA  X2   0.0000         P                        2
 3 EB  S    0              P                        3
```

B

Operator communication block

Application

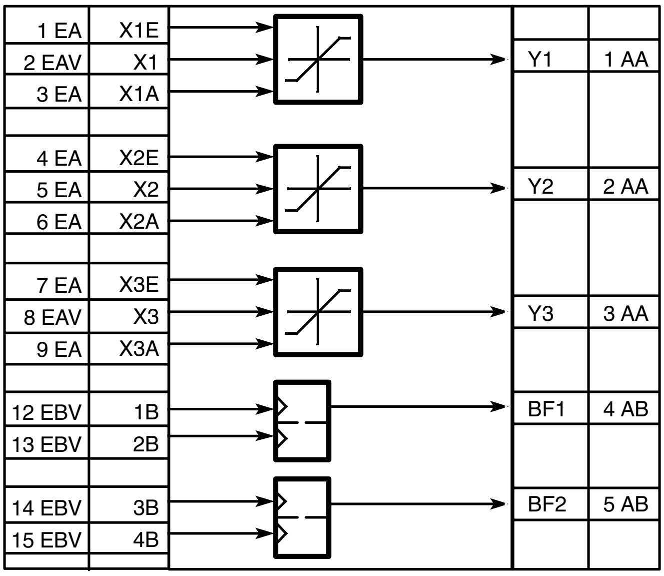
This block is used for the display of analog values (e.g. internal results of arithmetic operations) and for manipulating analog and digital values (e.g. specification of constant values).

In conventional technology, the block corresponds to the operator control and display elements in control board systems (TELEPERM C, SIMATIC) or to the TELEPERM 300 operation and control stations.

Method of Operation

The input variables (X1, X2 and X3) are displayed within their measuring ranges (X1E, X1A, X2E, X2A and X3E, X3A). The process communication keyboard can be used to control the two inputs (X1 and X3) within their measuring spans.

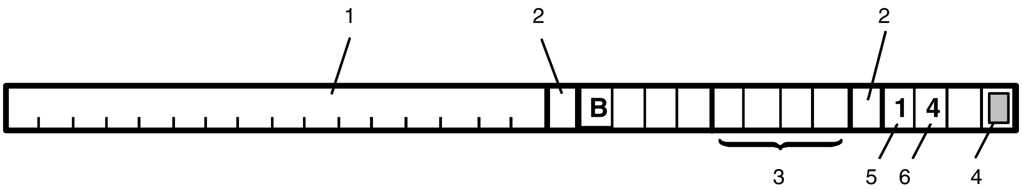
The three limited analog values are available at the outputs Y1, Y2 and Y3. The four keys (B1 to B4) on the process communication keyboard can be used to control two binary functions (BF1 and BF2).



B	PBT keys
BF	Binary function
X1, X2, X3	Analog input variables
X1A, X2A, X3A	Lower range limit of the analog input variables
X1E, X2E, X3E	Upper range limit of the analog input variables
Y1, Y2, Y3	Output values

Fig. 9.11 Operator communication block, logic diagram

- Normalized representation in a group display



1 Process–related name of the output block, as in the loop display
2 Separating blank
3 Name/number of the operator communication block
4 Blinking mark if the alarm signal “External fault” is active
5 “1” if the binary function 1 is active
6 “4” if the binary function 2 is not active

Fig. 9.12 Operator communication block; normalized representation in a group display

Input 22 (group display: no./location no.) is parameterized in the following manner to display the block by 30 characters at a specific location in a group display:

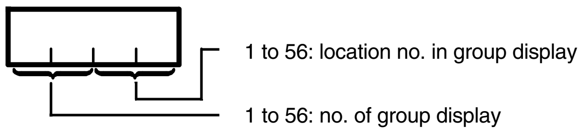


Fig. 9.13 Operator communication block: parameterization of input 22

Set input 22 to “0” if the normalized representation of the block in a group display is to be suppressed. Set GPU to 1 to suppress the transmission of the status word and the fading in of the blinking symbol in the AS.

- Normalized representation of the loop display

  The following loop display (Fig. 9.14) contains the below–mentioned static and dynamic information:

Static data

1 Mnemonic name and name of the operator communication block
2 Process–related name of the operator–communication block
3 Process–related names of adjacent analog values
4 Process–related names of adjacent binary values (B1, B2, B3, B4) [1)]
5.1 Operator communication block variable X1 [1)]
5.2 Operator communication block variable X2 [1)]
5.3 Operator communication block variable X3 [1)]
6 Binary functions (B1, B2, B3, B4) [1)]
7 Alarm signal ”External Fault” [1)]
8 Process–related names of adjacent analog values
9 Physical quantity of the input variable X1
10 Physical quantity of the adjacent analog values
11 Physical quantity of the input variable X2
12 Lower range limit of the input variable X1
13 Upper range limit of the input variable X1
14 Lower range limit of the input variable X2
15 Upper range limit of the input variable X2
16 Mnemonic name of the bars (X1, X2) [1)]

Dynamic data

17 Input variable X1 as bar (analog display)
18 Input variable X2 as bar (analog display)
19 Input variable X1 (digital display)
20 Input variable X2 (digital display)
21 Input variable X3 (digital display)
22 Digital display of the adjacent analog values
23 States of the binary functions
e.g. 1B = ”1” binary function 1 **”ON”**
2B = ”0”
3B = ”0” binary function 2 **”OFF”**
4B = ”1”
24 Status “External fault”; “1” fault has occurred
25 States of the adjacent binary values

1) Pre–defined mnemonic names

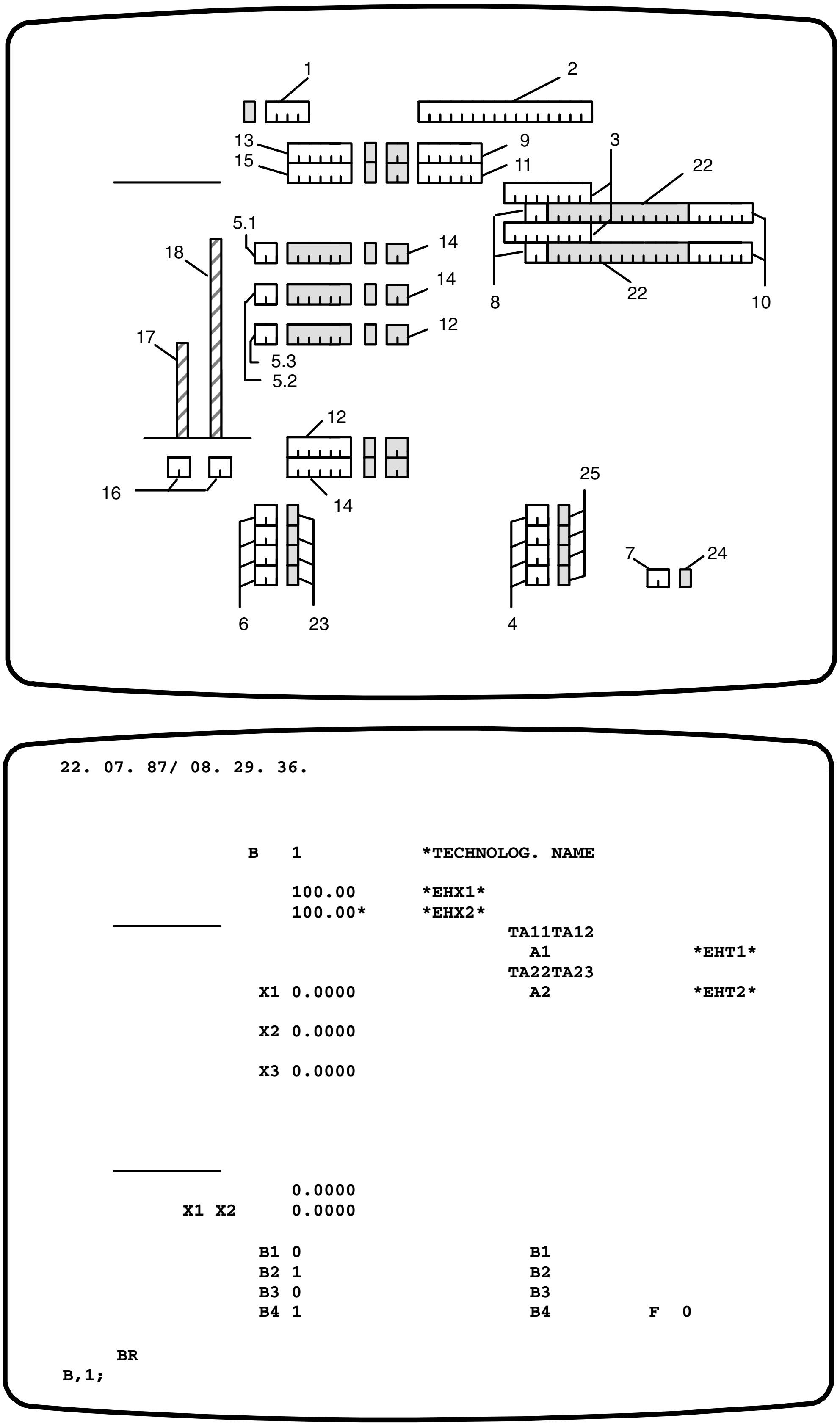


Fig. 9.14 Operator communication block; normalized representation in a loop display

- Operator input using the process communication keyboard

  Six function keys (X1 =, X3 =, B1 = 1, B2 = 1, B3 = 1 and B4 = 1) will be assigned after the loop display has been selected and the key “Operator input” (BE) depressed.

  After the key (X1 = or X3 =) has been depressed, a sequence of numbers may be entered and terminated by pressing the execute key (◈). The keys “More” (↑) or “Less“ (↓) may be pressed to continue, without previously entering figures. The execute key (◈), normally required for termination, need not be pressed in this case. The change is approximately 1% of the measuring span per processing cycle.

  If a greater change is required, the appropriate key “More” (↑) or “Less” (↓) is to be pressed together with the key “High–speed” (~). The change is then approximately 10% of the measuring span per processing cycle.

  The function key inputs B1 = 1, B2 = 1, B3 = 1 und B4 = 1 must be terminated by pressing the (◈) key.

X1 =	X3 =	B1 = 1	B2 = 1	B3 = 1	B4 = 1		

B1	Binary function 1 “ON“
B2	Binary function 1 “OFF“
B3	Binary function 2 “ON“
B4	Binary function 2 “OFF”
X1,3	Input variable 1,3

Fig. 9.15 Operator communication block, automatic assignment of the process communication keyboard

- Data structure (designation of inputs and outputs)

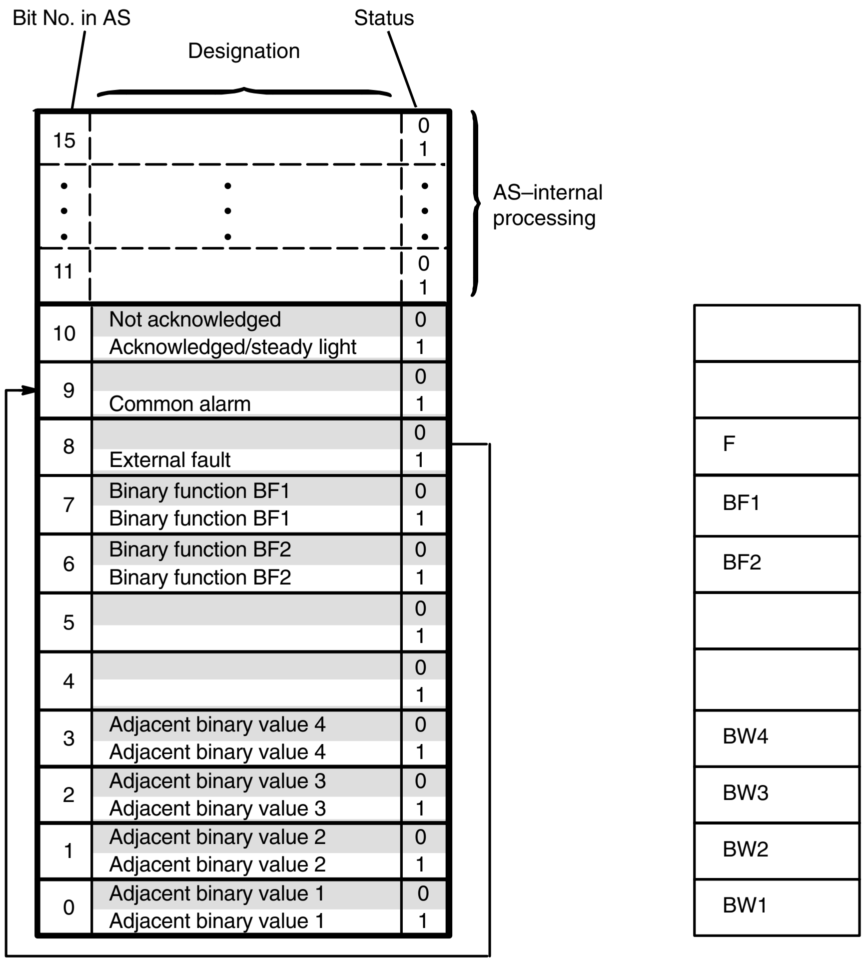
Meaning	Mnemonic name	Input/output No.	Type
Output variable 1	Y1	1	AA
Output variable 2	Y2	2	AA
Output variable 3	Y3	3	AA
Binary function 1	BF1	4	AB
Binary function 2	BF2	5	AB
Upper range limit 1	X1E	1	EA
Lower range limit 1	X1	2	EAV
Input variable 1	X1A	3	EA
Upper range limit 2	X2E	4	EA
Input variable 2	X2	5	EA
Lower range limit 2	X2A	6	EA
Upper range limit 3	X3E	7	EA
Input variable 3	X3	8	EAV
Lower range limit 3	X3A	9	EA
Adjacent analog value 1	AW1	10	EA
Adjacent analog value 2	AW2	11	EA
Binary function 1 ON	B1	12	EBV
Binary function 1 OFF	B2	13	EBV
Binary function 2 ON	B3	14	EBV
Binary function 2 OFF	B4	15	EBV
Adjacent binary value 1	BW1	16	EB
Adjacent binary value 2	BW2	17	EB
Adjacent binary value 3	BW3	18	EB
Adjacent binary value 4	BW4	19	EB
External fault	F	20	EB
Suppression group display ”1”	GPU	21	EB
Group display: no./location no.	NRPL	22	ID
cf. loop display	TX1	23	S2
”	TX2	24	S2
”	TX3	25	S2
”	TB1	26	S2
”	TB2	27	S2
”	TB3	28	S2
”	TB4	29	S2
”	TAW1	30	S2
”	TAW2	31	S2
”	TBW1	32	S2
”	TBW2	33	S2
”	TBW3	34	S2
”	TBW4	35	S2
”	TF	36	S2
”	EHX1	37	S
”	EHX2	38	S
”	TA11	39	S4
”	TA12	40	S4
”	EHT1	41	S
”	TA21	42	S4
”	TA22	43	S4
”	EHT2	44	S
”	AT	45	S16

- Block list

```
   B       1                01. 01. 81/ 00. 00. 43. P:  1

 1 AA  Y1   0.0000          #                     N    45
 2 AA  Y2   0.0000          #                     N    46
 3 AA  Y3   0.0000          #                     N    47
 4 AB  BF1  0                                     N    48
 5 AB  BF2  0                                     N    49
 1 EA  X1E  100.00            P                         1
 2 EAV X1   0.0000                              CB      2
 3 EA  X1A  0.0000            P                         3
 4 EA  X2E  100.00            P                         4
 5 EA  X2   0.0000            P                         5
 6 EA  X2A  0.0000            P                         6
 7 EA  X3E  100.00            P                         7
 8 EAV X3   0.0000                              CB      8
 9 EA  X3A  0.0000            P                         9
10 EA  AW1   15      0     0A  P                        10
11 EA  AW1   15      0     0A  P                        11
12 EBV B1   0                                    B     12
13 EBV B2   0                                    B     13
14 EBV B3   0                                    B     14
15 EBV B4   0                                    B     15
16 EB  BW1  0              A  P                        16
17 EB  BW2  0              A  P                        17
18 EB  BW3  0              A  P                        18
19 EB  BW4  0              A  P                        19
20 EB  F    0                 P                        20
21 EB  GBU  0                 P                        21
22 ID  NRPL     0                               C      22
23 S2  TX1  X1                                         23
24 S2  TX2  X2                                         24
25 S2  TX3  X3                                         25
26 S2  TB1  B1                                         26
27 S2  TB2  B2                                         27
28 S2  TB3  B3                                         28
29 S2  TB4  B4                                         29
30 S2  TAW1 A1                                         30
31 S2  TAW2 A2                                         31
32 S2  TBW1 B1                                         32
33 S2  TBW2 B2                                         33
34 S2  TBW3 B3                                         34
35 S2  TBW4 B4                                         35
36 S2  TF   F                                          36
37 S   EHX1 *EHX1*               6                     37
38 S   EHX2 *EHX2*               6                     38
39 S4  TA11 TA11                                       39
40 S4  TA12 TA12                                       40
41 S   EHT1 *EHT1*               6                     41
42 S4  TA21 TA22                                       42
43 S4  TA22 TA23                                       43
44 S   EHT2 *EHT2*               6                     44
45 S16 AT   *TECHNOLOG. NAME    16                     58
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

BF1, 2	Binary function 1, 2
BW1 ... 4	Adjacent binary value 1 ... 4
F	External fault

Fig. 9.16 Status word for the B block

BAF

Binary output block for field multiplexer

Application

This block is used for the output of binary signals via a field multiplexer (FM) binary output module (see Chap. 9.2). The binary signals can be freely assigned to the FM modules.

Method of Operation

The block can only be used together with a higher–order FM block (input 1). Beginning with the interconnection address specified in input 2 (GBA), it transfers a number of bytes (= 8 bits), which can be parameterized via input 4 (ANBY), from the binary area in AS 235 to the FM binary output module.

The BEF block can be used to read the module–specific fault signals. In the case of a malfunction in the FM module, an I&C alarm is issued when this is addressed. This takes place independently of the reading of the fault signals.

- Parameterization

  The FM header block is interconnected with input 1 (FMX).

  The source block of the binary area in the AS 235 is interconnected with input 2 (GBA).

  The block number within the field multiplexer is selected via input 3 (USBY).

  The number of bytes to be transferred is entered in input 4 (ANBY). This number corresponds to the number of FM binary output modules installed contiguously starting at USBY.

- System messages

Alarm number	Meaning
S 790 S 7xy	Illegal parameterization, over–range Fault display of the peripheral module xy (0 ... 44)
	The common alarm includes the following malfunctions: – Module is missing or incorrectly addressed – Module is defective – Multiple addressing

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Configuration details
FM header block	FMX	1	EA	
Interconnection	GBA	2	EB	
UERAM starting address	USBY	3	I	1)
Number of bytes	ANBY	4	I	2)

- Block list

```
   BAF     1              15. 08. 84/ 10. 28. 02.  P: 1

 1 EA  FMX                   P                  C   Q  1
 2 EB  GBA                   P                      Q  2
 3 I   USBY    0                                C      3
 4 I   ANBY    0                                C      4
```

1) Transfer RAM starting address: 0 ... 44
= 1st FM binary output module number

2) Number of bytes: 1 ... 32
Number of output modules, contiguously installed next to each other

BAU

Binary output block

Application

The BAU block is used for the output of up to 32 binary signals via binary output modules (see Chap. 9.2). The binary signals are made available for output in the GB block.

Method of Operation

The BAU block outputs a type–dependent number of binary signals via binary output modules. The binary signals are to be made available in a contiguous area beginning with GBA (GB starting address). Output “BGF” is set if hardware faults are detected during the output process.

Error message S 322 is issued if the fault bit has been set in one of the binary values. Output is performed if GB.ORPA.29 = 0; and is inhibited if GB29 = 1.

System message S 304 is generated and output does not take place if the specified area to be output, starting at the GBA interconnection in the GB block, is too short.

Block type ”BTYP” = 1: 8–bit output
= 2: 16–bit output
= 3: 32–bit output
= 0: No output

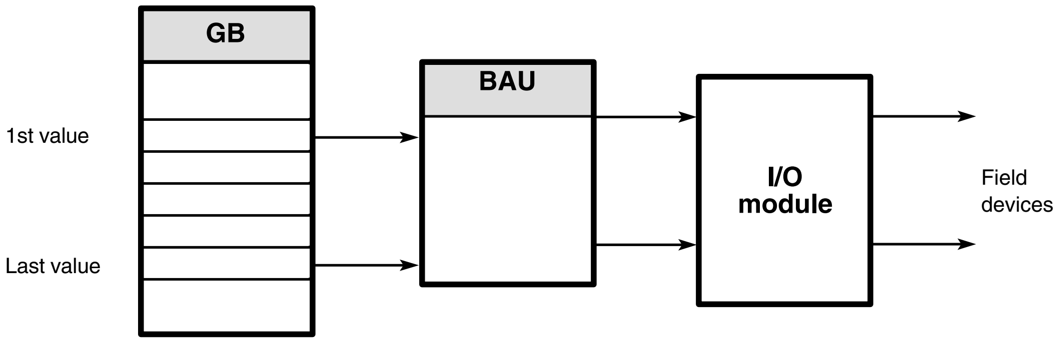


Fig. 9.17 BAU block, logic diagram

- System messages

  S 304: Addressing error in the block
  S 322: Fault bit detected in output value

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Module fault	BGF	1	AB
GB starting address	GBA	1	EB
Module number	BGNR	2	I
Module type	BTYP	3	I

The driver should be removed or the associated XB switched off as it should be inactive if either of the parameters BGNR or KNR change.

- Block list

```
   BAU     1                 03. 03. 83/ 00. 06. 47.  P: 1

 1 AB  BGF  0                  #                    N    4
 1 EB  GBA                                            Q  1
 2 I   BGNR    0                                  C      2
 3 I   BTYP    0                                  C      3
```

BCA

BCD output block

Application

This block is used for converting an analog value into a 4–digit BDC–coded digital signal.

Method of Operation

The block converts an analog value from the internal floating point representation into a 4–digit BCD–coded digital signal (see Fig. 9.18) and stores the signal in a GB block.

The positive analog value entered via input 1 (X) is multiplied by the factor present at input 2 (KF). The product is limited to the range of values $0 \leq KF * X \leq 9999$. The positions after the decimal point of the analog value KF * X are not taken into consideration.

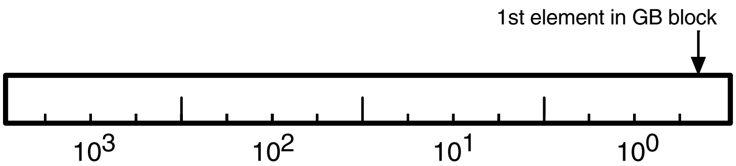


Fig. 9.18 BCA block, significance

The converted 4–digit digital signal is stored in a GB block. Using the driver “BAU”, it can be output via a binary signal output module.

Input 3 (GBA) is interconnected with the GB target block. The specified element number is the lowest–order binary value. Processing will not take place if the GB block is too short (system message S 304). A fault bit will be added to all 16 binary values if the analog value X has been marked by a fault bit.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Analog value	X	1	EA
Factor	KF	2	EA
Number of 1st binary output	GBA	3	EB

- Block list

```
   BCA     1                15. 08. 84/ 10. 30. 00.  P: 1

 1 EA  X    0.0000            P                          1
 2 EA  KF   1.0000            P                          2
 3 EB  GBA                    P                       Q  3
```

BCE

BCD Input block

Application

This block is used for converting a 4–digit BCD–coded digital signal into an analog value in internal floating point representation.

Method of Operation

The block converts a 4–digit BCD–coded digital signal, which may have been entered in a GB block via a binary input module (see Fig. 9.19), into an analog value in internal floating point representation.

An analog value in the range $0 \leq X \leq 9999$ which corresponds to the digital signal of the binary input module is available at output 1 (X). Prior to conversion, each decade is checked for pseudo tetrads. A fault is indicated via output 2. A fault bit is then added to the last value, which will be retained at output 1 (X).

The 4–digit digital signal is read from a binary field (GB block). A driver "BEI" or "BRA" is used to transfer the digital signal to a GB block via binary input modules.

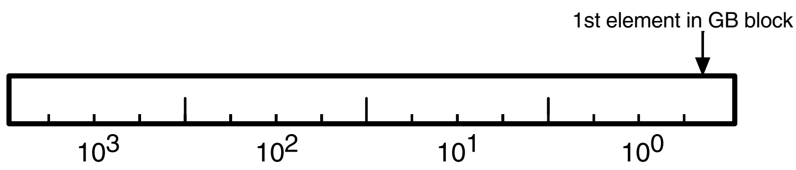


Fig. 9.19 BCE block, significance

Input 1 (GBA) is interconnected with the source GB block. The specifies element number is the lowest–order binary value of the 16 binary values.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Analog value	X	1	AA
Fault (pseudo–tetrad)	F	2	AB
Number of 1st binary input	GBA	1	EB

- Block list

```
  BCE     1              03. 03. 83/ 00. 07. 31.  P: 1

1 AA  X    0.0000         #                      N    2
2 AB  F    0              #                      N    3
1 EB  GBA                   P                      Q  1
```

BEF

Binary input block for field multiplexer

Application

This block is used for acquiring binary signals via field multiplexer (FM) binary input modules (see Chap. 9.2) or fault signals from the FM binary input modules or FM binary output modules.

Method of Operation

The block can only be used together with a higher–order FM block (input 1). The FM header block is interconnected with input 1 (FMX).

The block reads a number of bytes, which can be parameterized via input 4, from the FM binary input module, and stores them in the binary area (GB) which is interconnected to input 2 (GBA). The number of the first input to be read must be parameterized at input 3 (USBY).

The fault signals from the FM binary input modules can be read, starting with the virtual module numbers 46 or 51 and stored in the binary area (input 5 = 0) in the same manner as the binary signals. If input 5 is parameterized by “1”, the fault signals from the FM binary ouput modules can be read from the virtual module numbers 52 to 57.

The fault signals from the binary input and output modules cannot be read into a block simultaneously. In the case of a malfunction in the FM module, an I&C alarm is issued when this module is addressed (BEBA = 0). This takes place independently of the reading of the fault signals.

One fault bit will be stored for each module installed.

	USBY	Fault bit location for module nos. 0 to 44								
Virtual module number	46	7	6	5	4	3	2	1	0	FM binary input (BEBA = 0)
	47	15							8	
	48	23							16	
	49	31							24	
	50	39							32	
	51				44	43	42	41	40	
	52	7	6	5	4	3	2	1	0	FM binary output (BEBA = 1)
	53	15							8	
	54	23							16	
	55	31							24	
	56	39							32	
	57			44	43	42	41	40		

Further processing of the fault signals, for example with STEP M, is possible.

- System messages

Alarm number	Meaning
S 790 S 7xy	Illegal parameterization, over–range Fault display of the peripheral module xy (0 ... 44)
	xy = Module number of the defective peripheral board (0 ... 44) The common alarm includes the following malfunctions: – Module is missing or incorrectly addressed – Module is defective – Multiple addressing in the FM peripherals

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Configuration details
FM header block interconnection	FMX	1	EA	
Target block interconnection	GBA	2	EB	
UERAM starting address	USBY	3	I	1)
Number of bytes	ANBY	4	I	2)
Binary input or output window	BEBA	5	PB	3)

- Block list

```
  BEF     1              03. 03. 83/ 00. 07. 31.  P: 1

1 EA  FMX  0.0000          P                  C    Q  1
2 EB  GBA  0               P                       Q  2
3 I   USBY    0                               C       3
4 I   ANBY    0                               C       4
5 PB  BEBA 0                                          5
```

1) Starting address of transfer RAM: 0 ... 57
= number of 1st FM binary input module 0 ... 44
or virtual module number 46 ... 57

2) Number of bytes: 1 ... 32
Number of input modules contiguously installed next to each other (readable within one block) or number of virtual modules (fault signals)

3) 0 – Binary input modules
1 – Binary output modules

BEI

Binary input block

Application

This block is used for acquiring binary signals via a binary input module (see Chap. 9.2). The number of the binary signal inputs depends on the type. The binary signals are stored in the GB block for further processing/interconnection. Additional legal interconnection addresses are: GM and FB blocks.

Method of Operation

The BEI block acquires up to 48 binary signals which are stored contiguously from “GBA” (GB starting address). Output “BGF = 1” is set, the fault bit is set in the binary values, and the binary values retain their old values if a fault is detected during acquisition.

Module type “BTYP”	= 1:	8–bit input
”	= 2:	16–bit input
”	= 3:	32–bit input
”	= 4:	48–bit input
”	= 0:	No input

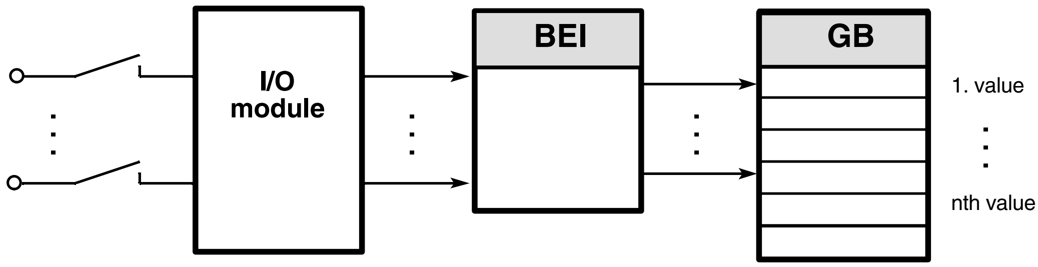


Fig. 9.20 BEI block, logic diagram

- System message

S 304: Processing will not take place if the number of elements defined starting with the interconnection address is insufficient with regard to “BTYP”.

⚠ The module 6DS1 601–8BA must be used if binary value acquisition with common interrupt is performed.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Ein–/ Ausgang No.	Type
Module fault	BGF	1	AB
GB starting address	GBA	1	EB
Module number	BGNR	2	I
Module type	BTYP	3	I

☞ The acquisition of binary values using interrupts is discussed in a separate Chapter.

- Block list

```
  BEI      1               03. 03. 83/ 00. 07. 31.  P: 1

1 AB   BGF  0              #                      N    4
1 EB   GBA                   P                      Q  1
2 I    BGNR    0                                C      2
3 I    BTYP    0                                C      3
```

BILD

Display output block

Application

This block is used for the output of a picture programmed in a LAYOUT. A picture can be superimposed on the overall display, the area display, and on all group and loop displays (also PICTURE) as well as on specific displays.

The display of a picture can be initiated by entering “**`BILD,bname;`**“ or by executing the BILD block in a block sequence.

Method of Operation

The system offers organization aids, which save computer time, for BILD processing. The bit numbers 205, 206, 207 and 208 are made available to the user in the GB area. The system ensures that only the bit corresponding to the display type currently selected at at least one interface is set in the GB area. These bits are set automatically by the system if an operator input call occurs; they are reset by ZYK 4 after a cycle has elapsed.

These are:
– GB205 for loop displays (“**`tname,bname;`**”, e.g. “**`RN,1;`**“)
– GB206 for group displays (**`GP,no;`**)
– GB207 for area displays (**`BR;`**)
– GB208 for overall displays (**`UB;`**)

The user can subdivide the BILD blocks into the following task groups:

– BILD for loop displays
– BILD for group displays
– BILD for area displays
– BILD for overall displays

Each group should be initiated in the block list by an XB block whose parameter 1 is interconnected with the associated bit in GB.ORPA.

A layout cannot be superimposed on a parameterization display. This ensures that only those BILD blocks which correspond to the display type currently selected are executed. The first–run identifier managed by the system in GB.ORPA bit 209 enables the user to distinguish in LAYOUT between static and dynamic part of the display.

The display block can transfer different data records to the associated LAYOUT for further processing.

GAX–DSX	≠	0:	These multiplex parameters are assigned to the layout block if MPX = 1.
MPX	=	1:	Multiplexing is performed upon call
	=	0:	No multiplexing: shorter execution time.

- Activation by operation

  The block need not be installed in a processing cycle if it is only to be activated by selection via the process communication keyboard. When called by ”**`BILD,bname;`**” the BILD block is executed. The inputs BINA, MODI and BADR are then insignificant. It is possible to inhibit operator input by assigning a name beginning with an alpha character to a BILD block installed in a block sequence. Selection via the process communication keyboard is then impossible.

- Activation by installation in a block sequence

  The parameters BINA, MODI and BADR specify the processing conditions.

  The parameters have the following meaning:

BINA	=	0:	No entry is made to the operator interface
	=	1:	An entry is made to the operator interface during the first execution in the cycle where the superimposing conditions (MODI, BADR) are satisfied (first run). This entry initiates cyclic execution of the BILD block as long as the superimposing conditions are satisfied. Execution is started by the system, and guarantees cyclic updating of the display after an XB block has enabled cyclical execution for the first run only. The BILD block should be installed in ZYK 4 in this case. If cyclical execution is not switched off by an XB block after the first run, unnecessary additional image processing will be performed.
MODI	=	0:	The block is exited without output
	=	1:	Type comparison is made between the display type currently selected and the block type interconnected via “BADR”. If the two types are identical, the layout interconnected via “LAYO” will be output. Application: all M displays, for example.
	=	2:	Comparison with respect to type and no./name is made between the image currently selected and the block interconnected via “BADR”. If these parameters are identical, the layout interconnected via “LAYO” will be output. Application: only display M,17, for example.
	=	3:	The interconnected LAYOUT is output if a display of type BR (area display) has been selected in an operator interface.
	=	4:	The interconnected LAYOUT is output if a display of type UB (overall display) has been selected in an operator interface.
	=	5:	The interconnected LAYOUT is output if a display of type KR (all loop displays) has been selected in an operator interface.
	=	6:	The interconnected LAYOUT is output if a display of type BR, UB or a loop display has been selected in an operator interface (summary of MODI = 3, 4, and 5).

☞ Comparison is performed in both operator interfaces; LAYOUT will thus be output on both monitors, if applicable.

BADR = 0: This parameterization causes the system to exit the block for MODI = 1 and 2, since a comparison is not possible.

≠ 0: The comparison type must be interconnected with this parameter.

Only those display blocks where the parameterization tallies with the display selected, will be executed in the next cycles. It is not expedient to install several BILD blocks in the block sequence for the same type of display, since only one BILD block can be entered into the operator interface via “BINA = 1” and only the last BILD block to have been entered will become active.

If neither parameter, “BTYP” of “BADR”, has been parameterized, the block will be exited without layout output, since no reference to an operator position exists.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
”1” = cyclical output by system	BINA	1	PB
Output type	MODI	2	I
Target address for output	BADR	3	EA
Layout	LAYO	4	EA
Multiplex parameter	GAX	5	EA
	GBX	6	EB
	GMX	7	EB
	GTX	8	EA
	DSX	9	EA
”1” = with multiplex parameter	MPX	10	PB

- Block list

```
   BILD    1               03. 03. 83/ 00. 08. 54.  P: 1

 1 PB  BINA 0                                          1
 2 I   MODI    0                                       2
 3 EA  BADR 0.0000      P                   C    Q     3
 4 EA  LAYO 0.0000      P                   C    Q     4
 5 EA  GAX  0.0000      P                   C    Q     5
 6 EB  GBX  0           P                   C    Q     6
 7 EB  GMX  0           P                   C    Q     7
 8 EA  GTX  0.0000      P                   C    Q     8
 9 EA  DSX  0.0000      P                   C    Q     9
10 PB  MPX  0                                         10
```

BKE

Binary linking receiver block

Application

This block is used for receiving binary signals from the data record of a different bus device's binary linking transmitter block (BKS), via the bus subsystem.

Method of Operation

The binary linking receiver block BKE is used to receive up to 128 binary values transmitted by a BKS block in a different bus device. Only figures between 1 and 4095 are valid for the definition of the block names.

The transmitting device/block and the mode (direct communication DI or common data communication CD) are specified in the configuration instruction

– **`KD,busno,deviceno,BKS,bname;`**
– **`KC,busno,deviceno,BKS,bname;`**

The parameterization will only be accepted without error message if the transmitter block has previously been defined. The definitions (bus/device number and/or block number) are stored with the parameters BUSX and/or BSTX respectively.

The received analog values are stored in a contiguous area of a GB/GM block. Corrupted binary values are reset.

Only if the parameter UEBW has been used to configure link monitoring, should the block be incorporated in a cyclic processing list. The maximum number or block cycles after which communication (transfer of values) should be performed is then defined. (UEBW = 0: no monitoring, other values 1 ... 32767 cycles).

If the number of cycles selected has been reached without value updating, the fault output FKOP is set to “1”. FKOP is cleared when the next values arrive. Each updating sets the AKT output to “1”. AKT is reset to “0” via the input RESE (if an XA block is interconnected with an output AKT, AKT is reset with each processing of the XA block).

The input GBA, which may be interconnected, is used to specify the starting address from which the binary values will be stored in the GB area. AAD1, EAD1, AAD2 and EAD2 can be used to define two windows by their starting and end addresses. These windows can be used to address two different areas of the maximum of 128 possible binary values. From the starting address GBA, the two windows are joined together in the GB block in uninterrupted sequence.

☞ A BKS block only transmits to one BKE block per coupled bus/participant number at a time. If a second BKE block is coupled with the same BKS block in one AS only the BKE block which was coupled last receives data from the BKS block.

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/Output No.	Type
Communication fault: no updating during selected monitoring time				
Code “values updated” (set for each incoming message)		AKT	2	AB
Code ”Mode” (0 = CD/1 = DI)		BA	3	AB
RESET input: “AKT” will be cleared with each block execution		RESE	1	EB
Monitoring time in processing cycles. is restarted with each message frame (→ FKOP).		UEBW	2	ID
Target address for message data (GBx specifies storage starting address)		GBA	3	EB
Bus/device no. of transmitter block (bus no. * 100 + device)		BUSX	4	ID
Transmitter block number		BSTX	5	S4
Start window 1	(no. of value in message frame)	AADI	6	I
End window 1	(no. of value in message frame)	EAD1	7	I
Start window 2	(no. of value in message frame)	AAD2	8	I
End window 2	(no. of value in message frame)	EAD2	9	I

- Block list

```
   BKE     1               03. 03. 83/ 00. 09. 20.  P: 1

 1 AB  FKOP 0                                 N   10
 2 AB  AKT  0                                 N   11
 3 AB  BA   1                                 N   12
 1 EB  RESE 0              P                       1
 2 ID  UEBW    0                            C      2
 3 EB  GBA  0          A   P                C   Q  3
 4 ID  BUSX    0                              N    4
 5 S4  BSTX                                   N    5
 6 I   AAD1    0                            C      6
 7 I   EAD1    0                            C      7
 8 I   AAD2    0                            C      8
 9 I   EAD2    0                            C      9
```

BKS

Binary linking transmitter block

Application

This block is used for the transfer of up to 128 binary values from an AS system to up to 6 (DI mode) or all (CD mode) bus devices.

Method of Operation

The binary linking transmitter block (BKS) is used to transfer up to 128 binary values to other bus devices. The receiver may be an OS, a process computer or another AS containing a BKE receiver block. Depending on the mode selected (DI or CD), the following number of receivers may be connected:

– in a DI link up to 6 bus devices
– in a CD link all bus devices with the same bus number.

This function block is incorporated in an acyclic [1)] or cyclic sequence cascade (cf. XA/XB block) in the same manner as every other block. Only numbers between 1 and 4095 are valid for the definition of the block names.

CD mode is only permitted for function blocks with the numbers 1 to 16 in the bus devices 0 to 31. In CD mode, a block number may only be assigned to either an AKS, BKS or ZKS block, for the same bus device. The mode is specified (configuration instruction KC, ... or KD, ...) whilst the receiver blocks are linked together.

Output STOE = 1 indicates that the transmission request has not been accepted by the local bus interface. The BKS block cannot detect any bus faults (e.g. bus connector has not been installed).

The cyclic message trafic is monitored at the receiver end.

Output ANZ indicates the number of receivers (BKE) connected. Output BA indicates the mode.

BA = 0 means CD communication
BA = 1 means DI communication

The channel number (1 = slow channel, = fast channel) can be selected via input KANR if DI communication has been chosen. This selection specifies whether or not there will be repetitions on transfer level. This input is not relevant for CD communication.

The maximum number of BKS blocks which are installed in a processing sequence under the same scan parameters should be limited to 10.

Reactions to corrupted binary values

– The reaction to corrupted digital values is selected by GB.ORPA.264:

GB264 = 0 Corrupted binary values are set to 0 before they are transferred (as before)
GB264 = 1 Corrupted binary values are not modified before they are transferred

⚠ The slow channel must be used for a coupling by bus coupler to a participant on another bus (KANR = 1).

1) Output STOE must be evaluated in acyclic mode to ensure that data has actually been transmitted.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Code ”Mode” (0 = CD/1 = DI)	BA	1	AB
Number of logged–on devices	ANZ	2	AA
Fault output message could not be transmitted	STOE	3	AB
1st value to be transmitted (all 128 values will be transmitted if no additional input is interconnected with a binary field of at least 128 values).	E1	1	EB
2nd value to be transmitted	E2	2	EB
:	:	:	:
128th value to be transmitted	E128	128	EB
Channel identifier for DI communication (0 = fast/1 = slow channel)	KANR	129	EBV
Bus/device no. of logged–on receivers 1 to 6 (DI communication only)	BUS1	130	ID
	:	:	:
	BUS6	135	ID
Block no. of logged–on receivers 1 to 6 (DI communication only)	BST1	136	S4
	:	:	:
	BST6	141	S4

- Block list

```
   BKS     1              03. 03. 83/ 00. 10. 34.  P: 1

 1 AB  BA   1                                  N  142
 2 AA  ANZ  0.0000                             N  143
 3 AB  STOE 0                                  N  144
 1 EB  E1                                    C   Q  1
 2 EB  E2                                    C   Q  2
 3 EB  E3                                    C   Q  3
 4 EB  E4                                    C   Q  4
 5 EB  E5                                    C   Q  5
 6 EB  E6                                    C   Q  6
 7 EB  E7                                    C   Q  7
 8 EB  E8                                    C   Q  8
 9 EB  E9                                    C   Q  9
10 EB  E10                                   C   Q 10
11 EB  E11                                   C   Q 11
12 EB  E12                                   C   Q 12
13 EB  E13                                   C   Q 13
14 EB  E14                                   C   Q 14
15 EB  E15                                   C   Q 15
16 EB  E16                                   C   Q 16
17 EB  E17                                   C   Q 17
18 EB  E18                                   C   Q 18
```


Block list (continued)

```
19 EB  E19                                                     C    Q 19
20 EB  E20                                                     C    Q 20
21 EB  E21                                                     C    Q 21
22 EB  E22                                                     C    Q 22
23 EB  E23                                                     C    Q 23
24 EB  E24                                                     C    Q 24
25 EB  E25                                                     C    Q 25
26 EB  E26                                                     C    Q 26
27 EB  E27                                                     C    Q 27
28 EB  E28                                                     C    Q 28
29 EB  E29                                                     C    Q 29
30 EB  E30                                                     C    Q 30
31 EB  E31                                                     C    Q 31
32 EB  E32                                                     C    Q 32
33 EB  E33                                                     C    Q 33
34 EB  E34                                                     C    Q 34
35 EB  E35                                                     C    Q 35
36 EB  E36                                                     C    Q 36
37 EB  E37                                                     C    Q 37
38 EB  E38                                                     C    Q 38
39 EB  E39                                                     C    Q 39
40 EB  E40                                                     C    Q 40
41 EB  E41                                                     C    Q 41
42 EB  E42                                                     C    Q 42
43 EB  E43                                                     C    Q 43
44 EB  E44                                                     C    Q 44
45 EB  E45                                                     C    Q 45
46 EB  E46                                                     C    Q 46
47 EB  E47                                                     C    Q 47
48 EB  E48                                                     C    Q 48
49 EB  E49                                                     C    Q 49
50 EB  E50                                                     C    Q 50
51 EB  E51                                                     C    Q 51
52 EB  E52                                                     C    Q 52
53 EB  E53                                                     C    Q 53
54 EB  E54                                                     C    Q 54
55 EB  E55                                                     C    Q 55
56 EB  E56                                                     C    Q 56
57 EB  E57                                                     C    Q 57
58 EB  E58                                                     C    Q 58
59 EB  E59                                                     C    Q 59
60 EB  E60                                                     C    Q 60
61 EB  E61                                                     C    Q 61
62 EB  E62                                                     C    Q 62
63 EB  E63                                                     C    Q 63
64 EB  E64                                                     C    Q 64
65 EB  E65                                                     C    Q 65
66 EB  E66                                                     C    Q 66
67 EB  E67                                                     C    Q 67
68 EB  E68                                                     C    Q 68
69 EB  E69                                                     C    Q 69
70 EB  E70                                                     C    Q 70
71 EB  E71                                                     C    Q 71
72 EB  E72                                                     C    Q 72
73 EB  E73                                                     C    Q 73
74 EB  E74                                                     C    Q 74
75 EB  E75                                                     C    Q 75
76 EB  E76                                                     C    Q 76
77 EB  E77                                                     C    Q 77
78 EB  E78                                                     C    Q 78
79 EB  E79                                                     C    Q 79
80 EB  E80                                                     C    Q 80
81 EB  E81                                                     C    Q 81
82 EB  E82                                                     C    Q 82
```

Block list (continued)

83	EB	E83			C	Q	83
84	EB	E84			C	Q	84
85	EB	E85			C	Q	85
86	EB	E86			C	Q	86
87	EB	E87			C	Q	87
88	EB	E88			C	Q	88
89	EB	E89			C	Q	89
90	EB	E90			C	Q	90
91	EB	E91			C	Q	91
92	EB	E92			C	Q	92
93	EB	E93			C	Q	93
94	EB	E94			C	Q	94
95	EB	E95			C	Q	95
96	EB	E96			C	Q	96
97	EB	E97			C	Q	97
98	EB	E98			C	Q	98
99	EB	E99			C	Q	99
100	EB	E100			C	Q	100
101	EB	E101			C	Q	101
102	EB	E102			C	Q	102
103	EB	E103			C	Q	103
104	EB	E104			C	Q	104
105	EB	E105			C	Q	105
106	EB	E106			C	Q	106
107	EB	E107			C	Q	107
108	EB	E108			C	Q	108
109	EB	E109			C	Q	109
110	EB	E110			C	Q	110
111	EB	E111			C	Q	111
112	EB	E112			C	Q	112
113	EB	E113			C	Q	113
114	EB	E114			C	Q	114
115	EB	E115			C	Q	115
116	EB	E116			C	Q	116
117	EB	E117			C	Q	117
118	EB	E118			C	Q	118
119	EB	E119			C	Q	119
120	EB	E120			C	Q	120
121	EB	E121			C	Q	121
122	EB	E122			C	Q	122
123	EB	E123			C	Q	123
124	EB	E124			C	Q	124
125	EB	E125			C	Q	125
126	EB	E126			C	Q	126
127	EB	E127			C	Q	127
128	EB	E128			C	Q	128
129	EBV	KANR	0				129
130	ID	BUS1		0		N	130
131	ID	BUS2		0		N	131
132	ID	BUS3		0		N	132
133	ID	BUS4		0		N	133
134	ID	BUS5		0		N	134
135	ID	BUS6		0		N	135
136	ID	BST1				N	136
137	ID	BST2				N	137
138	ID	BST3				N	138
139	ID	BST4				N	139
140	ID	BST5				N	140
141	ID	BST6				N	141

BRA

Binary routing block

Application

The block is used for acquiring up to 8 binary signals via a binary input module (see Chap. 9.2). The binary signals are routed to specified interconnection addresses (typically in GB blocks) and are available there for further processing/interconnection (see Fig. 9.21).

☞ The PROM identifier (P) must be cleared by parameterizing the targets in the respective block prior to the first execution of the BRA if the interconnection specified is not in a GB block.

Method of Operation

The BRA block acquires up to 8 binary signals which are stored in the binary parameters interconnected with “GBA1” to “GBA8”. Output “BGF = 1” is set, the fault bit set in the binary values, and the old values retained if a fault is detected during acquisition.

Channel no. ”KNR”	= 0:	1.	Read 1st byte	
”	= 1:	2.	Read 2nd byte	”
”	= 2:	3.	Read 3rd byte	”
”	= 3:	4.	Read 4th byte	”
”	= 4:	5.	Read 5th byte	”
”	= 5:	6.	Read 6th byte	”

(cf. Chap. 2.3.6.2.3).

Exception: BGNR = 61, KNR = 2 (see separate Chapter “Binary Input Module with Interrupt 6DS1 601–8BA”)!

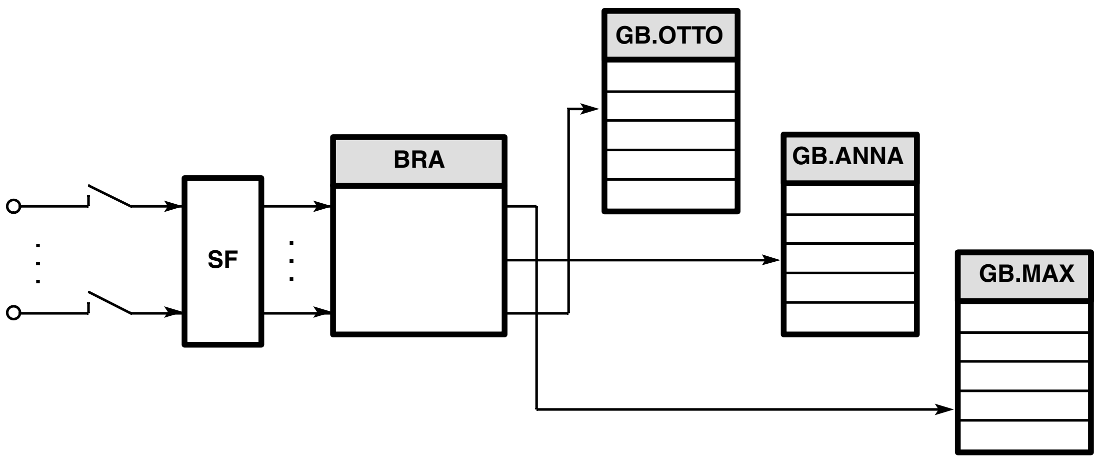


Fig. 9.21 BRA block, logic diagram

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Module fault	BGF	1	AB
GB address 1 for 1st bit	GBA1	1	EB
GB address 2 for 2nd bit	GBA2	2	EB
GB address 3 for 3rd bit	GBA3	3	EB
GB address 4 for 4th bit	GBA4	4	EB
GB address 5 for 5th bit	GBA5	5	EB
GB address 6 for 6th bit	GBA6	6	EB
GB address 7 for 7th bit	GBA7	7	EB
GB address 8 for 8th bit	GBA8	8	EB
Module number	BGNR	9	I
Channel number	KNR	10	I

- Block list

```
   BRA     1              03. 03. 83/ 00. 18. 03.  P: 1

 1 AB  BGF  0                                    N   11
 1 EB  GBA1                                        Q  1
 2 EB  GBA2                                        Q  2
 3 EB  GBA3                                        Q  3
 4 EB  GBA4                                        Q  4
 5 EB  GBA5                                        Q  5
 6 EB  GBA6                                        Q  6
 7 EB  GBA7                                        Q  7
 8 EB  GBA8                                        Q  8
 9 I   BGNR        0                           C      9
10 I   KNR         0                           C     10
```

BRBK

Driver block for binary arithmetic module (coordination block)

Application

This block is used for acquiring signals from the unassigned flag area of the binary arithmetic module (see Chap. 9.2). The acquired signals can be made available in any binary fields of the system.

The BRBK block transfers binary values from binary system areas to the module's flag area, and is used as a coordination block for the data transfer of the blocks ABR (analog input/output), MSB (individual control for motor, valve and actuator) and TVB (partial subgroup and preselector control).

Each BRBK block allows a maximum of the following blocks to be connected:

4 ABR blocks and
5 MSB blocks as valve and/or motor controls and
2 TVB blocks as partial control and
2 TVB blocks as preselector controls

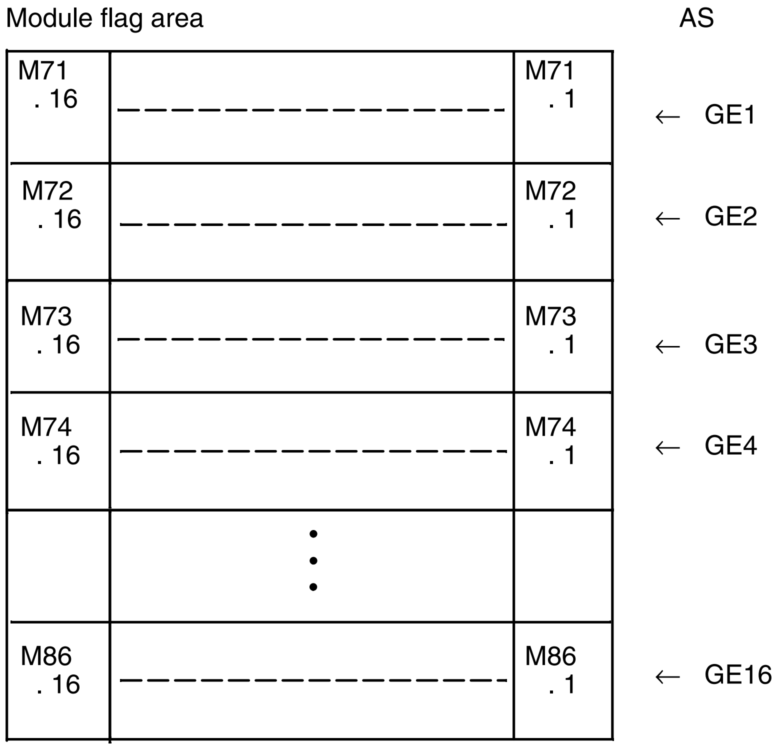
Method of Operation

Using the BRBK block, up to 32 binary values can be entered in the module's flag area (flags 15.1 to 15.16 or 16.1 to 16.16). The binary values must be provided in two fields with 16 values each. References must be established with the inputs GBA1 and GBA2.

Module flag area AS

M 15 16	–––––––––––––––––	M 15 1	← GBA1
M 16 16	–––––––––––––––––	M 16 1	← GBA2

In addition, 256 binary values are read from the module's flag area (from flags 71.1 to 71.16, to flags 86.1 to 86.16). The binary values are stored in 16 fields with 16 values each. References must be established with the inputs GE1 to GE16. All digital values will be set to 0 if a module malfunction has been detected.



The BRBK block coordinates and monitors the data transfer to the module. Subordinate blocks can only exchange data with the module after the BRBK block has internally enabled data transfer.

- Block sequence

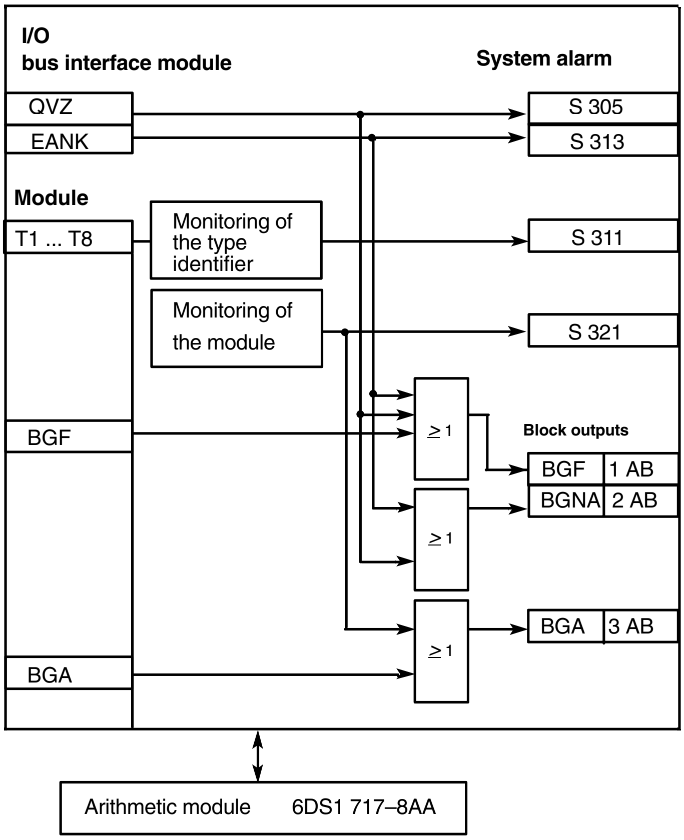
  All subdriver blocks (ABR/MSB/TVB) pertaining to a BRBK should be installed in the same processing cycle (before the BRBK) in order to avoid synchronization errors.

- Parameterization/interconnection

  The block number is specified via input 1 (BGNR).

  The following conditions apply for binary field interconnection (GE1 ... 16, GBA1, GBA2): the target, which may be a GB, GM or FB block or an input/output field (e.g. PB:16) of a function block, must be a binary field with at least 16 more elements.

  References to subdrivers are only permitted via the corresponding inputs (ABR 1 ... 4 → ABR block, MSB1 ... 5 → MSB block, TVx1 ... 2 → TVB block). The mode (partial control/preselection) must be selected in the TVB block before the TVS1 ... TVV2 inputs can be interconnected.



T1 ... T8	Type identifier of the module
QVZ	Time–out
EANK	Multiple addressing
BGA	Module failure
BGF	Module fault
BGNA	Module cannot be addressed

Fig. 9.22 BRBK block, alarm logic

- System messages

S 305: No acknowledgement from module (incorrect address, module defective)
S 311: Wrong module type
S 321: Module malfunction/defective (cycle error)
S 324: Processing inhibit has been set

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Module fault	BGF	1	AB
Module cannot be addressed	BGNA	2	AB
Module failure	BGA	3	AB
Module number	BGNR	1	I
Target 1st read binary field	GE1	2	EB
⋮	⋮	⋮	⋮
Target 16th read binary field	GE16	17	EB
Source 1st binary field to be output	GBA1	18	EB
Source 2nd binary field to be output	GBA2	19	EB

- Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Reference to subdriver ABR 1	ABR1	20	EA
Reference to subdriver ABR 2	ABR2	21	EA
Reference to subdriver ABR 3	ABR3	22	EA
Reference to subdriver ABR 4	ABR4	23	EA
Reference to subdriver MSB 1	MSB1	24	EA
Reference to subdriver MSB 2	MSB2	25	EA
Reference to subdriver MSB 3	MSB3	26	EA
Reference to subdriver MSB 4	MSB4	27	EA
Reference to subdriver MSB 5	MSB5	28	EA
Reference to subdriver TVB 1 partial control	TVS1	29	EA
Reference to subdriver TVB 2 partial control	TVS2	30	EA
Reference to subdriver TVB 1 preselection	TVV1	31	EA
Reference to subdriver TVB 2 preselection	TVV2	32	EA

- Block list

```
   BRBK    1               01  01. 88/ 01. 50. 49.  P: 1   *

 1 AB  BGF  0                 #                       33
 2 AB  BGNA 0                 #                       34
 3 AB  BGA  0                 #                       35
 1 I   BGNR 0                                 C        1
 2 EB  GE1  0               A    P            C   Q    2
 3 EB  GE2  0               A    P            C   Q    3
 4 EB  GE3  0               A    P            C   Q    4
 5 EB  GE4  0               A    P            C   Q    5
 6 EB  GE5  0               A    P            C   Q    6
 7 EB  GE6  0               A    P            C   Q    7
 8 EB  GE7  0               A    P            C   Q    8
 9 EB  GE8  0               A    P            C   Q    9
10 EB  GE9  0               A    P            C   Q   10
11 EB  GE10 0               A    P            C   Q   11
12 EB  GE11 0               A    P            C   Q   12
13 EB  GE12 0               A    P            C   Q   13
14 EB  GE13 0               A    P            C   Q   14
15 EB  GE14 0               A    P            C   Q   15
16 EB  GE15 0               A    P            C   Q   16
17 EB  GE16 0               A    P            C   Q   17
18 EB  GBA1 0               A    P            C   Q   18
19 EB  GBA2 0               A    P            C   Q   19
20 EA  ABR1    15    0     0A    P            C   Q   20
21 EA  ABR2    15    0     0A    P            C   Q   21
22 EA  ABR3    15    0     0A    P            C   Q   22
23 EA  ABR4    15    0     0A    P            C   Q   23
24 EA  MSB1    15    0     0A    P            C   Q   24
25 EA  MSB2    15    0     0A    P            C   Q   25
26 EA  MSB3    15    0     0A    P            C   Q   26
27 EA  MSB4    15    0     0A    P            C   Q   27
28 EA  MSB5    15    0     0A    P            C   Q   28
29 EA  TVS1    15    0     0A    P            C   Q   29
30 EA  TVS2    15    0     0A    P            C   Q   30
31 EA  TVV1    15    0     0A    P            C   Q   31
32 EA  TVV2    15    0     0A    P            C   Q   32
```


BU8

Binary encoder monitoring block for 8 binary values

Application

This block is used for acquiring and monitoring up to 8 binary signals via a binary input module (Chap. 9.2).

Method of Operation

The states of the binary signals applied to the binary input modules are scanned and made available at the corresponding outputs (BU1 to BU8).

In addition to the binary value there are two binary qualifiers which indicate if the associated binary value BWn

– is simulated (outputs SI1 to SI8) or
– disturbed (outputs BU1 to BU8).

If binary values (one or several) are simulated or disturbed, a common alarm is issued via the outputs SASI or SAST respectively. Input BGNR is used to parameterize the number of the binary input module.

If a hardware fault has occurred (time–out, EANK), the fault bit is set in all binary values (outputs 1 to 26) and the old values retained.

- System messages

  S 305: Module does not acknowledge (incorrect address, incorrect jumper setting, defective module).
  S 313: Multiple addressing (incorrect jumper setting) EANK.

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/Output No.	Type
Binary value		BW1	1	AB
Simulation	(BW1)	SI1	2	AB
Binary signal monitor has responded	(BW1)	BU1	3	AB
		BW2	4	AB
		SI2	5	AB
		BU2	6	AB
		BW3	7	AB
		SI3	8	AB
		BU3	9	AB
		BW4	10	AB
		SI4	11	AB
		BU4	12	AB
		BW5	13	AB
		SI5	14	AB
		BU5	15	AB
		BW6	16	AB
		SI6	17	AB
		BU6	18	AB
		BW7	19	AB
		SI7	20	AB
		BU7	21	AB
		BW8	22	AB
Simulation	(BW8)	SI8	23	AB
Binary signal monitor has responded	(BW8)	BU8	24	AB
Common alarm simulation		SASI	25	AB
Common alarm fault		SAST	26	AB
Module fault		BGF	27	AB
Module number		BGNR	1	I

- Block list

```
   BU8     1               03. 03. 83/ 00. 20. 26.  P: 1

 1 AB  BW1  0                #                    N    2
 2 AB  SI1  0                #                    N    3
 3 AB  BU1  0                #                    N    4
 4 AB  BW2  0                #                    N    5
 5 AB  SI2  0                #                    N    6
 6 AB  BU2  0                #                    N    7
 7 AB  BW3  0                #                    N    8
 8 AB  SI3  0                #                    N    9
 9 AB  BU3  0                #                    N   10
10 AB  BW4  0                #                    N   11
11 AB  SI4  0                #                    N   12
12 AB  BU4  0                #                    N   13
13 AB  BW5  0                #                    N   14
14 AB  SI5  0                #                    N   15
15 AB  BU5  0                #                    N   16
16 AB  BW6  0                #                    N   17
17 AB  SI6  0                #                    N   18
18 AB  BU6  0                #                    N   19
19 AB  BW7  0                #                    N   20
20 AB  SI7  0                #                    N   21
21 AB  BU7  0                #                    N   22
22 AB  BW8  0                #                    N   23
23 AB  SI8  0                #                    N   24
24 AB  BU8  0                #                    N   25
25 AB  SASI 0                #                    N   26
26 AB  SAST 0                #                    N   27
27 AB  BGF  0                #                    N   28
 1 I   BGNR   0                                 C      1
```

BU16

Binary encoder monitoring block for 16 binary values

Application

This block is used for acquiring and monitoring up to 16 binary signals via a binary input module (Chap. 9.2).

Method of Operation

The states of the binary signals applied to the binary input modules are scanned and made available at the corresponding outputs (BZ1 to BU16). In addition to the binary value there are two binary qualifiers which indicate if the associated binary value BWn

– is simulated (outputs SI1 to SI16) or
– disturbed (outputs BU1 to BU16).

If binary values (one or several) are simulated or disturbed, a common alarm is issued via the outputs SASI or SAST respectively. Input BGNR is used to parameterize the number of the binary input module.

If a hardware fault has occurred (time–out, EANK), the fault bit is set in all binary values (outputs 1 to 50) and the old values retained.

- System messages
  S 305: Module does not acknowledge (incorrect address, incorrect jumper setting, defective module)
  S 313: Multiple addressing (incorrect jumper setting) EANK.

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/Output No.	Type
Binary value		BW1	1	AB
Simulation	(BW1)	SI1	2	AB
Binary signal monitor has responded	(BW1)	BU1	3	AB
		BW2	4	AB
		SI2	5	AB
		BU2	6	AB
		BW3	7	AB
		SI3	8	AB
		BU3	9	AB
		BW4	10	AB
		SI4	11	AB
		BU4	12	AB
		BW5	13	AB
		SI5	14	AB
		BU5	15	AB
		BW6	16	AB
		SI6	17	AB
		BU6	18	AB
		BW7	19	AB
		SI7	20	AB
		BU7	21	AB
		BW8	22	AB
		SI8	23	AB
		BU8	24	AB
		BW9	25	AB
		SI9	26	AB
		BU9	27	AB
		BW10	28	AB
		SI10	29	AB
		BU10	30	AB
		BW11	31	AB
		SI11	32	AB
		BU11	33	AB
		BW12	34	AB
		SI12	35	AB
		BU12	36	AB
		BW13	37	AB
		SI13	38	AB
		BU13	39	AB
		BW14	40	AB
		SI14	41	AB
		BU14	42	AB
		BW15	43	AB
		SI15	44	AB
		BU15	45	AB
		BW16	46	AB
Simulation	(BW16)	SI16	47	AB
Binary signal monitor has responded	(BW16)	BU16	48	AB
Common alarm simulation		SASI	49	AB
Common alarm fault		SAST	50	AB
Module fault		BGF	51	AB
Module number		BGNR	1	I

- Block list

```
   BU16    1              03. 03. 83/ 00. 21. 35.  P: 1

 1 AB  BW1  0                 #                    N    2
 2 AB  SI1  0                 #                    N    3
 3 AB  BU1  0                 #                    N    4
 4 AB  BW2  0                 #                    N    5
 5 AB  SI2  0                 #                    N    6
 6 AB  BU2  0                 #                    N    7
 7 AB  BW3  0                 #                    N    8
 8 AB  SI3  0                 #                    N    9
 9 AB  BU3  0                 #                    N   10
10 AB  BW4  0                 #                    N   11
11 AB  SI4  0                 #                    N   12
12 AB  BU4  0                 #                    N   13
13 AB  BW5  0                 #                    N   14
14 AB  SI5  0                 #                    N   15
15 AB  BU5  0                 #                    N   16
16 AB  BW6  0                 #                    N   17
17 AB  SI6  0                 #                    N   18
18 AB  BU6  0                 #                    N   19
19 AB  BW7  0                 #                    N   20
20 AB  SI7  0                 #                    N   21
21 AB  BU7  0                 #                    N   22
22 AB  BW8  0                 #                    N   23
23 AB  SI8  0                 #                    N   24
24 AB  BU8  0                 #                    N   25
25 AB  BW8  0                 #                    N   26
26 AB  SI9  0                 #                    N   27
27 AB  BU9  0                 #                    N   28
28 AB  BW10 0                 #                    N   29
29 AB  SI10 0                 #                    N   30
30 AB  BU10 0                 #                    N   31
31 AB  BW11 0                 #                    N   32
32 AB  SI11 0                 #                    N   33
33 AB  BU11 0                 #                    N   34
34 AB  BW12 0                 #                    N   35
35 AB  SI12 0                 #                    N   36
36 AB  BU12 0                 #                    N   37
37 AB  BW13 0                 #                    N   38
38 AB  SI13 0                 #                    N   39
39 AB  BU13 0                 #                    N   40
40 AB  BW14 0                 #                    N   41
41 AB  SI14 0                 #                    N   42
42 AB  BU14 0                 #                    N   43
43 AB  BW15 0                 #                    N   44
44 AB  SI15 0                 #                    N   45
45 AB  BU15 0                 #                    N   46
46 AB  BW16 0                 #                    N   47
47 AB  SI16 0                 #                    N   48
48 AB  BU16 0                 #                    N   49
49 AB  SASI 0                 #                    N   50
50 AB  SAST 0                 #                    N   51
51 AB  BGF  0                 #                    N   52
 1 I   BGNR   0                                  C      1
```

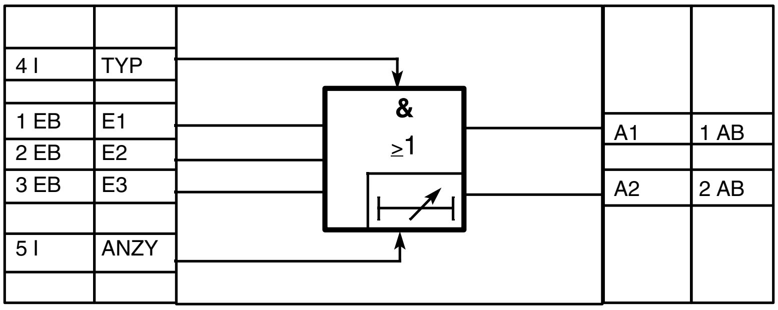
BW

Binary selector block

Application

This block is used for selecting the state combination (1–out–of–2, 2–out–of–2, 2–out–of–3) of up to three binary signals.

Method of Operation



A1	Selector output
A2	Selector monitoring function
TYP	Mode
E1,E2,E3	Input 1, 2 or 3
ANZY	Delay

Fig. 9.23 BW block, logic diagram

The selector output (A) indicates whether the state combination (1–out–of–2, 2–out–of–2, 2–ou–of–3) of the three inputs (E1, E2, E3) which has been selected by the mode (TYP) is true.

The output of the selector monitoring function (A2) indicates whether or not the states of the input signals determined by the mode tally, i.e. whether they are all “1” or all “0” after the selected delay (ANZY) time has elapsed.

The following table shows the mode parameterization (TYP) and the output signal states as a function of the input state combinations.

Mode	Type	Input state combination Number of "1" inputs		Selector output A1	Selection monitoring A2 [1)]
1–out–of–2	0	E_1, E_2	0–out–of–2 1–out–of–2 2–out–of–2	0 1 1	0 1 0
2–out–of–2	1	E_1, E_2	0–out–of–2 1–out–of–2 2–out–of–2	0 0 1	0 1 0
2–out–of–3	2	E_1, E_2, E_3	0–out–of–3 1–out–of–3 2–out–of–3 3–out–of–3	0 0 1 1	0 1 1 0

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Selector output	A1	1	AB
Selector monitoring function	A2	2	AB
Input value 1	E1	1	EB
Input value 2	E2	2	EB
Input value 3	E3	3	EB
1 v 2 = 0, 2 v 2 = 1, 2 v 3 = 2	TYP	4	I
Delay	ANZY	5	I [2)]

- Block list

```
   BW      1              03. 03. 83/ 00. 23. 19.  P: 1

 1 AB  A1    0              #                      N    6
 2 AB  A2    0              #                      N    7
 1 EB  E1    0                P                    N    1
 2 EB  E2    0                P                    N    2
 3 EB  E3    0                P                    N    3
 4 I   TYP      0                                       4
 5 I   ANZY     0                                       5
```

1) Transition from „0" → „1" is indicated after the delay time selected with ANZY; transition from „1" → „0" is indicated immediately.

2) The input is parameterized with the integer value of the quotient "parameter/scan time" (cf. XB block). ANZY = number of cycles.

C

Switchover block

Application

This block is used for the following binary signal switchover combinations (e.g. manual/automatic mode etc.):

– 1–out–of–2 (using one push–button)
  i.e. 1 out of 2 binary signals has the value “1”.
  Changeover using one push–button possible (Fig. 9.24)

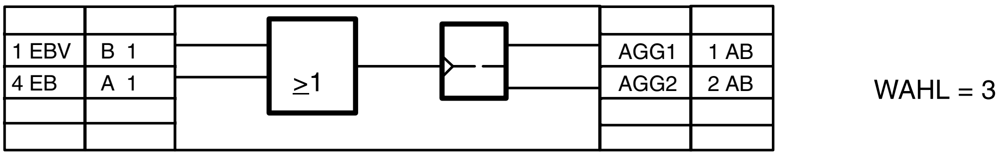
– 1–out–of–2 (using two push–buttons)
  i.e. 1 out of 2 binary signals has the value “1”.
  Changeover using two push–buttons possible (Fig. 9.25)

– 1–out–of–3 (using three push–buttons)
  i.e. 1 out of 3 binary signals has the value “1”.
  Changeover using three push–buttons possible (Fig. 9.26)

– 2–out–of–3 (using three push–buttons)
  i.e. 2 out of 3 binary signals have the value “1”.
  Changeover using three push–buttons possible (Fig. 9.27)

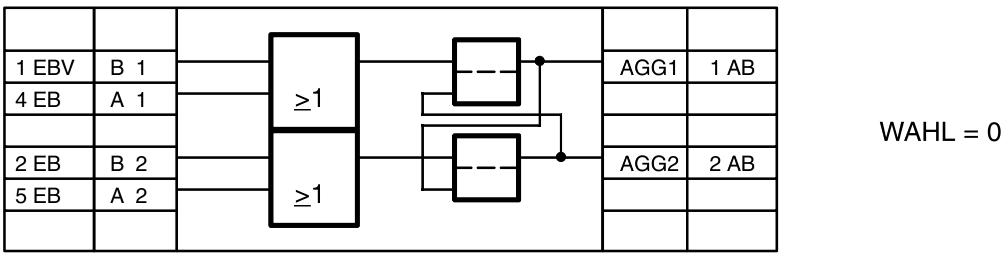
Method of Operation

Depending on the WAHL mode, up to three binary signals can be switched over by pressing push–buttons on the process communication keyboard or by automatic control. Figs. 9.24 to 9.27 show the logic diagrams of these modes. Inputs 1 and 4 have the highest–priority over inputs 2 and 5 and inputs 3 and 6. The automatic inputs have priority over the operator–controllable inputs.



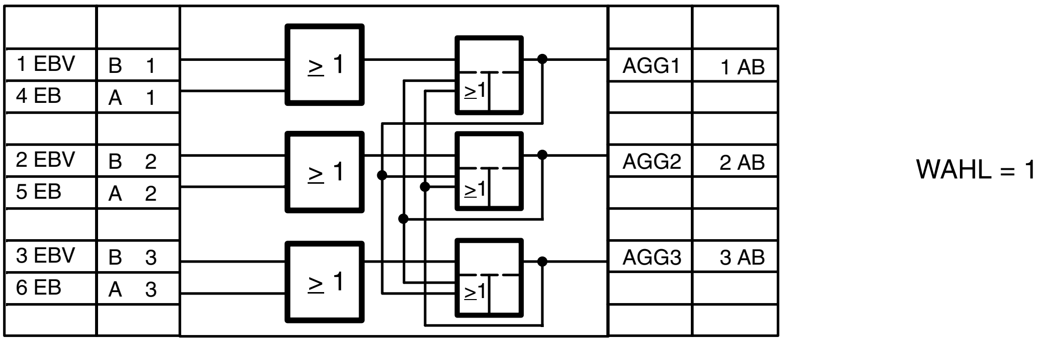
B1 Operator–controllableinput 1
A1 Automatic input 1

Fig. 9.24 Switchover block, logic diagram for 1–out–of–2 selection by one push–button (WAHL, input 7 = 3)



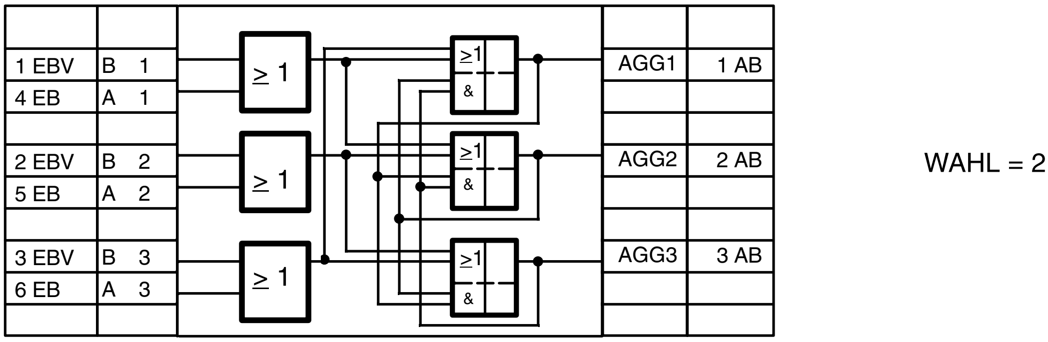
B1, B2 Operator–controllable input 1 or 2
A1, A2 Automatic input 1 or 2

Fig. 9.25 Switchover block, logic diagram for 1–out–of–2 selection by two push–buttons (WAHL, input 7 = 0)



B1, B2, B3 Operator–controllable input 1, 2 or 3
A1, A2, A3 Automatic input 1, 2 or 3

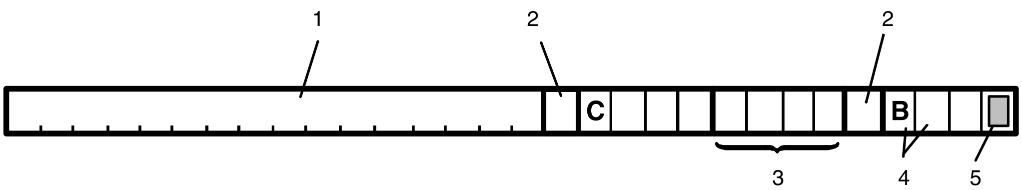
Fig. 9.26 Switchover block, logic diagram for 1–out–of–3 selection by three push–buttons (WAHL, input 7 = 1)



B1, B2, B3 Operator–controllable input 1, 2 or 3
A1, A2, A3 Automatic input 1, 2 or 3

Fig. 9.27 Switchover block, logic diagram for 2–out–of–3 selection by three push–buttons (WAHL, input 7 = 2)

- Normalized representation in a group display



1 Process–related name of the switchover block, as in loop display
2 Separating blank
3 Number of the switchover block
4 Switching state of the switchover block.
Two characters of the associated mnemonic name (inputs 9, 10, 11) will be output here according to the switching state.
5 Fault indicator

Fig. 9.28 Switchover block, normalized representation in the group display

Input 8 (group display no./location no.) is parameterized in the following manner, to display the block by 30 characters at a specific location in a group display:

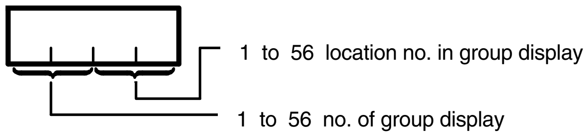


Fig. 9.29 Switchover block; parameterization of input 8

Set input 8 to “0” if the normalized representation of the block in a group display is to be suppressed.

- Normalized representation of the loop display

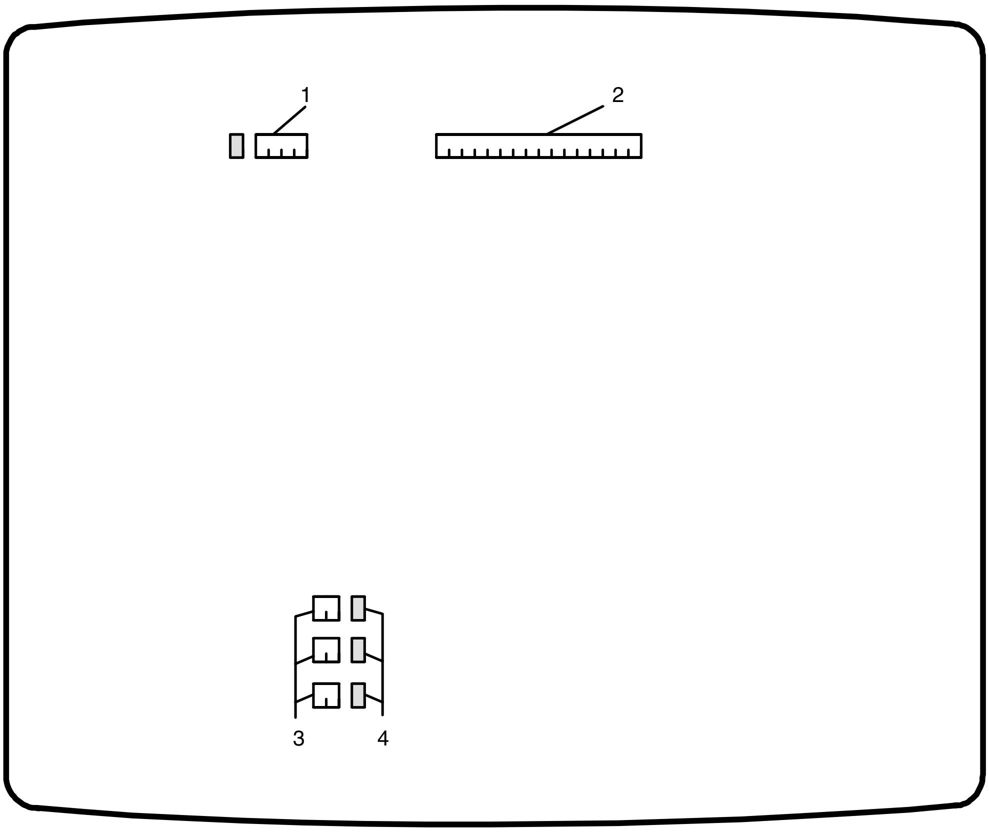
The following loop display (Fig. 9.30) contains the below–mentioned static and dynamic data:

Static data

1 Mnemonic name and name of the switchover block
2 Process–related name of the switchover block
3 Mnemonic names of the switching states

Dynamic data

4 Switching states



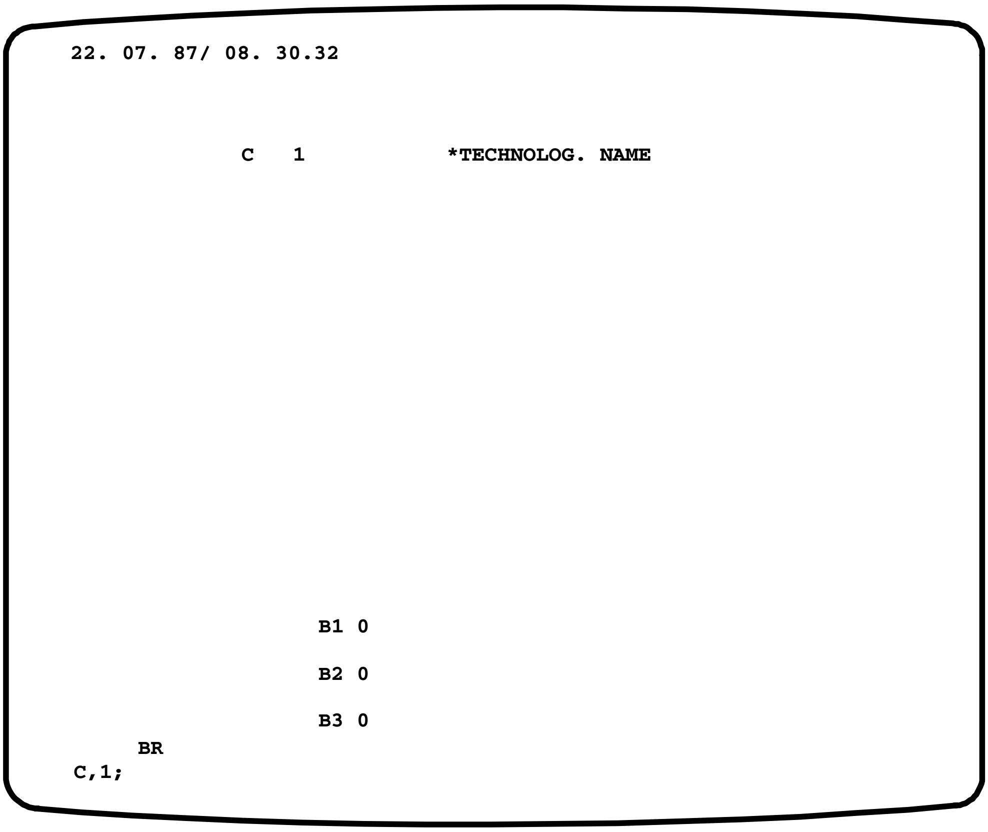


Fig. 9.30 Loop display of the C block, example

- Operator control via process communication keyboard

B1=1[1]	B2=1[2]	B3=1[3]					

B1, 2, 3 Operator–controllable input 1, 2, 3

[1] Mnemonic name of the key corresponding to input 9 of the switchover module: default value is “B1”.
[2] Mnemonic name of the key corresponding to input 10 of the switchover module: default value is “B2”.
[3] Mnemonic name of the key corresponding to input 11 of the switchover module: default value is “B3”.

Fig. 9.31 C block, automatic labelling of the process communication keyboard

Depending on the mode, up to three function keys are assigned to the mnemonic names parameterized via inputs 9, 10 or 11 after the loop display has been selected and the BE key depressed.

All function key entries must be directly terminated by pressing the execute key ().

- Data structure (designation of inputs and outputs)

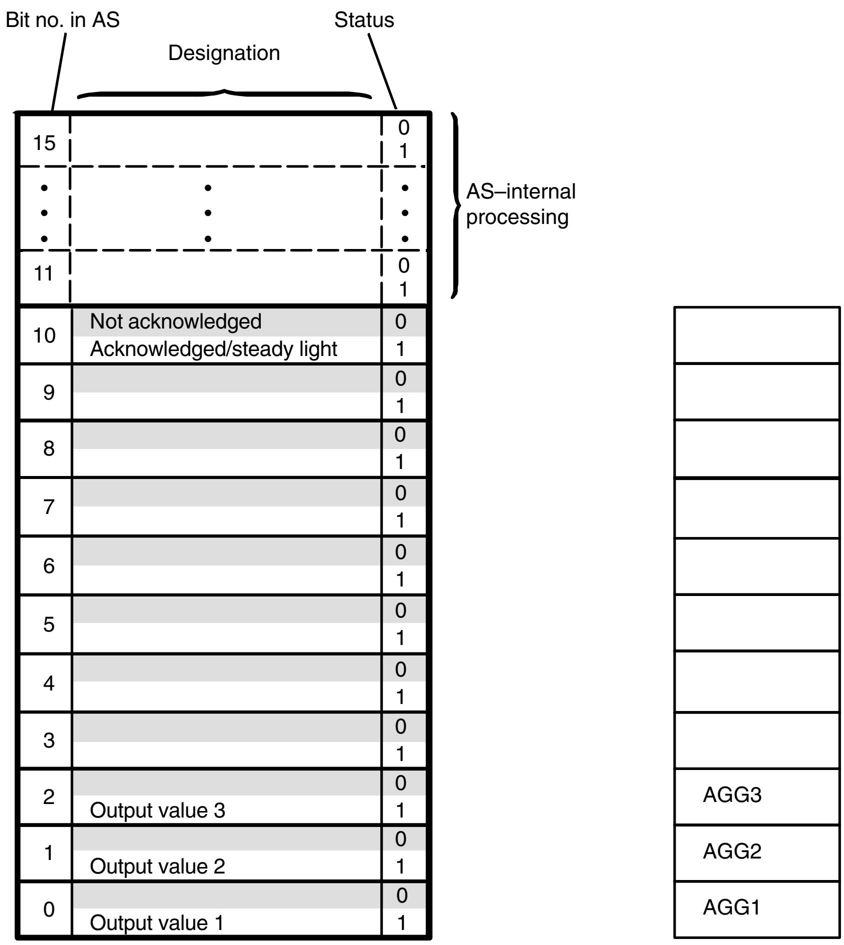
Meaning	Mnemonic name	Input/Output No.	Type
Output value 1	AGG1	1	AB
Output value 2	AGG2	2	AB
Output value 3	AGG3	3	AB
Operator–controllable input 1	B1	1	EBV
Operator–controllable input 2	B2	2	EBV
Operator–controllable input 3	B3	3	EBV
Automatic input 1	A1	4	EB
Automatic input 2	A2	5	EB
Automatic input 3	A3	6	EB
Mode	WAHL	7	I
Group display: no./location no.	NRPL	8	I
Cf. loop display	TBD1	9	S2
”	TBD2	10	S2
”	TBD3	11	S2
”	AT	12	S16

- Block list

```
   C       1                03. 03. 83/ 00. 23. 39.  P: 1   *


  1 AB   AGG1 0                #                      N    12
  2 AB   AGG2 0                #                      N    13
  3 AB   AGG3 0                #                      N    14
  1 EBV B1    0                                      B      1
  2 EBV B2    0                                      B      2
  3 EBV B3    0                                      B      3
  4 EB   A1   0                  P                          4
  5 EB   A2   0                  P                          5
  6 EB   A3   0                  P                          6
  7 I    WAHL    1                                  C       7
  8 ID   NRPL    0                                  C       8
  9 S2   TBD1 B1                                            9
 10 S2   TBD2 B2                                    C      10
 11 S2   TBD3 B3                                    C      11
 12 S16 AT    *TECHNOLOG. NAME    16                       19
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

AGG1 ... 3   Output value 1 ... 3

Fig. 9.32   Status word for the C block

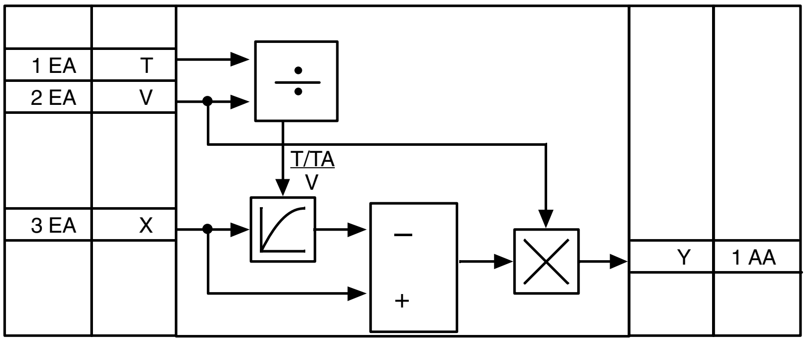
DIF

Derivative block

Application

This block is used
as a derivative unit, to generate decaying pulses,
as a derivative element in a controller or
as a derivative element in feedforward control.

Method of Operation



T Derivative time constant
V Gain
X Input variable
Y Output variable

Fig. 9.33 Derivative block, logic diagram

The transfer function of the derivative block is given by:

$$\frac{Y(s)}{X(s)} = \frac{T \cdot s}{1 + \frac{T \cdot s}{V}}$$

where T derivative time constant
T/V time lag constant
s Laplace operator

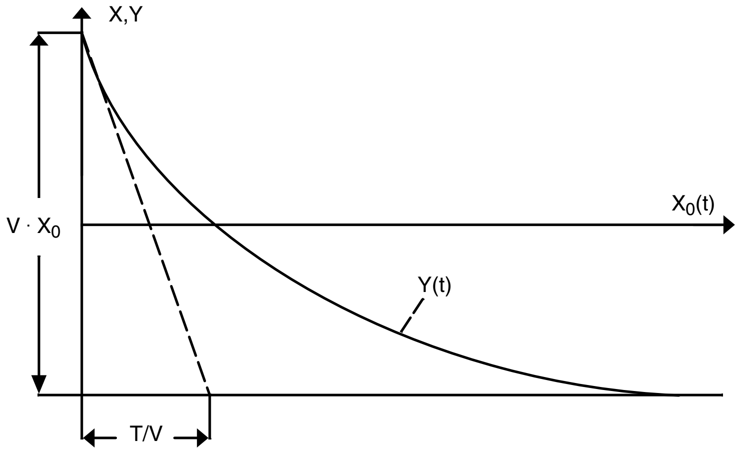
☞ The parameter T/TA must be assigned to input 1 ("T"). TA is the cycle time of the DIF block (cf. XB block).
Example:
T/TA = 16 must be entered if the derivative block should use a time constant of T = 2 s and if the block is executed every TA = 1/8 s.

- Initialization behaviour

  The DIF block executes an initialization run if a higher–order XB block is switched off and back on. This includes the following actions:

  – Y is set to 0 and
  – the internal old value is set to X (updating).

- Response to a sudden change of the input variable

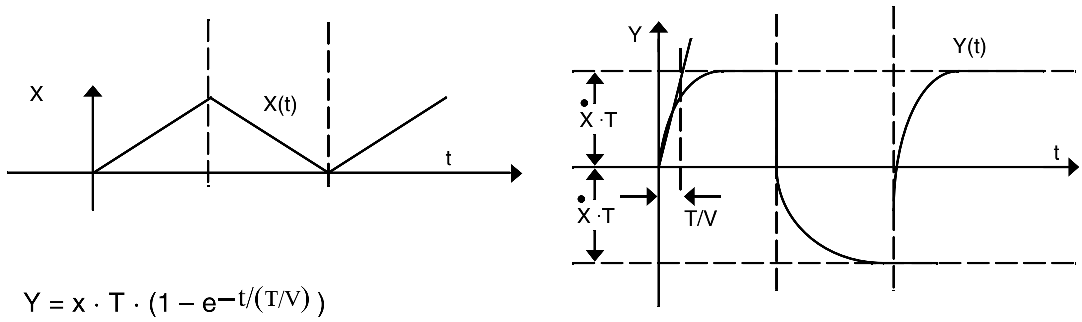


$$Y = V \cdot X_0 \cdot e^{-t/(T/V)}$$

t Time
T Derivative time constant
T/V Time lag constant
V Gain
X_0 Input variable (unit pulse)
Y Output variable

Fig. 9.34 Derivative block, step response

- Response to an input ramp



$$Y = x \cdot T \cdot (1 - e^{-t/(T/V)})$$

X Input variable
x Ramp gradient (dx/dt)
y Output variable
t Time
T Derivative time constant
V Gain

Fig. 9.35 Derivative block, ramp response

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
T/TA	T	1	EA
Gain	V	2	EA
Input variable	X	3	EA

- Block list

```
   DIF     1              03. 03. 83/ 00. 24. 31.  P: 1

 1 AA  Y    0.0000        #                      N    4
 1 EA  T    0.0000          P                         1
 2 EA  V    1.0000          P                         2
 3 EA  X    0.0000          P                         3
```

DIV

Divider block

Application

The transfer function of the divider block is given by:

Y = X1/X2

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
Dividend	X1	1	EA
Divisor	X2	2	EA

- Block list

```
  DIV    1              03. 03. 83/ 00. 25. 48.  P: 1

1 AA  Y    0.0000       #                      N    3
1 EA  X1   0.0000         P                         1
2 EA  X2   1.0000         P                         2
```

DR

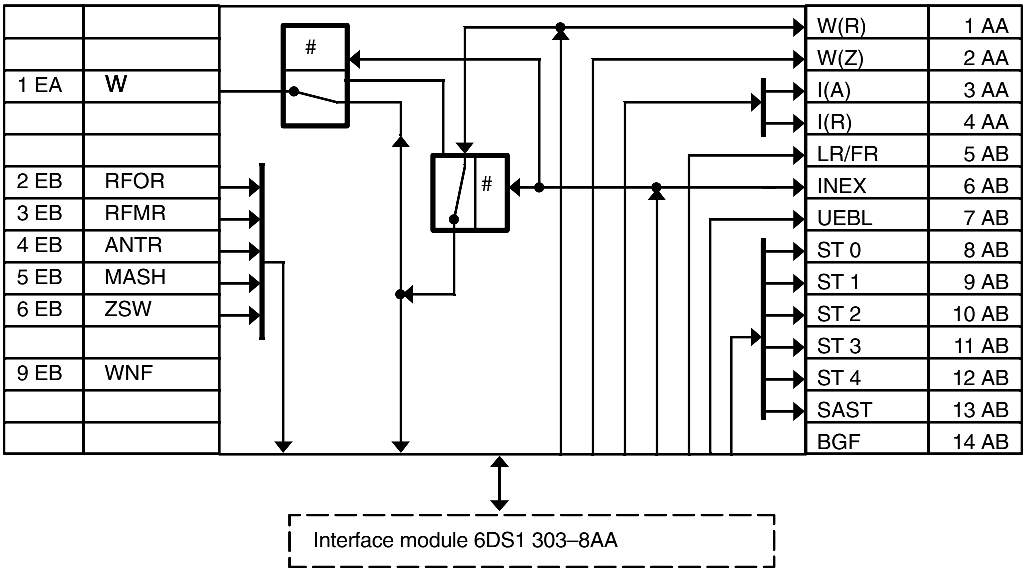
I/O block for speed controller

Application

This block is used for acquiring signals from the interface module (see Chap. 9.2) and for the transfer of signals to this interface module.

Method of Operation

Various binary and analog signals are transferred from the interface module to the DR block and made available as output signals of this block.



ANTR	Drive (ON)	SAST	Common alarm
BGF	Module fault	ST 0 ... 4	Status message
FRLR	Follower/master controller	UEBL	Overrange
IA	Absolute actual value	W	Setpoint input
INEX	Internal/external	WNF	Correction input
IR	Relative actual value	WR	Returned setpoint
MASH	Machine ON	WZ	Auxiliary setpoint, output
RFMR	Controller enabled with reset	ZSW	Auxiliary setpoint, input
RFOR	Controller enabled without reset		

The module number is selected via input 7 and the controller number (channel) via input 8.

BGNR: 0 .... 60 or 100 ... 160
KNR: 1 ... 63

Fig. 9.36 I/O block for speed controller, logic diagram

- Analog signals
  - Returned setpoint WR
  - Auxiliary setpoint WZ
  - Absolute actual value IA
  - Relative actual value IR
- Binary signals
  - Master controller (output 5 = 1)
    Follower controller (output 5 = 0)
  - External (output 6 = 1)
    Internal (output 6 = 0)
  - Overrange
  - Status messages
    . Controller enabled/disabled without reset
    . Controller enabled/disabled with reset
    . Drive ON/OFF
    . Machine ON/OFF
    . Auxiliary setpoint ON/OFF
  - Common alarm
  - Module fault
- The following analog and binary signals from the DR block are transferred to the interface module.

  Analog signals:

  - Setpoint (W)
    . As absolute value for master controllers
    . As relative value for follower controllers

  Binary signals

  - Controller enabled (input 2 = 1) /
    Controller disabled without reset (input 2 = 0)
  - Controller enabled (input 3 = 1) /
    Controller disabled (input 3 = 0)
  - Drive ON (input 4 = 1) /
    Drive OFF (input 4 = 0)
  - Machine ON (input 5 = 1) /
    Machine OFF (input 5 = 0) and
  - Auxiliary setpoint ON (input 6 = 1) /
    Auxiliary setpoint OFF (input 6 = 0)
- Internal setpoint (correction for bumpless switchover)

  WNF = 1 and INEX = 0:

  If internal setpoint has been selected (output 6 = 0), the DR I/O block transfers the displayed setpoint (output 1) to the setpoint input (input 1), i.e. the setpoint input is corrected (AS 220 compatible). Input W is not non–interacting during this operation. The setpoint transferred to the interface module (input 1) is not passed on to the speed controller module.

WNF = 0 and INEX = 0:

The setpoint input is not corrected. Correction is configurable by external interconnection. A group alarm (output 13) is issued if an overrange alarm or a time, controller or transfer fault occurs. Input W is thus non–interacting.

Output 14 (BGF) is set to “1” in the event of a time fault, a multiple read error or module faults such as time–out or multiple addressing. In the event of multiple read errors, time–out or multiple addressing the old values of the outputs 1 to 12 are retained and supplemented by a fault bit. Outputs 13 and 14 are set to “1”.

- System messages

S 305 Module does not acknowledge (incorrect address, incorrect jumper setting, defective module).
S 313 Multiple addressing (incorrect jumper setting).
S 321 Module failure or repeated read error in KSF.

☞ All DR block having access to the same module must be installed in the same cycle level. They may, however, run with different processing cycles. The shortest permissible processing cycle for the modules is 250 ms.

- Datea structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Returned setpoint	WR	1	AA
Auxiliary setpoint	WZ	2	AA
Absolute actual value	IA	3	AA
Relative actual value	IR	4	AA
Follower controller = ”0”, master controller = ”1”	FRLR	5	AB
Internal = ”0”, External = ”1”	INEX	6	AB
Overrange = ”1”	UEBL	7	AB
Controller enabled/disabled without reset	STO	8	AB
Controller enabled/disabled with reset	ST1	9	AB
Drive ON/OFF	ST2	10	AB
Machine: ON/OFF	ST3	11	AB
Auxiliary setpoint: ON/OFF	ST4	12	AB
Common alarm	SAST	13	AB
Module fault	BGF	14	AB
Setpoint	W	1	EA
Controller enabled = ”1” /disabled without reset = ”0”	RFOR	2	EB
Controller enabled = ”1” /disbaled with reset = ”0”	RFMR	3	EB
ON = ”1”/OFF = ”0”	ANTR	4	EB
Machine: ON = ”1”/OFF = ”0”	MASH	5	EB
Auxiliary setpoint: ON = ”1”/OFF = ”0”	ZSW	6	EB
Module number	BGNR	7	I
Controller number	KNR	8	I
W correction	WNF	9	EB

- Block list

```
   DR      1               03. 03. 83/ 00. 24. 52.  P: 1

 1 AA  WR   0.0000         #                           10
 2 AA  WZ   0.0000         #                           11
 3 AA  IA   0.0000         #                           12
 4 AA  IR   0.0000         #                           13
 5 AB  FRLR 0              #                           14
 6 AB  INEX 0              #                           15
 7 AB  UEBL 0              #                           16
 8 AB  STO  0              #                           17
 9 AB  ST1  0              #                           18
10 AB  ST2  0              #                           19
11 AB  SI3  0              #                           20
12 AB  ST4  0              #                           21
13 AB  SAST 0              #                           22
14 AB  BGF  0              #                           23
 1 EA  W    0.0000           P                          1
 2 EB  RFOR 0                P                          2
 3 EB  RFMR 0                P                          3
 4 EB  ANTR 0                P                          4
 5 EB  MASH 0                P                          5
 6 EB  ZSW  0                P                          6
 7 I   BGNR   0                                  C      7
 8 I   KNR    0                                  C      8
 9 EB  WNF  1                P                          9
```

DZ

Driver block for proportioning counter module (2/4 channels)

Application

This block is used

- for acquiring signals from the proportioning counter module (2/4 channels) and for making these signals available at the block outputs.
- for sending commands (ZS, ZR, SP, FR, V/R, UG/OG) and normalized analog values (EW, VW, KF, TM) to the proportioning counter module.

Method of Operation

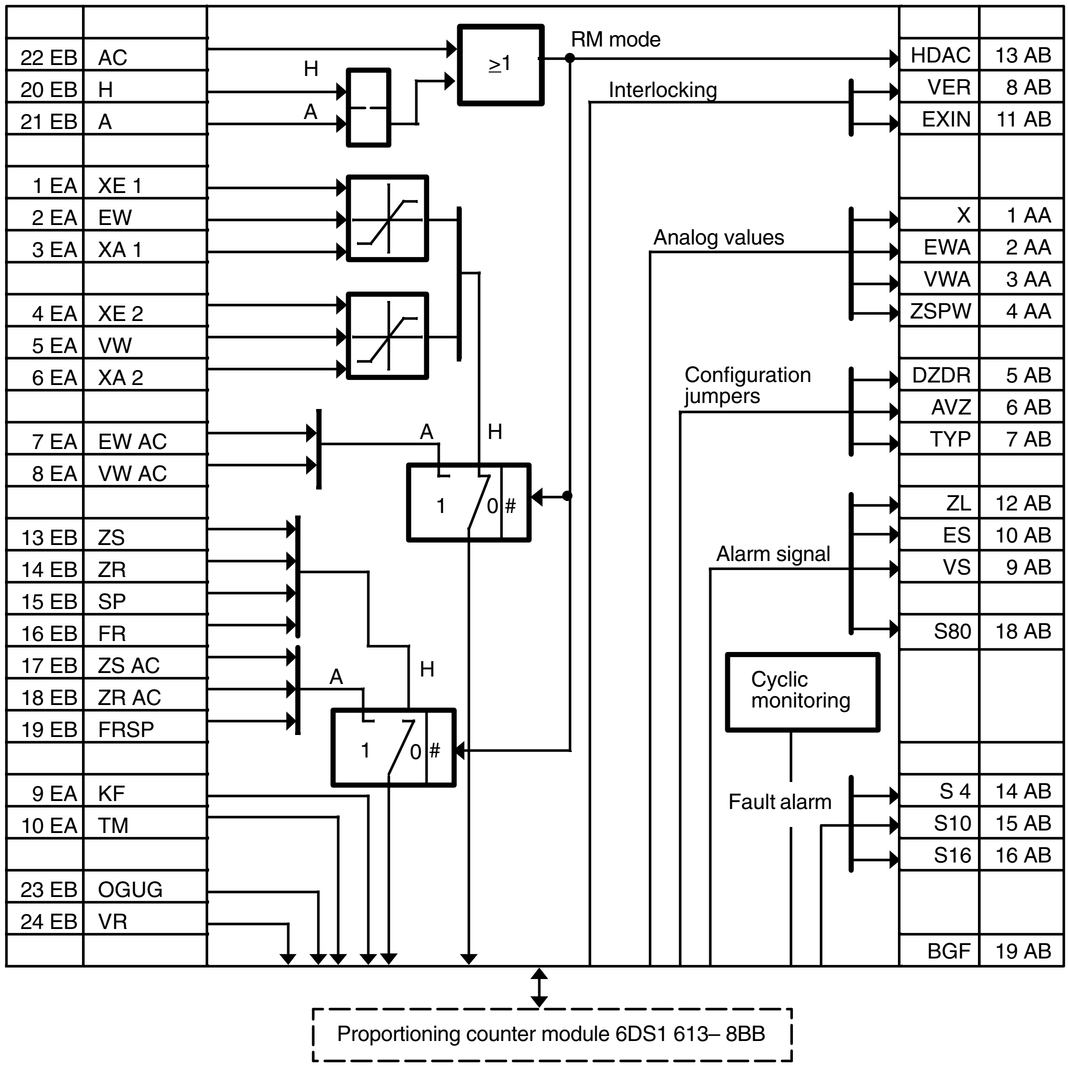


Fig. 9.37 DZ block, logic diagram

The function chart on the previous page (Fig. 9.37) contains the following mnemonics:

Inputs

AC	Automatic mode
H	Manual mode selection (PBT)
A	Automatic mode selection (PBT)
ZS	Set counter manually (PBT)
ZSAC	Set counter automatically
ZR	Reset counter manually (PBT)
ZRAC	Reset counter automatically
SP	Disable counter output manually (PBT)
FR	Enable counter output manually (PBT)
FRSP	Enable/disable counter output automatically
EW	Final value in manual mode
XE1	Upper range limit of the final value in manual mode
XA1	Lower range limit of the final value in manual mode
VW	Intermediate value in manual mode (PBT)
XE2	Upper range limit of the intermediate value in manual mode
XA2	Lower range limit of the intermediate value in manual mode
VWAC	Intermediate value in automatic mode
KF	Correction factor
TM	Measuring time
OGUG	Monitoring of upper (0) or lower (1) limit value
VR	Up or down counter (0 = up, 1 = down)
AW1/AW2	Adjacent analog values
BW1/BW2	Adjacent binary values
UMGF	Fault due to environment
NORM	Bar representation x
NRPL	Group display no./location no.
BGNR	Hardware module number
KNR	Channel no. on module

Outputs

HDAC	Mode: 0 = manual, 1 = automatic mode
VER	Interlocking
EXIN	Mode internal/external (0 = external, 1 = internal)
ZL	Counter active
ES	Final signal
VS	Intermediate signal
X	Count
EWA	Final value
VWA	Intermediate value
ZSPW	Buffer value
DZDR	Configuration jumper: proportioning/speed measurement
AVZ	Configuration jumper: automatic disabling of count inputs
TYP	Configuration jumper: 2– or 4–channel module
S4, S10, S16, S80	Error messages from module
BGF	Watchdog fault, module fault (common alarm)

The proportioning counter module transfers various groups of binary and analog signals to the DZ block. Here they are activated as output signals:

– Fault alarms (S4, S10, S16)

– Return data mode, interlocking (EXIN, VER)

– Configuration jumpers (DZDR, AVZ, TYP)

– Alarm signals, states (ESA, VSA, ZL)

– Analog values (X, ZSPW)

The following groups of binary and analog signals from the DZ block are transferred to the proportional counter module:

– Analog counter parameters (EW,VW,KF,TM)
– Binary counter parameters (VR,OGUG)
– Operator input commands (ZS,ZR,SP,FR)

- Modes

  Monitoring and control of the proportioning counter module by the AS 235 system are enabled if mode “External”, EXIN = 0 (corresponds to the hardware signal FEI = 0) has been selected. The operator input command “Set counter” (ZS = 1) is used to transfer the analog values EW, VW, KF, TM and the binary values OGUG and VR to the proportioning counter module.

  The process communication keyboard can be used in manual mode (HDAC = 0) to specify the final value EW within the programmable range limits (XA1 and XE1). The intermediate value VW can also be modified within the programmable control limits (XA2 and XE2) via the process communication keyboard.

  ZS = 1 interconnects the inputs EWAC and VWAC with the proportioning counter module in automatic mode (HDAC = 1). New count parameters (EW, VW, KF, TM) may only be entered after the current count operation has been completed, i.e. after the return message ES = 1 has been set.

- Effect of the operator input commands (ZS, ZR, SP, FR)

  – ZS = 1: Acceptance of the counter parameters transferred by the DZ block and start of counting. Return data: counter active (ZL = 1).
  – ZR = 1: Counting is interrupted, the counter content (X) is reset to zero. A counter inhibit is released. Depending on the ANL configuration jumper, the signal “Final value attained” is set (ES = 1).
  – SP = 1: The counter output is disabled, the signal “Final value attained” is set (ES = 1). The counter continues running (X display) and counts a possible overshoot.
  – FR = 1: If the counter is enabled (FR = 1) before the final value has been attained, “Final value attained” is reset to zero.

  The mode “Internal” EXIN = 1 (corresponds to the hardware signal FEI = 1) only permits monitoring of the proportioning counter module via the DZ block. The counter parameters and operator input commands can no longer be transferred to the proportioning counter module via the DZ block.

  The module continues using the counter parameters selected by the DZ block until the hardware signal “External setting” (H level) of the corresponding channel triggers acceptance of the final counter value into the buffer memory (ZSPW) of the module. This value has been set on a 4–digit thumbwheel switch. Counting is then restarted.

  The buffer value (ZSPW) is loaded into the intermediate and final value (VW = EW) when counting is restarted in this mode.

- Bar representation X
  - For bar representation X it is possible in counter functions to set the end of the display range to the final value if the input NORM = 1 is parameterized.
  - The measuring range (display range) can be specified by the range limits (XA1, XE1) as required (NORM = 0) if speed/rotational speed measurement has been selected.
- Mode selection

  The DZ block modes (H, A) can either be selected via the process communication keyboard (operator–controllable inputs 20 and 21 (H and A)) or via the interconnectable binary input 22 (AC). Mode A is selected if “1” has been applied to the binary input AC. The mode cannot then be selected via the process communication keyboard.
- Parameterization

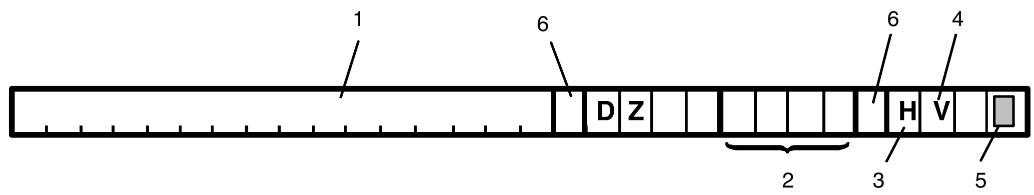
  The module number is parameterized via input 30 (BGNR).

  The channel number is parameterized with the following values via input 31:

Channel no.	Module	Integer number
1	2–channel	0
	4–channel	10
2	2–channel	1
	4–channel	11
3	4–channel	12
4	4–channel	13

  If one of the parameters BGNR or KNR is changed, the driver should be removed or the associated XB switched off, as it should be inactive during this operation.

  The displays SP, FR and I are omitted in the loop display if measurement of speed or rotational speed (DZDR = 1) has been selected. The corresponding inputs (45, 46, 47) should then be parameterized with blanks.
- Normalized representation in a group display



1 Process–related name of the DZ block, as in loop display
2 Name/number of the DZ block
3 Mode indicator
  I – Internal (1st character of S2 string TINT)
  H – Manual (1st character of S2 string TH)
  A – Automatic (1st character of S2 string TA)
4 Status indicator
  S – Counter disabled (1st character of S2 string TSP)
  E – Final signal attained, ES = 1 (1st character of S2 string TES)
  V – Intermediate signal, VS = 1 (1st character of S2 string TVS)
  No indication – counter active, ZA = 1
5 Blinking mark indicating: common alarm, group fault from F (fault, environment),
  I&C fault alarms S (S no.), intermediate signal attained (VS = 1) or final signal attained (ES = 1)
6 Separating blank

Fig. 9.38 Normalized representation in a group display

The 30 characters for this block are displayed at a specific location in a group display. This requires the following parameterization of input 29 (group display: no./location no.):

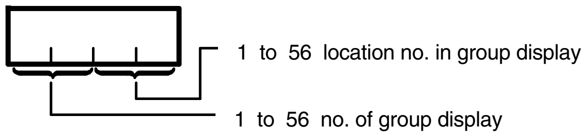


Fig. 9.39 DZ block; parameterization of input 29

- Normalized representation of the loop display

The following loop display (Fig. 9.40) contains the below–mentioned static and dynamic data:

Static data

1 Mnemonic name and no. of the proportioning counter block
2 Process–related name of the proportioning counter block
3 Process–related name of adjacent analog values
4 Process–related name of adjacent binary values
5 Internal enabling (I = 1 internal, I = 0 external)
6 Final value quantity (EW) of current count
7 Intermediate value quantity (VW) of current count
8 Actual value quantity (X) of current count
9 Mode: A, H (A = 1 automatic mode, H = 1 manual mode)
10 Alarm signals (ES,VS,F,S) ES = Final signal attained
VS = Intermediate signal attained
F = External fault
S = I&C fault alarm
11 Mnemonic name of the bar (X)
12 Physical quantity of EW, VW and X
13 Physical quantities of adjacent analog values
14 Lower range limit of X
15 Upper range limit of X
16 Process–related quantities of adjacent analog values
25 Mnemonic names of operator–controllable inputs :
FR = enable counter output
SP = disable counter output
ZR = reset counter
ZS = set counter

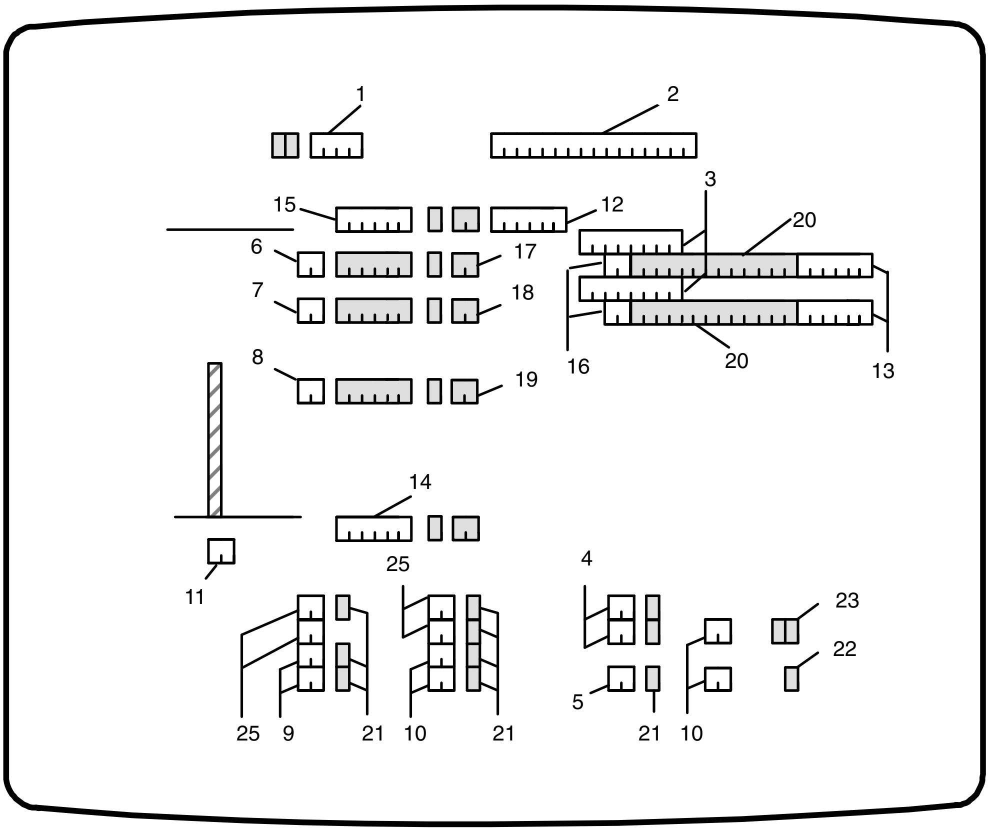
Dynamic data

17 Final value (EW)
18 Intermediate value (VW)
19 Actual value (X)
20 Digital values of the adjacent analog values
21 Modes (I, A, H, ES, VS, SP, FR, ZS)
I = 1 Internal, I = 0 External
A = 1 Automatic mode
H = 1 Manual mode
ES = 1 Final signal attained
VS = 1 Intermediate signal attained
SP = 1 Counter output disabled (ES = 1)
FR = 1 Counter output enabled
ZS = 1 Counter set and active (ZA = 1)
22 External fault (1 = fault has occurred)
23 I&C fault alarms: Priority [1)]

S80	Module defective	1
S4	Hardware fault on module	2
S10	Sensor failure	3
S16	Command output fault	4

24 States of the adjacent binary values

1) The I&C fault alarms are displayed according to priority (1 = highest priority).




```
22. 07. 82/ 08. 55. 04.


              DZ    1          *TECHNOLOG. NAME


        _________    100.00      *EHTX*
                                        TA11TA12
                EW 0.0000                 A1              EHT1**
                                        TA21TA22
                VW 0.0000                 A2              EHT2**



                X  0.0000




        _________    0.0000
           X


                ZS 0      SP 0          B1
                ZR        FR 1          B2       S     0
                A  0      ES 0
                H  1      VS 0          I  0     F     0


     BR
DZ,1;
```

Fig. 9.40 DZ block, normalized representation in the loop display

- Using the process communication for operator input

  6 keys in speed measuring mode (EW =, VW =, ZS = 1, ZR = 1, H = 1 and A = 1) or 8 keys in proportioning counter mode (EW =, VW =, ZS = 1, ZR = 1, SP = 1, FR = 1, H = 1 and A = 1) will be assigned after the loop display has been selected and the BE key (”Operator input”) depressed.

  After the (EW =) or (VW =) key has been depressed, a sequence of numbers may be entered and terminated by pressing the execute key (◈). It is possible to press the keys “More” (↑) or ”Less” (↓) for continuation without entering figures (final value EW or intermediate value VW). It is then not necessary to terminate with the execute key (◈).

  The change is approximately 1% of the measuring span per processing cycle. The function key inputs ZS = 1, ZR = 1, A = 1, H = 1, SP = 1 and FR = 1 must be terminated by pressing the execute key (◈).

EW=	VW=	ZS=1	ZR=1	SP=1	FR=1	H=1	A=1

A Automatic mode
EW Final value
FR Enable counter output 1)
H Manual mode
SP Disable counter output 1)
VW Intermediate value
ZR Reset counter
ZS Set counter

1) Speed and rotational speed measurements required the second character of the parameters 41 and 42 to be parameterized with “*” in order to suppress assignment of SP = 1 and FR = 1.

Fig. 9.41 DZ block; automatic assignment of the process communication keyboard.

☞ A new intermediate or final value may only be entered after the current count procedure is finished (ZL = 0). If a count has not been activated (i.e. ZL = 0), the input values 2EA (EW) or 7EA (EWA) and 5EA (VW) or 8EA (VWA) corresponding to the mode (HDAC) are displayed via the outputs 2AA (EW) and 3AA (VW).

- System message

  S 305: Time–out in module (check module).
  S 313: Multiple addressing (several modules are set to the same address).
  S 321: The watchdog timer has timed–out (is also indicated by BGF = 1, S 80 = 1)
  or: multiple read error when reading from module
  or: time–out/multiple addressing detected

  If a read error has occurred, the corresponding outputs are also marked as defective (# code set) and the last values retained. The next correct value will be accepted and the # code reset.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Default values	Configuration details
Current count	X	1	AA	.0000	
Final value	EWA	2	AA	.0000	
Intermediate value	VWA	3	AA	.0000	7)
Buffer value	ZSPW	4	AA	.0000	
Proport.counter/speed mtr 0/1	DZDR	5	AB	0	
Interlocking	AVZ	6	AB	0	
2/4 channel module, 0/1,	TYP	7	AB	0	
RM disable count pulses	VER	8	AB	0	
RM intermediate signal	VS	9	AB	0	
RM final signal or UG/OG	ES	10	AB	0	1)
RM enable, internal	EXIN	11	AB	0	7) 8)
Counter active	ZL	12	AB	0	
H/A mode, 0/1	HDAC	13	AB	0	
Fault alarm	S4	14	AB	0	
Fault alarm	S10	15	AB	0	
Fault alarm	S16	16	AB	0	
Fault alarm	S31	17	AB	0	
Fault alarm	S80	18	AB	0	
Module fault	BGF	19	AB	0	
Upper range limit	XE1	1	EA	100.0	
Setpoint final value	EW	2	EAV	.0000	2)
Lower range limit	XA1	3	EA	.0000	
Upper control limit	XE2	4	EA	100.0	7)
Setpoint intermediate value	VW	5	EAV	.0000	2) 7)
Lower control limit	XA2	6	EA	.0000	7)
Setpoint final value (A)	EWAC	7	EA	.0000	
Setpoint intermdt. value (A)	VWAC	8	EA	.0000	7)
Correction factor	KF	9	EA	1.000	
Measuring time/oversh. time	TM	10	EA	.0000	
Adjacent analog value 1	AW1	11	EA	.0000	4)
Adjacent analog value 2	AW2	12	EA	.0000	4)
Set counter (H)	ZS	13	EBV	0	6)
Reset counter (H)	ZR	14	EBV	0	6)
Disabling counter output	SP	15	EBV	0	6) 7) 8)
Enabling counter output	FR	16	EBV	0	7) 8)
Set counter (A)	ZSAC	17	EB	0	
Reset counter (A)	ZRAC	18	EB	0	
Disable/enable	FRSP	19	EB	0	7)8)
Manual mode (PBT)	H	20	EBV	1	6)
Automatic mode (PBT)	A	21	EBV	0	6)
Automatic	AC	22	EB	0	
Code UG/OG,	OGUG	23	EB	0	3)
Setpoint V/R, = 1	VR	24	EB	0	8)
Environment fault	UMGF	25	EB	0	
Adjacent binary value 1	BW1	26	EB	0	5)
Adjacent binary value 2	BW2	27	EB	0	5)
X normalization XE1, EW, 0/1, group display	NORM	28	I	0	

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type	Default values	Configuration details
Group displ. no./loc. no.	NRPL	29	ID	0	
Module number	BGNR	30	ID	0	
Channel number	KNR	31	I	0	see addressing
Cf. loop display	TEW	32	S2	EW	
” ”	TVW	33	S2	VW	
” ”	TX	34	S2	X	
” ”	TZS	35	S2	ZS	7)
” ”	TZR	36	S2	ZR	
” ”	TA	37	S2	A	
” ”	TH	38	S2	H	
” ”	TES	39	S2	ES	
” ”	TVS	40	S2	VS	
” ”	TSP	41	S2	SP	9)
” ”	TFR	42	S2	FR	9)
” ”	TINT	43	S2	I	
” ”	TSNR	44	S2	S	
” ”	TF	45	S2	F	
” ”	EHTX	46	S6	*EHTX*	
” ”	TAW1	47	S2	A1	
” ”	TAW2	48	S2	A2	
” ”	TBW1	49	S2	B1	
” ”	TBW2	50	S2	B2	
” ”	TA11	51	S4	TA11	
” ”	TA12	52	S4	TA12	
” ”	EHT1	53	S6	EHT1 **	
” ”	TA21	54	S4	TA21	
” ”	TA22	55	S4	TA22	
” ”	EHT2	56	S6	EHT2 **	
” ”	AT	57	S16	* Technolog.Name	

1) Meaning for:
– 2–channel module : ES
– 4–channel module : UG/OG
Signal state ”0” : no violation of limit values
Signal state ”1” : violation of upper or lower limit value

2) Input cannot be interconnected. Operator–controllable inputs are non–interacting.

3) Meaning for:
– 2–channel module : none
– 4–channel module : In mode “Rotational speed/length measurement”, the measured count X is compared with the “Final value” after the measuring time TM has elapsed. This comparison can be performed for the upper and the lower limit.
OGUG = 0 means comparison referring to UG
OGUG = 1 means comparison referring to OG

4) Configurable input for the adjacent analog value to be shown in the loop display (see loop display).

5) Configurable input for the adjacent binary value to be shown in the loop display (see loop display).

6) Input for the operator communication keyboard of the process communication keyboard (not non–interacting).

7) Insignificant for the 4–channel module.

8) Insignificant for rotational speed or speed measurement.

9) Speed measurement mode requires the second character of the parameters 41 and 42 to be parameterized with “*” in order to suppress assignment of the corresponding PBT key.

- Block list

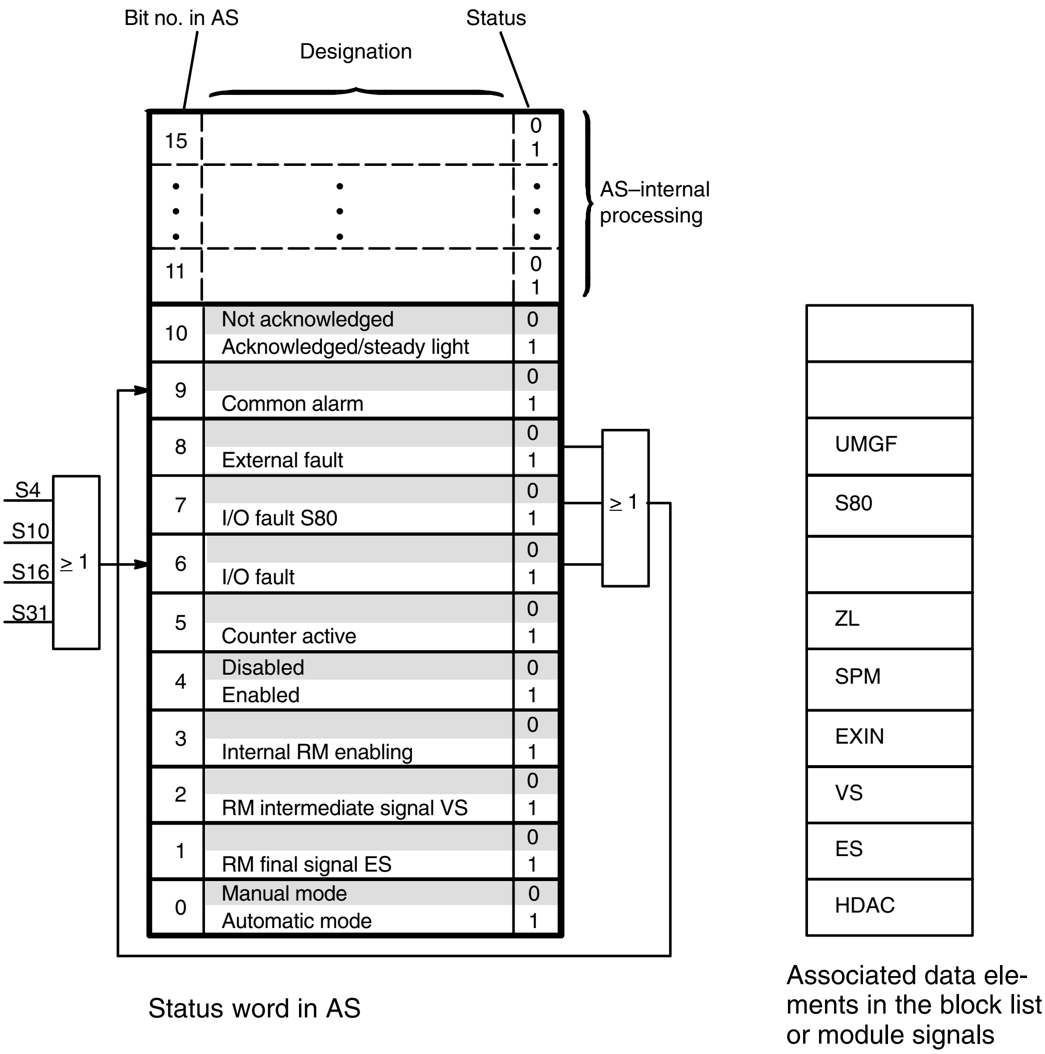
```
   DZ       1                15. 08. 84/ 10. 31. 41.  P: 1

 1 AA  X    0.0000            #                    N   57
 2 AA  EWA  0.0000            #                    N   58
 3 AA  VWA  0.0000            #                    N   59
 4 AA  ZSPW 0.0000            #                    N   60
 5 AB  DZDR 0                 #                    N   61
 6 AB  AVZ  0                 #                    N   62
 7 AB  TYP  0                 #                    N   63
 8 AB  VER  0                 #                    N   64
 9 AB  VS   0                 #                    N   65
10 AB  ES   0                 #                    N   66
11 AB  EXIN 0                 #                    N   67
12 AB  ZL   0                 #                    N   68
13 AB  HDAC 0                 #                    N   69
14 AB  S4   0                 #                    N   70
15 AB  S10  0                 #                    N   71
16 AB  S16  0                 #                    N   72
17 AB  S31  0                 #                    N   73
18 AB  S80  0                 #                    N   74
19 AB  BGF  0                 #                    N   75
 1 EA  XE1  100.00              P                  N    1
 2 EAV EW   0.0000                               CB     2
 3 EA  XA1  0.0000              P                       3
 4 EA  XE2  100.00              P                       4
 5 EAV VW   0.0000                               CB     5
 6 EA  XA2  0.0000              P                       6
 7 EA  EWAC 0.0000              P                       7
 8 EA  VWAC 0.0000              P                       8
 9 EA  KF   1.0000              P                       9
10 EA  TM   0.0000              P                      10
11 EA  AW1    15    0       0A   P                      11
12 EA  AW2    15    0       0A   P                      12
13 EBV ZS   0                                    CB    13
14 EBV ZR   0                                    CB    14
15 EBV SP   0                                    CB    15
16 EBV FR   0                                    CB    16
17 EB  ZSAC 0                   P                      17
18 EB  ZRAC 0                   P                      18
19 EB  FRSP 0                   P                      19
20 EBV H    0                                     B    20
21 EBV A    0                                     B    21
22 EB  AC   0                   P                      22
23 EB  OGUG 0                   P                      23
24 EB  VR   0                   P                      24
25 EB  UMGF 0                   P                      25
26 EB  BW1  0               A   P                      26
27 EB  BW2  0               A   P                      27
28 I   NORM     0               P                C     28
29 ID  NRPL     0               P                C     29
30 ID  BGNR     0               P                C     30
31 I   KNR      0               P                C     31
32 S2  TEW  EW                                         32
33 S2  TVW  VW                                         33
34 S2  TX   X                                          34
35 S2  TZS  ZS                                         35
36 S2  TZR  ZR                                         36
37 S2  TA   A                                          37
38 S2  TH   H                                          38
39 S2  TES  ES                                         39
40 S2  TVS  VS                                         40
```

Block list (continued)

```
41 S2  TSP  SP                                41
42 S2  TFR  FR                                42
43 S2  TINT I                                 43
44 S2  TSNR S                                 44
45 S2  TF   F                                 45
46 S   EHTX *EHTX*            6               46
47 S2  TAW1 A1                                47
48 S2  TAW2 A2                                48
49 S2  TBW1 B1                                49
50 S2  TBW2 B2                                50
51 S4  TA11 TA11                              51
52 S4  TA12 TA12                              52
53 S   EHT1 EHT1**            6               53
54 S4  TA21 TA21                              54
55 S4  TA22 TA22                              55
56 S   EHT2 EHT2**            6               56
57 S16 AT   *TECHNOLOG. NAME 16                8
```

- Status word



ES	RM final signal or upper limit/lower limit
EXIN	Internal RM enabling
HDAC	Manual/automatic mode
S80	Fault signal S80
UMGF	Environment fault
SPM	Internal element

Fig. 9.42 Status word for the DZ block

E110

Binary input block for the S5–110A link

Application

This block is used as a driver block for reading 8 or 16 binary values from an interface module to the SIMATIC S5 peripheral devices or from TELEPERM M standard binary input modules.

See Chapter 9.2 for interface modules or binary input modules.

Method of Operation

The E110 driver block reads 8 or 16 binary values from the interface module to the S5–110A or from a standard binary input module (linking signal transformer; see the two following logic diagrams 9.43 and 9.44).

The number of binary values to be read depends on the BA1 and BA2 parameters:

BA1 = 0	BA2 = any value	:	The whole block is switched off.
BA1 ≠ 0	BA2 = 0	:	8 binary values (E1 to E8). Odd channel numbers are permitted.
BA1 ≠ 0	BA2 ≠ 0	:	16 binary values (E1 to E16). Only even channel numbers are permitted.

Up to four S5–110A controllers can be connected to one S5–110A interface module. Each S5–110A controller can be equipped with

– 7 modules with 8 binary values each (= 56 binary values= with 1–tier structure
– 15 modules with 8 binary values each (= 120 binary values) with 2–tier structure

The channel number (KNR) and BA2 # 0 are used to parameterize two adjacent modules in the S5–110A controller (channel number = even module number in the S5–110A controller) when 16 binary values are transferred.

The driver should be removed or the associated XB switched off, as it should be inactive if one of the parameters BGNR or KNR is changed.

- Channel number (KNR) for S5–110A (1–tier)

1. S5–110A: Channel number	0 :	binary value	1 – 16	module 0+1
	2 :	binary value	17 – 32	module 2+3
	4 :	binary value	33 – 48	module 4+5
	6 :	binary value	49 – 64	module 6+ a
2. S5–110A: Channel number	8 :	binary value	65 – 80	module 0+1
	10 :	binary value	81 – 96	module 2+3
	12 :	binary value	97 – 112	module 4+5
	14 :	binary value	113 – 128	module 6+ a
3. S5–110A: Channel number	16 :	binary value	129 – 144	module 0+1
	18 :	binary value	145 – 160	module 2+3
	20 :	binary value	161 – 176	module 4+5
	22 :	binary value	177 – 192	module 6+ a
4. S5–110A: Channel number	24 :	binary value	193 – 208	module 0+1
	26 :	binary value	209 – 224	module 2+3
	28 :	binary value	225 – 240	module 4+5
	30 :	binary value	241 – 256	module 6+ a

a = flag

The last eight binary values of each S5–110A contain flags and may not be interconnected with a module.

- Channel number (KNR) for S5–110A (2–tier)

1. S5–110A: Channel number	0 :	binary value	1 – 16	module 0+ 1
	2 :	binary value	17 – 32	module 2+ 3
	4 :	binary value	33 – 48	module 4+ 5
	6 :	binary value	49 – 64	module 6+ 7
	8 :	binary value	65 – 80	module 8+ 9
	10 :	binary value	81 – 96	module 10+11
	12 :	binary value	97 – 112	module 12+13
	14 :	binary value	113 – 128	module 14+ a
2. S5–110A: Channel number	16 :	binary value	129 – 144	module 0+ 1
	18 :	binary value	145 – 160	module 2+ 3
	20 :	binary value	161 – 176	module 4+ 5
	22 :	binary value	177 – 192	module 6+ 7
	24 :	binary value	193 – 208	module 8+ 9
	26 :	binary value	209 – 224	module 10+11
	28 :	binary value	225 – 240	module 12+13
	30 :	binary value	241 – 256	module 14+ a
3. S5–110A: Channel number	32 :	binary value	257 – 275	module 0+ 1
	34 :	binary value	276 – 291	module 2+ 3

etc. to

4. S5–110A: Channel number	62 :	binary value	496 – 512	module 14+ a

The last eight binary values of each S5–110A contain flags and may not be interconnected with a module.

- Flag assignments

Binary values
E9 = Incorrect number of lines (jumper)
E10 = Rapid shutdown, since cyclic monitoring has failed (binary outputs reset)
E11 = Message frame fault
E12 = No time specified
E13 = Module fault
E14 = Not applicable
E15 = Not applicable
E16 = Not applicable

One or two bytes are read which correspond to a group of 8 binary values each. Depending on the mode selected (BA1 or BA2) for the individual groups, the binary values can either be stored continguously in a binary field (see Fig. 9.43) which is interconnected with E1 or E9, respectively (instruction `Q,...;`), or in individual binary variables (see Fig. 9.44) which are interconnected with E1 to E8 or E9 to E16, respectively.

The number of bytes read and the associated channel address depend on the parameters BA1, BA2, and KNR.

BA1 = 0	BA2 any	:	Whole block deactivated
BA1 ≠ 0	BA2 = 0	:	1 byte from address = KNR is transferred to the first group. KNR may be odd or even.
BA1 ≠ 0	BA2 ≠ 0	:	2 bytes are read from the even address KNR. The next similar even address is used if KNR is odd.

Old and new value of each group (E1 to E8, E9 to E16) are compared with each other; new values are only stored if there is a difference in these values. Output BGF will be set and a fault code entered in the old binary values if the module has been set incorrectly on the module or in the E110 block or if several modules use the same module number.

- Significance of the parameters

BA1	:	= 0; No processing, block is switched off
	:	= 1; Interconnection of .E1 is considered as a field address
	:	≥ 2; Interconnection of .E1 to .E8 is considered as an individual address
E1	:	Binary value 1
E2	:	Binary value 2
E3	:	Binary value 3
E4	:	Binary value 4
E5	:	Binary value 5
E6	:	Binary value 6
E7	:	Binary value 7
E8	:	Binary value 8
BA2	:	= 0; 2nd group switched off
	:	= 1; Interconnection of .E9 is considered as a field address
	:	≥ 2; Interconnection of .E9 to .E16 is considered as an individual address
E9	:	Binary value 9
E10	:	Binary value 10
E11	:	Binary value 11
E12	:	Binary value 12
E13	:	Binary value 13
E14	:	Binary value 14
E15	:	Binary value 15
E16	:	Binary value 16

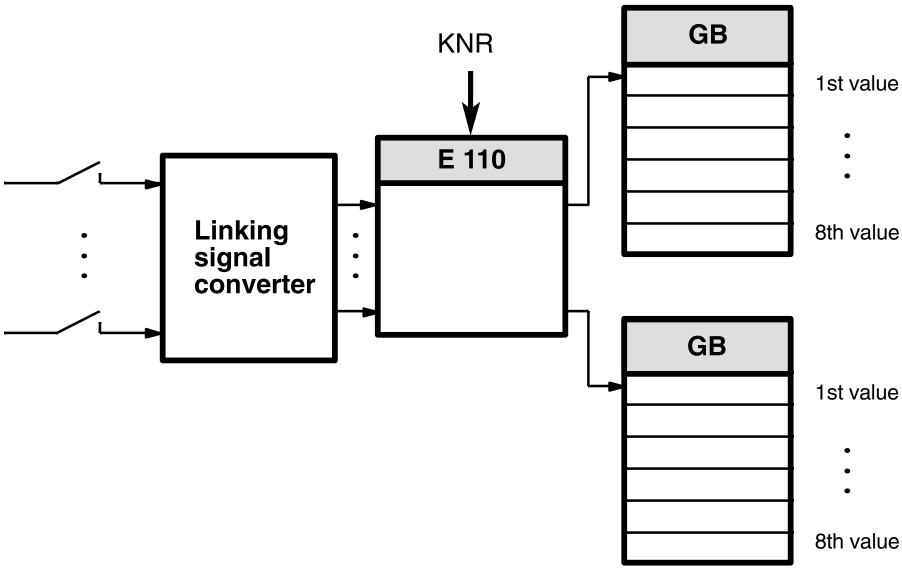


Fig. 9.43 BA1 / BA2 = 1 mode, logic diagram

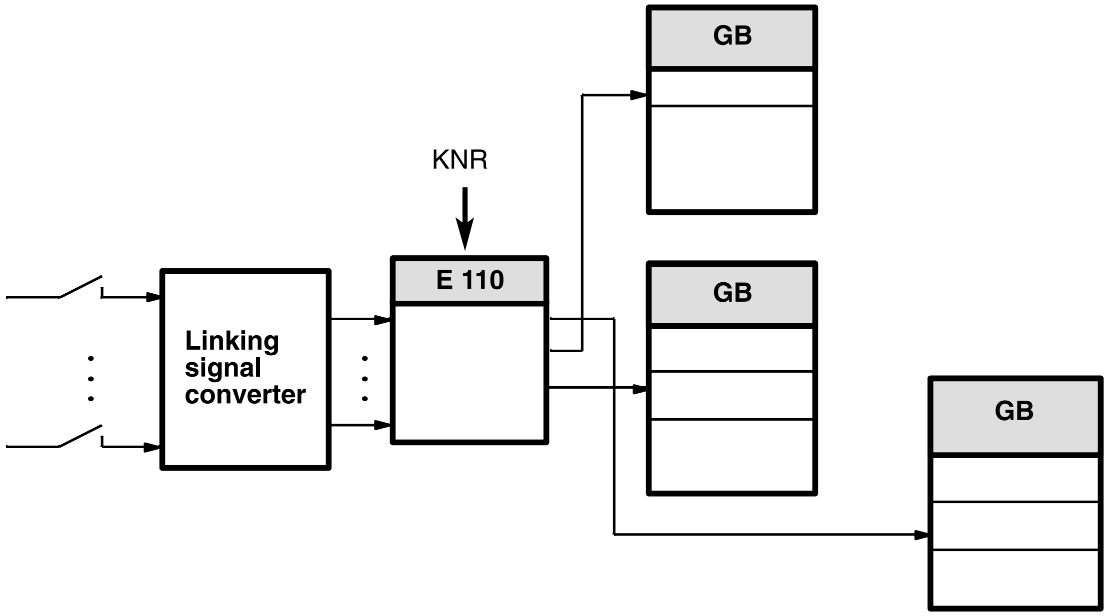


Fig. 9.44 BA1/BA2 = 2, logic diagram

- System messages

S 304: Addressing error in block
S 305: Time–out from external devices
S 313: Multiple addressing from external devices

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Module fault	BGF	1	PB
Change binary value E1 – E8	AE1	2	PB
Change binary value E9 – E16	AE2	3	PB
Mode 1	BA1	1	I
Binary value 1	E1	2	EB
” 2	E2	3	EB
” 3	E3	4	EB
” 4	E4	5	EB
” 5	E5	6	EB
” 6	E6	7	EB
” 7	E7	8	EB
” 8	E8	9	EB
Mode 2	BA2	10	I
Binary value 9	E9	11	EB
” 10	E10	12	EB
” 11	E11	13	EB
” 12	E12	14	EB
” 13	E13	15	EB
” 14	E14	16	EB
” 15	E15	17	EB
” 16	E16	18	EB
Module number	BGNR	19	I
Channel number	KNR	20	I

- Block list

```
   E110    1              03. 03. 83/ 00. 28. 48.  P: 1

 1 PB  BGF  0                                    N   21
 2 PB  AE1  0                                    N   22
 3 PB  AE2  0                                    N   23
 1 I   BA1     0                               C      1
 2 EB  E1                                      C   Q  2
 3 EB  E2                                      C   Q  3
 4 EB  E3                                      C   Q  4
 5 EB  E4                                      C   Q  5
 6 EB  E5                                      C   Q  6
 7 EB  E6                                      C   Q  7
 8 EB  E7                                      C   Q  8
 9 EB  E8                                      C   Q  9
10 I   BA2     2                               C     10
11 EB  E9                                      C   Q 11
12 EB  E10                                     C   Q 12
13 EB  E11                                     C   Q 13
14 EB  E12                                     C   Q 14
15 EB  E13                                     C   Q 15
16 EB  E14                                     C   Q 16
17 EB  E15                                     C   Q 17
18 EB  E16                                     C   Q 18
19 I   BGNR    0                               C     19
20 I   KNR     0                               C     20
```

EAR

Routing block for individual analog values

Application

This block can be used, for example, to route analog values from block outputs to a GA block.

Method of Operation

The block features two EA inputs (X and Y). It reads the value interconnected with X (1EA) and writes this value to the address which is interconnected with Y (2EA).

Y is thus the block output, although it has been defined as EA (in order to make it interconnectable). Y can only be interconnected, and may not be parameterized. The block may not be installed before Y has been interconnected.

⚠ **When using variables with CHECK identifier:**

When using a parameter whose CHECK identifier (C) has been set, to interconnect input 2 (Y), it must be taken into consideration that this CHECK will not be performed. The value (from input 1 – X) will be entered in the parameter without a check having taken place, in contrast to an entry by operator input or parameterization.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Input (source) Output (target) only interconnectable	X Y	1 2	EA EA

- Block list

```
  EAR     1              03. 03. 83/ 00. 29. 43.  P: 1

 1 EA  X     0.0000          P                       1
 2 EA  Y                     P                    Q  2
```

EBR

Routing block for individual bits

Application

This block is used for the interconnection of individual binary outputs and of function blocks with GB/GM data blocks which cannot be interconnected directly.

Method of Operation

This block features 2 EB inputs (E and A); it reads the value from the address interconnected with E and writes it to the data element to which the interconnection of A refers. A is thus the block output, although it has been defined as EB (in order to make it interconnectable). A can only be interconnected, and may not be parameterized.

This block can be used to route outputs to the GB area, for example.
The block may not be installed before A has been interconnected.

⚠ **When using variables with CHECK identifier:**

When using a parameter, whose CHECK identifier (C) has been set, to interconnect input 2 (A), it must be taken into consideration that this CHECK will not be performed. The value (from input 1 – E) will be entered into the parameter without a check having taken place, in contrast to an entry by operation or parameterization.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Input (source)	E	1	EB
Output (target)	A	2	EB

- Block list

```
   EBR     1               03. 03. 83/ 00. 30. 04.  P: 1

 1 EB  E                                             Q  1
 2 EB  A                                             Q  2
```

EG

Driver block for open–loop control module

Application

This block is used for acquiring signals from an open–loop control module (see Chap. 9.2 for modules) and for making these signals available at the binary outputs. One EG block is required for each channel.

The block is also used to transfer commands to an open–loop control module.

Method of Operation

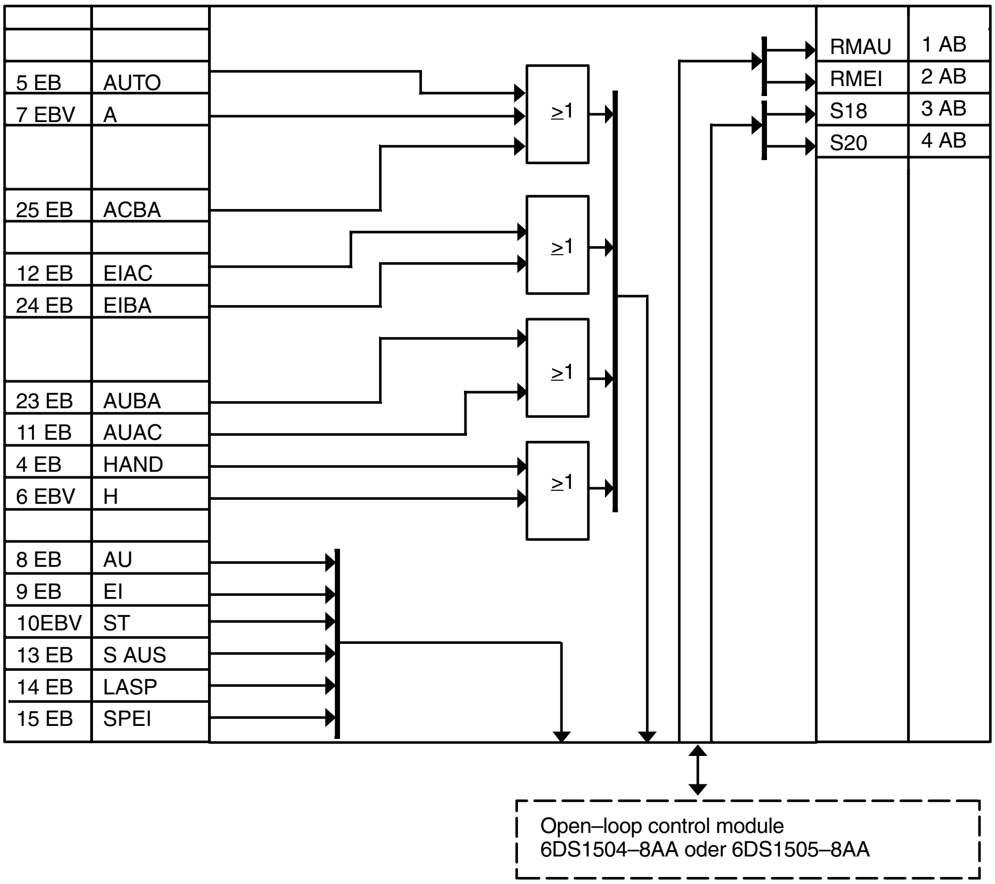


Fig. 9.45 EG block, logic diagram

- Modes

  The commands AU, EI and ST entered via the operator–controllable inputs are routed to the open–loop control module if manual mode (H) has been selected. The commands AUAC and EIAC or AUBA and EIBA from an automatic control are routed to the open–loop control module if automatic mode (A) has been selected.

  Manual mode can be selected via the operator–controllable input H or the automatic input HAND. Automatic mode can be selected via the operator–controllable input A, the automatic input AUTO or the input ACBA.

- Configuration instruction

  MANUAL or AUTOMATIC mode can only be selected for all channels of the open–loop control module 6DS1 504 or 6DS1 505 together. MANUAL or AUTOMATIC selection must therefore be the same in all driver blocks if several EG drivers act upon different channels of a module.

- Parameterization

  The module number is parameterized via input 20 (BGNR), the channel number via input 21 (KNR). The module type is parameterized via input 22 (TYP).

  Parameterization of input 22:

  0 : module 6DS15 04–8AA (4 channels)
  1 : module 6DS15 05–8AA (8 channels)
  2 : module 6DS15 05–8AA (4 channels)

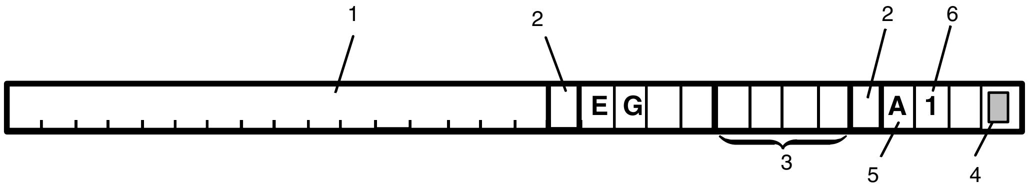
  Parameterization of input 21 following input 22:

  – Input 22 = 0 and 1:
    0 to 3 or 0 to 7 corresponds to channels 1 to 4 or 1 to 8 respectively.

  – Input 22 = 2
    0 : channel 1
    2 : channel 2
    4 : channel 3
    6 : channel 4

  The driver should be removed or the associated XB switched off, as it should be inactive if one of the parameters “BG number” or “KNR” is changed.

- Normalized representation in a group display



1 Process–related name of the block, as used in the loop display
2 Separating blank
3 Block name/no.
4 Loop message field: grouping of the S alarm signals and external faults
5 A for automatic mode
  H for manual mode
6 1 RM ON
  0 RM OFF

Fig. 9.46 EG block; normalized representation in the loop display

The 30 characters for this block are displayed on a specific location of a group display. This requires the following parameterization of input 19 (NRPL = group display: no./location no.):

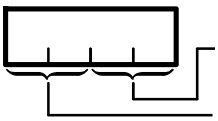


Fig. 9.47 EG block; normalized representation in the loop display

Set input 19 to “0” if the normalized representation of the block in a group display is to be suppressed.

- Normalized representation of the loop display

The below loop display (Fig. 9.48) contains static and dynamic data.

Static data

1 Mnemonic name and number of the EG block
2 Process–related name of the EG block
3 Mnemonic name of return data (EI, AU) 1) and STOP instruction (ST) 1)
4 Mnemonic name of mode (H, A) 1)
5 Mnemonic name of error messages (S) 1) and “External fault”
6 Process–related name of the adjacent analog value
7 Process–related quantity of the adjacent analog value
8 Physical quantity of the adjacent analog value
9 Process–related mnemonic name of the adjacent binary values (B1, B2) 1)

Dynamic data

10 Return data
11 Mode
12 Error messages (sorted by priorities)
  S18 End position monitoring has responded
  S20 Watchdog timer has responded
13 Status “External fault”
14 Digital display of the adjacent analog value
15 States of the adjacent binary values

1) Predefined mnemonic names.

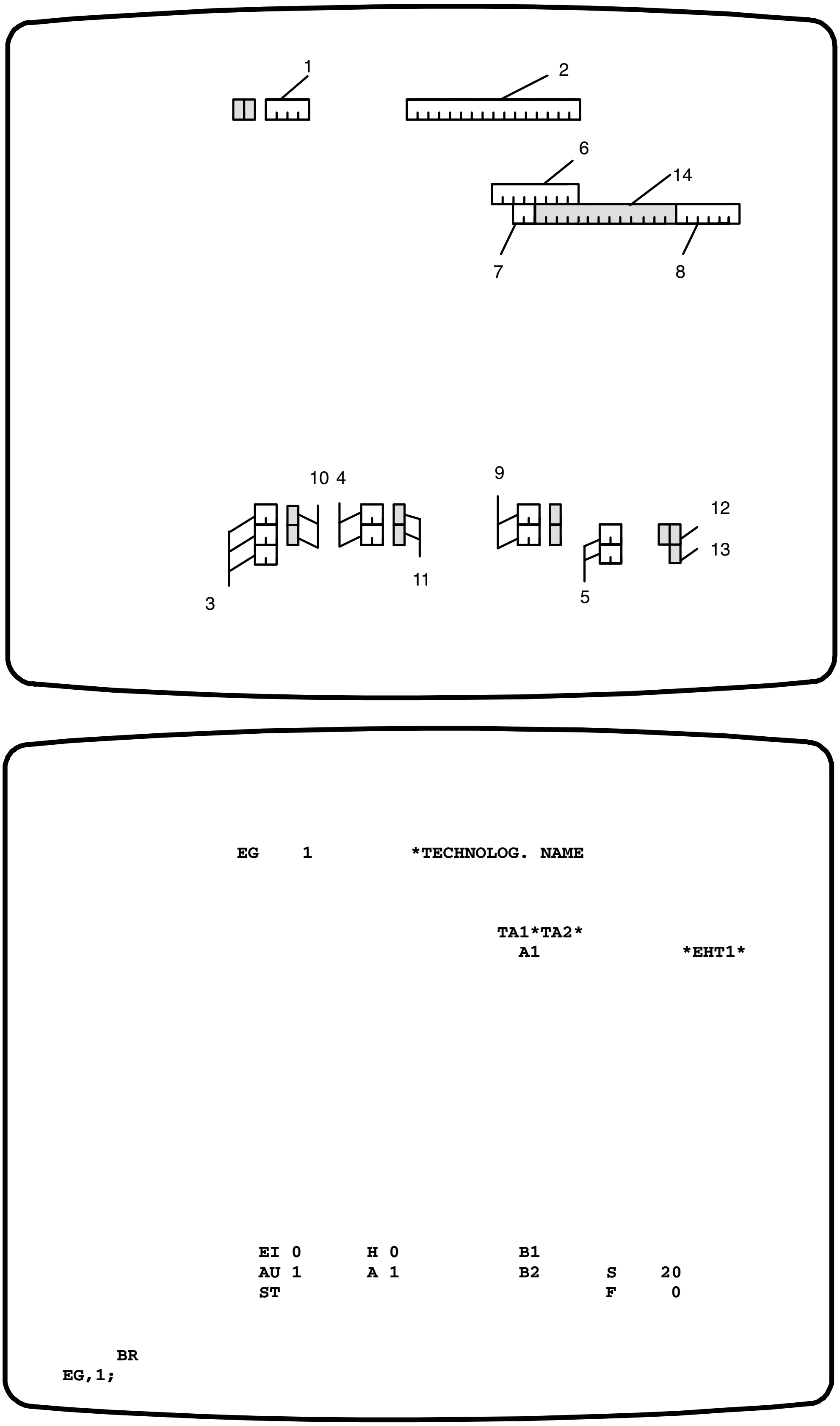


Fig. 9.48 EG block normalized representation in the loop display

- Using the process communication keyboard for operator input

  Five keys will be assigned after the loop display has been selected and the BE key (Operator input) depressed.

  Function key inputs must be terminated by pressing the execute (◇) key.

H=1	A=1	AU=1	EI=1	ST=1			

A Automatic mode
AU Off
EI On
H Manual mode
ST Stop

Fig. 9.49 EG block; automatic labeling of the process communication keyboard.

- System messages

  S 305 No acknowledgement from module (incorrect address, incorrect jumper setting or defective module)
  S 313 Multiple addressing (incorrect jumper setting)

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Default values	Configuration details
Return data OFF	RMAU	1	AB	0	1)
Return data ON	RMEI	2	AB	0	
End position error	S18	3	AB	0	1) 2)
Time–out	S20	4	AB	0	1) 2)
Mode 0/1	AH	5	AB	0	
Module fault	BGF	6	AB		
Adjacent analog value	AW	1	EA	0.0000	
Upper range limit	ME	2	EA	100.0	
Lower range limit	MA	3	EA	0.0000	
Manual mode	HAND	4	EB	0	
Automatic mode	AUTO	5	EB	0	
Manual mode (PBT)	H	6	EBV	0	4)
Automatic mode (PBT)	A	7	EBV	0	4)
Command OFF (PBT)	AU	8	EBV	0	4)
Command ON (PBT)	EI	9	EBV	0	4)
Command STOP (PBT)	ST	10	EBV	0	1) 3) 4)

1) Not relevant for 6DS1 505–8AA/8 (8–channel)
2) Not relevant for 6DS1 505–8AA (4–channel)
3) Not relevant for 6DS1 504–8AA (4–channel)
4) Input for operator communication keys of process communication keyboard (not non–interacting)

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type	Default values	Configuration details
Automatic OFF	AUAC	11	EB	0	
Automatic ON	EIAC	12	EB	0	
Protection OFF	SAUS	13	EB	0	1)
Circuit breaker locked	LASP	14	EB	0	
Interlocking ON	SPEI	15	EB	0	
Adjacent binary value 1	BW1	16	EB	0	
Adjacent binary value 2	BW2	17	EB	0	
Environment fault	UMGF	18	EB	0	
Location no./group display	NRPL	19	ID	0	
Module no.	BGNR	20	I	0	
Channel no.	KNR	21	I	0	
Configuration definition	TYP	22	I	0	
Command OFF (PAA)	AUBA	23	EB	0	
Command ON (PAA)	EIBA	24	EB	0	
Command automatic (PAA)	ACBA	25	EB	0	
Cf. loop display	TEI	26	S2	EI	
	TAU	27	S2	AU	
	TST	28	S2	ST	
	TA	29	S2	A	
	TH	30	S2	H	
	TS	31	S2	S	
	TF	32	S2	F	
	TAW	33	S2		
	TBW1	34	S2		
	TBW2	35	S2		
	TA1	36	S4		
	TA2	37	S4		
	EHT	38	S6		
	AT	39	S16		

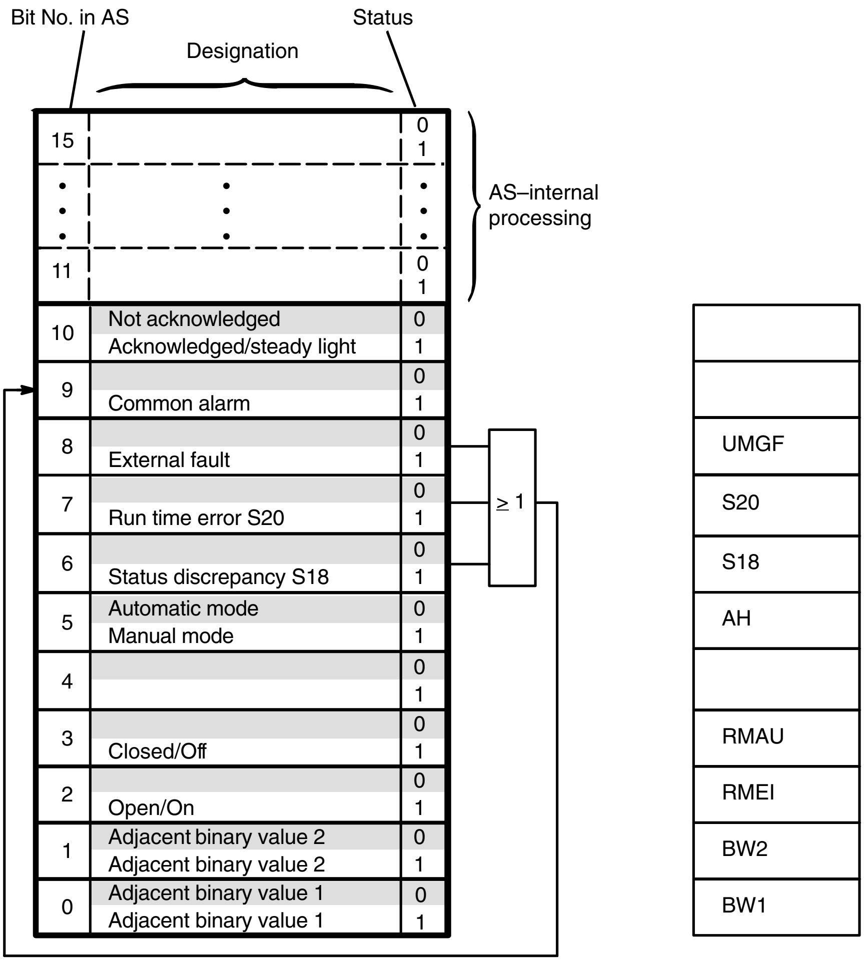
1) Different meaning for module 6DS1 505–8AA (4–channel): SPA

- Block list

```
   EG      1                01. 01. 81/ 00. 02. 34.  P: 1

 1 AB  RMAU 0                 #                     N   39
 2 AB  RMEI 0                 #                     N   40
 3 AB  S18  0                 #                     N   41
 4 AB  S20  0                 #                     N   42
 5 AB  AH   0                 #                     N   43
 6 AB  BGF  0                 #                     N   44
 1 EA  AW    15    0       0A   P                        1
 2 EA  ME   100.00              P                        2
 3 EA  MA   0.0000              P                        3
 4 EB  HAND 0                   P                        4
 5 EB  AUTO 0                   P                        5
 6 EBV H    0                                      B     6
 7 EBV A    0                                      B     7
 8 EBV AU   0                                      B     8
 9 EBV EI   0                   P                  B     9
10 EBV ST   0                   P                  B    10
11 EB  AUAC 0                   P                       11
12 EB  EIAC 0                   P                       12
13 EB  SAUS 0                   P                       13
14 EB  LASP 0                   P                       14
15 EB  SPEI 0                   P                       15
16 EB  BW1  0               A   P                       16
17 EB  BW2  0               A   P                       17
18 EB  UMGF 0                   P                       18
19 ID  NRPL   0                                   C     19
20 I   BGNR   0                                   C     20
21 I   KNR    0                                   C     21
22 I   TYP    0                                   C     22
23 EB  AUBA 0                   P                       23
24 EB  EIBA 0                   P                       24
25 EB  ACBA 0                   P                       25
26 S2  TEI  EI                                          26
27 S2  TAU  AU                                          27
28 S2  TST  ST                                          28
29 S2  TA   A                                           29
30 S2  TH   H                                           30
31 S2  TS   S                                           31
32 S2  TF   F                                           32
33 S2  TAW  A1                                          33
34 S2  TBW1 B1                                          34
35 S2  TBW2 B2                                          35
36 S2  TA1  TA1*                                        36
37 S2  TA2  TA2*                                        37
38 S   EHT  *EHT1*               6                      38
39 S16 AT   *TECHNOLOG. NAME    16                      39
```


- Status word



Status word in AS

Associated data elements in the block list or module signals

AH	Operating mode 0/1
BW1, 2	Adjacent binary value 1, 2
RMAU	Return data “OFF”
RMEI	Return data “ON”
S18	Status discrepancy
S20	Run time error
UMGF	Environment fault

Fig. 9.50 Status word for the EG block

EK

Driver block for open–loop control module–valve

Application

This block is used for acquiring signals from the open–loop control module (see Chap. 9.2 for modules) and for presenting these signals at the binary outputs, where they may be used, for example, by a subgroup controller.

Method of Operation

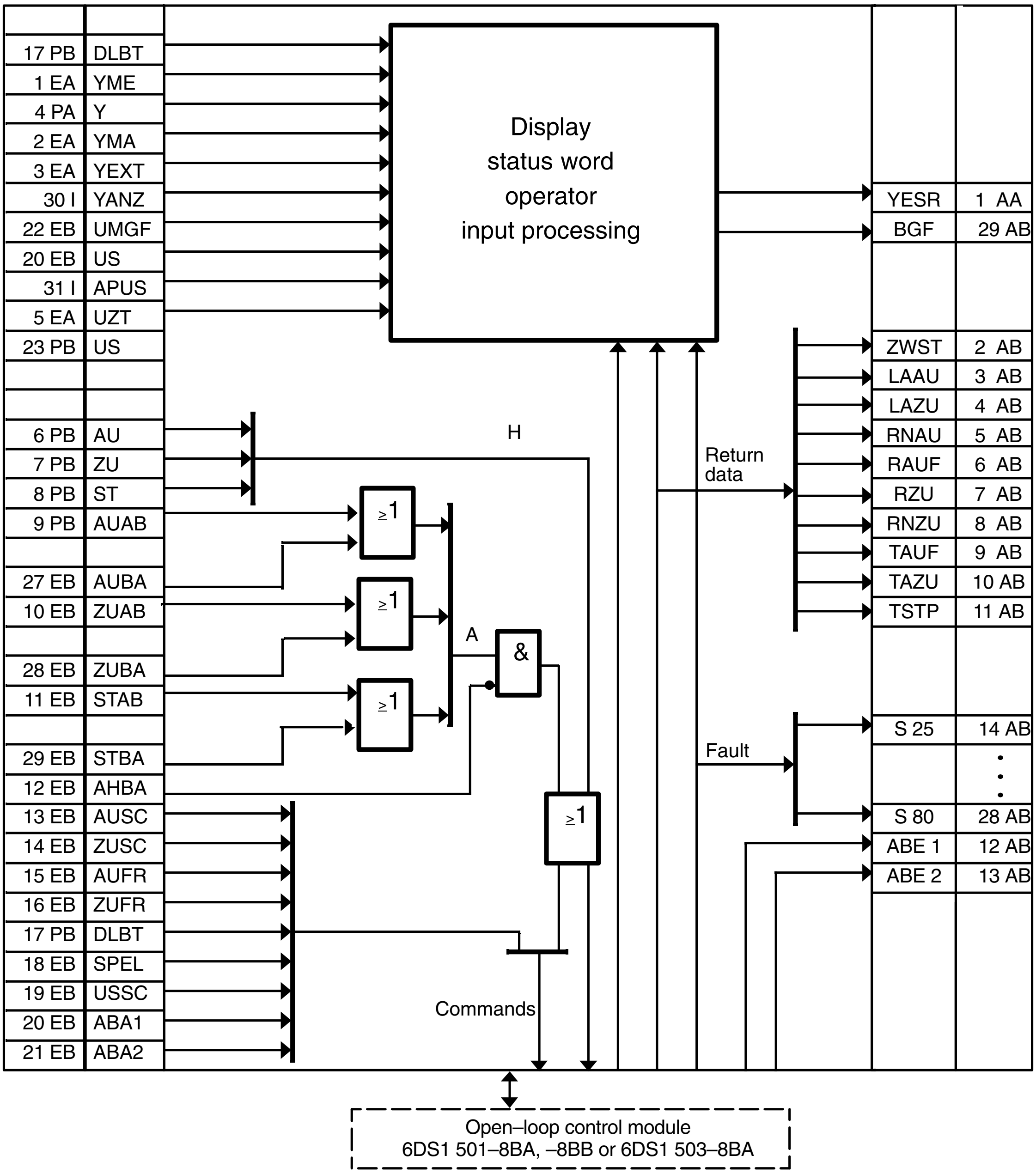


Fig. 9.51 Driver block for open–loop control module–valve; logic diagram

The logic diagram (Fig. 9.51) contains the following abbreviations:

AHBA	Mode selection
AUAB	Open in automatic mode
AU	Manual OPEN (+ acknowledgement OPEN)
AUBA	Command OPEN/AUTOMATIC–STEP
ZUAB	Close in automatic mode
ZU	Manual CLOSE (+ acknowledgement CLOSED)
AUSC	Open protection
ZUBA	Command CLOSE/AUTOMATIC–STEP
ZUSC	Close protection
STAB	Stop in automatic mode
ST	Stop in manual mode
STBA	Command STOP/AUTOMATIC–STEP
AUFR	Enable OPEN
ZUFR	Enable CLOSE
DLBT	Continuous/inching operation (PBT assignment only)
SPEL	Disable end position monitoring
USSC	Undervoltage protection
ABA1	Binary output 1 (PROCESS)
ABA2	Binary output 2 (PROCESS)
YESR	Electronic position indication
RM	Return data
S25 to S80	Fault alarms
YME	Upper range value of position indication
YMA	Lower range value of position indication
YEXT	External position indication
Y	Manipulated variable Y
YANZ	Display selection 0 = no display 1 = Y internal 2 = Y external
UMGF	External fault (block environment)
APUS	Cycle reduction for scan parameters
UZT	Monitoring time for interlocking monitoring indication
US	Suppression of status messages on the bus
ABE1	Binary input 1 (PROCESS)
ABE2	Binary input 2 (PROCESS)

- Modes

In manual mode (mode H), the commands AU (with OPEN acknowledgement), ZU (with CLOSED acknowledgement) and ST entered via the operator–controllable inputs are routed to the open–loop control module.

In automatic mode (mode A), the commands OPEN (input 9), CLOSE (input 10) and STOP (input 11) or OPEN/STEP, CLOSE/STEP and STOP/STEP (inputs 27, 28, 29 respectively) from an automatic controller are routed to the module. Priority is not given to automatic and automatic/STEP commands.

Simultaneous intervention (protective commands) is possible via the binary inputs AUSC and ZUSC. These commands have a higher priority; they are routed to the module as long as they are present. The commands OPEN/CLOSE acknowledgement are also valid during automatic operation.

The modes A/H (automatic/manual mode) can be selected via binary input 12 (AHBA).

- Parameterization

  The module number is parameterized via input 25 and the channel number via input 26.

  The driver should be removed or the associated XB switched off, as it should be inactive if one of the BGNR or KNR parameters is changed.
  Channel no. 0 : 1–channel open–loop control module 6DS1501–8BA/–8BB
  Channel no. 1, 2, 3: Respective channel of the open–loop control module 6DS1503–8BA

- System messages

  S 305: No acknowledgement from module (incorrect address, incorrect jumper setting or defective module
  S 313: Multiple addressing (incorrect jumper setting)
  S 321: Module malfunction or repeated read error

- Interlocking monitoring function

  The interlocking monitoring function informs the operator of a rejected OPEN or CLOSE command.

  Rejection can be caused by
  – missing process release or
  – a protective command in the opposite direction

  The interlocking monitoring function is shown during the monitoring time specified via input 5 (UZT, default value is 10 seconds) in the AS loop display. After this time it is deleted from the AS loop display. A status message is generated if the interlocking monitoring function responds (output .S31) and after the monitoring time has elapsed.

  In the OS subsystems, an operator notice (”B”), which need not be acknowledged, is derived at all levels from this function. If the monitoring time has been parameterized with “0”, the display is shown for the duration of one XB cycle. This signal will not be processed in the message processing function MELD. The cabinet or cabinet row lamps are not triggered either when this monitoring function responds.

- Electronic position indication

  The electronic position indication of the one–channel open–loop control module 6DS1 501–8BB is issued via analog output 1 within the parameterized range limits (input 30 has been parameterized with 1). The electronic position indication of the three–channel open–loop control module can be connected to input 3. Input 30 must then be parameterized with 2.

  The indication in the loop display can be suppressed if a position indicator has not been installed. Input 30 must then be parameterized with 0. The following indications then do not exist: 3, 7, 8, 9, 10, 11, 15 (cf. Fig. 9.55).

  If a three–channel module is parameterized for an internal position indicator, indication is suppressed in the loop display (no internal ESR).

- Continuous operation/inching operation (set on the module)

  Continuous operation is used to drive the actuators from end position to end position. The return data OPEN and CLOSED on the module is used for disconnection. Inching mode allows an actuator to be adjusted to any intermediate position between the two end positions.

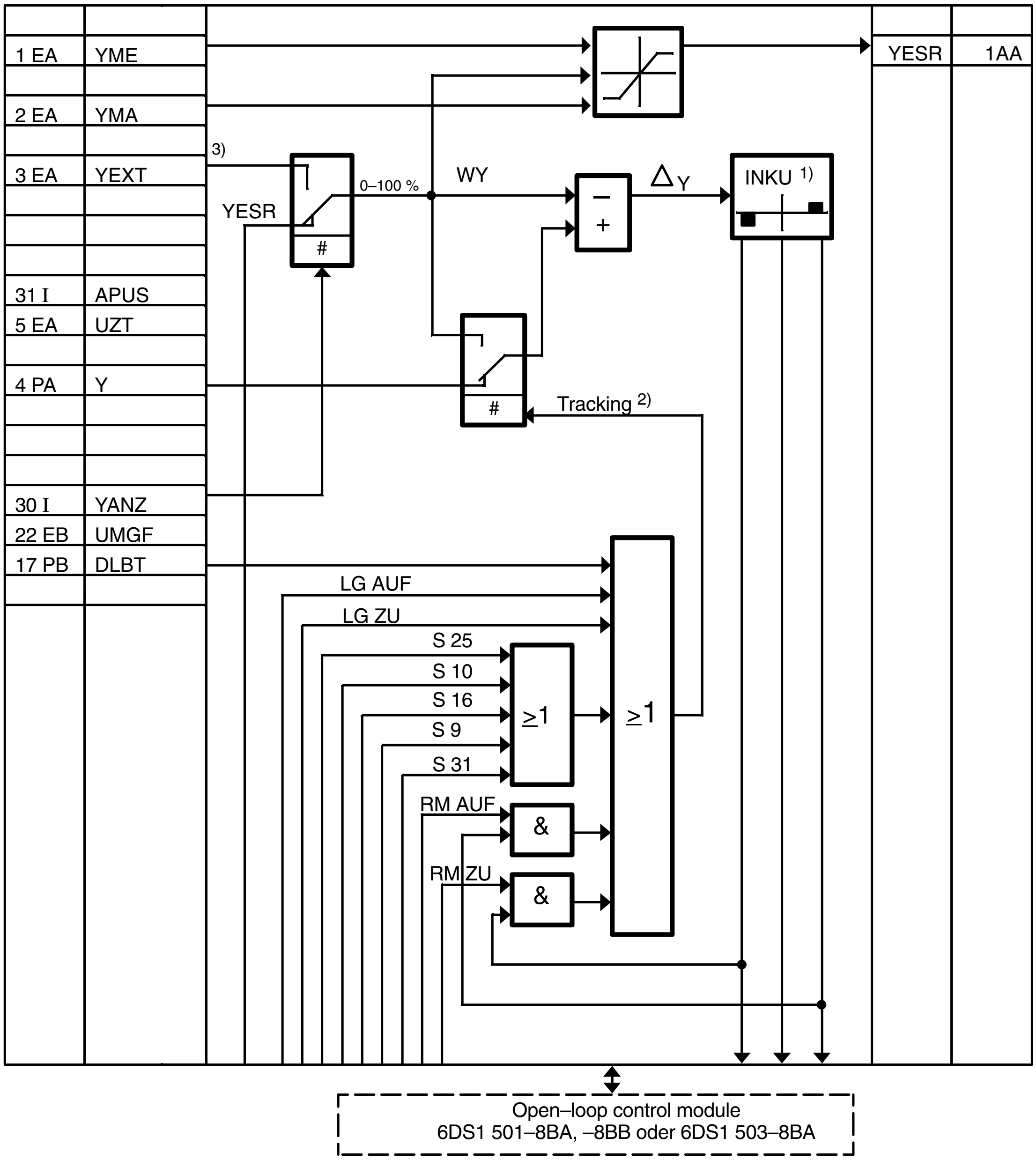
  An analog position indication must be present for inching operation (see Fig. 9.52) to be possible. The ESR signal is connected to the module if the one–channel open–loop control module 6DS1 501–8BB is used. The ESR signal must be connected to input 3 of the driver block if the multi–channel open–loop control module 6DS1 503–8BA is used.

  A comparator is used to determine the difference between position indication and position setpoint. This values are used by a subsequent increment converter to generate OPEN, CLOSE and STOP commands which the EK block then transfers to the module. A follow–up circuit ensures that the actuator is held in its actual position if a failure occurs. In both AS and OS subsystems, this function is operated manually, in the same manner as the operation of the manipulated variable of a controller. This means that the AS process communication keyboard can be used to enter an absolute value for setpoint or to actuate continuously at two speeds. In an OS subsystem, operation is performed by entering absolute values or by incremental adjustment.

  Parameterization of input 31 provides configuration of a cycle reduction. The EK block is always executed in the base cycle if the comparator has determined a deviation of the manipulated variable.

  After the OPEN or CLOSE switching process has been terminated, i.e. the initiated process is switched off by the EK, the module is supplied with the reduced cycle which will be used by the EK in subsequent operation.

  The EK thus always has a base load of approx. 1ms, the default value for the APU reduction factor is “0”. The preceding XB can also be used to achieve phase shifting within the base cycle, and thus better load distribution. If manual adjustment or acknowledgement is performed via the process communication keyboard, the system switches over for at least two cycles to the cycle defined by XB.

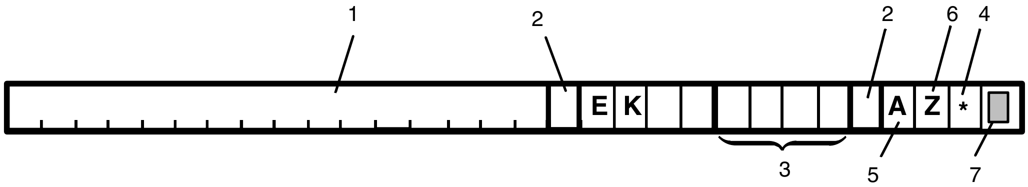


APUS	Clock reduction for scan parameters		
DLBT	= 0 continuous operation		
	= 1 inching mode		
INKU	Increment converter		
LGAUF	“Control station OPEN” key		
LGZU	“Control station CLOSED” key		
UMGF	External fault		
UZT	Monitoring time for display of interlocking monitoring function		
WY	Effective position indication		
Y	Stellgröße (-5 % bis 15 %)		
YANZ	Display selection:	0 = no display	
		1 = Y internal	
		2 = Y external	
YESR	Return data Y from module (YMA to YME)		
YEXT	Return data Y external (0 to 100 %)		
YMA	Lower range limit of position indication		

1) INKU hysteresis: 2%
2) Y is corrected to YESR/YEXT during connection. Y is not non–interacting
3) The value of YEXT which is limited to YMA/YME is set back to YEXT, i.e. YEXT is not non–interacting

Fig. 9.52 Driver block for open–loop control module–valve; logic diagram – inching operation

- Normalized representation in a group display



1 Process–related block name, as in the loop display
2 Separating blank
3 Block name/no.
4 Loop message field, grouping of the I/O error messages
Status display:
* Actuator running (2nd priority)
B Command inhibit (last priority)
(interlocking monitoring function has responded)
5 Mode display
A = automatic mode, H = manual mode
6 System checkback
Z = CLOSED, A = OPEN (.TZU, .TAU)
7 Common alarm display

Fig. 9.53 Driver block for open–loop control module–valve; normalized representation

The 30 characters for this block are displayed at a specific location in a group display. Input 24 (NRPL = group display: no./location no.) must then be parameterized as follows:

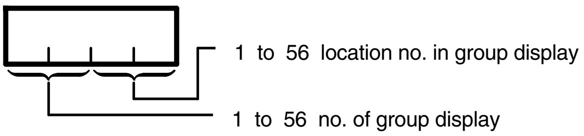


Fig. 9.54 Driver block for open–loop control module–valve; parameterization of input 24

Set input 24 to “0” if the normalized representation of the block in a group display it to be suppressed.

The below loop display (Fig. 9.55) contains the following abreviations as well as static and dynamic data:

EK 1	= Block name and number
Process–related name	= S16 string – user–specific block text
Y	= Mnemonic name for position indication YESR and bar representation of analog value and digital display
EHT	= Unassigned text for unit/dimension of YESR
AU	= State of RAUF return data
ZU	= State of RZU return data
ST	= State of STOP (ST, STAB, STBA)
LA	= State of return data LAUF–AUF
LZ	= State of return data LAUF–ZU
B	= State of command inhibit – interlocking monitoring function
S (u)	= Fault alarm display with error number
S (o)	= State environment fault UMGF

Static data

1 Mnemonic name and no. of the EK block
2 Process–related name of the EK block
3 Mnemonic name of the return data (Y) 1)
4 Mnemonic name of the checkback (OPEN, CLOSE) 1)
5 Mnemonic name of the error messages (S) 1)
6 Mnemonic name and “External fault” (S) 1)
7 Physical quantity of the position
8 Lower range limit of the position
9 Upper range limit of the position
10 Mnemonic name of the bar (Y) 1)
16 Mnemonic name of command inhibit 1)
18 Mnemonic name LAUF–AUF, LAUF–ZU
19 Mnemonic name STOP

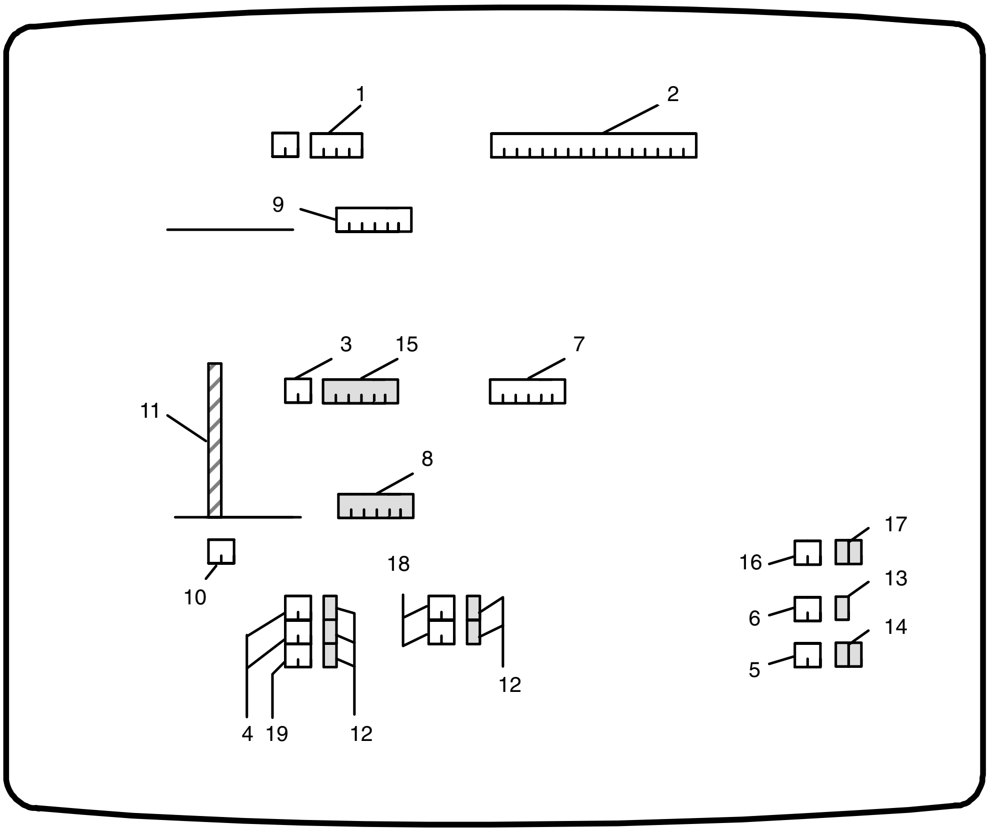
Dynamic data

11 Position in bar representation
12 Operating states of AU, ZU, LA, LZ, ST
13 State “External fault”
(“1” = fault has occurred)
14 Error messages

S 80	Module defective (highest priority)
S 4	Hardware fault on module
S 25	Power section has failed
S 10	Binary signal monitoring function has responded
S 16	Command outputs have failed
S 17	End position monitoring function OPEN has responded
S 18	End position monitoring function CLOSED has responded
S 21	Torque monitoring function OPEN has responded
S 22	Torque monitoring function CLOSED has responded
S 19	Run time monitoring function OPEN has responded
S 20	Run time monitoring function CLOSED has responded
S 9	Analog signal monitoring function has responded
S 6	Control station defective
S 26	Test position of switching device

15 Position Y (digital display)
17 Command inhibit (“1” = interlocking monitoring function has responded)

1) Predefined mnemonic names




```
22. 07. 87/ 08. 55. 04.

                EK     1           *TECHNOLOG. NAME

        __________    100.00

                 Y 0.0000           *EHT * *

        __________    0.0000
           Y
                                                       B   0
                 AU 0       LA 0                       S   0
                 ZU 0       LZ 0
                 ST 0                                  S   0

     BR
EK,1;
```

Fig. 9.55 EK block, normalized representation in the loop display

- Using the process communication keyboard for operator input

  The corresponding keys (AU = 1, ZU = 1, ST = 1 and Y =) will be assigned automatically once the loop display has been selected and the BE key ("Operator input") depressed. [1)]

  The function key inputs (AU = 1, ZU = 1, ST = 1) must be terminated by pressing the execute key (◈).

Continuous operation (DLBT = 0):

	AU=1	ZU=1	ST=1				

AU Open
ST Stop
ZU Closed

Fig. 9.56 EK block (continuous operation), automatic labeling of the process communication keyboard

Inching operation (DLBT = 1):

Y=							

Y Manipulated variable

Fig. 9.57 EK block (inching operation), automatic labeling of the process communication keyboard

A sequence of numbers (manipulated variable) may be entered after the "Y=" key has been depressed.

⚠ Since manual commands have a higher priority then automatic commands, a system operator can enter a quick succession of "AU = 1" commands via his process communication keyboard to open a valve, despite the presence of an "Automatic CLOSE" signal.

– If the CLOSED (OPEN) position is reached after a protective command CLOSED (OPEN) has arrived and has CLOSE (OPEN) not been enabled, the operator must acknowledge the CLOSE (OPEN) state by entering CLOSE (OPEN) = 1. Only then will an OPEN (CLOSE) protective command become effective.

– OPEN or CLOSE enabling signals of the module and the driver are logically ORed. It must therefore be ensured that the enabling signals of the module are not present when the driver enabling function is controlled by software.

– Sudden changes in the manipulated variable of YS < 2 % entered via the process communication keyboard or the alpha keyboard are not processed in inching operation (hysteresis).

[1)] Depending on the mode (input 17, DLBT), the keys of the process communication keyboard will be assigned to AU, ZU, ST or to Y.

- Data structure (designation of inputs and outputs)

Output elements

Ax	Type	Name	Attr.	Meaning	El.no
1	AA	YESR		Electronic position indication	42
2	AB	ZWST		Return data intermediate position	43
3	AB	LAAU		Return data LAUF–AUF	44
4	AB	LAZU		Return data LAUF–ZU	45
5	AB	RNAU		Return data NOT OPEN	46
6	AB	RAUF		Return data OPEN	47
7	AB	RZU		Return data CLOSED	48
8	AB	RNZU		Return data NOT CLOSED	49
9	AB	TAUF		Key OPEN	50
10	AB	TAZU		Key CLOSED	51
11	AB	TSTP		Key STOP	52
12	AB	ABE1		(Command CLOSE on module)	53
13	AB	ABE2		(Command OPEN on module)	54
14	AB	S25		Power section failure	55
15	AB	S10		Binary signal monitoring has responded	56
16	AB	S16		Command output failure	57
17	AB	S31		Interlocking monitoring function has responded	58
18	AB	S17		End position monitoring OPEN	59
19	AB	S18		End position monitoring CLOSED	60
20	AB	S21		Torque monitoring OPEN has responded	61
21	AB	S22		Torque monitoring CLOSED has responded.	62
22	AB	S19		Run time monitoring OPEN	63
23	AB	S20		Run time monitoring CLOSED	64
24	AB	S9		Analog signal monitoring has responded	65
25	AB	S26		Test position of switching device	66
26	AB	S6		Control station defective	67
27	AB	S4		Hardware fault detected on module	68
28	AB	S80		Module failure detected	69
29	AB	BGF		Module fault/driver message	70

Input elements

Ex	Type	Name	Attr.	Meaning	El no
1	EA	YME		Upper range limit for Y/YESR	1
2	EA	YMA		Lower range for Y/YESR	2
3	EA	YEXT		Position indication Y from external device	3
4	PA	Y	B C	Manipulated value Y for inching operation (0 to 100%) /text from EL.35 (–5 to 105%)	4
5	EA	UZT		Alarm duration for interlocking monitoring	5
6	PB	AU	B	Command OPEN–PBT / text from E.134	
7	PB	ZU	B	Command CLOSE–PBT/ text from E1.32	7
8	PB	ST	B	Command STOP–PBT / text from E1.33	8
9	EB	AUAB		Command OPEN – automatic	9
10	EB	ZUAB		Command CLOSE – automatic	10
11	EB	STAB		Command STOP – automatic	11
12	EB	AHBA		Automatic/manual mode	12
13	EB	AUSC		Protection – OPEN	13
14	EB	ZUSC		Protection – CLOSE	14
15	EB	AUFR		Enable – OPEN	15
16	EB	ZUFR		Enable – CLOSE	16
17	PB	DLBT		Continuous / inching operation „0"/„1"	17
18	EB	SPEL		Disable end position monitoring	18
19	EB	USSC		Undervoltage protection	19
20	EB	ABA1		Binary output 1	20
21	EB	ABA2		Binary output 2	21
22	EB	UMGF		Environment fault	22
23	PB	US		Suppression STATUS	23
24	ID	NRPL	C	Location number of group display	24
25	I	BGNR	C	Module number	25
26	I	KNR	C	Channel number	26
27	EB	AUBA		Command OPEN – automatic/STEP	27
28	EB	ZUBA		Command CLOSE – automatic/STEP	28
29	EB	STBA		Command STOP – automatic/STEP	29
30	I	YANZ	C	Y display 0 = OFF / 1 = Yint / 2 = Yext	30
31	I	APUS	C	Scan parameter – cycle reduction	31
32	S2	TZU	C	Character string for 'CLOSED'	32
33	S2	TST	C	Character string for 'STOP'	33
34	S2	TAU	C	Character string for 'OPEN'	34
35	S2	TY	C	Character string for YESR (display/PBT)	35
36	S2	TLA		Character string for LAUF–AUF	36
37	S2	TLZ		Character string for LAUF–ZU	37
38	S2	TS		Character string for fault no. S	38
39	S2	TFS		Character string for environment fault S	39
40	S2	TB		Character string for command inhibit B	40
41	S6	EHT		Unit for Y	41
42	S16	AT		String for process–related name	42

- Block list

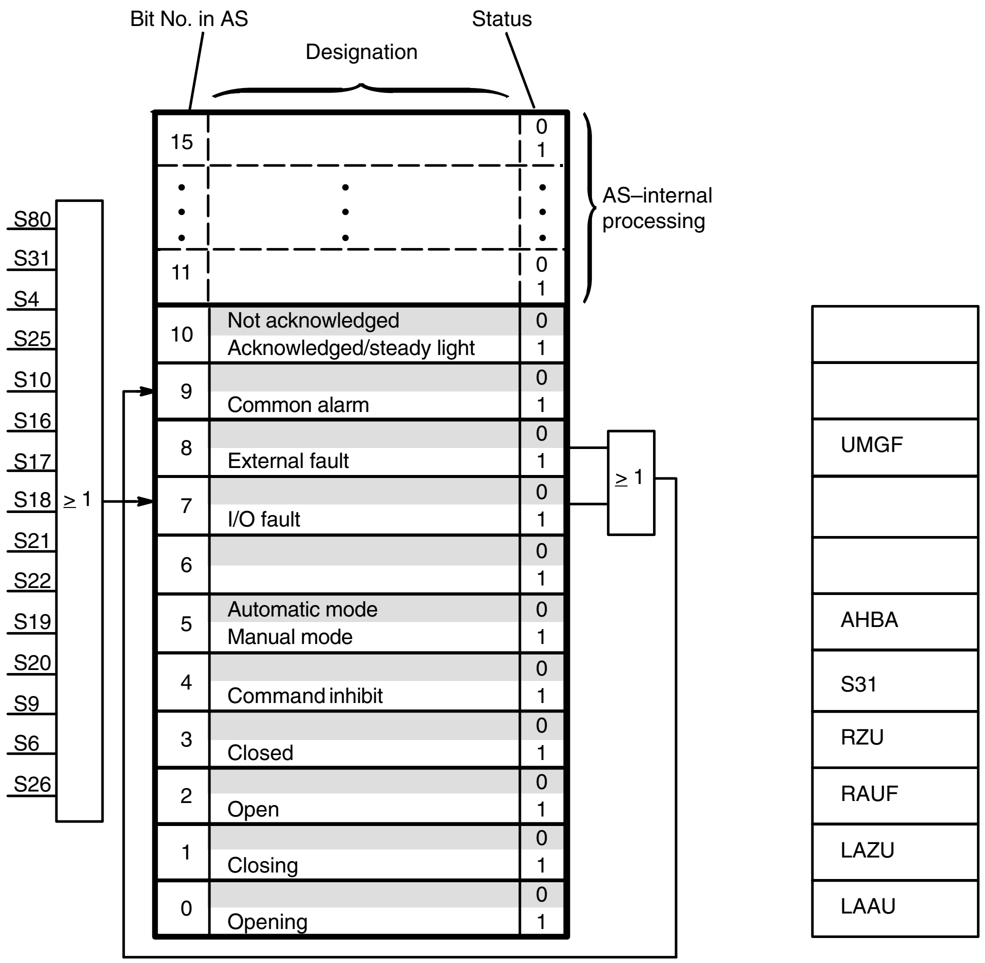
```
   EK      1                 11. 04. 86/ 09. 33. 45.  P: 1

 1 AA   YESR 0.0000            #                         42
 2 AB   ZWST 0                 #                         43
 3 AB   LAAU 0                 #                         44
 4 AB   LAZU 0                 #                         45
 5 AB   RNAU 0                 #                         46
 6 AB   RAUF 0                 #                         47
 7 AB   RZU  0                 #                         48
 8 AB   RNZU 0                 #                         49
 9 AB   TAUF 0                 #                         50
10 AB   TAZU 0                 #                         51
11 AB   TSTP 0                 #                         52
12 AB   ABE1 0                 #                         53
13 AB   ABE2 0                 #                         54
14 AB   S25  0                 #                         55
15 AB   S10  0                 #                         56
16 AB   S16  0                 #                         57
17 AB   S31  0                 #                         58
18 AB   S17  0                 #                         59
19 AB   S18  0                 #                         60
20 AB   S21  0                 #                         61
21 AB   S22  0                 #                         62
22 AB   S19  0                 #                         63
23 AB   S20  0                 #                         64
24 AB   S9   0                 #                         65
25 AB   S26  0                 #                         66
26 AB   S6   0                 #                         67
27 AB   S4   0                 #                         68
28 AB   S80  0                 #                         69
29 AB   BGF  0                 #                         70
 1 EA   YME  100.00              P                        1
 2 EA   YMA  0.0000              P                        2
 3 EA   YEXT 0.0000              P                        3
 4 PA   Y    0.0000                              CB       4
 5 EA   UZT  10.000              P                        5
 6 PB   AU   0                                    B       6
 7 PB   ZU   0                                    B       7
 8 PB   ST   0                                    B       8
 9 EB   AUAB 0                   P                        9
10 EB   ZUAB 0                   P                       10
11 EB   STAB 0                   P                       11
12 EB   AHBA 0                   P                       12
13 EB   AUSC 0                   P                       13
14 EB   ZUSC 0                   P                       14
15 EB   AUFR 0                   P                       15
16 EB   ZUFR 0                   P                       16
17 PB   DLBT 0                                   C       17
18 EB   SPEL 0                   P                       18
19 EB   USSC 0                   P                       19
20 EB   ABA1 0                   P                       20
21 EB   ABA2 0                   P                       21
22 EB   UMGF 0                   P                       22
23 PB   US   0                                           23
24 ID   NRPL    0                                C       24
25 I    BGNR    0                                C       25
26 I    KNR     0                                C       26
27 EB   AUBA 0                   P                       27
28 EB   ZUBA 0                   P                       28
29 EB   STBA 0                   P                       29
30 I    YANZ    0                                C       30
31 I    APUS    0                                C       31
32 S2   TZU  Z*                                  C       32
33 S2   TST  S*                                  C       33
```

Block list (continued)

```
34 S2  TAU  A*                                C     34
35 S2  TY   Y*                                C     35
36 S2  TLA  LA                                C     36
37 S2  TLZ  LZ                                C     37
38 S2  TS   S                                 C     38
39 S2  TFS  S                                 C     39
40 S2  TB   B                                 C     40
41 S    EHT  *EHT*                   6              41
42 S16 AT   *TECHNOLOG. NAME       16              87
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

AHBA	Automatic/manual mode
LAAU	Return data “Opening”
LAZU	Return data “Closing”
RAUF	Return data “Open”
RZU	Return data “Closed”
S31	Interlocking monitoring has responded
UMGF	Environment fault

Fig. 9.58 Status word for the EK block

EM

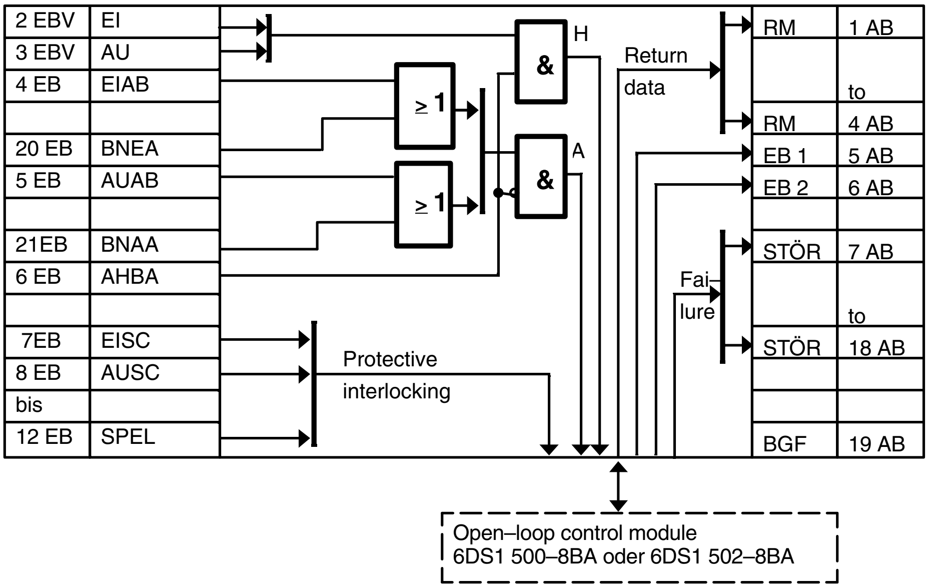
Driver block for open–loop control module–motor

Application

This block is used for acquiring signals from the open–loop control module (see Chap. 9.2 for modules) and to present these signals at the binary outputs, where they may be used, for example, by a subgroup controller.

The block is also used for transferring commands to the open–loop control module.

Method of Operation



EI	ON–manual/acknowledgement	RM	Return data
AU	OFF–manual/acknowledgement	EB	Binary input
EIAB	ON–automatic	STÖR	Failure
AUAB	OFF–automatic	BNEA	ON–automatic (BA)
EISC	Protection ON	BNAA	OFF–automatic (BA)
AUSC	Protection OFF	SPEL	Disable end positions for protective commands
AHBA	Mode selection	BGF	Module fault

Fig. 9.59 EM block; logic diagram

- Modes

  In manual mode (mode H), the commands ON–H/acknowledgement and OFF–H/acknowledgement entered via the operator–controllable inputs are routed to the open–loop control module.

  In automatic mode (mode A), the commands ON–A and OFF–A from an automatic controller are routed to the module. Simultaneous manual operation via the operator–controlled inputs is possible. Manual interventions have a higher priority and are applied to the module as long as they are present. The commands acknowledgement ON/OFF are also valid during automatic operation.

  The mode can be selected via the binary input 6.

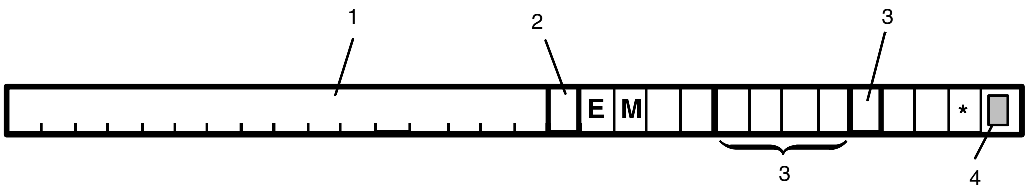
- Parameterization

  The module number is parameterized via input 18 and the channel number via input 19. Channel number 0 specifies a one–channel open–loop control module 6DS1500, channel numbers “1”, “2” or “3” specify the respective channel of module 6DS1502.

- System messages

  S 305: No acknowledgement form module (incorrect address, incorrect jumper setting or defective module)
  S 313: Multiple addressing (incorrect jumper setting)
  S 321: Module malfunction or repeated read error

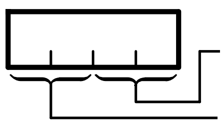
- Normalized representation in a group display



1 Process–related block name, as in the loop display
2 Separating blank
3 Block name/no.
4 Blinking mark, if a fault alarm has occurred (cf. loop display)

Fig. 9.60 EM block; normalized representation in a group display

The 30 characters for this block are displayed at a specific location in a group display. Input 17 (NRPL = group display: no./location no.) must then be parameterized as follows:



1 to 56: location no. in group display

1 to 56: no. of group display

Fig. 9.61 EM block; parameterization of input 17

Set input 17 to “0” if the normalized representation of the block in a group display is to be suppressed.

- Normalized representation of the loop display

  The loop display contains static and dynamic data for the operator.

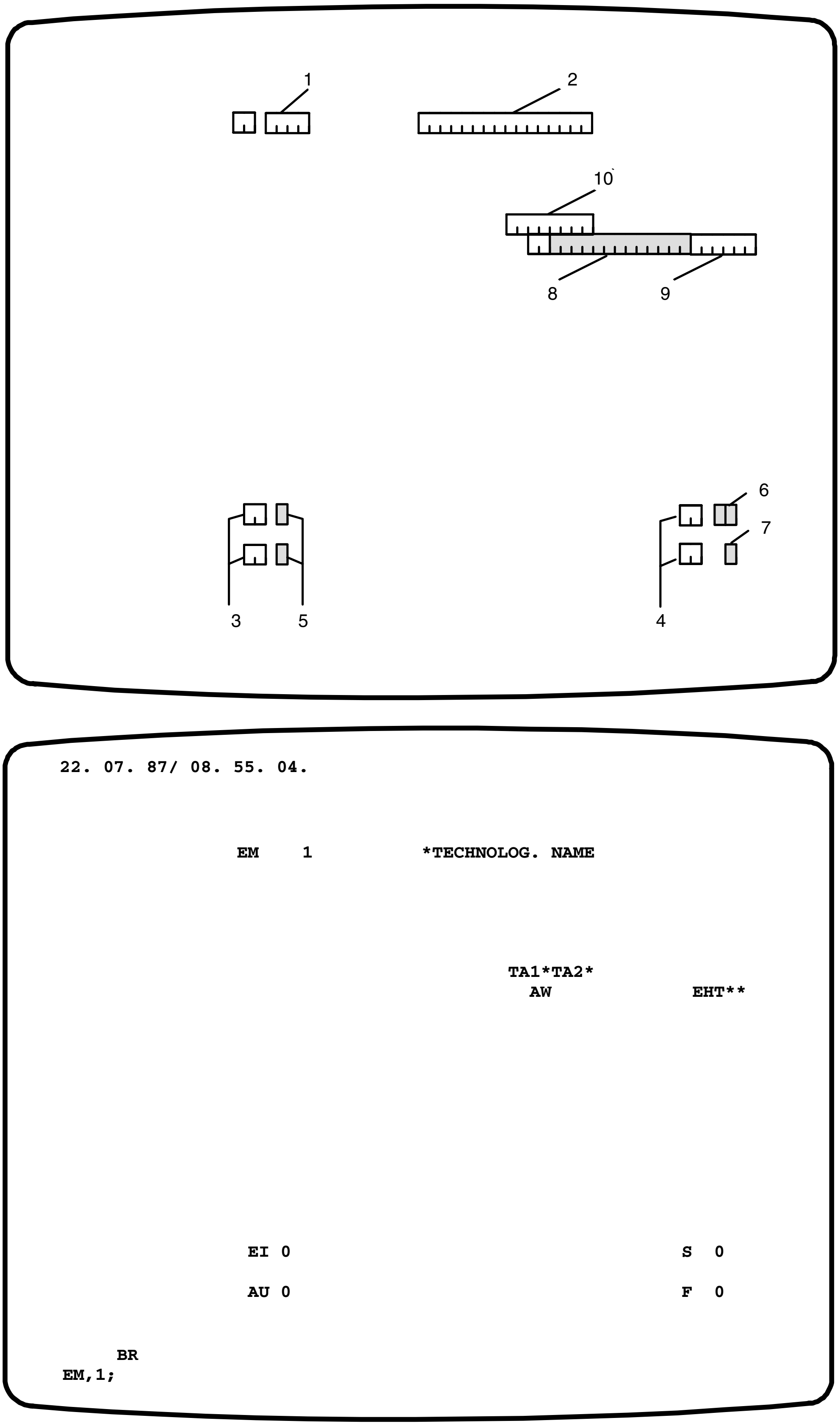


Fig. 9.62 EM loop display, example

The loop display (Fig. 9.62) contains the following static and dynamic data:

Static data

1 Mnemonic name and no. of the EM block
2 Process–related name of the EM block
3 Mnemonic name of the return data (EI, AU)
4 Mnemonic name of error messages (S) and ”External fault” (F)
9 Unit of AW
10 Text for AW

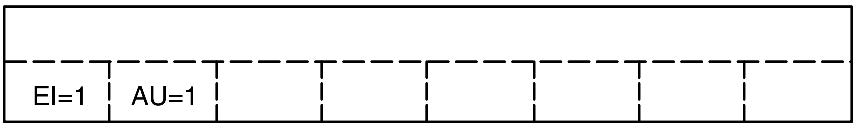
Dynamic data

5 Return data from the module
6 Error messages
 S 80 Module defective (highest priority)
 S 4 Hardware fault on module
 S 25 Power section has failed
 S 10 Binary signal monitoring function has responded
 S 16 Command outputs gave failed
 S 17 End position monitoring function ON has responded
 S 18 End position monitoring function OFF has responded
 S 19 Run time monitoring function ON has responded
 S 20 Run time monitoring function OFF has responded
 S 6 Control station defective
 S 26 Test position of switching device
 S 31 Interlocking monitoring has responded
7 State “External fault” (”1” = fault has occurred)
8 Adjacent analog value AW

- Using the process communication keyboard for operator input

 Two keys will be assigned after the loop display has been selected and the BE key (”Operator input”) depressed.

 Function key inputs must be terminated by pressing the execute key (◈).



AU OFF manual acknowledgement
EI ON manual acknowledgement

Fig. 9.63 EM block; automatic labeling of the process communication board

- Data structure (designation of inputs and outputs)

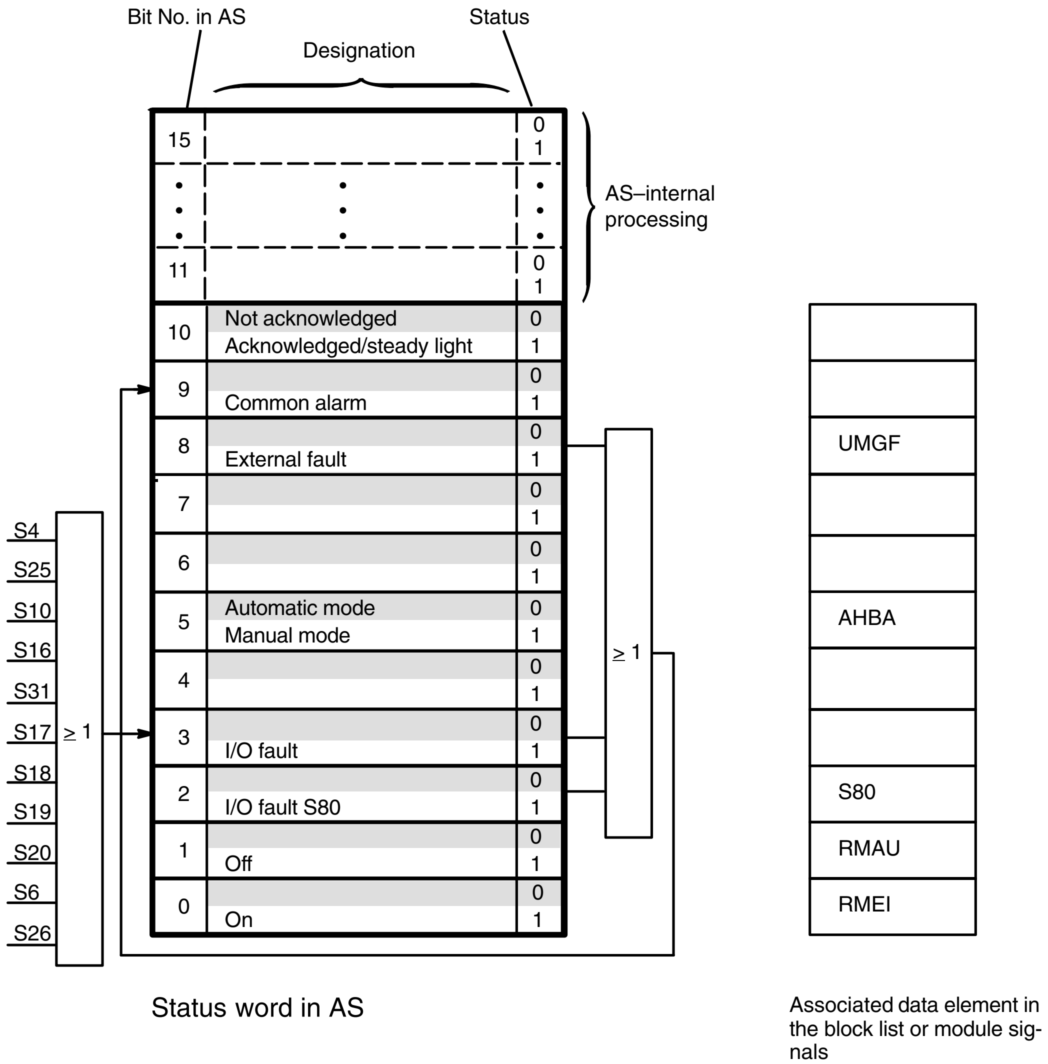
Meaning	Mnemonic name	Input/Output No.	Type
Return data OFF	RMAU	1	AB
Return data ON	RMEI	2	AB
Return data key OFF	TAUS	3	AB
Return data key ON	TEIN	4	AB
Binary input 1	EB1	5	AB
Binary input 2	EB2	6	AB
Power section has failed	S25	7	AB
Binary signal monitoring	S10	8	AB
Command output has failed	S16	9	AB
Interlocking monitoring function	S31	10	AB
End position monitoring OFF	S18	11	AB
End position monitoring ON	S17	12	AB
Control station defective	S26	13	AB
Run time monitoring OFF	S20	14	AB
Run time monitoring ON	S19	15	AB
Control station defective	S6	16	AB
Hardware failure	S4	17	AB
Module defective	S80	18	AB
Module fault	BGF	19	AB
Analog value environment	AW	1	EA
ON manual acknowledgement	EI	2	EBV
OFF manual acknowledgement	AU	3	EBV
ON automatic	EIAB	4	EB
OFF automatic	AUAB	5	EB
A/M (0,1)	AHBA	6	EB
Protection ON	EISC	7	EB
Protection OFF	AUSC	8	EB
Enable ON	EIFR	9	EB
Enable OFF	AUFR	10	EB
Undervoltage protection	USSC	11	EB
Disable end pos. monitoring for protective command	SPEL	12	EB
Internal reserve element	INT1	13	EB
Binary output 1	AB1	14	EB
Binary output 2	AB2	15	EB
Fault environment	UMGF	16	EB
Location no./group display	NRPL	17	ID
Module number	BGNR	18	I
Channel no. (0, 1, 2, 3)	KNR	19	I
ON automatic (BA)	BNEA	20	EB
OFF automatic (BA)	BNAA	21	EB
Cf. loop display	TEI	22	S2
”	TAU	23	S2
”	TS	24	S2
”	TF	25	S2
”	TAW	26	S2
”	TA1	27	S4
”	TA2	28	S4
”	EHT	29	S
”	AT	30	S16

- Block list

```
   EM      1                03. 03. 83/ 00. 30. 32.  P: 1

 1 AB  RMAU 0                 #                    N   30
 2 AB  RMEI 0                 #                    N   31
 3 AB  TAUS 0                 #                    N   32
 4 AB  TEIN 0                 #                    N   33
 5 AB  EB1  0                 #                    N   34
 6 AB  EB2  0                 #                    N   35
 7 AB  S25  0                 #                    N   36
 8 AB  S10  0                 #                    N   37
 9 AB  S16  0                 #                    N   38
10 AB  S31  0                 #                    N   39
11 AB  S18  0                 #                    N   40
12 AB  S17  0                 #                    N   41
13 AB  S26  0                 #                    N   42
14 AB  S20  0                 #                    N   43
15 AB  S19  0                 #                    N   44
16 AB  S6   0                 #                    N   45
17 AB  S4   0                 #                    N   46
18 AB  S80  0                 #                    N   47
19 AB  BGF  0                 #                    N   48
 1 EA  AW    15    0       0A   P                       1
 2 EBV EI   0                                     B     2
 3 EBV AU   0                                     B     3
 4 EB  EIAB 0                   P                       4
 5 EA  AUAB 0                   P                       5
 6 PB  AHBA 0                   P                       6
 7 PB  EISC 0                   P                       7
 8 PB  AUSC 0                   P                       8
 9 EB  EIFR 0                   P                       9
10 EB  AUFR 0                   P                      10
11 EB  USSC 0                   P                      11
12 EB  SPEL 0                   P                      12
13 EB  INT1 0                   P                      13
14 EB  AB1  0                   P                      14
15 EB  AB2  0                   P                      15
16 EB  UMGF 0                   P                      16
17 ID  NRPL    0                                 C     17
18 I   BGNR    0                                 C     18
19 I   KNR     0                                 C     19
20 EB  BNEA 0                   P                      20
21 EB  BNAA 0                   P                      21
22 S2  TEI  EI                                         22
23 S2  TAU  AU                                         23
24 S2  TS   S                                          24
25 S2  TF   F                                          25
26 S2  TAW  AW                                         26
27 S4  TA1  TA1*                                       27
28 S4  TA2  TA2*                                       28
29 S   EHT  *EHT**               6                     29
30 S16 AT   *TECHNOLOG. NAME    16                     57
```

- Status word



AHBA	Manual/automatic mode
RMAU	Return data “Off”
RMEI	Return data “On”
S80	Module defective
UMGF	Environment fault

Fig. 9.64 Status word for the EM block

EU

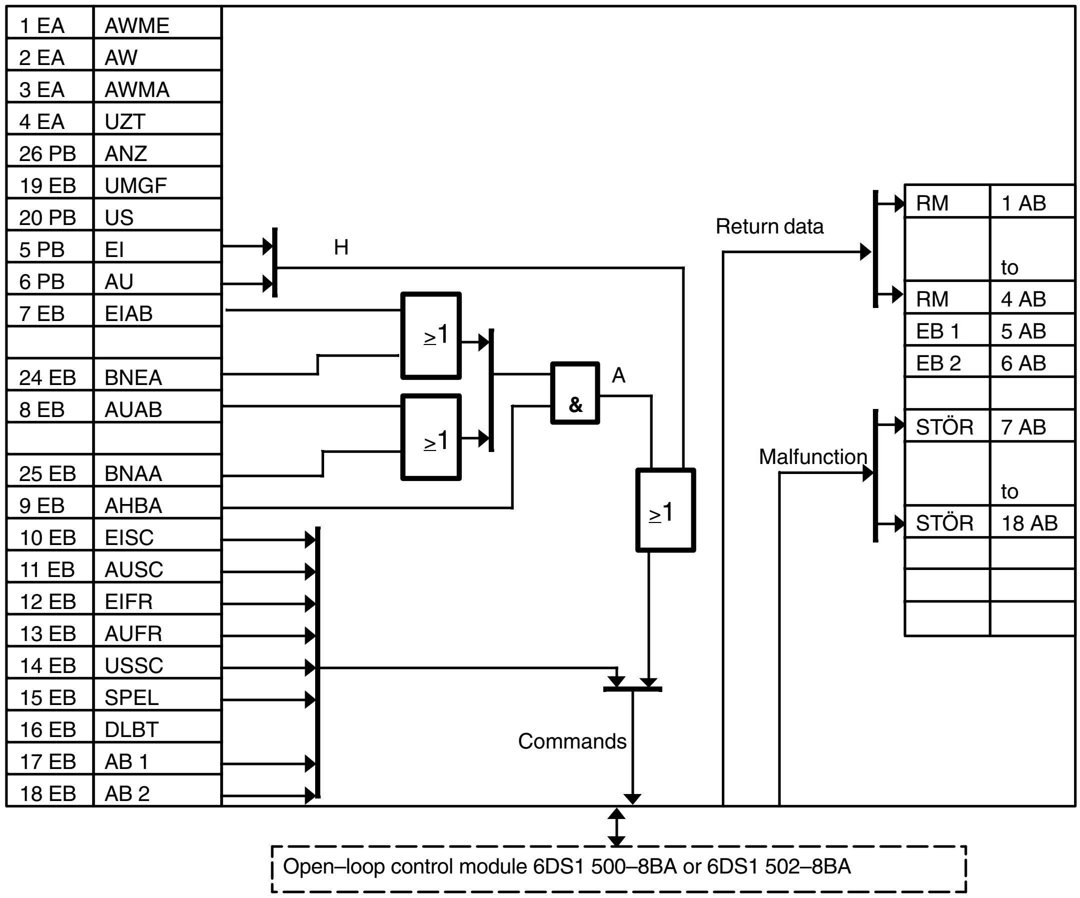
Driver block for open–loop control module–motor

Application

This block is used for acquiring signals from the open–loop control module (see Chap. 9.2 for modules) and to present these signals at the digital outputs, where they may be used, for example, by a subgroup controller.

The block is also used for transferring commands to the open–loop control module.

Method of Operation



A	Automatic mode	AWMA	Lower range limit for motor current
ANZ	Motor current display in loop display (ANZ = 1)	AWME	Upper range limit for motor current
AUAB	OFF by automatic	RMAU/RMEI	Return data
AU	Manual acknowledgement OFF	UMGF	External fault (block environment)
BNAA	OFF–AUTOMATIC/STEP	AUSC	Protection OFF
AB1	Binary output 1 (process)	EISC	Protection ON
AB2	Binary output 2 (process)	SPEL	Disable end position monitoring for protective command
DLBT	Continuous operation		
ELAB	ON by automatic	US	Suppression of status messages on the bus [1]
EL	Manual acknowledgement ON		
BNEA	ON–AUTOMATIC/STEP	USSC	Undervoltage protection
AUFR	Enable OFF	UZT	Monitoring time for display interlocking monitoring function
EIFR	Enable ON		
H	Manual mode	EB1	Binary input 1 (process)
AW	Motor current	EB2	Binary input 2 (process)

[1] Caution: Operation flags (e.g. ON/OFF) which are transferred together with the status will also be suppressed.

Fig. 9.65 Driver block for open–loop control module–motor; logic diagram

- Modes

  In manual mode (mode H), the commands EI/acknowledgement, AU/acknowledgement entered via the operator–controllable inputs are routed to the open–loop control module.

  In automatic mode (mode A), either the commands EI (input 7) or AU (input 8) or the commands ON/OFF–AUTOMATIC–STEP (inputs 24 and 25 respectively) from an automatic controller are routed to the module. Priority is not given to automatic and automatic/STEP commands. Simultaneous manual intervention is possible via the binary inputs. These commands have a higher priority: they are routed to the module as long as they are present. The commands “EI/Q” and “AU/Q” are also valid during automatic operation. The modes A/H can be selected via digital input 9.

- Parameterization

  The module number is parameterized via input 22 and the channel number via input 23.

  If the parameters BGNR or KNR are changed, both parameters must be re–entered following this sequence: module number – channel number. The driver should be inactive during this operation, i.e. the driver should be removed or the associated XB should be turned off.

Channel no. 0	: 1–channel open–loop control module 6DS1500–8BA
Channel no. 1, 2, 3	: Respective channel of the open–loop control module 6DS1502–8BA.

- System messages

S 305:	No acknowledgement from module (incorrect address, incorrect jumper setting or defective module)
S 313:	Multiple addressing (incorrect jumper setting)
S 321:	Module malfunction or repeated read error

- Interlocking monitoring function

  The interlocking monitoring function informs the operator of a rejected ON or OFF command. Rejection (output .S31) can be caused by

  – a missing process release
  – a protective command in the opposite direction

  The interlocking monitoring function is shown during the monitoring time specified via input 4 (UZT, default value is 10 seconds) on the AS loop display. After this time, it is deleted from the AS loop display. A status message is generated if the interlocking monitoring function responds and after the monitoring time has elapsed.

  In the OS subsystems, an operator notice (”B”), which need not be acknowledged, is derived at all levels from this function. If the monitoring time has been parameterized with “0”, the display is shown for the duration of one XB cycle.

  This signal will not be processed in the message processing function MELD. The cabinet or cabinet row lamps are not triggered either when this monitoring function responds.

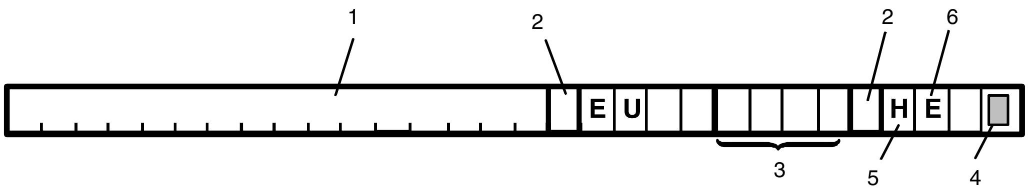
- Motor current display

  Input 26 is parameterized with “1” if a motor current display has been selected. The following fields are then activated (superimposed) on the circuit display (Fig. 9.68):

  5, 6, 7, 8, 9, 13, 14

  The motor current is fed as an analog signal to input 2. Normalization parameters are entered via input 1 (upper range limit) and input 2 (lower range limit).

- Normalized representation in a group display



1 Process–related block name, as in the loop display
2 Separating blank
3 Block name/no.
4 Loop message field, grouping of the I/O error messages
5 Mode display
  A = automatic mode
  H = manual mode
6 System checkback
  E = checkback ON (.TEI)
  A = checkback OFF (.TAU)

Fig. 9.66 Driver block for open–loop control module–motor; normalized representation

The 30 characters for this block are displayed at a specific location in a group display. Input 21 (group display: no./location no.) must then be parameterized as follows:

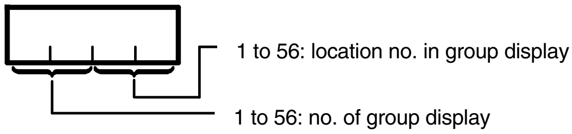


Fig. 9.67 Driver block for open–loop control module–motor; parameterization of input 21

Set input input 21 to “0” if the normalized representation of the block in a group display is to be suppressed.

The following loop display (Fig. 9.68) contains the below abbreviations as well as static and dynamic data:

EU 1	= Block name and number
*TECHNOL. NAME	= S16 string – user–specific block text
*EHT**	= Unassigned text for unit/dimension of analog value
I	= Motor current indication, interconnectable, display can be deselected by ANZE
EI	= State of ON return data
AU	= State of OFF return data
B	= Command inhibit
S	= Fault alarm display with error number (I/O fault)
S	= State environment fault UMGF

Static data

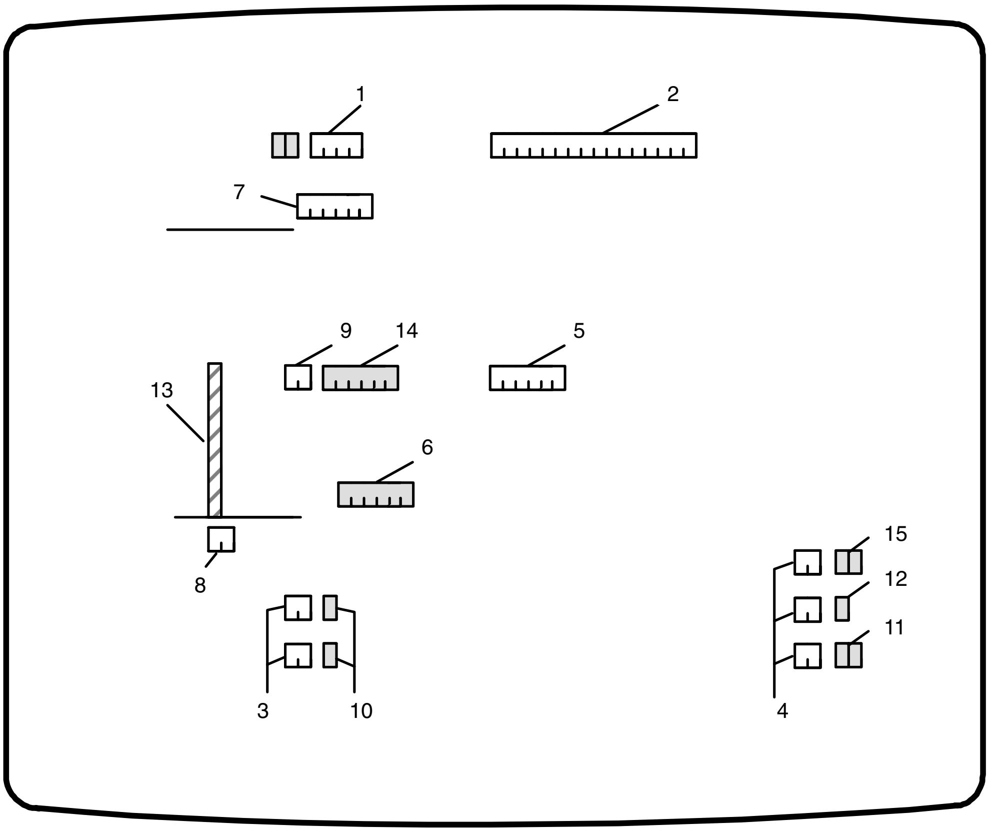
1 Mnemonic name and no. of the EU block
2 Process–related name of the EU block
3 Mnemonic name of the return data (EI, AU) [1]
4 Mnemonic name of the messages “I&C fault” (S) and command inhibit (B) [1]
5 [2] Physical quantity of the measured value
6 [2] Lower range limit
7 [2] Upper range limit
8 [2] Mnemonic bar name (corresponds to the 1st character of 9)
9 [2] Mnemonic name of the measured value (motor current [1])

Dynamic data

10 System return data ON, OFF
11 I/O error messages (sorted by priorities)
S 80 Module defective (highest priority)
S 4 Hardware fault on module
S 25 Power section has failed
S 10 Binary signal monitoring function has responded
S 16 Command outputs have failed
S 17 End position monitoring function ON has responded
S 18 End position monitoring function OFF has responded
S 19 Run time monitoring function ON has responded
S 20 Run time monitoring function OFF has responded
12 ”Fault environment” (1 = fault has occurred)
13 [2] Measured value as bar
14 [2] Digital display of measured value
15 Command inhibit (”1” = interlocking monitoring function has responded)

[1] Predefined mnemonic names
[2] Set input 26 PB to “1” to display this data.

- Normalized representation of the loop display



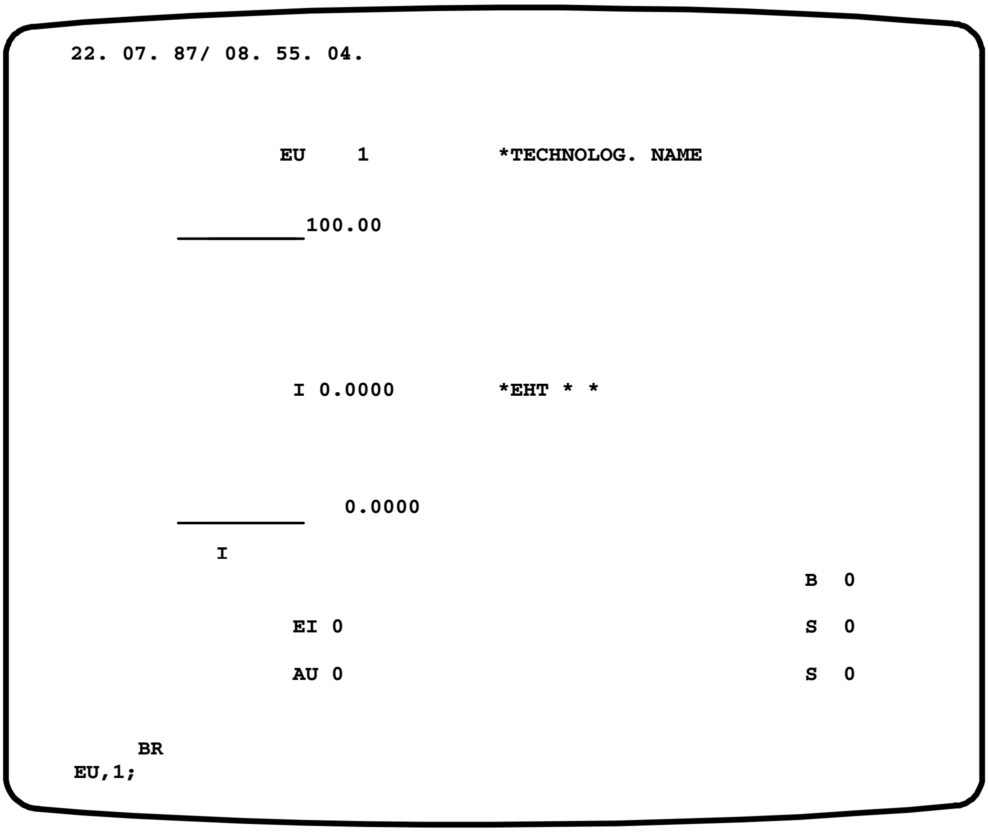


Fig. 9.68 EU block loop display during continuous operation

- Using the process communication keyboard for operator input

  The keys EI = 1 and AU = 1 are automatically assigned after the loop display has been selected and the BE key (”Operator input”) depressed. Each function key input must be terminated by pressing the execute key (◇).

EI=1	AU=1						

AU OFF manual acknowledgement
EI ON manual acknowledgement

Fig. 9.69 EU block; automatic labeling of the process communication keyboard

- Data structure (designation of inputs and outputs)

Output elements:

Ax	Type	Name	Attr.	Meaning	int. El. no.
1	AB	RMAU		Return data OFF	34
2	AB	RMEI		Return data ON	35
3	ABT	AUS		Key OFF	36
4	ABT	EIN		Key ON	37
5	AB	EB1		Process command ON	38
6	AB	EB2		Process command OFF	39
7	AB	S25		Power section has failed	40
8	AB	S10		Binary signal monitor function has responded	41
9	AB	S16		Command outputs have failed	42
10	AB	S31		Interlocking monitoring function has responded	43
11	AB	S18		End position monitoring ’OFF’	44
12	AB	S17		End position monitoring ’ON’	45
13	AB	S26		Test position switching device	46
14	AB	S20		Run time monitoring ’OFF’	47
15	AB	S19		Run time monitoring ’ON’	48
16	AB	S6		Control station defective	49
17	AB	S4		Hardware fault on module	50
18	AB	S80		Module failure detected	51
19	AB	BGF		Module fault/driver message	52

Input elements :

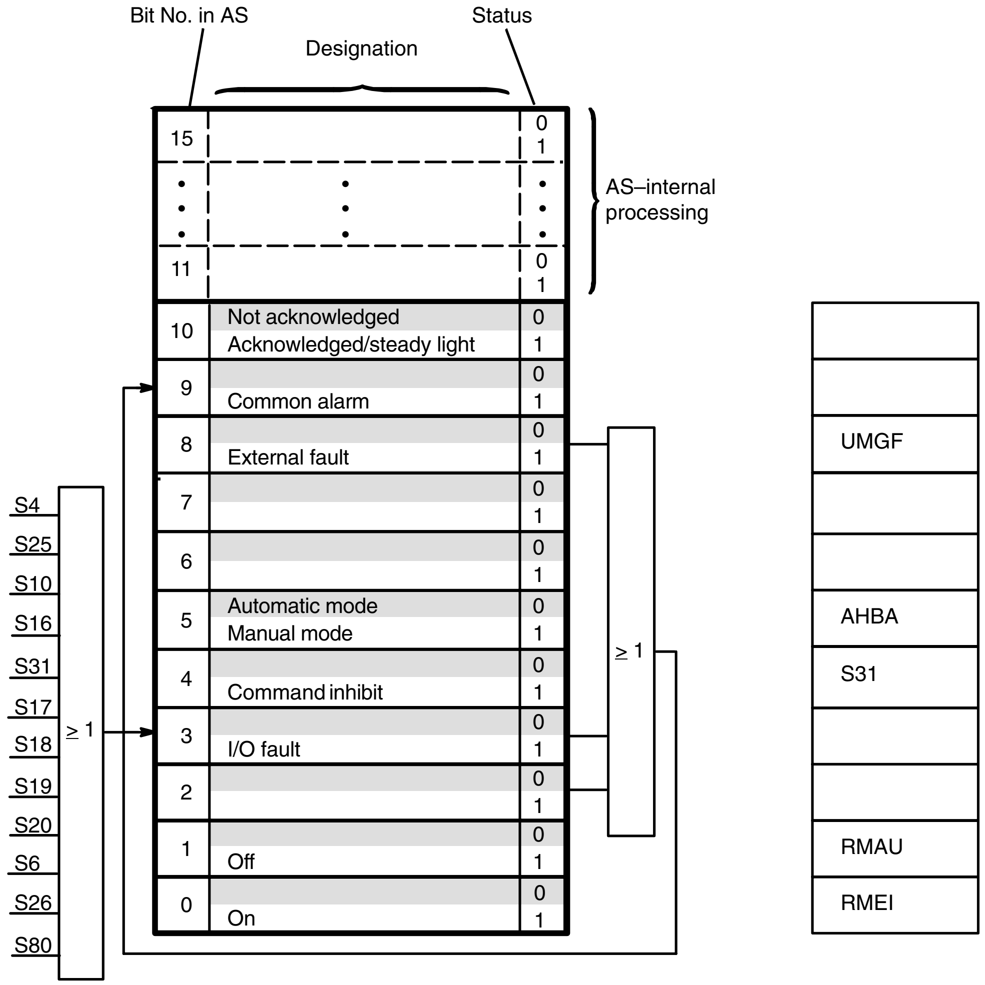
Ex	Type	Name	Attr.	Meaning	int. El. no.
1	EAD	AWME		Upper range limit	1
2	EAD	AW		Allocated analog value/interconnectable	2
3	EAD	AWMA		Lower range limit	3
4	EAD	UZT	C	Alarm duration for interlocking monitoring (in seconds)	4
5	PB	EI	B	Command ON–PBT/text from El.28	5
6	PB	AU	B	Command OFF–PBT/text from El.27	6
7	EB	EIAB		Command ON – automatic	7
8	EB	AUAB		Command OFF –automatic	8
9	EB	AHBA		Automatic/manual mode	9
10	EB	EISC		Protection – ON	10
11	EB	AUSC		Protection – OFF	11
12	EB	EIFR		Enable – ON	12
13	EB	AUFR		Enable – OFF	13
14	EB	USSC		Undervoltage protection	14
15	EB	SPEL		Disable end position monitoring for protective command	15
16	EB	DLBT		Continuous operation (input only relevant for loop display and PBT, not for module)	16
17	EB	AB1		Binary output 1	17
18	EB	AB2		Binary output 2	18
19	EB	UMGF		Environment fault	19
20	PB	US		STATUS suppression	20
21	ID	NRPL	C	Location number of group display	21
22	I	BGNR		Module number	22
23	I	KNR		Channel number	23
24	EB	BNEA		Command ON – automatic/STEP	24
25	EB	BNAA		Command OFF – automatic/STEP	25
26	PB	ANZE		Display yes/no 0/1	26
27	S2	TAU		Character string for ’OFF’	27
28	S2	TEI		Character string for ’ON’	28
29	S2	TSNR		Character string for fault no.	29
30	S2	TSU		Character string for environment fault	30
31	S2	TBS		Character string for command inhibit	31
32	S2	TWI		Character string for analog value ’I’	32
33	S6	EHT		Character string for ’I’ unit	33
34	S16	AT		String for process–related name	34

- Block list

```
   EU      1                11. 04. 86/ 09. 36. 53.  P: 1

 1 AB  RMAU 0                 #                    N    34
 2 AB  RMEI 0                 #                    N    35
 3 AB  TAUS 0                 #                    N    36
 4 AB  TEIN 0                 #                    N    37
 5 AB  EB1  0                 #                    N    38
 6 AB  EB2  0                 #                    N    39
 7 AB  S25  0                 #                    N    40
 8 AB  S10  0                 #                    N    41
 9 AB  S16  0                 #                    N    42
10 AB  S31  0                 #                    N    43
11 AB  S18  0                 #                    N    44
12 AB  S17  0                 #                    N    45
13 AB  S26  0                 #                    N    46
14 AB  S20  0                 #                    N    47
15 AB  S19  0                 #                    N    48
16 AB  S6   0                 #                    N    49
17 AB  S4   0                 #                    N    50
18 AB  S80  0                 #                    N    51
19 AB  BGF  0                 #                    N    52
 1 EAD AWME 100.00              P                        1
 2 EAD AW   0.0000              P                        2
 3 EAD AWMA 0.0000              P                        3
 4 EAD UZT  10.000              P                        4
 5 PB  EI   0                                     B      5
 6 PB  AU   0                                     B      6
 7 EB  EIAB 0                   P                        7
 8 EB  AUAB 0                   P                        8
 9 EB  AHBA 0                   P                        9
10 EB  EISC 0                   P                       10
11 EB  AUSC 0                   P                       11
12 EB  EIFR 0                   P                       12
13 EB  AUFR 0                   P                       13
14 EB  USSC 0                   P                       14
15 EB  SPEL 0                   P                       15
16 EB  DLBT 0                   P                       16
17 EB  AB1  0                   P                       17
18 EB  AB2  0                   P                       18
19 EB  UMGF 0                   P                       19
20 PB  US   0                                           20
21 ID  NRPL    0                                 C      21
22 I   BGNR    0                                 C      22
23 I   KNR     0                                 C      23
24 EB  BNEA 0                   P                       24
25 EB  BNAA 0                   P                       25
26 PB  ANZE 0                                           26
27 S2  TAU  AU                                          27
28 S2  TEI  EI                                          28
29 S2  TSNR S                                           29
30 S2  TSU  S                                           30
31 S2  TBS  B                                           31
32 S2  TWI  I                                           32
33 S   EHT  *EHT**             6                        33
34 S16 AT   *TECHNOLOG. NAME    16                      61
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

AHBA	Manual/automatic mode
RMAU	Return data “OFF”
RMEI	Return data “ON”
S31	Interlocking monitoring has responded
UMGF	Environment fault

Fig. 9.70 Status word for the EU block

EV

Driver block for open–loop control module–valve

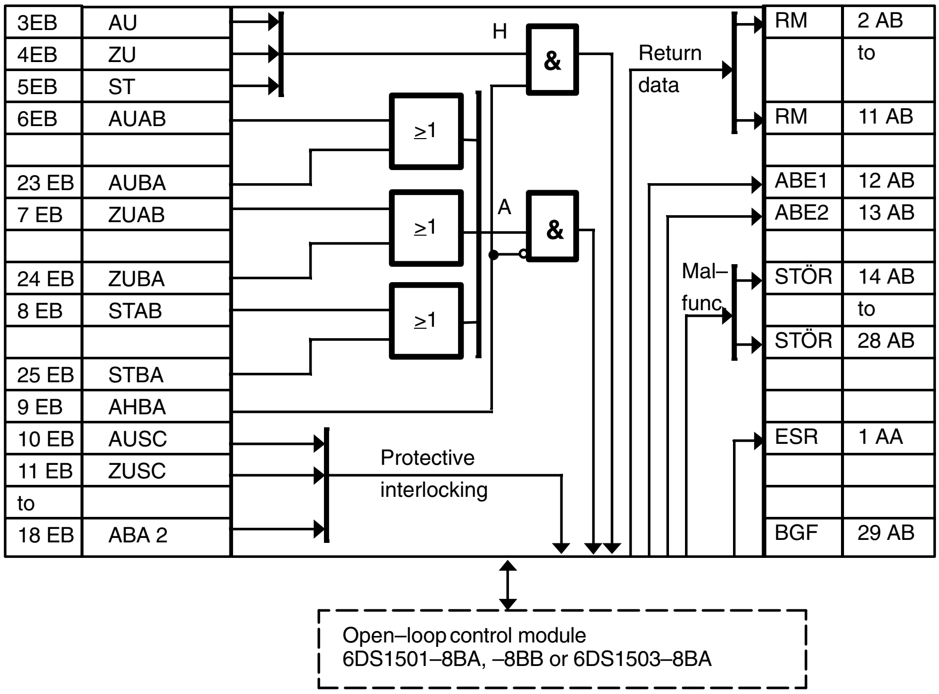
Application

This block is used for acquiring signals from the open–loop control module and to present these signals

– As binary outputs (e.g. for a subgroup control)

– To transfer commands to the open–loop control module

Method of Operation



AU	OPEN–manual/acknowledgement	AUSC	Protection–OPEN
ZU	CLOSED–manual/acknowledg.	ZUSC	Protection–CLOSE
ST	STOP–manual	RM	Return data
AUAB	OPEN–automatic	ABA/ABE	Binary values
ZUAB	CLOSED–automatic	STÖR	Failure
STAB	STOP–automatic	ESR	Electronic position indicator
AHBA	Mode selection	BGF	Module fault

Fig. 9.71 EV block; logic diagram

- Modes

  In manual mode (mode H), the commands AU/OPEN acknowledgement, ZU/CLOSED acknowledgement and ST (STOP), entered via the operator–controllable inputs, are routed to the open–loop control module.

  In automatic mode (mode A), the commands AUAB, ZUAB and STAB from an automatic controller are routed to the module. At the same time manual interventions are possible via the operator–controllable inputs. These commands have a higher priority; they are routed to the module for as long as they are present. The commands “OPEN/CLOSE acknowledgement” are also valid in automatic mode. The mode can be selected via binary input 9.

- Parameterization

  The module number is parameterized via input 21 and the channel number via input 22. Channel number “0” specifies a one–channel open–loop control module 6DS1501, channel numbers “1”, “2” or “3” specify the respective channel of the three–channel module 6DS1503.

  If the parameters BGNR or KNR are changed, both parameters must be re–entered following this sequence: module number – channel number. The driver should be inactive during this operation, i.e. the driver should be removed or the associated XB should be turned off.

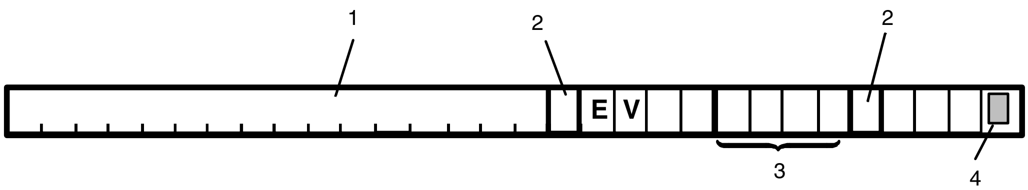
- System messages

  S 305: No acknowledgement from module (incorrect address, incorrect jumper setting or defective module)
  S 313: Multiple addressing (incorrect jumper setting)
  S 321: Module malfunction or repeated read error

- Electronic position indication

  The electronic position indication of the one–channel open–loop control module 6DS1 501–8BB is issued via analog output 1 within the parameterized range limits (XE, XA).

- Normalized representation in a group display



1 Process–related block name, as in loop display
2 Separating blank
3 Block name/no.
4 Blinking mark, if a fault alarm has occurred (cf. loop display)

Fig. 9.72 EV block; normalized representation in a group display

The 30 characters for this block are displayed on a specific location of a group display. Input 20 (group display: no/location no.) should be parameterized as follows for this purpose:

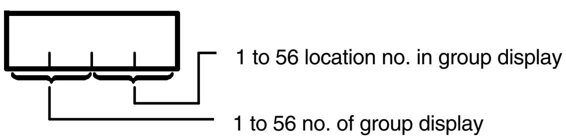
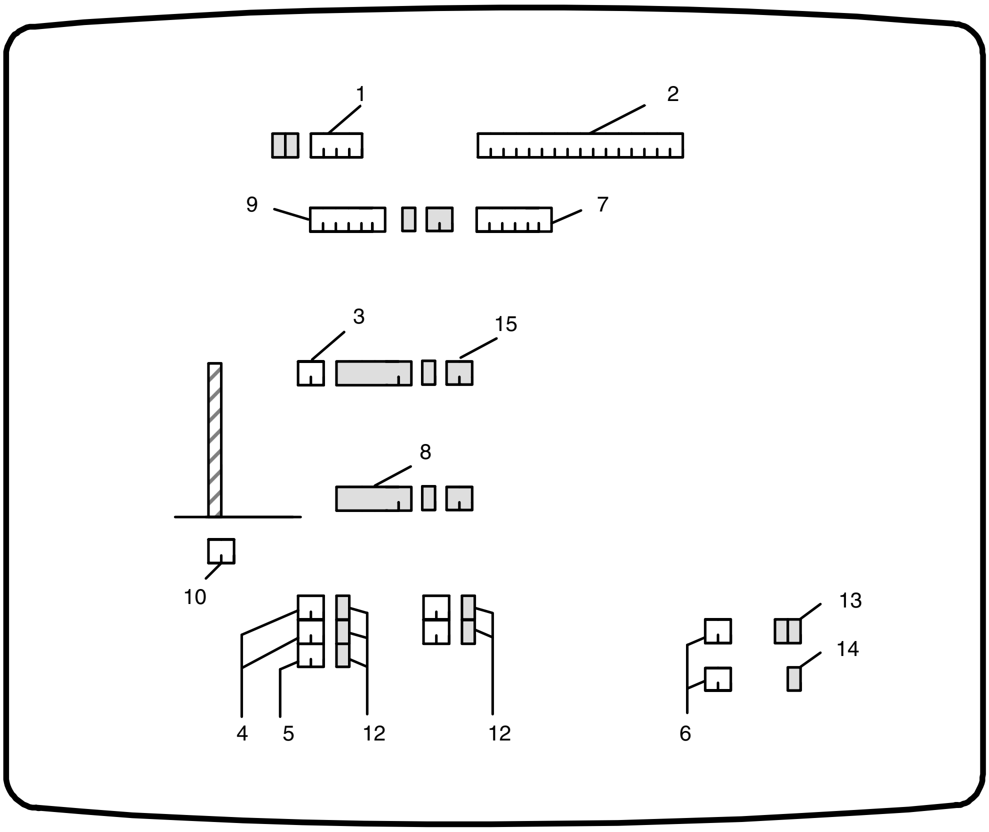


Fig. 9.73 EV block; parameterization of input 2

Set input 20 to “0” is the normalized representation of the block in a group display is to be suppressed.

- Normalized representation of the loop display

  The loop display contains static and dynamic data for the operator.




```
22. 07. 87/ 08. 55. 04.


                EV     1          *TECHNOLOG. NAME

                   100.00         *EHT**




                  Y  0.0000



                     0.0000
            Y

                  AU 0       LA 0
                  ZU         LZ 0                  S      0
                  ST 0
                                                   F      0

       BR
EV,1;
```

Fig. 9.74 EV loop display; example

Legend to Fig. 9.74 :

Static data:

1 Mnemonic name and no. of the EM block
2 Process–related name of the EM block
3 Mnemonic name of the return data (Y) [1)] [3)]
4 Mnemonic name of the checkback (AU, ZU) [1)]
5 Mnemonic name of the STOP command (ST) [1)]
6 Mnemonic name of the error messages (S) and "External fault" (F) [1)]
7 Physical quantity of the position
8 Lower range limit of position [3)]
9 Upper range limit of position [3)]
10 Mnemonic name of the bar (Y) [3)]

1) Predefined mnemonic names
2) Mnemonic names can be selected by the user
3) One–channel module only

Dynamic data:

11 Position in bar representation
12 Operating states of AU, ZU, LA, LZ, ST
13 Error messages

S 80	Module defective ↑3)↑ (highest priority)
S 4	Hardware fault on module
S 25	Power section has failed
S 10	Binary signal monitoring function has responded
S 16	Command outputs have failed
S 17	End position monitoring function OPEN has responded
S 18	End position monitoring function CLOSED has responded
S 21	Torque monitoring function OPEN has responded
S 22	Torque monitoring function CLOSED has responded
S 19	Run time monitoring function OPEN has responded
S 20	Run time monitoring function CLOSED has responded
S 9	Analog signal monitoring function has responded
S 6	Control station defective
S 26	Test position of switching device

14 State "External fault" ("1" = fault has occurred)
15 Position Y (digital display)

- Using the process communication keyboard for operator input

AU=1	ZU=1	ST=1					

AU = 1 : Open
ST = 1 : Stop
ZU = 1 : Closed

Fig. 9.75 EV block; automatic labeling of the process communication keyboard

Two keys will be assigned automatically after the loop display has been selected and the BE key ("Operator input") depressed.

The function key inputs must be terminated by pressing the execute key (◈).

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Electronic position indication	ESR	1	AA
RM intermediate position	ZWST	2	AB
RM run in direction OPEN	LAAU	3	AB
RM run in direction CLOSED	LAZU	4	AB
RM not OPEN	RNAU	5	AB
RM OPEN	RAUF	6	AB
RM CLOSED	RZU	7	AB
RM not CLOSED	RNZU	8	AB
Key OPEN	TAUF	9	AB
Key CLOSED	TAZU	10	AB
Key STOP	TSTP	11	AB
Binary input 1	ABE1	12	AB
Binary input 2	ABE2	13	AB
Power section failure	S25	14	AB
Binary signal monitoring has responded	S10	15	AB
Command output failure	S16	16	AB
Interlocking monitoring function has responded	S31	17	AB
End position monitoring CLOSED has responded	S18	18	AB
End position monitoring OPEN has responded	S17	19	AB
Torque monitoring OPEN has responded	S21	20	AB
Torque monitoring CLOSED has responded	S22	21	AB
Run time monitoring OPEN has responded	S19	22	AB
Run time monitoring CLOSED has responded	S20	23	AB
Analog signal monitoring has responded	S9	24	AB
Test position of switching device	S26	25	AB
Control station defective	S6	26	AB
Hardware fault detected on module	S4	27	AB
Module defective	S80	28	AB
Module fault	BGF	29	AB
Upper range limit	OG	1	EA
Lower range limit	UG	2	EA
Command OPEN/acknowledgement (PBT manual)	AU	3	EBV
Command CLOSE/acknowledgement (PBT manual)	ZU	4	EBV
STOP manual (PBT)	ST	5	EBV
Command OPEN (automatic)	AUAB	6	EB
Command CLOSE (automatic)	ZUAB	7	EB
STOP (automatic)	STAB	8	EB
Mode A: ”0” H: ”1”	AHBA	9	EB
Protection OPEN	AUSC	10	EB
Protection CLOSE	ZUSC	11	EB
Enable OPEN	AUFR	12	EB
Enable CLOSE	ZUFR	13	EB
Internal reserve element	INT1	14	EB
Disable end position monitoring	SPEL	15	EB
Internal reserve element	INT2	16	EB
Binary output 1	ABA1	17	EB
Binary output 2	ABA2	18	EB
Environment fault	UMGF	19	EB

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Location no./group display	NRPL	20	ID
Module number	BGNR	21	I
Channel number (0/1/2/3)	KNR	22	I
OPEN automatic (BA)	AUBA	23	EB
CLOSED automatic (BA)	ZUBA	24	EB
STOP automatic (BA)	STBA	25	EB
Cf. loop display	TY	26	S2
”	TAU	27	S2
”	TZU	28	S2
”	TST	29	S2
”	TLA	30	S2
”	TLZ	31	S2
”	TS	32	S2
”	TF	33	S2
”	EHT	34	S
”	AT	35	S16

- Block list

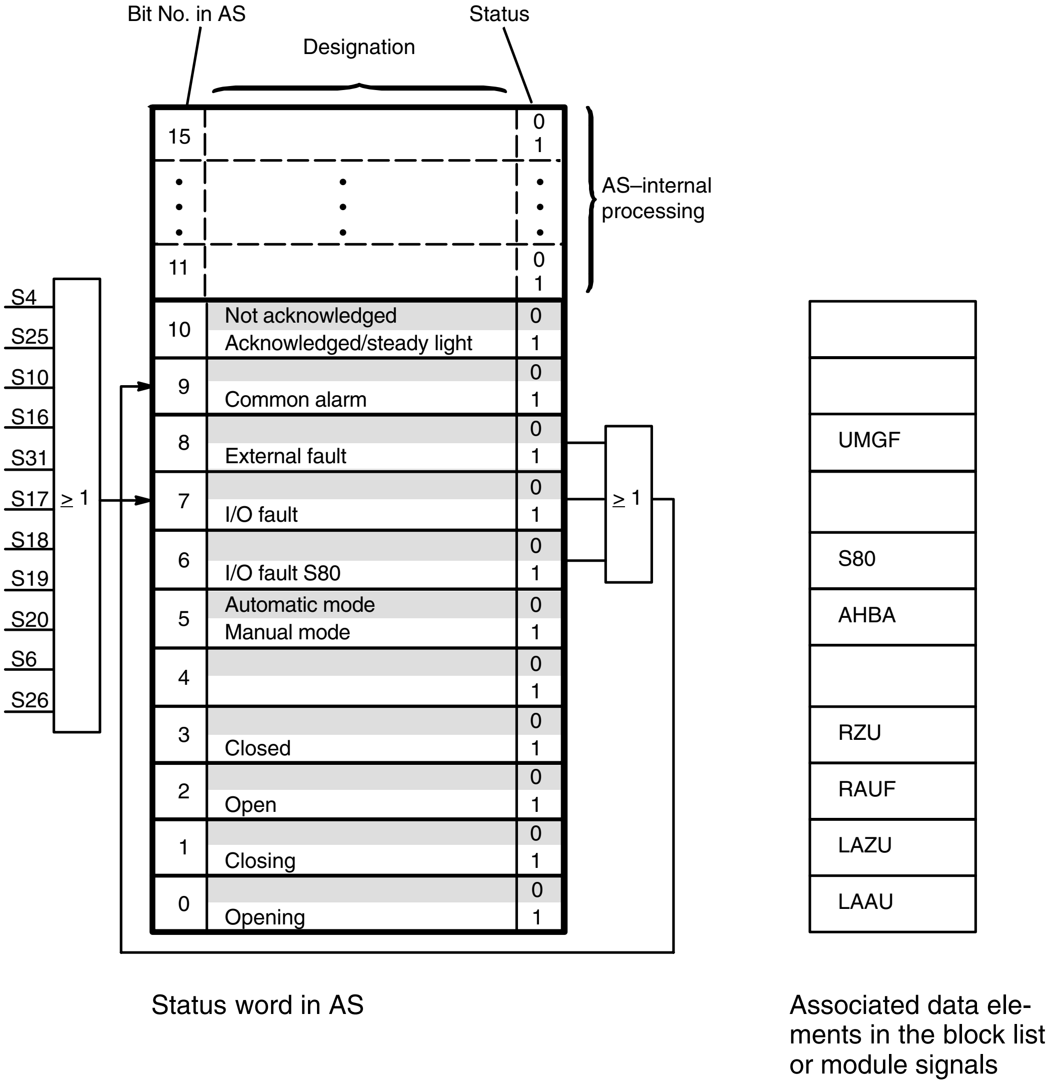
```
  EV      1                                        P:  1

 1 AA  ESR  0.0000           #                   N     35
 2 AB  ZWST 0                #                   N     36
 3 AB  LAAU 0                #                   N     37
 4 AB  LAZU 0                #                   N     38
 5 AB  RNAU 0                #                   N     39
 6 AB  RAUF 0                #                   N     40
 7 AB  RZU  0                #                   N     41
 8 AB  RNZU 0                #                   N     42
 9 AB  TAUF 0                #                   N     43
10 AB  TAZU 0                #                   N     44
11 AB  TSTP 0                #                   N     45
12 AB  ABE1 0                #                   N     46
13 AB  ABE2 0                #                   N     47
14 AB  S25  0                #                   N     48
15 AB  S10  0                #                   N     49
16 AB  S16  0                #                   N     50
17 AB  S31  0                #                   N     51
18 AB  S18  0                #                   N     52
19 AB  S17  0                #                   N     53
20 AB  S21  0                #                   N     54
21 AB  S22  0                #                   N     55
22 AB  S19  0                #                   N     56
23 AB  S20  0                #                   N     57
24 AB  S9   0                #                   N     58
25 AB  S26  0                #                   N     59
26 AB  S6   0                #                   N     60
27 AB  S4   0                #                   N     61
28 AB  S80  0                #                   N     62
29 AB  BGF  0                #                   N     63
 1 EA  OG   100.00             P                        1
 2 EA  UG   0.0000             P                        2
 3 EBV AU   0                                   B       3
 4 EBV ZU   0                                   B       4
 5 EBV ST   0                                   B       5
 6 EB  AUAB 0                  P                        6
```

Block list (continued)

```
 7 EB  ZUAB 0                    P                    7
 8 EB  STAB 0                    P                    8
 9 EB  AHBA 0                    P                    9
10 EB  AUSC 0                    P                   10
11 EB  ZUSC 0                    P                   11
12 EB  AUFR 0                    P                   12
13 EB  ZUFR 0                    P                   13
14 EB  INT1 0                    P                   14
15 EB  SPEL 0                    P                   15
16 EB  INT2 0                    P                   16
17 EB  ABA1 0                    P                   17
18 EB  ABA2 0                    P                   18
19 EB  UMGF 0                    P                   19
20 ID  NRPL      0                          C        20
21 I   BGNR      0                          C        21
22 I   KNR       0                          C        22
23 EB  AUBA 0                    P                   23
24 EB  ZUBA 0                    P                   24
25 EB  STBA 0                    P                   25
26 S2  TY   Y                                        26
27 S2  TAU  AU                                       27
28 S2  TZU  ZU                                       28
29 S2  TST  ST                                       29
30 S2  TLA  LA                                       30
31 S2  TLZ  LZ                                       31
32 S2  TS   S                                        32
33 S2  TF   F                                        33
34 S   EHT  *EHT**                   6               34
35 S16 AT   *TECHNOLOG. NAME        16               72
```

- Status word



AHBA	Manual/automatic mode
LAAU	RM opening
LAZU	RM closing
RAUF	RM off
REIN	RM on
S80	Module defective
UMGF	Environment fault

Fig. 9.76 Status word for the EV block

EXP

Exponential blocks

Application

This block is used for generating the exponential value of an input variable

Method of Operation

The block follows the equation:

$Y = e^x$

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
Input value	X	1	EA

- Block list

```
  EXP     1                 03. 03. 83/ 00. 34. 18. P: 1

 1 AA  Y    0.0000          #                   N      2
 1 EA  X    0.0000             P                       1
```

F

Window Block

Application

This block is used to display five measured values and five associated pairs of limit values

Method of Operation

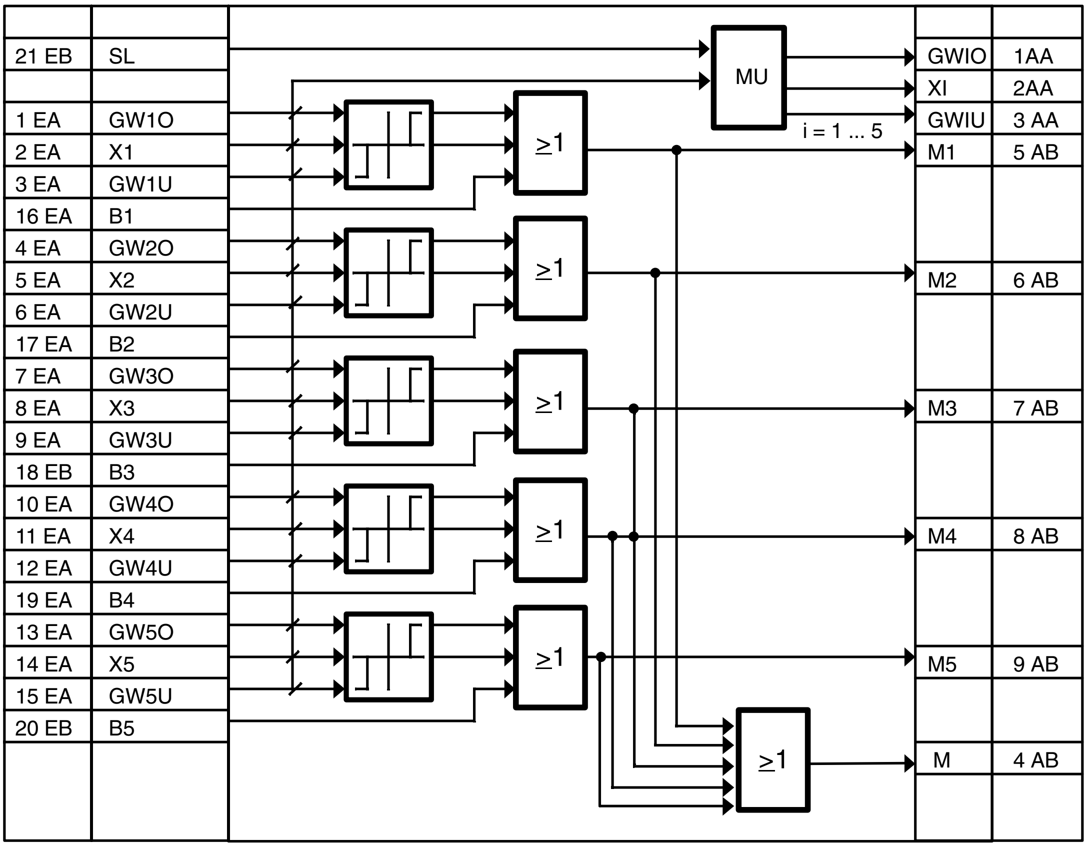


Fig. 9.77 Window block logic diagram

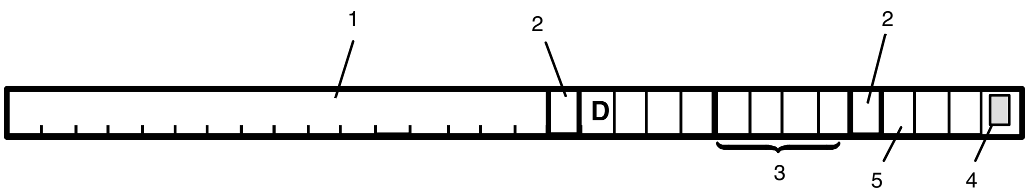
The limit value pairs GWiO *) and GWiU *) of each of the five measured values Xi *) is monitored. The monitoring result is ORed with a binary qualifier Bi *) which may, for example, contain a statement regarding the validity of the measured value (sensor failure).

The five alarm signals (M1 to M5) and the "Group alarm signal" (M) are present at the block outputs.

The limit value pairs GWiO *) and GWiU *) selected via SL and the measured value Xi *) are also present at block outputs.

*) i = 1 ... 5

- Normalized representation in a group display



1 Process–related block name, as in loop display
2 Separating blank
3 Block name/no.
4 Blinking mark, if one of the following alarm signals is pending: M1, M2, M3, M4 or M5.
5 Blank

Fig. 9.78 Window block; normalized representation in a group display

The 30 characters for this block are displayed at a specific location in a group display. Input 22 (group display: no./location no.) should be parameterized as follows for this purpose:

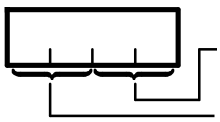


Fig. 9.79 Window block; normalized representation in a group display

Set input 22 to “0” if the normalized representation of the block in a group display is to be suppressed.

- Normalized representation of the loop display

Legend to Fig. 9.80:

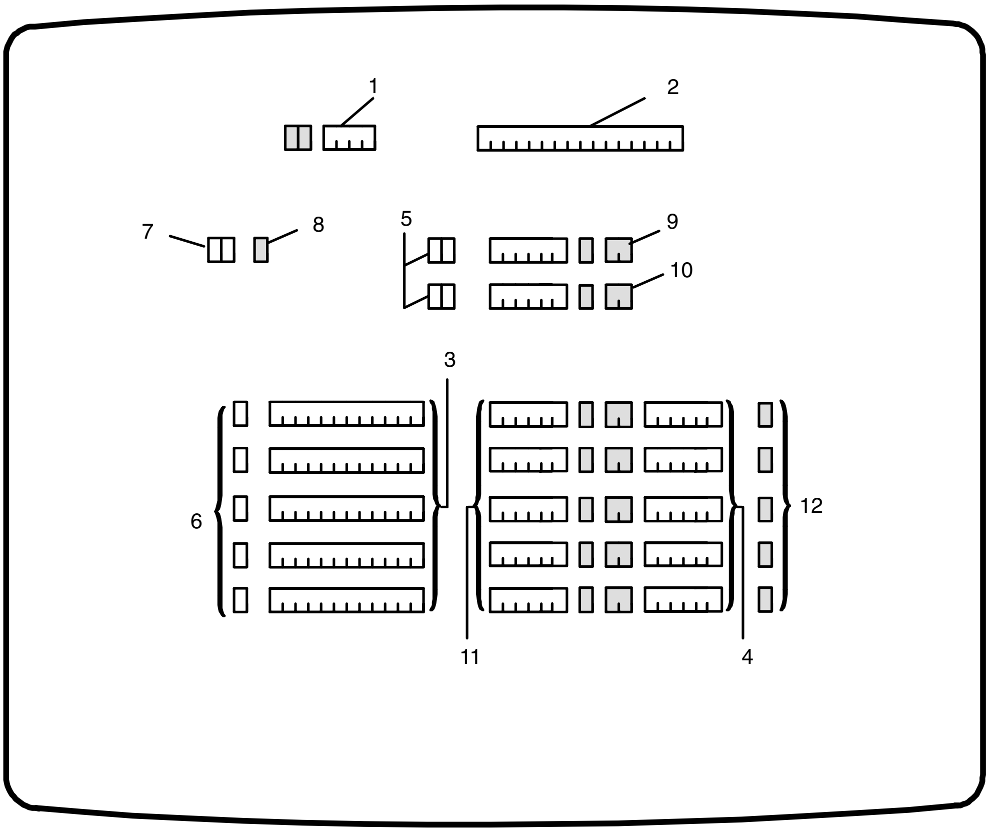
Static data:

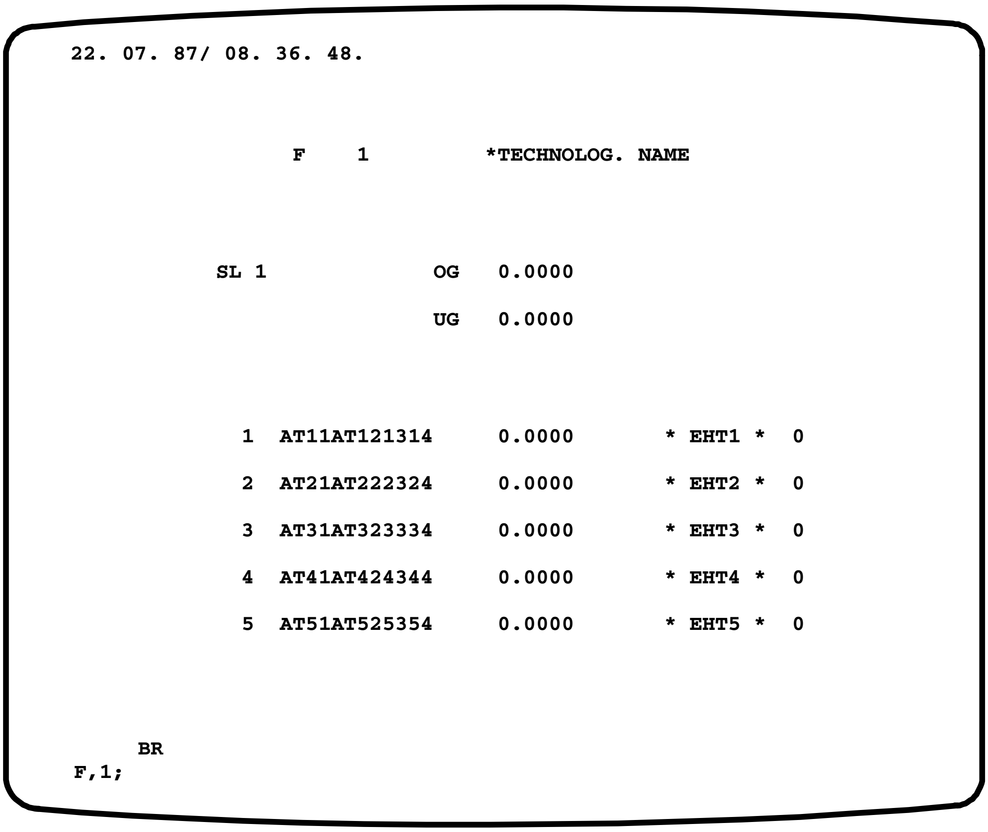
1 Mnemonic name and number of the window block
2 Process–related name of the window block
3 Process–related name of the measured values
4 Physical unit of the measured values
5 Name of the limit value pair (OG, UG)
6 Sequence number of measured values (1 to 5)
7 Mnemonic name for “Select” (SL) [1)]

Dynamic data:

8 Sequence number of the measured value selected for display of its limit value pair
9 Upper limit value of the measured value selected
10 Lower limit value of the measured value selected
11 Digital display of the measured values
12 Alarm status “1” means that a limit value has been violated or that a malfunction of the binary qualifier has occurred.

1) Predefined mnemonic names





```
22. 07. 87/ 08. 36. 48.

                 F    1          *TECHNOLOG. NAME

          SL 1            OG   0.0000
                          UG   0.0000

            1  AT11AT121314     0.0000       * EHT1 *  0
            2  AT21AT222324     0.0000       * EHT2 *  0
            3  AT31AT323334     0.0000       * EHT3 *  0
            4  AT41AT424344     0.0000       * EHT4 *  0
            5  AT51AT525354     0.0000       * EHT5 *  0

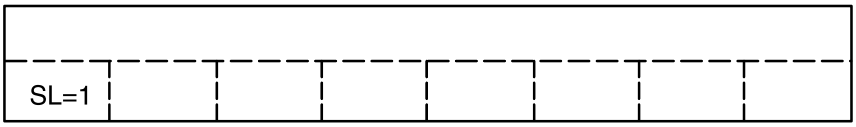
     BR
F,1;
```

Fig. 9.80 Loop display of F block

- Using the process communication keyboard for operator input

  One key (SL = 1) is assigned automatically after the loop display has been selected and the BE key ("Operator input") depressed. The function key input must be terminated by pressing the execute key ( ).

  Using this key sequence, the limit value pairs of all measured values in a window (up to 5) can be selected cyclically in the sequence 1, 2, 3, 4, 5. If, for example, the (SL = 1) key is depressed after the limit value pair X3 has been selected, the limit value pair of measured value X4 will appear. The measured values and their limit value pairs can thus be monitored.



SL = 1 : Select (select limits)

Fig. 9.81 Window block; automatic labeling of the process communication keyboard

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Upper limit value i (i = 1 ... 5)	GWIO	1	AA
Upper range limit i (i = 1 ... 5)	XI	2	AA
Lower limit value (i = 1 ... 5)	GWIU	3	AA
Group alarm signal	M	4	AB
Alarm signal	M1	5	AB
Alarm signal	M2	6	AB
Alarm signal	M3	7	AB
Alarm signal	M4	8	AB
Alarm signal	M5	9	AB
Upper limit value 1	GW1O	1	EA
Measured value 1	X1	2	EA
Lower limit value 1	GW1U	3	EA
Upper limit value 2	GW2O	4	EA
Measured value 2	X2	5	EA
Lower limit value 2	GW2U	6	EA
Upper limit value 3	GW3O	7	EA
Measured value 3	X3	8	EA
Lower limit value 3	GW3U	9	EA
Upper limit value 4	GW4O	10	EA
Measured value 4	X4	11	EA
Lower limit value 4	GW4U	12	EA
Upper limit value 5	GW5O	13	EA
Measured value 5	X5	14	EA
Lower limit value 5	GW5U	15	EA

Data structure (continued)

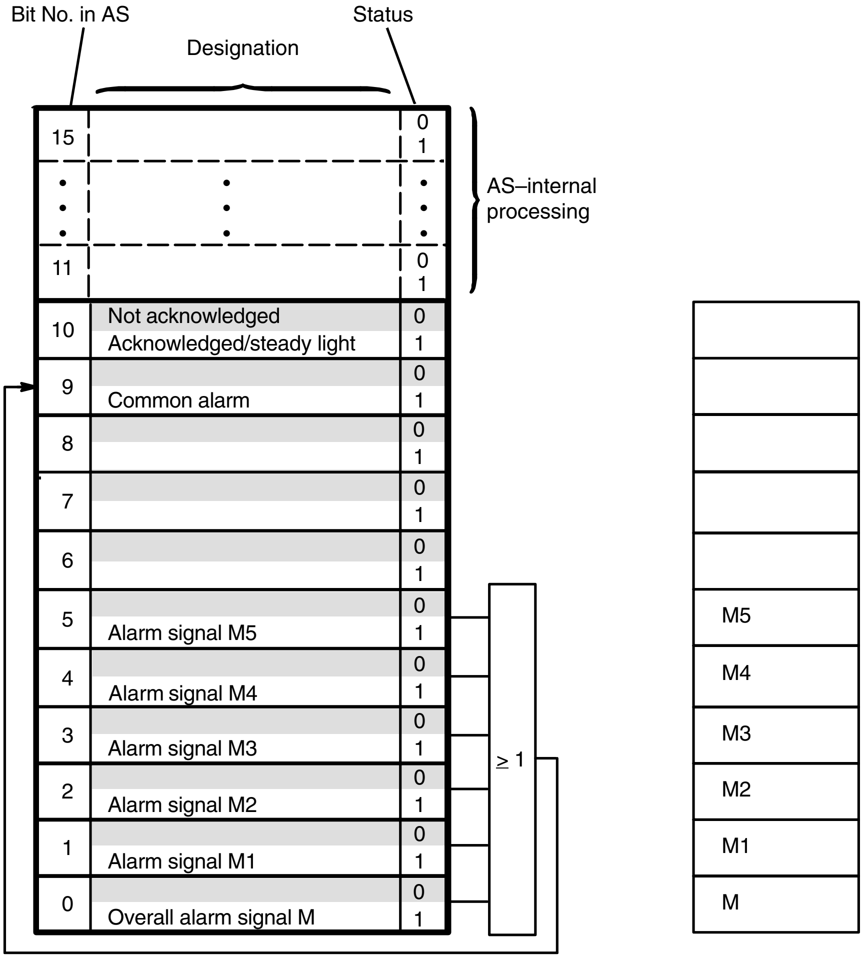
Meaning	Mnemonic name	Input/Output No.	Type
Binary qualifier 1	B1	16	EB
Binary qualifier 2	B2	17	EB
Binary qualifier 3	B3	18	EB
Binary qualifier 4	B4	19	EB
Binary qualifier 5	B5	20	EB
Select	SL	21	EBV
Group display: No./location no.	NRPL	22	ID
Cf. loop display	TSL	23	S2
”	AT13	24	S2
”	AT14	25	S2
”	AT23	26	S2
”	AT24	27	S2
”	AT33	28	S2
”	AT34	29	S2
”	AT43	30	S2
”	AT44	31	S2
”	AT53	32	S2
”	AT54	33	S2
”	AT11	34	S4
”	AT12	35	S4
”	EHT1	36	S
”	AT21	37	S4
”	AT22	38	S4
”	EHT2	39	S4
”	AT31	40	S4
”	AT32	41	S4
”	EHT3	42	S
”	AT41	43	S4
”	AT42	44	S4
”	EHT4	45	S
”	AT51	46	S4
”	AT52	47	S4
”	EHT5	48	S
”	AT	49	S16

- Block list

```
   F       1                                              P: 1

 1 AA   GWIO 0.0000            #                   N      49
 2 AA   XI   0.0000            #                   N      50
 3 AA   GWIU 0.0000            #                   N      51
 4 AB   M    0                 #                   N      52
 5 AB   M1   0                 #                   N      53
 6 AB   M2   0                 #                   N      54
 7 AB   M3   0                 #                   N      55
 8 AB   M4   0                 #                   N      56
 9 AB   M5   0                 #                   N      57
 1 EA   GW10 100.00               P                        1
 2 EA   X1   0.0000               P                        2
 3 EA   GW1U 0.0000               P                        3
 4 EA   GW20 100.00               P                        4
 5 EA   X2   0.0000               P                        5
 6 EA   GW2U 0.0000               P                        6
 7 EA   GW30 100.00               P                        7
 8 EA   X3   0.0000               P                        8
 9 EA   GW3U 0.0000               P                        9
10 EA   GW40 100.00               P                       10
11 EA   X4   0.0000               P                       11
12 EA   GW4U 0.0000               P                       12
13 EA   GW50 100.00               P                       13
14 EA   X5   0.0000               P                       14
15 EA   GW5U 0.0000               P                       15
16 EB   B1   0                    P                       16
17 EB   B2   0                    P                       17
18 EB   B3   0                    P                       18
19 EB   B4   0                    P                       19
20 EB   B5   0                    P                       20
21 EBV  SL   0                                    B       21
22 ID   NRPL      0                              C        22
23 S2   TSL  SL                                           23
24 S2   AT13 13                                           24
25 S2   AT14 14                                           25
26 S2   AT23 23                                           26
27 S2   AT24 24                                           27
28 S2   AT33 33                                           28
29 S2   AT34 34                                           29
30 S2   AT43 43                                           30
31 S2   AT44 44                                           31
32 S2   AT53 53                                           32
33 S2   AT54 54                                           33
34 S4   AT11 AT11                                         34
35 S4   AT12 AT12                                         35
36 S    EHT1 *EHT1*                    6                  36
37 S4   AT21 AT21                                         37
38 S4   AT22 AT22                                         38
39 S    EHT2 *EHT2*                    6                  39
40 S4   AT31 AT31                                         40
41 S4   AT32 AT32                                         41
42 S    EHT3 *EHT3*                    6                  42
43 S4   AT41 AT41                                         43
44 S4   AT42 AT42                                         44
45 S    EHT4 *EHT4*                    6                  45
46 S4   AT51 AT51                                         46
47 S4   AT52 AT52                                         47
48 S    EHT5 *EHT5*                    6                  48
49 S16  AT   *TECHNOLOG. NAME         16                  68
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

M Overall alarm signals
M1 ... 5 Alarm signal 1 ... 5

Fig. 9.82 Status word for F block

FM

Driver block for field multiplexer

Application

This block is used for acquiring signals from a channel (serial interface) of the FM interface module (FMBG 6DS1304–8BB) and for the transfer of signals to the interface module in conjunction with the FM central unit module (FMZT) and the subordinate FM–related driver blocks AAF, AEF, BAF and BEF.

Method of Operation

The block is a mandatory header block for the subordinate sequence of driver blocks (AAF, AEF, BAF and BEF). It monitors the operability of the interface module and performs acquisition and interpretation of I&C alarms (LTM) from the field multiplexer.

In a redundant AS structure, it automatically controls the switchover process between the two redundant interface modules.

- Modes

  The mode (FM arrangement) must be selected via input 4 (FAN):

FAN	FM interface module (FMBG)	FM central unit (FMZT)	AS	Connecting cable AS–FM
1	single	single	single	single
2	single	redundant	single	single
3	–	–	–	–
4 or 7	redundant	redundant	single	redundant
5	redundant (1 per AS)	redundant	double	redundant
6	redundant (1 per AS)	redundant	double	single

FAN = 1 permits a direct link without using FM peripherals between two AS subsystems via an FMBG interface module in each subsystem. This link requires the establishment of a hardware connection between the channels (serial interfaces) of the two interface modules (back–to–back connection). Data exchange is performed via the FM–related driver blocks.

FAN = 4 requires consecutive module numbers (n and n+1) for the two interface modules. The number n is to be assigned to the module number BGNR of the driver block. Only one interface module is active; however, the inactive module is monitored cyclically.

The parameter input FAN = 7 has the same effect as FAN = 4 whereby the interface modules must have the module numbers n and n + 16. If used in a slot–addressed AS, the two interface modules may thus be installed in different subracks.

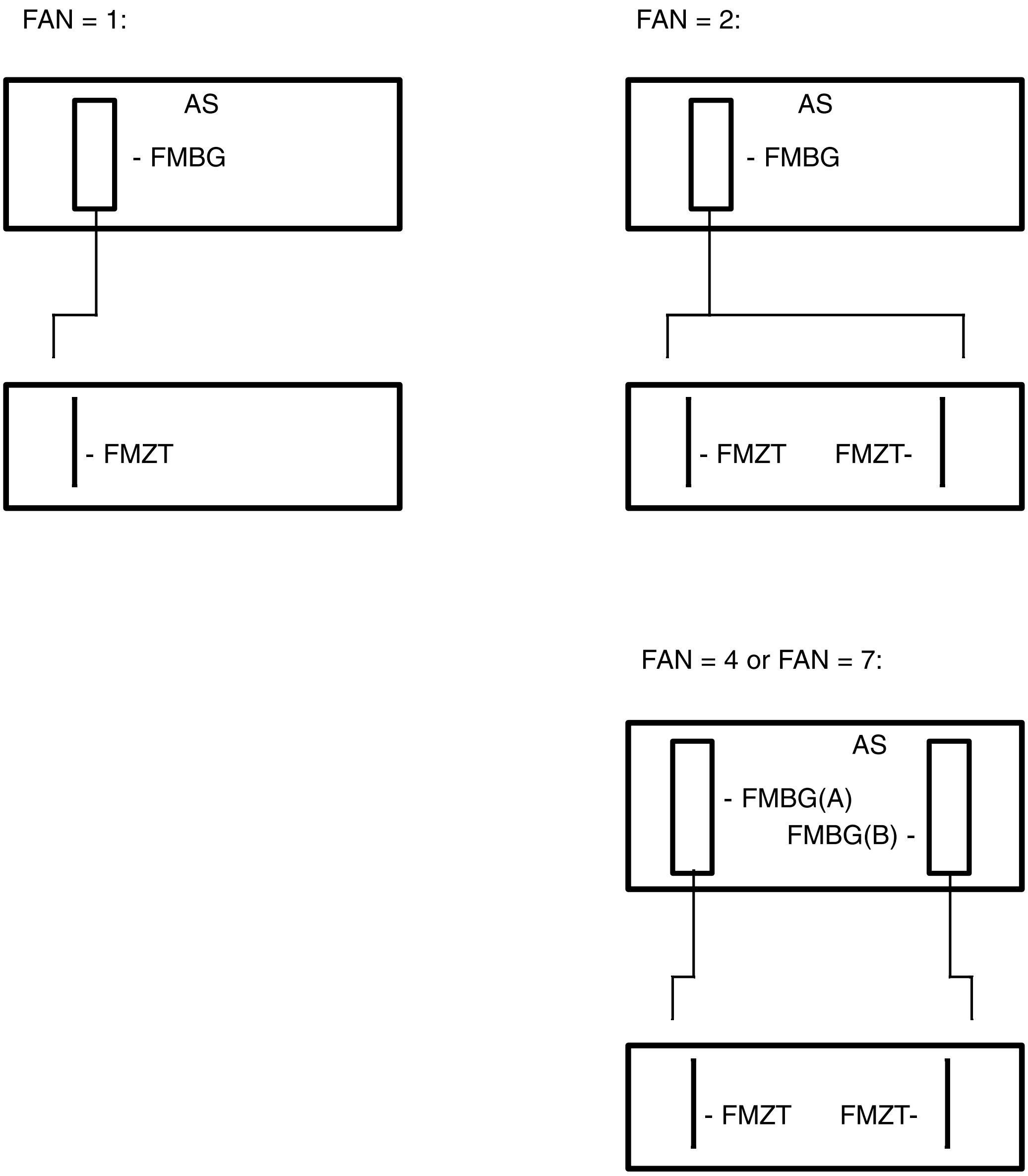


Fig. 9.83 Modes of the interface modules

- FM block error messages

Message number	Meaning
S 305	Time–out on module (check module), BGFA/BGFB = 1
S 313	Multiple addressing I/O bus during access to interface module
S 770	Malfunction on FM module (A), BFGA = 1
S 771	Malfunction on FM module interface to FM central unit (A), SSFA = 1
S 772	Malfunction on FM central unit interface to FM module (A), SSFA = 1
S 773	Malfunction on FM central unit/power supply (A), ZTFA = 1
S 774	Malfunction in power supply of FM peripherals
S 775	Malfunction in FM peripherals
S 776	Malfunction on FM analog input modules
S 777	FM peripherals switched to emergency stop
S 778	—— reserved ——
S 779	FM module cycle overload
S 780	Malfunction on FM module (B), BGFB = 1
S 781	Malfunction on FM module interface to FM central unit (B), SSFB = 1
S 782	Malfunction on FM central unit interface to FM module (B), SSFB = 1
S 783	Malfunction on FM central unit/power supply (B), ZTFB = 1
S 785	Malfunction of terminal temperature measurement
S 786	Operating temperature of FMZT beyond permissible range

With redundant FM central unit, I&C messages not distinguishing between FMZT A and B are only generated by the active FM central unit. I&C messages connected with a switchover are output by the previously active FMZT before the acquisition of I&C messages is switched over to the currently active FMZT.

- Error messages from peripheral modules

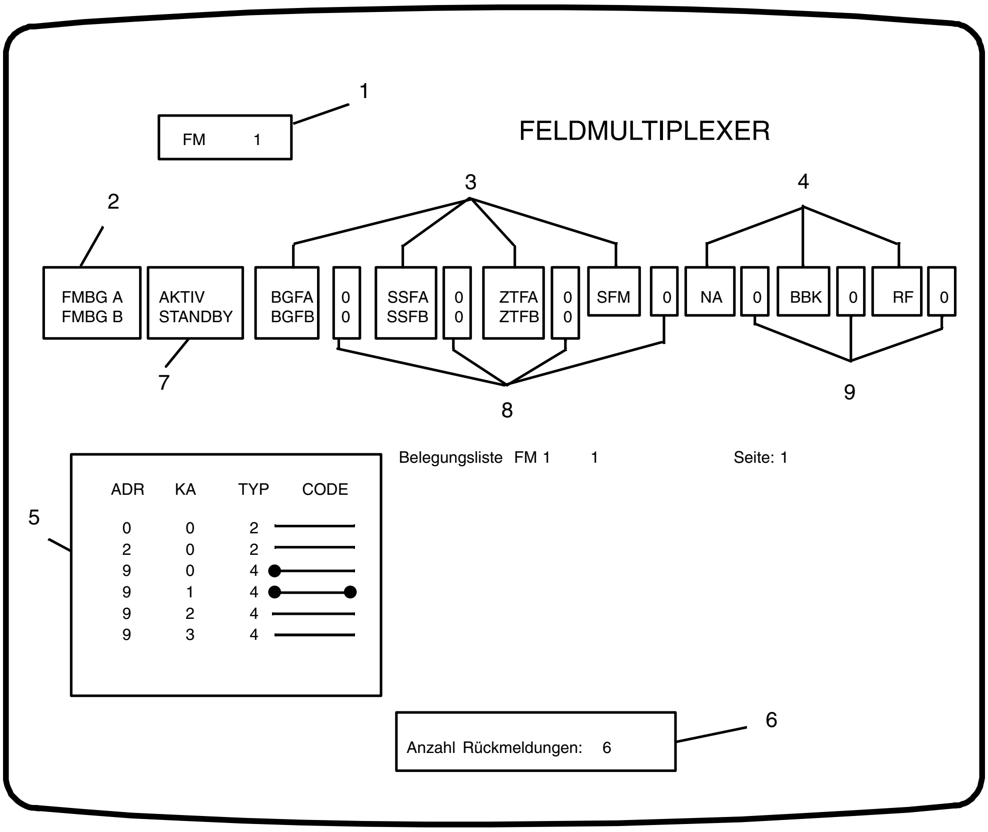
Message number	Meaning
S 7xy (700–744)	FM peripheral board defective xy module number of the defective peripheral board (0 ... 44) The common alarm includes the following malfunctions: – Module is missing or incorrectly addressed – Module is defective – Analog signal monitoring at AEF has responded

- Parameterization

The binary input 1 (AKT) is used to activate the block and its subordinate sequence of driver blocks and to initiate the execution of the FM driver blocks. The block only performs cyclic monitoring and LTM interpretation in its inactive state (AKT = 0).

The module number (0 to 60 or 100 to 160) is selected via input 2 (BGNR). The channel number (serial interface) on the interface module (1 to 4) is selected via input 3 (FMSS).

The mode (see Modes) is parameterized via input 4 (FAN). An interlocking section must be used in the two automation subsystems to activate AKT accordingly if FAN = 5 or 6 has been selected. The two automation subsystems must then be coordinated (e.g. using a BKS/BKE link or hardware–controlled binary output/input signals).



Static data:

1 Mnemonic name and no. of the FM block
2 Mnemonic name of the FM interface module
3 Mnemonic name of binary error message outputs
BGFA/BGFB = Malfunction FMBG(A)/FMBG(B)
SSFA/SSFB = Malfunction on interface (A)/(B)
ZTFA/ZTFB = Malfunction on FM central unit (A)/(B)
SFM = Group fault (active module A or B)
4 Mnemonic names of operating states
NA = Emergency stop
BBK = Back–to–back connection
RF = Redundancy fault/state
5 Board return data from FM–I/O peripherals (up to 48 return data items per page)
6 Number of return data items (up to 144)

Dynamic data:

7 State of FM interface module
8 Error messages
9 Status messages

Fig. 9.84 Loop display representation

- Meaning of the block outputs

  Output 1 (BBKO) is set for back–to–back connection

  Output 2 (KNR, A/B) is only relevant for FAN = 4 and FAN = 7; it indicates the active state of the interface module with the module number n ("A") or the interface with module number n + 1 or n + 16 ("B"). The error messages from the central unit module FMZT and the interface module FMBG are provided via outputs 3 to 11.

  The terminal temperature in the FM cabinet is output at output 12 [1)] in °C. The temperature is the basis for temperature measurement using thermocouples. In case of malfunction of the terminal temperature measurement, the last valid measured value is retained in the FM output KTMP and marked with a fault bit (#).

- Coding of the FM peripheral assignment list

ADR :	Board address in decimal representation	range 0 ... 44
KA :	Channel number in decimal representation	range 0, 1, 2, 3
TYP :	Coded board type	range 0 ... 15

TYP	Designation	
1	Counter input	16 bits
2	Binary input	8 bits
3	– . –	
4	Analog input	12 bits
5	Frequency input	
6	GWM analog input	8 bits
7	Repetition board	
8	Analog output	8 bits
9	Binary output	8 bits
10	– . –	
11	– . –	
12	Analog output	10 bits
13	SPC closed–loop controller	
14	Intelligent I/O board	
15	– . –	

CODE: Coding of the jumpers X1, X2, X3, X4:
× = jumper inserted
– = jumper not inserted

Representation: CODE
Jumper X4 X3 X2 X1

The jumpers have a card–related meaning which is discussed in the user description of the individual peripheral boards.

1) The output KTMP does not yet exist in system software versions < F03.01. Defined FM blocks from old user structures are automatically supplemented with the output KTMP. The supplement is upwards and downwards compatible.

- Using the process communication keyboard for operator input

BS=1	FB=1	BD=1					

BD = 1 Assignment list is printed
BS = 1 Monitor assignment list
FB = 1 Continue, display next page

Fig. 9.85 FM block, automatic labeling of the process communication keyboard.

Three keys will be assigned after the loop display has been selected and the BE key (”Operator input”) depressed. The function key input must be terminated by pressing the execute key ( ).

The board return data from the FM I/O peripherals is requested and retrieved by the FM after the display has been selected and the first operation performed. The following points are required:

– AS (FM block) – FMBG – FMZT must exist and be operational
– FM block must be processed.

After a maximum time of 8 seconds, either the return data or the message “No Return Data” arrives. The FM retrieves the assignment list only once. If the peripheral system is changed, the FM display selection must be re–executed.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Config. details
Back–to–back–connection	BBKO	1	AB	
Channel 0 = A, 1 = B	KNR	2	AB	1)
Emergency stop	NA	3	AB	
Group error	SFM	4	AB	
Redundancy missing	RF	5	AB	
Malfunction on FMZT (A)	ZTFA	6	AB	
Malfunction on interface (A)	SSFA	7	AB	
Malfunction on FMBG (A)	BGFA	8	AB	
Malfunction on FMZT (B)	ZTFB	9	AB	1)
Malfunction on interface (B)	SSFB	10	AB	1)
Malfunction on FMBG (B)	BGFB	11	AB	1)
Terminal temperature °C	KTMP	12	AA	
Activation	AKT	1	EB	
Module number FMBG	BGNR	2	I	2)
FMBG interface/channel number	FMSS	3	I	3)
FM arrangement	FAN	4	I	4)
VDU assignment list	BS	5	PB	
Display next page	FB	6	PB	
Printer assignment list	BD	7	PB	

1) Only relevant for FM arrangement, FAN = 4
2) BGNR – module number: 0 ... 60, 100 ... 160
3) FMBG interface: 1 ... 4
4) FM arrangement: 1 ... 6

- Block list

```
   FM      1                 30. 10. 92/ 02. 50. 18. P: 1

 1 AB   BBKO 0               #                          8
 2 AB   KNR  0               #                          9
 3 AB   NA   0               #                         10
 4 AB   SFM  0               #                         11
 5 AB   RF   0               #                         12
 6 AB   ZIFA 0               #                         13
 7 AB   SSFA 0               #                         14
 8 AB   BGFA 0               #                         15
 9 AB   ZTFB 0               #                         16
10 AB   SSFB 0               #                         17
11 AB   BGFB 0               #                         18
12 AA   KTMP 0.0000          #                         37
 1 EB   AKT  0                  P                       1
 2 I    BGNR      0                            C        2
 3 I    FMSS      0                            C        3
 4 I    FAN       0                            C        4
 5 PB   BS   0                                 CB       5
 6 PB   FB   0                                 CB       6
 7 PB   BD   0                                 CB       7
```

FN

Window block

Application

This block is used to display five measured values and to monitor these values for violation of limit values. It specifies five pairs of limits values including the associated hysteresis and five measuring ranges for displaying the measured values in the AS or OS system.

☞ Only limit value violations for the measured values 1, 2 and 3 cause an area alarm (in the OS subsystem).

Method of Operation

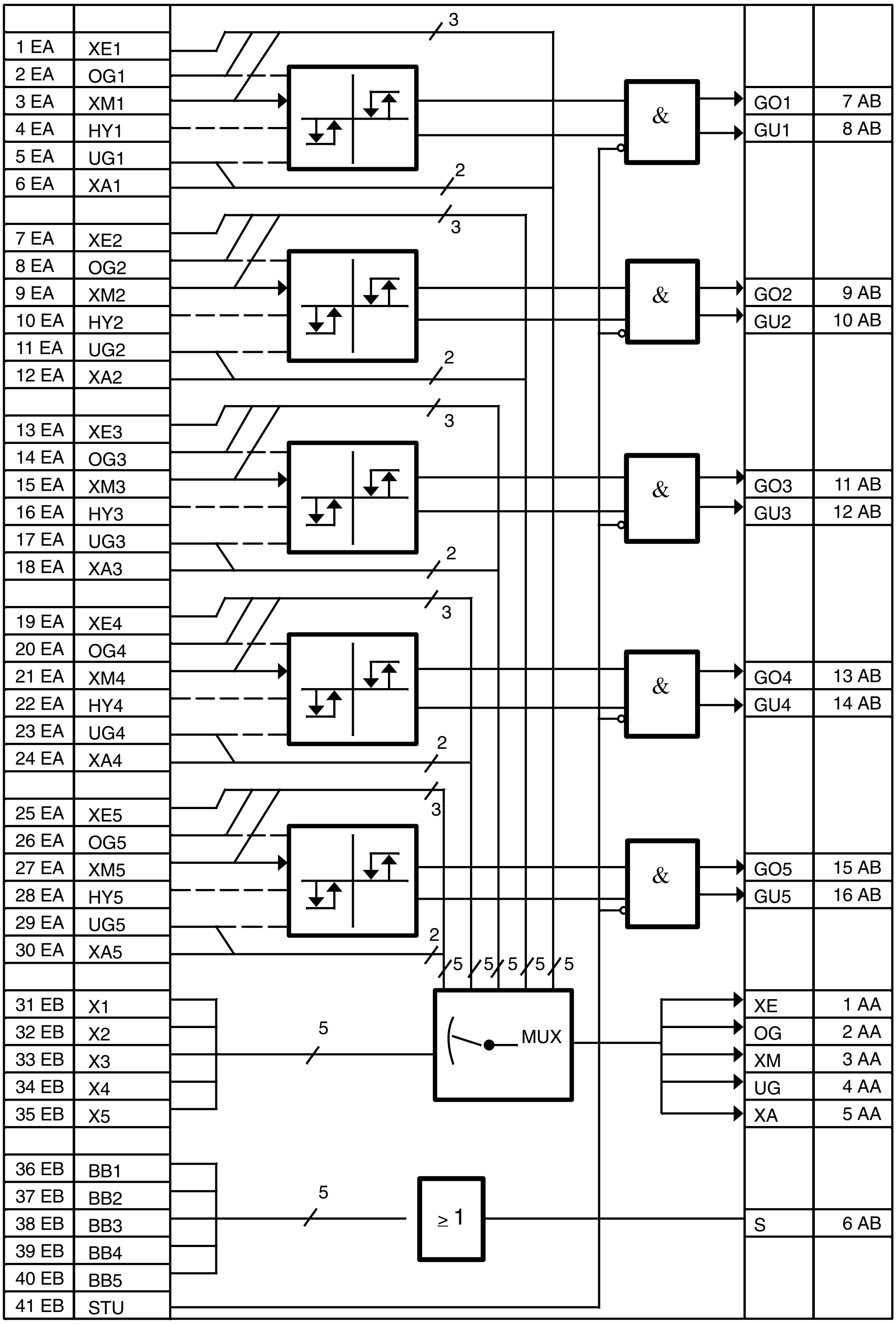


Fig. 9.86 FN block; logic diagram (see page 9–189 for legend)

Legend to Fig. 9.86:

GOi	Upper limit signal
GUi	Lower limit signal
HYi	Hysteresis
MUX	Multiplexer
OGi	Upper limit
S	Fault output (common alarm)
Si	Binary qualifier
STU	Alarm suppression
UGi	Lower limit
XAi	Lower range limit
XEi	Upper range limit
Xi	Selection of measured value i
XMi	Measured signal

A measuring range (XAi, XEi), which is used to parameterize the measured value display, is specified for each measured value Xi. A pair of limit values (OGi, UGi) is selected for each measured value XMi for monitoring its upper and lower limit. The measured values are monitored cyclically for limit value violation.

If a measured value violates its limits, a binary output issues an alarm and a message is shown on the AS loop display.

A programmable hysteresis HYi for the pair of limit values is assigned to each measured value. The limit value alarm is reset if the measured quantity assumes a value which is below the upper or above the lower limit value by the hysteresis value HYi. The limit value monitoring function can be suppressed via input STU (alarm suppression). STU = 1 means that limit value monitoring and alarm output will not be performed.

The binary qualifiers BB1 to BB5, which are assigned to the measured values and indicate transducer malfunctions, are ORed, and the result is provided at the group alarm signal (S) ("External fault").

Inputs X1 to X5, which are used to set the output multiplexer, are interconnected with specific binary values. According to the specification made by Xi, the limits associated with the measured value XMi, its range, and the measured value SMi are provided at the block outputs 1 to 5.

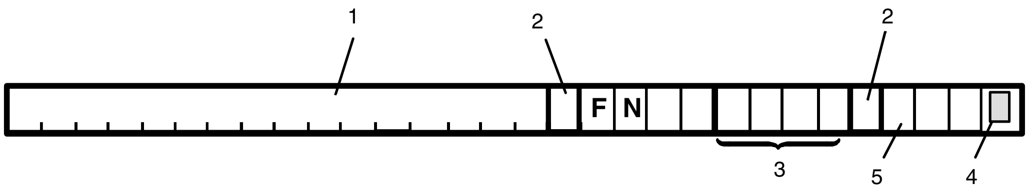
The logo display is activated by the connected process communication keyboard (PBT). Five windows of the loop display show the measured values, the range, the limit values and the limit signals. A measured value can be selected via the PBT and displayed in higher resolution and as bar graph next to the windows. The measured value selected is indicated by an arrow in the window.

Input US (status output suppression), which is not shown in the logic diagram, is used to suppress the block status output. No status message is sent from the block to the bus subsystem if US = 1. Neither is an area alarm issued if a limit value is violated within the FN block.

Only limit value messages for the measured values 1 to 3 are entered in the block status word. A limit value violation of measured values 4 and 5 does not cause an area alarm and thus an indication in the OS subsystem. The block can be used to monitor warning, alarm and error limits. The default values of the strings in the loop displays apply to monitoring the warning limit (W...). The default value 0 of the parameter WAF (43 I) refers to the same function.

The parameter WAF (43 I) = "WAF mode" (warning, alarm and error mode) is used for modifying the display in the OS subsystem. It must be parameterized with 1 or 2 if the block is used to monitor faults or alarms.

- Normalized representation in a loop display



1 Process–related block name, as in loop display
2 Separating blank
3 Block name/no.
4 Blinking mark, if one of the following alarm signals is pending: GO1, GU1, GO2, GU2, GO3, GU3 or S.
5 Blank

Fig. 9.87 Window block; normalized representation in a group display

The 30 characters for this block are displayed on a specific location of a group display. Input 44 (group display: no./location no.) must be parameterized as follows for this purpose:

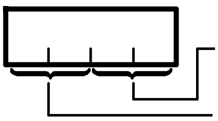


Fig. 9.88 Window block; parameterization of input 44

Set input 44 to “0” if the normalized representation of the block in a group display is to be suppressed.

- Normalized representation of the loop display

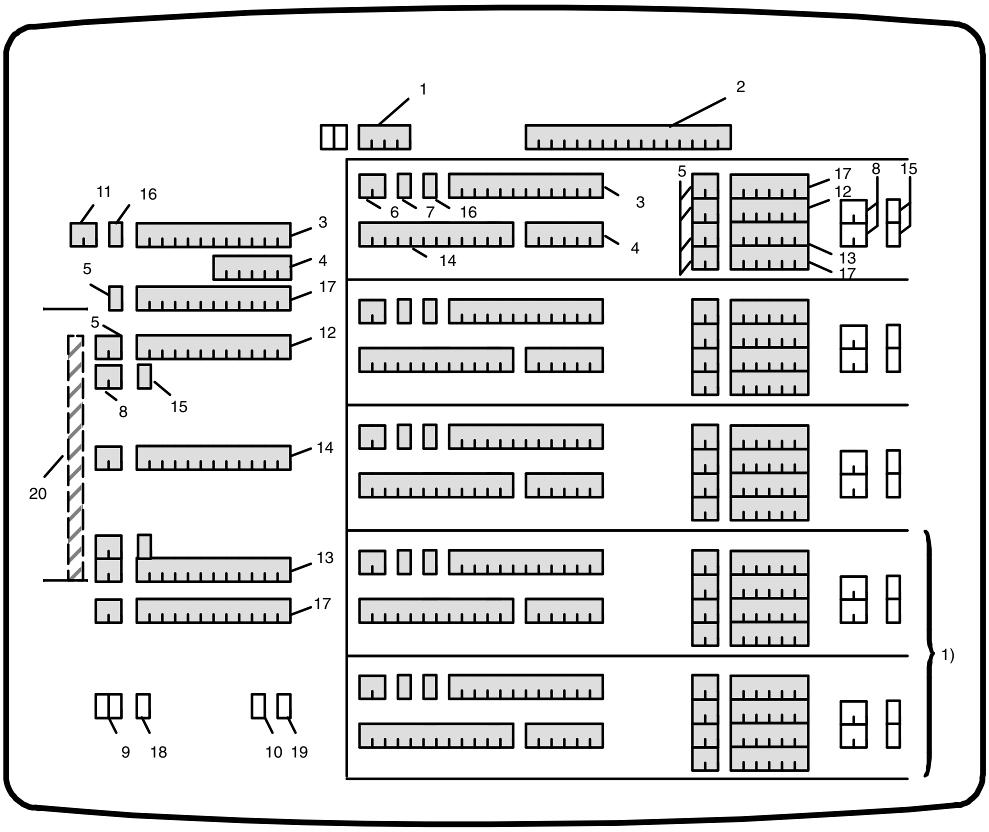
Legend to Fig. 9.89:

Static data:

1 Mnemonic name and number of the window block
2 Process–related name of the window block
3 Process–related name of the measured values
4 Physical unit of the measured values
5 Name of the limit value pair (OW, UW) and the range limits XE, XA
6 Mnemonic name of the test point
7 Identifier for selection
8 Names of the warning limits WO, WU
9 Name of the alarm suppression STU
10 Name of the common alarm S
11 Name of the measured value selected

Dynamic data:

12 Upper limit of the measured value
13 Lower limit of the measured value
14 Digital display of the measured values
15 Alarm status “1” means that a limit value violation has occurred
16 States of the binary qualifiers
17 Range limits
18 Alarm suppression status
19 Common alarm status
20 Bar graph display of measured value selected




```
22. 07. 87/ 10. 34. 08.

                              FN    1         *TECHNOLOG. NAME

                              X1 □ 0  AT111213AT14       XE 100.00
                                                         OW 100.00  WO 0
X1 0 AT111213AT14              0.0000          *EHT1*    UW 0.0000  WU 0
                                                         XA 0.0000
          *EHT1*
____XE 100.00                 X2 □ 0  AT212223AT24       XE 100.00
                                                         OW 100.00  WO 0
    OW 100.00                  0.0000          *EHT2*    UW 0.0000  WU 0
                                                         XA 0.0000
    WO 0
                              X3 □ 0  AT313233AT34       XE 100.00
                                                         OW 100.00  WO 0
    X1 0.0000                  0.0000          *EHT3*    UW 0.0000  WU 0
                                                         XA 0.0000

                              X4 □ 0  AT414243AT44       XE 100.00
    WU 0                                                 OW 100.00  WO 0
____UW 0.0000                  0.0000          *EHT4*    UW 0.0000  WU 0
                                                         XA 0.0000
    XA 0.0000
                              X5 □ 0  AT515253AT54       XE 100.00
                                                         OW 100.00  WO 0
    SU  0       S 0            0.0000          *EHT5*    UW 0.0000  WU 0
                                                         XA 0.0000
       BR
FN,1;
```

1) Limit value violation of these two measured values does not cause an area alarm

Fig. 9.89 Loop display of FN block

- Using the process communication keyboard for operator input

Five keys (Xi = 1;) are assigned automatically after the loop display (`FN,no;`) has been selected and the BE key ("Operator input") depressed. The function key input must be terminated by pressing the execute key (◈). All windows showing measured values, pairs of limit values, range limits and states will be displayed. In addition, a selected window will be displayed in detailed representation.

A detailed representation of the range and the pair of limit values related to measured value i is displayed after the keys Xi = 1 and execute key (◈) have been pressed. The values related to measured value 1 are displayed if the detailed representation is selected for the first time. Subsequently, the values viewed last will be displayed. An arrow marks the measured value whose range and pair of limit values are displayed in detailed representation.

X1=1	X2=1	X3=1	X4=1	X5=1			

X1... 5 Input variable 1... 5

Fig. 9.90 FN block; automatic labeling of the process communication keyboard

Selection of the measured value (Xi = 1) by the operator does not set the measured value multiplexer. This is achieved by interconnecting the five parameters X1 to X5 of the elements 31 to 35. The default value X1 is valid if an interconnection has not been selected. If more than one Xi = 1 is set, the assignment to the window with the smaller sequence number is valid. Limit signals cannot be multiplexed.

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/Output No.	Type
Upper range limit		XE	1	AA
Upper limit value	from interconnected window according to parameters 31 to 35	OG	2	AA
Measured value		XM	3	AA
Lower limit value		UG	4	AA
Lower range limit		XA	5	AA
External fault		S	6	AB
Upper limit signal 1		GO1	7	AB
Lower limit signal 1		GU1	8	AB
Upper limit signal 2		GO2	9	AB
Lower limit signal 2		GU2	10	AB
Upper limit signal 3		GO3	11	AB
Lower limit signal 3		GU3	12	AB
Upper limit signal 4		GO4	13	AB
Lower limit signal 4		GU4	14	AB
Upper limit signal 5		GO5	15	AB
Lower limit signal 5		GU5	16	AB

Data structure (continued)

Meaning		Mnemonic name	Input/Output No.	Type
Upper range limit	Window 1	XE1	1	EA
Upper limit value		OG1	2	EA
Measured		XM1	3	EA
Hysteresis		HY1	4	EA
Lower limit value		UG1	5	EA
Lower range value		XA1	6	EA
Meaning as window 1	Window 2	XE2	7	EA
		OG2	8	EA
		XM2	9	EA
		HY2	10	EA
		UG2	11	EA
		XA2	12	EA
Meaning as window 1	Window 3	XE3	13	EA
		OG3	14	EA
		XM3	15	EA
		HY3	16	EA
		UG3	17	EA
		XA3	18	EA
Meaning as window 1	Window 4	XE4	19	EA
		OG4	20	EA
		XM4	21	EA
		HY4	22	EA
		UG4	23	EA
		XA4	24	EA
Meaning as window 1	Window 5	XE5	25	EA
		OG5	26	EA
		XM5	27	EA
		HY5	28	EA
		UG5	29	EA
		XA5	30	EA
Interconnection of measured value, select 1		X1	31	EB
” ” ” 2		X2	32	EB
” ” ” 3		X3	33	EB
” ” ” 4		X4	34	EB
” ” ” 5		X5	35	EB
Binary qualifier 1		BB1	36	EB
” ” 2		BB2	37	EB
” ” 3		BB3	38	EB
” ” 4		BB4	39	EB
” ” 5		BB5	40	EB

Data structure (continued)

Meaning		Mnemonic name	Input/Output No.	Type
Alarm suppression		STU	41	EB
Status output suppression		US	42	EB
WAF mode		WAF	43	I
Group display/location number		NRPL	44	ID
Mnemonic name of test point 1		TX1	45	S2
" " " " 2		TX2	46	S2
" " " " 3		TX3	47	S2
" " " " 4		TX4	48	S2
" " " " 5		TX5	49	S2
	Character no.:			
Measured value name for X1	5 – 6	AT12	50	S2
	7 – 8	AT13	51	S2
Measured value name for X2	5 – 6	AT22	52	S2
	7 – 8	AT23	53	S2
Measured value name for X3	5 – 6	AT32	54	S2
	7 – 8	AT33	55	S2
Measured value name for X4	5 – 6	AT42	56	S2
	7 – 8	AT43	57	S2
Measured value name for X5	5 – 6	AT52	58	S2
	7 – 8	AT53	59	S2
Text upper range limit		TXE	60	S2
Text lower range limit		TXA	61	S2
Text upper limit value		TOG	62	S2
Text lower limit value		TUG	63	S2
Text upper limit signal		TGO	64	S2
Text lower limit signal		TGU	65	S2
Text alarm suppression		TSU	66	S2
Text fault output		TS	67	S2
	Character no.:			
Measured value name for X1	1 – 4	AT11	68	S4
	9 – 12	AT14	69	S4
Physical quantity		EHT1	70	S
Measured value name for X2	1 – 4	AT21	71	S4
	9 – 12	AT24	72	S4
Physical quantity		EHT2	73	S
Measured value name for X3	1 – 4	AT31	74	S4
	9 – 12	AT34	75	S4
Physical quantity		EHT3	76	S
Measured value name for X4	1 – 4	AT41	77	S4
	9 – 12	AT44	78	S4
Physical quantity		EHT4	79	S
Measured value name for X5	1 – 4	AT51	80	S4
	9 – 12	AT54	81	S4
Physical quantity		EHT5	82	S
Process–related name of FN		AT	83	S16

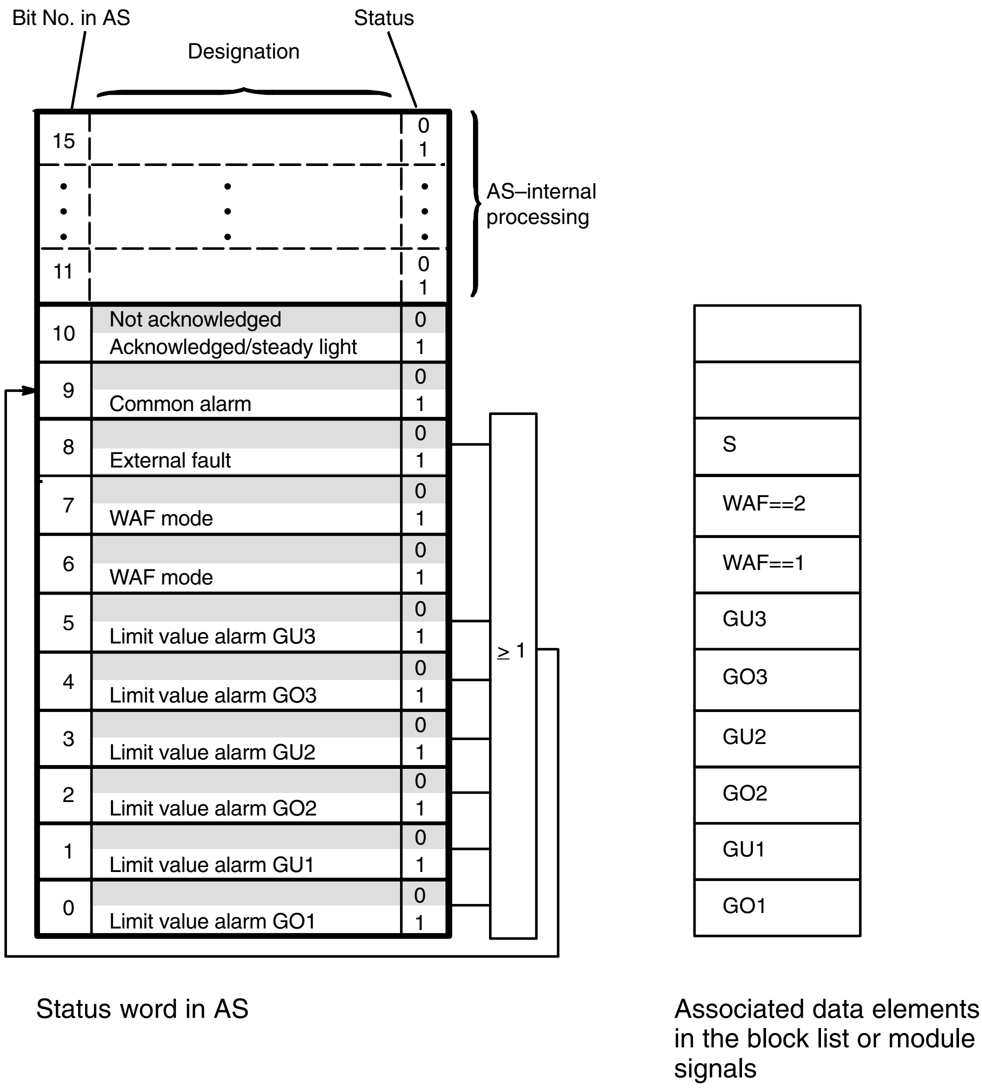
- Block list

```
   FN      1                  03. 12. 90/ 17. 18. 19. P: 1
 1 AA  XE   0.0000            #                          83
 2 AA  OG   0.0000            #                          84
 3 AA  XM   0.0000            #                          85
 4 AA  UG   0.0000            #                          86
 5 AA  XA   0.0000            #                          87
 6 AB  S    0                 #                          88
 7 AB  GO1  0                 #                          89
 8 AB  GU1  0                 #                          90
 9 AB  GO2  0                 #                          91
10 AB  GU2  0                 #                          92
11 AB  GO3  0                 #                          93
12 AB  GU3  0                 #                          94
13 AB  GO4  0                 #                          95
14 AB  GU4  0                 #                          96
15 AB  GO5  0                 #                          97
16 AB  GU5  0                 #                          98
 1 EA  XE1  100.00               P                        1
 2 EA  OG1  100.00               P                        2
 3 EA  XM1  0.0000               P                        3
 4 EA  HY1  0.0000               P                        4
 5 EA  UG1  0.0000               P                        5
 6 EA  XA1  0.0000               P                        6
 7 EA  XE2  100.00               P                        7
 8 EA  OG2  100.00               P                        8
 9 EA  XM2  0.0000               P                        9
10 EA  HY2  0.0000               P                       10
11 EA  UG2  0.0000               P                       11
12 EA  XA2  0.0000               P                       12
13 EA  XE3  100.00               P                       13
14 EA  OG3  100.00               P                       14
15 EA  XM3  0.0000               P                       15
16 EA  HY3  0.0000               P                       16
17 EA  UG3  0.0000               P                       17
18 EA  XA3  0.0000               P                       18
19 EA  XE4  100.00               P                       19
20 EA  OG4  100.00               P                       20
21 EA  XM4  0.0000               P                       21
22 EA  HY4  0.0000               P                       22
23 EA  UG4  0.0000               P                       23
24 EA  XA4  0.0000               P                       24
25 EA  XE5  100.00               P                       25
26 EA  OG5  100.00               P                       26
27 EA  XM5  0.0000               P                       27
28 EA  HY5  0.0000               P                       28
29 EA  UG5  0.0000               P                       29
30 EA  XA5  0.0000               P                       30
31 EB  X1   0                    P               CB      31
32 EB  X2   0                    P               CB      32
33 EB  X3   0                    P               CB      33
34 EB  X4   0                    P               CB      34
35 EB  X5   0                    P               CB      35
36 EB  BB1  0                    P                       36
37 EB  BB2  0                    P                       37
38 EB  BB3  0                    P                       38
39 EB  BB4  0                    P                       39
40 EB  BB5  0                    P                       40
41 EB  STU  0                    P                       41
42 EB  US   0                    P                       42
43 I   WAF      0                                    C   43
44 ID  NRPL     0                                    C   44
45 S2  TX1  X1                                           45
46 S2  TX2  X2                                           46
```


Block list (continued)

47	S2	TX3	X3		47
48	S2	TX4	X4		48
49	S2	TX5	X5		49
50	S2	AT12	12		50
51	S2	AT13	13		51
52	S2	AT22	22		52
53	S2	AT23	23		53
54	S2	AT32	32		54
55	S2	AT33	33		55
56	S2	AT42	42		56
57	S2	AT43	43		57
58	S2	AT52	52		58
59	S2	AT53	53		59
60	S2	TXE	XE		60
61	S2	TXA	XA		61
62	S2	TOG	OW		62
63	S2	TUG	UW		63
64	S2	TGO	WO		64
65	S2	TGU	WU		65
66	S2	TSU	SU		66
67	S2	TS	S		67
68	S4	AT11	AT11		68
69	S4	AT14	AT14		69
70	S	EHT1	*EHT1*	6	70
71	S4	AT21	AT21		71
72	S4	AT24	AT24		72
73	S	EHT2	*EHT2*	6	73
74	S4	AT31	AT31		74
75	S4	AT34	AT34		75
76	S	EHT3	*EHT3*	6	76
77	S4	AT41	AT41		77
78	S4	AT44	AT44		78
79	S	EHT4	*EHT4*	6	79
80	S4	AT51	AT51		80
81	S4	AT54	AT54		81
82	S	EHT5	*EHT5*	6	82
83	S16	AT	*TECHNOLOG. NAME	16	109

- Status word



GO1 ... 3	Upper limit signal 1 ... 3
GU1 ... 3	Lower limit signal 1 ... 3
S	External fault
WAF	WAF mode
WAF = 1	Bit 6 of the status word is set if WAF = 1, otherwise the bit is reset
WAF = 2	Bit 7 of the status word is set if WAF = 2, otherwise the bit is reset

Fig. 9.91 Status word for the FN block

FUTA

Function key start block

Application

This block is used for switching blocks and block sequences on or off according to operator inputs. The block can be started via the function keys of the process communication keyboard and/or the code word “**FT,no;**” from the alphanumeric keyboard.

Method of Operation

The block starting keyboard number (multiple of 10, correction with CHECK) is selected via input 1 (”ANFN”) (e.g. 0, 10, 20, 30...). The function keys of the process communication keyboard are paralleled during this operation. The function key numbers are assigned from 1 to 9. The system always addresses the block using the starting address (”ANFN”) 0.

A block parameterized with a negative number (i.e. ANFN < 0) is unable to run. To perform a quasi function key start, code word FT and a key number are entered via the configuration keyboard. The key number and the parameterized starting address are used to search the corresponding block and the corresponding output within this block, which is then set to “1”. The user must ensure that the output is reset (e.g. direct interconnection with XA block), since the block outputs retain their states.

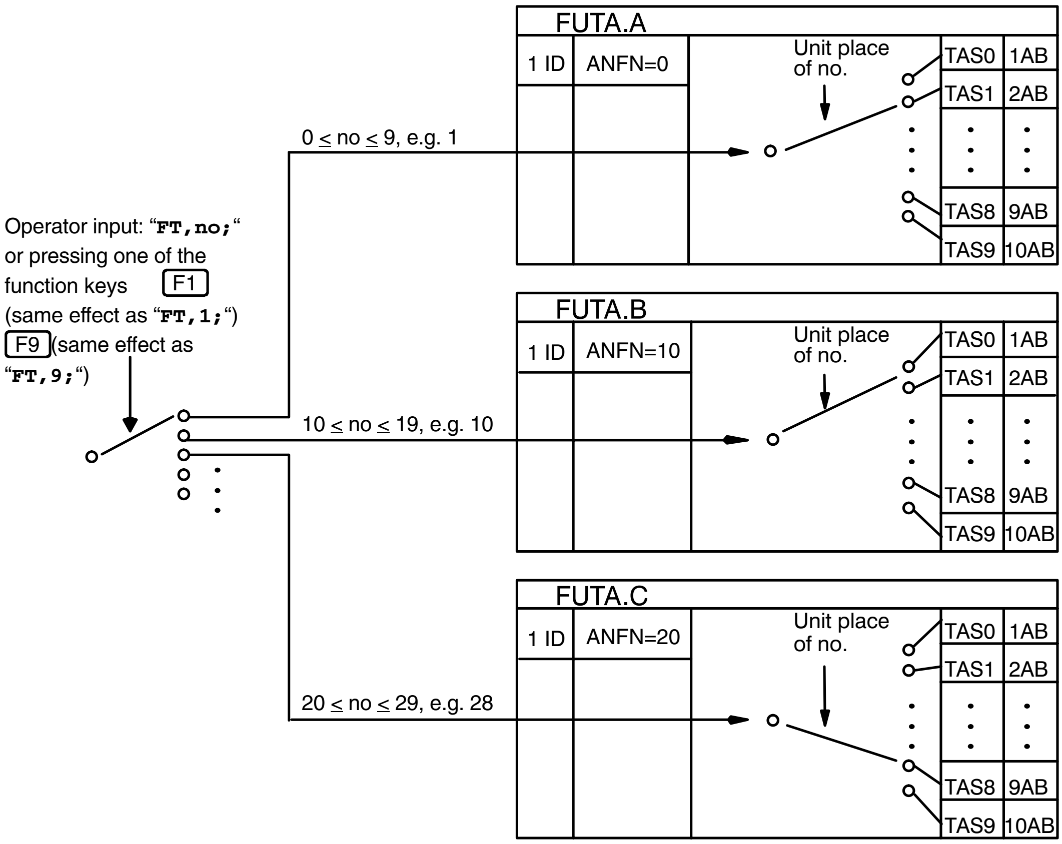


Fig. 9.92 FUTA block, logic diagram

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/Output No.	Type
Function key	0	TAS0	1	AB
”	1	TAS1	2	AB
”	2	TAS2	3	AB
”	3	TAS3	4	AB
”	4	TAS4	5	AB
”	5	TAS5	6	AB
”	6	TAS6	7	AB
”	7	TAS7	8	AB
”	8	TAS8	9	AB
”	9	TAS9	10	AB
Starting key no.		ANFN	1	ID

- Block list

```
   FUTA    1                                          P: 1

 1 AB  TAS0  0                                           2
 2 AB  TAS1  0                                           3
 3 AB  TAS2  0                                           4
 4 AB  TAS3  0                                           5
 5 AB  TAS4  0                                           6
 6 AB  TAS5  0                                           7
 7 AB  TAS6  0                                           8
 8 AB  TAS7  0                                           9
 9 AB  TAS8  0                                          10
10 AB  TAS9  0                                          11
 1 ID  ANFN      -1                              C       1
```


G

Subgroup control block

Application

This block is used to monitor and control sequence cascades in power plant systems.

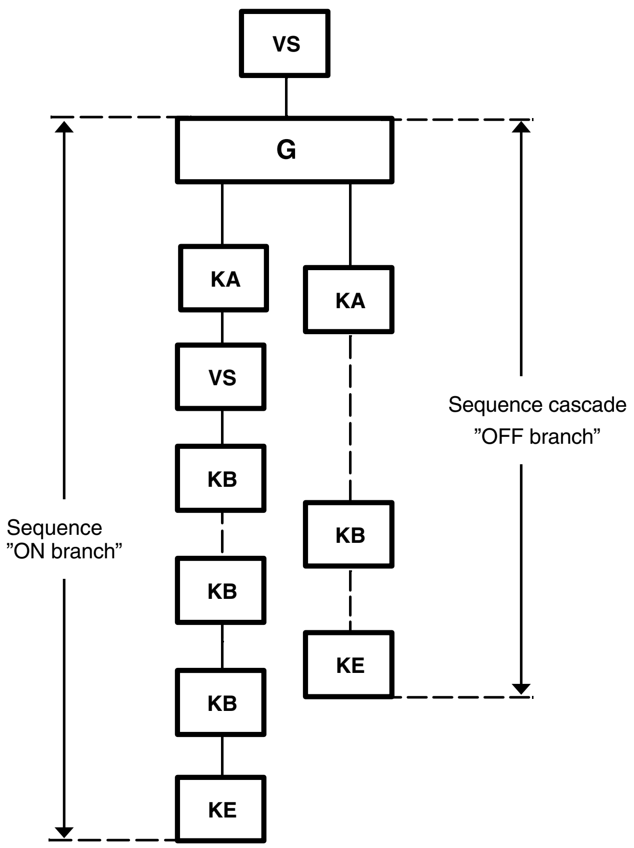
It is used for the following tasks:

– Coordination of sequence cascades (ON and OFF branch)
– Selection of: Mode and display of the selected, current and last step
  the step duration
  the mode
  the alarm status and
  the conditions of the current step.

- Structure of a sequencer

  Apart from the subgroup control module, the following blocks are required for a sequencer:

  – Sequence starting block (KA).
    The sequence starting address marks the beginning of the ON or OFF branch.
  – Sequence block (KB).
    This block processes the step conditions, detects the conditions and sets the outputs.
  – Sequence ending block (KE).
    This block is the last block in each branch.



G Subgroup control block
KA Sequence starting block
KB Sequence block
KE Sequence ending block
VS STEP M block

Fig. 9.93 Structure of a subgroup control

Method of Operation (Fig. 9.94)

- Operational requirements

  The sequence can only be executed if the sequence starting blocks have been interconnected with the subgroup control block, the enable inputs have been set to “1” and the controller to “automatic mode” or “operator guide mode”. The ON or OFF branch can then be started by operator input or via the automatic inputs.

  The system checks whether the attempt made to start a branch is legal. If a protective interlocking or the states of the enable inputs do not allow a branch to be started, a message appears on the circuit display and the fault output is set to “1”. The branch is started if the activation conditions for this branch are met, even if the sequence has not yet reached the end in the other branch.

  ⚠ The sequence must be installed after an XB block. The XB block must be switched off when the controller is being modified.

- Modes

  – Switch ON or OFF (EI, AU)
  Start ON or OFF branch by operator input

  – Automatic mode (A)
  The controller is set to “automatic mode”. The ON or OFF branch is only started after it is switched on via the process communication keyboard.

  – Operator guide mode (ML)
  In this mode, the incoming step conditions are used to keep the automatic controller running in parallel. The digital outputs and output 2 of the sequence block will not be set.

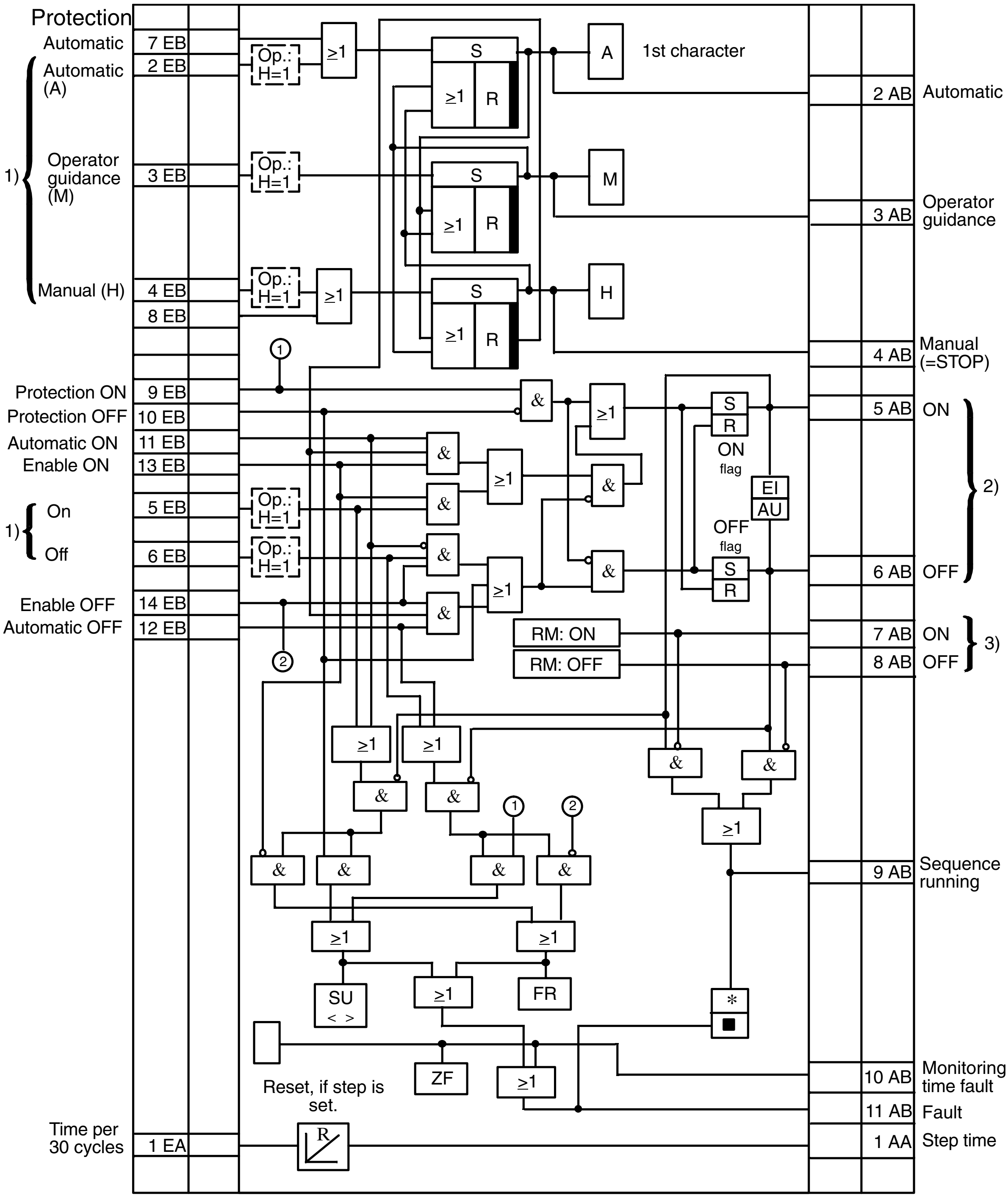
  The control interventions must be entered manually in the open–loop control level. Since the sequence can be monitored via a step and condition display, this mode is especially suitable for commissioning, test and training.

  – Manual mode (H)
  The automatic command control is completely switched off once manual mode has been selected. All control interventions are performed manually in the open–loop control level.

- Functional sequence of a branch

  After a branch has been started, the blocks from the sequence starting block (KA) up to and including the next sequence block (KB) are processed. The sequence block will be displayed as “Current step” (AS) in the loop display for as long as the required conditions have not been met. Once these are met, it becomes a “Set step” (GS), i.e. the parameterized outputs are set to “1”.

  Next, the blocks from the “Set step” up to and including the next sequence block will be processed. This block is then displayed as “Current step”. Only the subgroup control block is processed when the controller attains the end of the sequence. The output “Return data ON” or “Return data OFF” is set.



1) Operation keys (PBT)
2) To KA block ON/OFF sequence
3) Feedback (FB)

Fig. 9.94 Subgroup control block, logic diagram

- Step display

  The number of the sequence block (KB) and the process–related number (any two characters) for the following steps are shown in the loop display:

  – Set step (GS)
  All conditions have been met and all commands issued for the step displayed after GS.

  – Current step (AS)
  The current step is being executed. Its conditions have not yet been met.

  – Last step (LS)
  Depending on the controller step currently being processed, the number of the last step of this branch is shown here. This may be any two characters which have been parameterized in the subgroup control block.

- Step duration

  The duration of each step is shown in the loop display. After every 30th execution of the G block in the cycle, the step duration (output TS) is increased by the value of the input T (”Duration of 30 cycles”). The time dimension (four characters) has to be parameterized in the input EHT according to this value and the cycle time of the G block.

- Condition display

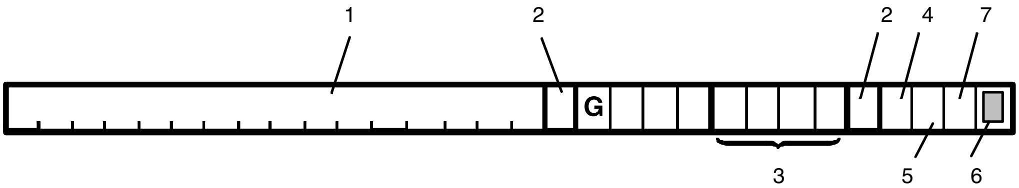
  Up to ten conditions related to the current step (AS) are shown as “0” or “1” states in the loop display of the operator communication block. For this purpose, the inputs of the condition displayed must be configured in the respective sequence block.

- Fault display

  The following fault states are displayed in the loop display:
  – “Protection” (SU)
  – “Enable” (FR)
  – “Time–out” (ZF)

  The states “SU” and “FR” occur after an attempt is made to switch on or off without the starting condition for the ON or OFF branch having been met. Time–out is indicated if the conditions of a sequence block are not met within the time specified.

- Normalized representation in a group display



1 Process–related block name of the subgroup control block, as in loop display
2 Separating blank
3 Blank name/no.
4 Mode A for automatic mode (.TA)
M for operator guide mode (.TML)
H for manual mode (.TH)
5 ON or OFF branch (E, A)
6 Blinking mark for fault indication
7 “*” blinking: sequence running

Fig. 9.95 Subgroup control block; normalized representation

The 30 characters for this block are displayed on a specific location of a group display. Input 15 (group display: no./location no.) must then be parameterized as follows:

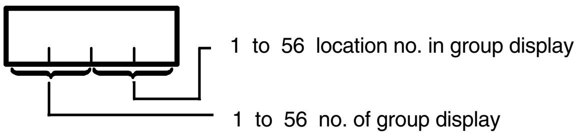


Fig. 9.96 Subgroup control block; parameterization of input 15

Set input 15 to “0” if the normalized representation of the block in a group display is to be suppressed.

- Normalized representation of the loop display

Set input 15 to “0” if the normalized representation of the block in a group display is to be suppressed.

Legend to Fig. 9.97:

Static data:

1 Mnemonic name and number of the subgroup control block
2 Process–related name of the subgroup control block (sequencer)
3 Mnemonic name of the step (GS, AS, LS) [1)]
4 Mnemonic name of the mode (A, ML, H) [1)]
5 Mnemonic name (EI, AU, SU, FR, ZF) [1)]
6 Unit of the step duration

Dynamic data:

7 Process–related step number
8 Numbers of the sequence blocks
9 Step duration
10 Modes of A, ML, H
11 State EI, AU
12 State SU, FR
13 State ZF
14 States of the conditions of the current step

[1)] Default values

☞ The parameters TLSB (input 16) and TLSS (input 17) are only displayed on an OS display if they have been parameterized numerically.

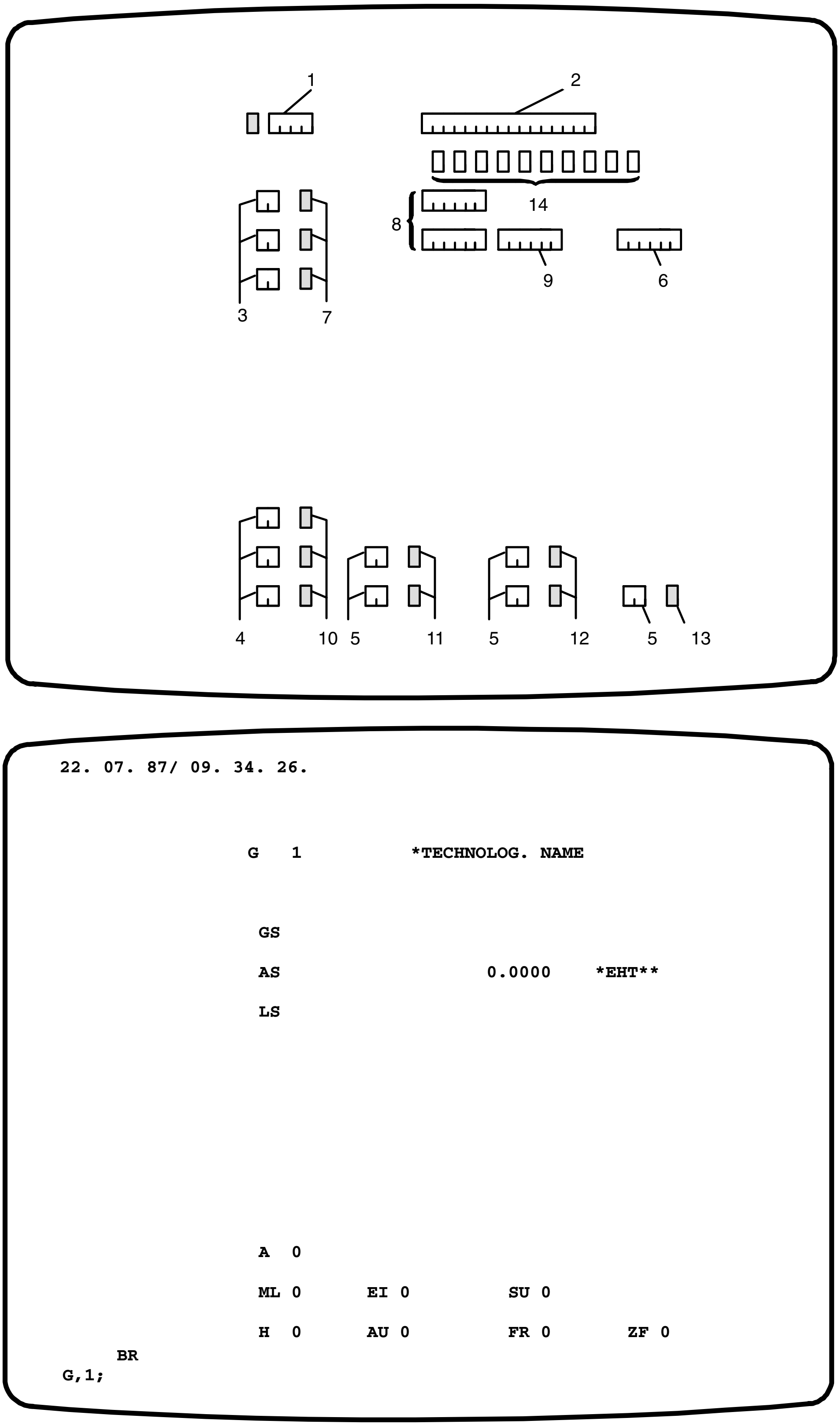


Fig. 9.97 G block; loop display

- Using the process communication keyboard for operator input

  Five keys (A = 1, ML = 1, H = 1, EI = 1 and AU = 1) will be assigned after the loop display has been selected and the BE key ("Operator input") depressed. The function key inputs (A = 1, ML = 1, H = 1, EI = 1 and AU = 1) must be terminated by pressing the execute key (◇).

A=1	ML=1	H=1	EI=1	AU=1			

A Automatic mode
AU Off
EI On
H Manual mode
ML Operator guide mode

Fig. 9.98 Subgroup control block; automatic labeling of the process communication keyboard.

- Data structure (designation of inputs and outputs)

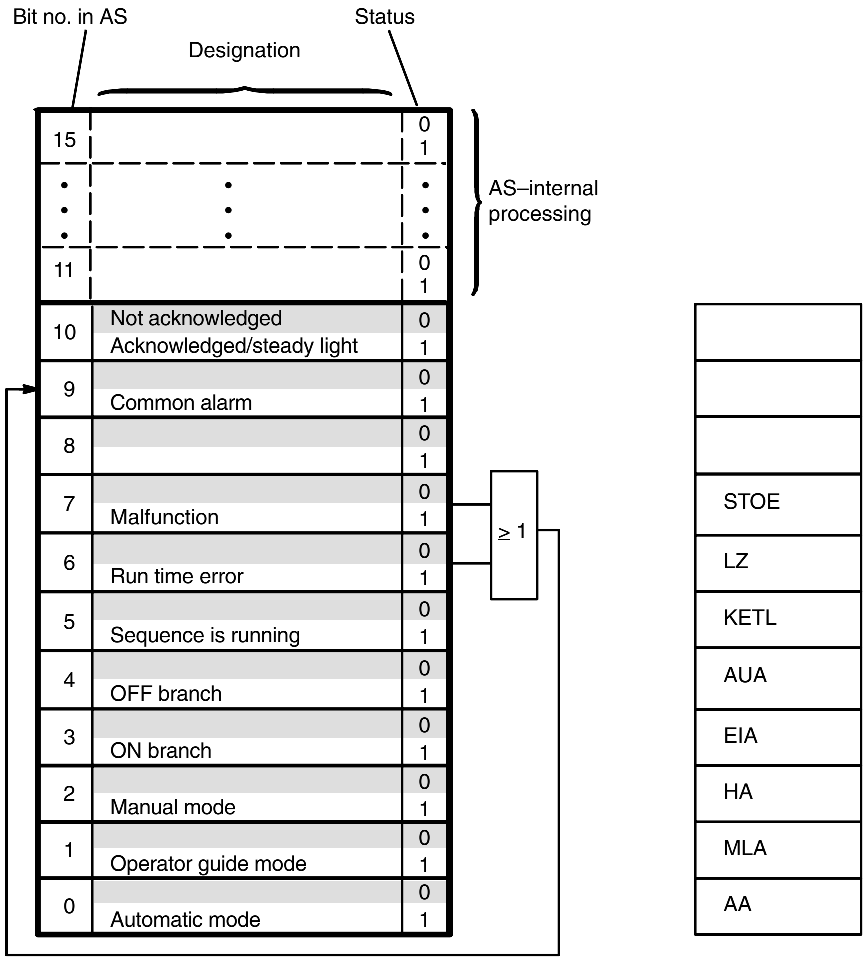
Meaning	Mnemonic name	Input/Output No.	Type
Step duration	TS	1	AA
Automatic mode “1”	AA	2	AB
Operator guide mode “1”	MLA	3	AB
Manual mode “1”	HA	4	AB
ON branch (to KA block of ON branch)	EIA	5	AB
OFF branch (to KA block of OFF branch)	AUA	6	AB
Return data ON “1”	REI	7	AB
Return data OFF “1”	RAU	8	AB
Sequence running “1”	KETL	9	AB
Time–out “1”	LF	10	AB
Malfunction “1”	STOE	11	AB
Time/ + 30 cycles	T	1	EA
Automatic mode	A	2	EBV
Operator guide mode	ML	3	EBV
Manual mode	H	4	EV
ON	EI	5	EBV
OFF	AU	6	EBV
Protection AUTO “1”	SCHA	7	EB
Protection MANUAL “1”	SCHH	8	EB
Protection ON “1”	SCHB	9	EB
Protection OFF “1”	SCHS	10	EB
Automatic ON “1”	AEI	11	EB
Automatic OFF “1”	AAU	12	EB
Enable ON “1”	FREI	13	EB
Enable OFF “1”	FRAU	14	EB
Group display / location no.	NRPL	15	ID
LS no. ON branch	TLSB	16	S2
LS no. OFF branch	TLSS	17	S2
Cf. loop display	TGS	18	S2
”	TAS	19	S2
”	TLS	20	S2
”	TA	21	S2
”	TML	22	S2
”	TH	23	S2
”	TEI	24	S2
”	TAU	25	S2
”	TSU	26	S2
”	TFR	27	S2
”	TZF	28	S2
”	EHT	29	S
”	AT	30	S16

- Block list

```
   G       1                  03. 03. 83/ 00. 37. 19. P: 1

 1 AA  TS   0.0000            #                   N     30
 2 AB  AA   0                 #                   N     31
 3 AB  MLA  0                 #                   N     32
 4 AB  HA   0                 #                   N     33
 5 AB  EIA  0                 #                   N     34
 6 AB  AUA  0                 #                   N     35
 7 AB  REI  0                 #                   N     36
 8 AB  RAU  0                 #                   N     37
 9 AB  KETL 0                 #                   N     38
10 AB  LF   0                 #                   N     39
11 AB  STOE 0                 #                   N     40
 1 EA  T    1.0000               P                       1
 2 EBV A    0                                    B       2
 3 EBV ML   0                                    B       3
 4 EBV H    1                                    B       4
 5 EBV EI   0                                    B       5
 6 EBV AU   0                                    B       6
 7 EB  SCHA 0                    P                       7
 8 EB  SCHH 0                    P                       8
 9 EB  SCHB 0                    P                       9
10 EB  SCHS 0                    P                      10
11 EB  AEI  0                    P                      11
12 EB  AAU  0                    P                      12
13 EB  FREI 0                    P                      13
14 EB  FRAU 0                    P                      14
15 ID  NRPL      0                              C       15
16 S2  TLSB EI                                          16
17 S2  TLSS AU                                          17
18 S2  TGS  GS                                          18
19 S2  TAS  AS                                          19
20 S2  TLS  LS                                          20
21 S2  TA   A                                           21
22 S2  TML  ML                                          22
23 S2  TH   H                                           23
24 S2  TEI  EI                                          24
25 S2  TAU  AU                                          25
26 S2  TSU  SU                                          26
27 S2  TFR  FR                                          27
28 S2  TZF  ZF                                          28
29 S   EHT  *EHT**                    6                 29
30 S16 AT   *TECHNOLOGNAME           16                 70
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

AA	Automatic "1"
AUA	OFF branch
EIA	ON branch
HA	Manual "1"
KETL	Sequence is running "1"
LZ	Run time error (internal element)
MLA	Operator guide mode "1"
STOE	Malfunction "1"

Fig. 9.99 Status word for the G block

GK

Subgroup control block

Application

This block is used for
- controlling a subgroup in step operation
- coordinating and monitoring the step sequences for operations and shutdown program
- conditioning the operator communication and control information from normalized displays.

- Task of the subgroup control

  A subgroup control uses a specified step–by–step sequence (”program”) to put a process subsystem from shutdown or operation into operation or shutdown respectively. During this process, the sequence control sends in each “Set step” commands to the subsystem and receives return data (criteria) which are used as conditions for continuing to the next step.

- Structure of a subgroup control

  The following function blocks are compulsory for a subgroup control:

  - GK block : Control header; coordinates the sequences.
  - KAK block : Start of sequence; marks the beginning of a sequence
  - KBK block : Sequence steps; step processing: This block checks whether or not step conditions have been met. Commands are issued and the sequence continued if the conditions have been met. Any number of KBK blocks may be installed in each branch..
  - KEK block : This block marks the end of a sequence

  Further blocks can be installed as required, except XA/XB blocks and blocks from other control sequences (S sequence, G sequence). These blocks are only executed during the current step (blocks from “Set step” to “Next step”).

  More combinations are possible if VS blocks are installed.

Method of Operation

The GK control consists of two branches, the operation branch and the shutdown branch. Each branch begins with a KAK and ends with a KEK.
Branch processing is described under the paragraph “Modes”.

The two branches are installed in sequence after the associated GK in the sequence list. The branch is marked as shutdown or operation branch by interconnecting the KAK input with the corresponding GK output.

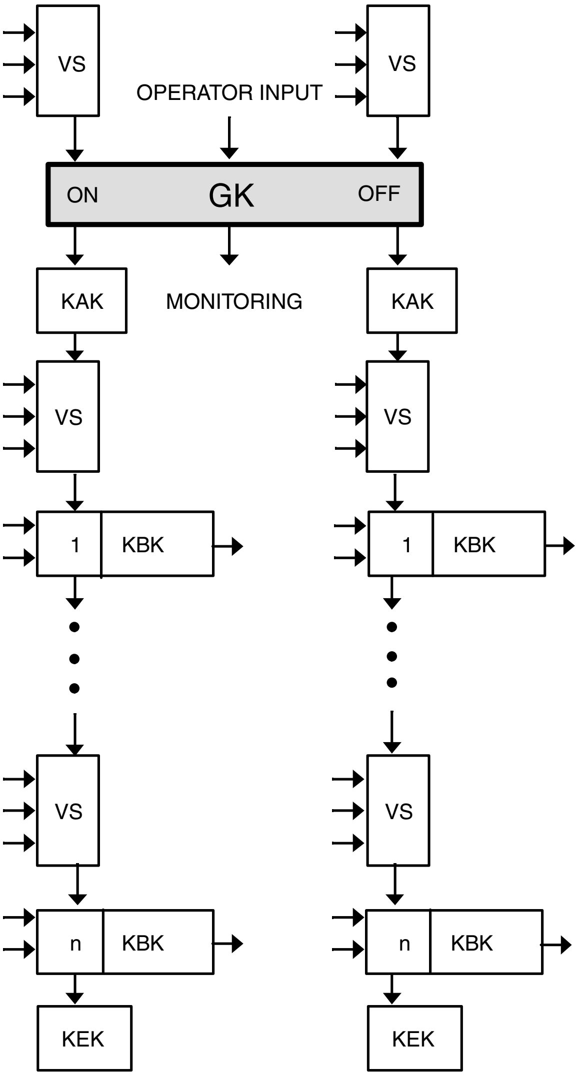


Fig. 9.100 Structure of a sequence control in power plant systems

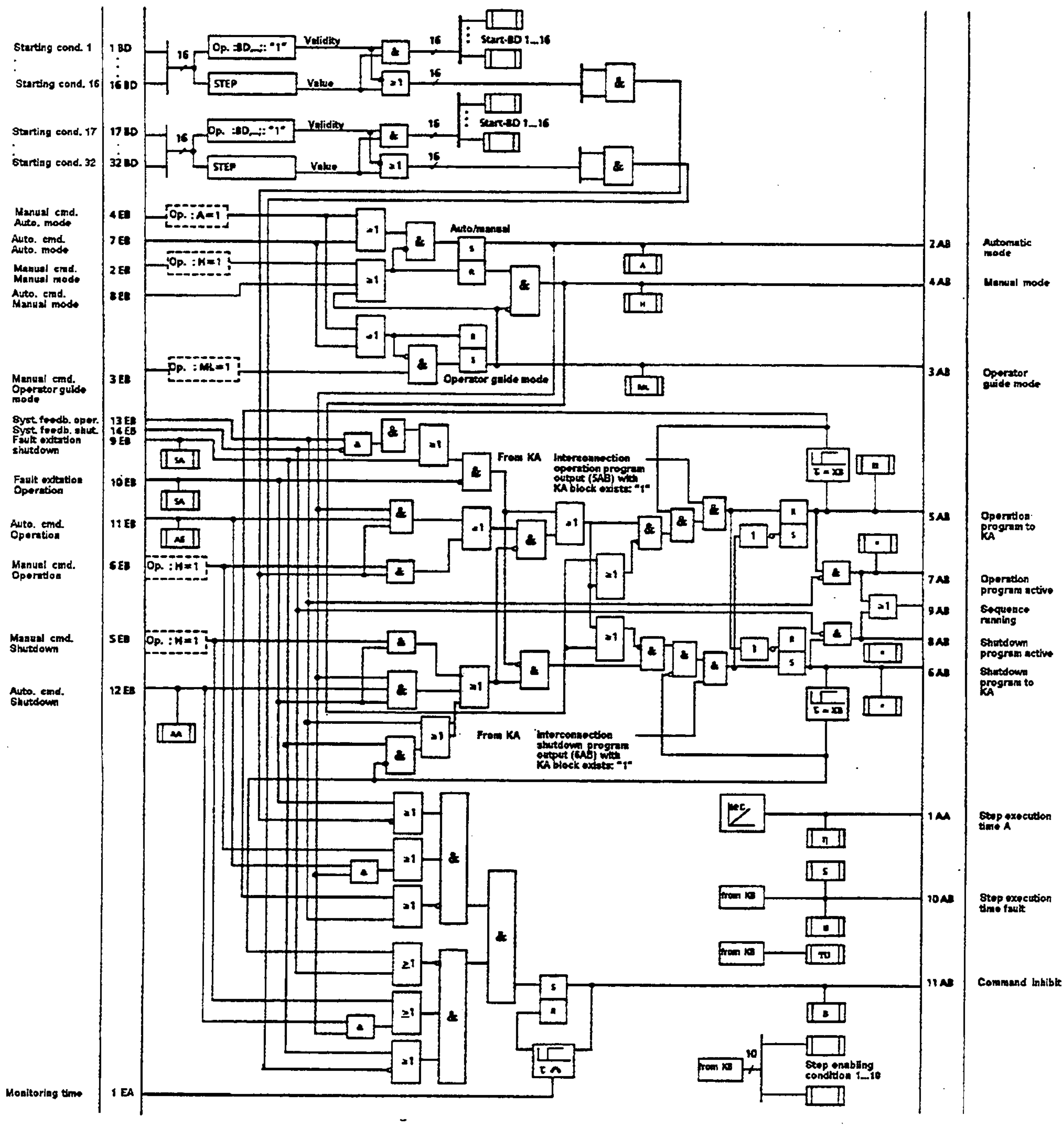


Fig. 9.101 GK block; logic diagram

- Modes
  - Manual mode

    Automatic control is switched off and thus ineffective in manual mode (HD). No commands are transferred from the subgroup control to the subordinate control level which means that this level can therefore only be controlled manually. Step numbers, step displays and time values are deleted or set to “0” if the system is switched to manual mode.

    The last step to have been set and the associated command outputs are reset. The GK sets the sequence list pointer after the last KEK. This skips all blocks of the sequence.

  - Automatic mode

    Undisturbed automatic operation

    In undisturbed automatic operation, the control function is executed step–by–step after a program (shutdown or operation) has been selected. The controller has achieved the desired process status after the program is finished (KEK attained or system return data has been set).

    If the step enabling conditions (criteria) are met for a specific step, this step will be set and issues commands (via interconnectable “inputs”) to the subordinate control level. Simultaneous setting of the next step is prepared (”Next step”) and the previous step reset. If the step enabling conditions have been met, this step will also be set and issues commands (”Set step”). The program continues in the same manner from step to step. The program progress can be viewed on normalized displays. Manual intervention is not required during undisturbed operation.

    A “waiting time” which specifies the minimum dwell time before a program leaves a step, even if the conditions have been met before, can be parameterized in the KBK.

    Each step executes those blocks which lie between the “Set step” (or the KAK if no step has been set yet) and the “Next step” (including the latter).

    Disturbed automatic operation

    The program stops in a program step (KBK) if one or several step enabling conditions have not been met. The program continues automatically after all step enabling conditions have been met (as during undisturbed operation). The maximum time for one step can be monitored if a “Monitoring time” has been parameterized in the KBK.

  - Operator guide mode

    The operation of the control function in this mode is the same as in automatic mode, except that no commands to the subordinate control levels are issued via the “inputs” of the KBK. All commands which would be issued during automatic operation by the control function must be given manually in the subordinate control level.

    This mode can be used during commissioning and test to meet the step enabling conditions (and thus setting the step) and to check the sequencer stepping without interfering with the process. The step and condition indicators allow viewing of the controller sequence as in automatic mode.

- Mode logic

  Automatic commands (interconnectable inputs) or operator commands (to PBT or OS) can be used to select automatic and manual mode. Operator guide mode can only be selected by an operator command.

  The priority and memory logic meets the following conditions:

  – “Manual mode” (H) has priority over “Automatic mode” (A).
  – “Automatic mode” has priority over “Operator guide mode” (ML).
  – “Operator guide mode” can only be left by operator commands, not by automatic commands.
  – Only one mode may be selected.

  The following checks and functions are performed when the mode is changed:

  AC → HD: Possible at any time; the sequence is reset; the program memory cleared; the previous GS is reset.
  AC → ML: Possible at any time
  HD → AC: Possible at any time
  HD → ML: Possible at any time
  ML → AC: Only by operator command
  ML → HD: Only by operator command; the sequence is reset; the program memory cleared; the previous GS (Set step) is reset.

  Non–interacting and interconnectable inputs are available for all automatic commands. Changeover from “Automatic mode” to “Operator guide mode” and vice versa, initiated by operator commands, is bumpless, i.e. the sequencer continues with the program step executed before the changeover. The state of the controller is not changed if a power failure occurs and the AS is subsequently restarted.

- Program section

  – Shutdown program/operation program
    This program is used for putting the subsystem (process) in an ON/OFF state (shutdown/operation) defined by steps (KBK and intermediate blocks).

    The two programs can be selected by:
      Protective commands (fault excitation)
      Automatic commands (interconnectable inputs)
      Operator commands via PBT or OS

    The operator commands “EI”/“AU” (start operation/shutdown program) are not accepted in manual mode.

- Priority and memory logic

  The logic meets the following conditions:

  – The two programs exclude one another.

  – Operator and automatic commands are only accepted if the associated process enabling signal is present. The enabling signal results from ANDing all interconnected conditions (BA01 ... BA16 and BE01 ... BE16).

  A program can only be started if it is not active. The counter can thus always be started, (if the enabling condition has been met) even if the program currently running has not yet been terminated (KEK not reached).

  The priorities are as follows:

  – Fault excitation “Shutdown” (highest priority)
  – Fault excitation “Operation”
  – Operator or automatic command “Shutdown”
  – Operator or automatic command “Operation” (lowest priority)

  The required program state is stored until

  – the sequence end “KEK” has been reached
  – the counter program is started
  – “Manual mode” is selected

  Both program memories are reset in manual mode.

  After the system return data (AREI and ARAU) has been received, the program memories are also set after

  – changeover from “Manual mode” to “Automatic mode”
  – changeover from “Manual mode” to “Operator guide mode”.

  With corresponding configuration, the “Skip step” function provides for the sequencer follow–up action.

  Two interconnectable inputs (“AREI” and “ARAU”) are used to generate the system return data out of system signals.

- Fault excitation

  Fault excitation, initiated by system signals, is a requirement for start by the corresponding program. It has a higher priority than a start by automatic or operator command. Two interconnectable inputs (”EIST” and “AUST”) can be used for fault excitation.

- Start criteria

  The associated process enabling signal must be present in order to start a program. One exception are starts initiated by fault excitation and by system return data. If there is no process enabling signal when the program is selected, the interlocking monitoring function responds and notifies the operator (blinking mark in the loop display) that start criteria is missing. Superimposed criteria (BA01 ... BA16 and BE01 ... BE16) can be displayed in the loop display for situation analysis if they have been interconnected and are thus relevant.

  All relevant conditions (max. 16 per branch) of the branch are ANDed to form the enabling signal.

- Skip step

  A KBK is not executed if input “SPUE” (skip step) of the associated KBK block has been set. The effect is the same as if this KEK had not been installed. The sequence controller goes to the first step which is not to be skipped if the “SPUE” inputs of various consecutive KBK have been set. The controller can thus be corrected to the actual system state.

- Jumping within a program

  The program can jump forwards or backwards to any step if the target (number of target KBK) has been parameterized and input BDSP set at KBNR.

  The controller then reacts in the following manner:

  – The KBK whose BDSP input has been set is no longer executed.
  – The target KBK (according to KBNR) becomes “Set step” (GS = 1, setting the command outputs). The step enabling conditions are not checked in this case.
  – Next, the blocks after the step which has currently been set, up to and including the next step (next KBK), are executed.

- Step time values

  – Monitoring time

    All step enabling conditions of a step must be met within the monitoring time. The output “Time–out” of KBK and GK is set if the monitoring time is exceeded. The same information is also (via status) transferred to the OS and indicated via the alarm hierarchy by a blinking mark on the AS. If the monitoring time has been parameterized, it is shown (in seconds) on the GK loop display.

  – Waiting time

    The waiting time specifies how long a step must last, regardless of the states of the step enabling conditions.

    Waiting/monitoring time (in AS cycles) and mode (waiting or monitoring) are parameterized in each KBK for the actual step. Waiting or monitoring is not performed if a jump or skip condition has been set.

  – Step run–time

    The step run–time specifies the time which has elapsed since the previous step was set. The time value (in seconds) is shown on the GK loop display.

    A timer counts up whilst the sequence is active (KETL = 1, or ”Program activated” and “Reset not yet arrived”). This timer is reset with every step change (next step becomes set step). The run–time data is available at an output.

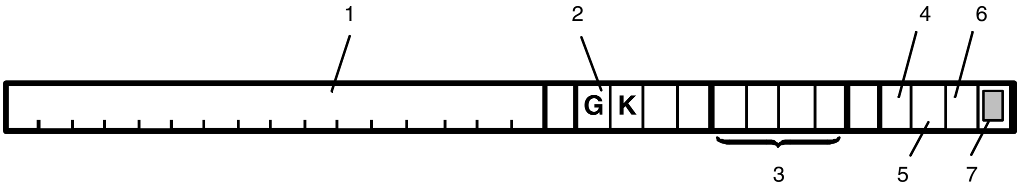
  – Interlocking monitoring

    If an interlocking condition inhibits the execution of a command (starting operation or shutdown program), a blinking mark appears on the GK loop display for a period of time (UZT, in seconds) which can be parameterized.

- Status word

  The status word combines all important normal and malfunction states. If any bit of the status word is changed, a message is sent immediately to all processing systems. The status word is the local point of central acknowledgement.

- Normalized representation in a group display



1 Process–related name, S16 string
2 Type of function block
3 Block number/name
4 Mode indicator
  A automatic mode
  M operator guide mode
  H manual mode
5 Program indicator
  E ON program (operation program)
  A OFF program (shutdown program)
6 Loop alarm location
  B command inhibit
  * sequence active
7 Common alarm indicator

Fig. 9.102 Normalized representation in a group display

The block is represented by 30 characters in a specific location of a group display. Input 16 NRPL (group display: no./location no.) must then be parameterized as follows:

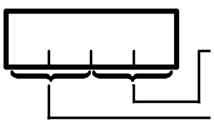
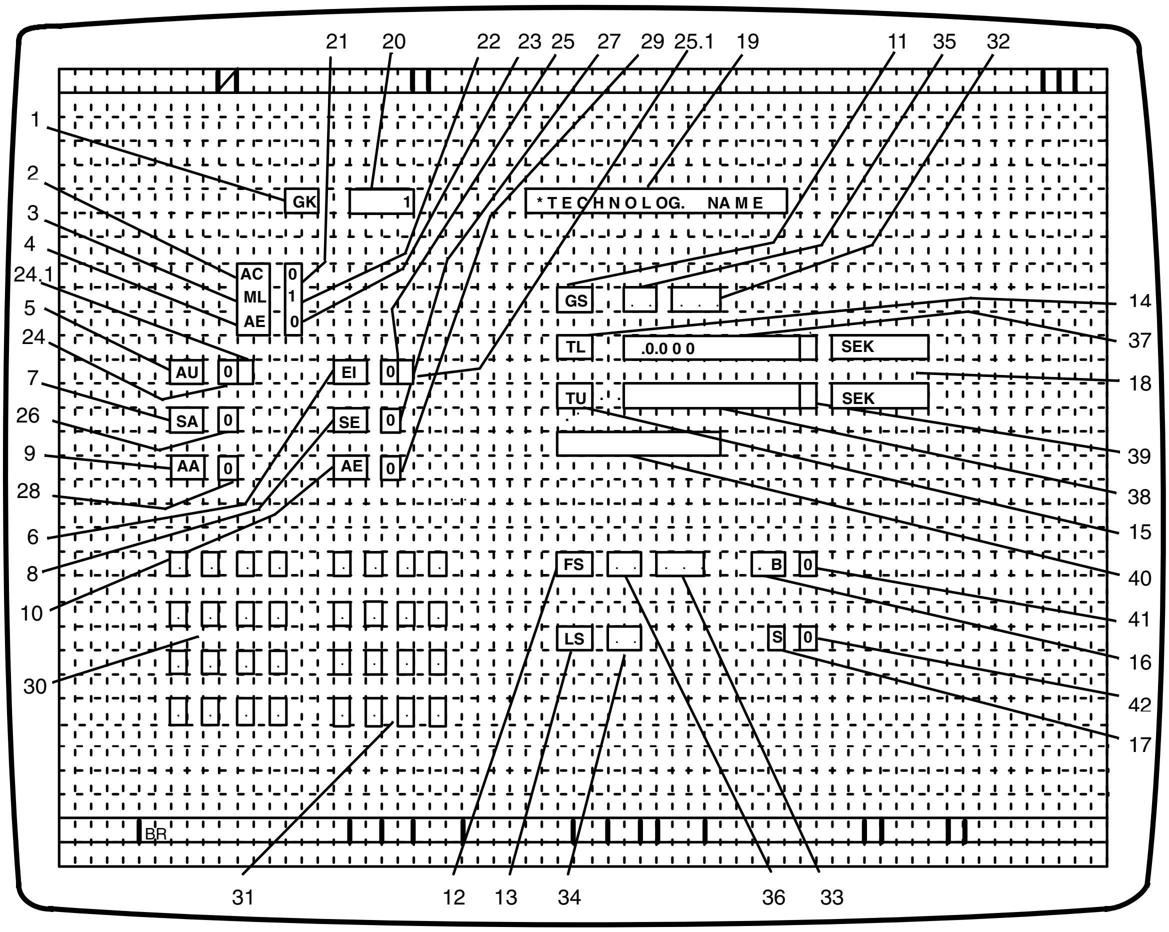


Fig. 9.103 Parameterization of input 16 NRPL

Set input 16 to “0“ if the normalized representation of the block in a group display is to be suppressed.



Static data

1	Type name		S2 string
2	Mnem. name Automatic mode		”
3	”	Operator guide mode	”
4	”	Manual mode	”
5	”	Shutdown program	”
6	”	Operation program	”
7	”	Fault excitation shutdown	”
8	”	Fault excitation operation	”
9	”	Aut. command shutdown	”
10	”	Automatic command op.	”
11	”	Set step	”
12	”	Next step	”
13	”	Previous step	”
14	”	Step run–time	”
15	”	Monitoring time	”
16	”	Operator input inhibit	”
17	”	I&C malfunction	”
18	”	Time unit	S4 string
19	Process–related name		S16 string

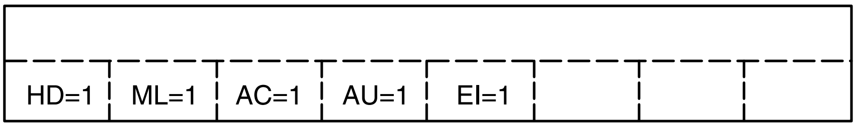
Dynamic data

20	Block number	
21	Status indicator	Automatic mode
22	”	Operator guide mode
23	”	Manual mode
24	”	Shutdown program
24.1	”	Shutdown program active (blinking asterisk)
25	”	Operation program
25.1	”	Operation program active (blinking asterisk)
26	”	Fault excitation shutdwon
27	”	Fault excitation operation
28	”	Automatic command shutdown
29	”	Automatic command operation
30	Status indicators	Start conditions OFF
31	Status indicators	Start conditions ON
32	Block number of the set step	
33	Block number of the next step	
34	Last step = LSEI or LSAU parameter of GK block	
35	Process–related name of the set step (parameter NRAT of KBK block)	
36	Process–related name of the next step (parameter NRAT of KBK block)	
37	Digital display of the step run–time	
38	Digital display of the monitoring time	
39	Blinking mark “Monitoring time exceeded”	
40	Step enabling conditions	
41	Status indicator “Command inhibit”	
42	Status indicator I&C fault (in GK identical with time–out)	

Fig. 9.104 Loop display GK block

☞ The parameters LSEI (input 17) and LSAU (input 16) are only displayed on an OS display if they have been parameterized numerically.

- Operation using the process communication keyboard



AC Automatic mode
AU Shutdown program (OFF)
EI Operation program (ON)
HD Manual mode
ML Operator guide mode

Fig. 9.105 GK block, automatic labeling of the process communication keyboard

Press the BE key to initiate operator input after the loop display has been selected. The associated mnemonic names (S2 strings) are then assigned to the other keys of key group 2 in the display area. Each input to the process must be terminated by pressing the execute key (◈).

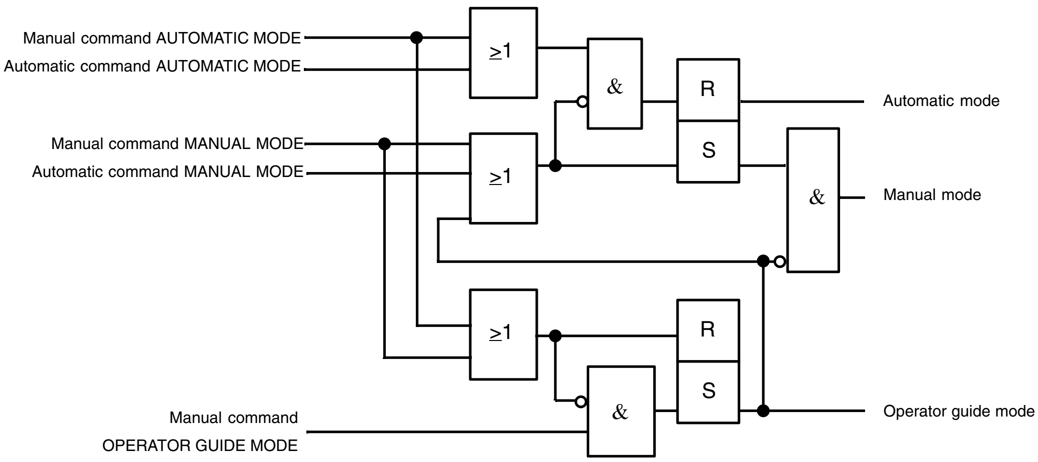


Fig. 9.106 Mode logic

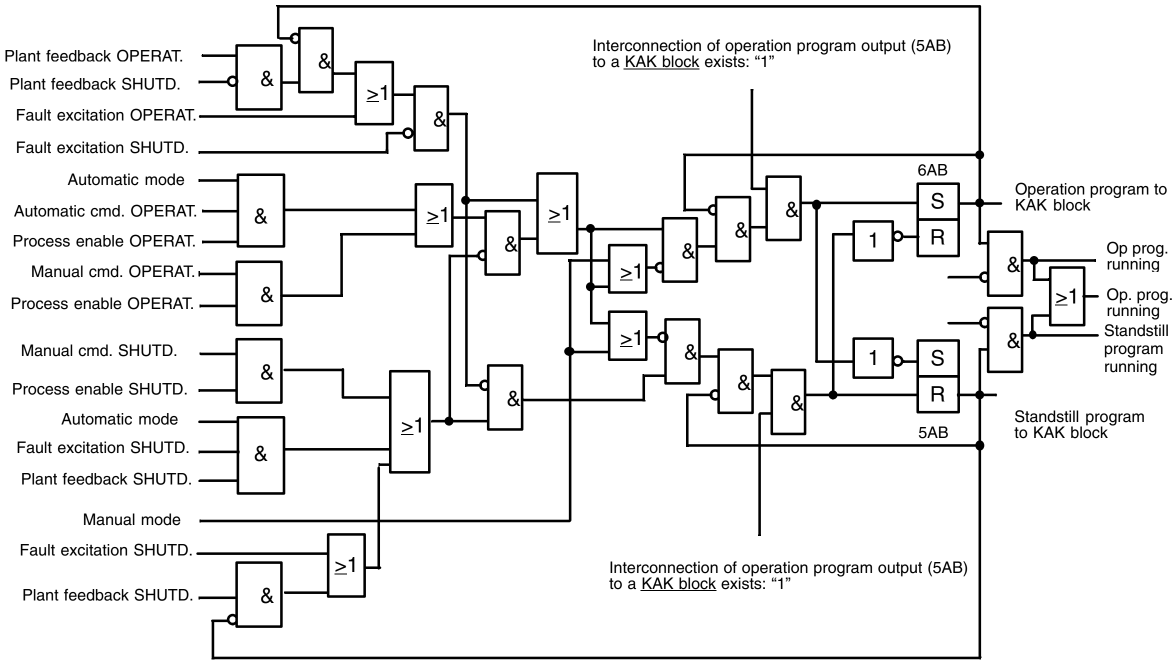


Fig. 9.107 Program type logic

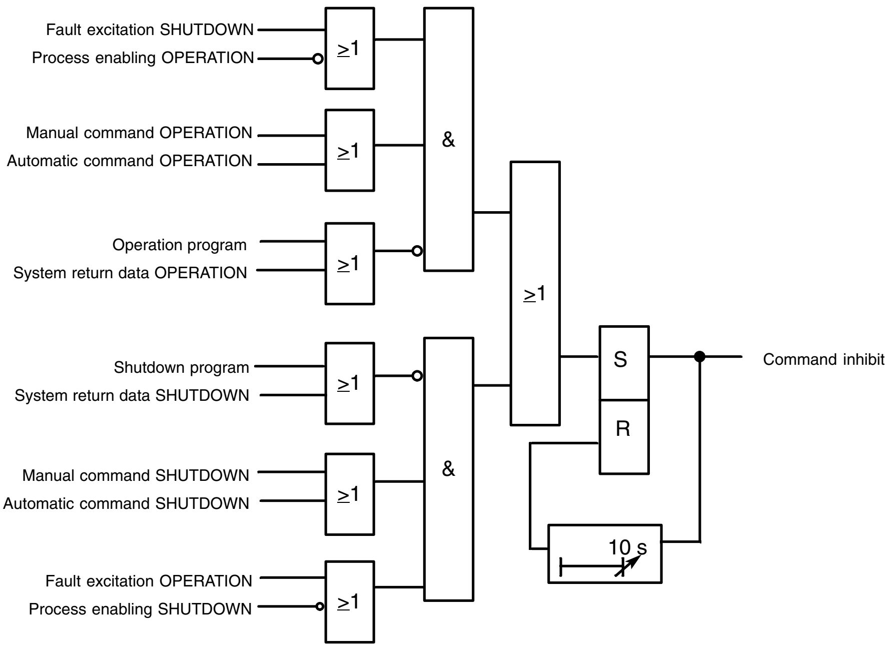


Fig. 9.108 Interlocking monitoring logic

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Default value	Configurat. details
Step run–time (in s)	TS	1	AA	.0000	
Automatic mode	ACA	2	AB	1	
Operator guide mode	MLA	3	AB	0	
Manual mode	HDA	4	AB	0	
Operat. prog. for KAK block	EIA	5	AB	0	
Shutdown prog. for KAK block	AUA	6	AB	0	
Operation program active	REI	7	AB	0	
Shutdown program active	RAU	8	AB	0	
Sequence active	KETL	9	AB	0	
Step run–time fault	LF	10	AB	0	
Command inhibit	SPER	11	AB	0	
Monitoring time (in s)	UZT	1	EA	10.00	
Manual com. man. mode	HD	2	PB	0	1)
Manual com. op. guide mode	ML	3	PB	0	1)
Manual com. auto. mode	AC	4	PB	0	1)
Manual command shutdown	AU	5	PB	0	1)
Manual command operation	EI	6	PB	0	1)
Auto. com. auto. mode	ACE	7	EB	0	
Auto. com. manual mode	HDE	8	EB	0	
Fault excitation operation	EIST	9	EB	0	
Fault excitation shutdown	AUST	10	EB	0	
Automatic com. operation	EIE	11	EB	0	
Automatic com. shutdown	AUE	12	EB	0	
System return data operation	AREI	13	EB	0	
System return data shutdown	ARAU	14	EB	0	
Status suppression	US	15	EB	0	
Group display: no./location no.	NRPL	16	ID	0	
Process–related no. of prev. “Operation” step	LSEI	17	S2	EI	
Process–related no. of prev. “Standstill” step	LSAU	18	S2	AU	
S2 string manual	THD	19	S2	HD	
S2 string operator guide	TML	20	S2	ML	
S2 string automatic	TAC	21	S2	AC	
S2 string OFF	TAU	22	S2	AU	
S2 string ON	TEI	23	S2	EI	
S2 string fault excitation OFF	TSA	24	S2	SA	
S2 string automatic OFF	TAA	25	S2	AA	
S2 string fault excitation ON	TSE	26	S2	SE	
S2 string automatic ON	TAE	27	S2	AE	
S2 string set step	TGS	28	S2	GS	
S2 string step duration	TTS	29	S2	TL	
S2 string time–out	TTW	30	S2	TW	
S2 string monitoring time	TTU	31	S2	TU	
S2 string next step	TAS	32	S2	FS	
S2 string previous step	TLS	33	S2	LS	

1) Inputs for operator input keys (not non–interacting)

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type	Default value	Configurat. details
S2 string command inhibit	TB	34	S2	B	
S4 string unit	EHT	35	S6	SEK	
Condition 1 shutdown	BA01	36	EB	0	
⋮	⋮				
Condition 16 shutdown	BA16	51	EB	0	
Condition 1 operation	BE01	52	EB	0	
⋮	⋮				
Condition 16 operation	BE16	67	EB	0	
S16 string process–related name	AT	68	S	*TECHNOLOG. NAME	

- Block list

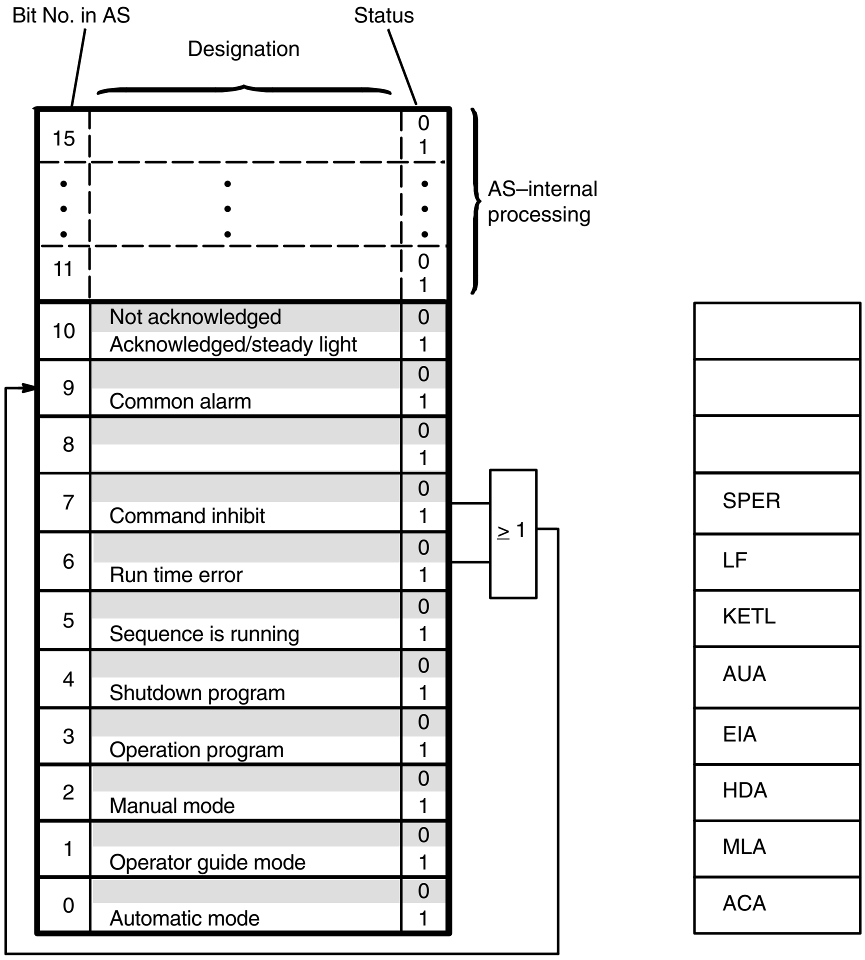
```
   GK      1               11. 04. 86/ 09. 38. 32.  P: 1 *

 1 AA  TS   0.0000         #                         68
 2 AB  ACA  1                                        69
 3 AB  MLA  0                                        70
 4 AB  HDA  0                                        71
 5 AB  EIA  0                                        72
 6 AB  AUA  0                                        73
 7 AB  REI  0              #                         74
 8 AB  RAU  0              #                         75
 9 AB  KETL 0              #                         76
10 AB  LF   0              #                         77
11 AB  SPER 0              #                         78
 1 EA  UZT  10.000            P                       1
 2 PB  HD   0                            CB           2
 3 PB  ML   0                            CB           3
 4 PB  AC   0                            CB           4
 5 PB  AU   0                            CB           5
 6 PB  EI   0                            CB           6
 7 EB  ACE  0                 P                       7
 8 EB  HDE  0                 P                       8
 9 EB  EIST 0                 P                       9
10 EB  AUST 0                 P                      10
11 EB  EIE  0                 P                      11
12 EB  AUE  0                 P                      12
13 EB  AREI 0                 P                      13
14 EB  ARAU 0                 P                      14
15 EB  US   0                 P                      15
16 ID  NRPL    0                         C           16
17 S2  LSEI EI                                       17
18 S2  LSAU AU                                       18
19 S2  THD  HD                                       19
20 S2  TML  ML                                       20
21 S2  TAC  AC                                       21
22 S2  TAU  AU                                       22
23 S2  TEI  EI                                       23
24 S2  TSA  SA                                       24
25 S2  TAA  AA                                       25
26 S2  TSE  SE                                       26
```

Block list (continued)

27	S2	TAE	AE				27
28	S2	TGS	GS				28
29	S2	TTS	TL				29
30	S2	TTW	TW				30
31	S2	TTU	TU				31
32	S2	TFS	FS				32
33	S2	TLS	LS				33
34	S2	TB	B				34
35	S	EHT	SEK	6			35
36	EB	BA01			C	Q	36
37	EB	BA02			C	Q	37
38	EB	BA03			C	Q	38
39	EB	BA04			C	Q	39
40	EB	BA05			C	Q	40
41	EB	BA06			C	Q	41
42	EB	BA07			C	Q	42
43	EB	BA08			C	Q	43
44	EB	BA09			C	Q	44
45	EB	BA10			C	Q	45
46	EB	BA11			C	Q	46
47	EB	BA12			C	Q	47
48	EB	BA13			C	Q	48
49	EB	BA14			C	Q	49
50	EB	BA15			C	Q	50
51	EB	BA16			C	Q	51
52	EB	BE01			C	Q	52
53	EB	BE02			C	Q	53
54	EB	BE03			C	Q	54
55	EB	BE04			C	Q	55
56	EB	BE05			C	Q	56
57	EB	BE06			C	Q	57
58	EB	BE07			C	Q	58
59	EB	BE08			C	Q	59
60	EB	BE09			C	Q	60
61	EB	BE10			C	Q	61
62	EB	BE11			C	Q	62
63	EB	BE12			C	Q	63
64	EB	BE13			C	Q	64
65	EB	BE14			C	Q	65
66	EB	BE15			C	Q	66
67	EB	BE16			C	Q	67
68	S16	AT	*TECHNOLOG. NAME	16			120

- Status word



Status word in AS

Associated data elements in the block list or module signals

ACA	Automatic mode
AUA	Shutdown program for KAK block
EIA	Operation program for KAK block
HDA	Manual mode
KETL	Sequence is running
LF	Step run time error
MLA	Operator guide mode
SPER	Command inhibit

Fig. 9.109 Status word for the GK block

GP

Group display block

Application

This block is used when establishing area or group displays.

Method of Operation

The block combines alarms and/or acknowledgement requests of a group into a blinking mark which is shown on the area display.

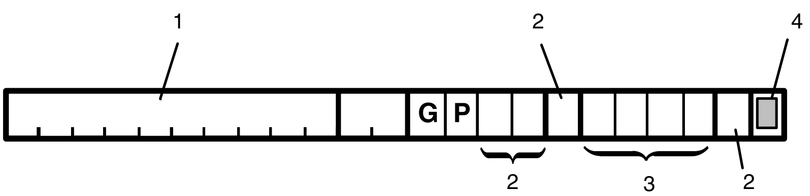
The process–related group name and the name of the group block (GP, No. 1 $\leq$ No. $\leq$ 56) are displayed next to the blinking mark. The process–related group name and the block name appear automatically as a headline in the group display.

23 characters are used for representation in the area display. Input 1 (location no. in the area display) is parameterized with the desired first location number. The group display shows those operator–controllable blocks which have been logged on to the GB block (NRPL parameter in this block). A group display block may not be installed in processing levels.

- Deleting a GP block

  Blocks are still logged on in a GP block if a deletion command for this block is rejected and F 409 displayed. These blocks must be determined by selecting the GP display (**`GP,no;`**) and subsequently logged off (NRPL = 0 in this block).

- Normalized representation in the area display



1 Process–related group name
2 Separating blank
3 Number of the group display block
4 Blinking mark if alarms and/or acknowledgement requests of the associated group display are waiting

Fig. 9.110 Group display block; representation in the area display

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Group alarm	SAME	1	AB
Area display: location no.	NRPL	1	ID
Process–related group name	AT1	2	S2
" "	AT2	3	S4
" "	AT3	4	S4
GP text	TGP	5	S2

- Block list

```
  GP      1                 03. 03. 83/ 00. 38. 43. P: 1

1 AB   SAME 0               #                   N      6
1 ID   NRPL      0                             C       1
2 S2   AT1  TE                                         2
3 S4   AT2  XT01                                       3
4 S4   AT3  0203                                       4
5 S2   TGP  GP                                         5
```

GW

Limit monitoring block

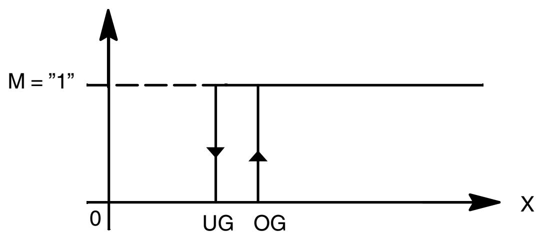
Application

This block is used for monitoring the limit values of an analog quantity.

Method of Operation

The block complies with the following function:

Alarm signal:	"1"	for	$X > OG$		Hysteresis $\neq 0$
	"0"	for	$X \leq UG$		
	"0"	for	$X = OG = UG$		Hysteresis $= 0$
Hysteresis:	$UG \leq X \leq OG$				



OG Upper switching points
UG Lower switching points

Fig. 9.111 Limit monitoring block; switching points

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Alarm signal	M	1	AB
Input variable	X	1	EA
Lower switching point	UG	2	EA [1)]
Upper switching point	OG	3	EA [1)]

[1)] UG < OG

- Block list

```
   GW      1                 03. 03. 83/ 00. 39. 01. P: 1

 1 AB  M    0               #                  N      4
 1 EA  X    0.0000             P                      1
 2 EA  UG   0.0000             P                      2
 3 EA  OG   0.0000             P                      3
```

HA

Booster oil automatic block

Application

The booster oil automatic system is used for the automatic control of electric booster oil pumps for bearing oil supply of large aggregates.

The HA function block contains the functions required for switching on the master drive and controlling the pressure–responsive action of the booster oil pump.

Method of Operation

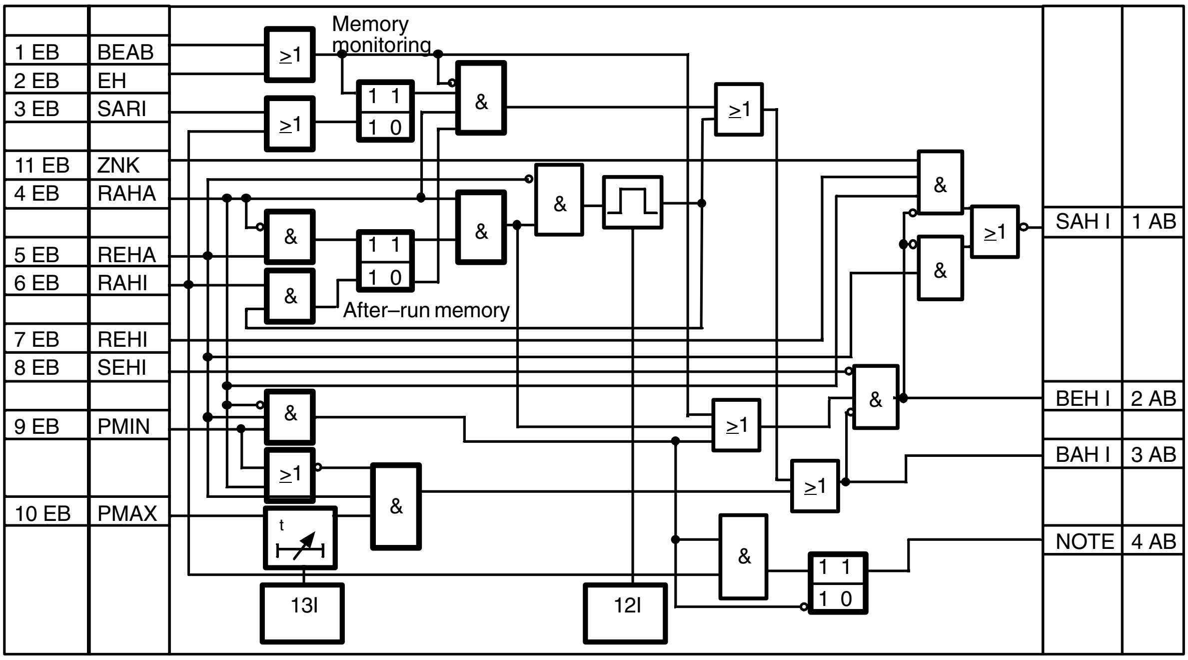


Fig. 9.112 Booster oil automatic block; logic diagram

Two different modes, each with different conditions, exist:

a) Switching ON
   - Commissioning
   - Emergency ON
   - After–run of the booster oil pump, also with additional criterion (rotational speed of the master drive)

b) Switching OFF
   - Forced shutdown
   - Pressure–responsive shutdown

- Switching ON

  – Commissioning

  During the master drive commissioning, the HA block executes the manual (BEH) or automatic (BEA) closing commands.

  These closing commands are transferred via the HA block to the auxiliary drive if no commands with higher priority are waiting (such as input signals “Disable start of auxiliary drive” SEHI and “Maximum pressure p_{max}” (PMAX).

  The closing command must be applied before the start–up acknowledgement from the master drive has been returned.

  During this time, the command direction “Switching OFF” in the EM block of the auxiliary drive is disabled via the SAHI output.

  – Emergency ON

  If the mechanical oil pump fails or an oil pump leaks, the auxiliary drive is switched on while the master drive is still running when the oil pressure falls below the pressure limit “min”. The auxiliary drive is only switched on if there is a correct feedback from the master drive.

  The message “Emergency ON of auxiliary drive” (NOTE) is issued as long as the pressure is below the limit value p_{min}.

  – After–run of the booster oil pump

  When the master drive is switched off or fails, the auxiliary drive is switched on as long as the master drive has not come to a complete stop. Regardless of the pressure, the set ON command is generated from the after–run memory (was ON) and the OFF return data from the master drive (is OFF). The memory can only be set if the signal “Auxiliary drive switched OFF” (RAHI) is not present.
  The after–run time is initiated if the master drive has been switched off or has failed.
  The after–run time must be configured by specifying the number of time cycles (one time cycle corresponds to the execution time of the HA block) via input 12 (TNZY).

Example

Execution time of HA block = 250 ms

After–run time = 5 min

$$\text{Time cycles} = \frac{\text{After–run time}}{\text{Execution time}} = \frac{5 \cdot 60\ \text{s}}{250 \cdot 10^{-3}\ \text{s}} = 1200$$

The closing signal is retained at the EM block of the auxiliary drive until the after–run time has elapsed. This prevents the drive being switched off, as specified during commissioning. After the after–run time has elapsed, the auxiliary drive is switched off without any further delay. An additionnal after–run criterion fed to input 11 (ZNK) can inhibit this breaking action. This condition may be, for example, governed by the rotational speed of the master drive and thus ensures that the booster oil pump is not switched off before the master drive has actually stopped. The after–run memory is cleared after the return data “Auxiliary drive OFF” (RAHI) has arrived and the after–run time elapsed.

- Switching OFF

  – Forced shutdown

The activated auxiliary drive is switched off if the command “Master drive ON” (manual or automatic) is aborted before the return data “Master drive ON” (REHA) has arrived.

If the auxiliary drive has been switched on, a monitoring memory is set when the closing command of the master drive arrives.
The auxiliary drive is switched off without delay if the input conditions of the AND element following the monitoring memory are met when the closing command is interrupted.
This forced shutdown action can be inhibited by a “1” signal at the input “Disable forced shutdown of auxiliary drive” (SARI) (resetting the monitoring memory).

– Pressure–responsive shutdown

It can be assumed that the oil supply has been taken over by the mechanical oil pump if the upper pressure limit p_{max} (PMAX) has been present for a certain time and if the return data “ON” from the master drive has arrived. The electrical booster oil pump is then switched off. The expected time for p_{max} can be extended via input 13. The time cycles are determined in the same fashion as for the after–run time.

- Alarm section

The HA block issues the message “Auxiliary drive emergency ON” (NOTE) if the oil pressure falls below the lower limit p_{min} whilst the master aggregate is running.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Drive shutdown auxiliary drive	SAHI	1	AB
Command start auxiliary drive	BEHI	2	AB
Command shutdown auxiliary drive	BAHI	3	AB
Alarm emergency ON	NOTE	4	AB
Automatic command master drive is ON	BEA	1	EB
Manual command master drive ON	BEH	2	EB
Disable forced shutdown auxiliary drive	SARI	3	EB
Return data master drive OFF	RAHA	4	EB
Return data master drive ON	REHA	5	EB
Return data auxiliary drive OFF	RAHI	6	EB
Return data auxiliary drive ON	REHI	7	EB
Enable start auxiliary drive	SEHI	8	EB
Pressure p_{min}	PMIN	9	EB
Pressure p_{max}	PMAX	10	EB
Additional after–run criteria	ZNK	11	EB
After–run time (cycles)	TNZY	12	ID
p_{max} delay (cycles)	TPVZ	13	ID

- Block list

```
   HA      1                  03. 03. 83/ 00. 39. 28. P: 1

 1 AB  SAHI 0                 #                           14
 2 AB  BEHI 0                 #                           15
 3 AB  BAHI 0                 #                           16
 4 AB  NOTE 0                 #                           17
 1 EB  BEA  0                    P                         1
 2 EB  BEH  0                    P                         2
 3 EB  SARI 0                    P                         3
 4 EB  RAHA 0                    P                         4
 5 EB  REHA 0                    P                         5
 6 EB  RAHI 0                    P                         6
 7 EB  REHI 0                    P                         7
 8 EB  SEHI 0                    P                         8
 9 EB  PMIN 0                    P                         9
10 EB  PMAX 0                    P                        10
11 EB  ZNK  0                    P                        11
12 ID  TNZY      0                                        12
13 ID  TPVZ      0                                        13
```


HUP

Horn block

Application

This block is used for activating signalling devices (optically or acoustically).

Method of Operation

If the HUP block is switched on, the binary output (SAB) is switched from 0 to 1 as soon as there is a change in one of the triggering signals SIn (SI1 – SI32).
Additionally, a flag is set in GB.ORPA (GB 142).
An acknowledgement can either be made via the acknowledgement input QUIT or by the operator input "**`QH;`**". The output SAB is reset. The input QUIT can be set via function keys. It is cleared by the HUP block after processing.
The operator input "**`QH;`**" acknowledges all HUP blocks and resets the flag GB142!
This blocks thus enables the activation of any signalling device.
To acquire signals which are pending briefly only, the HUP block should be processed cyclically. The scanning time should be as short as possible. Alarm indications in GB.ORPA.32 to GB.ORPA.79 or the common alarm in GB.ORPA.31 can be evaluated for a safe acquisition of interrupts (see Chap. 2.3.6 – interrupt processing).

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Signal output	SAB	1	AB
ON/OFF switch	EIN	1	EB
Horn acknowledgement	QUIT	2	EB
Input signal 1	SI1	3	EB
Input signal 2	SI2	4	EB
⋮	⋮	⋮	⋮
Input signal 32	SI32	34	EB

- Block list

```
   HUP     1                  27.11. 91/ 12. 21. 21. P: 1

  1 AB  SAB  0                #                   N      35
  1 EB  EIN  0                   P                        1
  2 EB  QUIT 0                   P                        2
  3 EB  SI1  0                   P                        3
  4 EB  SI2  0                   P                        4
  5 EB  SI3  0                   P                        5
  6 EB  SI4  0                   P                        6
  7 EB  SI5  0                   P                        7
  8 EB  SI6  0                   P                        8
  9 EB  SI7  0                   P                        9
 10 EB  SI8  0                   P                       10
 11 EB  SI9  0                   P                       11
 12 EB  SI10 0                   P                       12
 13 EB  SI11 0                   P                       13
 14 EB  SI12 0                   P                       14
 15 EB  SI13 0                   P                       15
 16 EB  SI14 0                   P                       16
 17 EB  SI15 0                   P                       17
 18 EB  SI16 O                   P                       18
 19 EB  SI17 0                   P                       19
 20 EB  SI18 0                   P                       20
 21 EB  SI19 0                   P                       21
 22 EB  SI20 0                   P                       22
 23 EB  SI21 0                   P                       23
 24 EB  SI22 0                   P                       24
 25 EB  SI23 0                   P                       25
 26 EB  SI24 0                   P                       26
 27 EB  SI25 0                   P                       27
 28 EB  SI26 0                   P                       28
 29 EB  SI27 0                   P                       29
 30 EB  SI28 0                   P                       30
 31 EB  SI29 0                   P                       31
 32 EB  SI30 0                   P                       32
 33 EB  SI31 0                   P                       33
 34 EB  SI32 0                   P                       34
```

INKU

Increment converter block

Application

This block is used for converting a positioning increment (INK) (of a controller for example) into an opening or closing impulse of equivalent length applied to a motor–driven actuator.

The block can be used for motor actuators with a typical actuating time of $\geq$ 30 s. An actuator travel resolution of < 0,5% can be achieved at an actuating time of 30 s if the scan time of the INKU block has been set to TA = 125 ms.

Method of Operation

The analog signal applied to the increment input (INK) is converted into an opening or closing impulse equivalent to sign and value of the input signal.

+ INK:	Opening impulse	(OEFF)
- INK:	Closing impulse	(SCHL)

The actuator travel resolution (STWA) is used to parameterize the actuator travel value (in percent) which corresponds to the shortest impulse. The correlation between the actuator travel resolution and the scan time of the INKU block is

$$STWA = \frac{T_A}{T_{st}} \cdot 100\ \%$$

STWA	actuator travel resolution
T_A	scan time
T_{St}	actuating time

A scan time TA = 125 ms should be used for the block execution to achieve the highest possible actuator travel resolution. The INKU function is executed in cycles 2 and 3 (execution in cycles 1, 4 and 5 would re–accept the value with each scan).

The source scan parameter (APQ) is used to specify when the block is to receive and process a new INK (to be converted into a new opening or closing impulse). If the “source block” (e.g. R block) is installed in the same cycle as the INKU block, the same value is specified here as was parameterized as a scan parameter (AP) in the XB block responsible as processing block for the source block [1)].

The APQ parameter multiplies and shifts the cycles accepting a new value of the INK input in the same way as the AP parameter in the XB block determines processed and omitted cycles. If the INKU block is installed behind an XB block it has to be ensured that the INKU block is also processed in cycles in which a new value is to be accepted from the INK input according to the parameter APQ.

The appropriate output (OEFF or SCHL) is set when a new INK has been accepted from the source. This output remains set until the currently applied INK has been processed as actuator travel resolution steps per scan.

1) ”Source block” is a block in which the value is generated.

Example

Block scan time	T_A = 125 ms
Actuating time	T_{St} = 60 s
Actuating increment	INK = - 10 %

The actuator travel resolution is then:

$$STWA = \frac{T_A}{T_{st}} \cdot 100\ \% = \frac{125\ ms}{60\ s} \cdot 100\ \% = 0{,}21\ \%$$

A closing impulse of 47 cycles is applied for INK = –10%.

$$\left\{ \frac{10}{0{,}21} = 47 + remainder,\ remainder < 0{,}21\% \right\}$$

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Opening impulse	OEFF	1	AB
Closing impulse	SCHL	2	AB
Increment/percent	INK	1	EA
Actuator travel resolution/percent	STWA	2	EA
Source scan parameter	APQ	3	ID

- Block list

```
   INKU    1                03. 03. 83/ 00. 40. 11. P: 1

 1 AB  OEFF 0               #                   N      4
 2 AB  SCHL 0               #                   N      5
 1 EA  INK  0.0000             P                       1
 2 EA  STWA 0.0000             P                       2
 3 ID  APQ       0                                     3
```

INT

Integrator block

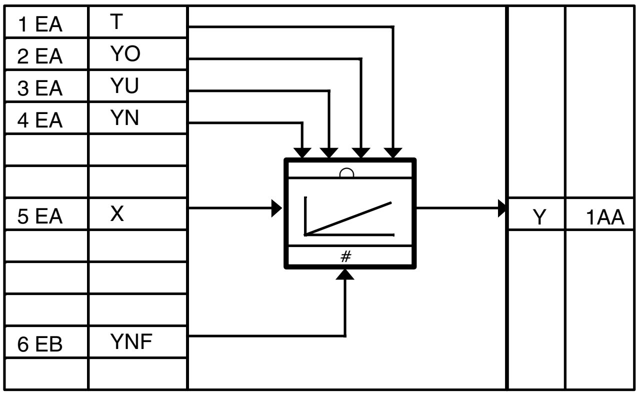
Application

This block is used
- for integration
- as ramp generator
- as integral–action element in a controller structure
- as analog value memory

Method of Operation

The integrator follows the equation:

$Y = K \cdot \int X \, dt$
with the integration constant $K = 1/TI$.

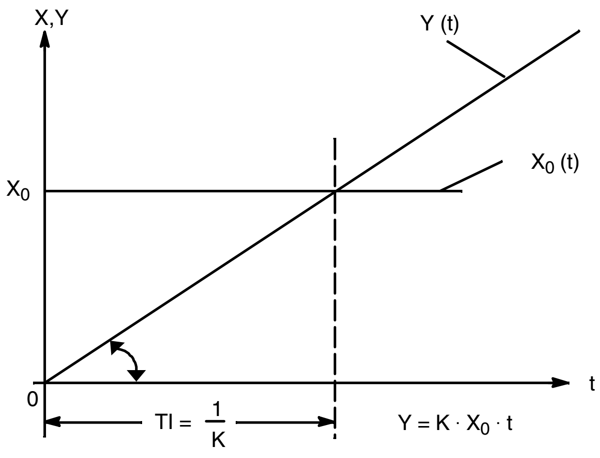


T = TI/TA	TI: Integration time constant, TA: Cycle time
X	Input variable
Y	Output variable
YN	Correction value
YNF	Input correction
YO	Upper limit of output value
YU	Lower limit of output value

Fig. 9.113 Integrator block; logic diagram

The value TI/TA is to be entered to input T;. TA is the cycle time of the INT block (cf. XB block). For example: if the integrator block is to use a time constant TI = 2 s, and the block is executed every TA = 1/8 s, then TI/TA = 2 s/0.125 s = 16 must be entered.

- Response to a sudden change of the input variable



K Integration constant
TI Integration time constant
t Time
X Input variable
Y Output variable

Fig. 9.114 Integrator block; step response

- Correction mode

  The integrator output value is corrected to the value YN in this mode. The correction input (YNF) must be set to “1” here.

- Storage mode

  This mode is equivalent to correction mode. During storage, however, the correction input (YNF) is reset from “1” to “0” (e.g. by the STEP–M block VS).

- Output value limitation

  A lower (YU) and upper (YO) limit are available for a possible limitation of the output value Y.

- Initialization behavior

  If a higher–order XB block is switched off and back on, the INT block performs an initialization run. The Y value (old value) is then corrected to the current value of Y.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AAD
TI/TA	T	1	EA
Upper limit	YO	2	EA
Lower limit	YU	3	EA
Correction input variable	YN	4	EA
Integrator input variable	X	5	EA
Correction ”1”	YNF	6	EB

- Block list

```
   INT     1                 03. 03. 83/ 00. 40. 35. P: 1

 1 AAD Y    0.0000           #                   N      7
 1 EA  T    10.000              P                       1
 2 EA  YO   100.00              P                       2
 3 EA  YU   0.0000              P                       3
 4 EA  YN   0.0000              P                       4
 5 EA  X    0.0000              P                       5
 6 EB  YNF  0                   P                       6
```

KA

Sequence starting block

Application

This block is used for marking the beginning of an ON or OFF in a subgroup control system for power plants.

Method of Operation

Input 1 must be interconnected with output 5 (EIA) (for the ON branch) or output 6 (AUA) (for the OFF branch) of the subgroup control block to notify the subgroup control block of the sequence starting block marking the beginning or an ON or OFF branch.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
ON/OFF G block	EA	1	EB

- Block list

```
  KA      1                 03. 03. 83/ 00. 41. 03. P: 1

1 EB  EA                                        Q     1
```

KAK

Sequence starting block for power plants

Application

This block is used for marking the beginning of an ON or OFF branch in a subgroup control system (GK) for power plants.

Method of Operation

Input 1 must be interconnected with output 5 (EIA) (for the ON branch) or output 6 (AUA) (for the OFF branch) of the subgroup control block to notify the subgroup control block (GK) of the sequence starting block marking the beginning of an ON or OFF branch.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
ON/OFF GK block	EB	1	EB

- Block list

```
  KAK     1                 03. 03. 83/ 00. 41. 03. P: 1

1 EB  EB                                        Q     1
```

KB

Sequence block

Application

This block is used as a step in sequencing controls for power plants.

Method of Operation

The sequence block is the smallest functional unit of a sequencer, and contains the conditions and commands of a step.

- Conditions

  The following conditions are processed in a sequence block:

  – Step enabling conditions

    The step enabling conditions must be met before step outputs can be set and the sequence can advance to the next step. The step enabling condition consists of a logic section with three AND and two OR inputs.

  – Jump condition

    A jump condition defines the point at which the program jumps to a different step. Forward and backward jumps are possible within a sequence. The program jumps to the sequence block parameterized via input 10 if the input 6 has been set to “1”.

    The outputs of the target block are set immediately, regardless of the status of the step enabling conditions. The target block thus becomes “Set step” and the block previously set is reset. The processing sequence is continued after the target block.

  – Step condition

    The sequence block is not executed and is skipped if the skip condition is met (input 7 = “1”).

  – Priorities of the conditions

    The conditions have the following priorities:
    – Jump condition: Priority 1
    – Skip condition: Priority 2
    – Step enabling condition: Priority 3

- Monitoring time

  The step duration is monitored if input 8 (wait/monitor) is set to “0”. “Time–out” will be indicated if the condition has still not been met after the time specified via input 9 has elapsed.

- Waiting time

  Input 8 (WUE) = “1” (= waiting):
  The inputs are only set after the conditions have been met and the waiting time (TWU 9ID) has elapsed.

  Time counting starts after the step has become “Current step”.

- Command outputs

  The sequence block becomes “Set step” when the step enabling conditions are met in the higher–order S block. This means that the step set previously is reset automatically.

  Resetting implies:
  a) Output 1 is set to “0”.
  b) The GB addresses defined by the inputs 11 to 15 are set to “0” if automatic mode has been selected.

- Condition display

  The condition displays (max. 10) must be configured to show the step enabling conditions related to a step on the circuit display of the subgroup control block (see Chapter 5).

- Fault display

  Outputs 2 of the sequence block and 10 of the subgroup control block are set to “1” if time–out occurs. The time–out is also indicated on the loop display of the subgroup control block and on the group display.

☞ Set step and next step are only displayed in OS if the NRAT (process–related step name) parameter has been parameterized numerically.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value, step set	GS	1	AB
Time–out	LF	2	AB
Condition 1	BDG1	1	EB 3)
Condition 2	BDG2	2	EB 3)
Condition 3	BDG3	3	EB 3)
Condition 4	BDG4	4	EB 4)
Condition 5	BDG5	5	EB 4)
Jump	SP	6	EB
Skip	SPUE	7	EB
Wait: ”1” Monitor: ”0”	WUE	8	EB
Time/TA	TWU	9	ID 2)
KB no. for jump	KBNR	10	ID

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Interconnection binary output area	GBA1	11	EB [1]
Interconnection binary output area	GBA2	12	EB [1]
Interconnection binary output area	GBA3	13	EB [1]
Interconnection binary output area	GBA4	14	EB [1]
Interconnection binary output area	GBA5	15	EB [1]
Process–related no. of the step	NRAT	16	S2
Condition display 1	AZ1	17	EB
Condition display 2	AZ2	18	EB
Condition display 3	AZ3	19	EB
Condition display 4	AZ4	20	EB
Condition display 5	AZ5	21	EB
Condition display 6	AZ6	22	EB
Condition display 7	AZ7	23	EB
Condition display 8	AZ8	24	EB
Condition display 9	AZ9	25	EB
Condition display 10	AZ10	26	EB

[1] Interconnect with Q.
[2] The input is parameterized with the quotient/scan time (cf. XB block).
[3] The inputs are logically ANDed.
[4] The inputs are logically ORed. The result of [3] is logically ANDed with the result of [4]. The result is the step enabling condition.

- Block list

```
   KB      1                  03. 03. 83/ 00. 41. 26. P: 1

 1 AB   GS    0               #                   N      27
 2 AB   LF    0               #                   N      28
 1 EB   BDG1  0                  P                        1
 2 EB   BDG2  1                  P                        2
 3 EB   BDG3  1                  P                        3
 4 EB   BDG4  1                  P                        4
 5 EB   BDG5  0                  P                        5
 6 EB   SP    0                  P                        6
 7 EB   SPUE  0                  P                        7
 8 EB   WUE   0                  P                        8
 9 ID   TWU        0                                      9
10 ID   KBNR       0                                C    10
11 EB   GBA1                       GB  ORPA  23      Q   11
12 EB   GBA2                       GB  ORPA  23      Q   12
13 EB   GBA3                       GB  ORPA  23      Q   13
14 EB   GBA4                       GB  ORPA  23      Q   14
15 EB   GBA5                       GB  ORPA  23      Q   15
16 S2   NRAT                                             16
17 EB   AZ1   0             A    P                       17
18 EB   AZ2   0             A    P                       18
19 EB   AZ3   0             A    P                       19
20 EB   AZ4   0             A    P                       20
21 EB   AZ5   0             A    P                       21
22 EB   AZ6   0             A    P                       22
23 EB   AZ7   0             A    P                       23
24 EB   AZ8   0             A    P                       24
25 EB   AZ9   0             A    P                       25
26 EB   AZ10  0             A    P                       26
```


KBK

Sequence block for power plants

Application

This block is used as a step block in a sequencing control (GK control sequence).
The block can only be used together with the other blocks of the GK control system.

Method of Operation

The KBK sequence block is the smallest functional unit of a sequencer, and contains the condition check and command output of a step.

If the conditions (inputs) checked by the KBK block of the subsequent sequence have been met, the current step is considered as “Set step”, commands are issued and the controller continues with the next step.

The following modes can be selected:

– Skip (highest priority)

  The KBK is skipped, i.e. not executed further, if the SPUE input has been set. The KBK block is exited with RETURN, without further execution taking place.

  If SPUE = 1, after the KBK has logged on as “Next step”, the following KBK is made to log on as “AS”, the step change identifier SWK in the GK is set and the step time counting is restarted (the step change resets the counter). Cf.: Target jumping (SPUE = 1 in the target invokes different behaviour in the sequence execution).

– Target jumping

  The sequencer jumps to a different step if a BDSP input has been set.

  No other conditions (inputs BDG1 to BDG5) are processed, no commands (GBA1 to GBA5) are issued.

  The sequence control jumps to the step parameterized in KBNR. The external KBK name of the target step, which KBK.CHECK converts into the internal address, is entered here.

  KBNR must be parameterized with a blank to cancel the target step.

  SPUE = 0 has been parameterized in the target KBK (no step skipped): The target step is marked as “Set step”; its conditions remain unchecked. The command outputs are set (only if the associated GK is in automatic mode) and the step registered as “Set step”. The blocks after this target step up to the next KBK, which is then considered as new “Current step”, are executed in the next AS cycle. The last “Set step” is reset when the steps change.

  SPUE = 1 has been parameterized in the target GK (step skipped): the target is not marked as “Set step”; the controller continues after the target in the next cycle (as above); the last GS remains set until a new step is set.

– Normal operation (lowest priority, neither BDSP nor SPUE have been set). Step enabling conditions, waiting/monitoring time, and command outputs are processed in this mode.

If the KBK is executed for the first time after a step change, it registers as “Next step”. A step change is notified by the GK block (after the sequence has been started) or by the last step when the latter is set (advancing) using SWK = 1 (GK–PASA).

A registration as “Next step” means:

– Entering name and pointers in the GK;
– Entering the monitoring time in the GK, if it has been parameterized and “Monitoring” has been selected.

After the sequence has been executed, the “Next” step block jumps to the end of the sequence by setting the sequence list pointer behind the last KEK.

As long as a step is “Next step”, its conditions (AZ1 – AZ10) are shown on the GK loop display. Only valid (interconnected) conditions are displayed. The first input which has not been interconnected will suppress the display of all further inputs.

- Step enabling conditions

The step enabling conditions are checked in the current step block. If they have been met, i.e.

(BDG1 AND BDG2 AND BDG3) OR BDG4 OR BDG5 = 1

the step is considered as being set (after the –> waiting time has elapsed, if applicable):

– The command outputs (the parameters interconnected with GA1 to GA5) are set (only in automatic mode of the GK).
– A time–out is reset.
– Output GS is set.
– The KBK registers as “Set step” in the GK (name and pointer).
– The step time counter in the GK is reset.
– The execution pointer GZEI in the GK is set after the step currently set; in the AS cycle, the will execute the blocks following the step currently set.

– The step change identifier is set; the following “Next step” can register
– The previous step is reset (command outputs and GS output).

- Waiting time

Waiting time is the minimum time which a step must last, independent of any step enabling conditions. The sequence can only advance after this time has elapsed. The time value (in AS cycles) is set at input TWU, input WUE must be set to “1” (= waiting).

- Monitoring time

Monitoring time is the maximum time which a step should last. A “Time–out error” will be indicated if the step enabling conditions have not been met after this time has elapsed. This alarm will be present at an LF output of the current KBK and at the LF output of the GK. “Time–out” is also indicated on the GK loop display and transferred via STATUS to the QS (I&C alarm). This alarm must be acknowledged in the OS.

After the step enabling conditions have been met (delayed), the sequence will advance automatically (as usual). The time–out alarm is then removed. The time (in AS cycles) is set at input TWU, input WUE must be set to “0” (= monitoring).

☞ Set step and next step are only displayed in OS if the NRAT (process–related step name) parameter has been parameterized numerically.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type	Default values	Con–figuration details
1B = step has been set	GS	1	AB		
1B = time–out	LF	2	AB		
Step enabling condition 1 AND ...	BDG1	1	EB		3)
Step enabling condition 2 AND ...	BDG2	2	EB		3)
Step enabling condition 3 AND ...	BDG3	3	EB		3)
Step enabling condition 4 OR ...	BDG4	4	EB		4)
Step enabling condition 5	BDG5	5	EB		4)
Jump to target	BDSP	6	EB		
Skip condition	SPUE	7	EB		
Mode 0 = monitoring Mode 1 = waiting	WUE	8	EB		
Time for WUE, in cycles	TWU	9	ID		2)
Name of target KBK (acc. to BDSP)	KBNR	10	S2		
Command output 1	GBA1	11	EB		1)
Command output 2	GBA2	12	EB		1)
Command output 3	GBA3	13	EB		1)
Command output 4	GBA4	14	EB		1)
Command output 5	GBA5	15	EB		1)
Process–related step name	NRAT	16	S2		
Condition display criterion 1	AZ1	17	EB		
Condition display criterion 2	AZ2	18	EB		
Condition display criterion 3	AZ3	19	EB		
Condition display criterion 4	AZ4	20	EB		
Condition display criterion 5	AZ5	21	EB		
Condition display criterion 6	AZ6	22	EB		
Condition display criterion 7	AZ7	23	EB		
Condition display criterion 8	AZ8	24	EB		
Condition display criterion 9	AZ9	25	EB		
Condition display criterion 10	AZ10	26	EB		

1) Interconnect with Q.
2) The input is parameterized or interconnected with the quotient parameter/scan time (cf. XB block).
3) The inputs are logically ANDed.
4) The inputs are logically ORed. The result of 3) is logically ANDed with the result of 4). The result is the step enabling condition.

- Block list

```
   KBK     1                                          P: 1

 1 AB  GS   0                 #                         27
 2 AB  LF   0                 #                         28
 1 EB  BDG1 0                    P                       1
 2 EB  BDG2 1                    P                       2
 3 EB  BDG3 1                    P                       3
 4 EB  BDG4 1                    P                       4
 5 EB  BDG5 0                    P                       5
 6 EB  BDSP 0                    P                       6
 7 EB  SPUE 0                    P                       7
 8 EB  WUE  0                    P                       8
 9 ID  TWU  0                                            9
10 S2  KBNR                                     C       10
11 EB  GBA1 0                    P                 Q    11
12 EB  GBA2 0                    P                 Q    12
13 EB  GBA3 0                    P                 Q    13
14 EB  GBA4 0                    P                 Q    14
15 EB  GBA5      0               P                 Q    15
16 S2  NRAT                                             16
17 EB  AZ1  0              A     P                      17
18 EB  AZ2  0              A     P                      18
19 EB  AZ3  0              A     P                      19
20 EB  AZ4  0              A     P                      20
21 EB  AZ5  0              A     P                      21
22 EB  AZ6  0              A     P                      22
23 EB  AZ7  0              A     P                      23
24 EB  AZ8  0              A     P                      24
25 EB  AZ9  0              A     P                      25
26 EB  AZ10 0              A     P                      26
```

KE

Sequence ending block

Application

This block is used as the end of a sequence cascade for power plant or industrial process systems.

Method of Operation

The sequence ending block is the last block in a sequence cascade and signals the end of a sequence to the operator communication block or the subgroup control block.

- Data structure (designation of inputs and outputs)

  There is no data structure, as the sequence ending block only has an organizational function.

  If an S block is used, the associated operator communication block is switched off automatically and set to STOP mode.

  If a G block is used, the return data “ON” or “OFF” is set. The last step of the branch remains set. The mode is retained.

- Block list:

  not applicable.

KEK

Sequence ending block for power plants

Application

This block is used as the sequence ending block in a sequencing control (GK control sequence).

The block can only be used together with the other blocks of the GK control system (cf. GK block description).

Method of Operation

The KEK block marks the end of a (shutdown or operation) sequence branch.

The program is considered solved and the sequence reset when the KEK block in a branch has been reached:

– the flags “Next step”, conditions, monitoring time are cleared; the step run–time counter is stopped and cleared.
– the program memory of the shutdown and operation branch and the display “Previous step” are retained.

- Data structure

  There is no data structure as the sequence ending block only has an organizational function

- Block list:

  not applicable.

KS

Sequence stepper block

Application

This block is used as a step in a sequencing control for industrial process systems.

Method of Operation

The sequence stepper block is the smallest functional unit of a sequence, and contains the conditions and commands of a step.

- NAME of the KS block

  The following points should be observed when defining a KS block:

  – NAME is numeric (KS.1, KS.123):
  The KS block can be specified as ZS target step (in an S block) or as jump target (in a KS block).

  – NAME is alphanumeric (KS.OFEN, KS.GAS1):
  The KS block cannot be used as a jump target. It can only be used within a linear sequence (or sub–sequence).

  ☞ The S block doesn't clear the GS output of the last KS block at shutdown or sequence end if the name of this KS is not numerical.

  – Only three characters may be used as a block name when the block is displayed on an OS system using NORA.

- Conditions

  The following conditions are processed in the sequence stepper block:

  – Step enabling conditions

  The step enabling conditions are used to determine at which point the commands of a step may be issued and at which point the sequence advances to the next step. The STEP–M language is used to program step enabling conditions (cf. STEP block).

  The last logic result (VKE) determines the point at which the controller advances to the next step.

  – Jump condition

  A jump condition determines whether or not the program jumps to a different step.

  Forward and backward jumps are possible within a sequence. The program jumps to the jump target parameterized via input 6 if input 5 has been set to “1”. The sequence processing is then continued with the sequence block specified by the jump target and the last “Set step” (GS) is retained.

  – Skip condition

  A skip condition determines whether or not a sequence block is skipped. The program jumps to the next sequence block if a “1” is applied to input 4. The step where the skip condition is met is not executed.

– Condition priorities

The conditions have the following priorities:

Jump condition:	Priority 1
Skip condition:	Priority 2
Step enabling condition:	Priority 3

The STEP–M program is not affected by these conditions, and is always executed.

- Command outputs

The commands are issued after the step enabling conditions have been met. The following cases are possible:

– Standard outputs (for digital output modules)

These outputs are set if the last logic result of the STEP–M commands is “1”. The number of set outputs (max. 5) is parameterized via input 7.

Addresses of GB areas can be interconnected with inputs 8 to 12 (GBAi) in order to output the states via digital output modules (BAU).

☞ If an output has been set, it is reset by the last logic result of the subsequent sequence stepper block. The connected STEP–M program is always executed if this KS is “Current step”, regardless of the conditions (BDSP, SPUE).

– Using the STEP–M language to control outputs (for binary outputs modules).

The set and reset commands of the STEP–M language can be used to set or reset the digital output modules.

☞ Outputs which have been set or reset are not automatically reset or set, as is the case with standard outputs.

– Block outputs

Outputs 1 to 4 may be controlled by STEP–M commands in a similar fashion as with the STEP–M block. This allows additional function blocks to access the sequence stepper block (e.g. closed–loop controller block).

- Condition display

Inputs 1 to (max.) 10 of the condition display must be configured using the Q command if the step enabling conditions associated with a step are to be displayed in the circuit display of the operator communication block (cf. Chapter 5).

- Step group control

Input 1 of the first sequence stepper block in a group is set to “1”.

- Command inhibit

  The commands issued by this step can be disabled by setting input 2 to “1”.

- Fault display

  Input 3 must be configured in order to show the step–related fault display in the loop display of the operator communication block.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value 1	AW1	1	AB
Output value 2	AW2	2	AB
Output value 3	AW3	3	AB
Output value 4	AW4	4	AB
Acknowledgement request	QS	5	AB
Step has been set	GS	6	AB
Control step groups ”1”	SG	1	EB
Command inhibit ”1”	BS	2	EB
Fault display ”1”	F	3	EB
Skip condition	BDUE	4	EB
Jump condition	BDSP	5	EB
Jump target	SPNR	6	ID [2]
Number of standard outputs	ASA	7	I
GB address for a binary output	GBA1	8	EB [1]
” ” ” ”	GBA2	9	EB [1]
” ” ” ”	GBA3	10	EB [1]
” ” ” ”	GBA4	11	EB [1]
” ” ” ”	GBA5	12	EB [1]
Condition display 1	AZ1	13	EB
Condition display 2	AZ2	14	EB
Condition display 3	AZ3	15	EB
Condition display 4	AZ4	16	EB
Condition display 5	AZ5	17	EB
Condition display 6	AZ6	18	EB
Condition display 7	AZ7	19	EB
Condition display 8	AZ8	20	EB
Condition display 9	AZ9	21	EB
Condition display 10	AZ10	22	EB
STEP program to be called	STEU	23	EA [1]
Multiplex input 1	GAX	24	EA [1]
” 2	GBX	25	EB [1]
” 3	GMX	26	EB [1]
” 4	GTX	27	EA [1]
” 5	DSX	28	EA [1]
Multiplex “1”	MPX	29	PB

[1] Address, interconnect with Q (`Q,inputno,type,no,elno;`)
[2] External number (name) of KS block. “1” must be parameterized if the jump signal is to be cleared.

- Block list

```
   KS      1                  03. 03. 83/ 00. 42. 31. P: 1

 1 AB  AW1  0                 #                   N     29
 2 AB  AW2  0                 #                   N     30
 3 AB  AW3  0                 #                   N     31
 4 AB  AW4  0                 #                   N     32
 5 AB  QS   0                 #                   N     33
 6 AB  GS   0                 #                   N     34
 1 EB  SG   0                    P                       1
 2 EB  BS   0                    P                       2
 3 EB  F    0                    P                       3
 4 EB  BDUE 0                    P                       4
 5 EB  BDSP 0                    P                       5
 6 ID  SPNR    0                                C        6
 7 I   ASA     0                                         7
 8 EB  GBA1 0                    P                       8
 9 EB  GBA2 0                    P                       9
10 EB  GBA3 0                    P                      10
11 EB  GBA4 0                    P                      11
12 EB  GBA5 0                    P                      12
13 EB  AZ1  0                                      Q    13
14 EB  AZ2  0                                      Q    14
15 EB  AZ3  0                                      Q    15
16 EB  AZ4  0                                      Q    16
17 EB  AZ5  0                                      Q    17
18 EB  AZ6  0                                      Q    18
19 EB  AZ7  0                                      Q    19
20 EB  AZ8  0                                      Q    20
21 EB  AZ9  0                                      Q    21
22 EB  AZ10 0                                      Q    22
23 EA  STEU 0.0000                              C  Q    23
24 EA  GAX  0.0000                              C  Q    24
25 EB  GBX  0                                   C  Q    25
26 EB  GMX  0                                   C  Q    26
27 EA  GTX  0.0000                              C  Q    27
28 EA  DSX  0.0000                              C  Q    28
29 PB  MPX  0                                           35
```

KV

Sequence branching block

Application

This block is used in industrial processes for splitting a sequence cascade into various branches (up to 6 are possible).

Method of Operation

In the sequence branching block, the user specifies the sequence step to which the program is to jump (branch). The KS block whose numbers are entered in the parameters VZW1 to VZW6 are processed in the same step as the KV block. The sequence continues after the first KS block in which the step enabling conditions are met. The KS block sequence in the VZW1 to VZW6 parameter list defines how the sequence is to be continued if several blocks meet the step enabling conditions simultaneously. The block to which the program has jumped becomes set step.

Forward and backward jumps are possible within a sequence.

No branching is possible in mode “SO”.

The number of branches (max. 6) is specified via input 1.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Number of branches	AZVW	1	I
Step number	VZW1	2	EAV
Step number	VZW2	3	EAV
Step number	VZW3	4	EAV
Step number	VZW4	5	EAV
Step number	VZW5	6	EAV
Step number	VZW6	7	EAV

- Block list

```
   KV      1                03. 03. 83/ 00. 43. 44. P: 1

 1 I   AVZW     0                             C        1
 2 EAV VZW1 0.0000                            C        2
 3 EAV VZW2 0.0000                            C        3
 4 EAV VZW3 0.0000                            C        4
 5 EAV VZW4 0.0000                            C        5
 6 EAV VZW5 0.0000                            C        6
 7 EAV VZW6 0.0000                            C        7
```

LAYO

Form output block

Application

This block is used for performing user–specific outputs to VDU and printer.

Method of Operation

LAYOUT blocks are user blocks structured with display and logging commands. A block definition is only possible if the keyswitch on the process communication keyboard is in position 3.

LAYOUT blocks may not be installed in a block sequence. Only display/log output blocks can be used for installation in a block sequence. Different outputs may be initiated by parameterizing the display/log output block accordingly.

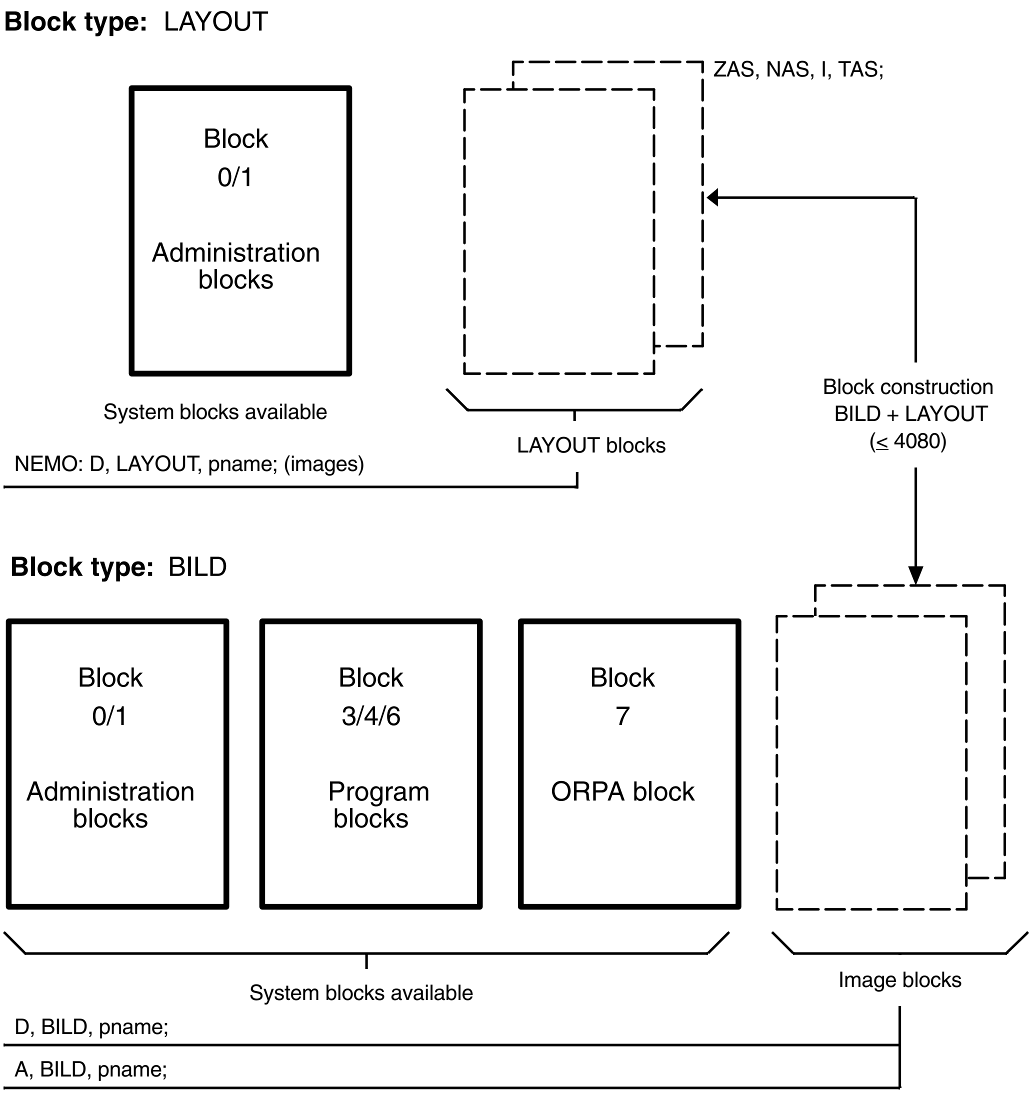


Fig. 9.115 Block structure for image output

A LAYOUT block requires a previously defined BILD block. These two blocks can only be executed together. They may only be installed into a block sequence after both blocks have been configured properly and correctly.

The following configuration instructions can be used for LAYOUT blocks::

NEMO;

D,LAYOUT,pname;

– Instructions (display/log)

DE;

A,LAYOUT,pname;

```
– LS,lineno;
– EI,lineno;
  instruction;

– ER,lineno;
  instruction;

– F;

– Z;

– K;
```

AE;

L,LAYOUT,pname;

END;

LN

Logarithmic block

Application

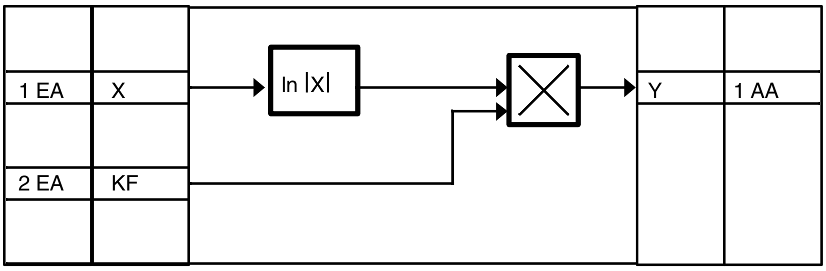
This block is used for logarithmic operations applied to an input variable.

Method of Operation

The logarithmic block follows the equation:

$Y = KF \cdot \ln |x|$ $\quad | \; |$ amount of
(ln: natural logarithm)

A system error message will be issued if X = 0 (see fault display list).



KF Constant value
X Input variable
Y Output variable

Fig. 9.116 Logarithmic block; logic diagram

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
Input variable	X	1	EA
Factor	KF	2	EA

- Block list

```
   LN      1                03. 03. 83/ 00. 44. 23. P: 1

 1 AA  Y    0.0000          #                   N      3
 1 EA  X    0.0000             P                       1
 2 EA  KF   1.0000             P                       2
```


M

Measured value monitoring block

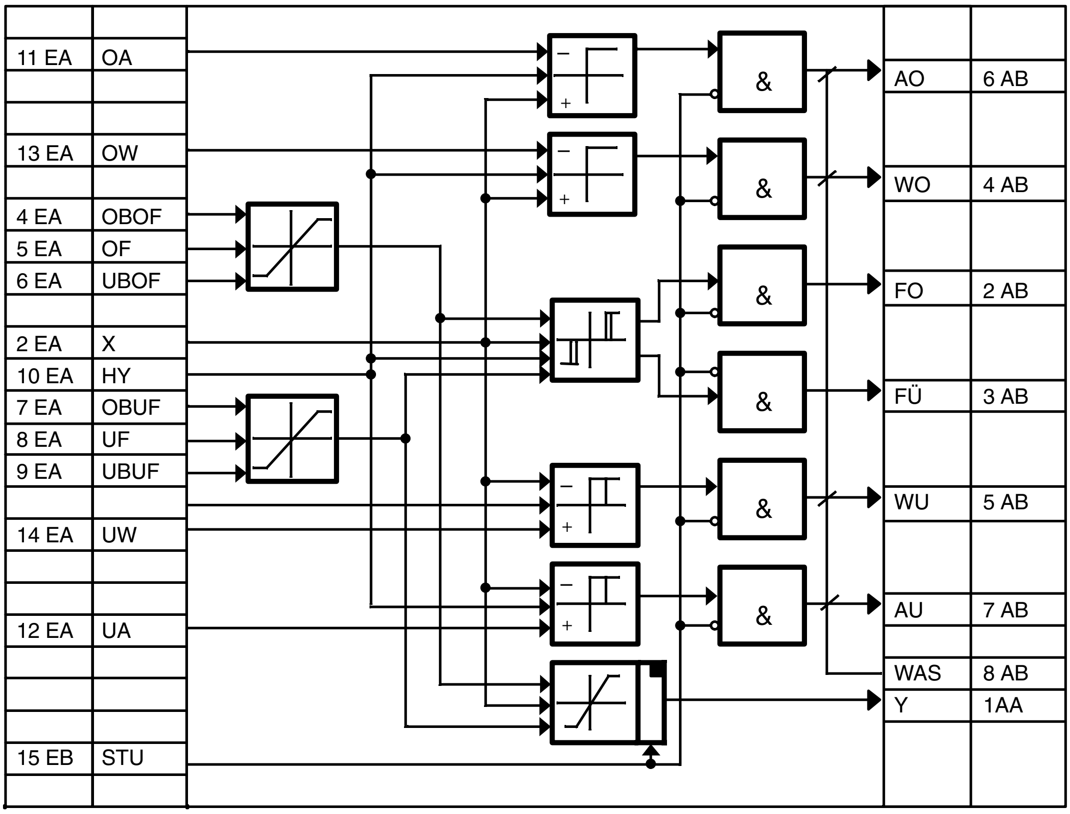
Application

Monitoring a measured value for three pairs of limit values
(error limits, warning limits and alarm limits).

Expanding a controller block for limit value monitoring, if the pair of limit values in a controller is insufficient.

Limitation of the measured value to the error limits

Method of Operation (Figs 9.117 and 9.118)



AO	Upper alarm signal	UA	Lower alarm limit
AU	Lower alarm signal	UBOF	Lower control limit of OF
FO	Upper error signal	UBUF	Lower control limit of UF
FU	Lower error signal	UF	Lower error limit
OA	Upper alarm limit	UW	Lower warning limit
OBOF	Upper control limit of OF	WAS	Warning alarm status
OBUF	Lower control limit of UF	WO	Upper warning signal
OF	Upper error limit	WU	Lower warning signal
OW	Upper warning limit	X	Measured value
STU	Interference suppression	Y	Output value

Fig. 9.117 M block; logic diagram

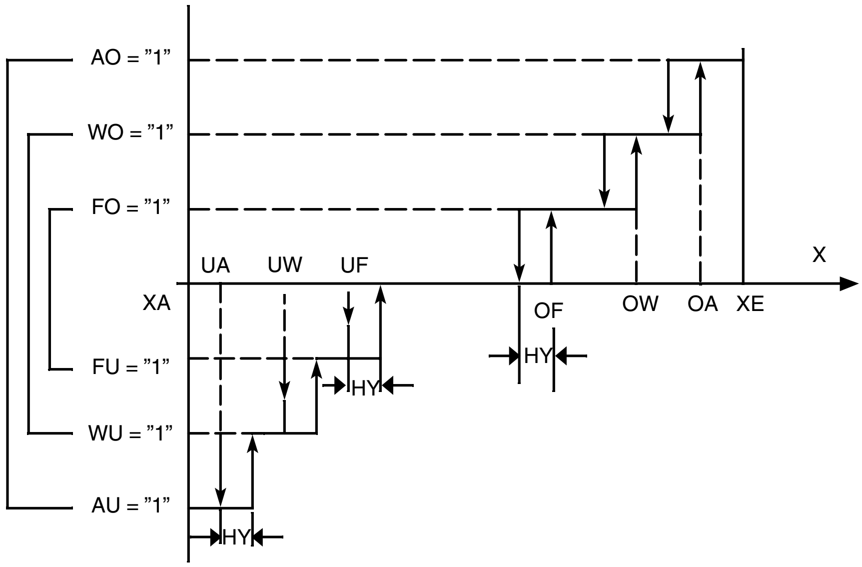
The limit values OF and UF (error limits) of the measured value X, which can be within the signal span (X_A - X_E) are monitored (limit value generation with hysteresis) by a comparator. The limit values OF and UF, which may be altered via the process communication keyboard, can be configured in the ranges UBOF to OBOF and UBUF to OBUF respectively. Four additional comparators are used to monitor the warning and alarm limits (limit value generation with hysteresis). One common hysteresis value is specified for all limit values.

The six alarm outputs, the WAS output and the block status output may be disabled via “interference suppression” (STU). This feature can be used for batch processes, for example; all these outputs are then set to “0”.

The controller input “Warning alarm status” (WAS, R block) is interconnected with output WAS of the M block (Fig. 9.119). The normalized representation in the group display must then be suppressed by setting NRPL = 0 and the status output by setting US = 1. The M block operates as slave.

The measured value is present at output (Y). It is, however, limited to the operator–controllable error limits (OF and UF). This is also the case for STU = 1.

The status output to the CS 275 bus subsystem can be suppressed by setting US = ”1”. US = ”1” does not effect the signals WO, WU, AO, AU, FO, FU and WAS.



AO	Upper alarm signal	OF	Upper error limit
AU	Lower alarm signal	OW	Upper warning limit
FO	Upper error signal	UA	Lower alarm limit
FU	Lower error signal	UF	Lower error limit
HY	Hysteresis (same for all limit values)	UW	Lower warning limit
WO	Upper warning signal	OA	Upper alarm limit
WU	Lower warning signal		

Fig. 9.118 Measured value monitoring block; pairs of limit values

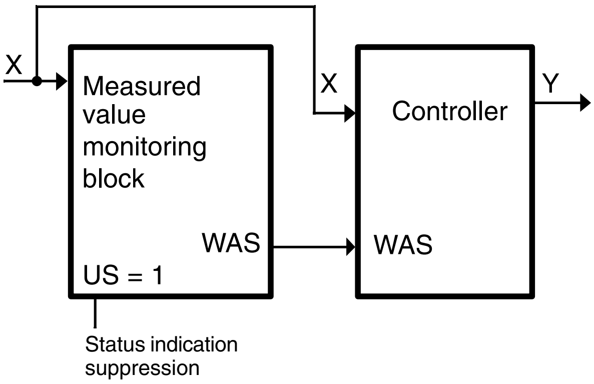


Fig. 9.119 Interconnection of an R block with an M block for limit value monitoring

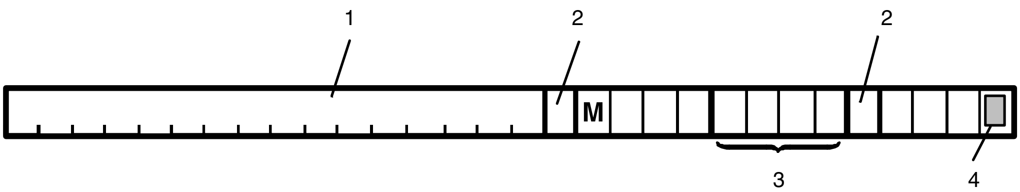
- Normalized representation in a group display

The block is represented by 30 characters at a specific location of a group display. Input 18 (group display: no./location no.) must then be parameterized as follows:

`P,18,nrpl;`

nrpl	=	100 · gpnr + plnr
plnr	=	location no. in the group display (1 – 56)
gpnr	=	Group display no. (1 – 56)

Set input 18 NRPL to “0” if the normalized representation of the block in a group display is to be suppressed.



1 Process–related name of the M block, as in loop display
2 Separating blank
3 Name/number of M block
4 Blinking mark if an alarm signal or “External fault” is active

Fig. 9.120 Measured data monitoring block; normalized representation in a group display

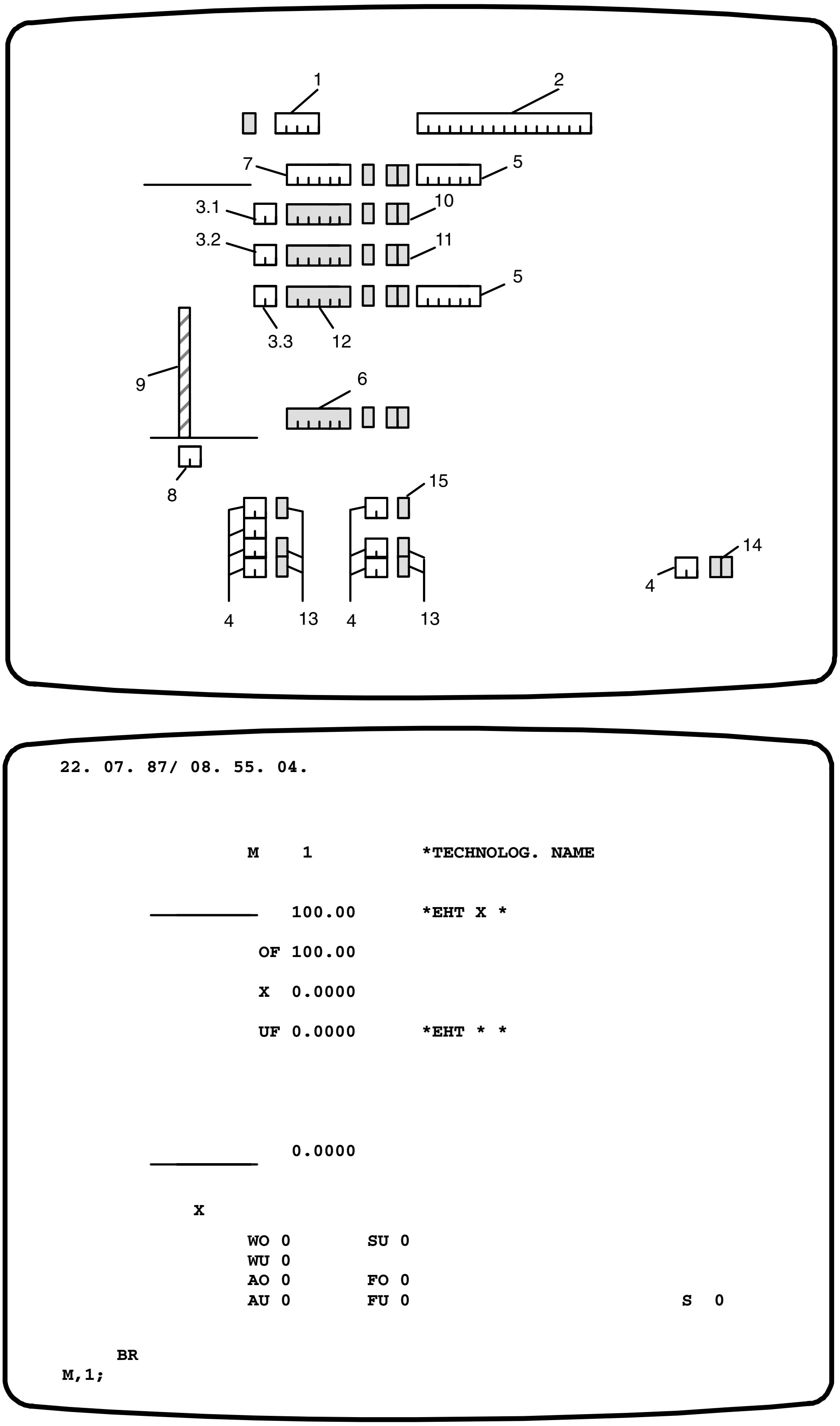


Fig. 9.121 Measured value monitoring block; normalized representation of the loop display

- Normalized representation of the loop display

  The loop display (Fig. 9.121) contains static and dynamic data:

  Static data

  1 Mnemonic name and number of M block
  2 Process–related name of M block
  3.1 Measured value OF [1)]
  3.2 Measured value X [1)]
  3.3 Measured value UF [1)]
  4 Alarm signals (WO, WU, AO, AU, FO, FU, S) [1)], STU signal
  5 Physical unit of the measured value
  6 Lower range limit
  7 Upper range limit
  8 Mnemonic name of the bar (X) [1)]

  Dynamic data

  9 Measured value as bar (analog display)
  10 Upper error limit OF (digital display)
  11 Measured value X (digital display)
  12 Lower error limit UF (digital display)
  13 Alarm states (”1” indicates a limit value violation)
  14 State “External fault” (”1” indicates that a fault has occurred)
  15 Status interference suppression STU

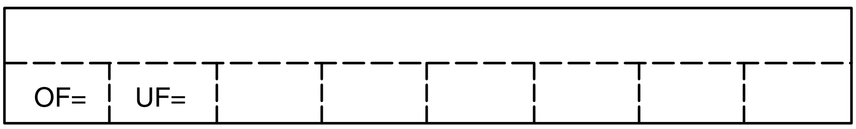
  [1)] Pre–defined mnemonic name

- Operator input using the process communication keyboard

  Two keys (OF =) and (UF =) are assigned after the loop display has been selected and the key “Operator input” (BE) depressed. After the (OF =) or (UF =) key has been depressed, a sequence of numbers may be entered and terminated by pressing the execute key (◈).

  The “More” (↑) or “Less” (↓) keys may be pressed to continue, without figures having been entered previously. The execute key (◈), normally required for termination, need not be pressed in this case. The “More” (↑) and “Less” (↓) keys also become effective after an input which has been terminated by execute key (◈). They then refer to the last control parameter to have been entered.

  The change is approximately 1% of the measuring span per processing cycle. If a greater change is required, the appropriate key, either “More” (↑) or ”Less” (↓) should be pressed together with the “High–Speed” (~) key. The change is then approximately 10% or the measuring span per processing cycle.



OF Upper error limit
UF Lower error limit

Fig. 9.122 M block, automatic labeling of the process communication keyboard

- Data structure (designation of inputs and outputs)

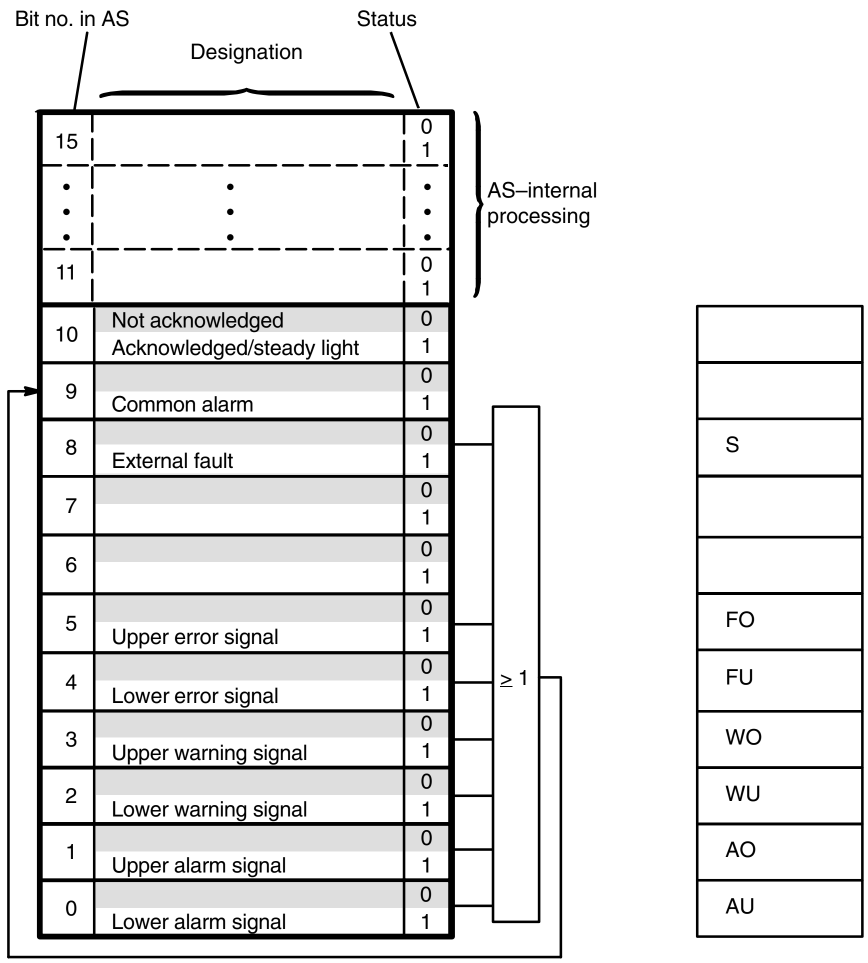
Meaning		Mnemonic name	Input/Output No.	Type
Limited value		Y	1	AA
Upper error signal	”1”	FO	2	AB
Lower error signal	”1”	FU	3	AB
Upper warning signal	”1”	WO	4	AB
Lower warning signal	”1”	WU	5	AB
Upper alarm signal	”1”	AO	6	AB
Lower alarm signal	”1”	AU	7	AB
Warning alarm status		WAS	8	AB
Upper range limit		XE	1	EA
Measured value		X	2	EA
Lower range limit		XA	3	EA
Upper control limit	OF	OBOF	4	EA
Upper error limit		OF	5	EAV
Lower control limit	OF	UBOF	6	EA
Upper control limit	UF	OBUF	7	EA
Lower error limit		UF	8	EAV
Lower control limit	UF	UBUF	9	EA
Hysteresis		HY	10	EA
Upper alarm limit		OA	11	EA
Lower alarm limit		UA	12	EA
Upper warning limit		OW	13	EA
Lower warning limit		UW	14	EA
Interface suppression	”1”	STU	15	EB
External fault		S	16	EB
Suppression status output ”1”		US	17	EB
Group display: no./location no.		NRPL	18	ID
Cf. loop display		TOF	19	S2
”		TX	20	S2
”		TUF	21	S2
”		TWO	22	S2
”		TWU	23	S2
”		TAO	24	S2
”		TAU	25	S2
”		TFO	26	S2
”		TFU	27	S2
”		TS	28	S2
”		EHTX	29	S
”		EHT	30	S
”		AT	31	S16

- Block list

```
   M       1                 15. 08. 84/ 10. 41. 23. P: 1

 1 AA  Y    0.0000           #                   N      31
 2 AB  FO   0                #                   N      32
 3 AB  FU   0                #                   N      33
 4 AB  WO   0                #                   N      34
 5 AB  WU   0                #                   N      35
 6 AB  AO   0                #                   N      36
 7 AB  AU   0                #                   N      37
 8 AB  WAS                         4             N      38
         0  0                #
         1  0                #
         2  0                #
         3  0                #
 1 EA  XE   100.00              P                        1
 2 EA  X    0.0000              P                        2
 3 EA  XA   0.0000              P                        3
 4 EA  OBOF 100.00              P                        4
 5 EAV OF   100.00                             CB        5
 6 EA  UBOF 0.0000              P                        6
 7 EA  OBUF 100.00              P                        7
 8 EAV UF   0.0000                             CB        8
 9 EA  UBUF 0.0000              P                        9
10 EA  HY   0.0000              P                       10
11 EA  OA   100.00              P                       11
12 EA  UA   0.0000              P                       12
13 EA  OW   100.00              P                       13
14 EA  UW   0.0000              P                       14
15 EB  STU  0                   P                       15
16 EB  S    0                   P                       16
17 EB  US   0                   P                       17
18 ID  NRPL      0                             C        18
19 S2  TOF  OF                                          19
20 S2  TX   X                                           20
21 S2  TUF  UF                                          21
22 S2  TWO  WO                                          22
23 S2  TWU  WU                                          23
24 S2  TAO  AO                                          24
25 S2  TAU  AU                                          25
26 S2  TFO  FO                                          26
27 S2  TFU  FU                                          27
28 S2  TS   S                                           28
29 S   EHTX *EHTX*                  6                   29
30 S   EHT  *EHT**                  6                   30
31 S16 AT   *TECHNOLOG. NAME       16                   45
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

AO	Upper alarm signal
AU	Lower alarm signal
FO	Upper alarm signal
FU	Lower alarm signal
S	Fault suppression
WO	Upper warning signal
WU	Lower warning signal

Fig. 9.123 Status word for the M block

MAX

Maximum value selector block

Application

This block is used for the maximum value generation of analog variables.

Method of Operation

The blocks follows the equation:

Y = MAX (X1, X2, X3)

It selects the arithmetically largest value from three input variables.

The binary outputs (X1MA, X2MA, X3MA) indicate the input variable with the largest value. The input with the smaller number has priority if several input variables are identical.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
X1 maximum "1"	X1MA	2	AB
X2 maximum "1"	X2MA	3	AB
X3 maximum "1"	X3MA	4	AB
Input variable	X1	1	EA
Input variable	X2	2	EA
Input variable	X3	3	EA

- Block list

```
   MAX     1                03. 03. 83/ 00. 46. 27. P: 1

 1 AA  Y     0.0000         #                   N      4
 2 AB  X1MA  0              #                   N      5
 3 AB  X2MA  0              #                   N      6
 4 AB  X3MA  0              #                   N      7
 1 EA  X1    0.0000            P                       1
 2 EA  X2    0.0000            P                       2
 3 EA  X3    0.0000            P                       3
```

MEL

Alarm signalling block

Application

This block is used for the output of configured messages to the

– message line of the VDU
– printer
– bus
– alarm buffer.

The MEL block stores the message line in a print buffer until it can be transferred to the printer or VDU. The number of messages which can be buffered can be selected via parameter 33 in the GA.ORPA block (default value is 21).

Method of Operation

The alarm output is activated via the digital control input (input 3, “SE”)
(SE = 0 → 1 : M + /SE = 1 → 0 : M –).

Input 4 (”MUWE”) is used to select either the analog value (input 1, ”X”), the binary value (input 2, ”BW”) or the text in the configurable S8 string (input 11, “S8AD”) for output.

“MUWE = 0”:	Output of analog and binary value. (Caution: Analog values with an exponent > 9 will always be suppressed)
“MUWE = 1”:	No output of analog or binary value
“MUWE = 2”:	Output of analog and binary value and of the S8 string interconnected with input 11 (instead of MELxxxxx)
“MUWE = 3”:	No analog or binary value output; the S8 string interconnected with input 11 is output instead of MELxxxxx.

The message output can be suppressed via input 5 (MU).

“MU = 1”:	All message outputs are suppressed.
“MU = 0”:	Message output to VDU, printer and bus and STRT.MEAP

Input 6 (FORM) defines whether the message output is triggered by a signal transition of the control input (SE):

“0”	→	”1”	input 6 = 0
“1”	→	”0”:	input 6 = 1 (trailing edge)
“0”	→	”1”	and
“1”	→	”0”:	input 6 = 2 (leading and trailing edge)

VDU output can be selected/deselected via input 8 (MUSG).

“MUSG = 0”:	Message output on VDU
“MUSG = 1”:	No message output on VDU

Inputs 9 and 10 are used to specify the printing devices. The back–up device (”ERDR”) is only activated if the main device (”DRNR”) is defective.

“DRNR/ERDR = 0”:	No printer output
“DRNR/ERDR = 1”:	Message output on printer 1
“DRNR/ERDR = 2”:	Message output on printer 2
“DRNR/ERDR = 3”:	Message output on printer 3
“DRNR/ERDR = 4”:	Message output on printer 4

An S8 string with any optional text can be interconnected with input 11 (”S8AD”). This S8 string will be output or suppressed, depending on the parameterization of input 4.

Input 12 (”PUAU”) is used to define whether or not the message is to be stored in a user–specific buffer (STRT.MEAP) (see Chapter 8.4.1). This buffer can be accessed by a TML program; independent message processing can be performed.

”PUAU = 0”: No message output to user–specific buffer
”PUAU = 1”: Message output to user–specific buffer

Output 1 (”MA”) is set after a message output has been terminated properly. The output can be reset in user–specific manner, e.g. by interconnection with an XA block.

The following items are output via printer, monitor, bus and/or user–specific buffer:

	selectable
Time (hours, minutes, seconds)	
Number of MEL block or S5 string	x
Message text	
Analog value	x
Binary value	x
Reference to incoming (+) or outgoing (–) message	

Representation on the message line of a monitor:

```
11.  22.  47.   MEL   BKE   BK–KOPPEL.GEST.    0.000  1  M+
11.  22.  48.   MEL   BKE   BK–KOPPEL.GEST.    0.000  1  M -
```

1 2 3 4 5

1 Time
2 MEL xxxx or S8 string
3 Message text (S16 string)
4 Output of analog or binary value
5 Reference to incoming (+) or outgoing (–) message

The message is preceded by the up–to–date date of the printer (own system or message receiver connected to the bus) if output on a printer.

Representation on a printer:

```
05. 03. 92/11.  22.  47 MEL   BKE BK-KOPPEL.GEST.   0.000 1  M+
```

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Message output ready	MA	1	AB
Analog value	X	1	EA
Binary value	BW	2	EB
Control input	SE	3	EB
Message suppression ”values”	MUWE	4	I
Message suppression	MU	5	EB
Message if ”0→1/1→0/0→1→0”	FORM	6	I
Message text	TEXT	7	S16
Message suppression “VDU”	MUSG	8	EB
Printer channel	DRNR	9	I
Back–up printer channel	ERDR	10	I
Extended message text	S8AD	11	EA
Message output “buffer”	PUAU	12	EB

- Block list

```
    MEL     1                 03. 03. 83/ 00. 46. 48. P: 1

  1 AB  MA   0                #                   N     13
  1 EA  X    0.0000              P                       1
  2 EB  BW   1                   P                       2
  3 EB  SE   0                   P                       3
  4 I   MUWE      0                                      4
  5 EB  MU   0                   P                       5
  6 I   FORM      0                                      6
  7 S16 TEXT                         16                  7
  8 EB  MUSG 0                   P                       8
  9 I   DRNR      1                                      9
 10 I   ERDR      2                                     10
 11 EA  S8AD                       MEL ORPA TEXT   Q    11
 12 EB  PUAU 0                   P                      12
```


MIN

Minimum value selector block

Application

This block is used for extreme value generation (MIN) of analog variables.

Method of Operation

The blocks follows the equation:

Y = MIN (X1, X2, X3)

It selects the arithmetically smallest value from three input variables. The binary outputs (X1MI, X2MI, X3MI) indicate the input variable with the smallest value.

The input with the smaller number has priority if several input variables are identical.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
X1 minimum “1”	X1MI	2	AB
X2 minimum “1”	X2MI	3	AB
X3 minimum “1”	X3MI	4	AB
Input variable	X1	1	EA
Input variable	X2	2	EA
Input variable	X3	3	EA

- Block list

```
   MIN     1                 03. 03. 83/ 00. 47. 43. P: 1

 1 AA   Y     0.0000         #                   N      4
 2 AB   X1MI  0              #                   N      5
 3 AB   X2MI  0              #                   N      6
 4 AB   X3MI  0              #                   N      7
 1 EA   X1    0.0000            P                       1
 2 EA   X2    0.0000            P                       2
 3 EA   X3    0.0000            P                       3
```

MKE

Message coupling and receiver block

☞ The MKE block in the AS 235 is not identical to the MKE block in the MS 236 or AS 231. The functions of the MKE blocks from the two different system cannot be present together in one system.

Application

For reception of binary signals which are transmitted from another bus participant via the CS 275 bus system, as well as the time of transmission.

Method of Operation

The MKE block is used to receive and process the messages of a message coupling and transmitter block (MKS) with 32 binary signals transmitted from another bus participant via the CS 275 bus system, as well as the time of transmission.

- Block definition

  Only numbers between 1 and 4095 are permissible as the block name when defining an MKE block. Only numbers up to 255 can be used for the coupling to an AS 220 EAI because of the block number limit present in this system.

- Establishment of coupling

  The coupling to the MKS block is established from the selected MKE block.

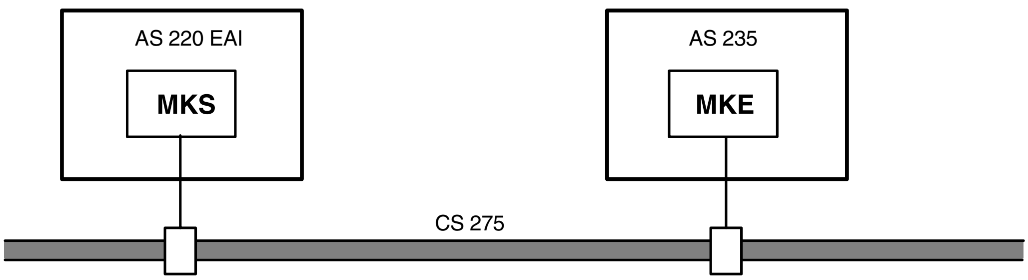


Fig. 9.124 Establishment of coupling, example

The transmitting participant and the block name of the MKS block are defined by the following configuring instruction.

KD,bus no,participant no,MKS,bname;

bus no:	Bus number
participant no:	Participant number
bname:	Block name, only numbers between 1 and 4095 are permissible (only up to 255 with AS 220 EAI)

Only a direct coupling is possible between MKS and MKE blocks, a common data coupling is not permissible. The specified MKS block must already be defined and addressable via the bus system when the coupling is established. The bus/participant numbers and the block name of the coupled MKS block are displayed in the BUSX and BSTX parameters in the MKE block.

- Updating

  An MKS message (see Fig. 9.125) generates an internal system interrupt in the receiving AS. This interrupt has a high priority and results in setting of the output AKT and restoring of the message into the binary data field connected to the parameter GBA. Evaluation of the received message and transmission of the curent data into the outputs and display parameters of the MKE block (if the MKE block is installed in a cycle) also take place cyclically in addition to this acyclic acquisition of MKS messages.

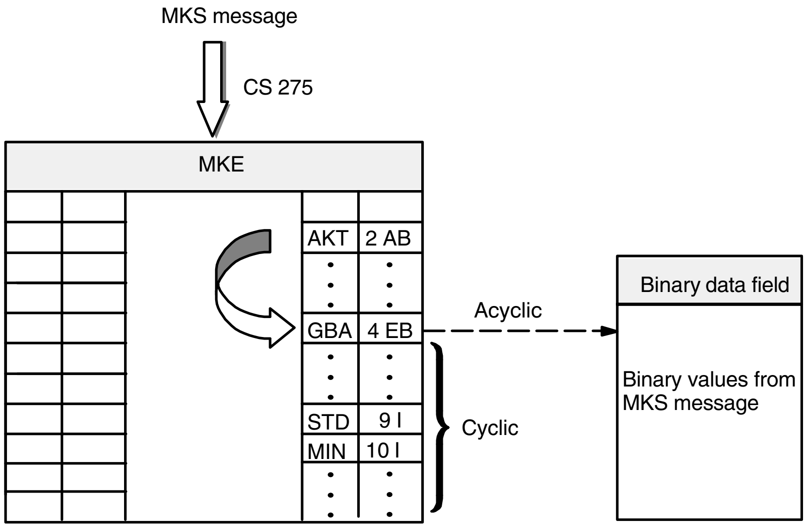


Fig. 9.125 Updating of MKE block

– Acyclic updating at this time a message is received (parameters AKT and GBA)

  The acyclic updating interrupts the processing in the cycles. The driver sets the output AKT for the local bus interface module during the acyclic updating and directly transfers the binary values from the MKS message into the binary data field which is referred by the link at the input GBA. The acyclic transmission takes place independent of whether binary values have changed compared to the previously received MKS message. The 32 transmitted values are stored in the binary data field without gaps, starting at the initial address GBA. The acyclic updating in the MKE block corresponds to the mode of operation of the MKE block. The acyclic data transmission is omitted if the input GBA is not connected or if the linked binary data field is too short, and only the output AKT is set when the message is received. The alarm level (cycle 1) can be started by this output in that it is linked to an XA block which is installed prior to the MKE block in cycle 1. By starting the MKS processing in the alarm level, the other functions of the MKE block which are otherwise only carried out in cyclic processing can be activated at high priority as a reaction to the reception of an MKS message.

– Cyclic updating of MKE block installed in a cycle

  All outputs apart from the output AKT, and the parameters with input numbers 6 to 24, are updated cyclically. The advantage of cyclic updating is that the data remain unchanged and consistent throughout the complete cycle time in which the MKE block is processed. Processing of the data of the last MKS message as well as the auxiliary data provided by the MKE block can take place in the cycle in which the MKE block is also processed, uninfluenced by any other incoming MKS messages. The data of MKS messages arriving between the sampling points of the MKE block are collected and conditioned internally for the next cyclic MKE processing without disturbing the processing in the cycle. The cycle and the sampling time are freely selectable.

– Display of current binary values in outputs BI1 to BI32

  Following the processing of the MKE block, the outputs BI1 to BI32 contain the binary values of the last MKS message received prior to commencement of the cyclic processing of the MKE block.

– Display of current binary values as bit sequence in the analog parameters ZS, ZSW1 and ZSW2

  The same binary values present in the binary outputs BI1 to BI32 are additionally displayed as a bit sequence in parameter ZS. The binary values in the outputs BI1 to BI32 have significances of 2^0 to 2^{31} in the analog parameter ZS. The parameters ZSW1 and ZSW2 can be used to access the bit sequence in the ZS word–by–word. The values of the first 16 outputs (least–significant mantissa of ZS) are present in the parameter ZSW1, and the values of outputs BI17 to BI32 (most significant mantissa of ZS) in the parameter ZSW2.

– Display of modifications of binary outputs BI1 to BI32 using parameters AEN1 and AEN0

  The parameters AEN1 and AEN0 indicate whether at least one of the 32 binary outputs BI1 to BI32 has changed since the last cyclic processing. Changes in ths status from 0 to 1 are indicated by AEN1 = 1 and changes in the status from 1 to 0 by AEN0 = 1.

– Display of multiple changes in signal in one cycle by means of parameter FLAT

  The parameter FLAT indicates a multiple change (chatter) in at least one of the 32 binary signals in a sequence of MKS messages which have been received since the last cyclic updating. It is not necessary in all cases for a change to take place at outputs BI1 to Bi32 at the time of cyclic processing, or for a modification display to be set in AEN0 or AEN1, because only the last received message is displayed in the cyclically updated outputs.

– Output of modifications in the MKS message in the output AEN

  The output AEN indicates that a modification in a message compared to the previously received message has occurred at least once since the last cyclic MKE processing. The output AEN is the common display (OR operation) of the displays AEN1, AEN0 and FLAT. The output AEN is therefore also set if a signal has changed several times in a sequence of messages without resulting in a change in the binary output at the time of cyclic processing (FLAT = 1, AEN0 = 0, AEN1 = 0).

– Time display in the parameters STD, MIN, SEK and MSEK

The parameters STD, MIN, SEK and MSEK contain the time in hours, minutes, seconds and milliseconds from the last message prior to cyclic processing of the MKE block in which at least one binary value has changed compared to the previously received message. The time is thus only updated if the output AEN is also set.

– Time in system representation in parameter SUHR

The parameters SUHR contains the same time in the system representation as displayed in the parameters STD, MIN, SEK and MSEK. The time is present coded in the two mantissas (see Fig. 9.126)

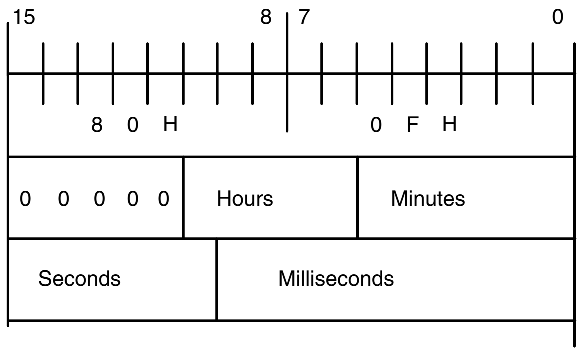


Fig. 9.126 Parameter SUHR

– Display of multiple entry of a time with the parameter UHRF

The parameter UHRF is set if changes occur more than once within the cycle time when receiving messages. The parameter indicates that the time in the parameters STD, MIN, SEK and MSEK or SUHR can be specified too late by up to the cycle time for individual changes in signals.

– Disabling of updating of modification displays the parameter RAEN

The parameter RAEN defines whether the data of the MKE block are to be updated with each cyclic processing of the data or only when the output AEN has been reset by another program. The setting RAEN = 1 (default setting) results in the updating of the output AEN and all other cyclically updated displays and outputs in each cycle. Modification displays are thus only retained for one cycle and are reset if no more modifications occur in the next cycle.
The setting RAEN = 0 means that the cyclically updated parameters remain unchanged until the output AEN is reset externally and new cyclic processing commences. The current status and the evaluation of all messages which have been received in the meantime are then output again. A delayed reset of the output AEN thus has the same effect as a dynamic extension of the cycle time of the MKE block.

– Activation of updating of processing aids in the parameters IND1, NEU1, IND0, NEU0, INDF and NEUF using the parameter PRUE

  The parameter PRUE is used to switch on the processing aids in the parameters IND1, NEU1, IND0, NEU0, INDF and NEUF. If these parameters are not evaluated, the parameter PRUE should be reset in order to save calculation time. The numbers of all outputs BIx which have changed from 0 to 1 during the past cycle time are stored without gaps in the data field NEU1. The data field NEU0 is used in the same manner for modifications from 1 to 0. The numbers of all binary values which have changed more than once during the past cycle time are stored without gaps in the data field NEUF. The highest occupied index in the data fields NEU1, NEU0 and NEUF is entered in the parameters IND1, IND0 and INDF. These values can be transferred directly into a DO loop for further processing in a TML program in that the fields NEU1, NEU0 and NEUF are scanned with a continuous index. The auxiliary data in the parameters IND1 and NEU1 are only valid if AEN1 and PRUE are set. The auxiliary data in the parameters IND0 and NEU0 are only valid if AEN0 and PRUE are set. The auxiliary data in the parameters INDF and NEUF are only valid if FLAT and PRUE are set. The default setting and the invalid code in the parameters IND1, NEU1, IND0, NEU0, INDF and NEUF is –1.
  It is possible to react to signals which are present for a time shorter than one MKE cycle time by using the chatter display FLAT and the display of the associated binary signal numbers in the data field NEUF.

– Coupling monitoring with parameter UEBW

  The parameter UEBW is used to configure a coupling monitoring function for a cyclically transmitting MKS block. The number of cycles are defined for a cyclically processed MKE block after which an MKS message must have been received. The monitoring function is switched off if UEBW = 0.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Coupling error: updating with an MKS message has not taken place within the set monitoring time UEBW	FKOP	1	AB
Updating display: MKS message received	AKT	2	AB
Modification display: at least on message with different binary values compared to the previously received message has occurred within the cycle time	AEN	3	AB
Bit No. 1 from the last MKS message in the cycle	BI1	4	AB
Bit No. 2 from the last MKS message in the cycle	BI2	5	AB
⋮	⋮	⋮	⋮
Bit No. 32 from the last MKS message in the cycle	BI32	35	AB
Monitoring time in number of cycles (see FKOP)	UEBW	1	ID
Bus/participant number of transmitter (bus no. . 100 + participant number)	BUSX	2	ID
Block name of transmitter block	BSTX	3	S4
Destination address for message data (GB or GM)	GBA	4	EB
Reset order for output AEN: 1 = cyclic reset, 0 = no updating until AEN is reset externally	RAEN	5	EB
Status of outputs BI1 to BI32 as bit sequence (32 bits)	ZS	6	PAD
Status of outputs BI1 to BI16 (bit sequence)	ZSW1	7	ID
Status of outputs BI17 to BI32 (bit sequence)	ZSW2	8	ID
Hours obtained from time of last message	STD	9	I
Minutes obtained from time of last message	MIN	10	I
Seconds obtained from time of last message	SEK	11	I
Milliseconds obtained from time of last message	MSEK	12	ID
Time in system representation	SUHR	13	PAD

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Time error: more than one message has entered a time during a cycle time	UHRF	14	PB
Display of modifications in BI1 to BI32 from 0 to 1 during a cycle time	AEN1	15	PB
Display of modifications in BI1 to BI32 from 1 to 0 during a cycle time	AEN0	16	PB
Chatter display: multiple modifications of a binary value in messages during a cycle time	FLAT	17	PB
Test order for received data: write numbers of binary values modified in the last cycle into NEU1, NEU0 and NEUF	PRUE	18	PB
Largest occupied index in field NEU1	IND1	19	ID
Number of all outputs BIx which have changed from 0 to 1 in the last cycle	NEU1	20	ID: 32
Largest occupied index in field NEU0	IND0	21	ID
Number of all outputs BIx which have changed from 1 to 0 in the last cycle	NEU0	22	ID: 32
Largest occupied index in field NEUF	INDF	23	ID
Number of all binary values which have changed more than once in the last cycle	NEUF	24	ID: 32

- Block list

```
   MKE     1                                         P:  1 *

 1 AB  FKOP 0                 #                         25
 2 AB  AKT  0                 #                         26
 3 AB  AEN  0                 #                         27
 4 AB  BI1  0                 #                         28
 5 AB  BI2  0                 #                         29
 6 AB  BI3  0                 #                         30
 7 AB  BI4  0                 #                         31
 8 AB  BI5  0                 #                         32
 9 AB  BI6  0                 #                         33
10 AB  BI7  0                 #                         34
11 AB  BI8  0                 #                         35
12 AB  BI9  0                 #                         36
13 AB  BI10 0                 #                         37
14 AB  BI11 0                 #                         38
15 AB  BI12 0                 #                         39
16 AB  BI13 0                 #                         40
17 AB  BI14 0                 #                         41
18 AB  BI15 0                 #                         42
19 AB  BI16 0                 #                         43
20 AB  BI17 0                 #                         44
21 AB  BI18 0                 #                         45
22 AB  BI19 0                 #                         46
23 AB  BI20 0                 #                         47
24 AB  BI21 0                 #                         48
25 AB  BI22 0                 #                         49
26 AB  BI23 0                 #                         50
27 AB  BI24 0                 #                         51
28 AB  BI25 0                 #                         52
29 AB  BI26 0                 #                         53
30 AB  BI27 0                 #                         54
31 AB  BI28 0                 #                         55
32 AB  BI29 0                 #                         56
33 AB  BI30 0                 #                         57
34 AB  BI31 0                 #                         58
35 AB  BI32 0                 #                         59
 1 ID  UEBW     0                                        1
 2 ID  BUSX     0                                 N      2
 3 S4  BSTX                                       N      3
 4 EB  GBA  0               A   P               C  Q     4
 5 EB  RAEN 1                   P                        5
 6 PAD ZS   0.0000                                N      6
 7 ID  ZSW1     0                                 N      7
 8 ID  ZSW2     0                                 N      8
 9 I   STD      0                                 N      9
10 I   MIN      0                                 N     10
11 I   SEK      0                                 N     11
12 ID  MSEK     0                                 N     12
13 PAD SUHR 0.0000                                N     13
14 PB  UHRF 0                                     N     14
15 PB  AEN1 0                                     N     15
16 PB  AEN0 0                                     N     16
17 PB  FLAT 0                                     N     17
18 PB  PRUE 0                                           18
19 ID  IND1 0   -1                                N     19
20 ID  NEU1 0                  32                 N     20
         0      -1
```

Block list (continued)

```
   MKE      1                     06. 10. 92/ 06. 44. 38. P:  2 *

20 ID  NEU1                             32               N   20
          1       -1
          2       -1
          3       -1
          4       -1
          5       -1
          6       -1
          7       -1
          8       -1
          9       -1
         10       -1
         11       -1
         12       -1
         13       -1
         14       -1
         15       -1
         16       -1
         17       -1
         18       -1
         19       -1
         20       -1
         21       -1
         22       -1
         23       -1
         24       -1
         25       -1
         26       -1
         27       -1
         28       -1
         29       -1
         30       -1
         31       -1
21 ID  IND0       -1                                     N   21
22 ID  NEU0                             32               N   22
          0       -1
          1       -1
          2       -1
          3       -1
          4       -1
          5       -1
          6       -1
          7       -1
          8       -1
          9       -1
         10       -1
         11       -1
         12       -1
         13       -1
         14       -1
         15       -1
         16       -1
         17       -1
         18       -1
         19       -1
         20       -1
         21       -1
```

Block list (continued)

```
   MKE     1                    06. 10. 92/ 06. 46. 08. P:  3 *

22 ID  NEU0                           32              N   22
         22        -1
         23        -1
         24        -1
         25        -1
         26        -1
         27        -1
         28        -1
         29        -1
         30        -1
         31        -1
23 ID  INDF        -1                                 N   23
24 ID  NEUF                           32              N   24
          0        -1
          1        -1
          2        -1
          3        -1
          4        -1
          5        -1
          6        -1
          7        -1
          8        -1
          9        -1
         10        -1
         11        -1
         12        -1
         13        -1
         14        -1
         15        -1
         16        -1
         17        -1
         18        -1
         19        -1
         20        -1
         21        -1
         22        -1
         23        -1
         24        -1
         25        -1
         26        -1
         27        -1
         28        -1
         29        -1
         30        -1
         31        -1
```

MKS

Message linking transmitter block

Application

This block is used for transmitting up to 32 binary signals to other bus devices (in particular the MS 236 signalling subsystem. OS subsystems or PR/KSN 16) via the CS 275 bus system. These signals are transmitted as messages, i.e. together with the time when a signal transition from 0 to 1 or vice versa occurred.

An MKE block must be configured at the receiver end (or macro call "$WARTMELD"...).

Method of Operation

The MKS message linking transmitter block is used to transmit up to 32 messages (binary signal plus time) to the MS 236 signalling subsystem, the OS subsystem or to a process computer. The MKS block can only be used in DI communication. Up to 6 devices can receive the messages transmitted.

This function block is incorporated in an acyclic or cyclic sequence cascade (cf. XA/XB block) in the same manner as every other block. A message is transmitted if one of the 32 binary signals has changed. The message contains the time with an accuracy of 10 seconds.

A synchronization sequence (.SYNC) can be parameterized and a single transmission (.NEUA) initiated. The output signal STOE = 1 indicates that the request for transmission has not been accepted by the own local bus interface. The MKS block cannot detect a bus malfunction (e.g. bus connector not installed). The cyclic communication is monitored at the receiver end.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Number of logged on devices	ANZ	1	AA
Fault output – message could not be sent	STOE	2	AB
Restart – input for one–time synchronization (automatically reset)	NEUA	1	EB
1st value to be transmitted	BI1	2	EB
•	•	•	•
•	•	•	•
•	•	•	•
32nd value to be transmitted	BI32	33	EB
Synchronization sequence – max. number of block executions before a message is sent	SYNC	34	ID
Bus/device number of logged–on receivers 1 to 6	BUS1	35	ID
	•	•	•
	•	•	•
	•	•	•
	BUS6	40	ID
Block number of logged–on receivers 1 to 6	BST1	41	S4
	•	•	•
	•	•	•
	•	•	•
	BST6	46	S4

- Block list

```
   MKS     1                   03. 03. 83/ 00. 48. 25. P:  1

 1 AA  ANZ  0.0000                                N      47
 2 AB  STOE 0                                     N      48
 1 EB  NEUA 0                P                            1
 2 EB  BI01 0                                      Q      2
 3 EB  BI02 0                                      Q      3
 4 EB  BI03 0                                      Q      4
 5 EB  BI04 0                                      Q      5
 6 EB  BI05 0                                      Q      6
 7 EB  BI06 0                                      Q      7
 8 EB  BI07 0                                      Q      8
 9 EB  BI08 0                                      Q      9
10 EB  BI09 0                                      Q     10
11 EB  BI10 0                                      Q     11
12 EB  BI11 0                                      Q     12
13 EB  BI12 0                                      Q     13
14 EB  BI13 0                                      Q     14
15 EB  BI14 0                                      Q     15
16 EB  BI15 0                                      Q     16
17 EB  BI16 0                                      Q     17
18 EB  BI17 0                                      Q     18
19 EB  BI18 0                                      Q     19
20 EB  BI19 0                                      Q     20
21 EB  BI20 0                                      Q     21
22 EB  BI21 0                                      Q     22
23 EB  BI22 0                                      Q     23
24 EB  BI23 0                                      Q     24
25 EB  BI24 0                                      Q     25
26 EB  BI25 0                                      Q     26
27 EB  BI26 0                                      Q     27
28 EB  BI27 0                                      Q     28
29 EB  BI28 0                                      Q     29
30 EB  BI29 0                                      Q     30
31 EB  BI30 0                                      Q     31
32 EB  BI31 0                                      Q     32
33 EB  BI32 0                                      Q     33
34 ID  SYNC     0                               C        34
35 ID  BUS1     0                                 N      35
36 ID  BUS2     0                                 N      36
37 ID  BUS3     0                                 N      37
38 ID  BUS4     0                                 N      38
39 ID  BUS5     0                                 N      39
40 ID  BUS6     0                                 N      40
41 S4  BST1                                       N      41
42 S4  BST2                                       N      42
43 S4  BST3                                       N      43
44 S4  BST4                                       N      44
45 S4  BST5                                       N      45
```

MPX

Multiplex block

Application

This block is used for multiplexing the STEP command parameterization in the subsequent KS/VS block.

Method of Operation

The block transfers inputs 1 to 5 into the next KS/VS block. An error message (S 370) is issued if there is no subsequent KS/VS block.

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/Output No.	Type
Multiplex input	1	GAX	1	EA [1)]
”	2	GBX	2	EA [1)]
”	3	GMX	3	EA [1)]
”	4	GTX	4	EA [1)]
”	5	DSX	5	EA [1)]

1) Address, interconnected with Q (“**`Q,input no,tname,bname,0;`**”)

- Block list

```
   MPX     1              03. 03. 83/ 00. 50. 11. P: 1

 1 EA  GAX  0.0000                           C  Q   1
 2 EB  GBX  0                                C  Q   2
 3 EB  GMX  0                                C  Q   3
 4 EA  GTX  0.0000                           C  Q   4
 5 EA  DSX  0.0000                           C  Q   5
```


MSB

Block for the ESG functions “motor, valve and actuator control” on the binary arithmetic module

Application

This block is used for data acquisition and transfer from and to the binary arithmetic module (see Chap. 9.2 for module) and for monitoring and controlling the ESG functions of the module.

Each binary arithmetic module permits a maximum of 5 MSB blocks to be assigned as motor/valve controls, or a maximum of 4 MSB blocks to be assigned as actuator controls.

Method of Operation

The MSB block can only be used together with a BRBK block. The interconnection must be established from the BRBK block. The block name is shown in the BRBK element and may be checked there. Input BART defines whether the block is to be executed as a motor/valve control (BART = 1/11) or as an actuator control (BART = 2/12). Block execution is inhibited if control mode has not been selected (BART = 0).

The ESG block input defines which ESG channel of the block is to be used.

☞ The user must ensure that the required function has been implemented on the module, since the system does not perform any check.

In order to provide better representation, the impulse–type module signal BBL is extended in the MSB block. The extension time is specified in seconds via input UZT. It is restarted after each 0/1 transition.

- Operating status STO

  Operator inputs are rejected in STO status.

- Signals from the MSB block to the module

  The MSB block transfers the following input signals to the module:

AU	Manual command	’OPEN’	(only effective if FHD = 1)
ZU	Manual command	’CLOSED’	(only effective if FHD = 1)
ST	Manual command	’STOP’	(only effective if FHD = 1 and BART = 2/12)
QB	Acknowledgement		
FHD	Manual enabling		
BAOE	Automatic command	’OPEN’	
BAS	Automatic command	’CLOSE’	
FPOE	Process release	’OPEN’	
FPS	Process release	’CLOSE’	
SS1	Aggregate protection	’CLOSE’	
SS2	Plant protection	’CLOSE’	
SOE	Protection	’OPEN’	

  The inputs AU, ZU, ST and QB are reset subsequently. Input QB is transferred to the module without enabling signal (FHD = 0) in the same manner as an AU or ZU manual command.

- Signals from the module to the MSB block

  The signals coming from the module are partially deposited in outputs and partially in internal elements.

BGF	Module fault
ARAF	Plant return data ’OPEN/ON’
ARZU	Plant return data ’CLOSED/OFF’
ALOE	Output command ’OPEN/ON, OPENING’
ALS	Output command ’CLOSE/OFF, CLOSING’
FPOE	Enabling from process ’OPEN’
FPS	Enabling from process ’CLOSE’
S1S	Aggregate protection ’CLOSE’/OFF
S2S	Plant protection ’CLOSE’/OFF
S2OE	Protection ’OPEN’/ON
WEZU	End–of–travel signal ’CLOSED’
WEAF	End–of–travel signal ’OPEN’
WENZ	End–of–travel signal ’not CLOSED’
WENA	End–of–travel signal ’not OPEN’
DEZS	Torque signal ’CLOSED’
DEAS	Torque signal ’OPEN’
M1	Individual open–loop controller alarm
M2	Time–out alarm
M3	End position error alarm
M4	Branch error alarm
BBL	Command blocked (internal; signal is extended)

- Parameterization

  The AU and ZU operator input function can be enabled (FHD = 1) or disabled (FHD = 0) via input 5 (FHD).

  An analog value can be interconnected with input 14 (ESR) and used as a position feedback signal. This value is shown in bar and numeric representation in the loop display (only if BART = 2/12). Inputs 13 (OG) and 15 (UG) are used as bar limits.

  The physical unit of the value is defined at input 16 (EHTY) festgelegt. The output is suppressed if an analog value has not been interconnected.

  In order to provide improved representation, the impulse–type module signal “Command blokked” (BBL) is extended in the MSB block. The extension time is specified in seconds via input 17 (UZT). It is restarted after each 0/1 transition.

  A binary value interconnected at input 18 (FEXT) is shown as an external fault in the loop display and accepted into the MSB block status word. Acceptance can be suppressed by input 20 (STU).

  Status transfer via the bus is suppressed if input 19 (US) has been set to 1. The OS does then not receive any status messages (the last bus message resets the message).

  A LAYOUT block can be interconnected with input 21 (LAYO) in order to supplement the loop display. This block is cyclically called when the MSB loop display is selected.

  Input 23 (BART) specifies whether a motor/valve control (BART = 1/11) or an actuator control function (BART = 2/12) is to be executed.

Input 24 specifies the ESG channel of the module which is to be used. Parameterization is only possible after the mode has been selected. Valid channel numbers are:

for BART = 1/11: 1 to 5
for BART = 2/12: 1 to 4

The modes “local operation” and “test position” are no actual I/O faults and therefore need not appear in the status word as I/O faults. To suppress the modes in the status word, the parameter BART (input 23 I) is supplemented by the modes 11 and 12.

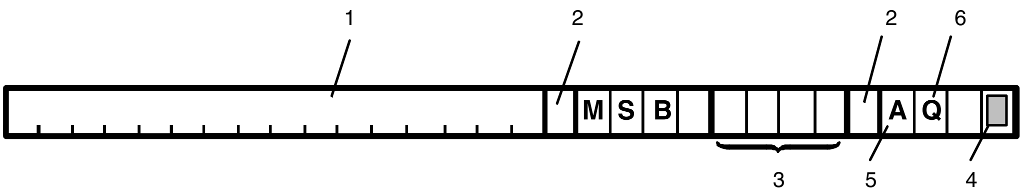
BART function with:

= 1 as before “local” and “test” appear in the status word
= 2 as before “local” and “test” appear in the status word
= 11 as with 1, “local” and “test” do not appear in the status word
= 12 as with 2, “local” and “test” do not appear in the status word

Block execution remains disabled if mode (BART = 0) and/or channel number (ESG = 0) have not been selected (→ S 325).

☞ The user must ensure that the required function has been implemented on the module, since the system does not perform any check. A selected channel number will be deleted when the mode (BART) is parameterized.

- Normalized representation in the group display



1 Process–related name of the MSB block in the loop display
2 Separating blank
3 Name/number of MSB block
4 Loop message field: grouping of the following alarm signals as a blinking mark: BGF, TBBL and TZHW
5 Plant return data OPEN/CLOSED
6 Acknowledgement request

Fig. 9.127 MSB block, normalized representation in the group display

Input 22 (NRPL.) is parameterized in the following manner to display the block by 30 characters at a specific location in a group display:

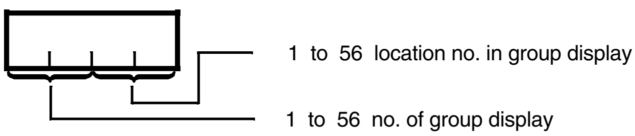
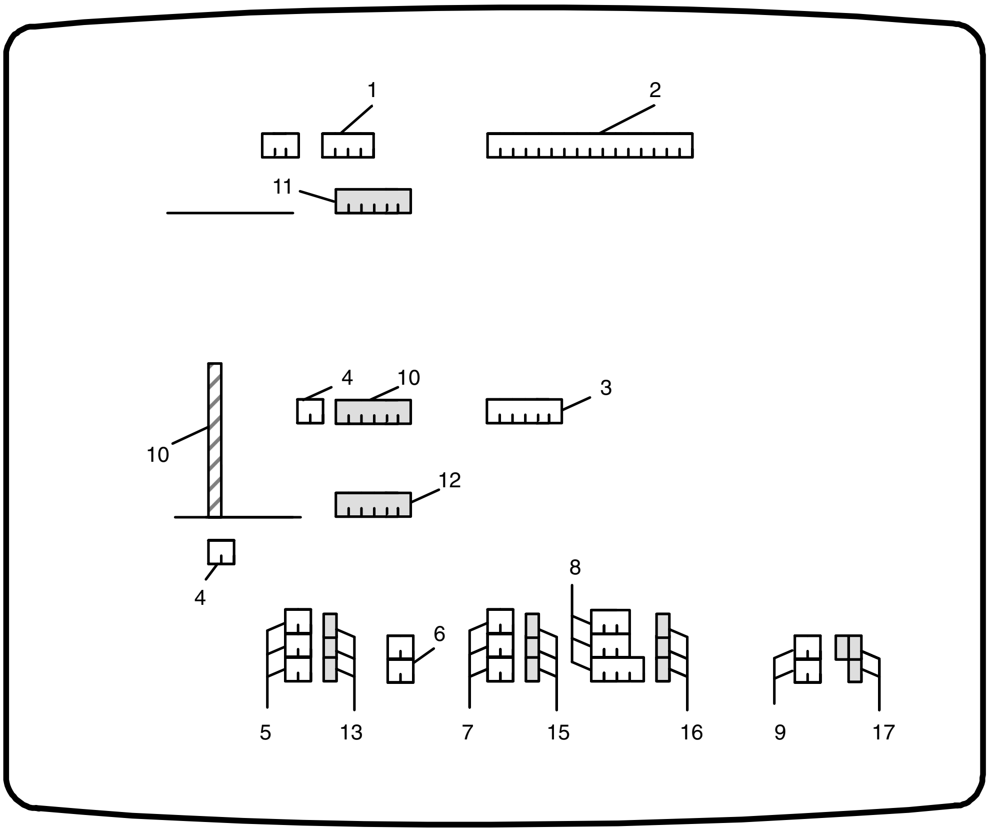


Fig. 9.128 MSB block; parameterization of input 22

- Normalized representation in the loop display



Static data

1	Mnemonic name and number of the MSB block	
2	Process–related name of the MSB block	(AT)
3	Physical unit of the control output checkback	(EHTY)
4	Mnemonic name of the control output checkback	(TY)
5	Mnemonic name of the command parameters	(TQB, TAU, TZU)
6	Mnemonic name of the run display (BART = 2/12)	(TLA, TLZ)
7	Mnemonic name of the status display	(TBBL, TFA, TFZ)
8	Mnemonic name of the protection states	(TS1S, TS2S, TS2O)
9	Mnemonic name of the error messages	(TS, TF)

Dynamic data

10	Control output checkback (analog and digital display)	(ESR)
11	Upper limit for control output checkback	(UG, UG)
12	Lower limit for control output checkback	(UG, UG)
13	Acknowledgement request/command status	(ARAF, ARZU)
14	Travel direction indication (BART = 2/12)	(ALOE, ALS)
15	Fault states	(BBL, PFOE, PFS)
16	Protection states	(S1S, S2S, SOE)
17	Error messages	(FEXT)

Fig. 9.129 MSB block; normalized representation of the loop display

```
22. 07. 87/ 08. 55. 04.


              MSB     1         * MOTOR / VENTIL

















               QB              BL 0    S1S   0
               AU 0            FA 0    S2S   0           S   0
               ZU 0            FZ 0    S20E 0            F   0



    BR
MSB,1;
```

Fig. 9.130 MSB block loop display, mode 1

AU=1	ZU=1	QB=1					

AU Open
QB Acknowledgement
ZU Close

Fig. 9.131 MSB block; automatic labeling of the process communication keyboard in mode 1

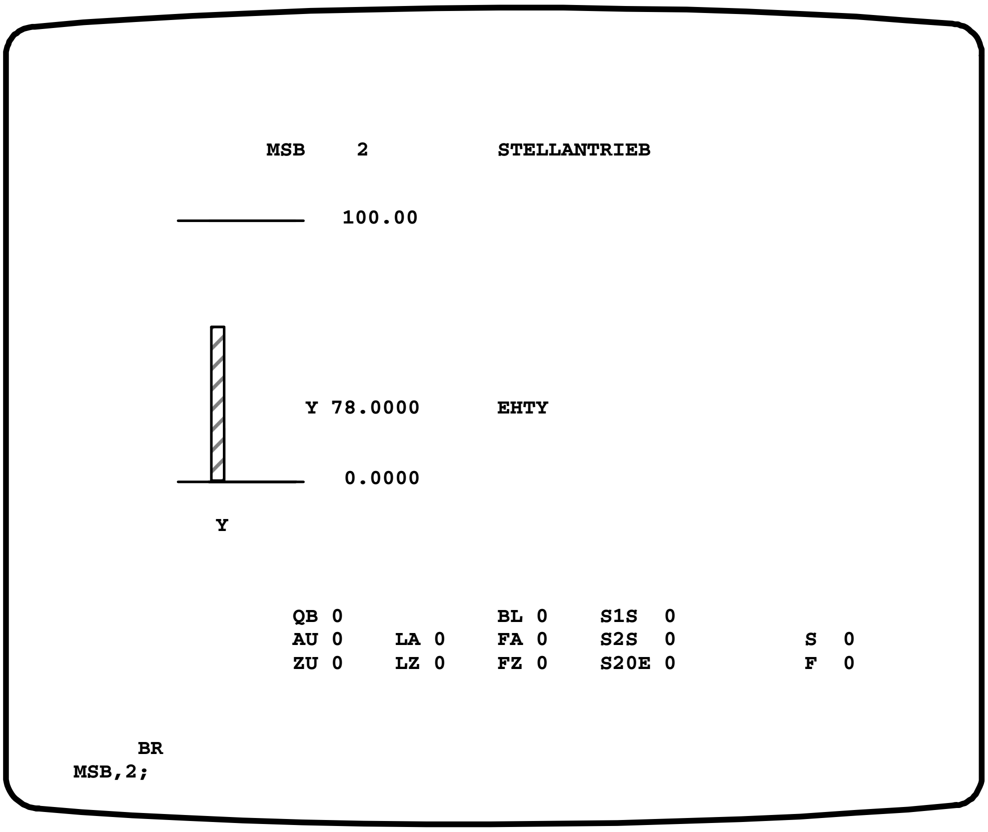
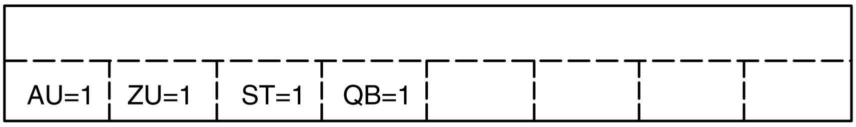


Fig. 9.132 MSB block loop display; mode 2 with control output checkback



AU Open
QB Acknowledgement
ST Stop
ZU Close

Fig. 9.133 MSB block; automatic assignment of the process communication keyboard in mode 2

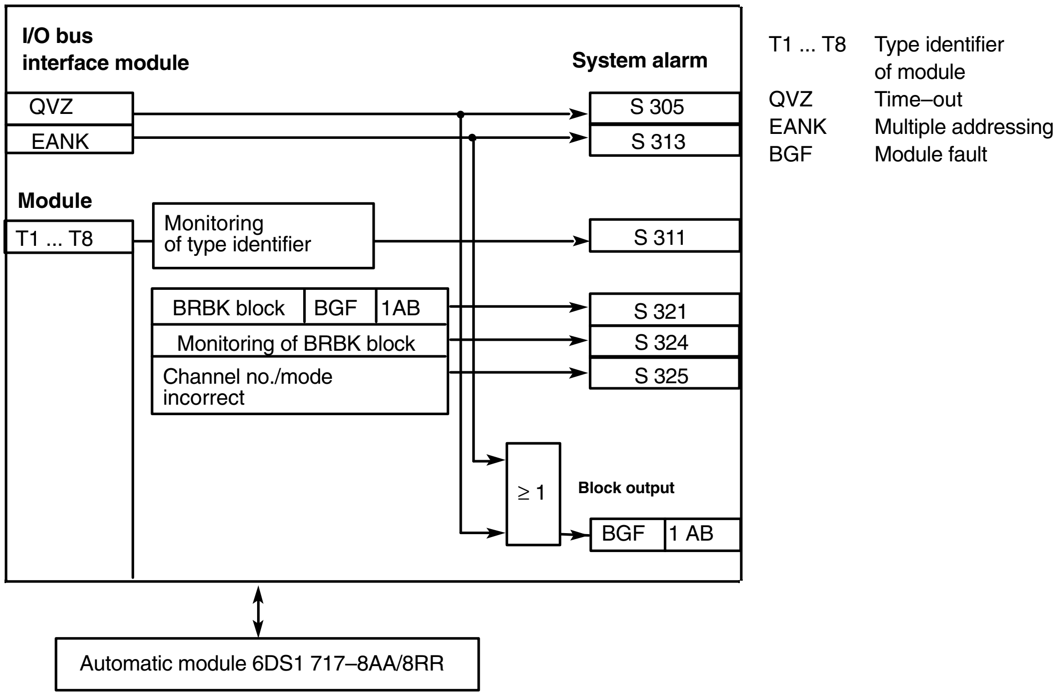


Fig. 9.134 MSB block, alarm logic

- System messages

S 305	No acknowledgement from module (incorrect address, module defective)
S 311	Wrong module type
S 321	Module faulty/defective (cycle fault)
S 324	Failure of BRBK block
S 325	No BRBK block assignment No mode or ESG channel number selected

- I/O error messages

I/O error messages are shown in the loop display, and have the following meaning:

Priority ↑

S 80	Module failure
S 4	Hardware fault on module
S 25	Branch error
S 27	low voltage, interconnected
S 16	Command output monitoring
S 17	End position monitoring CLOSED to OPEN
S 18	End position monitoring OPEN to CLOSED
S 19	Run time monitoring OPENING
S 20	Run time monitoring CLOSING
S 21	Torque monitoring function OPEN has responded
S 22	Torque monitoring function CLOSED has responded
S 8	Status signal fault 1
S 9	Status signal fault 2
S 5	Local operation
S 26	Test position

The highest priority message is displayed if several messages occur simultaneously.

Allocation of I/O error numbers to module flags in the loop display.

I/O error messages in the loop display	Driver		Module	
	Mnem. name	Input/Output	Internal name	Flag no. ESG 1
S 80	BGA	75 PB	BGA	M,0,9
S 4	BGF	1 AB	—	—
S 25	AZS	55 PB	AZS	M,26,9
S 27	UAV	58 PB	UAV	M,26,11
S 16	UEBA	59 PB	ÜBA	M,26,12
S 17	EFZA	54 PB	EFZAV	M,26,8
S 18	EFAZ	53 PB	EFAZM	M,26,7
S 19	LZAF	52 PB	LZAFV	M,26,6
S 20	LZZU	51 PB	LZZUV	M,26,5
S 21	DEAS	20 AB	DEAFS	M,27,1
S 22	DEZS	19 AB	DEZUS	M,26,16
S 8	RMF1	61 PB	RMF1	M,26,14
S 9	RMF2	62 PB	RMF2	M,26,15
S 4	VOV	60 PB	VOV	M,26,13
S 26	TE	56 PB	TE	M,26,10

☞ The driver input and output numbers of the data type “PB” are internal parameters and can only be displayed after ”**NEDA;**” and then ”**A,MSB,...;**” has been input.

Flag number allocation of the 5 ESG channels of the module

ESG channel 1 occupies the flags 26,1 bis 34,16
ESG channel 2 occupies the flags 35,1 bis 43,16
ESG channel 3 occupies the flags 44,1 bis 52,16
ESG channel 4 occupies the flags 53,1 bis 61,16
ESG channel 5 occupies the flags 62,1 bis 70,16

- Block sequence

  The MSB block should be inserted before the associated BRBK in the same processing cycle in order to avoid synchronization errors. Assignment must be performed in the BRBK block.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Module fault	BGF	1	AB
Plant feedback “OPEN”/ON	ARAF	2	AB
Plant feedback ”CLOSED”/OFF	ARZU	3	AB
Output command “OPEN/ON, OPENING“	ALOE	4	AB
Output command “CLOSE/OFF, CLOSING“	ALS	5	AB
Enable from process “OPEN“	PFOE	6	AB
Enable from process “CLOSE“	PFS	7	AB
Aggregate protection “CLOSE“/OFF	S1S	8	AB
Aggregate protection “CLOSE“/OFF	S2S	9	AB
Aggregate protection “OPEN“/ON	S2OE	10	AB
Individual open–loop controller alarm	M1	11	AB
Time–out alarm	M2	12	AB
End position error alarm	M3	13	AB

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Branch error alarm	M4	14	AB
End–of–travel signal “CLOSED“	WEZU	15	AB
End–of–travel signal “OPEN“	WEAF	16	AB
End–of–travel signal “not CLOSED“	WENZ	17	AB
End–of–travel signal “not OPEN“	WENA	18	AB
Torque signal “CLOSED“	DEZS	19	AB
Torque signal “OPEN“	DEAS	20	AB
Manual command “OPEN“ (only effective if FHD = 1)	AU	1	PB
Manual command “CLOSED“ (only effective if FHD = 1)	ZU	2	PB
Manual command “STOP“ (only effective if FHD = 1 + BART = 2/12)	ST	3	PB
Acknowledgement	QB	4	PB
Manual enabled	FHD	5	EB
Automatic command “OPEN“	BAOE	6	EB
Automatic command “CLOSE“	BAS	7	EB
Enabling from process “OPEN“	FPOE	8	EB
Enabling from process “CLOSE“	FPS	9	EB
Aggregate protection “CLOSE“	SS1	10	EB
Aggregate protection “CLOSE“	SS2	11	EB
Protection “OPEN“	SOE	12	EB
Upper limit for position feedback	OG	13	EA
Position feedback	ESR	14	EA
Lower limit for position feedback	UG	15	EA
Physical unit for position feedback	EHTY	16	S4
Delay for BBL signal	UZT	17	I
External fault	FEXT	18	EB
Status output suppression	US	19	EB
External interference suppression	STU	20	EB
Connection for additional LAYOUT block	LAYO	21	EA
Location number in group display	NRPL	22	ID
Mode	BART	23	I
ESG channel number	ESG	24	I
Cf. loop display	TAU	25	S2
Cf. loop display	TZU	26	S2
Cf. loop display	TST	27	S2
Cf. loop display	TQB	28	S2
Cf. loop display	TLA	29	S2
Cf. loop display	TLZ	30	S2
Cf. loop display	TFA	31	S2
Cf. loop display	TFZ	32	S2
Cf. loop display	TS1S	33	S4
Cf. loop display	TS2S	34	S4
Cf. loop display	TS20	35	S4
Cf. loop display	TS	36	S2
Cf. loop display	TF	37	S2
Cf. loop display	TY	38	S2
Cf. loop display	TBBL	39	S2
Name of related BRBK block	BRBK	40	S2
Process–related name	AT	41	S16

- Block list

```
MSB   ORPA                         11. 01. 89/14.12. 19. P:    1*

  1 AB   BGF    0                  #  P                        41
  2 AB   ARAF   0                  #  P                        42
  3 AB   ARZU   0                  #  P                        43
  4 AB   ALOE   0                  #  P                        44
  5 AB   ALS    0                  #  P                        45
  6 AB   PFOE   0                  #  P                        46
  7 AB   PFS    0                  #  P                        47
  8 AB   S1S    0                  #  P                        48
  9 AB   S2S    0                  #  P                        49
 10 AB   S2OE   0                  #  P                        50
 11 AB   M1     0                  #  P                        51
 12 AB   M2     0                  #  P                        52
 13 AB   M3     0                  #  P                        53
 14 AB   M4     0                  #  P                        54
 15 AB   WEZU   0                  #  P                        55
 16 AB   WEAF   0                  #  P                        56
 17 AB   WENZ   0                  #  P                        57
 18 AB   WENA   0                  #  P                        58
 19 AB   DEZS   0                  #  P                        59
 20 AB   DEAS   0                  #  P                        60
  1 PB   AU     0                                     B         1
  2 PB   ZU     0                                     B         2
  3 PB   ST     0                                     B         3
  4 PB   QB     0                                     B         4
  5 EB   FHD    1                     P                         5
  6 EB   BAOE   0                     P                         6
  7 EB   BAS    0                     P                         7
  8 EB   FPOE   0                     P                         8
  9 EB   FPS    0                     P                         9
 10 EB   SS1    0                     P                        10
 11 EB   SS2    0                     P                        11
 12 EB   SOE    0                     P                        12
 13 EB   OG     100.00                P                        13
 14 EA   ESR       15     0    0A     P                        14
 15 EA   UG     0.0000                P                        15
 16 S4   EHTY   EHTY                                           16
 17 I    UZT        10                                         17
 18 EB   FEXT   0                     P                        18
 19 EB   US     0                                              19
 20 EB   STU    0                     P                        20
 21 EA   LAYO    15       0    0A     P             C   Q      21
 22 ID   NRPL       0                               C          22
 23 I    BART       0                               C          23
 24 I    ESG        0                               C          24
 25 S2   TAU    AU                                             25
 26 S2   TZU    ZU                                             26
 27 S2   TST    ST                                  C          27
 28 S2   TQB    QB                                             28
 29 S2   TLA    LA                                             29
 30 S2   TLZ    LZ                                             30
 31 S2   TFA    FA                                             31
 32 S2   TFZ    FZ                                             32
 33 S4   TS1S   S1S                                            33
 34 S4   TS2S   S2S                                            34
 35 S4   TS20   S2OE                                           35
 36 S2   TS     S                                              36
 37 S2   TF     F                                              37
 38 S2   TY     Y                                              38
 39 S2   TBBL   BL                                             39
 40 S4   BRBK                                            N     40
 41 S16  AT     *TECHNOL.NAME*              16                106
```


Allocation of the MSB driver block designations to the designations of the binary arithmetic module 6DS1 717–8AA/8RR (signal direction central unit → BG)

Driver		Module		Meaning	Function
Mne–monic name	Input/ output	Internal name	Flag number		
BAS	7 EB	BAST	M,11,1	Command automatic CLOSE	1)
BAOE	6 EB	BAOET 5)	M,11,2	Command automatic OPEN	1)
BAS	7 EB	BAST	M,11,3	Command automatic CLOSE	2)
BAOE	6 EB	BAOET	M,11,4	Command automatic OPEN	2)
BAS	7 EB	BAST	M,11,5	Command automatic CLOSE	3)
BAOE	6 EB	BAOET	M,11,6	Command automatic OPEN	3)
BAS	7 EB	BAST	M,11,7	Command automatic CLOSE	4)
BAOE	6 EB	BAOET	M,11,8	Command automatic OPEN	4)
SS1	10 EB	SS1T	M,12,1	Protection CLOSE 1	1)
SS2	11 EB	SS2T	M,12,2	Protection CLOSE 2	1)
FPS	9 EB	FPST	M,12,3	Enable process CLOSE	1)
FPOE	8 EB	FPOET	M,12,4	Enable process OPEN	1)
SOE	12 EB	SOET	M,12,5	Protection OPEN	1)
SS1	10 EB	SS1T	M,12,6	Protection CLOSE 1	2)
SS2	11 EB	SS2T	M,12,7	Protection CLOSE 2	2)
FPS	9 EB	FPST	M,12,8	Enable process CLOSE	2)
FPOE	8 EB	FPOET	M,12,9	Enable process OPEN	2)
SOE	12 EB	SOET	M,12,10	Protection OPEN	2)

☞ The identical names of inputs and outputs repeatedly used differ in the channel selections (cf. ESG parameter = input 24). The driver block is only able to exchange data with an ESG.

1) ESG 1
2) ESG 2
3) ESG 3
4) ESG 4
5) Incorrect name “BADET” in module manual

(continued)

Driver		Module		Meaning	Function
Mne–monic name	Input/ Output	Internal name	Flag number		
SS1	10 EB	SS1T	M,12,11	Protection CLOSE 1	[3)]
SS2	11 EB	SS2T	M,12,12	Protection CLOSE 2	[3)]
FPS	9 EB	FPST	M,12,13	Enable process CLOSE	[3)]
FPOE	8 EB	FPOET	M,12,14	Enable process OPEN	[3)]
SOE	12 EB	SOET	M,12,15	Protection OPEN	[3)]
SS1	10 EB	SS1T	M,13,1	Protection CLOSE 1	[4)]
SS2	11 EB	SS2T	M,13,2	Protection CLOSE 2	[4)]
FPS	9 EB	FPST	M,13,3	Enable process CLOSE	[4)]
FPOE	8 EB	FPOET	M,13,4	Enable process OPEN	[4)]
SOE	12 EB	SOET	M,13,5	Protection OPEN	[4)]
SS1	10 EB	SS1T	M,13,6	Protection CLOSE 1	[5)]
SS2	11 EB	SS2T	M,13,7	Protection CLOSE 2	[5)]
FPS	9 EB	FPST	M,13,8	Enable process CLOSE	[5)]
FPOE	8 EB	FPOET	M,13,9	Enable process OPEN	[5)]
SOE	12 EB	SOET	M,13,10	Protection OPEN	[5)]
BAS	7 EB	BAST	M,13,11	Command automatic CLOSE	[5)]
BAOE	6 EB	BAOET	M,13,12	Command automatic OPEN	[5)]

[3)] ESG 3
[4)] ESG 4
[5)] ESG 5

Allocation MSB driver block to binary arithmetic module (signal direction module → central unit)

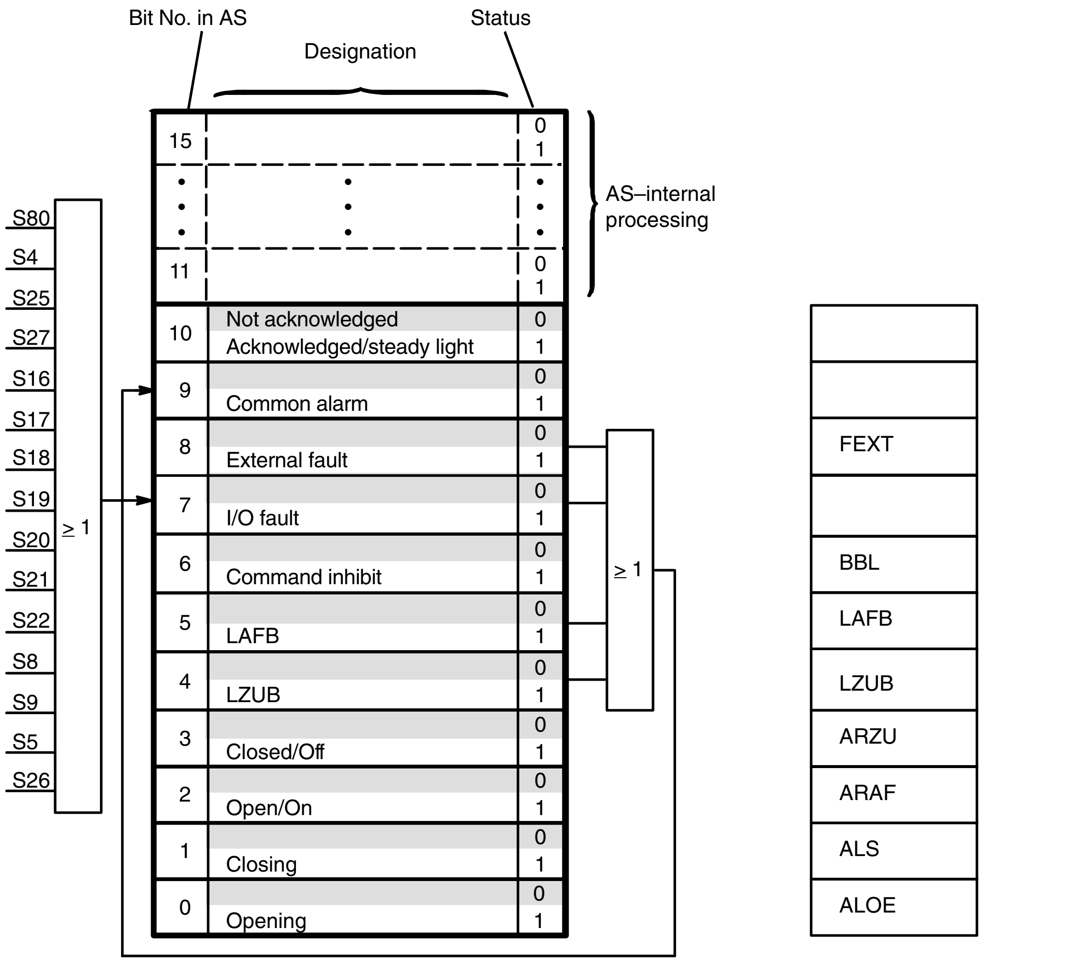
Driver		Module		Meaning	Function
Mne–monic name	Input/ Output	Internal name	Flag number		
M1	11 AB	M1 (MESG1)	M,26,1	Individual open–loop controller alarm	6)
M2	12 AB	M2	M,26,2	Time–out alarm	6)
M3	13 AB	M3	M,26,3	End position error alarm	6)
M4	14 AB	M4	M,26,4	Branch error alarm	6)
DEZS	19 AB	DEZUS	M,26,16	Torque signal “CLOSED”, malfunction	6)
DEAS	20 AB	DEAFS	M,27,1	Torque signal “OPEN”, malfunction	6)
ARZU	3 AB	ARZU	M,27,2	Plant feedback “CLOSED”	6)
ARAF	2 AB	ARAF	M,27,3	Plant feedback “OPEN”	6)
S1S	8 AB	S1S	M,27,7	Aggregate protection “CLOSE”	6)
S2S	9 AB	S2S	M,27,8	Plant protection “CLOSE”	6)
S2OE	10 AB	S2OE	M,27,9	Plant protection “OPEN”	6)
ALS	5 AB	ALS	M,27,12	Output command “CLOSE”	6)
ALOE	4 AB	ALOE	M,27,13	Output command “OPEN”	6)
PFS	7 AB	PFS	M,27,15	Enable from process “CLOSE”	6)
PFOE	6 AB	PFOE	M,27,16	Enable from process “OPEN”	6)
WEZU	15 AB	WEZU	M,28,3	End–of–travel signal “CLOSED”	6)
WEAF	16 AB	WEAF	M,28,4	End–of–travel signal “OPEN”	6)
WENZ	17 AB	WENZ	M,28,5	End–of–travel signal “not CLOSED”	6)
WENA	18 AB	WENA	M,28,6	End–of–travel signal “not OPEN”	6)

Allocation MSB driver block to binary arithmetic module (signal direction ZT → BG)

Driver		Module		Meaning	Function
Mne–monic name	Input/ Output	Internal name	Flag number		
ZU QB	2 PB 4 PB	BHST	M,31,5	Command manual “CLOSE” 1	6)
AU QB	1 PB 4 PB	BHOST	M,31,6	Command manual “OPEN”	6)
ST	3 PB	BST	M,31,7	Command STOP	6)
FHD	5 PB	FHDT	M,31,8	Manual enabling	6)

6) ESG channel 1

- Status word



Status word in AS

Associated data elements in the block list or module signals

ALOE	Output command OPEN
ALS	Output command CLOSE
ARAF	System return data OPEN
ARZU	System return data CLOSE
BBL	Command inhibit (internal element)
FEXT	External fault
LAFB	Lamp OPEN, blinking light (internal element)
LZUB	Lamp CLOSE, blinking light (internal element)

Fig. 9.135 Status word for the MSB block

MUL

Multiplier block

Application

This block is used for the multiplication and negation of input parameters. The multiplier factor is parameterized with –1 to negate the input variable.

Method of Operation

The multiplier block follows the equation: $Y = X1 \cdot X2$

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
Multiplicand	X1	1	EA
Multiplier	X2	2	EA

- Block list

```
   MUL     1               03. 03. 83/ 00. 50. 32. P:   1

 1 AA  Y    0.0000           #                   N      3
 1 EA  X1   0.0000              P                       1
 2 EA  X2   0.0000              P                       2
```

PBE

Driver block for testable binary input module

Application

The driver is used for acquiring the input signals of the testable binary input module (see Chap. 9.2 for modules) and for transmitting these binary values into binary value arrays.

Method of Operation

The driver reads the currently applied input signals from the module whose slot number is defined by the BGNR parameter (module number), and transfers these values in groups of 16 binary values to the binary value arrays that have been interconnected by BA1, BA2 and BA3. All other input signals are transferred to the corresponding binary value arrays even if one value has not been interconnected.

The following errors cause the BGF binary output (module fault) to be set:

– A module cannot be addressed under the slot address specified in BGNR (QVZ). The I&C alarm PBE xxxx * S 305 is also issued in this case.

– More than one module issues acknowledgement under the slot address specified in BGNR. (Multiple addressing is possible since the module addresses of other TELEPERM M modules are selected by jumpers on the modules). The I&C alarm PBE xxxx * S 313 is also issued in this case.

– The type identifier of the module addressed by BGNR is incorrect. The I&C alarm PBE xxxx * S 311 is also issued in this case.

– A fault has occurred during the module test that has been activated by TEST. The I&C alarm PBE xxxx * S 325 is also issued in this case. One of the binary outputs FTST, FSPB or FSPT has also been set (see below).

xxxx specifies the block name of the initiating driver.

A module function test is performed in the following steps once the binary driver block input TEST has been set:

The driver block causes the testable binary input modules to connect various test patterns via their test pattern drivers to the 48 input channels.

The driver block reads these binary values and compares them with the expected values stored in the central unit system RAM. The driver block sets the binary outputs FTST (fault during test) and BGF and issues the I&C alarm PBE xxxx * S 325 if it detects any discrepancies.

A complete run using all test patterns takes 32 executions of the driver, i.e. 32 times the block cycle time. The green TEST LED lights up briefly whenever a test run is performed.

The test includes the module power supply. The binary outputs FSPB (module power supply fault) and BGF are set and the I&C alarm PBE xxxx * S 325 issued if the test detects that the supply voltage is out of tolerance.

The test also includes the power supply of the test pattern drivers. The binary outputs FSPT (fault in test pattern driver power supply) and BGF are set and the I&C alarm PBE xxxx * S 325 issued if the test detects that the supply voltage is out of tolerance.

The red TEST LED lights up on the modules if an FTST, FSPB or FSPT fault has occurred.

The binary outputs FTST, FSPB, FSPT and BGF are reset and the red TEST LED on the module is extinguished after 32 successive faultless driver or test executions have been performed.

- Block list

```
PBE  ANNA              25. 10. 90/ 14. 33. 13. P:   1


  1  AB  BGF   0                              N     1
  2  AB  FTST  0                              N     2
  3  AB  FSPB  0                              N     3
  4  AB  FSPT  0                              N     4
  1  EB  BA1                                C   Q   5
  2  EB  BA2                                C   Q   6
  3  EB  BA3                                C   Q   7
  4  EB  TEST  1                            C       8
  5  I   BGNR      1                        C       9
```

PICT

Form input/output block

Application

This block is used for the integration into the system of operator–controllable user blocks with a specific loop display. Operator input via the process communication keyboard and output via VDU are identical with the operational sequence of operator–controllable standard blocks.

Method of Operation

PICTURE blocks are user–specific blocks which have been built up using display command. A block definition is possible if the keyswitch on the process communication keyboard is in position 3.

PICTURE blocks may **not** be installed in a block sequence. They can only be started via the process communication keyboard or the alphanumeric keyboard. The image is displayed on the VDU assigned to the keyboard, the image refresh rate being 2 seconds.

See PROGRAM block for block structure.

Possible configuration instructions for PICTURE blocks are:

```
NEMO;
D,name,PICTURE;
-   instructions (display commands)
DE;
A, name, PICTURE;
-   LS,no;
-   EI,no;
    instruction;
-   ER,no;
    instruction;
-   F;
-   Z;
-   K;
-   BI;
AE;
L,name,PICTURE;
END;
```


PKF

Process linking alarm sequence block

Application

– This block is used for the output of PKM messages on the

  VDU message line
  printer
  back–up printer if the main printer is defective
  bus

– for the display of the PKM block alarm history
– for the display of new PKM block messages

Method of Operation

Only numbers between 1 and 9999 are permitted for the definition of block names. The block can be switched on or off via the binary input 1 (AUEI). Once switched off, messages or logs will not be generated, blinking marks for new messages are not processed and new messages cannot be acknowledged.

A PKM block is used to create the messages which are then entered in a PKF block. A PKF block should be installed in a cyclic level (cycle 4, image output). This enables detection of messages which have recently been entered in the buffer (cyclic check of the buffer pointers). A blinking mark can be set in the area message field. A mark for alarms which have not been acknowledged is shown on the PKF display, irrespective of a page selection.

An I&C alarm is issued if the buffer has reached its 80% limit or maximum level. The number of lost alarms is only reset when sufficient space reappears in the buffer. Cyclic background processing is required for the coordination of the message output to bus and printers (message jam), setting the blinking marks, and advancing the acknowledgement pointer. The PKF block generates the update/status log of a PKM block in order to reach a time separation. Only one PKM entry can be buffered.

The messages entered by the PKM block are issued as one–line messages according to the parameterization of input 3 (MODI):

“MODI(0) = 0”	No message output on VDU message line
“MODI(0) = 1”	Message output on VDU message line
“MODI(1) = 0”	No message printout
“MODI(1) = 1”	Printout on printer 1
“MODI(1) = 2”	Printout on printer 2
“MODI(1) = 3”	Printout on printer 3
“MODI(1) = 4”	Printout on printer 4

Positive acknowledgement is only expected during printout if a back–up device has been configu-red.

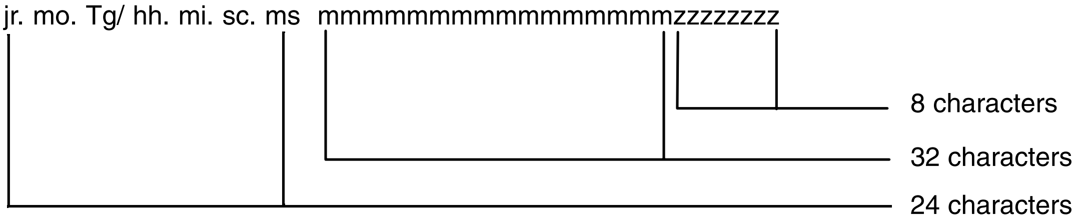
“MODI(2) = 0”	No message printout on back–up printer
“MODI(2) = 1”	Back–up printer 1
“MODI(2) = 2”	Back–up printer 2 if main printer
“MODI(2) = 3”	Back–up printer 3 is defective (Index 1)
“MODI(2) = 4”	Back–up printer 4
“MODI(3) = 0”	No message output to bus
“MODI(3) = 1”	Message output to bus
“MODI(3) = 2”	Automatic acknowledgement for linked system and bus output or automatic acknowledgement. The message via the bus corresponds to the plaintext to the plaintext message from an MEL block.

☞ Do not use the COPY instruction to copy a PKF block.
The ANSE input can only be parameterized in STO mode.

- Message structure for printer and message line

  The log is issued as a one–line message. Printer and message line use the same format:

  jr. mo. Tg/ hh. mi. sc. ms mmmmmmmmmmmmmmmmmzzzzzzzz



  A message for the change of date is generated automatically and entered in the PKF block. Input 5 (TAGW) can be used to suppress the entry of such a message. This message is not logged, but merely displayed on the alarm sequence display, where it requires a location.

  “TAGW = 0” No message entered for the change of date
  “TAGW = 1” Message entered for the change date

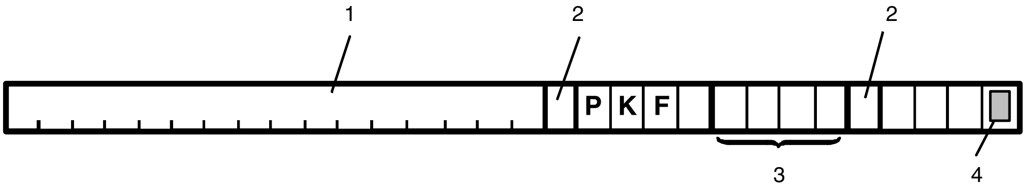
- Processing the blinking mark in the area message field

  Input 2 (TYP) can be used to switch on the processing of a blinking mark in the area message

  “TYP (0) = 0” No blinking mark processing
  “TYP (0) = no” Blinking mark processing ON, no = 2 – 12
  “TYP (1) = 0” Means that all alarms come from the PKM block

- Representation in a group display

  The block is represented by 30 characters in a specific location of a group display which is specified by input 6 (NRPL). Set input 6 NRPL to “0” if the representation of the block in a group display is to be suppressed.



1 Process–related name of the PKF block, as in alarm sequence display
2 Blank
3 Name of PKF block
4 Mark for alarms which have not been acknowledged
Blinking = alarms waiting which have not been acknowledged
Steady light = alarm sequence display of PKF block selected
No mark = no alarms without acknowledgement

Fig. 9.136 Process linking alarm sequence block; representation in a group display

The block is represented by 30 characters in a specific location of a group display. For that purpose, input 6 (NRPL) will be parameterized as follows:

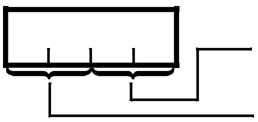


Fig. 9.137 Process linking alarm sequence block; parameterization of input 6 (NRPL)

- Alarm sequence display on a VDU

  Input 4 (ANSE), which must be parameterized, is used to define the screen pages. Up to 150 pages with 24 alarm messages on each page can be parameterized. The number of pages is the total sum of all new pages and all old pages. Parameterization may only be performed in STO mode.

- Display of the PKM block alarm history

  The previous PKM alarms from the buffer are displayed in the work area on the screen. Up to 24 alarms can be displayed at the same time. Scrolling (operator input BE), which is possible in forward or backward direction, allows another 24 alarms per page to be displayed. The latest alarm is always in the bottom line, previous alarms are displayed above in the sequence of the buffer entry. The alarms are not chronologically arranged.

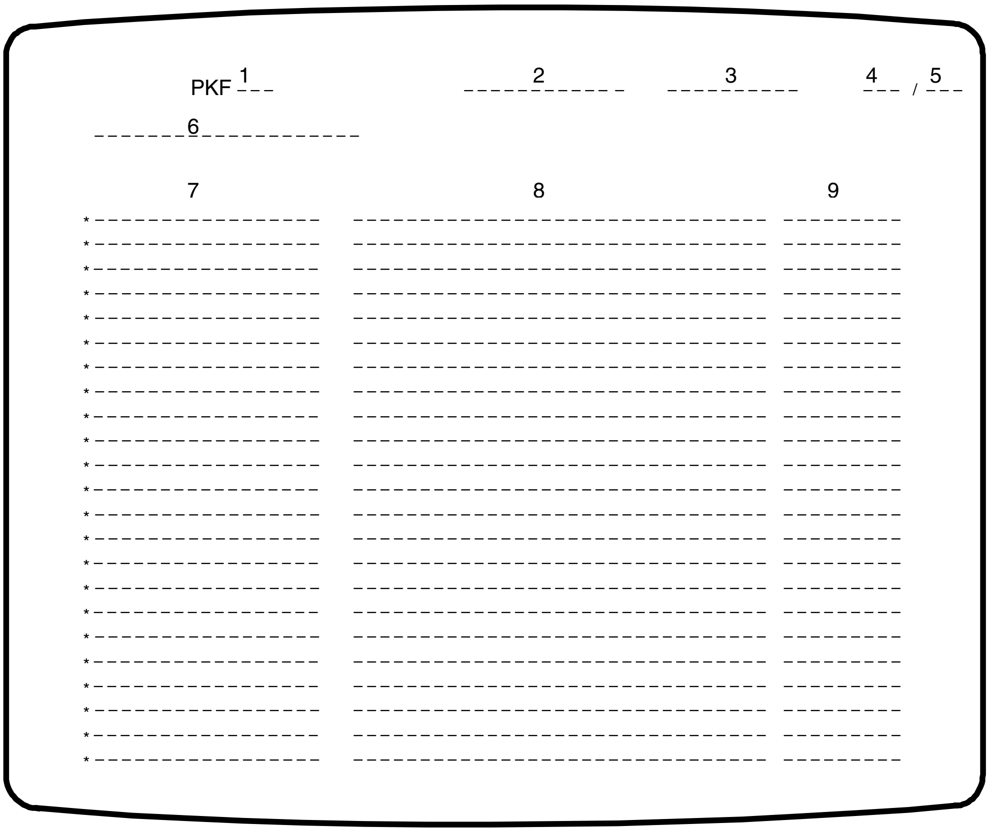
  Old page 1 always contains the latest alarms, the old page with the highest page number contains the oldest alarms. The date of the following alarms is shown above the first alarm. A change of date is displayed instead of an alarm. The work area on the screen is blank if there are no messages on old page 1.

- Display of new PKM block alarms with summary identifier when new alarms occur

  PKM alarms which have occurred since the last selection of the display are displayed. The oldest alarm not yet to have been acknowledged is displayed in the top line of the work area, the more recent alarms are displayed below in the sequence as they are stored in the buffer. The date of the following alarms is shown above the first alarm. A change of date is displayed instead of an alarm.

  All alarms displayed on the screen can be acknowledged together via operator input. A new alarm page will be issued if there are more alarms which have not been displayed. The work area remains empty if there are no further alarms. New alarms occurring while the selected screen is being shown are displayed in the first empty line, if space is available.

  New page 1 is the oldest new page, followed by new pages 2 to n. A new page can only be acknowledged after new page 1 has been selected. New page 1 becomes an old page after it has been acknowledged. New page 2 (if there is one) becomes new page 1.



The alarm sequence display contains dynamic and static data:

1 Mnemonic name and name of the PKF block
2 Process–related name
3 New page/old page according to selection
4 Current page number
5 Maximum number of pages defined
6 Date/time of oldest alarm in work area
7 Date/time of change–of–date message
8 Alarm signal name
9 Alarm status
* Mark for alarms which have not been printed

Fig. 9.138 PKF block alarm sequence display


```
   27. 03. 84 / 12. 01. 43.

          PKF   1           *TECHNOLOG. NAME NEUSEITE 1 /   2

   01  01  00/ 00 23 44 12

   00.23.44.12   MELDUNG 2                        GEKOMMEN
   27. 03. 84/ 00.00.01.07
   11.06.27.25   MELDUNG 2                        GEGANGEN
   11.08.19.25   MELDUNG 1                        GEKOMMEN
 * 11.08.59.25   MELDUNG 2                        GEGANGEN
 * 11.08.59.25   MELDUNG 1                        GEKOMMEN









 PKF,1
```

Fig. 9.139 PKF block alarm sequence display (example)

- Operator input using the process communication keyboard

  Four keys (MQ = 1, FB = 1, ZB = 1, NS = 1) will be assigned after the loop display has been selected and the “Operator input” (BE) key depressed.

  The key operations must be terminated by pressing the execute key ( ).

MQ=1	FB=1	ZB=1	NS=1				

FB Scroll forward
MQ Acknowledge message
NS Select first new page
ZB Scroll backward

Fig. 9.140 PKF block, automatic labeling of the process communication keyboard

MQ = 1 : Acknowledgement of the alarms displayed as new page 1. The new page becomes an old page if there are more than 24 new alarms, the displayed alarms are acknowledged and the next waiting new alarms displayed. Only the oldest new page can be acknowledged. The PKF block must be executable when it is installed.

FB = 1 : Forward scrolling when viewing the new/old pages. Automatic transition from old page 1 to new page 1. After the maximum new page, the display is reset to new page 1.

ZB = 1 : Backward scrolling when viewing the new/old pages. Automatic transition from new page 1 to old page 1. After the maximum old page, the display is reset to new page 1.

NS = 1 : Direct selection of the first new page. The first new page is always displayed when the block has been selected.

In all displays, the page numbers are represented as constant values and the alarms as variables:

Example 1: Operator position 1 = new page 2 selected, 3 new pages available.

Operator position 2 = new page 1 selected and acknowledged.

New page 3 is displayed as new page 2 on operator position 1; new page 3 no longer exists.

Example 2: Operator position 1 = old page 1 selected; 1 new page with 4 messages available.
Operator position 2 = new page 1 selected and acknowledged.
Old page 1 of operator position 1 is started with the display of the 4 last alarms to have been acknowledged. The oldest four alarms are shifted to old page 2 if old page 1 was full.

- System messages

The following I&C messages may occur during the execution of the PKF block:

S 304	Addressing error in the block: PKM block cannot be found; block is not executable.	
S 307	Type error = no interconnection/block has been deleted	
S 314	Main memory error: PKM block cannot be found	
S 371	Buffer limit/80% limit has been reached	(message only)
S 372	Buffer full	(message only)

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Alarm output–common alarm (devices)	MEF	1	AB
Buffer overflow	PUUB	2	AB
Number of lost alarms	ANZ	3	AA
Block processing ON/OFF	AUEI	1	EB
Alarm processing area message field	TYP (0)	2	I
Alarm generator 0 = PKM block	TYP (1)	2	I
Alarm output on VDU	MODI (0)	3	I
Printer number	MODI (1)	3	I
Back–up printer number	MODI (2)	3	I
Switch on bus output	MODI (3)	3	I
Number of pages in alarm buffer (24 each)	ANSE	4	I [1)]
Change–of–date input	TAGW	5	EB
Group display entry	NRPL	6	ID
Process–related name	AT	7	S16

1) The input can only be parameterized in STO mode

- Block list

```
  PKF     1                 15. 08. 84/ 10. 43. 03. P: 1

1 AB  MEF  0                #                            7
2 AB  PUUB 0                #                            8
3 AA  ANZ  0.0000           #                            9
1 EB  AUEI 0                   P                         1
2 I   TYP                                    C           2
      0        0
      1        0
3 I   MODI                                   C           3
      0        0
      1        0
      2        0
      3        0
4 I   ANSE     0                             C           4
5 EB  TAGW 1                   P                         5
6 ID  NRPL     0                             C           6
7 S16 AT   *TECHNOLOG. NAME          16                 31
```

PKM

Process link alarm acquisition block

Application

- Acquisition of configured alarms from a process interface
- Acquisition of configured alarms from a GB block:
  The alarm is stored in the PKF block buffer.
- This block is also used for the acquisition of alarms for the acyclic level ZYK 1 with higher resolution, used for the AS 235 with direct access to the process interface "dynamic binary input module for 16 binary values" (6DS1 601–8BA).

Method of Operation

Only numbers between 1 and 9999 are permitted as block name.

The PKM block is normally installed after an XA block (acyclic level ZYK1 or ZYK5) or an XB block in the sequence list. The block assumes control function for one cycle after a common alarm has occurred. The required execution time is thus reduced to a minimum.

The binary input modules 6DS1601–8BA and 6DS1602–... can be used as process interfaces.

Acquisition of the PKM block alarm status

- **Alarm acquisition for internal binary values**

  16 binary values are read from the GB block interconnected via input 39 (GBA) if input 37 (BGNR) has been parameterized with 255. The address in GBA is used as a field address with 16 binary values, and must be specified if the parameter is BGNR = 255.

  The binary values are checked for changes; a flag is set in the PKM block, if applicable. The alarm for the binary values is generated by the PKM block.

- **Alarm acquisition binary module "dynamic binary input DYN" (6DS1 602–8BA)**

  If input 37 (BGNR) has been parameterized with 0 to 60 or 100 to 145, the 16 binary values are read from the binary input module with the corresponding module number.

  BGNR = 0 – 60, 100 – 160

  The even byte address of the binary input module is specified via input 38 (KNR).

  KNR = 0 – 62

16 binary values, starting at the module address selected via BGNR and KNR, are read and processed. Input 39 (GBA) can be used to make a GB field of 16 values available to store the read binary values (interconnection of input 39).

GBA : – Interconnection with GB field (16 binary values): the values which have been read are updated in the GB field if change occurs.

The binary values are checked for changes; a flag is set in the PKM block, if applicable. The alarm for the binary values 1 to 16 is generated by the PKM block.

- **Selective processing of the 16 binary values (internal and external processing)**

The interconnection of inputs 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34 (FCxx) with a 16–character string (e.g. input 43 or FC block) activates a binary signal. The binary value is not processed if basic interconnection is selected. Only binary values whose FCxx parameters have been interconnected with 16–byte string in an FC field or with a PKLM block are processed. Characters 0 to 7 are used for binary status “0”, characters 8 to 15 for binary status “1”.

Operator input: Process control may exclude individual binary values from processing

The signal names are specified via inputs 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33 (MTxx). Input field 35 (TYP) contains an edge selection parameter for each binary signal. Field index 1 = binary value 1, field index 16 = binary value 16.

Edge selection : 0 = rising edge $0 \rightarrow 1$ (leading edge)
1 = falling edge $1 \rightarrow 0$ (trailing edge)
2 = leading and trailing edge, $0 \rightarrow 1$, $1 \rightarrow 0$

The parameter input type TYP (0) = 1 is used to set and reset (pulse) the output SIAN for one block cycle in case of a signal change.

Input 36 (MODI) defines updating and disabling/enabling of binary signals for process control.

“MODI(0) = 0” Updating not permitted; ’UP = 1’ key not assigned
“MODI(0) = 1” Updating permitted “without log”; ’UP = 1’ key assigned
“MODI(0) = 2” Updating permitted “with log”; UP = 1 key assigned

“MODI(1) = 0” Enabling/disabling of binary signals not permitted;
’FR = ’ and ’SP = ’ keys not assigned
“MODI(1) = 1” Enabling/disabling of binary signals permitted;
’FR = ’ and SP = ’ keys assigned

The number of the printer used for printing the updating log/status log is defined via input 42 (UPDR)

“UPDR = 0” No printout
“UPDR = 1” PT90 – 1 printer 1
“UPDR = 2” PT90 – 2 printer 2

The PKF block interconnected with input 40 (PKF1) issues the logs. The PKF block only buffers one request.

- **Updating the binary status of the alarm signals**

  All binary values can be read again, initiated by process control. An old/new comparison is not performed; change alarms will therefore not be issued. The read binary status of all binary values is used as initial status for all subsequent signal changes. Internal binary values can be updated and data acquisition from binary modules is possible. This operation can be modified by parameterization (MODI).

  Input 2 (UPDA) is used for updating after restart. The RESTART block can set this input to 1 and call the PKM block as subroutine. The input is reset afterwards and no log is printed. The UPDA input is only effective if it has been enabled via input 36 (MODI).

  Alarm generation

  During each block scan, the signals of the configured binary values are checked for changes; a flag is stored in the PKF block if a change has occurred. Up to two PKF blocks can be specified as indicator blocks. An I&C alarm is issued by the PKF block if a buffer overflow occurs or when 80% of the buffer capacity has been reached. All alarms are transferred if there is sufficient free space in the PKF buffer. Alarms are entered in the PKF buffer until it is full. The selection of the alarms which cannot be entered is indicated at output 3 (ANZ) of the PKF block; the buffer overflow is indicated at output 2 (PUUB). Output ANZ will be reset upon the next successful entry. If inputs 40 (PKF1) or 41 (PKF2) have been interconnected with a PKF block, a message will be entered when a signal transition occurs.

- **Screen output of the alarm states**

  In the display, the PKM block uses the stored binary states to show the alarm states of all parameterized alarm signals. All states of the alarm signals will be displayed on the work area of the screen; alarm states which have not been parameterized are not displayed (empty line, binary number only).

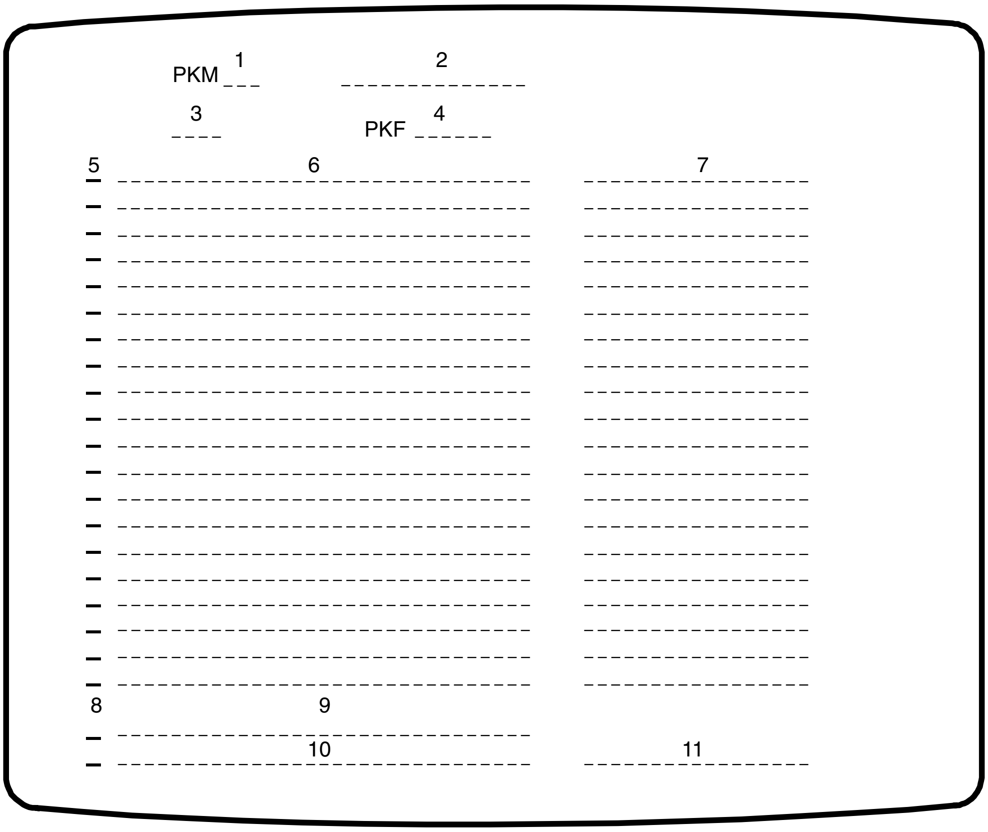
  An alarm has not been parameterized if the input “FCxx” pertaining to the alarm signal has not been interconnected with an FC field.

  The alarm status is displayed in location–oriented manner. If a binary value has been disabled by operator input, the binary value number at its alarm location is marked.

  - Red mark : disabled
  - Green mark : being processed
  - Not parameterized : only binary number output

  If the status of a binary value has changed since the last display selection, a mark in reverse display is set at its location. The last transferred status of a binary value can be displayed together with date and time by process control in the bottom line of the work area.

- **Normalized representation of the current alarm states**



The display contains static and dynamic data.

Static data:

1 Mnemonic name and number of PKM block
2 Process related name
4 Name of the PKF block for messages
6 Signal name of a binary value

Dynamic data:

3 Block status EI/AU = ON/OFF
5 Signal number
7 Current signal status
8 Selection binary value/signal number
9 Date/time of the previous alarm
10 Signal name
11 Signal status of the previous alarm

Fig. 9.141 Representation of the message sequence display of the PKM block

```
27. 03. 84 / 12. 03. 58.

     PKM   1    *TECHNOLOG. NAME

     EI         PKF         1

   1      MELDUNG 1                 GEGANGEN
   2      MELDUNG 2                 GEKOMMEN
   3
   4
   5
   6
   7      MELDUNG 7                 GEGANGEN
   8
   9
  10
  11
  12
  13
  14
  15
  16

   2 27  03  84/ 11.08.59.25.
         MELDUNG 2                  GEKOMMEN

PKM,1
```

Fig. 9.142 Detailed representation of signal states (PKM block)

- **Operator input using the process communication keyboard**

Up to six keys will be assigned after the detailed display has been selected and the “Operator input” (BE) key depressed. Some of the assignments can be defined via input 36 (MODI) (MQ = 1, MZ = 1, MD =, UP = 1, SP =, FR =).

Key entries using QM=1, MZ=1 and UP=1 must be terminated by pressing the execute key ().

After one of the MD =, SP = and FR = keys has been depressed, the signal number must be entered as a sequence of figures and the entry terminated by the execute key ().

MQ=1	MZ=1	MD=	UP=1	SP=	FR=		

FR Enable
MD Selection of last message status
MQ Message acknowledgement
MZ Message status on logging device
SP Inhibit processing
UP Update

Fig. 9.143 PKM block; automatic labeling of the process communication keyboard

MQ = 1: Acknowledgement of the new marked alarms.
The alarm signals which have changed since the last acknowledgement with MQ = 1 cause a reversed display of the associated alarm number. The internal change flags are cleared after an MQ = 1 operator input and the alarm number is displayed normally.

MZ = 1: Alarm status on logging device
All alarms states are transferred to and output on the parameterized logging device as marked alarm without edge selection. The PKF block interconnected with input 40 (PKF1) performs the log output. The PKF block only buffers one request.

MD = mn: Selective choice of the last alarms status of the binary value mn.

UP = 1: Updating of the whole binary image and acceptance of the new binary values as old states. Operator input inhibit and logging function perform according to parameterization. Output is as for MZ.

SP = mn: Processing is disabled for the binary value with the number mn. The binary value is excluded from alarm processing until it is re–enabled. It is identified by a black and red alarm number. Processing can only be disabled with an appropriate parameterization.

FR = mn: Operation enabling for the binary value with the number mn. This binary value, which is identified by a green alarm number, is processed.

No key assignment exists for UP, SP or FR if these functions have been disabled via mode selection.

- **System messages**

The following system messages may occur during block execution

S 305 Time–out from peripheral device: incorrect module number
S 307 Incorrect type = no interconnection/block has been deleted
S 313 EANK, multiple addressing/acknowledgement from modules
S 314 Main directory fault = no interconnection

- **Data structure (designation of inputs and outputs)**

Meaning	Mnemonic name	Input/Output No.	Type
Common module alarm	BGF	1	AB
Change in module signal group	SIAN	2	AB
Block processing ON/OFF	AUEI	1	EB
Updating	UPDA	2	EB
Alarm name x – S32 string	MTO1	3	S32
Status text 1 – interconnection	FCO1	4	EA
Alarm name x – S32 string	MTO2	5	S32
Status text 2 – interconnection	FCO2	6	EA
Alarm name x – S32 string	MTO3	7	S32
Status text 3 – interconnection	FCO3	8	EA
Alarm name x – S32 string	MTO4	9	S32
Status text 4 – interconnection	FCO4	10	EA
Alarm name x – S32 string	MTO5	11	S32
Status text 5 – interconnection	FCO5	12	EA
Alarm name x – S32 string	MTO6	13	S32
Status text 6 – interconnection	FCO6	14	EA
Alarm name x – S32 string	MTO7	15	S32
Status text 7 – interconnection	FCO7	16	EA
Alarm name x – S32 string	MTO8	17	S32
Status text 8 – interconnection	FCO8	18	EA
Alarm name x – S32 string	MTO9	19	S32
Status text 9 – interconnection	FCO9	20	EA
Alarm name x – S32 string	MT10	21	S32
Status text 10 – interconnection	FC10	22	EA
Alarm name x – S32 string	MT11	23	S32
Status text 11 – interconnection	FC11	24	EA
Alarm name x – S32 string	MT12	25	S32
Status text 12 – interconnection	FC12	26	EA
Alarm name x – S32 string	MT13	27	S32
Status text 13 – interconnection	FC13	28	EA
Alarm name x – S32 string	MT14	29	S32
Status text 14 – interconnection	FC14	30	EA
Alarm name x – S32 string	MT15	31	S32
Status text 15 – interconnection	FC15	32	EA
Alarm name x – S32 string	MT16	33	S32
Status text 16 – interconnection	FC16	34	S32
Acquisition type One parameter per signal (0 – 16)	TYP	35	I(16)
Processing mode alarms	MODI	36	I(1)
Update parameter	MODI(0)	36	
Enable/disable by operator input	MODI(1)	36	
Module number	BGNR	37	I
Module channel number	KNR	38	I
GB digital value field for signals	GBA	39	EA
Cyclic alarm buffer 1	PKF1	40	EA
Cyclic alarm buffer 2	PKF2	41	EA
Printer number (updating/status log)	UPDR	42	I
Basic alarms status texts FCxx Default: “WENT/CAME”	FCGZ	43	S16
Process–related name	AT	44	S16

- Block list

```
   PKM     1                 15. 08. 84/ 10. 44. 13. P: 1

 1 AB  BGF  0                #                         44
 2 AB  SIAN 0                #                         45
 1 EB  AUEI 0                  P                        1
 2 EB  UPDA 0                  P                        2
 3 S   MT01                        32                   3
         0
        16
 4 EA  FC01 0.0000                           C Q        4
 5 S   MT02                        32                   5
         0
        16
 6 EA  FC02 0.0000                           C Q        6
 7 S   MT03                        32                   7
         0
        16
 8 EA  FC03 0.0000                           C Q        8
 9 S   MT04                        32                   9
         0
        16
10 EA  FC04 0.0000                           C Q       10
11 S   MT05                        32                  11
         0
        16
12 EA  FC05 0.0000                           C Q       12
13 S   MT06                        32                  13
         0
        16
14 EA  FC06 0.0000                           C Q       14
15 S   MT07                        32                  15
         0
        16
16 EA  FC07 0.0000                           C Q       16
17 S   MT08                        32                  17
         0
        16
18 EA  FC08 0.0000                           C Q       18
19 S   MT09                        32                  19
         0
        16
20 EA  FC09 0.0000                           C Q       20
21 S   MT10                        32                  21
         0
        16
22 EA  FC10 0.0000                           C Q       22
23 S   MT11                        32                  23
         0
        16
24 EA  FC11 0.0000                           C Q       24
25 S   MT12                        32                  25
         0
        16
26 EA  FC12 0.0000                           C Q       26
27 S   MT13                        32                  27
```

Block list (continued)

```
   PKM      1                     15. 08. 84/ 10. 45. 25. P: 2

28 EA  FC13 0.0000                                  C Q      28
29 S   MT14                               32                 29
         0
        16
30 EA  FC14 0.0000                                  C Q      30
31 S   MT15                               32                 31
         0
        16
32 EA  FC15 0.0000                                  C Q      32
33 S   MT16                               32                 33
         0
        16
34 EA  FC16 0.0000                                  C Q      34
35 I   TYP                                          C        35
         0      0
         1      0
         2      0
         3      0
         4      0
         5      0
         6      0
         7      0
         8      0
         9      0
        10      0
        11      0
        12      0
        13      0
        14      0
        15      0
        16      0
36 I   MODI                                         C        36
         0      0
         1      0
37 I   BGNR     0                                   C        37
38 I   KNR                    0                     C        38
39 EB  GBA      0                                   C Q      39
40 EA  PKF1 0.0000                                  C Q      40
41 EA  PKF2 0.0000                                  C Q      41
42 I   UPDR     0                                   C        42
43 S16 FCGZ GEGANGENGEKOMMEN     16                          43
44 S16 AT   *TECHNOLOG. NAME     16                          62
```

PLG

Polygon curve block

Application

This block is used for the linearization of analog input variables, as a polygon calculator and for indirect measurements.

Method of Operation

An analog input variable can be adapted as required via six pairs of vertexes.

The curve is interpolated in linear fashion between the vertexes. Y is set to Y1 (if X < X1) or to Y6 (if X > X6) outside the range if X1 ≤ X2 ≤ X3 ≤ X4 ≤ X5 ≤ X6!

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/Output No.	Type
Output value		Y	1	AA
Input variable		X	1	EA
Vertex	1	X1	2	EA
Vertex	1	Y1	3	EA
Vertex	2	X2	4	EA
Vertex	2	Y2	5	EA
Vertex	3	X3	6	EA
Vertex	3	Y3	7	EA
Vertex	4	X4	8	EA
Vertex	4	Y4	9	EA
Vertex	5	X5	10	EA
Vertex	5	Y5	11	EA
Vertex	6	X6	12	EA
Vertex	6	Y6	13	EA

- Block list

```
   PLG      1                                        P:  1

 1 AA  Y    0.0000         #                   N      14
 1 EA  X    0.0000            P                        1
 2 EA  X1   0.0000            P                        2
 3 EA  Y1   0.0000            P                        3
 4 EA  X2   0.0000            P                        4
 5 EA  Y2   0.0000            P                        5
 6 EA  X3   0.0000            P                        6
 7 EA  Y3   0.0000            P                        7
 8 EA  X4   0.0000            P                        8
 9 EA  Y4   0.0000            P                        9
10 EA  X5   0.0000            P                       10
11 EA  Y5   0.0000            P                       11
12 EA  X6   0.0000            P                       12
13 EA  Y6   0.0000            P                       13
```

PLPS

Read/Write Parameter Block

Application

The PLPS block enables up to 20 parameters to be read from or written to an AS 230/235 connected to the CS 275 bus.

Method of Operation

At any one time, the PLPS block only processes the message type selected by the parameterization in SCHR (i.e. either read or write message). Up to 20 block addresses can be specified for the parameters to be transferred.

The parameter description consists of:

BTn:	Block type	e.g.	RN
BNn:	Block name	e.g.	OTTO
PTn:	Parameter type	e.g.	S16
PNn:	Parameter number	e.g.	90

A mixed specification of parameters is possible, i.e. different parameters from various blocks can be specified. The number of parameters per message is limited by the system buffer size of 60 words and therefore depends on the parameter types specified.

Parameter type length

1 Word	2 Word	3 Word	8 Word
EB, EBV, PB, AB I, ID S2	EA, EAV, ETV S4 AA, PA, PGT	EAD, EDV, AAD, PAD	S16

Allocation of data blocks to parameter types

Block	Parameter type
GA	PAD
GB	PB
GM	PB
GT	PGT
FA	PAD
FSA	PA
FB	PB
FC	S

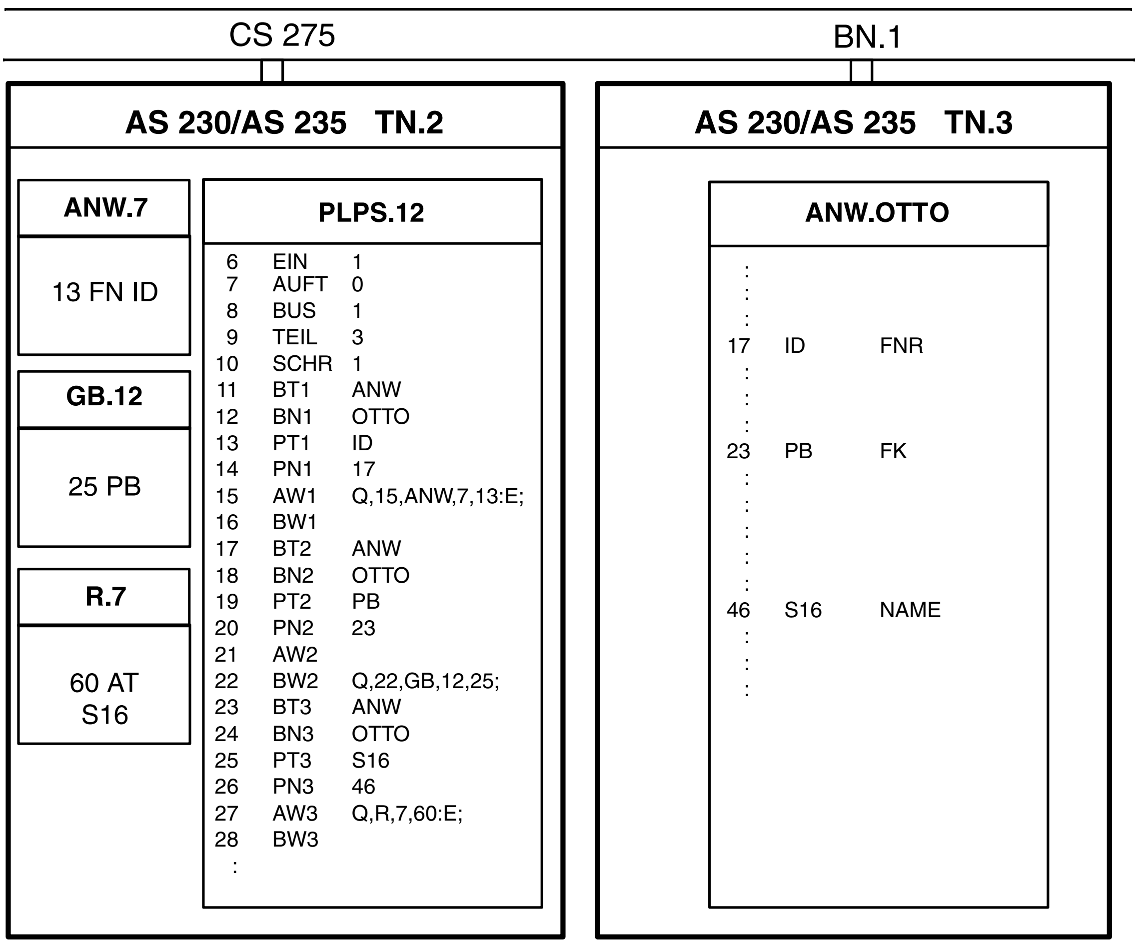
Initialization function:

The block is installed in a cyclic processing level (ZYK 3).
A "Y initialization" must be performed before a read or write message can be processed. This initialization function checks whether the parameters specified in the block exist in the partner AS, and returns the internal addresses of these parameters.

The internal parameter addresses required for processing are generated from the parameterized external addresses, and the internal data buffers are created and preset according to the parameters entered. No other messages are processed by the block during this time.

Re–activation of the Y initialization is necessary after one of the following modifications has been performed:

- Re–parameterization of previously defined elements.
- Change of the message type (read/write)
- Change of the interconnection address for target or source data (e.g. device number change, definition of new blocks, etc.)
  (e.g. device number change, definition of new blocks, etc.)
- Re–configuration in the subordinate automation systems.



Parameterization example: three parameters from AS 2 (TN.2) are written to the block ANW.OTTO in AS 3 (TN.3) which is connected to BUS 1 (BN.1).

Fig. 9.144 Example of write parameterization

☞ Malfunctions may occur (internal name ≠ external name) without the PLPS block issuing an error message when a block has been deleted from the subordinate automation system and is re–defined at a later point in time. Y initialization must then be repeated.
Y initialization may not be performed simultaneously for several specified blocks. If more than one PLPS block has been parameterized for a Y initialization, the next PLPS block may only be enabled for Y initialization after processing of the previous block has been terminated.
The PLPS block currently processed may not be interrupted, as otherwise the remaining PLPS block will not be processed.

Y initialization is started by the job code parameter (AUFT).

AUFT can assume four different values:

– AUFT = 255 Default value.

  This value shows that the block has not yet been processed.

– AUFT = 0 The Y initialization function is finished.

  The block is now ready for transmitting read or write messages with the specified block addresses. Faultless Y initialization has only been performed for a subset of the parameterized elements if additional error messages are issued together with AUFT = 0.

– AUFT = 1 User start of the Y initialization function.

  The internal data buffers have been created during Y initialization depending on the parameterization of the SCHR and MUXS inputs.

  Read message frame: (SCHR = 0) The blocks checks whether the expected length of the response is valid for the data buffer. The first element which goes beyond the buffer limit and all subsequent elements will not be processed.

  Write message frame: (SCHR = 1) Processing depends on the parameterization of the MUXS elements during Y initialization.

  Group processing: The valid user data length is checked and subsequent error handling performed in the same manner as the read message is processed. Dynamic parameter modification is possible during message processing.

  Individual processing: Violation of the buffer limits is not checked. Changeover from individual to group processing is only possible after a new Y initialization has been performed.

– AUFT = 2 Parameterization enabled

  This entry starts parameter modification for a new Y initialization. The parameters relevant for the Y initialization can only be modified in this state. The current message processing is aborted after this entry.

The following procedure is recommended for performing Y initialization:

- Definition of function blocks and global areas in the subordinate automation system.
- Definition of the PLPS block in the higher order automation system,
- Set job code AUFT = 2.
- Enter the parameters BUS, TEIL, SCHR and MUXS.
- Parameterization of the external element addresses (BTn/PNn) and the associated interconnection addresses (AWn/BWn).
  It is possible to parameterize all elements and to perform Y initialization for a subset only. Delimiters are blank at input BTn.

☞ Parameter SCHR cannot be changed once the first interconnection address has been interconnected.
The direction can only be modified if the job code AUFT = 2 is set after definition but prior to interconnection. Otherwise the block has to be deleted and defined once more.

- Set job code AUFT = 1
- Note return data (3 possibilities)
  1. AUFT = 0 (no error message)
     The job for all element addresses has been terminated without errors.
  2. AUFT = 0 (error message issued)
     The job has not been terminated without errors. Input BTn of an element address where an error has been detected is cleared.
     Message processing without a new Y initialization is possible for all elements preceding in the block list.
  3. AUFT = 2
     An error has been detected whilst the first element address has been processed. The initialization function is aborted.

Job code AUFT = 1 starts the Y initialization. A message is sent for each individual parameter to the partner automation system, and a reply awaited.

☞ The whole Y initialization may therefore last for several seconds.
It is not possible to redefine a transmitting PLPS block into a receiving one.
Transfer of S16 strings using the PLPS block is an exception in PLPS execution. It may only be used if the data target is an S16 string, not an FC field.

⚠ CHECK execution in the target AS is not performed if a message contains more than one write task.
Only one parameter per message frame may be written to the parameter with C code via the bus.

Error messages

Output	Meaning	Remedial action
TNFY PNFY BNFY	Incorrect or missing external element address	Check type name, parameter number and block type
AWBW	Incorrect interconnection address	Does interconnection address exist? Do interconnection address and element address match?
ZEIT	Message return data monitoring time (5 s) has elapsed	Check hardware and bus load
FEN8 FEBU	N8 error message Bus error message	Cf. I&C alarms S 382 to S 389
TELA	Message length exceeded	Check parameter type length
ELFE	Number of faulty element address	

- Read message frame (SCHR = 0)

The read message frame can be activated in two different ways:

MOD = 0 Cyclic message frame processing.
MOD = 1 The message frame is only sent cyclically if the picture/layout interconnected with PICT has been selected via an operator position.

The required data may not exceed a total length of 60 words. The total length is the sum of the individual lengths of the specified parameter types (see table). Errors are already detected during Y initialization.

Element address parameter types and the associated interconnection addresses must be expediently coordinated with each other.

☞ Character strings may only be stored as strings.

Error messages

Output	Meaning	Remedial action
WART	Cannot yet be processed by N8	Processing is repeated in the next cycle. Check bus load, if applicable
PABU	Passive bus. N8 only listens, and does not transmit	Check GA.ORPA.28 and re–parameterize if necessary
TF	Message fault. Required data incorrect or source does not exist	Has subordinate system been modified after initialization? New Y initialization if necessary.
ZEIT	Message return data monitoring time (5 s) has elapsed	Check hardware
AWBW	The received data is not stored in the target	Check interconnection address

- Write message frame (SCHR = 1)

The write message frame is only sent once to the subordinate automation system. Transfer is initiated via input TELS, and feedback is not given to the higher–order automation system after the message frame has been received.

The parameterized elements can be processed individually or as a group.

MUXS = 0 : Group processing
All elements send their current values to the subordinate automation system.

MUXS = 1 : Individual processing
Only the element specified by TENS performs the write function.

Any changeover of thei multiplex function during message frame processing depends on the MUXS value during Y initialization.

The transmit buffer holds 60 words of user data for group processing. This should be considered during element parameterization. Each element occupies 2 words plus the length of the corresponding parameter type (see Table 1). Configuration errors are detected during Y initialization.

The data buffer limits and the parameter type length need not be taken into account when the initialization function is performed for individual processing.

The following points should be taken into consideration when configuring the system, in order to obtain maximum benefit from the write function with minimum memory requirements.

- Expedient selection of the multi–function
  (individual or group processing)
- Length of the specified parameter types
  (transmit buffer limit for group processing)
- Minimization of the number of PLPS blocks.

The following rule applies to the writing of parameters:

- If the CHECK routine provided in the computer is to be executed when a parameter is written, i.e. the parameter has a C code, only one parameter may be transmitted in the message.
- If more than one parameter is transmitted in the message, CHECK codes are not taken into consideration, i.e. values which might have been rejected by CHECK with an individual transfer are entered.

Meaning of the MUXS parameter during Y initialization

Y initialization	Write message	Possible application
MUXS = 0	MUXS = 0	Simultaneous transfer of several values (e.g. binary states from a global area)
MUXS = 0	MUXS = 1 MUXS = 0	Multiplex function changeover depending on process state is possible
MUXS = 1	MUXS = 1	Individual processing with optimum use of the internal PLPS block buffer

A check bit is used for rejecting illegal write access (violation of CHECK inputs, writing to outputs) in the subordinate automation system. An error message is not issued.

Note for group processing:

- The check bit remains ineffective in the event of an illegal write access if the message contains a parameter from the global area (GA, GB).
- The strings must follow the global area element addresses in a message if data from global area and character strings are transferred together.

Error messages:

Output	Meaning	Remedial action
WART	Cannot yet be processed by N8	Processing is repeated in the next cycle. Check bus load, if applicable
PABU	Passive bus, N8 only listens, and does not transmit	Check GA.ORPA.28 and re–paramaterize if necessary
PAFE	Parameterization error. Common processing has been selected, although individual processing has been selected during Y initialization	MUXS re–parameterization or new Y initialization
TF	Individual processing message fault: incorrect element number	Check interconnection or TENS parameterization

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Element with incorrect processing	ELFE	1	AA
Read/Write message processing in progress	LESC	2	AB
Type name not found during Y initialization	TNFY	3	AB
Parameter number not found during Y initialization	PNFY	4	AB
Block not found during Y initialization	BNFY	5	AB
Illegal interconnection address AWn/BWn	AWBW	6	AB
Time monitoring function has responded	ZEIT	7	AB
Error message from N8	FEN8	8	AB
Error message from Bus	FEBU	9	AB
Message fault	TF	10	AB
Parameter read/write error			
Message length has been exceeded	TELA	11	AB
N8 busy	WART	12	AB
Passive bus	PABU	13	AB
Parameterization error	PAFE	14	AB
Write message (MUXS = 1)	TENS	1	EA
The element with this number is processed			
Read message (MOD = 1):	PICT	2	EA
Interconnection address for picture/layout mode			
(read message frame only)	MOD	3	EB
= 0 Message frame is always processed			
= 1 A message frame is only transmitted if the image parameterized under .PICT is waiting at an operator position.			
Write message frame multiplex function	MUXS	4	EB
= 1 The element parameterized under .TENS is processed.			
= 0 All parameterized elements are transferred			
Initiate write message	TELS	5	EB [1]
= 1 Activate block processing	EIN	6	EB
= 0 Deactivate block processing			
Job code	AUFT	7	I
Bus number	BUS	8	I
Device	TEIL	9	I
Write code	SCHR	10	PB
= 1 Write			
= 0 Read			
Block type – element no. 1	BT 1	11	S4
Block type – element no. 1	BN 1	12	S4
Parameter type – element no. 1	PT 1	13	S4
Parameter number – element no. 1	PN 1	14	S4
Interconnection address analog value 1	AW 1	15	EA
Interconnection address binary value 1	BW 1	16	EB

[1] The input device is a pushbutton; cyclic transmission requires the input to be set again.

- Block list

PLPS 1

1	AA	ELFE	0.0000				131
2	AB	LESC	0				132
3	AB	TNFY	0				133
4	AB	PNFY	0				134
5	AB	BNFY	0				135
6	AB	AWBW	0				136
7	AB	ZEIT	0				137
8	AB	FEN8	0				138
9	AB	FEBU	0				139
10	AB	TF	0				140
11	AB	TELA	0				141
12	AB	WART	0				142
13	AB	PABU	0				143
14	AB	PAFE	0				144
1	EA	TENS	0.0000	P			1
2	EA	PICT	0.0000	P	C	Q	2
3	EB	MOD	0	P			3
4	EB	MUXS	0	P			4
5	EB	TELS	0	P			5
6	EB	EIN	0	P			6
7	I	AUFT	255		C		7
8	I	BUS	0		C		8
9	I	TEIL	0		C		9
10	PB	SCHR	0		C		10
11	S4	BT1			C		11
12	S4	BN1			C		12
13	S4	PT1			C		13
14	S4	PN1			C		14
15	EA	AW1	0.0000	P	C	Q	15
16	EB	BW1	0	P	C	Q	16
17	S4	BT2			C		17
18	S4	BN2			C		18
19	S4	PT2			C		19
20	S4	PN2			C		20
21	EA	AW2	0.0000	P	C	Q	21
22	EB	BW2	0	P	C	Q	22
23	S4	BT3			C		23
24	S4	BN3			C		24
25	S4	PT3			C		25
26	S4	PN3			C		26
27	EA	AW3	0.0000	P	C	Q	27
28	EB	BW3	0	P	C	Q	28
29	S4	BT4			C		29
30	S4	BN4			C		30
31	S4	PT4			C		31
32	S4	PN4			C		32
33	EA	AW4	0.0000	P	C	Q	33
34	EB	BW4	0	P	C	Q	34
35	S4	BT5			C		35
36	S4	BN5			C		36
37	S4	PT5			C		37
38	S4	PN5			C		38
39	EA	AW5	0.0000	P	C	Q	39
40	EB	BW5	0	P	C	Q	40
41	S4	BT6					41
42	S4	BN6			C		42
43	S4	PT6			C		43
44	S4	PN6			C		44
45	EA	AW6	0.0000	P	C	Q	45
46	EB	BW6	0	P	C	Q	46
47	S4	BT7			C		47

Block list (continued)

48	S4	BN7			C		48
49	S4	PT7			C		49
50	S4	PN7			C		50
51	EA	AW7	0.0000	P	C	Q	51
52	EB	BW7	0	P	C	Q	52
53	S4	BT8			C		53
54	S4	BN8			C		54
55	S4	PT8			C		55
56	S4	PN8			C		56
57	EA	AW8	0.0000	P	C	Q	57
58	EB	BW8	0	P	C	Q	58
59	S4	BT9			C		59
60	S4	BN9			C		60
61	S4	PT9			C		61
62	S4	PN9			C		62
63	EA	AW9	0.0000	P	C	Q	63
64	EB	BW9	0	P	C	Q	64
65	S4	BT10			C		65
66	S4	BN10			C		66
67	S4	PT10			C		67
68	S4	PN10			C		68
69	EA	AW10	0.0000	P	C	Q	69
70	EB	BW10	0	P	C	Q	70
71	S4	BT11			C		71
72	S4	BN11			C		72
73	S4	PT11			C		73
74	S4	PN11			C		74
75	EA	AW11	0.0000	P	C	Q	75
76	EB	BW11	0	P	C	Q	76
77	S4	BT12			C		77
78	S4	BN12			C		78
79	S4	PT12			C		79
80	S4	PN12			C		80
81	EA	AW12	0.0000	P	C	Q	81
82	EB	BW12	0	P	C	Q	82
83	S4	BT13			C		83
84	S4	BN13			C		84
85	S4	PT13			C		85
86	S4	PN13			C		86
87	EA	AW13	0.0000	P	C	Q	87
88	EB	BW13	0	P	C	Q	88
89	S4	BT14			C		89
90	S4	BN14			C		90
91	S4	PT14			C		91
92	S4	PN14			C		92
93	EA	AW14	0.0000	P	C	Q	93
94	EB	BW14	0	P	C	Q	94
95	S4	BT15			C		95
96	S4	BN15			C		96
97	S4	PT15			C		97
98	S4	PN15			C		98
99	EA	AW15	0.0000	P	C	Q	99
100	EB	BW15	0	P	C	Q	100
101	S4	BT16			C		101
102	S4	BN16			C		102
103	S4	PT16			C		103
104	S4	PN16			C		104
105	EA	AW16	0.0000	P	C	Q	105
106	EB	BW16	0	P	C	Q	106
107	S4	BT17			C		107
108	S4	BN17			C		108
109	S4	PT17			C		109

Block list (continued)

110	S4	PN17			C		110
111	EA	AW17	0.0000	P	C	Q	111
112	EB	BW17	0	P	C	Q	112
113	S4	BT18			C		113
114	S4	BN18			C		114
115	S4	PT18			C		115
116	S4	PN18			C		116
117	EA	AW18	0.0000	P	C	Q	117
118	EB	BW18	0	P	C	Q	118
119	S4	BT19			C		119
120	S4	BN19			C		120
121	S4	PT19			C		121
122	S4	PN19			C		122
123	EA	AW19	0.0000	P	C	Q	123
124	EB	BW19	0	P	C	Q	124
125	S4	BT20			C		125
126	S4	BN20			C		126
127	S4	PT20			C		127
128	S4	PN20			C		128
129	EA	AW20	0.0000	P	C	Q	129
130	EB	BW20	0	P	C	Q	130

PRA

Driver block for testable relay output module

Application

The driver is used for outputting binary values to the testable relay output module (see Chap. 9.2).

Method of Operation

The driver transfers the binary values BE1 to BE16 to the relay output module whose slot number is defined by the BGNR parameter (module number).

The current output signals and the received values (BE1 to BE16) are compared on the output module. The binary outputs FTSP (fault in coil voltage test) and BGF (module fault) are set if there are any discrepancies between these values.

Two test patterns (AA55H und 55AAH) are then written to the module and read back. This causes the channel–related LEDs to be triggered briefly. Any discrepancies between written and read values also set the binary outputs FTST and BGF. This test runs so quickly that the relays on the modules do not change their states. The module outputs signals remain constant.

Faults in the 16 channels are indicated in a binary array, provided that the KF binary input has been interconnected with a binary array. A binary value “0” indicates that the corresponding channel is faultless; “1” indicates a fault. KF must be interconnected with a binary array which has at least a length of 16 after the interconnection address. The binary values then correspond to the channels 1 to 16 (according to ascending numbers).

Next the fuses of the 16 channels are tested. The binary outputs SIF (tripped fuse) and BGF are set if a fuse has tripped. The corresponding channel is also indicated in the binary array that has been interconnected by the KF binary input (see above). The red “SIF” LED on the module is triggered, too.

The EINF binary input enables the user to select whether, in the event of a central unit failure, default values (EINF = 0B) are to be used or the last output values are to be held (EINF = 1B). The default values can be specified by the parameters VWF1 to VWF2 (failure default values). Four output signals are assigned to each parameter according to the following pattern (K.x = channel x):

VWF1	K.4	K.3	K.2	K1
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

VWF2	K.8	K.7	K.6	K.5
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

VWF3	K.13	K.11	K.10	K.9
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

VWF4	K.16	K.15	K.14	K.13
0	0	0	0	0
1	0	0	0	1
2	0	0	1	0
3	0	0	1	1
4	0	1	0	0
5	0	1	0	1
6	0	1	1	0
7	0	1	1	1
8	1	0	0	0
9	1	0	0	1
10	1	0	1	0
11	1	0	1	1
12	1	1	0	0
13	1	1	0	1
14	1	1	1	0
15	1	1	1	1

Table 9.3 Allocation of failure default values/channel

The failure default values (see VWF1 to VWF4) transferred to the module are also read back and compared with the written values. The binary outputs FVW (fault when reading the default values) and BGF are set when a fault is detected. The corresponding channel is again indicated in the binary array that has been interconnected by the KF binary output (see above).

Subsequent to the driver execution that follows the failure, the WD binary output indicates that the watchdog on the module has responded (WD = 1N). The WD binary output then returns to 0B.

The UESP (overvoltage) and BGF binary outputs are set if an overvoltage has been detected on the module.

The EINF value that has been transferred to the module is also read back and checked for correctness. An incorrect values causes the binary outputs FEIN (fault when reading back the freeze bit) and BGF to be set.

The I&C alarm PRA xxxx * S 325 is issued if a fault occurs during the above–mentioned standard test that sets the binary outputs WD, FTSP, SIF, FVW, UESP or FEIN.

Enhanced test

The standard tests explained in the previous Chapter are always performed during each driver execution. There are two additional tests that are activated by the UTST (reduction for test) and RT (relay test) parameters:

– Test of the tripped fuse monitoring function including solenoid voltage test with 8 test patterns (tripped fuse monitoring test)
– Relay test with broken wire monitoring function (relay test). The UTST parameter specifies the number of driver executions between two identical test steps of the enhanced test.

This parameter may only be 0 or a natural number ≥ 577. The reason for this rule is that a complete execution of the enhanced test requires 577 driver executions.
Once the test has been completed, the next test will only be performed after UTST – 577 driver executions. In order to prevent too many relay operations to be performed (which would reduce the service life of the relays), UTST should be used for specifying a reduction such that a complete test execution is only performed approximately every two hours.
With a cycle time of 125 ms, UTST should be parameterized with a number ≥ 57600.

No further test will be performed if 0 has been used for parameterization.
If UTST has a number ≥ 577 allocated, the additional tests to be performed depend on the RT parameter:

UTST	RT	
0	irrelevant	No enhanced test
≥ 577	0B	Test of tripped fuse monitoring function
≥ 577	1B	Test of tripped fuse monitoring function and relay test

Once the enhanced test has been started, the green TEST LED on the installed module lights up during each test step. On a slave module, this LED is only triggered for channels that are interconnected in a 1–out–of–1 structure.

The test of the tripped fuse monitoring function on the module is triggered by the driver. The outputs FTSI (fault during tripped fuse monitoring test) and BGF are set if any tripped fuse monitored function has not responded within approximately 1.2 ms. The faulty channels are indicated by the binary array that has been interconnected in the KF binary input (see above), and the I&C message PRA xxxx * S 325 is issued. The red SIF LED on the module lights up too.

Together with this test, a more extensive test of the coil voltages is performed. This test writes 8 test patterns (AAAAH, 5555H, F0F0H, 0F0FH, FF00H, 00FFH, CCCCH, 3333H) to the module and reads them back. The I&C message PRA xxxx * S 325 is issued, and the FTSP (fault during coil voltage test) and BGF outputs are set if there are any discrepancies between written and read values. This test is performed so rapidly that the relays on the module do not change their states. The module's output signals thus remain unchanged. Faulty channels are again indicated in the binary array that has been interconnected by the KF binary input (see above).

Modes of the PRA driver

Stand alone mode describes a method of operation in which actuators are controlled by a PRA driver via a single channel in a 1–out–of–1 structure (cf. Fig. 8 in Chapter 3.6.6 of the C79000–B8076–C160 instructions). In this mode, **one** module and **one** pertaining driver from one unit.

Master/slave mode describes a method of operation in which at least one actuator is controlled via two channels in a 1–out–of–2 or 2–out–of–2 structure (cf. Fig. 9 in Chapter 3.6.6 and Fig. 4 in Chapter 3.6.2 of the C79000–B8076–C160 instructions). In this mode, **two** modules and **two** drivers from one unit. Each of the two modules has a driver allocated in this mode. The driver that tests the channels in a 1–out–of–2 or 2–out–of–2 structure on both modules is known as the **master driver**. The other driver is the **slave driver**.

The following Chapter (”Typical master/slave operation”) shows how master and slave driver are defined and how the modes for the individual channels are specified. The next Chapter (”Additional explanations regarding the enhanced test”) gives a detailed description of the individual configuration rules.

Typical master/slave operation

The sequence of parameterization is particulary important for the interconnection type definition. The following typical configuration demonstrates this on the basis of two related PRA drivers.

Definitions:

– 4 channels in 1–out–of–2 connection
– 2 channels in 2–out–of–2 connection
– 3 channels in 1–out–of–1 connection on the master driver
– 2 channels in 1–out–of–1 connection on the slave driver
– Test of the tripped fuse monitoring function and relay test are to be performed
– The driver is to be installed in cycle 3

First of all, two PRA drivers are defined:

```
D,PRA,MAST;        (future master driver)
D,PRA,SLAV;        (future slave driver)
```

The MAST driver is now introduced to the other drivers by interconnecting the SPRA (slave PRA) element.

```
A,PRA,MAST;
Q,23,PRA,SLAV,0;
```

The driver with the name MAST (interconnection was started here) is now defined as the master driver while the other one is the slave driver. In order to be able to identify the slave driver, the name of the master driver is automatically entered in its MPRA element (master PRA). There is no entry in the MPRA of the master driver.

The interconnection type of the individual channels is now defined according to the following rules:

- Start with the master driver.
- Each channel on the module corresponds to one element in the VERS array:

  Channel 1 → element 1, channel 16 → element 16.
  Element 0 of VERS does not correspond to a channel and may not be parameterized.
- The VERS elements must be assigned **from the beginning without leaving a gap.**
- Although the interconnection types may freely be selected on a per–channel basis, channels of the same interconnection type should always be combined in blocks (clear structure).
- Only the elements of the master driver's VERS may be written to when the interconnection types are defined. Writing to the corresponding slave driver's elements is done automatically by the driver.

First, elements 1 to 3 of the master are parameterized with 11 (corresponds to 1–out–of–1 interconnection) [1]. Subsequently, 11 is automatically entered in elements 9 to 11 of the slave driver's VERS. (in 1–out–of–2– and 2–out–of–2 structures, channels 1 to 8 of the master driver are allocated to the slave driver's channels 9 to 16, and channels 9 to 16 of the master driver are allocated to channels 1 to 8 of the slave driver.)

A,PRA,MAST;				
P,25:1,11;	in master driver:	11	→	VERS(1),
	in slave driver:	11	→	VERS(9)
P,25:2,11;	in master driver:	11	→	VERS(2),
	in slave driver:	11	→	VERS(10)
P,25:3,11;	in master driver:	11	→	VERS(3),
	in slave driver:	11	→	VERS(11)

Elements 4 to 7 of the master driver's VERS are now parameterized with 12 (corresponds to 1–out–of–2 interconnection). Entry into the elements 12 to 15 of the slave driver's VERS is done automatically.

A,PRA,MAST;				
P,25:4,12;	in master driver:	12	→	VERS(4),
	in slave driver:	12	→	VERS(12)
P,25:5,12;	in master driver:	12	→	VERS(5),
:	in slave driver:	12	→	VERS(13)
P,25:6,12;	in master driver:	12	→	VERS(6),
	in slave driver:	12	→	VERS(14)
P,25:7,12;	in master driver:	12	→	VERS(7),
	in slave driver:	12	→	VERS(15)

In the same fashion, elements 8 and 9 of the master driver's VERS are then parameterized with 22 (corresponds to a 2–out–of–2 interconnection). Entry into the elements 16 and 1 of the slave driver's VERS is again done automatically.

A,PRA,MAST;				
P,25:8,22;	in master driver:	22	→	VERS(8),
	in slave driver:	22	→	VERS(16)
P,25:9,22;	in master driver:	22	→	VERS(9)
	in slave driver:	22	→	VERS(1)

1) Elements 1 to 16 of the VERS array will have 11 assigned immediately after a PRA driver has been defined. This step may therefore be omitted.

VERS allocation in the master driver's VERS is now completed. The user does **not parameterize the slave driver's VERS array** as any element that has not been written from the master driver will have 11 assigned once the driver has been defined.

Table 9.4 shows the above–mentioned VERS elements and the related interconnection type.

Element no. in VERS	Master driver	Slave driver
1	X (1 v 1)	X (2 v 2)
2	X (1 v 1)	X (1 v 1)
3	X (1 v 1)	X (1 v 1)
4	X (1 v 2)	-
5	X (1 v 2)	-
6	X (1 v 2)	-
7	X (1 v 2)	-
8	X (2 v 2)	-
9	X (2 v 2)	-
10	-	-
11	-	-
12	-	X (1 v 2)
13	-	X (1 v 2)
14	-	X (1 v 2)
15	-	X (1 v 2)
16	-	X (2 v 2)

X Element is relevant
– Element is irrelevant

Table 9.4 VERS assignments

The element number of VERS that corresponds to the last channel on the master module that is to be tested (here: 9) must be written to ANZK (number of channels to be tested) of the master driver.

```
A,PRA,MAST;
P,28,9;
```

The master driver also tests the channels 1–out–of–2– or 2–out–of–2 interconnection of the slave module. The element number of VERS that corresponds to the last channel 1–out–of–1 interconnection on the slave module (here: 3) must be written to ANZK of the slave driver.

```
A,PRA,SLAV;
P,28,3;
```

The chronological sequence of the test must also be specified.

As the drivers are to be installed in cycle 3, UTST of the master driver will be parameterized with a number ≥ 7200 (UTST ≥ 7200 corresponds to an interval of two hours between two enhanced tests). The slave driver's UTST will not be parameterized as only the UTST parameter of the master driver is relevant in master/slave operation.

```
A,PRA,MAST;
P,26,8000;
```

RT must now be parameterized with 1 in order to initiate the relay test. This is only required in the master driver as only the master driver's RT is relevant in master/slave operation.

```
A,PRA,MAST;
P,29,1;
```

Interconnections for the binary values that are to be output (BE1 to BE16) need only be specified for BE2 and BE3 of the slave driver. The binary values whose pertaining channels are used in 1–out–of–2 or 2–out–of–2 interconnection type are read from the master driver. Only the master driver's value is relevant for the EINF input and need to be parameterized if required.

With inputs VWF1, VWF2, VWF3 and VWF4, only the master driver's values are relevant for the bits whose channels correspond to the 1–out–of–2 or 2–out–of–2 interconnection type.

Please remember when you parameterize BGNR that the module that is related to the master driver belongs to the L+ (this rule must always be observed when at least one channel is used in 2–out–of–2 interconnection).

Additional explanations regarding the enhanced test

- Stand alone operation

  In addition to the above–mentioned parameterization instructions for UTST and RT, the following explanations must be observed:

  – The ANZK parameter is used for defining the number of relays that are to be tested by the driver. Definition always starts with channel 1.

    ⚠ In master/slave operation, ANZK has a different meaning for the slave driver (cf. "Master/slave operation").

  The binary values that are to be output must be assigned **from the beginning without leaving a gap**.
  Parameterizing ANZK, for example, will test the relays 1, 2, and 3.

  If the RT parameter is set and UTST ≥ 577, ANZK may not be parameterized with a number that is larger than the number of connected outputs.

  – If a PRA driver is used, it must be preceded by an XB block in the execution sequence. If more than one PRA driver is used, the related XB block must precede the first PRA driver.

- Master/slave operation

  The following explanations are based on the Chapter “Typical master/slave operation”.

  The following points must be observed in master/slave operation:

  – The following rule applies to two interrelated drivers: The slave driver must be installed in the same cycle, immediately before the master driver.

  – Different relay types must be interconnected in channels that are used in 1–out–of–2 or 2–out–of–2 interconnection. This is achieved by the following interconnection rules.

Master driver module	Slave driver module
Channel 1	Channel 9
Channel 2	Channel 10
Channel 3	Channel 11
Channel 4	Channel 12
Channel 5	Channel 13
Channel 6	Channel 14
Channel 7	Channel 15
Channel 8	Channel 16
Channel 9	Channel 1
Channel 10	Channel 2
Channel 11	Channel 3
Channel 12	Channel 4
Channel 13	Channel 5
Channel 14	Channel 6
Channel 15	Channel 7
Channel 16	Channel 8

Table 9.5 Required interconnections

During configuration, merely enter 12 (for 1–out–of–2 interconnection) or 22 (for 2–out–of–2 interconnection) in the master driver’s VERS array of the related channel. The corresponding entry in the slave driver’s VERS array is made by the master driver. Please note that the master driver must know the associated slave driver’s name when VERS is parameterized (this means that a valid interconnection must have been entered in the master driver’s SPRA element).

– With channels that are used in 1–out–of–2 or 2–out–of–2 interconnection, the master driver always performs the test of corresponding channels on **both** modules. If, for example, VERS(2) in the master driver has been parameterized with 12, the master driver will test channel 2 of the master module and channel 10 of the slave module. With channels that are used in 1–out–of–1 interconnection, each driver tests the corresponding channel on its related module.

– The VERS element number that corresponds to the last channel that is to be tested on its module must be written to the ANZK of the master driver. The VERS element number that corresponds to the last channel in 1–out–of–1 interconnection that is to be tested on its module must be written on the ANZK of the slave driver. If, for example, ANZK in the slave driver is parameterized with 7, the slave driver first checks which channels among its first 7 channels are used in 1–out–of–1 interconnection. These channels will then be tested.

- The slave driver only requires interconnections to be entered for those binary values whose related channels are used in 1–out–of–1 interconnection. The binary value of the channels that are used in 1–out–of–2 or 2–out–of–2 interconnection are read from the master driver. In master/slave operation, only the master driver's inputs are relevant for the UTST, RT, and EINF inputs.
  With inputs VWF1, VWF2, VWF3, VWF4, only the master driver's values are relevant for the bits that correspond to channels in 1–out–of–2 or 2–out–of–2 interconnection.
- If at least one channel is used in 2–out–of–2 interconnection, the master driver (via the BGNR parameter) must be parameterized such that its associated module belongs to the L+ side.
- A channel that has been parameterized for 2–out–of–2 interconnection requires the related contact voltage read–back jumper on the slave driver's module to be in position 1–2 (voltage read–back on common contact; cf. Chapter 5.2.3 of the C79000–B8076–C160 instructions). The resistance of the associated actuators must be < 20 kΩ sein. In any other case the contact voltage read–back jumper on the module must be in position 2–3 (voltage read–back on NO contact).
- If more than one PRA driver is used, an XB block must precede the first PRA driver in the execution sequence.

The following paragraphs describe some details that must be observed when parameterizing the VERS array, entering an interconnection in SPRA, or deleting a master or slave driver.

Parameterization of an element of the VERS array is only permitted in a master driver and only if a binary value has not yet been interconnected with the corresponding channel of the slave driver. Element 0 may not be written to as it does not correspond to a channel. A valid parameterization is always followed by an assignment of the corresponding VERS element in the slave driver. In addition, the pending channel faults are cleared during parameterization, and the enhanced test is started from its beginning.

Entering an interconnection in SPRA is only permitted if the required slave driver has not yet been declared master or slave driver. If, by interconnecting SPRA, the activated driver has already been defined as a master driver, the local block name is deleted from MPRA of the previously allocated slave driver, and all relevant array elements of VERS have 11 assigned. Please note that all relevant array elements of VERS in the local driver also have 11 assigned. Once an interconnection has been entered, the master driver's block name is entered in MPRA of the new slave driver. Cancelling an interconnection results in MPRA, UTST, ANZK, EINF and RT of the previous slave driver to be cleared, the relevant VERS elements to be initialized with 11, and the VERS array in the local driver to be initialized in the same function.

Deleting a master driver results in the MPRA, UTST, ANZK, EINF, and RT variables of the slave driver to be deleted, and the relevant array elements of VERS to have 11 assigned (corresponds to stand alone operation). Deleting a slave driver causes the relevant array elements of VERS to be initialized with 11 and the previous interconnection to be removed from SPRA.

Fault indications and restart of the enhanced test

First of all, the outputs that can be set by the enhanced test are specified:

Output	Meaning
FTSI	Fault during test of tripped fuse monitoring function
FTSP	Fault during coil voltage test
FTRL	Fault during relay test
FTDL	Fault during test for broken wire to L+
FTDS	Fault during test for broken wire to actuator

Any BFG, FTSI, FTSP, FTRL, FTDL, FTDS output that has been set during the enhanced test, the detected channel faults, and the red TEST LED remain set until a new execution of the entire test does not detect any faults (this also includes faults detected by standard tests). All faults must therefore be eliminated before the driver resets the channel faults. In the worst case, this procedure may take several hours (depends on the UTST parameterization). This is why a restart of the enhanced test at any time has been made possible (requires RT to be parameterized with 1). The parameterization RT = 1 resets the above–mentioned fault outputs and the channel faults, and the enhanced test starts again from the beginning at the next driver execution. Any persistent fault will then be detected within the next 577 driver executions (duration of the enhanced test with activated relay test).

☞ The above–mentioned fault outputs and channel faults are also reset and the enhanced test is restarted if

- a VERS element is parameterized (caution: only permitted in master/slave operation and only with the master driver)
- UTST is parameterized
- ANZK is parameterized [1)]
- the module fuse is removed and inserted.

⚠ This does **not** reset the BGF output. This output is only reset if no fault is detected during a new execution of the test or after one of the above–mentioned parameterizations has been performed.

1) Parameterizing ANZK in a slave driver resets the fault outputs of the slave driver without restarting the enhanced test.

- Data structure (Designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Module fault	BGF	1	AB
Module watchdog	WD	2	AB
Tripped fuse	SIF	3	AB
Default value read–back error	FVW	4	AB
Over/undervoltage fault	UESP	5	AB
Freeze bit read–back error	FEIN	6	AB
Fault in test of tripped fuse monitoring function	FTSI	7	AB
Fault in coil voltage test	FTSP	8	AB
Fault in relay test	FTRL	9	AB
Fault in test for broken wire to L +	FTDL	10	AB
Fault in test for broken wire to actuator	FTDS	11	AB
Binary value 1	BE1	1	EB
Binary value 2	BE2	2	EB
Binary value 3	BE3	3	EB
Binary value 4	BE4	4	EB
Binary value 5	BE5	5	EB
Binary value 6	BE6	6	EB
Binary value 7	BE7	7	EB
Binary value 8	BE8	8	EB
Binary value 9	BE9	9	EB
Binary value 10	BE10	10	EB
Binary value 11	BE11	11	EB
Binary value 12	BE12	12	EB
Binary value 13	BE13	13	EB
Binary value 14	BE14	14	EB
Binary value 15	BE15	15	EB
Binary value 16	BE16	16	EB
Freeze bit	EINF	17	PB
Interconnection address for channel fault	KF	18	EB
Relay output default values for malfunction	VWF1	19	I
Relay output default values for malfunction	VWF2	20	I
Relay output default values for malfunction	VWF3	21	I
Relay output default values for malfunction	VWF4	22	I
Interconnection address of allocated slave driver	SPRA	23	EA
Name of related master driver	MPRA	24	S4
Array for interconnection type of each channel	VERS	25	I
Reduction of enhanced test	UTST	26	ID
Module number	BGNR	27	I
Number of channels to be tested	ANZK	28	I
Selector switch for required test type of enhanced test	RT	29	PB

System messages

The I&C message PRA xxxx * S 325 is issued if a fault occurs during one of the above–mentioned standard tests that causes the binary outputs WD, FTSP, SIF, FVW, UESP or FEIN to be set.

The BGF binary output is set and the I&C message PRA xxxx * S 311 issued if the driver block tries an access to a module with an incorrect type code (not a 6DS1 606 module).

The BGF binary output is set and the I&C message PRA xxxx * S 305 issued if a module cannot be addressed under the slot address that has been parameterized in BGNR (QVZ).

The BGF binary output is set and the I&C message PRA xxxx * S 313 issued if more than one module acknowledges under the slot address that has been parameterized in BGNR. (Address conflicts are possible as the module addresses of the TELEPERM M I/O modules are selected by jumpers on the modules).

The I&C message PRA xxxx * S 325 is issued if a fault occurs during the enhanced test that causes the binary outputs FTSI, FTSP, FTRL, FTDL or FTDS to be set.

- Block list

PRA ORPA 18. 04. 91/ 09. 32. 15. P: 1 *

1	AB	BGF	0	#	P	N	1
2	AB	WD	0	#	P	N	2
3	AB	SIF	0	#	P	N	3
4	AB	FVW	0	#	P	N	4
5	AB	UESP	0	#	P	N	5
6	AB	FEIN	0	#	P	N	6
7	AB	FTSI	0	#	P	N	7
8	AB	FTSP	0	#	P	N	8
9	AB	FTRL	0	#	P	N	9
10	AB	FTDL	0	#	P	N	10
11	AB	FTDS	0	#	P	N	11
1	EB	BE1	0		P	C Q	12
2	EB	BE2	0		P	C Q	13
3	EB	BE3	0		P	C Q	14
4	EB	BE4	0		P	C Q	15
5	EB	BE5	0		P	C Q	16
6	EB	BE6	0		P	C Q	17
7	EB	BE7	0		P	C Q	18
8	EB	BE8	0		P	C Q	19
9	EB	BE9	0		P	C Q	20
10	EB	BE10	0		P	C Q	21
11	EB	BE11	0		P	C Q	22
12	EB	BE12	0		P	C Q	23
13	EB	BE13	0		P	C Q	24
14	EB	BE14	0		P	C Q	25
15	EB	BE15	0		P	C Q	26
16	EB	BE16	0		P	C Q	27
17	PB	EINF	0				28
18	EB	KF	0		P	C Q	29

Block list (continued)

```
PRA ORPA            18. 04. 91/    09. 32. 15. P:              1 *
 19  I    VWF1       0                           C      30
 20  I    VWF2       0                           C      31
 21  I    VWF3       0                           C      32
 22  I    VWF4       0                           C      33
 23  EA   SPRA   0.0000         P                C  Q   34
 24  S4   MPRA                                     N    35
 25  I    VERS                         17        C      36
            0        0
            1       11
            2       11
            3       11
            4       11
            5       11
            6       11
            7       11
            8       11
            9       11
           10       11
           11       11
           12       11
           13       11
           14       11
           15       11
           16       11
26  ID    UTST       0                           C      37
27  I     BGNR       0                           C      38
28  I     ANZK       0                           C      39
29  PB    RT     0                               C      40
```

PROB

User block

Application

These blocks are used to integrate special user routines into the system. They do not contain any data requiring parameterization or interconnection.

Method of Operation

The PROBLEM blocks are user routines written in TML, and can only be defined when the keyswitch on the process communication keyboard has been set to position 3. A PROBLEM block may not be installed directly in a block sequence.

A PROBLEM block can only be inserted into a block sequence via an APRO connecting block. PROBLEM blocks can also be used as subroutines called from other PROBLEM blocks (TML instruction: **`CALL PROBLEM.name;`**) or from STEP blocks (STEP instruction: **`UP,PROBLEM,name;`**).

Any sequence of block definitions can be selected. The blocks are only executable in combination, and can only be installed in a block sequence after both blocks have been configured completely and correctly.

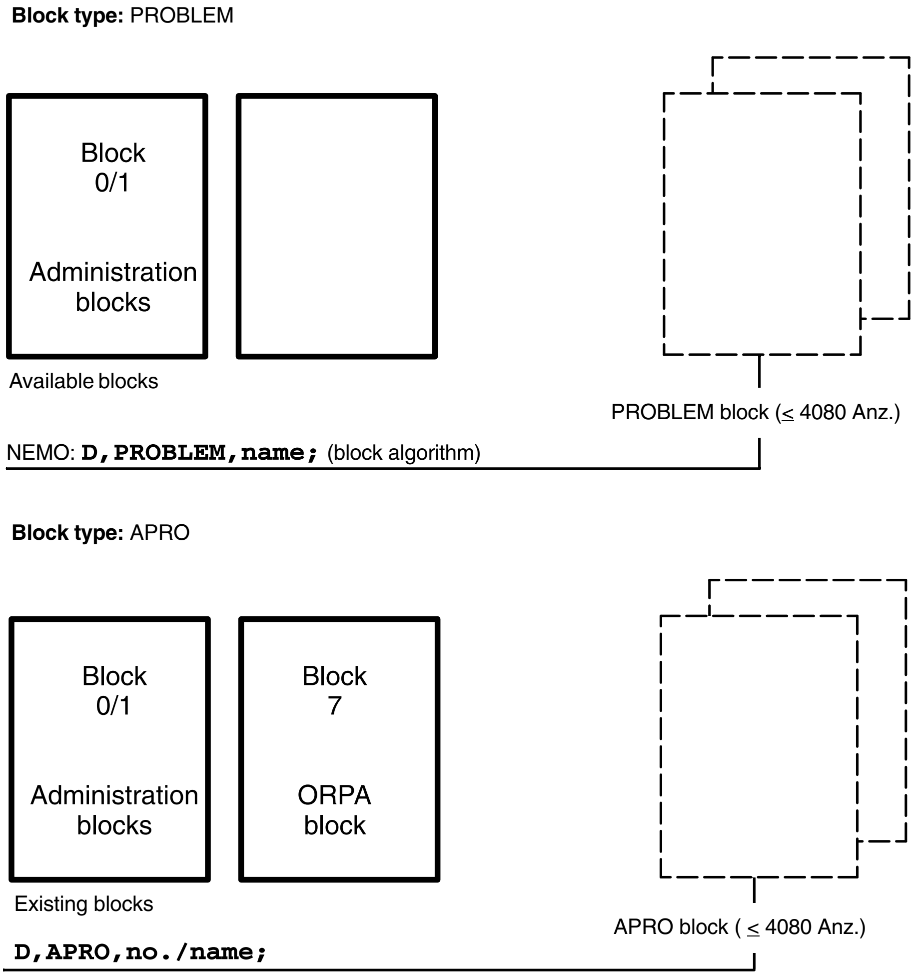


Fig. 9.145 Block structure

The following configuration instructions can be used for PROBLEM blocks:

```
NEMO;
D,PROBLEM,name;
      :
instructions (TML)
      :
DE;
A,PROBLEM,name;
-   LS,no;
-   EI,no;
instruction;
-   ER,no;
instruction;
-   F;
-   Z;
-   K;
-   BI;
AE;
L,PROBLEM,name;
END;
```

- Call structures

  APRO and VS/KS are blocks which may be inserted into a block sequence. The parameterized multiplex parameters (GAX, GMX, GTX and DSX) are transferred to the calling PROB/STEP block.

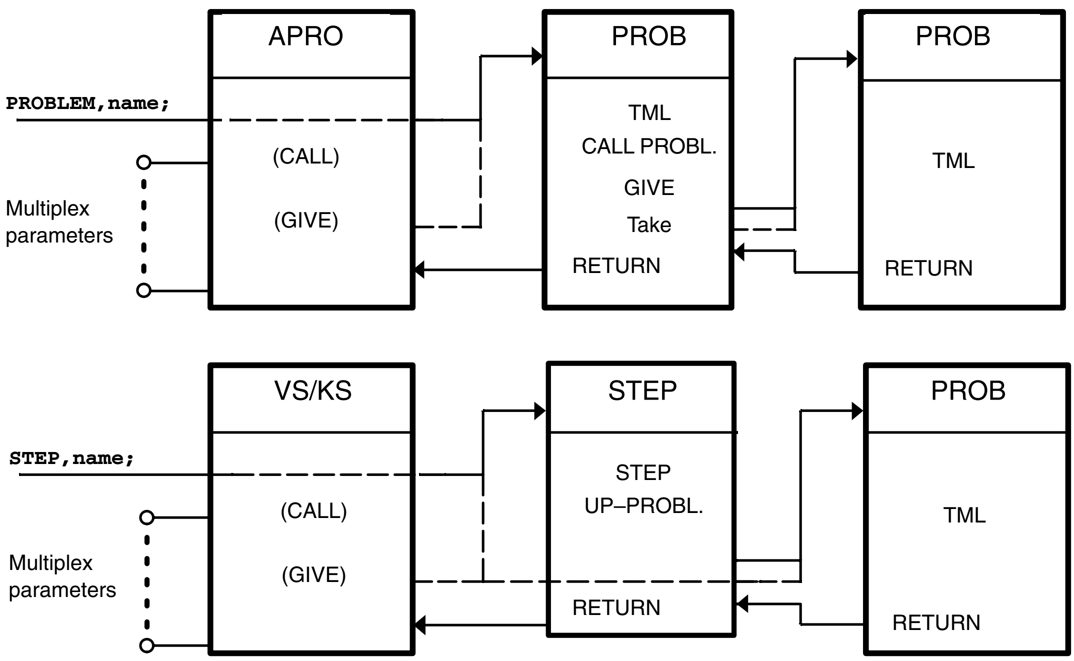


Fig. 9.146 Call structures

PROG

TML function block

Application

The PROGRAM blocks are used for the integration of operator–controllable and non–operator–controllable user–specific function blocks into the system. The data records assigned to the PROGRAM blocks can be multiplexed. The blocks are handled (configuration, process–control/monitoring) in the same fashion as the standard blocks.

Method of Operation

The user–specific PROGRAM blocks have been written in TML, and can be defined when the keyswitch on the process communication keyboard has been set to position 3.

The PROGRAM blocks are inserted into block sequences in connection with a specified data record. When defining a typical PROGRAM block, it is assumed that an appropriate data record of the same type has been created (**`D,type,ORPA:number;`**). The user may integrate up to 100 own PROGRAM blocks in the system.

The following structure should be observed when creating a new block type: block type called NEUB (= new block).

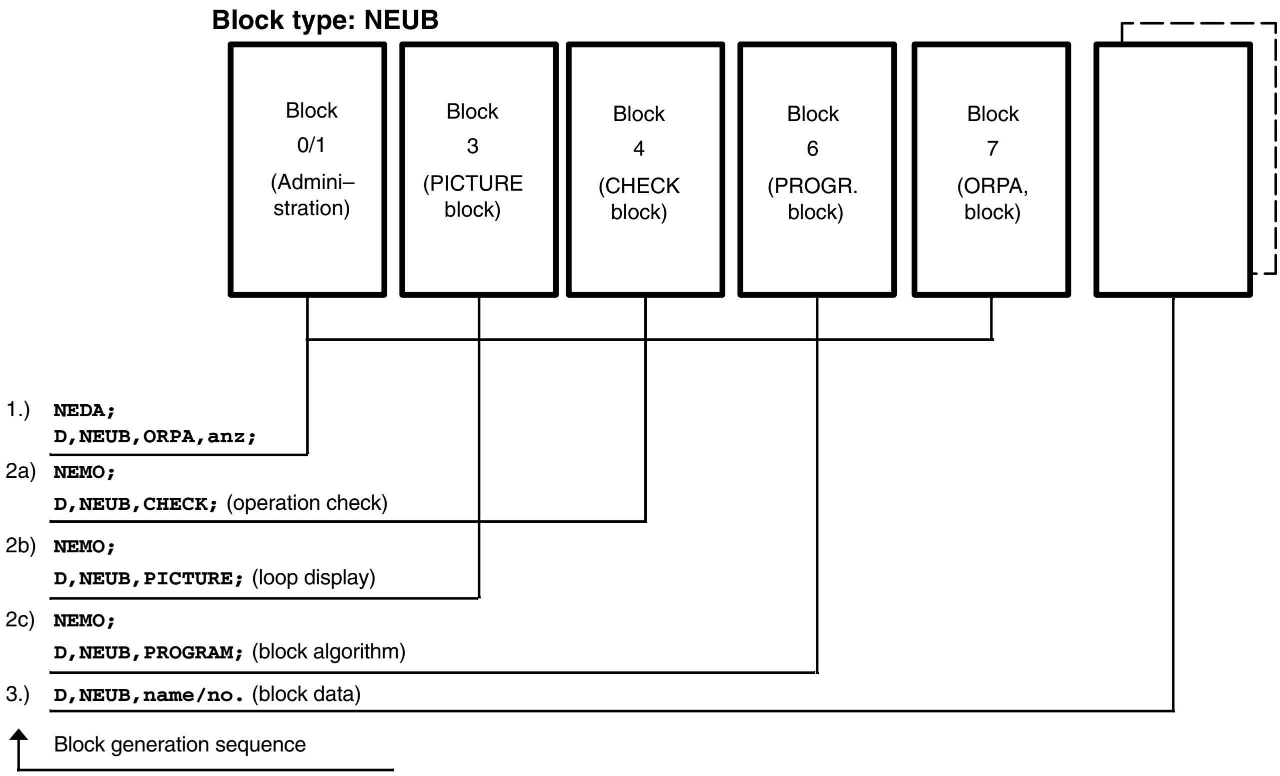


Fig. 9.147 Block structure

A CHECK block is only required if the limits and plausibility of the operator parameters (process control, configuration inputs) are to be checked.

A PICTURE block is only required if the block is operator–controllable with a user–specific loop display.

The following configuration instructions can be used for PROGRAM blocks:

```
NEMO;
D,typename,PROGRAM;
- TML instruction
DE;
A,typename,PROGRAM;
- LS,no;
- EI,no,instruction;
- ER,no,instruction;
L,typename,PROGRAM;
F;
Z;
K;
BI;
AE;
END;
```

PROT

Log output block

Application

PROT blocks are used for the output of system–related logs on a PT 89/90 printer.

Printout can be in page mode (whole pages) or line mode (output of one LAYOUT line). In the latter mode only one line is permitted for the LAYOUT; Y coordinates are ignored.

Method of Operation

The parameters have the following meaning:

EIAU	=	0 :	The block is left without output because it has been switched off.		
	=	1 :	The layout interconnected with the parameter LAYO is output via the output channel specified by the KANU parameter. Output FERT is set and input EIAU reset if the block has been able to terminate its output properly. As the block sets output FERT to “0” when the printout starts, a log output in the correct sequence can be configured for multi–page logs if an appropriate interconnection (example) has been established.		
KANU	=	0 :	No output		
		1 :	Output on printer 1	(1st operator position)	page mode
		2 :	Output on printer 2	(2nd operator position)	page mode
		11 :	Output on printer 1	(1st operator position)	line mode
		12 :	Output on printer 2	(2nd operator position)	line mode
		13 :	Output on matrix dot printer 1	(1st operator position)	line mode
		14 :	Output on matrix dot printer 2	(2nd operator position)	line mode
		others :	No output		
GAX–DSX	≠	0 :	These multiplex parameters are assigned to the layout		
MPX	=	0 :	No multiplexing when called (time optimization)		
	=	1 :	Multiplexing is performed (e.g. `MUX,GB,*;` possible in LAYOUT)		

- Error message

  S327 Meaning: Channel cannot be found
  Reaction: Abortion

- Example of a three–page log

PROT.S1	for page 1
PROT.S2	for page 2
PROT.S3	for page 3

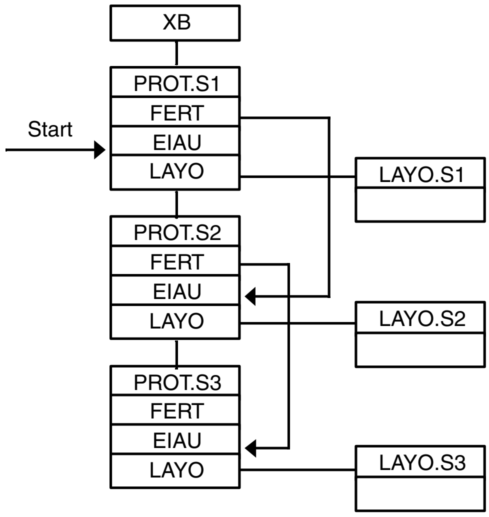


Fig. 9.148 Log structure (example)

- Interconnection

XXXX of XXXX.XX with EIAU of PROT.S1	starting condition
FERT of PROT.S1 with EIAU of PROT.S2	end of page 1
FERT of PROT.S2 with EIAU of PROT.S3	end of page 2
FERT of PROT.S3 with XXXX of XXXX.XX	enf of log

- Operational sequence

An attempt is made to output the associated LAYOUT as soon as the starting condition has set input EIAU of PROT.S1. The associated output and thus the continuation input EIAU is set if the output has been successful.
The EIAU input of PROT.S1 is now cleared.
The EIAU input of PROT.S2 is now set.

PROT.S2 can be executed; sets its ”FERT” output and thus EIAU of PROT.S3 to 1 and resets EIAU of PROT.S2.
The EIAU input of PROT.S1 is still cleared.
The EIAU input of PROT.S2 is now cleared.
The EIAU input of PROT.S3 has been set.

PROT.S3 has been executed, it resets its ”FERT” output and thus the total end message and EIAU of PROT.S3.
The EIAU input of PROT.S1 is still cleared.
The EIAU input of PROT.S2 is still cleared
The EIAU input of PROT.S3 is still cleared

The PROT sequence is now waiting for a new starting condition.

☞ The FERT output signals the successful conclusion of the printing process. If the printer is not ready, the EIAU input will not be cleared and the FERT output will not be set. The block waits until the printer is ready again! If the printer is switched offline, input EIAU will be reset and the I&C alarm S 334 or S 335 will be output.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Ready message	FERT	1	AB
Switch "1" = ON	EIAU	1	EB
Channel no. (printer)	KANU	2	I
LAYOUT	LAYO	3	EA
	GAX	4	EA
Multiplex parameters	GBX	5	EB
	GMX	6	EB
	GTX	7	EA
	DSX	8	EA
Multiplex switch	MPX	9	PB

- Block list

```
  PROT    1                03. 03. 83/ 00. 52. 14. P:   1

1 AB   FERT 0                #                   N     10
1 EB   EIAU 0                   P                       1
2 I    KANU    0                                        2
3 EA   LAYO 0.0000                             C   Q    3
4 EA   GAX  0.0000                             C   Q    4
5 EB   GBX  0                                  C   Q    5
6 EB   GMX  0                                  C   Q    6
7 EA   GTX  0.0000                             C   Q    7
8 EA   DSX  0.0000                             C   Q    8
9 PB   MPX  0                                           9
```


PT

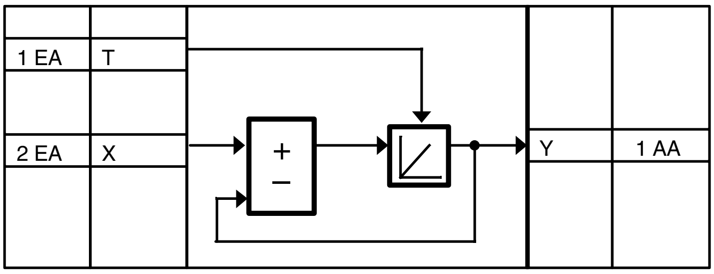
Delay block

Application

This block is used as a delay element to simulate a controlled system.

☞ An appropriate number of PT blocks has to be connected in series to establish a higher–order controlled system.

Method of Operation



T Time lag constant
X Input variable
Y Output value

Fig. 9.149 Delay block; constant value

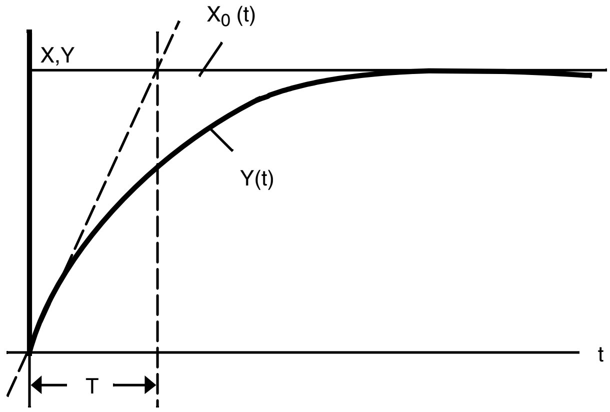
The delay block follows the transfer function:

$$\frac{Y(s)}{X(s)} = \frac{1}{1 + T \cdot s}$$

where **T** = time lag constant and **s** = Laplace Operator.

☞ The value T/TA must be specified at the input; TA is the cycle time of the PT block (cf. XB block). For example: if the time constant of the delay block is T = 2 s and the block is executed every TA = 1/8 s, then T/TA = 2 s / 0,125 s = 16 must be entered.

Response to a sudden change of the input variable



$$Y = X_0\left(1 - e^{-\frac{t}{T}}\right)$$

t Time
T Time lag constant
X_0 Input variable
Y Output variable

Fig. 9.150 Delay block; step response

- Initialization behavior

  If a higher–order XB block is switched off and back on, the PT block performs an initialization run. The Y value (old value) is then corrected to the current value of Y.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AAD
T/TA	T	1	EA
Input variable	X	2	EA

- Block list

```
  PT      1               03. 03. 83/ 00. 52. 40. P:   1

1 AAD Y    0.0000          #                   N      3
1 EA  T    0.0000             P                       1
2 EA  X    0.0000             P                       2
```


R

Closed–loop control block

Application

This block is used as a PID controller block for the following standard closed–loop circuits:

- Set value control
- Cascaded control (single or multiple cascades)
- Ratio control
- Synchro control

Apart from the closed–loop control function, the closed–loop control block also provides the following processing function:

- Feedforward control directly to XD
- Limit value monitoring of X or XD
- Parameter control for KP, TN, TV, V
- The D section can be configured with X or XD or any other variable (e.g. noise quantity)
- Dead band (threshold) for XD
- W correction
- Y correction

Method of Operation

- Setpoint generation

  The internal setpoint (W) is limited to the measuring range (XA, XE). Input values beyond these limits are accepted without fault display. The input value is replaced by the respective limit value.

  The internal setpoint (W) is corrected to the actual value (X) in setpoint correction mode (WNF)

  The internal setpoint (W) is always corrected to WEXT if the setpoint is specified externally.

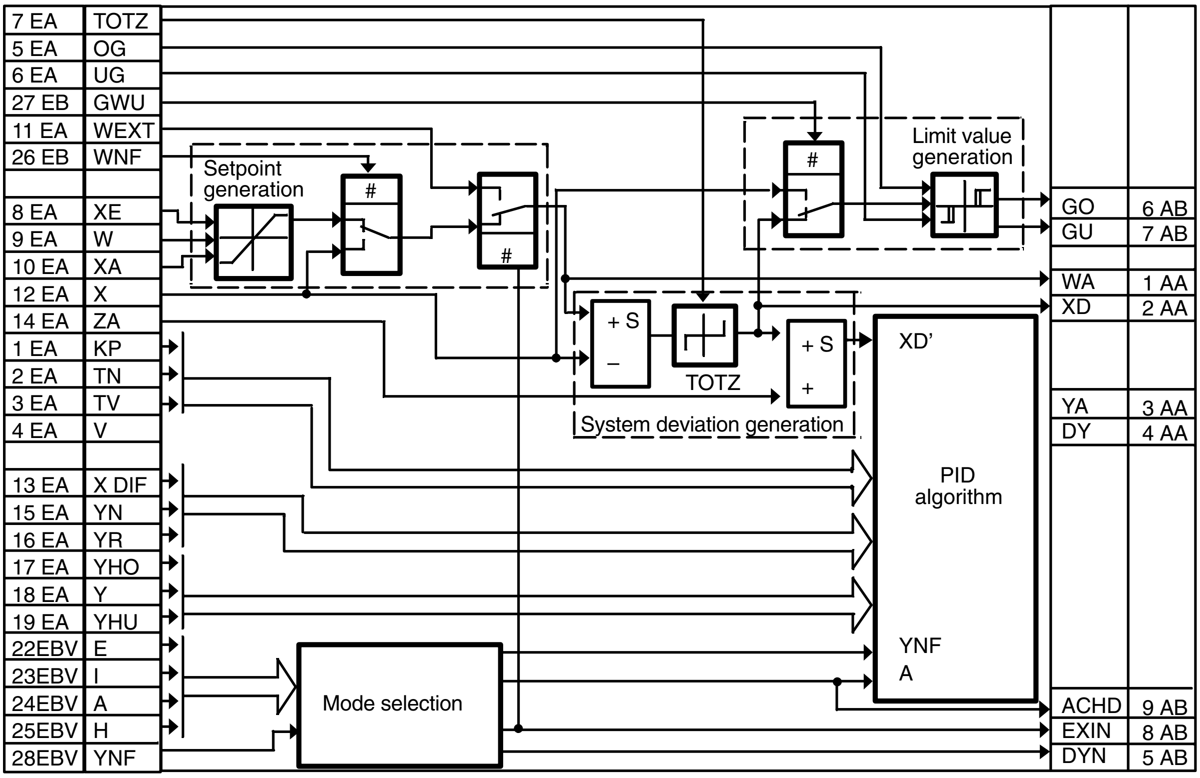
  The “External” and “Internal” keys are used to select the setpoint (W or WEXT) to be connected to the system deviation generation. This effective setpoint is available as an output (WA).

- System deviation

  The system deviation is generated from the effective setpoint (WA) and the actual value (X) and provided with a dead band. This system deviation is available at the output (XD).

  An influencing quantity (Z) can be added to the system deviation (XD).

  This effective system deviation (XD) is processed in the PID algorithm.



A Automatic mode
ACHD Automatic/manual
DYN Output to dynamic correction
E External setpoint (mode)
EXIN External/Internal
GO Upper alarm signal
GU Lower alarm signal
GWU Limit value switchover
H Manual mode
I Internal setpoint (mode)
KP Proportional coefficient
OG Upper limit value
TN Reset time
TOTZ Dead band of positioning increment
TV Derivative action time
UG Lower limit value
V Gain of D part
WA Effective setpoint
WEXT External setpoint
W Internal setpoint
WNF Setpoint correction
X Actual value of controlled variable
XA Lower range limit
XD System deviation
XDIF Input of D part
XE Upper range limit
YA Value of manipulated
Y Manipulated variable in manual
YHO Upper limit of manipulated variable in manual mode
YHU Lower limit of manipulated variable in manual mode
YN Corrective manipulated variable
YNF Correction of manipulated variable
YR Actuator position
DY Positioning increment
ZA Influencing quantity

Fig. 9.151 Controller block; logic diagram

- PID algorithm

  The algorithm follows the equation:

$$\frac{Y(s)}{XD(s)} = KP\left(1 + \frac{1}{TN}\cdot\frac{1}{s} + TV\frac{s}{1 + \frac{TV}{V}\,s}\right)$$

KP	Proportional coefficient
s	Laplace Operator
TN	Reset time
TV	Derivative action time
TV/V	Time lag constant
V	D part gain
XD(s)	System deviation
Y(s)	Manipulated variable

The D part is delaying derivative unit. XD, X or an influencing quantity Z can be fed to input XDIF. The values of TV and V must be negative if XD is connected. Since the quotient of TV and V is a time constant, both parameters must be either positive or negative when the effective direction of the XDIF differentiating input is reversed.

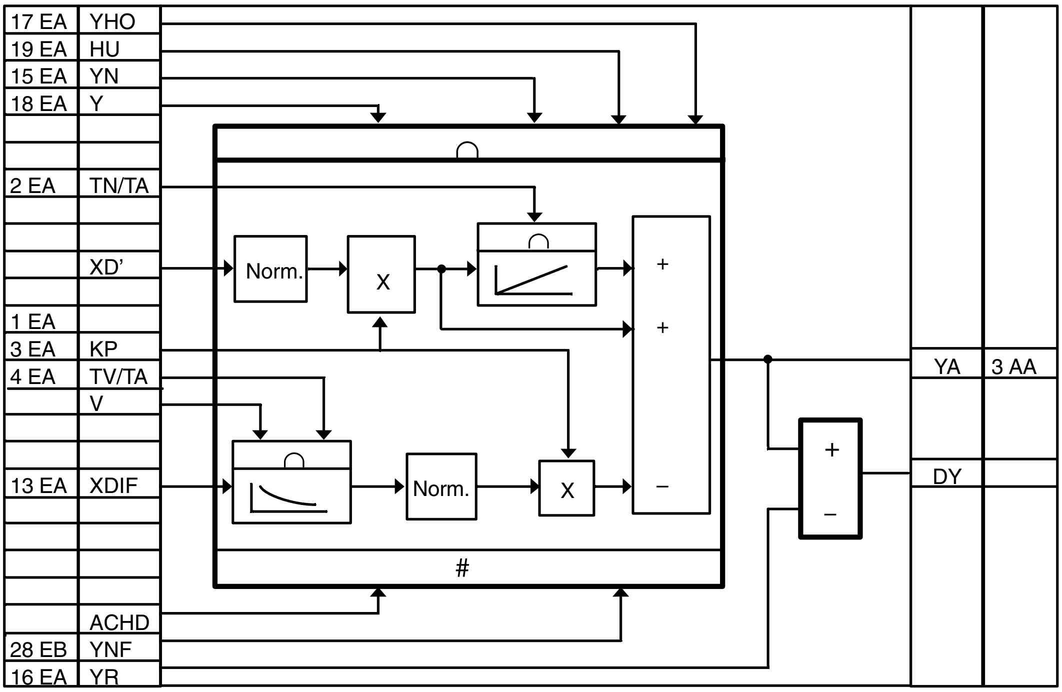
The controller parameters KP, TN, TV, V are interconnectable, i.e. they may be modified by parameter control. TN/TA, TV/TA must be entered via the inputs (TN, TV). TA is the R block cycle time (cf. XB block). For example: if TN of the control algorithm is 2 s and the R block is executed every TA = 1/8 s, then TN/TA = 2 s/0.125 s = 16 must be specified for input TN.

If KP is negatively parameterized, the controller can be reversed (i.e. increasing X increases YA).

The positioning increment “DY” is generated by calculating and adding up P, I and D positioning increments from the increments of the individual parts. After the value has been multiplied by KP, it is normalized to the measuring span (XE–XA).

The values YHU –5% and YHO +5% delimit the controller output. When the manipulated variable reaches the upper or lower limit value, the integral–action component is frozen until it has taken the manipulated variable away from the limit (integral anti–wind–up response). In the mode “Correction of manipulated variable” (YNF) which has priority over changeover to manual mode, the controller output is corrected to the value of YN. The manual value of the manipulated variable delimited by YHU and YHO is connected to the controller output (YA) in manual mode.

The positioning increment (DY) is required if closed–loop controller modules are used. This value is the difference between the value of the manipulated variable (YA) and the actuator position (YR). On a module with continuous output, the value of the manipulated variable is fed back.



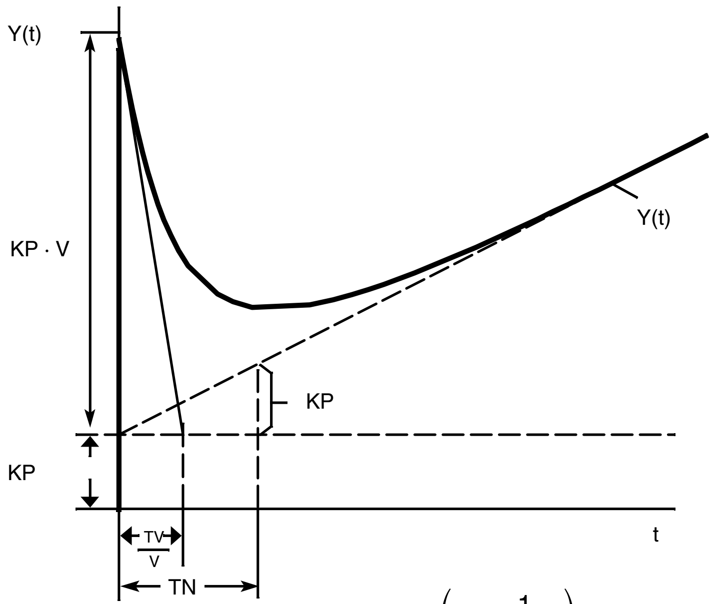
ACHD	Automatic/manual mode	YA	Value of manipulated variable
KP	Proportional coefficient	Y	Value of manipulated variable in manual mode
TA	Scan time	YHQ	Upper limit of manipulated variable in manual mode
TN	Reset time	YHU	Lower limit of manipulated variable in manual mode
TOTZ	Dead band of positioning increment	YN	Corrective manipulated variable
TV	Derivative action time	YNF	Correction of manipulated variable
V	D part gain	YR	Actuator position
XD	Effective control difference	DY	Positioning increment
XDIF	D part input		

Fig. 9.152 Controller block; PID algorithm

- Mode selection (Fig. 9.151: Closed–loop control block, logic diagram)

  Mode flags are set and the signals ACHD (automatic/manual mode) and EXIN (external/internal setpoint) are output via process communication keyboard input (E, I, A, H). An impulse is present at output DYN for one cycle (TA) when the system changes from (I) to (E). This output can be used, for example, for bumpless changeover of a master controller.

  W also becomes effective during this cycle; WEXT is only selected subsequently.



$$Y(t) = KP\left(1+\frac{1}{TN}t\right)XD(t) - KP\cdot V\cdot e^{-\frac{V}{TV}t}\cdot XDIF(t)$$

Step response for XD (t) = –XDIF = $\begin{cases} 1 \text{ for } t \geq 0 \\ 0 \text{ for } t < 0 \end{cases}$

KP	Proportional coefficient
t	Time
TN	Reset time
TV	Derivative action time
V	Gain of D part
XD	Control difference
XDIF	Differentiating input (controlled variable X connected)
Y	Value of manipulated variable

Fig. 9.153 Controller block; step response

- Limit value generation (Fig. 9.151: Closed–loop control block, logic diagram)

  The controlled variable (X) or the control difference (XD) can be used for limit value generation, depending on the input (GWU). The selected value is then monitored for its limit values (OG and UG). If a limit value has been violated, an alarm signal is issued at the output GO or GU. The R block may be supplemented by an M block if the pair of limit values is insufficient (cf. M block, Method of Operation).

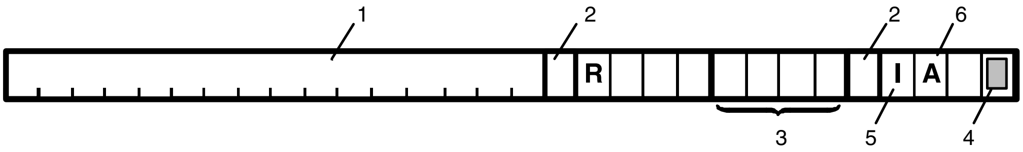
- Initialization behavior

  If a higher–order XB block is switched off and back on, the R block performs an initialization run. The modes are set to INTERNAL and MANUAL, the actuator position YR is accepted by Y (old value). The old value of the derivative block is updated.

  ☞ Installing an activated XB block before an R block starts initialization.

- Normalized representation in the group display

The block is represented by 30 characters in a specific location of a group display. Set input 35 (NRPL) to “0” if the normalized representation of a block in a group display is to be suppressed.



1 Process–related name of the closed–loop controller block, as in loop display
2 Separating blank
3 Number of the closed–loop controller block
4 Loop alarm field: summary of the alarm signals GO, GU or “External fault”
5 E if “External setpoint” has been selected
6 H if manual mode has been selected

Fig. 9.154 Closed–loop controller block; normalized representation in a group display

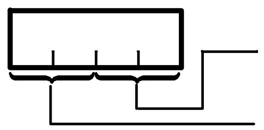


Fig. 9.155 Closed–loop control; parameterization of input 35

- Normialized representation of the loop display

The following loop display (Fig. 9.156) contains the below static and dynamic data:

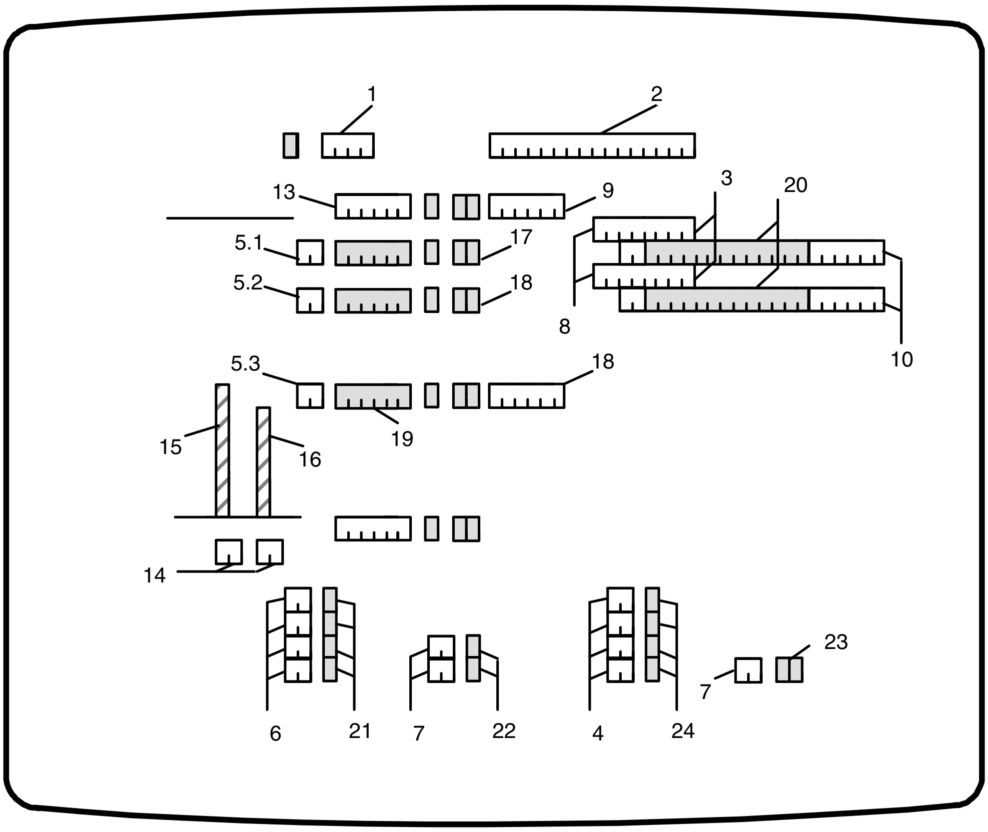
Static data:

1 Mnemonic name and number of R block
2 Process–related name of R block (AT)
3 Process–related names of adjacent analog values (TA11, TA12, TA21, TA22)
4 Process–related names of adjacent binary values (TBW1, TBW2, TBW3, TBW4)
5.1 Controller variable W (TW) [1)]
5.2 Controller variable X (TX) [1)]
5.3 Controller variable Y (TY) [1)]
6 Mode E, I, A, H (TEXT, TINT, TAC, THD) [1)]
7 Alarm signals OG, UG, F (TGO, TGU, TF) [1)]
8 Process–related quantities of adjacent analog values A 1, A 2 (TAW1, TAW 2) [1)]
9 Physical unit of actual value and setpoint (EHTW)
10 Physical unit of the adjacent analog values (EHT1, EHT2)
11 Unit of manipulated variable (EHTY)
12 Lower range limit of actual and setpoint (XA)
13 Upper range limit of actual and setpoint (XE)
14 Mnemonic name of the bars X, W (TX, TW) [1)]

[1)] Pre–defined mnemonic names

Dynamic data:

15 Setpoint W as bar (analog display)
16 Actual value X as bar (analog display)
17 Set point W (digital display)
18 Actual value X (digital display)
19 Manipulated value Y (digital display)
20 Display of adjacent analog values
21 Mode indication E, I, A, H:
”0” indicates that the associated mode is switched off, ”1” indicates that it is switched on
22 Alarm states (”1” = indicates a limit value violation)
23 State “External fault” (”1” indicates that a fault has occurred)
24 States of adjacent binary values




```
22. 07. 87/ 08. 30. 32.


                R     1          *TECHNOLOG. NAME


   ──────────    100.00          *EHTW*
                                         TA11TA12
                 W  100.00                 A1               *EHT1*
                                         TA22TA23
                 X  0.0000                 A2               *EHT2*



                 Y  0.0000          %




   ──────────    0.0000

            X  W
                E  0                       B1
                I  1                       B2
                A  0       OG 0            B3
                H  1       UG 0            B4         F  0


        BR
R,1;
```

Fig. 9.156 R block; loop display (example)

- Operator input using process communication keyboard

  Six keys (W =, Y =, E = 1, I = 1, A = 1, H = 1) are assigned after the loop display has been selected and the “Operator input” (BE) key depressed.

  Key inputs using E = 1, I = 1, A = 1 and H = 1 must be directly terminated by execute key (◇). After the keys (W =) or (Y =) have been depressed, a sequence of numbers may be entered and terminated by pressing the execute key (◇).

  The “More” (↑) or “Less” (↓) keys may be pressed to continue without any figures having previously be entered (setpoint Y). The execute key (◇), normally required for termination, need not be pressed in this case.

  The change is approximately 1% of the measuring span per processing cycle. If a greater change is required, the appropriate “More” (↑) or “Less” (↓) is to be pressed together with the “High–Speed” (~) key. The change is then approximately 10% or the measuring span per processing cycle.

W=	Y=	E=1	I=1	A=1	H=1		

A Automatic mode
E External setpoint (mode)
H Manual mode
I Internal setpoint (mode)
W Setpoint (internal setpoint WI)
Y Manipulated variable

Fig. 9.157 R block, automatic labeling of the process communication keyboard

- Data structure (designation of input and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Effective setpoint	WA	1	AA
System deviation	XD	2	AA
Manipulated variable	YA	3	AA
Actuating increment	DY	4	AA
Dynamic correction	DYN	5	AB
Upper alarm signal ”1”	GO	6	AB
Lower alarm signal ”1”	GU	7	AB
E: ”1”/I: ”0”	EXIN	8	AB
A: ”1”/H: ”0”	ACHD	9	AB
KP	KP	1	EA
TN/TA	TN	2	EA
TV/TA	TV	3	EA
Gain of D part	V	4	EA
Upper limit value	GO	5	EA
Lower limit value	GU	6	EA
Dead band of Y	TOTZ	7	EA
Upper range value	XE	8	EA
Internal setpoint	W	9	EAV
Lower range value	XA	10	EA

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
External setpoint	WEXT	11	EA
Controlled variable	X	12	EA
Differential input	XDIF	13	EA
Feedforward control	ZA	14	EA
Follow–up input	YN	15	EA
Actuator position	YR	16	EA
Upper limit Y manual	YHO	17	EAV
Y manual	Y	18	EAV
Lower limit Y manual	YHU	19	EAV
Adjacent analog value 1	AW1	20	EA
Adjacent analog value 2	AW2	21	EA
External	E	22	EBV
Internal	I	23	EBV
Automatic	A	24	EBV
Manual	H	25	EBV
W correction ”1”	WNF	26	EB
GW changeover XD: ”0”/X: ”1”	GWU	27	EB
Y correction ”1”	YNF	28	EB
Adjacent binary value 1	BW1	29	EB
Adjacent binary value 2	BW2	30	EB
Adjacent binary value 3	BW3	31	EB
Adjacent binary value 4	BW4	32	EB
External fault ”1”	F	33	EB
Warning/alarm status	WAS	34	EB
Group display: no./location no.	NRPL	35	ID
Cf. loop display	TW	36	S2
”	TX	37	S2
”	TY	38	S2
”	TEXT	39	S2
”	TINT	40	S2
”	TAC	41	S2
”	THD	42	S2
”	TGO	43	S2
”	TGU	44	S2
”	TAW1	45	S2
”	TAW2	46	S2
”	TBW1	47	S2
”	TBW2	48	S2
”	TBW3	49	S2
”	TBW4	50	S2
”	TF	51	S2
”	EHTW	52	S
”	EHTY	53	S
”	TA11	54	S4
”	TA12	55	S4
”	EHT1	56	S
”	TA21	57	S4
”	TA22	58	S4
”	EHT2	59	S
”	AT	60	S16

- Block list

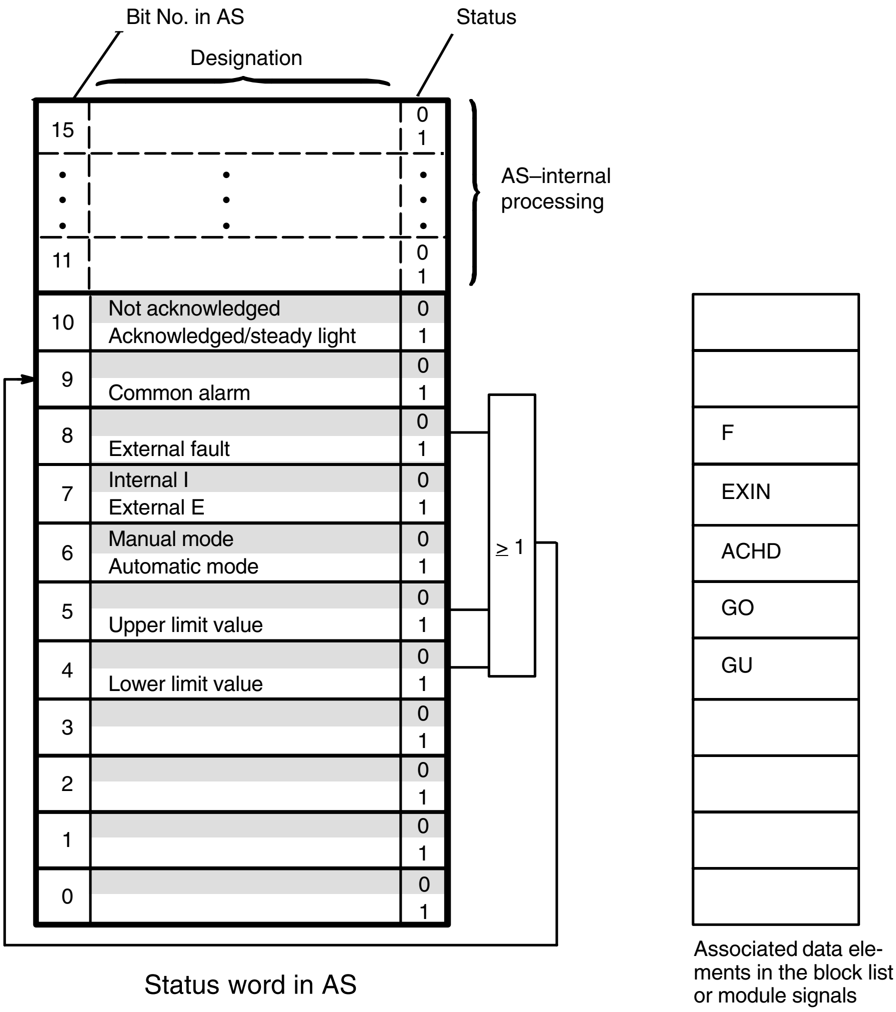
```
   R       1                03. 03. 83/ 00. 00. 55. P:   1

 1 AA  WA   0.0000            #                   N     60
 2 AA  XD   0.0000            #                   N     61
 3 AA  YA   0.0000            #                   N     62
 4 AA  DY   0.0000            #                   N     63
 5 AB  DYN  0                 #                   N     64
 6 AB  GO   0                 #                   N     65
 7 AB  GU   0                 #                   N     66
 8 AB  EXIN 0                                     N     67
 9 AB  ACHD 0                                     N     68
 1 EA  KP   0.0000               P                       1
 2 EA  TN   10.000               P                       2
 3 EA  TV   0.0000               P                       3
 4 EA  V    1.0000               P                       4
 5 EA  OG   100.00               P                       5
 6 EA  UG   0.0000               P                       6
 7 EA  TOTZ 0.0000               P                       7
 8 EA  XE   100.00               P                       8
 9 EAV W    0.0000                              CB       9
10 EA  XA   0.0000               P                      10
11 EA  WEXT 0.0000               P                      11
12 EA  X    0.0000               P                      12
13 EA  XDIF 0.0000               P                      13
14 EA  ZA   0.0000               P                      14
15 EA  YN   0.0000               P                      15
16 EA  YR   0.0000               P                      16
17 EAV YHO  105.00                                      17
18 EAV Y    0.0000                              CB      18
19 EAV YHU -5.0000                                      19
20 EA  AW1   15     0     0A     P                      20
21 EA  AW2   15     0     0A     P                      21
22 EBV E    0                                   B       22
23 EBV I    0                                   B       23
24 EBV A    0                                   B       24
25 EBV H    0                                   B       25
26 EB  WNF  0                    P                      26
27 EB  GWU  0                    P                      27
28 EB  YNF  0                    P                      28
29 EB  BW1  0             A      P                      29
30 EB  BW2  0             A      P                      30
31 EB  BW3  0             A      P                      31
32 EB  BW4  0             A      P                      32
33 EB  F    0                    P                      33
34 EB  WAS                          4              Q    34
         0  0                    P
         1  0                    P
         2  0                    P
         3  0                    P
35 ID  NRPL    0                                C       35
36 S2  TW   W                                           36
37 S2  TX   X                                           37
38 S2  TY   Y                                           38
39 S2  TEXT E                                           39
40 S2  TINT I                                           40
41 S2  TAC  A                                           41
42 S2  THD  H                                           42
43 S2  TGO  OG                                          43
44 S2  TGU  UG                                          44
45 S2  TAW1 A1                                          45
46 S2  TAW2 A2                                          46
47 S2  TBW1 B1                                          47
48 S2  TBW2 B2                                          48
```

Block list (continued)

```
49 S2  TBW3 B3                                  49
50 S2  TBW4 B4                                  50
51 S2  TF   F                                   51
52 S   EHTW *EHTW*                   6          52
53 S   EHTY %                        6          53
54 S4  TA11 TA11                                54
55 S4  TA12 TA12                                55
56 S   EHT1 *EHT1*                   6          56
57 S4  TA21 TA21                                57
58 S4  TA22 TA22                                58
59 S   EHT2 *EHT2*                   6          59
60 S16 AT   *TECHNOLOG. NAME        16          84
```

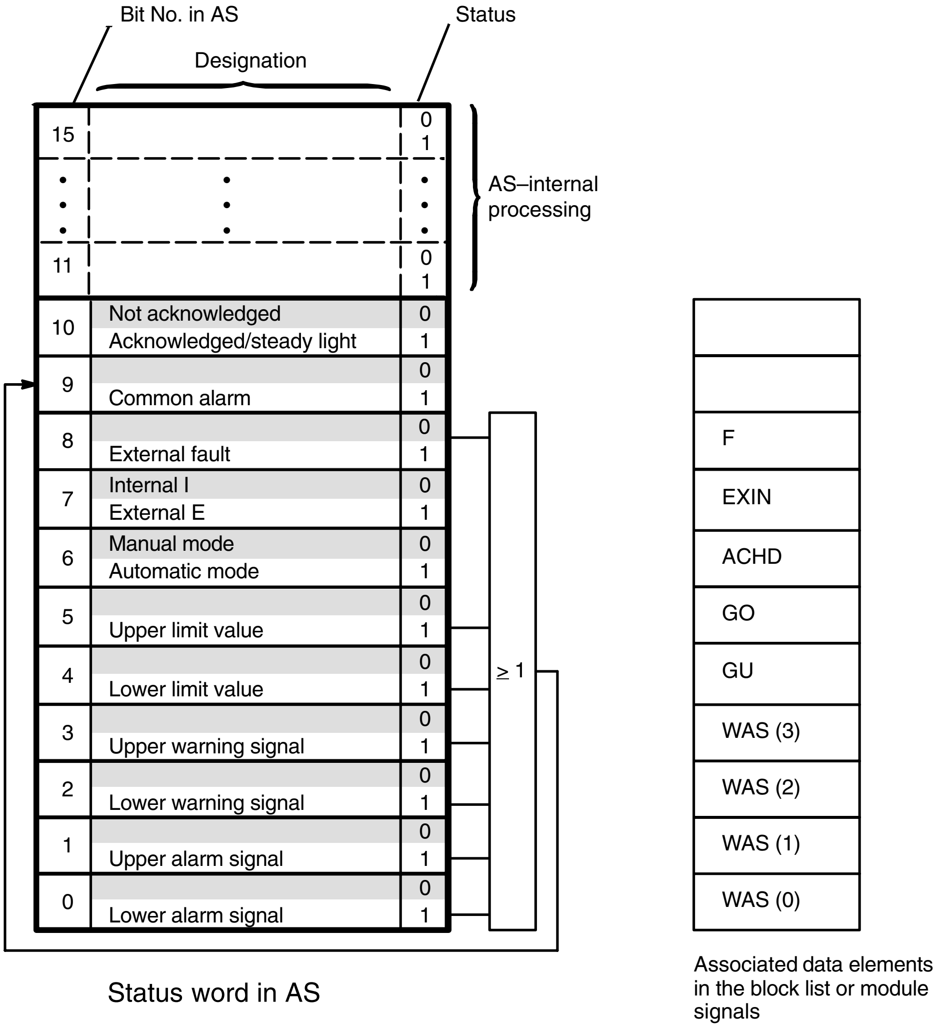
- Status word



ACHD	Manual/automatic mode
EXIN	External/internal mode
F	External fault
GO	Upper limit value
GU	Lower limit value

Fig. 9.158 Status word for the R block

- Status word for the R/M block: Warning, alarm, status interconnection WAS



ACHD	Manual/automatic mode
EXIN	External/internal mode
F	External fault
GO	Upper limit value
GU	Lower limit value
WAS(0...3)	Warning/alarm status (0...3)

Fig. 9.159 Status word for the R/M block (warning, alarm, status interconnection WAS)

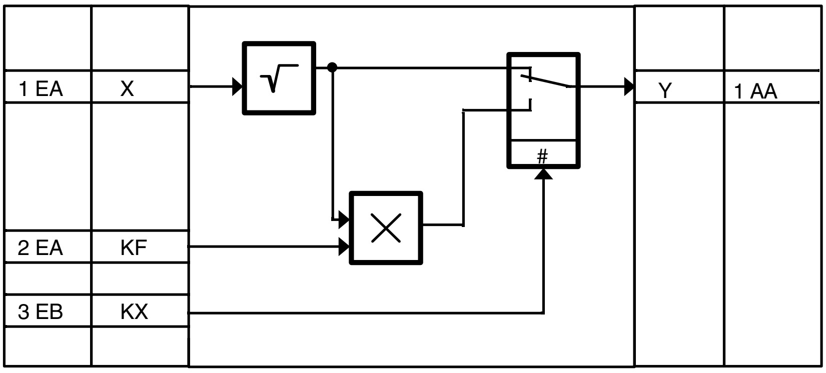
RAD

Root extractor block

Application

This block is used for extracting the root of an input variable (e.g. flow).

Method of Operation



KF Constant
KX Changeover of constant
X Input variable
Y Output variable

Fig. 9.160 Root extractor block; logic diagram

The root extractor block follows the equation:

$Y = KF \cdot \sqrt{X}$ or $Y = \sqrt{X}$

A binary signal fed to input 3 can be used to apply the constant value KF to the extracted value. A system error (S 328) will be indicated if the value of X is negative.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
Input value	X	1	EA
Factor	KF	2	EA
$Y = \sqrt{X}$ $Y = KF \cdot \sqrt{X}$	KX	3	EB

- Block list

```
 RAD     1              03. 03. 83/ 00. 05. 09. P:   1

1 AA  Y    0.0000        #                   N      4
1 EA  X    0.0000          P                        1
2 EA  KF   0.0000          P                        2
3 EB  KX   0               P                        3
```

RE

Closed–loop controller block

Application

This block is used for

– the acquisition of signals from the single–channel controller modules (S–type controller and K–type controller) and for presenting these signals at the block outputs;

– the transfer of commands and normalized increments (Y, W, V and XD) to the closed–loop controller module.

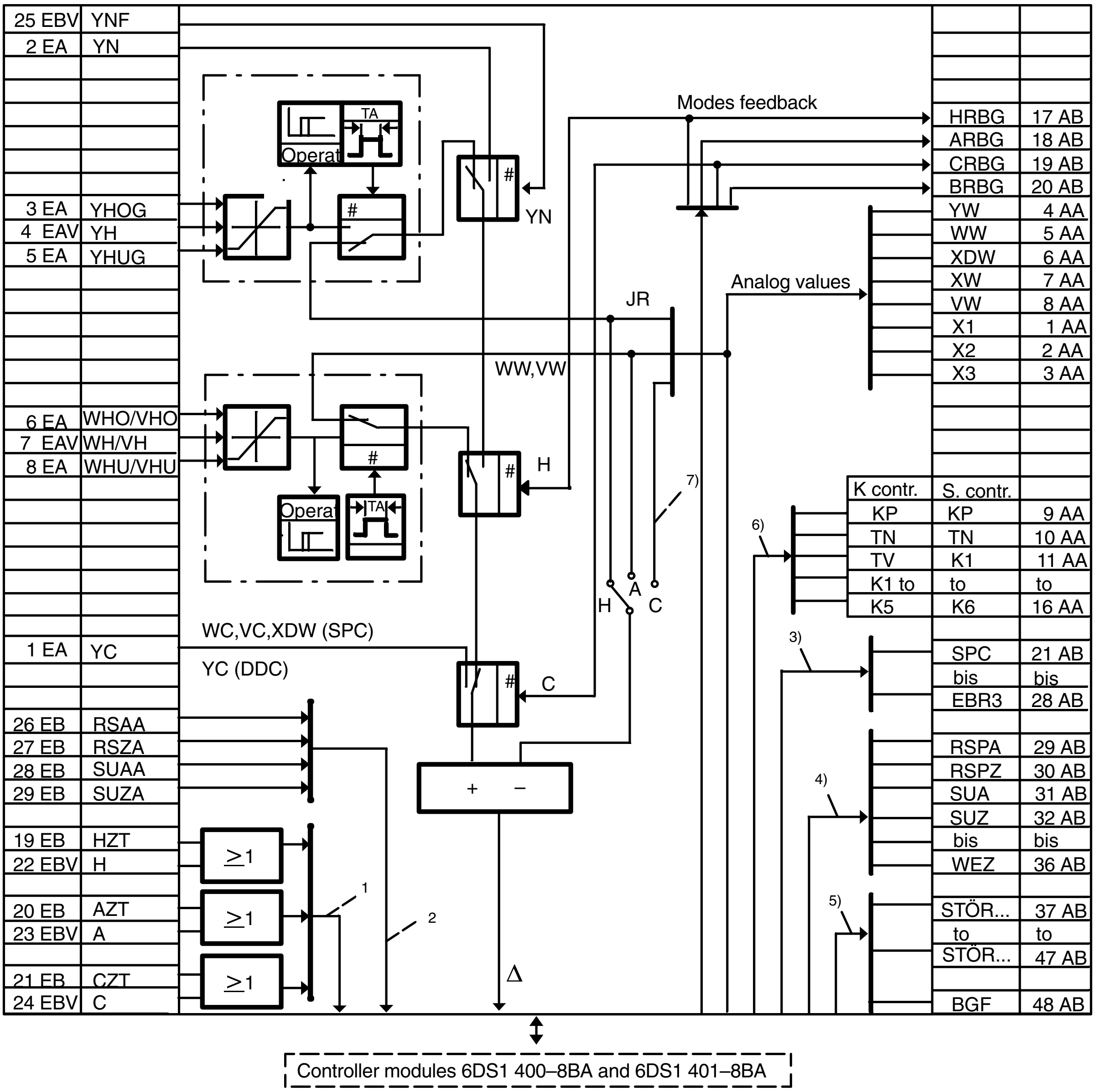
Method of Operation

Various groups of binary and analog signals are transferred from the controller module to the RE block, where they are presented as output signals:

– Fault alarms
– Return data protection interlocking
– Configuration jumpers
– Analog values
– Controller parameters
– Mode feedback

The following groups of analog and binary signals form the RE block are transferred to the controller module:

– Mode select
– Protective commands, interlocking
– Increments (Y, W, XD and V)



1) BA switchover
2) Commands, protection, interlocking
3) Configuration jumpers
4) Feedback, protection, interlocking
5) Fault alarms
6) Controller parameter, adjuster
7) YR (DDC), WW, VW, XDW (SPC)

Fig. 9.161 Driver block for single–channel closed–loop controller module; logic diagram

The logic diagram (Fig. 9.161) contains the following abbreviations:

Inputs

AZT	Automatic mode
A	Automatic mode from PST
CZT	Central unit mode
C	Central unit mode from PST
HZT	Manual mode
H	Manual mode from PST for input circuits
RSAA	Command “Open controller inhibit”
RSZA	Command “Close controller inhibit”
SUAA	Command “Open protection”
SUZA	Command “Close protection”
VC	Ratio from central unit
VH	Ratio from manual input
VHO	Upper ratio control limit
VHU	Lower ratio control limit in manual mode
WH	Setpoint from central unit
WHO	Upper setpoint control value in manual mode
WHU	Lower setpoint control value in manual mode
XDC	System deviation from central unit
YC	Manipulated variable from central unit
YH	Manipulated variable from manual input (PBT)
YHOG	Upper manip. variable control limit in manual mode
YHUG	Lower manipulated variable in manual mode
YN	Corrective manipulated variable
YNF	Correction mode
Bed.	Operator input via PBT
DDC	Direct digital control

Outputs

ARBG	Automatic mode
BGF	Module fault
BCRBG	Central unit mode
RBG	Central unit ready
EBR	Jumper states for input circuits
HRBG	Manual mode
KP	Proportional coefficient
K1 ... K6	Setting values 1 to 6
TN	Reset time
TV	Derivative action time
RSPA	Open controller inhibit
RSPZ	Close controller inhibit
STÖR	Fault alarm
SUA	Open protection
SUZ	Close protection
VW	Effective ratio
WEZ	Travel–related return data “Limit switch closed”
WW	Effective ratio
XDW	Effective system deviation
XW	Effective actual value
X1 ... X3	Analog value
YW	Effective actuator position
SPC	Setpoint control
TA	Scan time

- Modes

  In manual mode, the value of the manipulated variable Y can be specified within the parameterized control limits (YHOG and YHUG) via the process communication keyboard. The normalized positioning increment Y = YH – YR is transferred to the controller module.

  In automatic mode (A), either setpoint W or ratio V (for ratio control) can be specified within the parameterized control limits WUG/VUG and WOG/ VOG (Fig. 9.162), depending on the module input circuit (EBR1, EBR2 or EBR3).

  Depending on the jumper assignment configuration (Fig. 9.162), the appropriate normalized increment 0 to 100 is transferred to the controller module.

  When controlling Y in manual mode or W and V in automatic mode via the process communication keyboard. It should be noted that the respective value from the process communication keyboard is only present and effective for increment generation during one cycle (TA). The increment is buffered in the associated controller module and then processed. It will be 0 during the next cycle, as only the effective values W and WW or VW will then be used for increment generation.

  The analog values WC, VC or XDC (with SPC jumper) or YC (without SPC jumper) applied to input 1 and the effective analog values WW, VW, XDW (SPC) or W (DDC) are used for increment generation in C mode (central unit). The function of the SPC configuration jumper is shown in Fig. 9.162. If transition to C mode is possible, digital output 20 assumes “1” (ready for C mode).

In H mode and active correction of manipulated variable YNF, the actuator is corrected to the corrective manipulation variable. The actuator cannot be controlled manually as long as the correction of the manipulated variable is 1. The signal YNF must be reset to facilitate manual operation.

- Mode selection

The modes H, A and C are selected either via the process communication keyboard (binary inputs 22, 23 or 24) or via the unassigned binary inputs 19, 20 or 21. The unassigned inputs have a higher priority than the inputs for the process communication keyboard.
The signals for the unassigned inputs must be reset in order to give the same priority to both input types.

- Parameterization

The module number is parameterized via input 35.

Outputs 33 to 36 and 44 to 46 of the K–type controller (6DS1401–8BA) are insignificant. Outputs 21 to 28 (configuration jumper status) are only updated during initialization (i.e. first–time execution of a block after the associated XB block, which has been switched off, is switched back on).
Outputs 9 to 16 (controller parameters KP, TN and parameters of the adjusters K1 to K6) are updated either during initialization or after a transition to manual mode.

- System messages

S 305: No acknowledgement from module (incorrect address, incorrect jumper settings or module defective)
S 313: Multiple addressing (incorrect jumper setting)
S 321: Module malfunction or repeated read error

- Cycle

250 ms is the minimum processing cycle of the RE block permitted for communication with the module.

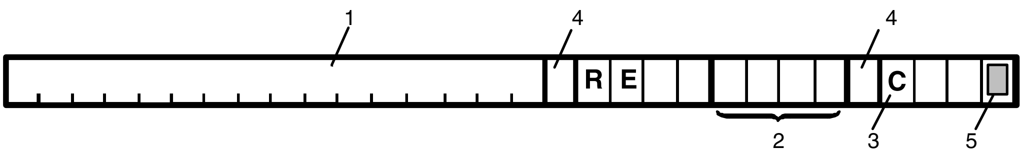
- Jumper assignments

Mode	Mode indicator	SPC	XDC	VR {EBR 1 = 1, EBR 2 = 1, EBR 3 = 1}	XD / XDE	WF	Δ	Measuring span of effective (W) and central unit (C) values
Manual	H = 1	X	X	X	X / X	X	Δ Y = Y – YW	YHUG to YHOG
Automatic	A = 1	X X	X X	0 1	0 / 0 0 / 0	0 0	Δ W = W – WW Δ V = W – VW	VWUG to VWOG
Central unit	C = 1	0	X	X	X / X	0	Δ Y = YC – YW	
	C = 1 A = 1	1 1 1	0 0 1	0 1 X	X / X X / X X / X	0 0 0	Δ W = YC – WW Δ V = YC – VW Δ XD = YC – XDW	

1 = jumper inserted
0 = jumper not inserted
X = not relevant

Fig. 9.162 Jumper assignment for increment generation

- Normalized representation in a group display



1 Process–related name of the RE block, as in loop display
2 Number of the RE block
3 Mode indicator
  C central unit
  H manual mode
4 Separating blank
5 Blinking mark indicating a common alarm

Fig. 9.163 RE block; normalized representation in the group display

The block is represented by 30 characters in a specific location of a group display. Input 34 (group display: no./location no.) must then be parameterized as follows:

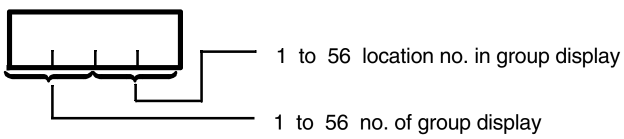


Fig. 9.164 RE block; normalized representation in the group display

Set input 34 (NRPL) to “0” if the normalized representation of a block in a group display is to be suppressed.

- Operator input using the process communication keyboard

Five keys (Y =, W =, H = 1, A = 1 and C = 1 or Y =, V =, H = 1, A = 1 and C = 1 for ratio control) will be assigned after the loop display has been selected and the “Operator input” (BE) key depressed. After the keys (Y =) and (W =) or (V =) have been depressed, a sequence of numbers may be entered and terminated by pressing the execute key (◈).

The “More” (↑) or “Less“ (↓) keys may be pressed to continue without figures previously having been entered (setpoint W, manipulated variable Y or ratio V). The execute key (◈), normally required for termination, need not be pressed in this case.

The change is approximately 1% of the measuring span per processing cycle. If a greater change is required, the appropriate “More” (↑) or “Less” (↓) key is to be pressed together with the “High–Speed” (~) key. The change is then approximately 10% of the measuring span per processing cycle.

Keyboard inputs using A = 1, C = 1 and H = 1 must be directly terminated by pressing the execute key (◈).

Fixed setpoint control and three component control

Y=	W=	H=1	A=1	C=1			

A Automatic mode
C Central unit mode
H Manual mode
W Setpoint
Y Manipulated variable

Fig. 9.165 RE block, automatic labeling of the process communication keyboard

Ratio control

Y=	V=	H=1	A=1	C=1			

A Automatic mode
C Central unit mode
H Manual mode
V Ratio
Y Manipulated variable

Fig. 9.166 RE block, automatic labeling of the process communication keyboard

For fixed setpoint control and three component control. Input 36 is parameterized with V (K–type controller only) and input 37 with W. The process communication keyboard then shows "W=". For ratio control, input 36 is parameterized with V and input 37 with W. The process communication keyboard then shows "V =".

- Normalized representation in the loop display

  The following loop display (Fig. 9.167) contains static and dynamic operator data.

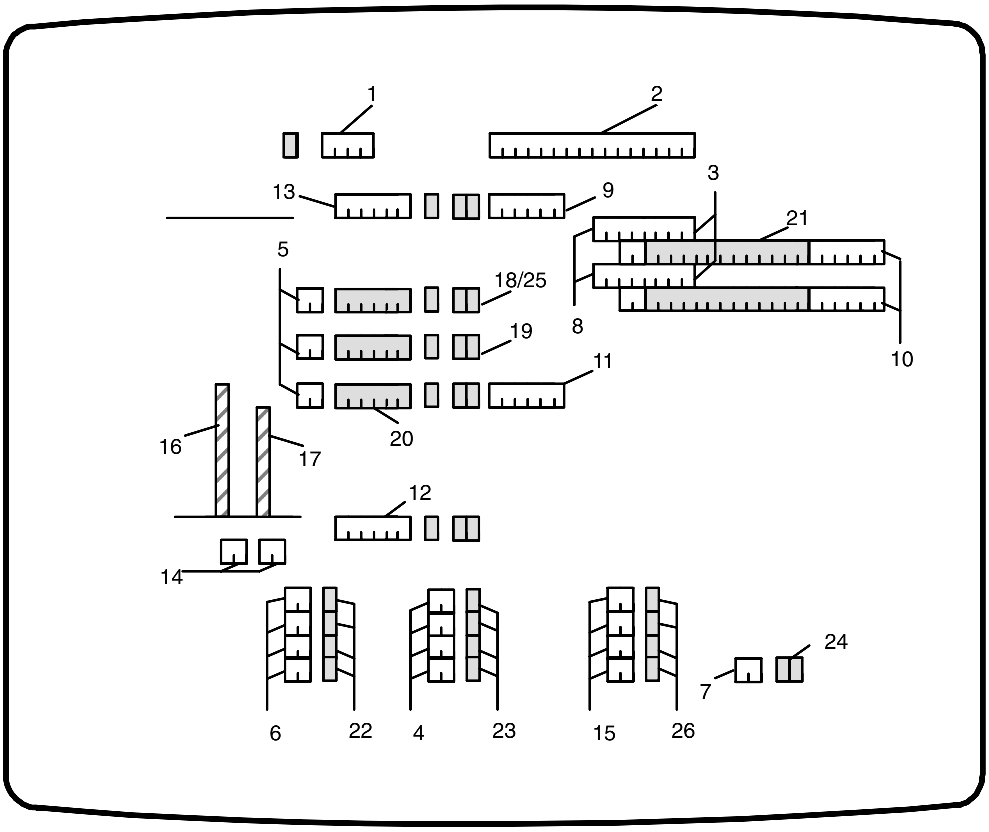
Static data

1 Mnemonic name and number of RE block
2 Process–related name of RE block
3 Process–related names of adjacent analog values
4 Process–related names of configuration jumpers (WF, WE, SP and XD) [1)]
5 Mnemonic names of the effective controlled variables (W, X, Y and V) [2) 1)]
6 Mnemonic name of the effective mode (B, C, A, H)
7 Mnemonic names of the error messages (S)
8 Process–related quantities of adjacent analog values
9 Physical unit of actual value and setpoint
10 Physical unit of the adjacent analog values
11 Unit of manipulated variable
12 Lower range limit of actual value and setpoint
13 Upper range limit of actual value and setpoint
14 Mnemonic name of the bars (X, W) [1)]
15 Process–related mnemonic name of adjacent digital values

Dynamic data

16 Effective setpoint W as bar (analog display)
17 Effective actual value X as bar (analog display)
18 Effective setpoint W (digital display)
19 Effective actual value (digital display)
20 Effective manipulated value Y (digital display)
21 Digital display of adjacent analog values
22 Indication of effective modes of B, C, A, H:
"0" the associated mode is switched off,
"1" the associated mode is switched on.
23 Configuration jumper setting (WF, WE, SP, XD):
"1" means that the jumper has been inserted.
24 Error messages (sorted by priorities):
S 4 Module failure
S 25 Failure in power section
S 24 Motor temperature too high
S 95 Transducer fuse has tripped
S 94 Analog signal monitoring function has responded YR
S 91 Analog signal monitoring function has responded X1
S 92 Analog signal monitoring function has responded X2
S 93 Analog signal monitoring function has responded X3
S 10 Binary signal monitoring function has responded [3)]
S 31 Interlocking monitoring function has responded
S 6 Control station defective
25 Ratio V (digital display) [2)]
26 States of adjacent binary values

[1)] Pre–defined mnemonic names
[2)] Display in ratio control mode only
[3)] No significance for K–type controllers



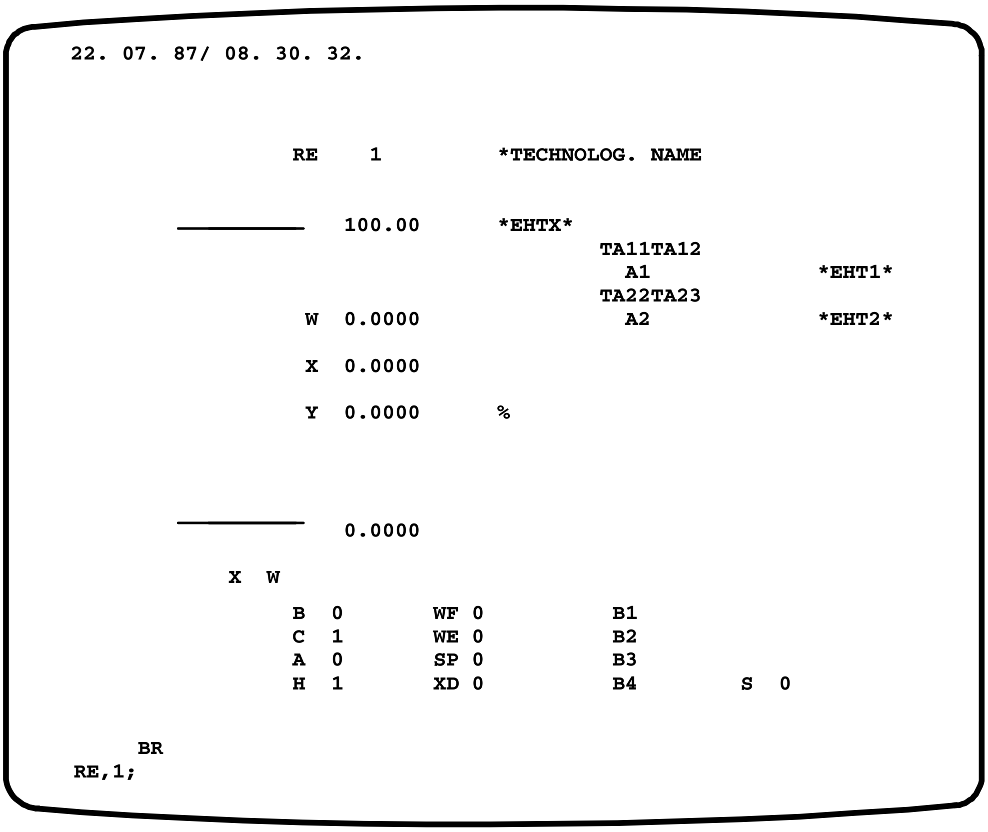


Fig. 9.167 RE block, loop display

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/Output No.	Type
Analog value X 1		X1	1	AA
Analog value X 2		X2	2	AA
Analog value X 3		X3	3	AA
Effective manipulated variable Yw (YR)		YW	4	AA
Effective setpoint Ww		WW	5	AA
Effective system deviation		XDW	6	AA
Effective controlled variable Xw		XW	7	AA
Effective ratio Vw		VW	8	AA
KP		KP	9	AA
TN		TN	10	AA
Setting value	1 [8)]	K1	11	AA
”	2 [8)]	K2	12	AA
”	3 [8)]	K3	13	AA
”	4 [8)]	K4	14	AA
”	5 [8)]	K5	15	AA
”	6 [8)]	K6	16	AA
Operating mode :	Manual mode (RBG)	HRBG	17	AA
”	Automatic mode (RBG)	ARBG	18	AB
”	Compute mode (RBG)	CRBG	19	AB
Controller module ready		BRBG	20	AB
Config. jumper	SPC	SPC	21	AB
”	XDC	XDC	22	AB
”	XDE	XDE	23	AB
”	WE	WE	24	AB
Config. jumper	WF	WF	25	AB
”	EBR1	EBR1	26	AB
”	EBR2	EBR2	27	AB
”	EBR3	EBR3	28	AB
Controller inhibit	Open	RSPA	29	AB
”	Closed	RSPZ	30	AB
Protect. command	Open	SUA	31	AB
”	Closed	SUZ	32	AB
Torque switch	Open	DEA	33	AB [6)]
”	Closed	DEZ	34	AB [7)]
Limit switch	Open	WEA	35	AB [5)]
”	Closed	WEZ	36	AB [5)]
HW fault module malfunction		S4	37	AB
Control station malfunction		S6	38	AB
Analog value	X 1 disturbed	S91	39	AB
”	X 2 disturbed	S92	40	AB
”	X 3 disturbed	S93	41	AB
”	Y w disturbed	S94	42	AB
Transducer monitoring		S95	43	AB
Binary signal monitoring		S10	44	AB [5)]
Motor temperature too high		S24	45	AB [5)]
Power section malfunction		S25	46	AB [5)]
Interlocking monitoring		S31	47	AB [5)]
Module fault		BGF	48	AB
YC, WC, VC, XDC		YC	1	EA
Correction input YN		YN	2	EA

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Upper limit Y manual	YHOG	3	EA
Y manual	Y	4	EAV 1) 4)
Lower limit Y manual	YHUG	5	EA
Upper limit WH or VH	VWOG	6	EA
WH or VH	WH	7	EAV 1) 4)
Lower limit WG or VH	VWUG	8	EA
Upper range limit X1	X1E	9	EA
Lower range limit X1	X1A	10	EA
Upper range limit X2	X2E	11	EA
Lower range limit X2	X2A	12	EA
Upper range limit X3	X3E	13	EA
Lower range limit X3	X3A	14	EA
Upper range limit (XW, WW, XDW)	XWE	15	EA
Lower range limit (XW, WW, XDW)	XWA	16	EA
Adjacent analog value 1	AW1	17	EA 2)
” ” 2	AW2	18	EA 2)
Manual mode H from central unit	HZT	19	EB
Automatic mode A ” ”	AZT	20	EB
Compute mode C ” ”	CZT	21	EB
Manual (PBT)	H	22	EBV 1) 3) 4)
Automatic (PBT)	A	23	EBV 1) 3) 4)
Compute (PBT)	C	24	EBV 1) 3) 4)
Y correction ”1”	YNF	25	EBV 1)
Controller inhibit Open	RSAA	26	EB
” Closed	RSZA	27	EB
Open protection SKA	SUAA	28	EB
Close protection SKZ	SUZA	29	EB
Adjacent binary value 1	BW1	30	EB
” ” 2	BW2	31	EB
” ” 3	BW3	32	EB
” ” 4	BW4	33	EB
Group display: no./location no.	NRPL	34	ID
Module no.	BGNR	35	I
Cf. loop display	TV	36	S2
”	TWF	37	S2
”	TWE	38	S2
”	TW	39	S2
”	TX	40	S2
”	TY	41	S2
”	TB	42	S2
”	TC	43	S2
”	TA	44	S2
”	TH	45	S2
”	TSP	46	S2
”	TXD	47	S2
”	TAW1	48	S2
”	TAW2	49	S2

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Cf. loop display	TBW1	50	S2
”	TBW2	51	S2
”	TBW3	52	S2
”	TBW4	53	S2
”	TS	54	S2
”	EHTX	55	S6
”	EHTY	56	S6
”	TA11	57	S4
”	TA12	58	S4
”	EHT1	59	S6
”	TA21	60	S4
”	TA22	61	S4
”	EHT2	62	S4
”	AT	63	S16

1) Input is not interconnectable
2) Operator's configuration input for adjacent analog value which is to appear in the loop display
3) Input for operator communication keys of the process communication keyboard PBT
4) Input is not non–interacting
5) No significance for K–type controllers
6) For K–type controller NE (correction ON)
7) Control command of K–type controller disturbed
8) Closed–loop control module

	6DS1 400–8..	6DS1 401–8..
K1	Input parameter 1	Input parameter
K2	Input parameter 2	Input parameter
K3	Input parameter 3	Input parameter
K4	Threshold for XD	Lower actuating signal limit
K5	Motor actuating time TY	Upper actuating signal limit
K6	Threshold for YC	----

- Block list

```
   RE      1               03. 03. 83/ 00. 05. 41. P: 1

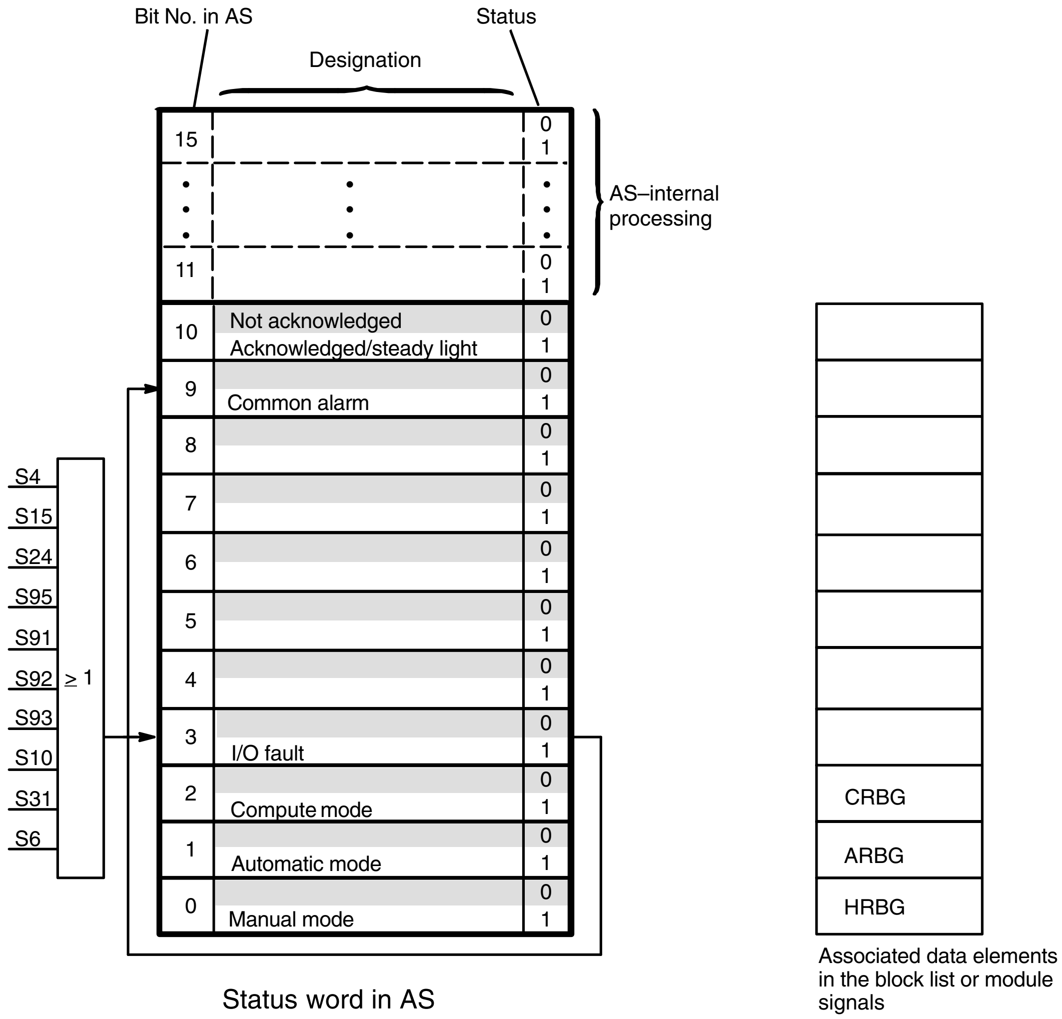
 1 AA   X1    0.0000          #                    N     63
 2 AA   X2    0.0000          #                    N     64
 3 AA   X3    0.0000          #                    N     65
 4 AA   YW    0.0000          #                    N     66
 5 AA   WW    0.0000          #                    N     67
 6 AA   XDW   0.0000          #                    N     68
 7 AA   XW    0.0000          #                    N     69
 8 AA   VW    0.0000          #                    N     70
 9 AA   KP    0.0000          #                    N     71
10 AA   TN    0.0000          #                    N     72
11 AA   K1    0.0000          #                    N     73
12 AA   K2    0.0000          #                    N     74
13 AA   K3    0.0000          #                    N     75
14 AA   K4    0.0000          #                    N     76
15 AA   K5    0.0000          #                    N     77
16 AA   K6    0.0000          #                    N     78
17 AB   HRBG  0               #                    N     79
18 AB   ARBG  0               #                    N     80
19 AB   CRBG  0               #                    N     81
20 AB   BRBG  0               #                    N     82
21 AB   SPC   0               #                    N     83
22 AB   XDC   0               #                    N     84
23 AB   XDE   0               #                    N     85
24 AB   WE    0               #                    N     86
25 AB   WF    0               #                    N     87
26 AB   EBR1  0               #                    N     88
27 AB   EBR2  0               #                    N     89
28 AB   EBR3  0               #                    N     90
29 AB   RSPA  0               #                    N     91
30 AB   RSPZ  0               #                    N     92
31 AB   SUA   0               #                    N     93
32 AB   SUZ   0               #                    N     94
33 AB   DEA   0               #                    N     95
34 AB   DEZ   0               #                    N     96
35 AB   WEA   0               #                    N     97
36 AB   WEZ   0               #                    N     98
37 AB   S4    0               #                    N     99
38 AB   S6    0               #                    N    100
39 AB   S91   0               #                    N    101
40 AB   S92   0               #                    N    102
41 AB   S93   0               #                    N    103
42 AB   S94   0               #                    N    104
43 AB   S95   0               #                    N    105
44 AB   S10   0               #                    N    106
45 AB   S24   0               #                    N    107
46 AB   S25   0               #                    N    108
47 AB   S31   0               #                    N    109
48 AB   BGF   0               #                    N    110
 1 EA   YC    0.0000             P                        1
 2 EA   YN    0.0000             P                        2
 3 EA   YHOG  105.00             P                        3
 4 EAV  Y     0.0000                              B       4
 5 EA   YHUG  5.0000             P                        5
 6 EA   VWOG  100.00             P                        6
 7 EAV  W     0.0000                              B       7
```

Block list (continued)

```
   RE      1                  03. 03. 83/ 00. 07. 20. P: 2

 8 EA  VWUG  0.0000                P                        8
 9 EA  X1E   100.00                P                        9
10 EA  X1A   0.0000                P                       10
11 EA  X2E   100.00                P                       11
12 EA  X2A   0.0000                P                       12
13 EA  X3E   100.00                P                       13
14 EA  X3A   0.0000                P                       14
15 EA  XWE   100.00                P                       15
16 EA  XWA   0.0000                P                       16
17 EA  AW1    15     0      0A     P                       17
18 EA  AW2    15     0      0A     P                       18
19 EB  HZT   0                     P                       19
20 EB  AZT   0                     P                       20
21 EB  CZT   0                     P                       21
22 EBV H     0                                    B        22
23 EBV A     0                                    B        23
24 EBV C     0                                    B        24
25 EBV YNF   0                                             25
26 EB  RSAA  0                     P                       26
27 EB  RSZA  0                     P                       27
28 EB  SUAA  0                     P                       28
29 EB  SUZA  0                     P                       29
30 EB  BW1   0                     P                       30
31 EB  BW2   0                     P                       31
32 EB  BW3   0                     P                       32
33 EB  BW4   0                     P                       33
34 ID  NRPL      0                               C         34
35 I   BGNR      0                               C         35
36 S2  TV    V*                                  C         36
37 S2  TWF   WF                                            37
38 S2  TWE   WE                                            38
39 S2  TW    W                                   C         39
40 S2  TX    X                                             40
41 S2  TY    Y                                             41
42 S2  TB    B                                             42
43 S2  TC    C                                             43
44 S2  TA    A                                             44
45 S2  TH    H                                             45
46 S2  TSP   SP                                            46
47 S2  TXD   XD                                            47
48 S2  TAW1  A1                                            48
49 S2  TAW2  A2                                            49
50 S2  TBW1  B1                                            50
51 S2  TBW2  B2                                            51
52 S2  TBW3  B3                                            52
53 S2  TBW4  B4                                            53
54 S2  TS    S                                             54
55 S   EHTX  *EHTX*                    6                   55
56 S   EHTY  *EHTY*                    6                   56
57 S4  TA11  TA11                                          57
58 S4  TA12  TA12                                          58
59 S   EHT1  *EHT1*                    6                   59
60 S4  TA21  TA21                                          60
61 S4  TA22  TA22                                          61
62 S   EHT2  *EHT2*                    6                   62
63 S16 AT    *TECHNOLOG.NAME          16                  128
```

- Status word



ARBG Automatic mode
CRBG Compute mode
HRBG Manual mode

Fig. 9.168 Status word for the RE block

REN

Driver block for the module 6DS1715

Application

The block is used for transferring analog and binary signals between AS 235 and the analog arithmetic module 6DS1715 (see Chap. 9.2). Only one REN block may be used per arithmetic module.

Method of Operation

The following signals are transferred from the driver inputs to the module:

– Up to 14 unassigned analog input values AE1 to AE14. The number of values must be parameterized in input AATB.
– 16 unassigned binary input values BE1 to BE16.

The following signals are transferred from the module to the driver outputs:

– Up to 14 unassigned analog output values AA1 to AA14. The number of values must be parameterized in input AABT.
– 24 unassigned binary input values BA1 to BA24
– Channel fault KFG1 to KFG4. The associated signals KF1 to KF4 on the module must be interconnected by the program on the module with the sensor fuse monitoring signals GSI1 to GSi4, and are then assigned to the analog values AA1 to AA4.
  The corresponding analog output value is marked as disturbed and the S 320 system message initiated if a channel fault occurs.
– Non–availability NV1 and NV2. These signals initiate an S 321 system message.
– Processing inhibit of the BSPV module. All binary output values BA1 to B24 are set to “0” and an S 324 system message is initiated if this signal is “1”.
– BGF module fault (corresponds to the BGNA signal in TELEPERM ME). A state “1” of this output can have the following meanings:
  – Module time–out (QVZ) S 305 system message.
  – Multiple addressing (EANK, incorrect jumper setting), S 313 system message.
  – Wrong module type detected, S 311 system message.
  – BGA signal (module failure) from the module, S 321 system message.
  All analog outputs are marked as disturbed and all binary outputs set to “0” if BGF = 1. The fault signals KFG1 to KFG4, NV1, NV2 and external faults 1 to 4 are set to “1”. The BSPV signal (module command inhibit) is set to “0”.
– External faults 1 to 4. The signals EXFE1 to EXFE4 on the module can be transferred to a binary field by interconnecting the EXFE input. This digital field must possess at least four binary values after the interconnection address, otherwise the error message F 415 will be issued during interconnection and the error message S 307/S 304 during execution (possible when field length is changed).
  The external faults EXFE1 to EXFE4 on the module initiate the S 326 system message.

The slot address must be specified as the module number. Valid addresses are 0 to 60 or 100 to 160, all other values are rejected and F 410 issued. The BGF block output is set to “1” (see above) if the slot is empty or if an incorrect module has been installed.

The inputs AATB and AABT must be parameterized with values between 0 and 14.

The module watchdog expires if the module has not been addressed by the driver blocki for more than 16 seconds. The module then sets all digital signals on the module to “0”. The driver block must therefore be processed every 16 seconds. The driver block cannot detect the fact that the watchdog has expired.

- System messages

S304: Incorrect addressing in the block (GB field of EXFE interconnection is too small)
S305: Time–out from peripheral units (QVZ)
S307: Incorrect type in variable access (GB field of EXFE interconnection is too small)
S311: Incorrect module code (wrong module installed)
S313: Multiple addressing from peripherals (EANK)
S320: KFG1 or KFG2 or KFG3 or KFG4 channel fault
S321: BGA signal (module failure) from the module or NV1 or NV2 non–availability signal or incorrect check byte when reading the analog output values from the module.

S324: Module processing fault (BSP)
S326: External fault 1, 2, 3 or 4

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Analog output value 1	AA1	1	AA
:	:	:	:
Analog output value 14	AA14	14	AA
Channel fault 1	KFG1	15	AB
Channel fault 2	KFG2	16	AB
Channel fault 3	KFG3	17	AB
Channel fault 4	KFG4	18	AB
Non–availability 1	NV1	19	AB
Non–availability 2	NV2	20	AB
Command inhibit	BSPV	21	AB
Module fault	BGF	22	AB
Binary output value 1	BA1	23	AB
:	:	:	AB
Binary output value 24	BA24	46	AB
Analog input value 1	AE1	1	EA
:	:	:	:
Analog input value 14	AE14	14	EA
Binary input value 1	BE1	15	EB
:	:	:	:
Binary input value 16	BE16	30	EB
Number of analog values to the module	AATB	31	I
Number of analog values from the module	AABT	32	I
External fault	EXFE	33	EB
Module number	BGNR	34	I

- Block list

```
   REN     1               05. 04. 89/ 12. 14. 27. P:1*

 1 AA  AA1  0.0000         #                   N      1
 2 AA  AA2  0.0000         #                   N      2
 3 AA  AA3  0.0000         #                   N      3
 4 AA  AA4  0.0000         #                   N      4
 5 AA  AA5  0.0000         #                   N      5
 6 AA  AA6  0.0000         #                   N      6
 7 AA  AA7  0.0000         #                   N      7
 8 AA  AA8  0.0000         #                   N      8
 9 AA  AA9  0.0000         #                   N      9
10 AA  AA10 0.0000         #                   N     10
11 AA  AA11 0.0000         #                   N     11
12 AA  AA12 0.0000         #                   N     12
13 AA  AA13 0.0000         #                   N     13
14 AA  AA14 0.0000         #                   N     14
15 AB  KFG1 0              #                   N     15
16 AB  KFG2 0              #                   N     16
17 AB  KFG3 0              #                   N     17
18 AB  KFG4 0              #                   N     18
19 AB  NV1  0              #                   N     19
20 AB  NV2  0              #                   N     20
21 AB  BSPV 0              #                   N     21
22 AB  BGF  0              #                   N     22
23 AB  BA1  0              #                   N     23
24 AB  BA2  0              #                   N     24
25 AB  BA3  0              #                   N     25
```

Block list (continued)

26	AB	BA4	0	#			N		26
27	AB	BA5	0	#			N		27
28	AB	BA6	0	#			N		28
29	AB	BA7	0	#			N		29
30	AB	BA8	0	#			N		30
31	AB	BA9	0	#			N		31
32	AB	BA10	0	#			N		32
33	AB	BA11	0	#			N		33
34	AB	BA12	0	#			N		34
35	AB	BA13	0	#			N		35
36	AB	BA14	0	#			N		36
37	AB	BA15	0	#			N		37
38	AB	BA16	0	#			N		38
39	AB	BA17	0	#			N		39
40	AB	BA18	0	#			N		40
41	AB	BA19	0	#			N		41
42	AB	BA20	0	#			N		42
43	AB	BA21	0	#			N		43
44	AB	BA22	0	#			N		44
45	AB	BA23	0	#			N		45
46	AB	BA24	0	#			N		46
1	EA	AE1	0.0000		P				47
2	EA	AE2	0.0000		P				48
3	EA	AE3	0.0000		P				49
4	EA	AE4	0.0000		P				50
5	EA	AE5	0.0000		P				51
6	EA	AE6	0.0000		P				52
7	EA	AE7	0.0000		P				53
8	EA	AE8	0.0000		P				54
9	EA	AE9	0.0000		P				55
10	EA	AE10	0.0000		P				56
11	EA	AE11	0.0000		P				57
12	EA	AE12	0.0000		P				58
13	EA	AE13	0.0000		P				59
14	EA	AE14	0.0000		P				60
15	EB	BE1	0		P				61
16	EB	BE2	0		P				62
17	EB	BE3	0		P				63
18	EB	BE4	0		P				64
19	EB	BE5	0		P				65
20	EB	BE6	0		P				66
21	EB	BE7	0		P				67
22	EB	BE8	0		P				68
23	EB	BE9	0		P				69
24	EB	BE10	0		P				70
25	EB	BE11	0		P				71
26	EB	BE12	0		P				72
27	EB	BE13	0		P				73
28	EB	BE14	0		P				74
29	EB	BE15	0		P				75
30	EB	BE16	0		P				76
31	I	AATB	0			C			77
32	I	AABT	0			C			78
33	EB	EXFE	0		P	C		Q	79
34	I	BGNR	0			C			80

REST

Initialization block

Application

The RESTART blocks are used to specify the start–up conditions of a system. Process signals can be set, for example, to a defined starting position.

Method of Operation

The RESTART blocks are executed once and always after a system start–up. [1)]

The processing sequence is defined by the definition sequence of the RESTART blocks (= internal block number).

After all RESTART blocks have been executed, the individual processing levels are enabled by the system. RESTART blocks are user–specific blocks written in TML. The whole TML instruction set is permitted. The blocks can only be defined when the keyswitch on the process communication keyboard has been set to authorization level 3.

RESTART blocks are not inserted in a block sequence.

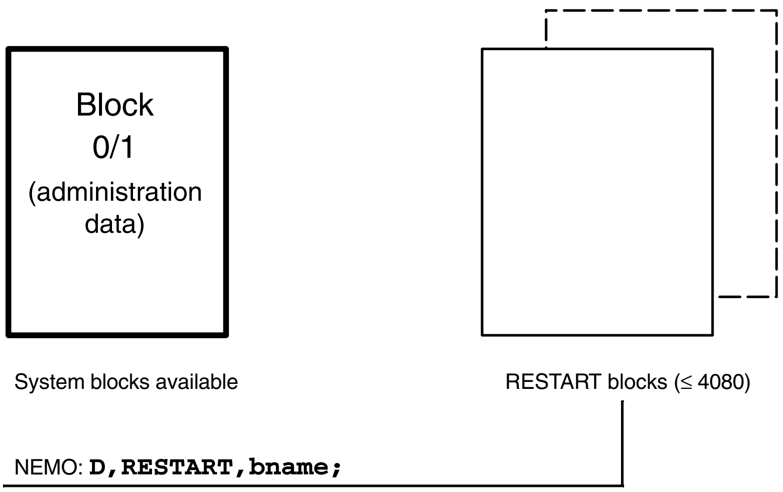


Fig. 9.169 Block structure

The RESTART blocks are processed in their internal block number sequence when the system is restarted.

The following configuration instructions are possible for RESTART blocks:

```
NEMO;
D,RESTART,bname;
-         instructions (TML)
A,RESTART,bname;
-         LS,no;
-         EI,no,instruction;
-         ER,no,instruction;
L,RESTART,bname;
F;
AE;
DE;
END;
```

1) For different start–up reasons, see “Initialization blocks” in Chap. 5.7.2.1.

RK

Driver block for single–channel closed–loop controller modules

Application

– This block is used for the acquisition of signals from the single–channel controller modules S–type controllers and K–type controllers (see Chap. 9.2)
or for presenting these signals at the block outputs and

– for the transfer of commands and normalized increments (Y, W, V and XD) to the controller module.

Method of Operation

The controller module transfers various groups of binary and analogs signals to the RK block where they are presented as outputs signals. These signals are:

– Fault alarm
– Return data protective interlocking
– Configuration jumpers
– Analog values
– Controller parameters
– Mode return data

The following groups of binary and analog signals from the RK block are routed in the controller module.

– Mode selection
– Protective commands, interlocking
– Increments (Y, W, XD and V)

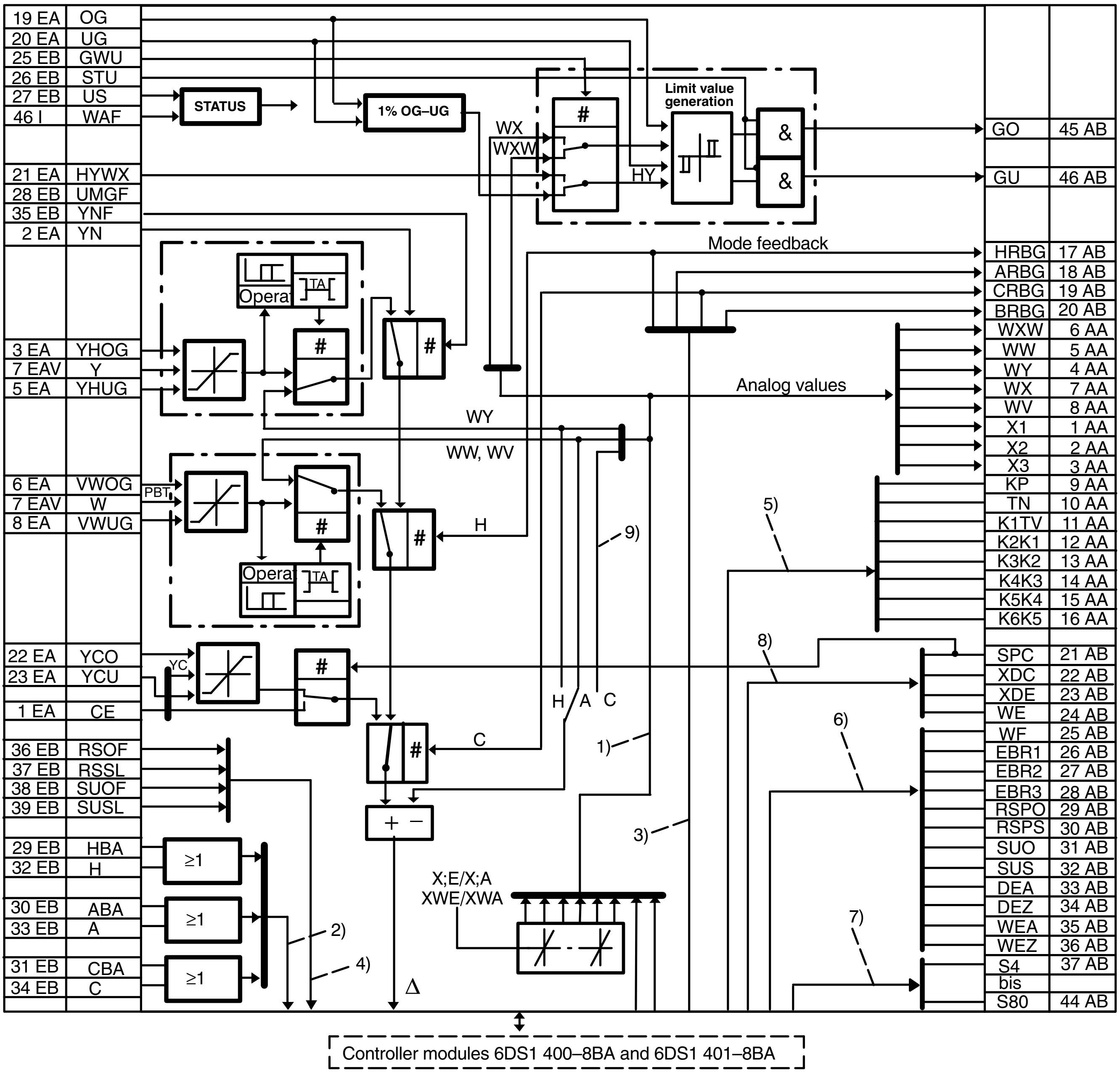
- Modes

  In manual mode (H), the manipulated variable Y can be specified with the parameterized control limits (YHOG and YHUG) via the process communication keyboard. The normalized actuating increment Y = YH – WY is then transferred to the controller module.

  In automatic mode (A), either setpoint W or ratio V (for ratio control) can be specified within the parameterized control limits WUG/VUG and WOG/VOG, depending on the module input circuit (EBR1, EBR2 and EBR3).

  Ratio control: EBR1 = 0 and EBR2 = EBR3 = 1
  Depending on the configuration jumper assignments (Fig. 9.171), the appropriate normalized increment 0 to 100 is transferred to the controller module.

  When controlling Y in manual mode or W and V in automatic mode via the process communication keyboard, it should be noted that the respective value from the process communication keyboard is only present and effective for increment generation during one cycle (TA). During program execution, the difference between the value entered and the currently effective value is transferred as an increment to the module. The increment will be 0 during the next cycle, as only the effective values WY, WXW, WW and WV will then be used for increment generation.



1) Analog values
2) Mode selection
3) Modes
4) Commands, protection, interlocking
5) Controller parameters, adjuster
6) Feedback, protection, interlocking
7) Fault alarm
8) Configuration jumpers
9) WY, (DDC), WW, WV, WXW, (SPC)

Fig. 9.170 Driver block for a single channel closed–loop controller module; logic diagram

Legend to Fig. 9.170:

Inputs

ABA	Automatic mode
A	Automatic mode from PBT
CBA	Compute (central unit mode)
C	Compute (PBT)
CE	Value specification to module for WY, WV, WW or WXW
GWU	Limit value selection
HBA	Manual mode
H	Manual mode from PBT
HYWX	Hysteresis for limit value monitoring
OG	Upper limit value
RSOF	Command ”Open controller inhibit”
RSSL	Command ”Close controller inhibit”
STU	Interference suppression
SUOF	Command ”Open protection”
SUSL	Command ”Close protection”
UG	Lower limit value
UMGF	Indication environment fault
US	Status suppression
WAF	Mode fault indication for OS
W	Setpoint from central unit
VWOG	Upper setpoint control unit (Manual mode)
VWUG	Untere Bediengrenze des Sollwertes (Man. mode)
Y	Manipulated variable in man. mode (PBT)
YCO/YCU	Upper/lower Y–DDC limit
YHOG	Upper control limit of manip. variable
YHUG	Lower limit in manual mode
YN	Corrective manipulated variable
YNF	Correction mode (PST)
XDE	External XD input
Operat	Operation via PBT
DDC	Direct digital control
SPC	Setpoint control

Outputs

ARBG	Automatic mode
BRBG	Central unit ready
CRBG	Central unit mode
DEA/DEZ	Torque switch OPEN/CLOSED
EBR1 to EBR3	Jumper status for input circuits
GO	Alarm signal upper limit
GU	Alarm signal lower limit
HRGB	Manual mode
KP	Proportional coefficient
K1 : : : : K6	Setting values 1 to 6
RSPO	Controller inhibit OPEN
RSPS	Controller inhibit CLOSE
S4–S80	Error messages
SPC	SPC jumper
SUO	Open protection
SUS	Close protecton
TN	Reset time
TV	Derivative action time
X1 : X3	Analog values 1 to 3
XDC	XD input from central unit
WEA/WEZ	Return data limit switch OPEN
WE	External setpoint
WF	Setpoint from front panel
WV	Effective ratio
WW	Effective setpoint
WX	Effective actual value
WXW	Effective system deviation
WY	Effective actuator position

Depending on the SPC configuration (inserted or not inserted, see Fig. 9.171), the analog values WC, VC or XDC (with SPC jumper) or YC (without SPC jumper), related to the currently effective analog values WW, WV, WXW or WY, are used in mode C (compute) for increment generation. If transition to C mode is possible, binary output 20 assumes “1” (ready for C mode).

In SPC mode, the parameterized limits YCO and YCU (inputs 22, 23) of input 1 are monitored and limited, if necessary. Although the input value is not modified, the delimited value will be used for increment generation.

In H mode and active correction of manipulated variable YNF, the actuator is corrected to the corrective manipulated variable YN. The actuator cannot be controlled manually as long as the correction value of the manipulated variable is 1. The signal YNF must be reset to facilitate manual operation.

- Mode selection

  The modes H, A or C are selected either via the process communication keyboard (binary inputs 32, 33 and 34) or via the unassigned binary inputs 29, 30 and 31. The unassigned inputs have a higher priority than the inputs for the process communication keyboard. The latter are only effective if all three unassigned inputs have been reset.

- Parameterization

  The module number is parameterized via input 45.
  The outputs 33 to 36 and 44 to 46 of the K–type controller 6DS1 401–8BA are insignificant. Outputs 21 to 28 (configuration jumper status) and outputs 9 to 16 (controller parameters KP, TN and parameters of the adjusters K1 to K6) are updated either during initialization or after a transition to manual mode. Initialization is the first–time execution of a block after the associated XB block, which has been switched off, is switched back on.

- System messages

  S 305 : No acknowledgement from module (incorrect address, incorrect jumper settings or defective)
  S 313 : Multiple addressing (incorrect jumper setting)
  S 321 : Module malfunction or repeated read error

- Cycle

  250 ms is the minimum processing cycle of the RK block permitted for communication with the module.

- Limit value generation

  The limits .OG and .UG of the effective system deviation .WXW of the effective controlled variable .WX are monitored. The monitoring value is selected by parameterizing input 25 (.GWU). The result of the limit value check is fed to the outputs 45 and 46 (.GO and .GU respectively).

  - .STU = 0
    - .GWU = 0
      The effective system deviation .WXW is used for limit value monitoring. A hysteresis of 1% (.OG – .UG) is considered when monitoring the limits .OG and .UG.
    - .GWU = 1
      The effective controlled variable .WX is used for limit value monitoring. A hysteresis parameterized via input 21 (.HYWX) is considered when monitoring the limits .OG and .UG.

  - .STU = 1
    - Monitoring is suppressed and the outputs 45 and 46 (.GO, .GU) are set to “0”.

- Interlocking monitoring

The fault alarm "Interlocking monitoring function has responded" (S 31) is not used for the error number generation. S 31 is mapped at output 43 and displayed in the loop display during the monitoring time specified via input 24 (.UZT). If UZT = 0, interlocking is displayed for the duration of one XB cycle.

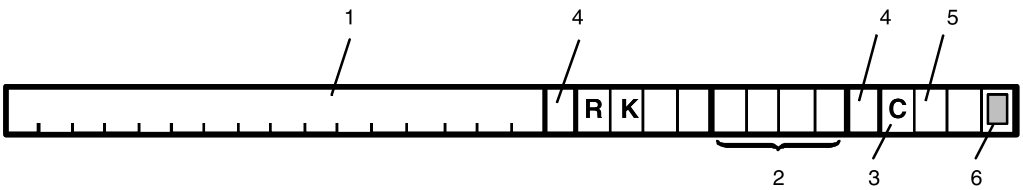
- Jumper assignments

Mode	Mode indicator	SPC	XDC	VR { EBR 1 = 1 EBR 2 = 1 EBR 3 = 1 }	XD / XDE	WF	Δ	Measuring span of effective (W) – and central unit – (C) values
Hand	H = 1	X	X	X	X / X	X	Δ Y = Y – YW	YHUG to YHOG
Automatic	A = 1	X X	X X	0 1	0 / 0 0 / 0	0 0	Δ W = W – WW Δ V = W – VW (W = V)	VWUG to VWOG
Compute	C = 1	0	X	X	X / X	0	Δ Y = CE – WY	YCU to YCD
	C = 1 A = 1	1 1 1	0 0 1	0 1 X	X / X X / X X / X	0 0 0	Δ W = CE – WW Δ V = CE – VW Δ XD = CE – WXW	

1 = jumper inserted
0 = jumper not inserted
X = not significant

Fig. 9.171 Jumper assignment for increment generation

- Normalized representation in a group display



1 Process–related name of the RK block, as in loop display
2 Number of the RK block
3 Mode indicator
  C compute
  H manual mode
  A automatic mode
4 Separating blank
5 Command inhibit (interlocking monitoring function)
6 Circuit alarm field: grouping of the fault alarm signals

Fig. 9.172 RK block; normalized representation in the group display

The block is represented by 30 characters in a specific location of a group display. This requires the following parameterization of input 44 (group display: no./location no.):

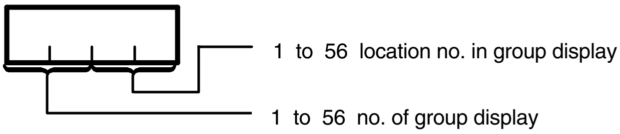


Fig. 9.173 Closed–loop control; parameterization of input 44

Set input 44 (NRPL) to “0” if the normalized representation of a block in a group display is to be suppressed.

- Operator input using the process communication keyboard

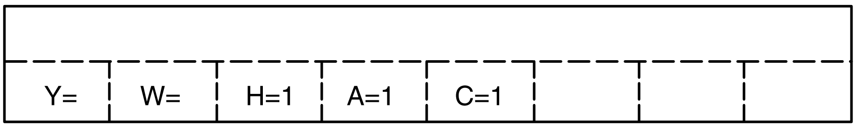
  Five keys (Y =, W =, H = 1, A = 1 and C = 1 or Y =, V =, H = 1, A = 1 and C = 1) will be assigned after the loop display has been selected and the “Operator input” (BE) key depressed.

  After the (Y =) and (W =) or (V =) keys have been depressed, a sequence of numbers may be entered and terminated by pressing the execute key (◈).

  The “More” (↑) or “Less” (↓) keys may be pressed to continue without figures previously having been entered (setpoint W, manipulated variable Y or ratio V). The execute key (◈), normally required for termination, need not be pressed in this case.

  The change is approximately 1% of the measuring span per processing cycle. If a greater change is required, the appropriate “More” (↑) or Less (↓) key is to be pressed together with the “High–Speed” (~) key. The change is then approximately 10% of the measuring span per processing cycle. Key inputs using A = 1, C = 1 and H = 1 must be directly terminated by the execute key (◈).

  Setpoint **V = ratio**



A Automatic mode
C Compute (mode)
H Manual mode
W Setpoint
Y Manipulated variable

Fig. 9.174 RK block; automatic labeling of the process communication keyboard

If an absolute value W is used as the setpoint, input 51 is parameterized with V* (K–type controller only) and input 48 with W. The process communication keyboard then shows “W =”. For ratio control, input 51 is parameterized with V and input 48 with W*. The process communication keyboard then shows “V =”.

Setpoint **W** = **absolute value** (system deviation generation: three component control, corrected control variable etc.)

Y=	V=	H=1	A=1	C=1			

A Automatic mode
C Compute (mode)
H Manual mode
V Ratio
Y Manipulated variable

Fig. 9.175 RK block; automatic labeling of the process communication keyboard

- Normalized representation in the loop display

The loop display contains static and dynamic data for the operator.

Legend to Fig. 9.176:

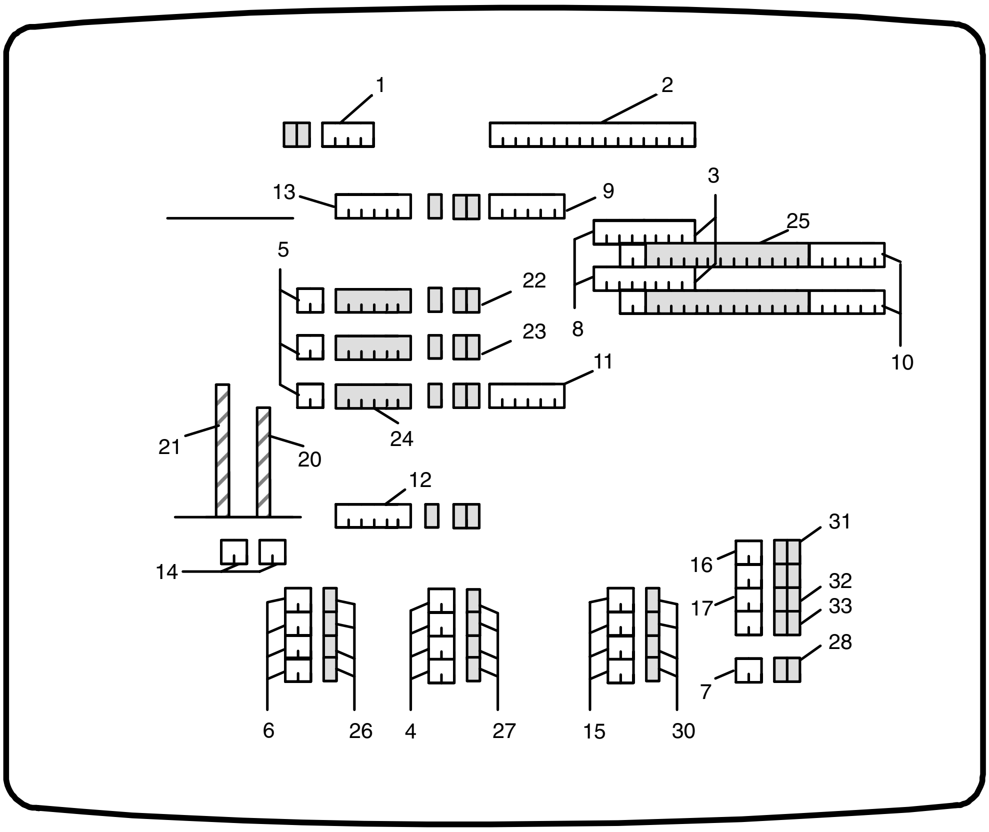
Static data

1 Mnemonic name and number of RK block
2 Process–related name of RK block
3 Process–related names of adjacent analog values
4 Process–related names of configuration jumpers (WF, WE, SP and XD) [1)]
5 Mnemonic names of the effective controlled variable (W, X, Y and V) [2)] [1)]
6 Mnemonic name of the effective mode (B, C, A, H)
7 Mnemonic names of the error messages (S)
8 Process–related quantities of adjacent analog values
9 Physical unit of actual value and setpoint
10 Physical unit of the adjacent analog values
11 Unit of manipulated variables
12 Lower range limit of actual value and setpoint
13 Upper range limit of actual value and setpoint
14 Mnemonic name of the bars (X, W) [1)]
15 Process–related mnemonic name of adjacent digital values
16 Mnemonic name for limit value violation (WO, WU)
17 Mnemonic name for command inhibit

[1)] Pre–defined mnemonic names
[2)] Display in ratio control mode only
[3)] No significance for K–type controllers

Dynamic data

20 Effective setpoint W as bar (analog display)
21 Effective actual value X as bar (analog display)
22 Effective setpoint W (digital display)
23 Effective actual value X (digital display)
24 Effective manipulated value Y (digital display)
25 Digital display of adjacent analog values
26 Indication of effective modes of B, C, A and H:
“0” the associated mode is switched off
“1” the associated mode is switched on
27 Configuration jumper setting (WF, WE, SP, XD
“1” means that the jumper has been inserted.
28 Error messages (sorted by priorities)
S 80 Module fault
S 4 Module failure
S 25 Failure in power section [3)]
S 24 Motor temperature too high [3)]
S 9 Analog signal monitoring has responded
S 10 Digital signal monitoring has responded [3)]
S 31 Interlocking monitoring function has responded
S 6 Control station defective
29 Ratio V (digital display) [2)]
30 States of adjacent digital values
31 Alarm status (“1” = limit value has been violated)
32 Command inhibit (“1” = interlocking monitoring function has responded)
33 Status environment fault (“1” = fault has occurred)




```
01. 01. 84/ 00. 27. 28.


                 RK     2          *TECHNOLOG.NAME


    __________       100.00        *EHTX*
                                           TA11TA12
                                             A1 0.0000      *EHT1*
                                           TA22TA22
                  W  50.0000                 A2 0.0000      *EHT2*

                  X  55.0000

                  Y  33.0000       %




    __________       0.0000
                                                      WO 0
            X  W                                      WU 0
                 BR 0       WF 0          B1 0        B   0
                 C  0       WE 0          B2 0        S   0
                 A  0       SP 0          B3 0
                 H  0       XD 0          B4 0        S   0



      BR
RK,1;
```

Fig. 9.176 RK block, loop display

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Analog value 1	X1	1	AA
Analog value 2	X2	2	AA
Analog value 3	X3	3	AA
Effective manipulated variable	WY	4	AA
Effective setpoint	WW	5	AA
Effective system deviation	WXW	6	AA
Effective controlled variable Xw	WX	7	AA
Effective ratio Vw	WV	8	AA
KP	KP	9	AA
Reset time	TN	10	AA
Adjuster constant K1/TV	K1TV	11	AA
Adjuster constant K2/K1	K2K1	12	AA
Adjuster constant K3/K2	K3K2	13	AA
Adjuster constant K4/K3	K4K3	14	AA
Adjuster constant K5/K4	K5K4	15	AA
Adjuster constant K6/K5	K6K5	16	AA
Operation mode : Manual mode (RBG)	HRBG	17	AB
" : Automatic mode (RBG)	ARBG	18	AB
" : Compute mode (RBG)	CRBG	19	AB
Controller block ready	BRBG	20	AB
Configuration jumper set point control	SPC	21	AB
Xd specification from central unit	XDC	22	AB
External system deviation	XDE	23	AB
External setpoint W	WE	24	AB
Setpoint W from front panel	WF	25	AB
Configuration jumpers	EBR1	26	AB
"	EBR2	27	AB
"	EBR3	28	AB
Controller inhibit OPEN	RSPO	29	AB
" CLOSE	RSPS	30	AB
Protective command OPEN	SUO	31	AB
" CLOSE	SUS	32	AB
Torque switch OPEN	DEA	33	AB 6)
" CLOSE	DEZ	34	AB 7)
Limit switch OPEN	WEA	35	AB 5)
" CLOSE	WEZ	36	AB 5)
Module malfunction (S1 v S2 v S3)	S4	37	AB
Control station malfunction	S6	38	AB
Common alarm S 91/92/93/94/95	S9	39	AB
Binary signal monitoring function has responded	S10	40	AB 5)
Motor temperature too high	S24	41	AB 5)
Power section malfunction	S25	42	AB 5)
Interlocking monitoring function has responded	S31	43	AB
Module fault, read/cycle error	S80	44	AB
Upper limit violation	GO	45	AB
Lower limit violation	GU	46	AB
Module fault QVZ or EANK	BGF	47	AB

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Computer presetting YC, WC, VC, XDC	CE	1	EA
Correction input YN	YN	2	EA
Upper limit Y manual	YHOG	3	EA
Y manual	Y	4	EAV 1) 3) 4)
Lower limit Y manual	YHUG	5	EA
Upper limit WH or VH	VWOG	6	EA
WH or VH	W	7	EAV 1) 3) 4)
Lower limit WG or VH	VWUG	8	EA
Upper range limit X1	X1E	9	EA
Lower range limit X1	X1A	10	EA
Upper range limit X2	X2E	11	EA
Lower range limit X2	X2A	12	EA
Upper range limit X3	X3E	13	EA
Lower range limit X3	X3A	14	EA
Upper range limit (WX, WW, WXW)	WXE	15	EA
Lower range limit (WX, WW, WXW)	WXA	16	EA
Adjacent analog value 1	AW1	17	EA 2)
Adjacent analog value 2	AW2	18	EA 2)
Upper limit value for WX/WXW	OG	19	EA
Lower limit value for WX/WXW	UG	20	EA
Hysteresis for XW lim. val. monitoring funct.	HYWX	21	EA
Upper Y–DDC limit	YCO	22	EA
Lower Y–DDC limit	YCU	23	EA
Monitoring time (s) for S 31 display	UZT	24	EA
Limit value switchover WX/WXW/(1/0)	GWU	25	EB
Interference suppression GO/GU	STU	26	EB
Status output suppression	US	27	EB
S display external environment fault	UMGF	28	EB
Manual mode from central unit	HBA	29	EB
Automatic mode from central unit	ABA	30	EB
Compute mode from central unit	CBA	31	EB
Manual (PBT)	H	32	EBV 1) 3) 4)
Automatic (PBT)	A	33	EBV 1) 3) 4)
Compute (PBT)	C	34	EBV 1) 3)
Y correction condition	YNF	35	EB
Controller inhibit OPEN	RSOF	36	EB
Controller inhibit CLOSE	RSSL	37	EB
Open SKA protection	SUOF	38	EB
Close SKZ protection	SUSL	39	EB
Adjacent binary value 1	BW1	40	EB
Adjacent binary value 2	BW2	41	EB
Adjacent binary value 3	BW3	42	EB
Adjacent binary value 4	BW4	43	EB
Group display: no./location no.	NRPL	44	ID
Module number	BGNR	45	I
Modus fault display 0 = W / 1 = F / 2 = A	WAF	46	I

Data structure

Meaning		Mnemonic name	Input/Output No.	Type
Character string for	”Y”	TY	47	S2
Character string for	”W” ”W*”	TW	48	S2
Character string for	”WF”	TWF	49	S2
Character string for	”W ”	TWE	50	S2
Character string for	”V*” ”V”	TV	51	S2
Character string for	”X”	TX	52	S2
Character string for	”BR”	TBR	53	S2
Character string for	”H”	TH	54	S2
Character string for	”A”	TA	55	S2
Character string for	”C”	TC	56	S2
Character string for	”SP”	TSP	57	S2
Character string for	”XD”	TXD	58	S2
Character string for	”A1”	TAW1	59	S2
Character string for	“A2”	TAW2	60	S2
Character string for	“B1”	TBW1	61	S2
Character string for	”B2”	TBW2	62	S2
Character string for	“B3”	TBW3	63	S2
Character string for	”B4”	TBW4	64	S2
Character string for .FNR	”S”	TS	65	S2
Character string for	”WO”	TGO	66	S2
Character string for	”WU”	TGU	67	S2
Character string for	”B ”	TS31	68	S2
Character string for .UMGF	”S”	TUMG	69	S2
Character string for Y	”%”	EHTY	70	S2
Character string for	” ”	TDUM	71	S2
Character string for X/W	”*EHTX*”	EHTX	72	S6
Character string for AW 1	”TA11”	TA11	73	S4
Character string for AW 1	”TA12”	TA12	74	S4
Character string for AW 1	”*EHT1*”	EHT1	75	S6
Character string for AW 2	”TA21”	TA21	76	S4
Character string for AW 2	”TA22”	TA22	77	S4
Character string for AW 2	”*EHT2*”	EHT2	78	S6
Process–related name of string		AT	79	S16

1) Input is not interconnectable
2) Operator’s configuration input for adjacent analog value which is to appear in the loop display
3) Input for operator communication keys of the process communication keyboard
4) Input is non–interacting
5) No significance for K–type controllers
6) NE for K–type controller (correction ON)
7) Control command for K–type controller disturbed

- Block list

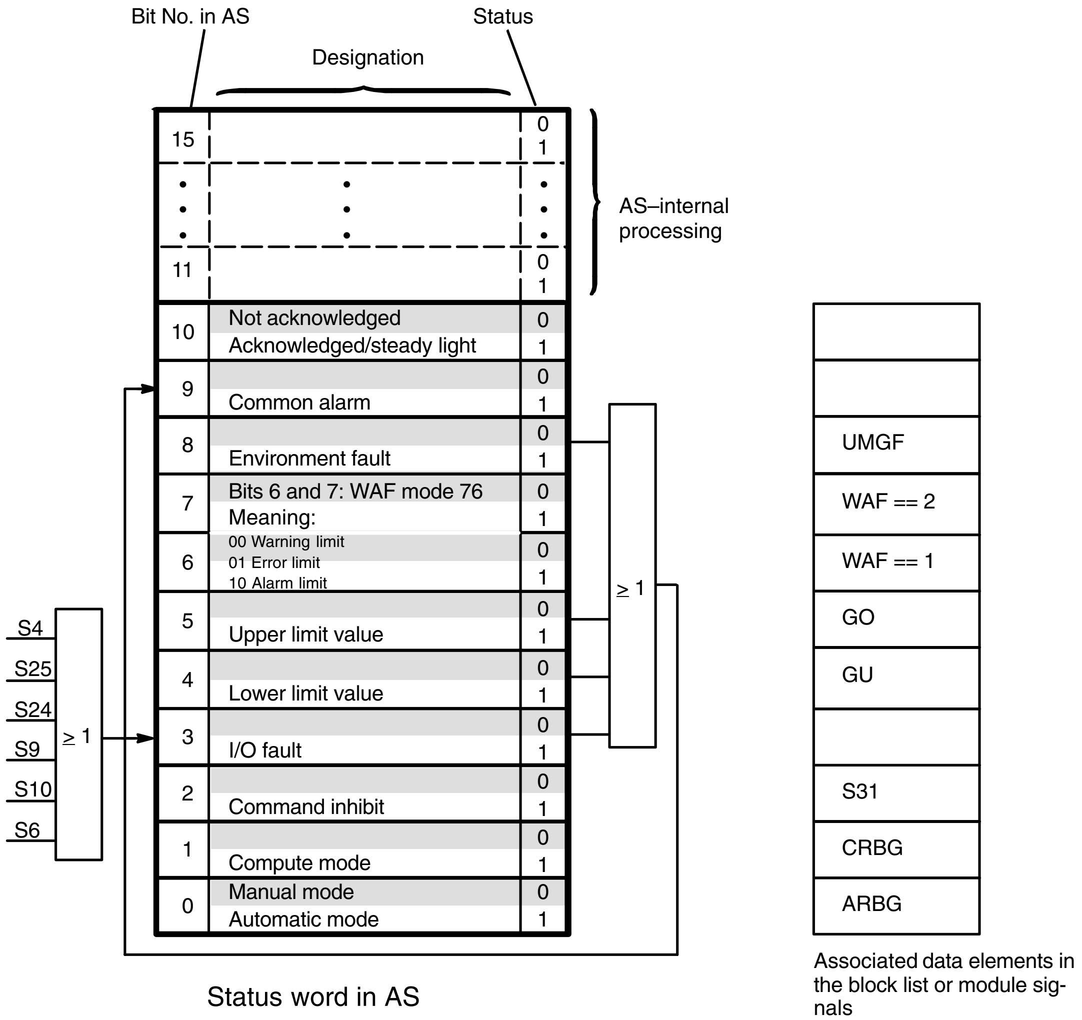
RK 11

1	AA	X1	0.0000	#			79
2	AA	X2	0.0000	#			80
3	AA	X3	0.0000	#			81
4	AA	WY	0.0000	#			82
5	AA	WW	0.0000	#			83
6	AA	WXW	0.0000	#			84
7	AA	WX	0.0000	#			85
8	AA	WV	0.0000	#			86
9	AA	KP	0.0000	#			87
10	AA	TN	0.0000	#			88
11	AA	K1TV	0.0000	#			89
12	AA	K2K1	0.0000	#			90
13	AA	K3K2	0.0000	#			91
14	AA	K4K3	0.0000	#			92
15	AA	K5K4	0.0000	#			93
16	AA	K6K5	0.0000	#			94
17	AB	HRBG	0	#			95
18	AB	ARBG	0	#			96
19	AB	CRBG	0	#			97
20	AB	BRBG	0	#			98
21	AB	SPC	0	#			99
22	AB	XDC	0	#			100
23	AB	XDE	0	#			101
24	AB	WE	0	#			102
25	AB	WF	0	#			103
26	AB	EBR1	0	#			104
27	AB	EBR2	0	#			105
28	AB	EBR3	0	#			106
29	AB	RSPO	0	#			107
30	AB	RSPS	0	#			108
31	AB	SUO	0	#			109
32	AB	SUS	0	#			110
33	AB	DEA	0	#			111
34	AB	DEZ	0	#			112
35	AB	WEA	0	#			113
36	AB	WEZ	0	#			114
37	AB	S4	0	#			115
38	AB	S6	0	#			116
39	AB	S9	0	#			117
40	AB	S10	0	#			118
41	AB	S24	0	#			119
42	AB	S25	0	#			120
43	AB	S31	0	#			121
44	AB	S80	0	#			122
45	AB	GO	0	#			123
46	AB	GU	0	#			124
47	AB	BGF	0	#			125
1	EA	CE	0.0000		P		1
2	EA	YN	0.0000		P		2
3	EA	YHOG	105.00		P		3
4	EAV	Y	0.0000	#		B	4
5	EA	YHUG	-5.0000		P		5
6	EA	VWOG	100.00		P		6
7	EAV	W	0.0000	#		B	7
8	EA	VWUG	0.0000		P		8
9	EA	X1E	100.00		P		9
10	EA	X1A	0.0000		P		10
11	EA	X2E	100.00		P		11
12	EA	X2A	0.0000		P		12
13	EA	X3E	100.00		P		13
14	EA	X3A	0.0000		P		14
15	EA	WXE	100.00		P		15

Block list (continued)

16	EA	WXA	0.0000		P			16
17	EA	AW1	0.0000		P			17
18	EA	AW2	0.0000		P			18
19	EA	OG	100.00		P			19
20	EA	UG	0.0000		P			20
21	EA	HYWX	0.0000		P			21
22	EA	YCO	100.00		P			22
23	EA	YCU	0.0000		P			23
24	EA	UZT	10.000		P			24
25	EB	GWU	0		P			25
26	EB	STU	0		P			26
27	EB	US	0		P			27
28	EB	UMGF	0		P			28
29	EB	HBA	0		P			29
30	EB	ABA	0		P			30
31	EB	CBA	0		P			31
32	EBV	H	0	#			B	32
33	EBV	A	0	#			B	33
34	EBV	C	0	#			B	34
35	EB	YNF	0		P			35
36	EB	RSOF	0		P			36
37	EB	RSSL	0		P			37
38	EB	SUOF	0		P			38
39	EB	SUSL	0		P			39
40	EB	BW1	0		P			40
41	EB	BW2	0		P			41
42	EB	BW3	0		P			42
43	EB	BW4	0		P			43
44	ID	NRPL	0				C	44
45	I	BGNR	0				C	45
46	I	WAF	0					46
47	S2	TY	Y					47
48	S2	TW	W				C	48
49	S2	TWF	WF					49
50	S2	TWE	WE					50
51	S2	TV	V*				C	51
52	S2	TX	X					52
53	S2	TBR	BR					53
54	S2	TH	H					54
55	S2	TA	A					55
56	S2	TC	C					56
57	S2	TSP	SP					57
58	S2	TXD	XD					58
59	S2	TAW1	A1					59
60	S2	TAW1	A2					60
61	S2	TBW1	B1					61
62	S2	TBW2	B2					62
63	S2	TBW3	B3					63
64	S2	TBW4	B4					64
65	S2	TS	S					65
66	S2	TGO	WO					66
67	S2	TGU	WU					67
68	S2	TS31	B					68
69	S2	TUMG	S					69
70	S2	EHTY	%					70
71	S2	TDUM						71
72	S	EHTX	*EHTX*			6		72
73	S4	TA11	TA11					73
74	S4	TA12	TA12					74
75	S	EHT1	*EHT1*			6		75
76	S4	TA21	TA22					76
77	S4	TA22	TA22					77
78	S	EHT2	*EHT2*			6		78
79	S16	AT	*TECHNOLOG.NAME*			16		142

- Status word



ARBG	Automatic mode (RGB)
CRBG	Compute mode (RBG)
UMGF	Environment fault
GO	Upper limit value
GU	Lower limit value
S31	Interlocking monitoring has responded
WAF == 1	Error limit in WAF mode
WAF == 2	Warning limit in WAF mode

Fig. 9.177 Status word for the RK block

RN

Closed–loop controller block

Application

The block is used as a PID controller block for the following standard closed–loop circuits:

– Fixed setpoint control
– Cascade control (single/multiple cascades)
– Ratio control
– Synchro control

Apart from the controller function, the closed–loop control block also provides the following processing functions:

– Limit value monitoring of X or XW (selectable)
– Feedforward control of X or XW (X–W) to error limit
– Monitoring of X for warning and alarm limits
– Direct feedforward control of XD (XD = W – X)
– Processing of externally generated system deviation XDE
– Dead band (threshold) in system deviation branch XD or XW
– Parameter control for KP, TN, TV, V (interconnectable inputs)
– The D section input can be configured with X or XW or any other variable (e.g. influencing quantity Z)
– W correction
– Y correction

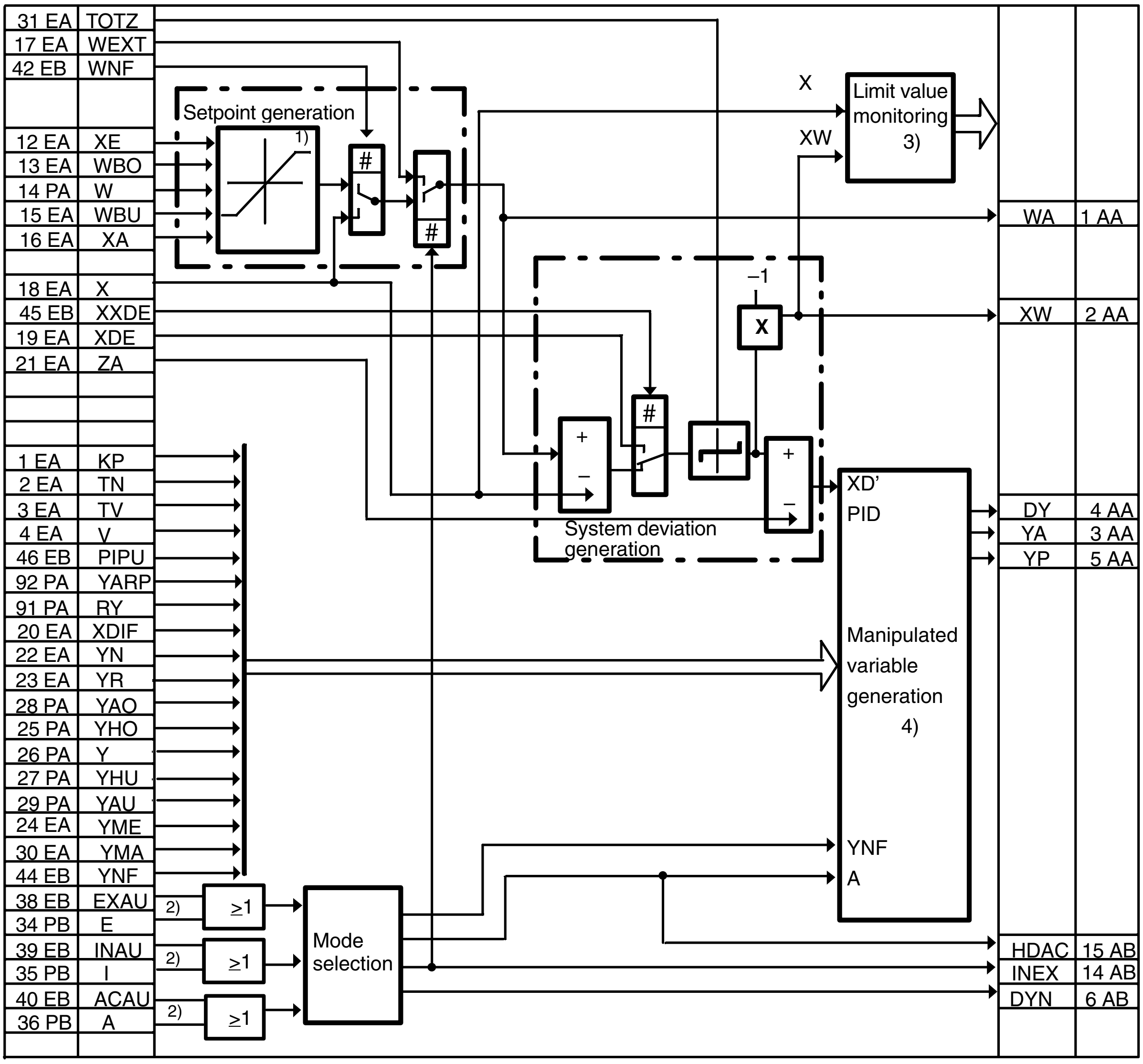
Method of Operation

- Setpoint generation (Fig. 9.178)

  The internal setpoint (via PBT or OS) is limited to the range (WBU, WBO) (depends on GB.ORPA.263, cf. the section “Monitoring operator input limits”).

  The internal setpoint (W) is corrected to the actual value (X) in setpoint correction mode (WNF = 1).

  The “external” and “internal” (E, I) communication keys are used to select which setpoint (W or WEXT) is to be effective. This effective setpoint, which is delimited to the measuring range XE/XA in all modes, is provided at output WA.



1) Operator input only (PBT/OS)
2) PBT input is only effective if all associated inputs are inactive
3) see Fig. 9.179
4) see Fig. 9.181

Fig. 9.178 RN closed–loop controller block, logic diagram

- Limit value generation (Fig. 9.179)

  Tolerance, warning and alarm limits can be monitored, a limit value generation always contains a hysteresis. Two modes exist for tolerance limit monitoring:

  GWU = 0: The system deviation XW (X – W) is monitored.
  The hysteresis is 1% (OF – UF).
  The hysteresis is only determined in the initialization run.

  GWU = 1: The actual value X is monitored.
  The hysteresis can be selected via input HY.

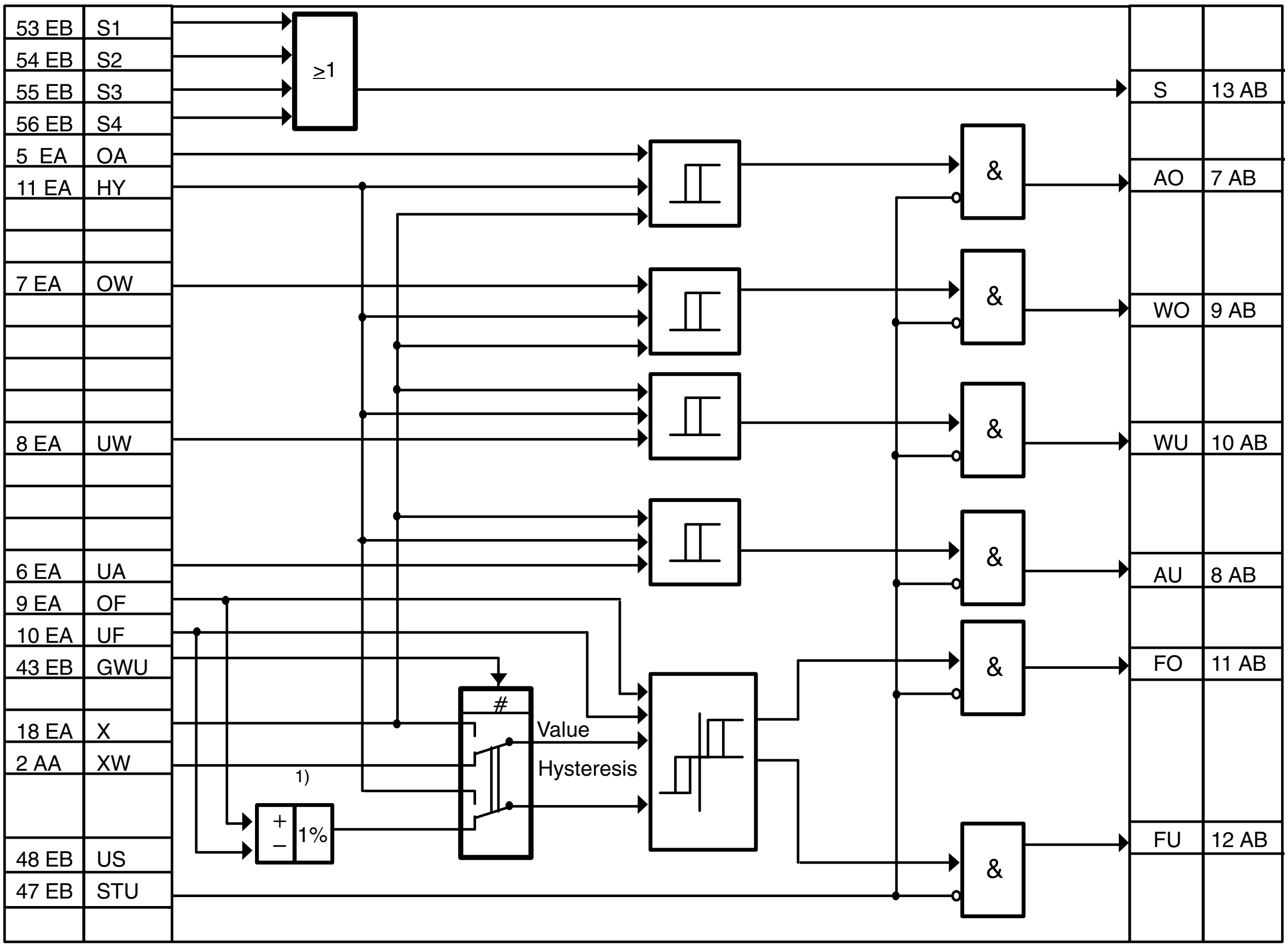
  The warning and alarm limits of the actual value are always monitored with the selectable hysteresis HY. The monitoring results are provided at outputs FU, FO, WU, WO, AU, AO.

  Set STU = 1 if, for example, during start–up, all six alarm outputs are to be suppressed. The alarm outputs and the associated status data are set to “0”.

☞ Internal hysteresis for monitoring XW (with GWU = 0B):
YHI = 1 % von (OF – UF)
Prior to release F03.03 and A03.02, the hysteresis for monitoring XW was only calculated in the initialization run, i.e. after having switched on/off the upstream XB block.
From release F01.00 and A03.00 onwards, the hysteresis of 1% deriving from the parameterization of OF or UF is recalculated in RN.CHEC and stored after YHI.

Legend to Fig. 9.178

A	Automatic mode via PBT
ACAU	Automatic mode
DYN	Output for dynamic correction
E	External setpoint (mode)
EXAU	External setpoint from PBT
H	Manual mode via PBT
HDAC	Manual/automatic mode
HDAU	Manual mode
I	Internal setpoint from PBT
INAU	Internal setpoint (mode)
INEX	Internal/external
KP	Proportional gain
PIPU	Changeover PI → P
RW, RY	Time derivative limit of W or Y respectively
TN	Reset time
TOTZ	Dead band of actuating increment
TV	Derivate action time
V	D part gain
WA	Effective setpoint
WEXT	External setpoint
W	Internal setpoint (PBT)
WNF	Setpoint correction
WBO	Upper control limit for W
WBU	Lower control limit for W
X	Actual value of controlled variable
XA	Lower range limit
XW	System deviation
XDE	External system deviation
XDIF	D part input
XE	Upper range limit
XXDE	Changeover to XDE (1 = XDE)
YA	Manipulated variable
YAO	Upper limit of manipulated variable in automatic mode
YAU	Lower limit of manipulated variabloe in automatic mode
YARP	Operat. point for manipulated variable (I = OFF, PIPU = 1)
Y	Manipulated variable in manual operation (PBT)
YHO	Upper limit of manipulated variable in manual mode
YHU	Lower limit of manipulated variable in manual mode
YMA	Lower range limit of manipulated variable
YME	Upper range limit of manipulated variable
YN	Corrective manipulated variable
YNF	Correction of manipulated variable
YP	Manipulated physical quantity
YR	Actuator position
DY	Actuating increment
ZA	Noise quantity



1) Initialization only

AO	Upper alarm signal
AU	Lower alarm signal
FO	Upper fault signal
FU	Lower fault signal
GWU	Limit value changeover
HY	Hysteresis for warning and alarm limits (tolerance limit)
OA	Upper alarm limit value
OF	Upper error limit value
OW	Upper warning limit value
S	Common fault 1 – 4
S1	External fault 1
S2	External fault 2
S3	External fault 3
S4	External fault 4
STU	Interference suppression
UA	Lower alarm limit value
UF	Lower error limit value
US	Status suppression
UW	Lower warning limit value
WO	Upper warning signal
WU	Lower warning signal
X	Controlled variable
XW	System deviation

Fig. 9.179 Limit value generation

- Generation of system deviation (Fig. 9.180)

  The system deviation is derived from the effective setpoint (WA) and the actual value (X). An externally generated system deviation can be fed to input 19 (XDE) if input 45 (XXDE = 1) has been parameterized. After a dead band (TOTZ) has been passed, an influencing quantity (ZA) may be added to the system deviation (XD).
  This effective system deviation (XD' = XD + ZA) is processed in the PID algorithm. The deviation (= –XD) is present at output 2 (XW).

- Generation of manipulated variable (Fig. 9.181)

  The following algorithm is used for generating the manipulated variable:

$$Y(s) = XD'(s) \cdot KP\left(1 + \frac{1}{TN} \cdot \frac{1}{s}\right) - XDIF(s) \cdot KP\frac{TVs}{1 + \frac{TV}{V}s}$$

If ZA = 0 and XDIF = XW, this equation corresponds to the transfer function of a PID controller:

$$\frac{Y(s)}{XD'(s)} = KP\left(1 + \frac{1}{TN} \cdot \frac{1}{s} + \frac{TVs}{1 + \frac{TV}{V}s}\right)$$

KP	Proportional coefficient
s	Laplace operator
TN	Integral action time
TV	Derivative action time
TV/V	Time lag constant
V	D part gain
XD‘ (s)	Effective deviation (XD + ZA)
Y(s)	Manipulated variable

The D part is an inverting and delaying derivative unit. .XW, X or an influencing quantity Z can be fed to the input (XDIF). Changing the sign of the parameters TV or V reverses the effective direction of the XDIF differentiating input. Since the quotient of TV and V is a time constant, the signs of both parameters must be either positive or negative.

The controller parameters KP, TN, TV, V are interconnectable, i.e. the parameters may be modified by a parameter controller.

If a negative value has been used for parameterizing KP, the controller can be reversed (i.e. increasing X causes Y to increase).

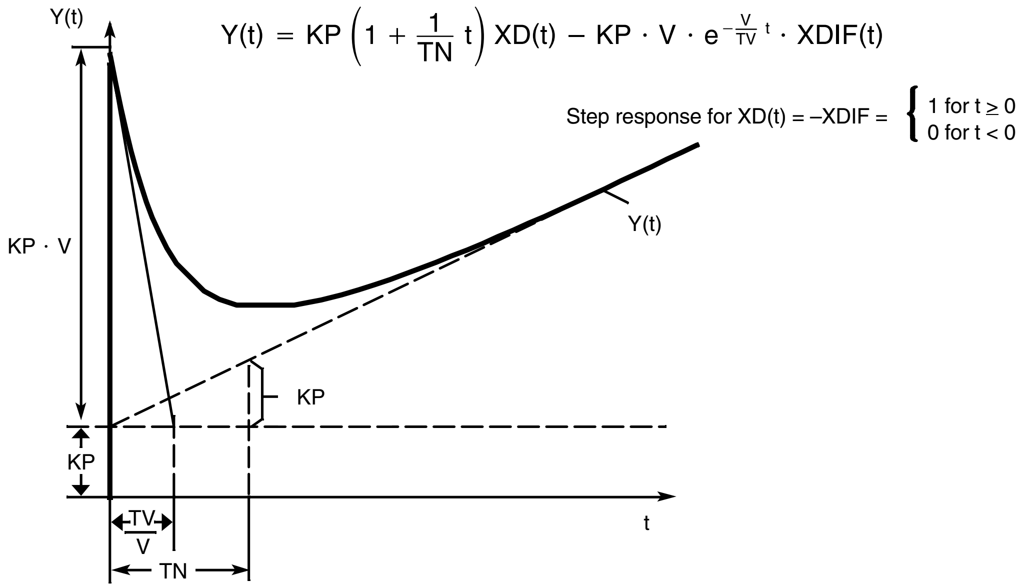
Two different controller responses can be selected for manual/automatic mode transition. The difference only becomes obvious if a system deviation exists when the controller is switched over. The switchover response is selected by parameterizing input no. 94: “PHA”.

PHA = 0: Only the integral–action component of the controller is effective for the manipulated variable. The manipulated variable approximates the corrected state according to the parameterization of TN.

PHA = 1: Proportional and integral–action component of the controller are effective for the manipulated variable. A setpoint step–change of the current system deviation amount results, without derivative–action component, however.

Input 46 (PIPU) can be used for a bumpless changeover from PI(D) to P(D) response (1 = without I).

The YARP parameter guides the current operating point of the manipulated variable. In PI/PID controller operation, this value is specified by the algorithm; parameterization of or writing to this value remains ineffective. YARP remains unchanged when changing to P/PD operation (PIPU = 1), i.e. bumpless changeover takes place. Any operating point for the manipulated variable may then be defined via YARP.

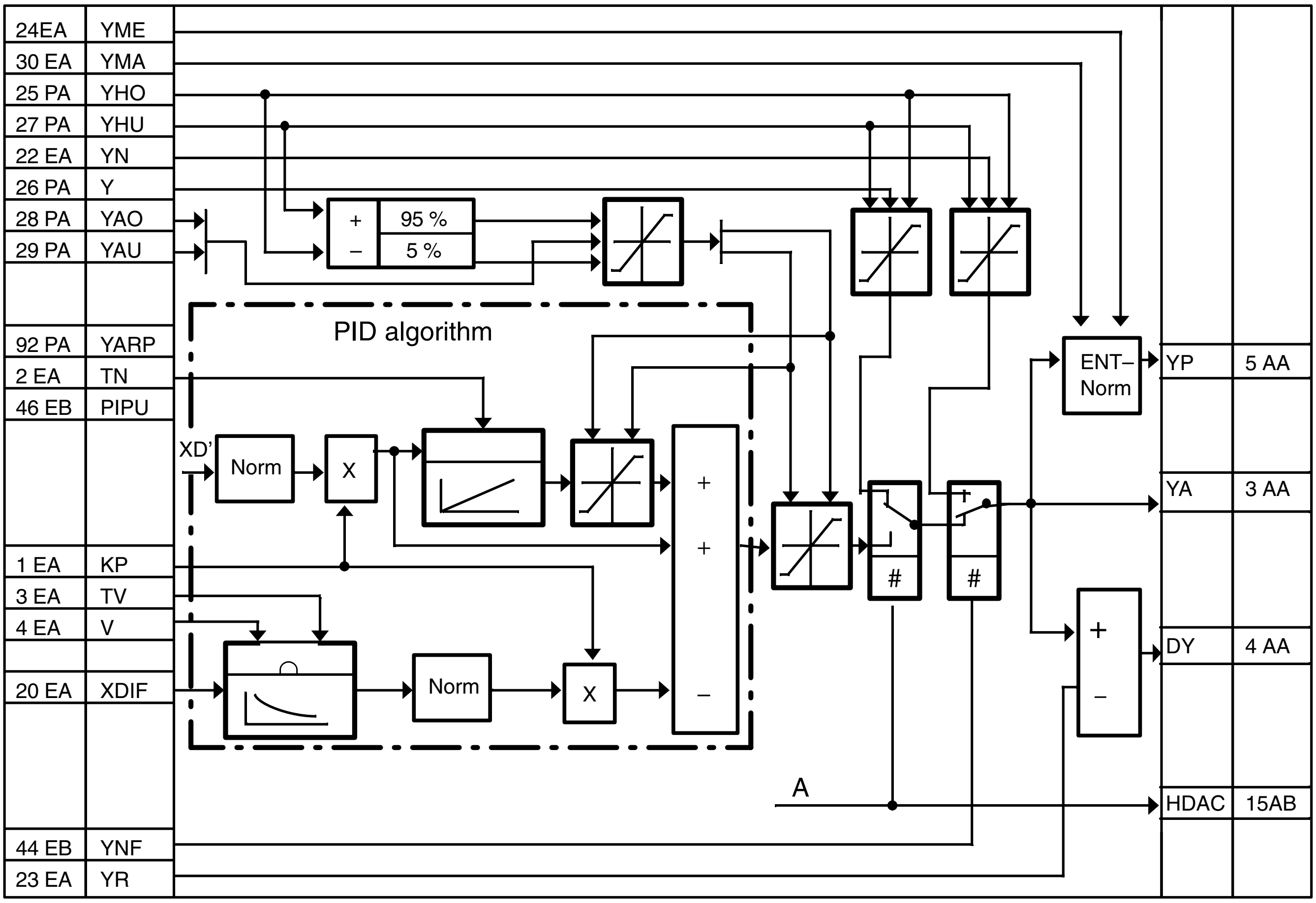


KP Proportional coefficient
t Time
TN Integral action time
TV Derivative action time
V D part gain
XDo System deviation (unit step)
XDIF Differentiating input (controlled variable X connected)
Y Manipulated variable

Fig. 9.180 RN block; step response

- Modes
  - Automatic mode
    In automatic mode, the output of the whole algorithm and the I part are limited to the integrator limits computed during initialization.
  - Manual mode
    In manual mode, the manual value of the manipulated variable, delimited by YHU and YHO, is fed to the controller output (Y) (depends on GB.ORPA.263, cf. the section “Monitoring of operator input limits”).
  - Correction mode
    In correction mode (YNF = 1), the controller output is corrected to the value of YN. The values YHU and YHO are always effective for delimiting the output. Y correction has priority over manual/automatic mode.
- Manipulated variable outputs

  The actuating increment (DY) is required when controller modules are used. DY is the difference between the manipulated variable (Y) and the actuator position. the manipulated variable is present as a physical quantity at output 5 (YP) if the block is used as a master controller. The range is then defined by the scan specified by parameters 30 (YMA) and 24 (YME). All other manipulated variables are related to the normalized range of 0 to 100%.



A	Mode selection
KP	Proportional coefficient
PIPU	Integrator selector (0 = with, 1 = without integration)
TN	Integrator action time (s)
TV	Derivative action time
V	D part gain
XD'	Effective system deviation
XDIF	D part input
YA	Manipulated variable
YAO	Upper limit of manipulated variable in automatic mode
YARP	Operating point of manipulated variable (I OFF by PIPU = 1)
YAU	Lower limit of manipulated variable in automatic mode
Y	Manipulated variable in manual operation
YHO	Upper limit of manipulated variable in manual mode
YHU	Lower limit of manipulated variable in manual mode
YMA	Lower range limit of manipulated variable
YME	Upper range limitr of manipulated variable
YN	Corrective manipulated variable
YNF	Correction of manipulated variable
YP	Manipulated variable as physical quantity
YR	Actuator position
DY	Actuating increment

Fig. 9.181 Generation of the manipulated variable

- Mode selection (Fig. 9.178)

  Mode flags are set and the outputs A (automatic mode), H (manual mode), E (external setpoint) or I (internal setpoint) are activated via the process communication keyboard (keys E, I, A, H). The following priorities apply: internal over external setpoint and manual over automatic mode. Changeover to manual and automatic mode as well as to internal setpoint definition is bumpless.
  For this purpose:

  – the internal setpoint W is corrected to the current setpoint in external and W–correction mode.
  – The manually manipulated variable YA is corrected to the current manipulated variable in automatic and Y–correction mode.
  – The old automatic values are corrected in manual and Y–correction mode.

  An impulse is present at output DYN for one cycle (TA) when the system changes from (I) to (E). This output can be used, for example, for bumpless changeover of a master controller.

  The control inputs E, I, A, H provide interconnectable inputs which can be used by STEP and TML programs or function blocks to select the modes. Automatic inputs have priority over the corresponding PBT inputs.

  Two different controller responses can be selected for manual/automatic mode transition. The difference only becomes obvious if a system deviation exists when the controller is switched over. The switchover response is selected by parameterizing input no. 94 “PHA” (former reserve input). PHA = 0 means that only the integral–action component is effective for the manipulated variable when the mode is changed. PHA = 1 means that the integral–action and proportional component are effective, and a setpoint step–change of the current system deviation amount results, without derivative–action step–change, however.

  The operating point is set by the YARP parameter in control mode without integral–action component. This value remains unchanged in manual mode. Switchover to automatic mode causes a step change of the manipulated variable which corresponds to the difference between the current manual value and the value in YARP. In order to avoid large step changes of the manipulated variable, the operating point follows a ramp function when changing from the current manual value to the YARP value. The ramp gradient RY (% per minuite) must be parameterized by a value different than 0.

- Status suppression

  Status transfer via the bus is suppressed if input US = 1. No mode status message is transferred to the OS (the last bus message resets the alarms).

- Initialization behavior

If an RN block is inserted in a currently running execution or if a higher–order XB block is switched off and back on, the RN block performs an initialization run:

– The RN block transmits a status message via the bus.

– The block is set to internal setpoint specification and manual mode.

– The manipulated variables YA and Y are corrected to YR (return data).

– The old derivative action is corrected such that bumpless switching on is facilitated.

– The hysteresis of 1% and the normalization factors are computed from YMA, YME, XA, XE, UF, OF and stored.

– The scan time of the block is computed and stored

– The effective limits of the manipulated variable in automatic mode (YIO and YIU) are computed from the parameterized values (YHO, YHU, YAO, YAU).

Initialization is not caused by an AS restart after re–loading or reset.

☞ Initialization is initiated if an activated XB block is installed before an RN block.

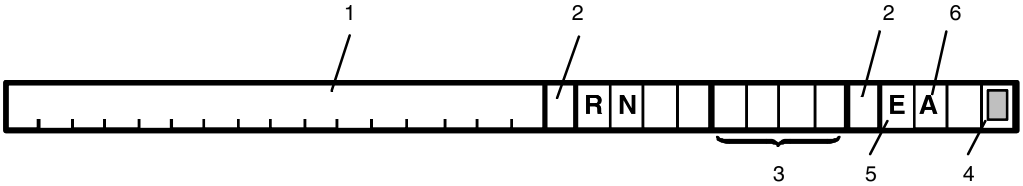
The delimiting values for the manipulated variable are computed from the values entered in the YHO, YHU, YAO and YAU parameters. Effective limit in automatic mode requires:

– The minimum of the two values
YAO and $\text{YHO} - \frac{\text{YHO} - \text{YHU}}{22}$ is used for the upper limit.

– The maximum of the two values
YAU and $\text{YHU} - \frac{\text{YHO} - \text{YHU}}{22}$ is used for the lower limit.

The limit values valid in automatic mode (without initialization) can be modified dynamically by writing to the internal parameters YIO and YIU (TML program or EAR interconnection in NEDA).
The relations
YHO = YIO + 5 % of (YIO – YIU)
YHU = YIU – 5 % of (YIO – YIU)
are used for computing the parameters YHO and YHU for a statically effective delimitation in automatic mode (YIO and YIU)
In manual mode, the limit values YHO and YHU are effective directly, i.e. the limit values valid in manual mode may differ from those valid in automatic mode.

- Normalized representation in a group display



1 Process–related name of the RN block, as in loop display
2 Separating blank
3 Number of the closed–loop controller block
4 Loop alarm field: summary of the alarm signals FO, FU, WO, WU, AO, AU or “External fault” as blinking alarms
5 E if “External setpoint” has been selected, I for “internal setpoint”
6 H if manual mode has been selected, A for “automatic mode”

Fig. 9.182 RN block; normalized representation in a group display

The block is represented by 30 characters in a specific location of a group display. Input 57 (group display: no./location no.) must then be parameterized as follows:
If nothing has been specified here, the normalized representation of the block in the area display will be issued according to the location number.

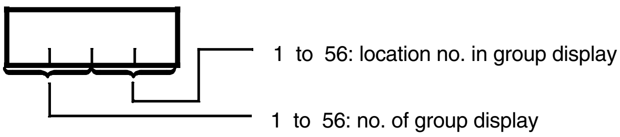


Fig. 9.183 RN block; parameterization of input 57

Set input 57 to “0” if the normalized representation of a block in a group display is to be suppressed.

- Normalized representation of the loop display

  The loop display contains static and dynamic data for the operator.

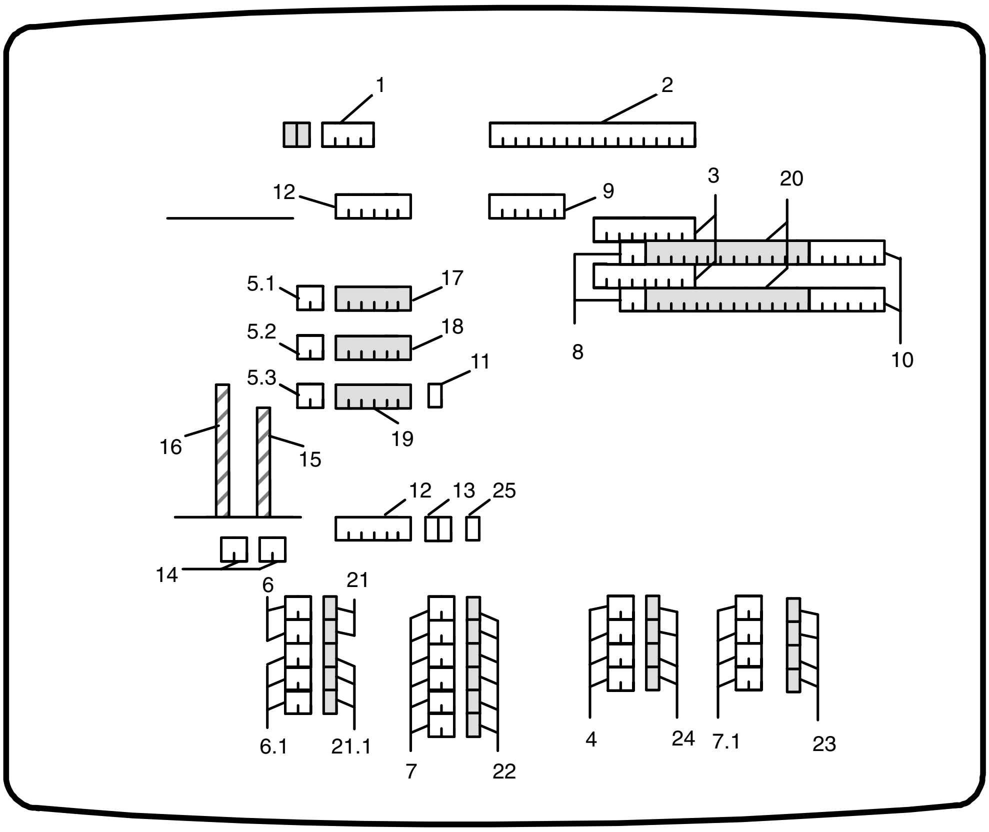
  Legend to Fig. 9.184 :

Static data:

1	Mnemonic name and number of RN block
2	Process–related name of RN block
3	Process–related names of adjacent analog values
4	Process–related names of adjacent digital values
5.1	Setpoint W
5.2	Measured value X
5.3	Manipulated value Y
6	Operating mode (E, I, A, H)
6.1	Display for correction mode
7	Alarm signals (FO, FU, WO, WU, AO, AU)
7.1	External faults (S1, S2, S3, S4)
8	Process–related quantities of adjacent analog values
9	Physical unit of actual value and setpoint
10	Physical unit of the adjacent analog values
11	Unit of manipulated variable
12	Measuring span of actual value and setpoint
13	Interference suppression STU
14	Mnemonic name of the bars

Dynamic data:

15	Setpoint W as bar (analog display)
16	Actual value X as bar (analog display)
17	Setpoint W (digital display)
18	Actual value X (digital display)
19	Manipulated value Y (digital display)
20	Display of adjacent analog values
21	Mode indication E, I, A, H: “0” indicates that the associated mode is switched off, “1” indicates that it is switched on
21.1	Correction mode status for Y and W correction (”0” = no correction mode, “Y” has higher priority than “W”)
22	Alarm states (”1” indicates a limit value violation)
23	State “External fault” (”1” indicates that a fault has occurred)
24	States of adjacent binary values
25	Status of interference suppression STU

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              RN     1          *TECHNOLOG. NAME


                  100.00        EHTW**
________                                TA11TA12
                                          A1 0.0000      EHT1**
                                        TA22TA22
               W  0.0000                  A2 0.0000      EHT2**

               X  0.0000

               Y  0.0000        %




________
                  0.0000 SU 0
        X  W

              E   0       AO 0          B1 0       S1  0
              I   1       WO 0          B2 0       S2  0
              A   0       FO 0          B3 0       S3  0
              H   1       FU 0          B4 0       S4  0
              NF Y        WU 0
                          AU 0
      BR
RN,1;
```

Fig. 9.184 RN block, loop display (example)

- Operator input using the process communication keyboard

Six of the upper keys (W =, Y =, E = 1, I = 1, A = 1 and H = 1) are automatically assigned after the loop display has been selected and the “Operator input” (BE) key depressed.

After the “W” or “Y” keys have been depressed, a sequence of numbers may be entered and terminated by pressing the execute key (◈). The “More” (↑) or “Less” (↓) keys may be pressed to continue without figures having previously been entered. The execute key (◈), normally required for termination, need not be pressed in this case.

The change is approximately 1% of the measuring span per processing cycle. If a greater change is required, the appropriate “More” (↑) or “Less” (↓) key should be pressed together with the “High–Speed” (~) key. The change is approximately 10 % of the measuring span per processing cycle. Keyboard inputs using ”E = 1”, ”I = 1”, ”A = 1” and ”H = 1” must be directly terminated by the execute key (◈).

W=	Y=	E=1	I=1	A=1	H=1		

A Automatic mode
E External setpoint
H Manual mode
I Internal setpoint
W Setpoint
Y Manipulated variable

Fig. 9.185 RN block; automatic labeling of the process communication keyboard

Monitoring operator input limits:

From release F01.00 and A03.00 onwards, the response to limit violations upon input of W or Y can be selected using GB.ORPA.263:

GB.ORPA.263 = 0B	The input value is limited without fault display, i.e. the limit value is transferred in case of limit value violations.
GB.ORPA.263 = 1B	Input values exceeding the operating limits are rejected and the fault message F469 is issued.

Prior to release F01.00 or A03.00, the RN block responded as described for GB.ORPA.263 = 0B.

- Limited actuating speed for W and Y

The values entered in the RW and RY parameters delimit the rate of change in percent of the measuring range per minute.

Example: RW = 3, XE = 100, XA = 0, Wold = 50, W_{new} = 80

→ The rate of change is 3 % per minute, i.e. the preset setpoint change of 30% will be reached after 10 minutes.

Delimiting the rate of change for Y is only effective in manual mode.

The default value for the RW and RY parameters is 0. This value does not delimit the rate of change.

- Data structure

Input elements:

Ex	Type	Name	Attr.	Meaning
1	EA	KP		Constant value for P part
2	EA	TN		Integral action time (for I part)
3	EA	TV		Derivative action time (for D part)
4	EA	V		Constant value for D part
5	EA	OA		Upper alarm limit
6	EA	UA		Lower alarm limit
7	EA	OW		Upper warning limit
8	EA	UW		Lower warning limit
9	EA	OF		Upper error limit
10	EA	UF		Lower error limit
11	EA	HY		Hysteresis for limit value monitoring
12	EA	XE		Limit of W, end of W/X bar
13	EA	WBO		Upper control limit of W
14	PA	W	C,B	Internal manual setpoint/TEXT from E1.58
15	EA	WBU		Lower control limit of W
16	EA	XA		Limit of W, beginning of W/X bar
17	EA	WEXT		External setpoint
18	EA	X		Actual value (for P and I part)
19	EA	XDE		External system deviation
20	EA	XDIF		Input D part; see block diagram
21	EA	ZA		Influencing quantity
22	EA	YN		Correction value for Y (physical quantity)
23	EA	YR		Actuator position feedback
24	EA	YME		Upper range value of Y for YP
25	PA	YHO		Upper limit of Y manual/controller output
26	PA	Y	C,B	Manipulated variable Y manual/TEXT from E1.60
27	PA	YHU		Lower limit of Y manual/controller output
28	PA	YAO		Upper limit of Y automatic
29	PA	YAU		Lower limit of Y automatic
30	EA	YMA		Lower range limit of Y for YP
31	EA	TOTZ		Dead band for XD
32	EA	AW1		Adjacent analog value (for display)
33	EA	AW2		Adjacent analog valuet (for display)
34	PB	E	B,C	”External” key/text from E1.61
35	PB	I	B,C	”Internal” key/text from E1.62
36	PB	A	B,C	”Automatic” key/text from E1.63
37	PB	H	B,C	”Manual” key/text from E1.64
38	EB	EXAU		”Ext” mode (automatic input)
39	EB	INAU		”Int” mode (automatic input)
40	EB	ACAU		”Auto” mode (automatic input)
41	EB	HDAU		”Manual” mode (automatic input)
42	EB	WNF		”W correction” mode
43	EB	GWU		Limit value changeover (”1”; check X)
44	EB	YNF		“Y correction” mode
45	EB	XXDE		0 = internal, 1 = external (XDE) XD
46	EB	PIPU		Controller response, 0 = PI–, 1 = P response
47	EB	STU		Interference suppression, 1 = suppressed

Input elements (continued)

Ex	Type	Name	Attr.	Meaning
48	EB	US		Status suppression, 1 = no status
49	EB	BW1		Adjacent binary value (for display)
50	EB	BW2		Adjacent binary value (for display)
51	EB	BW3		Adjacent binary value (for display)
52	EB	BW4		Adjacent binary value (for display)
53	EB	S1		Environment fault (display + output S)
54	EB	S2		Environment fault (display + output S)
55	EB	S3		Environment fault (display + output S)
56	EB	S4		Environment fault (display + output S)
57	ID	NRPL	C	Group display/location no.
58	S2	TW		Text for W
59	S2	TX		Text for X
60	S2	TY		Text for Y
61	S2	TEXT		Text for EX key
62	S2	TINT		Text for IN key
63	S2	TAC		Text for AC key
64	S2	THD		Text for HD key
65	S2	TNF		Text for correction input
66	S2	TFO		Text for upper error limit
67	S2	TFU		Text for lower error limit
68	S2	TAO		Text for upper alarm limit
69	S2	TWO		Text for upper warning limit
70	S2	TWU		Text for lower alarm limit
71	S2	TAU		Text for lower warning limit
72	S2	EHTY		Unit for manipulated variable Y
73	S2	TS1		Text for S1 (fault input)
74	S2	TS2		Text for S2 (fault input)
75	S2	TS3		Text for S3 (fault input)
76	S2	TS4		Text for S4 (fault input)
77	S2	TAW1		Text for analog value 1
78	S2	TAW2		Text for analog value 2
79	S2	TBW1		Text for binary value 1
80	S2	TBW2		Text for binary value 2
81	S2	TBW3		Text for binary value 3
82	S2	TBW4		Text for binary value 4
83	S6	EHTW		Unit for setpoint W
84	S4	TA11		Process–related name for AW1
85	S4	TA12		Process–related name for AW1
86	S6	EHT1		Unit for AW1
87	S4	TA21		Process–related name for AW2
88	S4	TA22		Process–related name for AW2
89	S6	EHT2		Unit for AW2
90	PA	RW		Maximal rate of change W (% per min)
91	PA	RY		Maximal rate of change Y (% per min)

Input elements (continued):

Ex	Type	Name	Attr.	Meaning
92	PA	YARP		Operating point manipulated variable
93	PA	RES2		Reserve
94	PB	PHA		Changeover reaction to manual → automatic changeover
95	PB	HAGR		Reserve
96	S16	AT		Process–related block name

Output elements:

Ax	Type	Name	Attr.	Meaning
1	AA	WA	N	Current setpoint
2	AA	XW	N	System deviation (X – W)
3	AA	YA	N	Manipulated variable (normalized quantity)
4	AA	DY	N	Difference of manipulated variable (Y – YR)
5	AA	YP	N	Manipulated variable (phys. quantity YMA, YME)
6	AA	DYN	N	Dynamic changeover I → E
7	AA	AO	N	Upper alarm limit
8	AA	AU	N	Lower alarm limit (all X, XW–monitoring depends on GWU)
9	AA	WO	N	Upper warning limit
10	AA	WU	N	Lower warning limit
11	AA	FO	N	Upper error limit
12	AA	FU	N	Lower error limit
13	AB	S	N	Common alarm (S1 to S4)
14	AB	INEX	N	”0” = internal, ”1” = external
15	AB	HDAC	N	”0” = manual, ”1” = automatic

- Block list

```
   RN       ORPA              24. 10. 84/ 14. 23. 02. P: 1

 1 AA   WA     0.0000          #  P                 96
 2 AA   XW     0.0000          #  P                 97
 3 AA   YA     0.0000          #  P                 98
 4 AA   DY     0.0000          #  P                 99
 5 AA   YP     0.0000          #  P                100
 6 AB   DYN    0                  P                101
 7 AB   AO     0               #  P                102
 8 AB   AU     0               #  P                103
 9 AB   WO     0               #  P                104
10 AB   WU     0               #  P                105
11 AB   FO     0               #  P                106
12 AB   FU     0               #  P                107
13 AB   S      0               #  P                108
14 AB   INEX   0                  P                109
15 AB   HDAC   0                  P                110
```

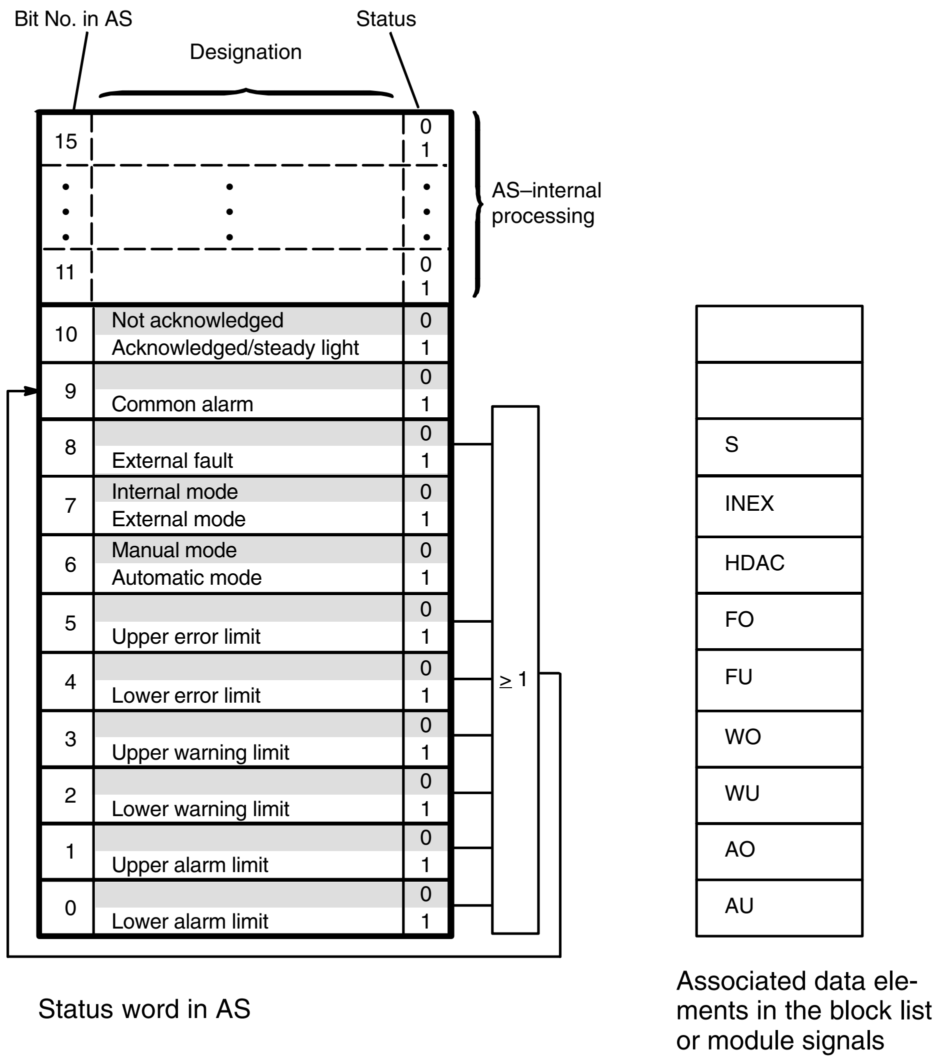
Block list (continued)

1	EA	KP	1.0000				P		1
2	EA	TN	10.000				P		2
3	EA	TV	0.0000				P		3
4	EA	V	1.0000				P		4
5	EA	OA	100.00				P		5
6	EA	UA	0.0000				P		6
7	EA	OW	100.00				P		7
8	EA	UW	0.000				P		8
9	EA	OF	100.00				P		9
10	EA	UF	0.000				P		10
11	EA	HY	0.0000				P		11
12	EA	XE	100.00				P		12
13	EA	WBO	100.00				P		13
14	PA	W	0.0000					CB	14
15	EA	WBU	0.0000				P		15
16	EA	XA	0.0000				P		16
17	EA	WEXT	0.0000				P		17
18	EA	X	0.0000				P		18
19	EA	XDE	0.0000				P		19
20	EA	XDIF	0.0000				P		20
21	EA	ZA	0.0000				P		21
22	EA	YN	0.0000				P		22
23	EA	YR	0.0000				P		23
24	EA	YME	100.00				P		24
25	PA	YHO	105.00						25
26	PA	Y	0.0000					CB	26
27	PA	YHU	-5.0000						27
28	PA	YAO	100.00						28
29	PA	YAU	0.0000						29
30	EA	YMA	0.0000				P		30
31	EA	TOTZ	0.0000				P		31
32	EA	AW1	15	0		OA	P		32
33	EA	AW2	15	0		OA	P		33
34	PB	E	0					CB	34
35	PB	I	1					CB	35
36	PB	A	0					CB	36
37	PB	H	1					CB	37
38	EB	EXAU	0				P		38
39	EB	INAU	0				P		39
40	EB	ACAU	0				P		40
41	EB	HDAU	0				P		41
42	EB	WNF	0				P		42
43	EB	GWU	1				P		43
44	EB	YNF	0				P		44
45	EB	XXDE	0				P		45
46	EB	PIPU	0				P		46
47	EB	STU	0				P		47
48	EB	US	0				P		48
49	EB	BW1	0		A		P		49
50	EB	BW2	0		A		P		50
51	EB	BW3	0		A		P		51
52	EB	BW4	0		A		P		52
53	EB	S1	0				P		53
54	EB	S2	0				P		54
55	EB	S3	0				P		55
56	EB	S4	0				P		56
57	ID	NRPL	0					C	57
58	S2	TW	W						58
59	S2	TX	X						59
60	S2	TY	Y						60

Block list (continued)

61	S2	TEXT	E		61
62	S2	TINT	I		62
63	S2	TAC	A		63
64	S2	THD	H		64
65	S2	TNF	NF		65
66	S2	TFO	FO		66
67	S2	TFU	FU		67
68	S2	TAO	AO		68
69	S2	TWO	WO		69
70	S2	TWU	WU		70
71	S2	TAU	AU		71
72	S2	EHTY	%		72
73	S2	TS1	S1		73
74	S2	TS2	S2		74
75	S2	TS3	S3		75
76	S2	TS4	S4		76
77	S2	TAW1	A1		77
78	S2	TAW2	A2		78
79	S2	TBW1	B1		79
80	S2	TBW2	B2		80
81	S2	TBW3	B3		81
82	S2	TBW4	B4		82
83	S	EHTW	EHTW**	6	83
84	S4	TA11	TA11		84
85	S4	TA12	TA12		85
86	S	EHT1	EHT1**	6	86
87	S4	TA21	TA21		87
88	S4	TA22	TA22		88
89	S	EHT2	EHT2**	6	89
90	PA	RW	0.0000		90
91	PA	RY	0.0000		91
92	PA	YARP	0.0000		92
93	PA	RES2	0.0000		93
94	PB	PHA	0		94
95	PB	HAGR	0		95
96	S16	AT	*TECHNOLOG.NAME	16	129

- Status word



AO	Upper alarm limit
AU	Lower alarm limit
FO	Upper error limit
FU	Lower error limit
INEX	Internal/external mode
HDAC	Manual/automatic mode
S	Environment fault
WO	Upper warning limit
WU	Lower warning limit

Fig. 9.186 Status word for the RN block

RNAM

Block renaming block

Application

This block is used for changing type/block names.

Changes are possible for:
- Type name of user–specific types (internal type no. ≥ 155)
- Block names of defined blocks (e.g. R.OTTO → R.VENT)
- Block names of PROBLEM, LAYOUT, STEP (e.g. PROBLEM.EIN → PROBLEM.AUS)

Changes are not possible for:
- Type names of types whose internal type nos. < 155
- Block names of PICTURE, CHECK, PROGRAM, ORPA blocks

Method of Operation

The old and new names are entered via parameterization.

- Select:

A,RNAM,1; (define first if it does not exist)

- Parameterize:

TYPA = old type name
BSTA = old block name (only required for BST name changes)
TYPN = new type name (only required for type name changes)
BSTN = new block name (only required for BST name changes)

Incorrect inputs are rejected.

TYPN and BSTN can only be parameterized if the corresponding old parameter (TYPA, BSTA) has previously been parameterized. Renaming is executed when the new name is parameterized. The type/block concerned can only then be called by its new name.

☞ When a block name is modified, this does not affect any block parametersand the CHECK block is not called.

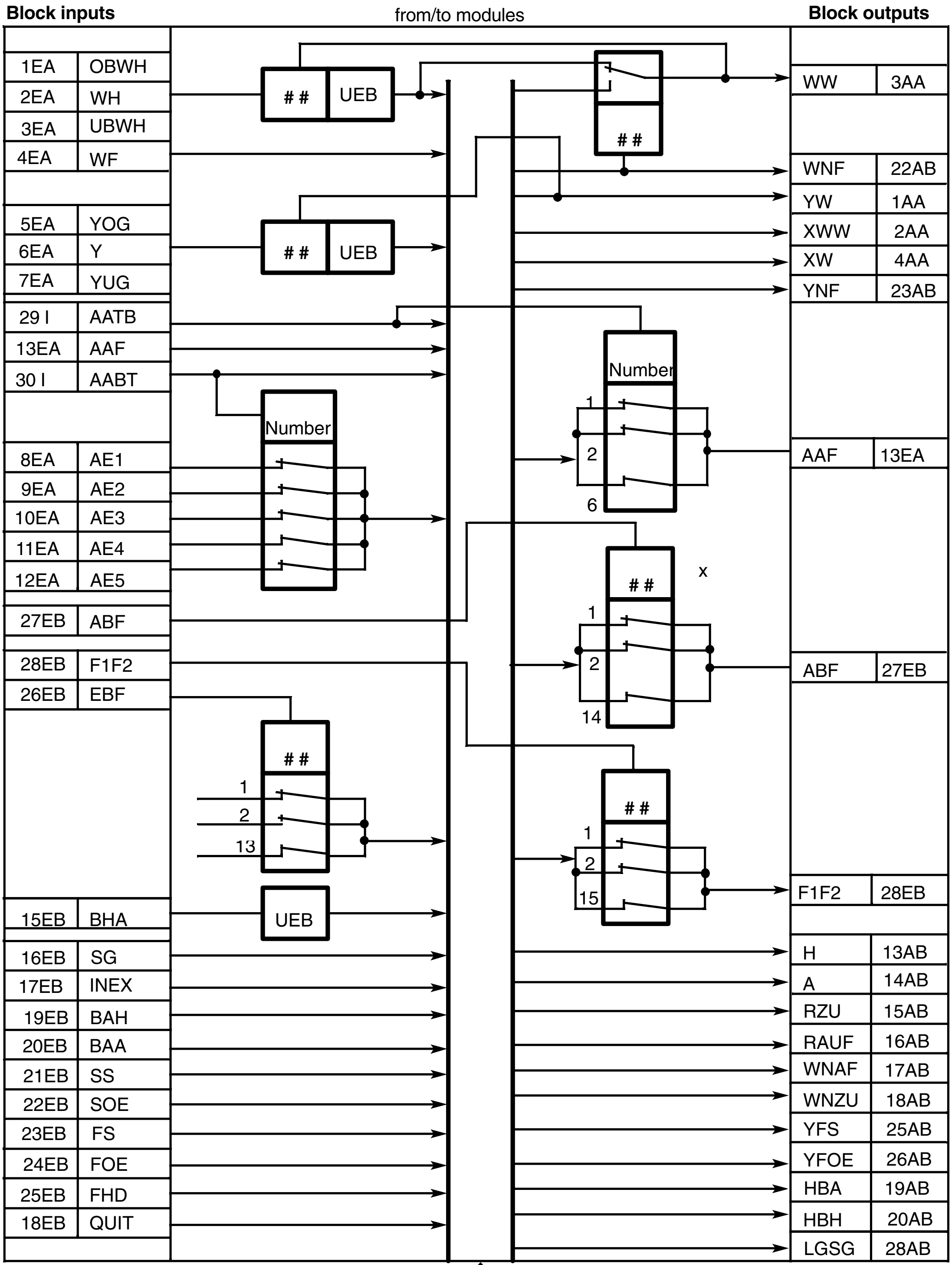
- Block list

```
RNAM  ORPA                                P: 1

   1  S4    TYPA                        C     1
   2  S4    BSTA                        C     2
   3  S4    TYPN                        C     3
   4  S4    BSTN                        C     4
   5  PB    LOEB  0                     C     5
```

RSK

Driver block for 1 and 2–channel K–type closed–loop controller modules



Controller module	6DS1 408–8BB	1–channel	S–type	6DS1 410–8BB	1–channel	K–type
	6DS1 411–8AA	2–channel	S–type	6DS1 412–8AA	2–channel	K–type

Fig. 9.187 RSK block; logic diagram

Legend to Fig. 9.187

Inputs

OBWH	Upper control limit WH
WH	Manual setpoint
UBWH	Lower control limit WH
WF	Reference setpoint
YOG	Upper control limit Y
Y	Manipulated variable Y
YUG	Lower control limit Y
AE1	Analog input variable 1
AE2	Analog input variable 2
AE3	Analog input variable 3
AE4	Analog input variable 4
AE5	Analog input variable 5
AAF	Unassigned analog output values
RSKB	Operator communication block name
F1F2	Error from F1/F2 (field 15)
SG	Command “High speed”
INEX	Internal/external command
QUIT	Manual command, Module acknowledgement
BAH	Command from automatic control ”HAND”
BAA	Command from automatic control ”AUTOMATIC”
SS	Protection ”CLOSE”
SOE	Protection ”OPEN”
FS	Enable “close actuator”
FOE	Enable “open actuator”
FHD	Enable “manual”
EBF	Unassigned binary input values
ABF	Unassigned binary outputs 1 to 14
BHA	Manual command, manual/automatic mode
AATB	Number of analog values from driver to module
AABT	Number of analog values from module to driver
BGNR	Module number
KNR	Channel number

Outputs

YW	Effective value of manipulated variable
XWW	Effective system deviation
WW	Effective setpoint
XW	Effective actual value
BGF	Disturbed access to module
M09	Hardware failure
XWGW	System deviation
M11	Fault in power controller
M12	Fault in actuator
NV1	YW not available
NV2	WW, XW, XWW, unassigned analog outputs not available
BSPV	Interconnected processing inhibit
H	Manual mode
A	Automatic mode
RZU	System feedback “CLOSED”
RAUF	System feedback “OPEN”
WNZU	End–of–travel “NOT CLOSED”
WNAF	End–of–travel “NOT OPEN”
HBA	Manual control AUTO
HBH	Manual control MANUAL
ZWHF	Forced manual
WNF	Setpoint correction
YNF	Manipulated value correction
BBL	Command inhibit
YFS	Enable “close actuator”
YFOE	Enable “open actuator”
BGTF	Module type does not match module
LGSG	Feedback from module ”slow/high–speed”
AAF	Unassigned analog output values
ABF	Unassigned binary outputs
F1F2	Fault in F1/F2

Application

– This module is used for acquiring signals from 1 and 2 channel closed–loop control modules

6 DS1 408–8BB 1 channel S–type controller
6 DS1 410–8BB 1 channel K–type controller
6 DS1 411–8AA 2 channel S–type controller
6 DS1 412–8AA 2 channel K–type controller

and providing these signals to the block outputs;

– transferring commands and controller input variables to the closed–loop control module.

Only data for one channel are processed at any one time. As the block possesses neither an image program nor an operator–controllable parameters, an additional block (RSKB block) is required for operator control.

Method of Operation (Fig. 9.187)

Various groups of analog and binary signals are transferred from the controller module to the RSK block. These signals are then provided as output signals of the RSK block:

– Fault alarms
– Protective interlocking feedback
– Mode feedback
– Unassigned analog values
– Controller output variables (YW, XWW, WW, XW)

The following groups of binary and analog values from the RSK block are routed to the module:

– Mode selection
– Protective commands
– Controller input variables (WH, Y)
– Unassigned binary values
– Unassigned analog values

- Initialization run

  The RSK block performs an initialization run after a module failure or after the pertaining XB block has been switched on/off. In this case, all values are read from the module and the module outputs are updated. This initialization run does **not** correspond to that of the RN block.

- Read binary values

  Binary values are read from the module in several steps. The module failure flag (BGA) is readfirst. If the flag has been set, no values will be read from the modueland the block outputs will be marked. Subsequently, all binary module outputs are read and written to the block outputs. Unassigned binary outputs, which have been activated at input 27 (ABF), are read and transferred to the specified field if interconnection has been performed at input 28 (F1F2). The lamp signals and additional feedback data are available as internal flags.

- Read analog values

  The analog values .YW, .XWW, .WW, .XW are always transferred directly to the outputs 1 to 4. Unassigned analog outputs (only those which have been parameterized in output 30 (AABT) are only processed if a field has been specified at input 13 (AAF). The module indicates via outputs 10 and 11 (NV1 and NV2) whether the analog values are disturbed. The module indicates WH or WW via output 3 (WW), depending on the state of output 22 (WNF).

- Binary/analog value output

  Binary values are directly transferred to the module, and interpreted by the command logic on the module. The analog inputs 2 and 6 (WH and Y) are checked for the limit values allocated and delimited in the event of a limit value violation. Only as many unassigned analog inputs 8 to 12 (AE1 to AE5) as have been specified in input 30 (AATB) are transferred to the module. Input 2 (WH) is written to output 3 (WW), depending on output 22 (WNF = 0)

- Pulse output of .INEX to the module and display of the actual status

  By interconnecting the input .BW4 of the RSKB block with the input .ABF of the RSK block, a pulse is output to the module and a feedback is sent from the module to the parameter .INEX of the RSKB block after “E=1” (EXTERNAL) or “I=1” (INTERNAL) has been entered via PBT.

☞ The switchover must be configured on the module via a flip–flop. The function parameter WEXT must be interconnected with the free flag A,T,22 (for the one–channel module) or to the free flags M,12,3/M,14,3 (for the two–channel module) to display the actual status.

The input .ABF of the RSK block always be interconnected with a GB field.

- Parameterization

If access to the module is faulty, output 5 (BGF) is set after time–out or acknowledgement from several modules or when a module with a different type code has been detected. Output 27 (BGTF) is set and an I&C alarm S 311 issued if a different type code has been detected.

The states "Hardware failure" (M09), "System deviation" (XWGW), "Power controller fault" (M11), "YW not available" (NV1), "WW, XW, XWX, unassigned analog outputs not available" (NV2), "Processing inhibit (interconnected) (BSPV) are supplemented by the driver program and indicated at outputs 6 to 12.
Outputs 19 and 20 (HBA and HBH) indicate operator inputs from the miniaturized control board. Since these signals are only present for one cycle, several operator inputs within one block cycle cannot be distinguished.

WH is corrected internally if the signal "Correct setpoint" (WNF) is present at output 22. Operator control of WH is not permitted if WNF = 1. Output 23 indicates that the setpoint has to be corrected.

"Manual setpoint" is applied to input 2 (WH) and checked for the limits .OBWH and .UBWH. The signal is displayed at the output if .WNF = 0 and limited if it exceeds the limit values.

Input 6 (Y) is checked for the limits .YOG and .YUG and limited to these values if necessary. Y interpretation must be configured on the module since Y specification is normally not possible. Y is transferred to the module if the driver program recognizes an operator in manual mode; otherwise the current value YW is transferred to the module and fed back to the operator–controllable input Y. A binary value = 1 is transferred as an operator input identifier for at least one driver block cycle. The signal "Y correction" must be generated on the module.

Operator input of Y is normally detected by a value change; if there is an interconnection to RSKB via input 14 (RSKB), every operator input of Y is detected even if there is no value change.

Unassigned analog inputs can be transferred to the module via inputs 8 to 12 (AE1 to AE5). The number of analog values is selected via input 29 (AATB).

Unassigned analog values can be transferred by interconnection from the module to a GA field via input 13 (AAF). The number of analog values is selected via input 30 (AABT).

Interconnection of input 14 (RSKB) with an RSKB block causes the operator input of WH, Y, BHA, SG, INEX to be read by RSKB and to be transferred to the module. Since an interconnection of .RSKB has high priority, all interconnections to the module of the inputs WH, Y, BHA, SG, QUIT and INEX are cleared when input .RSKB is interconnected. The operator input signals are now read by RSKB directly.

An active signal which lasts for at least the execution time of the driver block is transmitted to the module if input 15 changes (BHA, manual command, manual/automatic mode, 0 = manual, 1 = automatic mode). The driver block de–activates the signal to the module as soon as the module state has changed (manual → automatic, automatic → manual).

Since normally no inputs are present and transfer is performed via unassigned binary values, the two command inputs 16 (for high–speed = 1 and normal speed = 0) and 17 (internal = 0, external = 1) must be configured on the module or interpreted by software. The command input 16 (high–speed/normal speed) is sent to the module as an impulse.

☞ The “BBF” function module (monitoring and control reference variables) must not be used in the closed–loop module.

This function module may not be installed when the RSK driver block is used!

Take care when interconnecting!

- Manual setpoint	WH
- Analog input value	Y
- Manual command, manual/automatic mode	BHA
- Command high–speed	SG
- Command module acknowledgement	QUIT
- Command internal/external	INEX

Interconnection of these inputs is only possible if input .RSKB has not been interconnected. Since an interconnection of .RSKB has high priority, all interconnections of the inputs WH, Y, BHA, SG, QUIT and INEX are cleared when input .RSKB is interconnected. In order to implement an internal correction of Y or WH without an operator unit, a flag is set when Y or WH are interconnected, and reset when the interconnection is cleared.

An automatic control can specify values via inputs 19 to 22:

Command from automatic control “MANUAL”	BAH
Command from automatic control “AUTO”	BAA
Protection “CLOSE”	SS
Protection “OPEN”	SOE

Thirteen unassigned binary input values are read from a field and transferred to the module when input 26 (EBF) is interconnected. See “Data configuration” table for assignment.

Fourteen unassigned binary input values are read from the module and transferred to a field when input 27 (BF) is interconnected. See “Data configuration” table for assignment).

Additional error messages from the F1/F2 module area (15 values) are available when input 28 (F1F2) is interconnected. The complete set of binary field values is always transferred. See “Data configuration” for assignment).

The number of unassigned analog values transferred from the module to the driver is selected at input 30 (AABT). The driver block and module execution time are directly affected by this value.

The number of unassigned analog values transferred from the driver to the module is selected at input 29 (AATB). The driver block and module execution time are directly affected by this value.

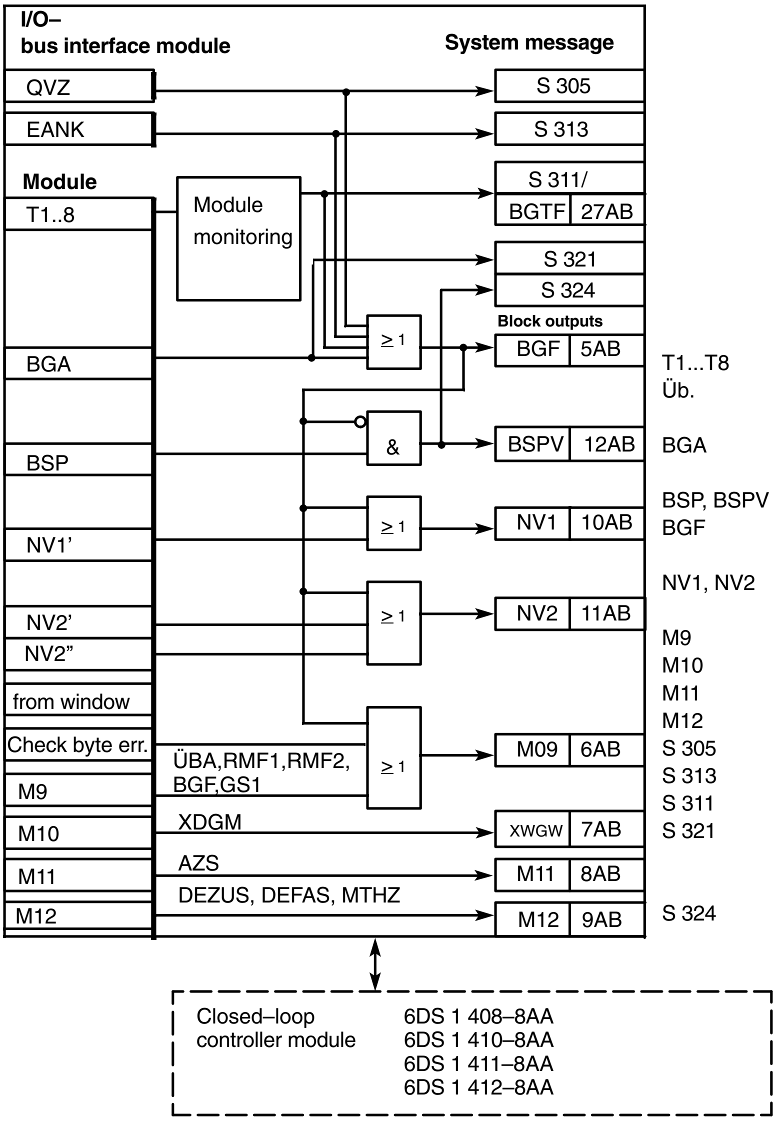
The module number is parameterized in input 31 (BGNR). The data record can be used for 1– and 2–channel closed–loop controller modules of type S and K, however the full I/O is not always used. The driver block should be installed in cyclic processing between 250 ms and 16 seconds as the processing cycle is limited by the module. The module cycle time is $\geq$ 100 ms.

Channel number and module type are defined via input 32 (KNR). These parameters should be defined first.

The following allocation of channel number and controller type applies:

0	=	1–channel S–type controller
1	=	2–channel S–type controller, channel 1
2	=	2–channel S–type controller, channel 2
10	=	1–channel K–type controller
11	=	2–channel K–type controller, channel 1
12	=	2–channel K–type controller, channel 2

The type check function verifies that the controller module which has been parameterized via input .KNR responds to the selected module number .BGNR. An I&C alarm is raised and the BGTF output set if the type check function detects a mismatch.



T1...T8	Type identification from module
Üb.	Monitoring of type identification from module
BGA	Module failure, detected by module
BSP, BSPV	Processing inhibit
BGF	Module failure, detected by driver
NV1, NV2	Non–availability of certain values
M9	Hardware failure
M10	System deviation
M11	Power controller failure
M12	Actuator failure
S 305	Time–out
S 313	Multiple addressing
S 311	Incorrect module type
S 321	Incorrect data access to module (check byte error), ASZYKL failure, MS, BGA
S 324	Message "Processing inhibit set"

Fig. 9.188 RSK block, alarm logic

- System messages

S 305: Timeoút from module (incorrect address, incorrect jumper setting, or defective)
S 311: Incorrect module identification (wrong module installed)
S 313: Multiple addressing (jumper setting)
S 321: Incorrect data access to module (check byte error), ASZYKL failure, flags from module (M9, BGA, NV1, NV2)
S 324: Message "Processing inhibit set"
S 325: RSK block has been inadvertently copied and interconnection with RSKB cleared.

- Data structure (designation of inputs and outputs)

Signal assignment on the module

Meaning	Name	Type	1–ch S	1–ch K	2–ch S 1/2	2–ch K 1/2
Effective control output	YW	1AA	x	x	x	x
Effective system deviation	XWW	2AA	x	x	x	x
Effective setpoint	WW	3AA	x	x	x	x
Effective actual value	XW	4 AA	x	x	x	x
Disturbed access to module	BGF	5AB				
Hardware failure	M09	6AB	x	x	x	x
System deviation	XWGW	7AB	x	x	x	x
Power controller failure	M11	8AB	x	x	x	x
Actuator failure	M12	9AB	x	–	x	–
Yw not available	NV1	10AB	x	x	x	x
Output not available	NV2	11AB	x	x	x	x
Processing inhibit (interconnected)	BSPV	12AB				
“MANUAL” mode	H	13AB	x	x	x	x
”AUTOMATIC” mode	A	14AB	x	x	x	x
System feedback “CLOSED”	RZU	15AB	x	x	x	x
System feedback “OPEN”	RAUF	16AB	x	x	x	x
Limit “NOT CLOSED”	WNZU	17AB	x	–	x	–
Limit “NOT OPEN”	WNAU	18AB	x	–	x	–
Manual input AUTO	HBA	19AB	x	x	x	x
Manual input MANUAL	HBH	20AB	x	x	x	x
Forced manual	ZWHF	21AB	x	x	x	x
Correct setpoint	WNF	22AB	x	x	x	x
Correct control output	YNF	23AB	A ,T,20	A ,T,20	M,12 ,1/ M,14, 1	M,12,1/ M,14,1
Command blocked	BBL	24AB	x	x	x	x
Enable actuator close	YFS	25AB	x	x	x	x
Enable actuator open	YFOE	26AB	x	x	x	x
Mismatch module type/module	BGTF	27AB				
Slow/high–speed feedback from module	LGSG	28AB	A,T,21	A,T,21	–	M,12, 2/ M,14, 2
Upper WH control limit	OBWH	1EA,				
Manual setpoint	WH	2EA 1) 3)	x	x	x	x
Lower WH control limit	UBWH	3EA				
Reference setpoint	WF	4EA	x	x	x	x
Upper Y control limit	YOG	5EA				
Analog input value	Y	6EA 1) 3)	EA, T, 6	EA, T, 6	MA,3,6/ MA,7,6	MA,3,6/ MA,7,6
Lower Y control limit	YUG	7EA				
Analog input value 1	AE1	8EA	EA,T, 8	EA,T,8	MA,3,7/ MA,7,7	MA,3,7/ MA,7,7
Analog input value 2	AE2	9EA	EA,T,9	EA,T,9	MA,3,8/ MA,7,8	MA,3,8/ MA,7,8
Analog input value 3	AE3	10EA	EA,T,10	A,T,10	MA,3,9/ MA,7, 9	MA,3,9/ MA,7,9
Analog input value 4	AE4	11EA	EA,T,11	EA,T,11	EA,T,1/ EA,T,3	EA,T,1/ EA,T,3
Analog input value 5	AE5	12EA	EA,T,12	EA,T,12	EA,T,2/ EA,T,4	EA,T,2/ EA,T,4
Unassigned analog output values field 1 to 6	AAF	13EA 3)				

- Data structure (designation of inputs and outputs)

Signal assignment on the module

Meaning	Name	Type	1–ch. S	1–ch. K	2–ch. S 1/2	2–ch. K 1/2
Value 1			AA,T,5	AA,T,5	MA,3,14/ MA,7,14	MA,3,14/ MA,7,14
Value 2			AA,T,6	AA,T,6	MA,3,5/ MA,7,15	MA,3,15/ MA,7,15
Value 3			AA,T,7	AA,T,7	MA,3,6/ MA,7,16	MA,3,16/ MA,7,16
Value 4			AA,T,8	AA,T,8	MA,4,1/ MA,8,1	MA,4,1/ MA,8,1
Value 5			AA,T,9	AA,T,9	AA,T,1/ AA,T,3	AA,T,1/ AA,T,3
Value 6			AA,T,10	AA,T,10	AA,T,2/ AA,T,4	AA,T,2/ AA,T,4
Operator block name	RSKB	14EA [3)]				
Manual command manual/auto mode	BHA	15EB [1) 3)]	M,0,16	M,0,16	M,17,14/ M,27,14	M,27,14/ M,27,14
High–speed command	SG	16EB [1) 3)]	ET,35	ET,35	–	M,6,1/ M,8,1
Command external/internal	INEX	17EB [1) 3)]	ET,36	ET,36	M,6,2/ M,8,2	M,6,2/ M,8,2
Manual command “module acknowledged”	QUIT	18EB [1) 3)]	M,0,16	M,0,16	M,17,14/ M,27,14	M,27,14/ M,27,14
Command from automatic control “MANUAL”	BAH	19EB	ET,21	ET,21	M,5,6/ M,7,6	M,5,6/ M,7,6
Command from automatic control “AUTOMATIC”	BAA	20EB	ET,22	ET,22	M,5,7/ M,7,7	M,5,7/ M,7,7
Protection “CLOSE”	SS	21EB	ET,29	ET,29	M,5,10/ M,7,10	M,5,10/ M,7,10
Protection “OPEN”	SOE	22EB	ET,30	ET,30	M,5,11/ M,7,11	M,5,11/ M,7,11
Enable close actuator	FS	23EB	ET,33	ET,33	M,5,14/ M,7,14	M,5,14/ M,7,14
Enable open actuator	FOE	24EB	ET,34	ET,34	M,5,15/ M,7,15	M,5,15/ M,7,15
Enable manual	FHD	25EB	M,1,1	M,1,1	M,17,15/ M,27,15	M,17,15/ M,27,15
Unassigned binary input values (13)	EBF	26EB [3)]	ET,38– ET,50	ET,38– ET,50	M,6,4 - M6,16/ M8,4 -M8,16	M,6,4 - M6,16/ M8,4 - M8,16
Unassigned binary outputs (1–14)	ABF	27EB [3)]	A,T,22– A,T,35	A,T,22– A,T,35	M,12,3 - M,12,16/ M,14,3 - M,14,16	M,12,3 - M,12,16/ M,14,3 - M,14,16
Error from F!/F2 (15)	F1F2	28EB [3)]				
Value 1 DEZUS			I,2,1	–	M,15,1/ M,25,1	– –
Value 2 DEFAS			I,2,2	–	M,15,2/ M,25,2	– –
Value 3 RMF1			I,2,3	–	M,15,3/ M,25,3	– –
Value 4 RMF2			I,2,4	–	M,15,4/ M,25,4	– –
Value 5 MUS			I,2,5	I,2,5	M,15,5/ M,25,5	M,15,5/ M,25,5

- Data structure (designation of inputs and outputs)

Signal assignment on the module

Meaning	Name	Type	1–ch. S	1–ch. K	2–ch. S 1/2	2–ch. K 1/2 channel
Value 6 MTZH			I,2,6	–	M,15,6/ M,25,6	– –
Value 7 AZS			I,2,7	I,2,7	M,15,77 M,25,7	M,15,7/ M,25,7
Value 8 UA			I,2,8	–	M,15,8/ M,25,8	– –
Value 9 VO			I,2,9	I,2,9	M,15,9/ M,25,9	M,15,9/ M,25,9
Value 10 GSI			X	X	ES,22/ ES,22	ES,22/ ES,22
Value 11 BSP			X	X	X	X
Value 12 XDGM			M,3,1	M,3,1	M,15,10/ M,25,10	M,15,10/ M,25,10
Value 13 TE			I,3,1	I,3,1	M,15,11/ M,25,11	M,15,11/ M,25,11
Value 14 UEBA			I,3,2	I,3,2	M,15,12/ M,25,12	M,15,12/ M,25,12
Value 15 EXFE			I,3,3	I,3,3	–	–
Number of analog values from driver to module	AATB	29I				
Number of analog values from module to driver	AABT	30I				
Module number	BGNR	31I				
Channel number	KNR	32I [2)]				

x = on controller module, fixed assignment
– = n/a; does not exist on controller module

1) Inputs are non–interacting
2) Set channel number first
- 0 = 1–channel S–type controller
- 1 = 2–channel S–type controller, channel 1
- 2 = 2–channel S–type controller, channel 2
- 10 = 1–channel K–type controller
- 11 = 2–channel K–type controller, channel 1
- 12 = 2–channel K–type controller, channel 2

3) Input can only be interconnected

The following signals require the definition of a configuration on the closed–loop controller module. Operator input and monitoring from AS 235 are not possible without this configuration.

Designation from data interface in transfer RAM

Signal name	1–ch. S	1–ch. K	2–ch. S 1/2 channel	2–ch. K 1/2 channel
BAH 3)	ET,21	ET,21	M,5,6/ M,7,6	M,5,6/ M,7,6
BAA 3)	ET,22	ET,22	M,5,7/ M,7,7	M,5,7/ M,7,7
SS 3)	ET,29	ET,29	M,5,10/ M,7,10	M,5,10/ M,7,10
SOE 3)	ET,30	ET,30	M,5,11/ M,7,11	M,5,11/ M,7,11
Y	EA,T,6	EA,T,6	MA,3,6/ MA,7,6	MA,3,6/ MA,7,6
Operator flag for Y 3)	ET,37	ET,37	M,6,3 M,8,3	M,6,3 M,8,3
SG 3) 4) 6)	ET,35	ET,35	–	M,6,1/ M,8,1
INEX 3)	ET,36	ET,36	M,6,2/ M,8,2	M,6,2/ M,8,2
FS (FYS) 3)	ET,33	ET,33	M,5,12/ M,7,12	M,5,12/ M,7,12
FOE (FYOE) 3)	ET,34	ET,34	M,5,13/ M,7,13	M,5,13/ M,7,13
FRS 1) 3)	ET,31	ET,31	M,5,14 M,7,14	M,5,14 M,7,14
FROE 2) 3)	ET,32	ET,32	M,5,15/ M,7,15	M,5,15/ M,7,15
YNF	A,T,20	A,T,20	M,12,1/ M,14,1	M,12,1/ M,14,1
LGSG 5)	A,T,21	A,T,21	–	M,12,2 M,14,2/

1) Enable “Open controller” (always transferred as logic “1” from the driver)
2) Enable “Close controller” (always transferred as logic “1” from the driver)
3) Unassigned flags (M,...) have a different meaning than described in the Controller Module Manual where S/K–type 2–channel controllers are concerned. The unassigned flags must be re–stored to the signal names assigned (with different flag numbers) of the repective channel.
4) Changeover is only transferred as an impulse.
5) The function module BBFS uses A,T,21 on the module in a different meaning.
6) The function module BBF uses ET,35 on the module in a different meaning.

Additional binary signals are available in internal elements:

Signal assignment on the module

Meaning	Name	Type	1–ch. S	1–ch. K	2–ch. S 1/2 channel	2–ch. K 1/2 channel
Lamp signals	LSB	PB	X	X	X	X
	LSR	PB	X	X	X	X
	LHB	PB	X	X	X	X
	LHR	PB	X	X	X	X
	LAB	PB	X	X	X	X
	LAR	PB	X	X	X	X
Close protection, interconnected	SSV	PB	X	X	X	X
Open protection, interconnected	SOEV	PB	X	X	X	X
Enable CLOSE	RFS	PB	X	X	X	X
Enable OPEN	RFOE	PB	X	X	X	X
Command CLOSE	BS	PB	X	X	X	X
Command OPEN	BOE	PB	X	X	X	X
	ABH	PB	X	X	X	X
	ABA	PB	X	X	X	X
Limit CLOSED	WEZU	PB	X	–	X	–
LImit OPEN	WEAU	PB	X	–	X	–
Torque NOT CLOSED	NDZU	PB	X	–	X	–
Torque NOT OPEN	NDAU	PB	X	–	X	–

- Block list

```
   RSK     1                09. 03. 89/ 09. 01. 46. P:1*

 1 AA  YW   0.0000          #                   N      1
 2 AA  XWW  0.0000          #                   N      2
 3 AA  WW   0.0000          #                   N      3
 4 AA  XW   0.0000          #                   N      4
 5 AB  BGF  0               #                   N      5
 6 AB  M09  0               #                   N      6
 7 AB  XWGW 0               #                   N      7
 8 AB  M11  0               #                   N      8
 9 AB  M12  0               #                   N      9
10 AB  NV1  0               #                   N     10
11 AB  NV2  0               #                   N     11
12 AB  BSPV 0               #                   N     12
13 AB  H    0               #                   N     13
14 AB  A    0               #                   N     14
15 AB  RZU  0               #                   N     15
16 AB  RAUF 0               #                   N     16
17 AB  WNZU 0               #                   N     17
18 AB  WNAU 0               #                   N     18
19 AB  HBA  0               #                   N     19
20 AB  HBH  0               #                   N     20
21 AB  ZWHF 0               #                   N     21
22 AB  WNF  0               #                   N     22
23 AB  YNF  0               #                   N     23
24 AB  BBL  0               #                   N     24
25 AB  YFS  0               #                   N     25
26 AB  YFOE 0               #                   N     26
27 AB  BGTF 0               #                   N     27
28 AB  LGSG 0               #                   N    104
```

Block list (continued)

```
   RSK      1                 09. 03. 89/ 09. 03. 27. P: 2

 1 EA   OBHW 0.0000              P              28
 2 EA   WH   0.0000              P         C  Q 29
 3 EA   UBWH 0.0000              P              30
 4 EA   WF   0.0000              P              31
 5 EA   YOG  0.0000              P              32
 6 EA   Y    0.0000              P         C  Q 33
 7 EA   YUG  0.0000              P              34
 8 EA   AE1  0.0000              P              35
 9 EA   AE2  0.0000              P              36
10 EA   AE3  0.0000              P              37
11 EA   AE4  0.0000              P              38
12 EA   AE5  0.0000              P              39
13 EA   AAF  0.0000              P         C  Q 40
14 EA   RSKB 0.0000              P         C  Q 41
15 EB   BHA  0                   P         C  Q 42
16 EB   SG   0                   P         C  Q 43
17 EB   INEX 0                   P         C  Q 44
18 EB   QUIT 0                   P         C  Q 45
19 EB   BAH  0                   P              46
20 EB   BAA  0                   P              47
21 EB   SS   0                   P              48
22 EB   SOE  0                   P              49
23 EB   FS   0                   P              50
24 EB   FOE  0                   P              51
25 EB   FHD  1                   P              52
26 EB   EBF  0                   P         C  Q 53
27 EB   ABF  0                   P         C  Q 54
28 EB   F1F2 0                   P         C  Q 55
29 I    AATB    0                          C    56
30 I    AABT    0                          C    57
31 I    BGNR    0                          C    58
32 I    KNR     0                          C    59
```


RSKB

Image and operator input block for TELEPERM ME closed–loop controller modules

Application

This block is used for

– monitoring and control of the RSK driver block
– acquiring and transferring signals to the RSK driver block
– providing signals to the block outputs
– providing a standardized interface for monitoring and control via OS systems

Method of operation

The RSKB block can only be used together with an RSK driver block. The necessary interconnection is established in the RSK driver block.

The RSKB image and operator input block must be installed in a cyclic processing sequence (it is recommended that it is installed after RSK in the same processing sequence).

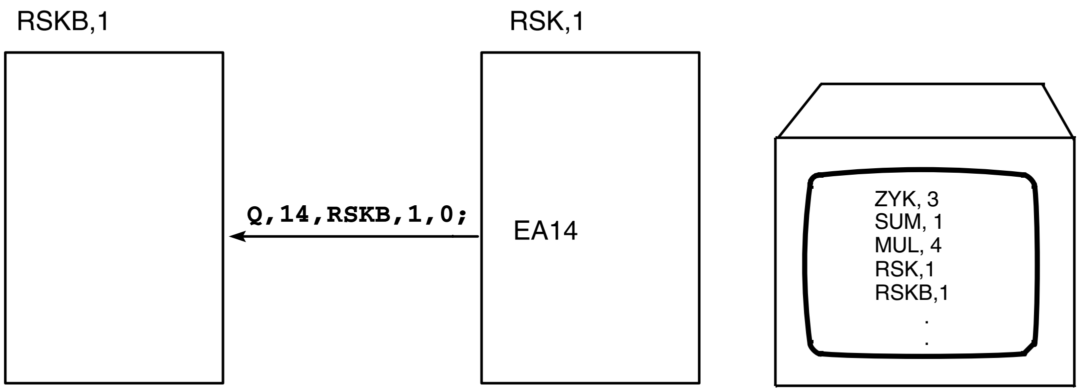


Fig. 9.189 Interconnection RSKB–RSK; processing sequence (example)

The RSKB block transfers analog values and the manual commands from the operator input unit and enters then in the corresponding block elements of teh respective (interconnected) RSK driver block.

The following parameters are transferred:

- Manual setpoint	WH
- Manual control value	YH
- EXTERNAL mode	E
- INTERNAL mode	I
- AUTOMATIC mode	A
- MANUAL Mode	H
- High–speed mode	SG
- Acknowledgement signal to module	QB

All operator inputs made in “STO” are rejected. Operator inputs can only be made for the module in “STA”.

- Module acknowledgement QB

  A malfunction requiring acknowledgement detected by the controller module is indicated by a blinking QB = 1 in the loop display. Selecting QB = 1 and AUSFÜHREN sends acknowledgement to the module.

- Limit value monitoring suppression STU

  Limit value monitoring of the actual value can be disabled or enabled via the STU block input (STU = 0: suppression OFF; STU = 1: suppression ON). The parameterization is shown under SU in the loop display.

- Status word suppression US

  The generation of a status word can be disabled or enabled via the US block input (US = 0: suppression OFF; STU = 1: suppression ON). The parameterization is shown under SU in the loop display.

- External fault FEXT

  A binary signal can be parameterized or interconnected via block input FEXT. The signal state is indicated under F in the loop display and stored in the status word (ORed) together with HAWF.

- Time setting for the signal “Command blocked” UZT

  A time value for the signal “Command blocked” can be specified via block input UZT. An applied signal will be extended by this value.

  Valid time values are between 1 and 1800 seconds. The signal state is shown in the loop display (BB) and stored in the status word.

- Hardware fault HAWF

  The HAWF block output signal is an ORed combination of the following module error messages:

Module fault
Hardware fault
System deviation too high
Drive fault
Motor temperature too high
YW not available
Analog outputs not available
Processing inhibit

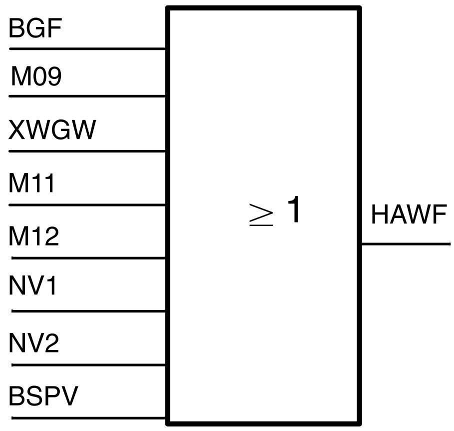


Fig. 9.190 Hardware fault signal generation

The HAWF signal is indicated in the loop display and stored in the status word (ORed) together with FEXT.

- LAYO

  This block output can be interconnected with a LAYOUT (image output) created in TML by the user.

  The information stored in this LAYOUT is then inserted when the loop display is selected.

  However, the data to be inserted should not cover up the loop display data.

- Upper range limit/lower range limit of control variable YE, YA

  These block elements must be parameterized as required by the OS bar display (of Y) standardization if operator input is performed via the OS system (NORA).

  They may also be used for representations in LAYOUT.

- Correction of WH

  In effective external mode the setpoint is specified from an external point (e.g. at the RSKB block input WF or on the controller module). In this mode, the manual setpoint (WH) is corrected to the external setpoint in order to avoid a sudden change of the setpoint when internal mode is selected. This setpoint correction is indicated as the WNF block output and marked by a “W” at NF in the loop display.

  ☞ WH correction must be configured on the controller module.

- Control variable adjusment and Y correction

  The control variable Y can only be adjusted by PBT input in manual mode and only within the parameterized limits.

  If control variable adjustments have not been entered via the PBT (e.g. via KW 48), the block input Y is corrected to the effective control variable in each processing cycle. Thus the effective control variable will be used if the control variable is adjusted at a later point in time using the PBT keys “↑” or “↓”.

  ☞ Control variable adjustment and Y correction from the AS 235 central unit must be configured on the controller module.

- Pulse output of .INEX to the module and display of the actual status

  By interconnecting the input .BW4 of the RSKB block with the input .ABF of the RSK block, a pulse is output to the module and a feedback is sent from the module to the parameter .INEX of the RSKB block after “E=1” (EXTERNAL) or “I=1” (INTERNAL) has been entered via PBT.

  ☞ The switchover must be configured on the module via a flip–flop. The function parameter WEXT must be interconnected to the free flag A,T,22 (for the one–channel module) or to the free flags M,12,3/M,14,3 (for the two–channel module) to display the actual status.

  The input .ABF of the RSK block must always be interconnected with a GB field.

- Unassigned analog values AW3, AW4 and AW5

  These parameters are unassigned flags which can either be parameterized as unassigned block inputs or from the NORA of an existing OS system.

If they are used via an OS system, the NORA of this system enters the control parameter settings of KP, TN and TV into the inputs AW3, AW4 and AW5, respectively. Three of the analog inputs AE1 to AE5 of the associated RSK block must be interconnected with the RSKB inputs (AW3, AW4, AW5).
(The AATB block element of the RSK block must be parameterized with a value greater than 3).

☞ A configuration which assigns these analog values to the controller parameter flags must be performed on the controller module.

It is possible to write to the inputs AW3, AW4 and AW5 using TML or to parameterize them if they are freely used. They can then be used either for LAYOUT or as analog flags.
The block inputs are not processed by the RSKB block.

- Text definitions TAW3, TAW4 and TAW5

  If the analog values AW3, AW4 and AW5 are used for controller parameter setting via OS systems, the corresponding texts (KP, TN, TV) must be parameterized at the inputs TAW3, TAW4 and TAW5. These characters are the displayed in the corresponding NORA of the OS system. The block outputs may also be accessed by LAYOUTs.

- Slow–speed, high–speed LG, SG

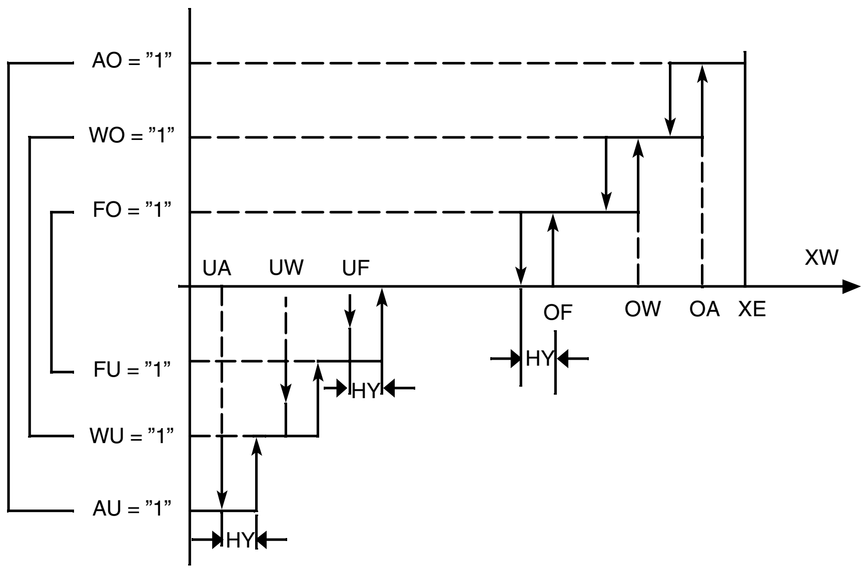
  Entries for selecting high–speed mode (SG = 1) are only permitted in MANUAL mode. Change-over to sloy–speed mode is performed either automatically by selecting the mode in AUTOMATIC mode or by entering LG = 1.
  The effective speed is indicated in the circuit display.

  ☞ The functions slow–speed and high–speed must be configured on the controller module.

- Limit value monitoring

  The effective actual value (XW) is monitored for the limit values OF and UF (error limits) by a comparator. Four other comparators monitor the warning and alarm limits. (Limit value formation with hysteresis). The hysteresis is preset for all limit values.

  The six alarm outputs of the block can be inhibited via the limit value monitoring function (STU) (e.g. for batch processes), i.e. all outputs = “0”.



AO	Upper alarm signal	OF	Upper error limit value
AU	Lower alarm signal	OW	Upper warning limit value
FO	Upper fault signal	UA	Lower alarm limit value
FU	Lower fault signal	UF	Lower error limit value
HY	Hysteresis (identical for all limit values)	UW	Lower warning limit value
WO	Upper warning signal	OA	Upper alarm limit value
WU	Lower warning signal	XW	Effective actual value

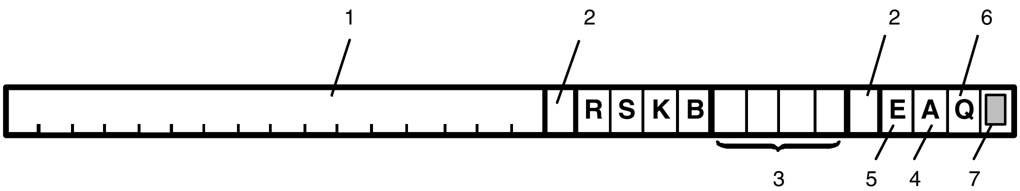
Fig. 9.191 Limit value monitoring

- System messages

S 325: Configuration error due to copy instruction. Interconnection note to RSK has been deleted.

Remedial action: Perform interconnection in the corresponding RSK block.

- Normalized representation in a group display



1 Process–related name of the RSKB block, as in loop display
2 Separating blank
3 Number of the RSKB block
4 H or A (MANUAL or AUTO)
5 I or E (INTERNAL or EXTERNAL)
6 B or Q (command blocked or acknowledge module)
7 Blinking mark in the event of a common alarm

Fig. 9.192 RSKB block; normalized representation in a group display

The block is represented by 30 characters in a specific location of a group display. Input 83 NRPL (group display: no./location no.) must then be parameterized as follows:

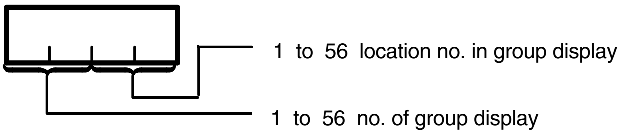


Fig. 9.193 RSKB block; parameterization of input 83

Set input 83 (NRPL) to “0” if the normalized representation of a block in a group display is to be suppressed.

Nine different operator–process communication activities can be performed after the circuit display has been selected and the “Operator input” (BE) key depressed. For this purpose, the appropriate process–related mnemonic names will be assigned to key group 2 of the process communication keyboard.

- Operator using the process communication keyboard

a)

W=	Y=	E=1	I=1	A=1	H=1	SG=1	LG=1

b)

QB=1							

A	Automatic mode
E	External mode
H	Manual mode
I	Internal mode
LG	Slow–speed ON
QB	High–speed ON
SG	Module acknowledged
W	Setpoint
Y	Manipulated variable

Fig. 9.194 a,b RSKB block; automatic labeling of the process communication keyboard

As the eight keys of key group 2 are insufficient for the 9 possible operator input functions of this block, the labeling can be enhanced by pressing the TE (keyboard expansion) key.

After the “W =”” or “Y =” keys have been depressed, a sequence of numbers may be entere-dand terminated by pressing the execute key ( ).
The “More” (↑) or “Less” (↓) keys may be pressed to continue input. The execute key ( ), normally required for termination, need not be pressed in this case.

The change is approximately 1% of the measuring span per processing cycle. If a greater change is required, the appropriate key should be pressed together with the “High–speed” (~) key. The change is then approximately 10% of the measuring span for each processing cycle.

Key inputs using E, I, A, H, SG, LG and QB must be directly terminated by the execute key ( ).

- Normalized representation of the loop display

  The loop display contains static and dynamic operator data.

  Legend to Fig. 9.195:

Static data

1 Mnemonic name and number of the RSKB block
2 Process–related name of the RSKB block
3 Process–related name of adjacent analog values [1)]
4 Mnemonic names of effective modes: E = EXTERNAL, I = INTERNAL, A = AUTO, H = MANUAL, QB = module acknowledged [1)]
5 Mnemonic names of effective control variables: W = Setpoint X = actual value XW = effective system deviation (system deviation); XWW (see output 2AA), Y = Manipulated variable [1)]
6 Mnemonic names of process states: FA = process enabling – controller open, FZ = process enabling – controller closed, SA = protection – controller open, SZ = protection – controller closed, BB = command blocked [1)]
7 Mnemonic names of the actual value monitoring limits: AO = upper alarm limits, WO = upper warning limit, FO = upper error limit, FU = lower error limit, WU = lower warning limit, AU = lower alarm limit [1)]
8 Mnemonic names of effective modes: LG = slow–speed, SG = high–speed, ZWHD = forced manual mode, HAWF = hardware failure, XWGW = system deviation too high, NF = correction mode [1)]
9 Process–related mnemonic name of binary values [1)]
10 Process–related mnemonic name of adjacent analog values [1)]
11 Physical unit of actual value and setpoint
12 Physical unit of adjacent analog values
13 Unit of manipulated variable
14 Lower range limit of actiual value and setpoint
15 Upper range limit of actual value and setpoint
16 Mnemonic name of limit value monitoring suppression [1)]
17 Mnemonic name of external fault indication [1)]
18 Mnemonic name of the bars [1)]

[1)] Pre–defined mnemonic names, may be changed by configuration.

Dynamic data

19 Effective actual value as bar or digital display
20 Effective setpoint as bar or digital display
21 Effective system deviation as bar or digital display
22 Effective manipulated variable as digital display
23 Effective display of adjacent analog values
24 Effective states of item 4
25 Effective states of item 6
26 Effective states of item 7
27 Effective states of item 8
28 Effective states of item 9
29 Effective states of item 16
30 Effective states of item 17

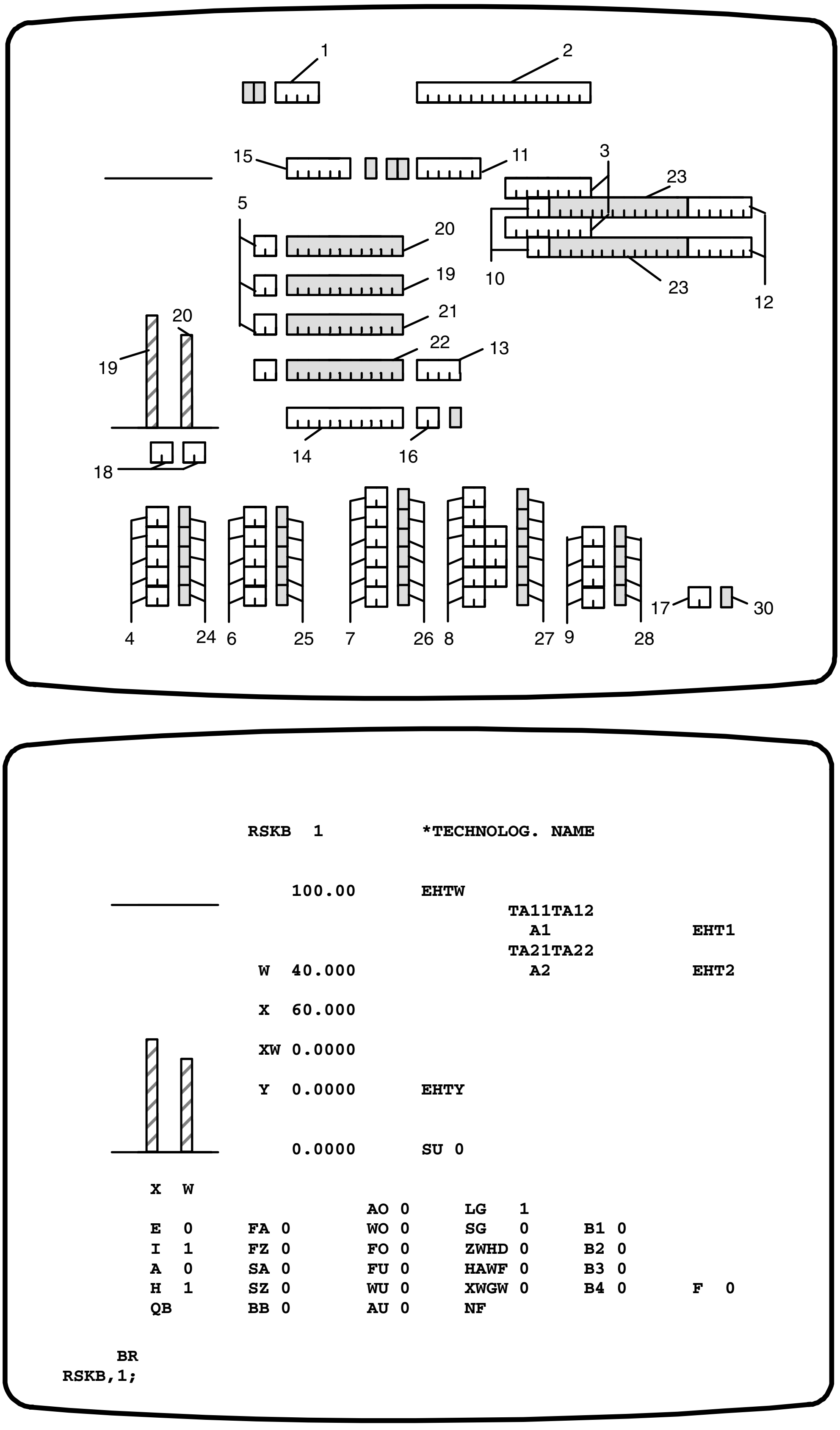


Fig. 9.195 RSKB block, normalized representation

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic names	Input/Output No.	Type
Effective manipulated variable	YW	1	AA
Effective system deviation	XWW	2	AA
Effective setpoint	WW	3	AA
Effective actual value	XW	4	AA
Upper alarm limit	AO	5	AB
Lower alarm limit	AU	6	AB
Upper warning limit	WO	7	AB
Lower warning limit	WU	8	AB
Upper error limit	FO	9	AB
Lower error limit	FU	10	AB
Module hardware failure	HAWF	11	AB
System deviation too high	XWGW	12	AB
Enable “close actuator”	YFS	13	AB
Enable “open actuator”	YFOE	14	AB
Close protection, interconnected	SSV	15	AB
Open protection, interconnected	SOEV	16	AB
Setpoint in correction mode	WNF	17	AB
Control output is corrected	YNF	18	AB
Forced manual fault	ZWHF	19	AB
Command blocked on module	BBL	20	AB
Module fault	BGF	21	AB
Hardware failure	MO9	22	AB
Power controller malfunction	M11	23	AB
Actuator malfunction	M12	24	AB
Manipulated variable YW not available	NV1	25	AB
Analog outputs not available	NV2	26	AB
Processing inhibit on module	BSPV	27	AB
External/internal mode	INEX	28	AB
Manual/automatic mode	HDAC	29	AB
Slow–/high–speed mode	LGSG	30	AB
Module acknowledgement state	QUIT	31	AB

Data structure (continued)

Meaning	Mnemonic name	Input/output No.	Type
Value for upper alarm limit	OA	1	EA
Value for lower alarm limit	UA	2	EA
Value for upper warning limit	OW	3	EA
Value for lower warning limit	UW	4	EA
Value for upper error limit	OF	5	EA
Value for lower error limit	UF	6	EA
Hysteresis value for limit value monitoring	HY	7	EA
Upper range limit setpoint WH	XE	8	EA
Upper control limit setpoint WH	WBO	9	EA
WH setpoint control input	W	10	PA
Lower control limit setpoint WH	WBU	11	EA
Lower range limit setpoint/actual value	XA	12	EA
Upper range limit manipulated variable Y	YE	13	EA
Upper control limit manipulated variable YH	YBO	14	EA
YH manipulated variable control input	Y	15	PA
Lower control limit manipulated variable YH	YBU	16	EA
Lower range limit manipulated variable Y	YA	17	EA
Value for adjacent analog value 1	AW1	18	EA
Value for adjacent analog value 2	AW2	19	EA
Value for analog value 3	AW3	20	PA
Value for analog value 4	AW4	21	PA
Value for analog value 5	AW5	22	PA
Interconnection to user image (LAYOUT)	LAYO	23	EA
Control input external mode	E	24	PB
Control input internal mode	I	25	PB
Control input automatic mode	A	26	PB
Control input manual mode	H	27	PB
Control input high–speed ON	SG	28	PB
Control input slow–speed ON	LG	29	PB
Control input module acknowledgement	QB	30	PB
Value for adjacent binary value 1	BW1	31	EB
Value for adjacent binary value 2	BW2	32	EB
Value for adjacent binary value 3	BW3	33	EB
Value for adjacent binary value 4	BW4	34	EB
Suppress limit value monitoring	STU	35	EB
Suppress status word processing	US	36	EB
Interconnection with external fault	FEXT	37	EB
Setpoint text assignment	TW	38	S2
Actual value text assignment	TX	39	S2
Manipulated variable text assignment	TY	40	S2
External text assignment	TEXT	41	S2
Internal text assignment	TINT	42	S2
AUTO text assignment	TAC	43	S2
MANUAL text assignment	THD	44	S2
Text assignment “enable actuator open”	TFA	45	S2
Text assignment “enable actuator closed”	TFZ	46	S2
Text assignment “protection open”	TSA	47	S2
Text assignment “protection closed”	TSZ	48	S2
Text assignment “high–speed”	TSG	49	S2
Text assignment “slow–speed”	TLG	50	S2

Data structure (continued)

Meaning	Mnemonic name	Input/output No.	Type
Text assignment “module acknowledgement”	TQB	51	S2
Text assignment “command blocked”	TBBL	52	S2
Adjacent analog value 1 text assignment	TAW1	53	S2
Adjacent analog value 2 text assignment	TAW2	54	S2
Adjacent binary value 1 text assignment	TBW1	55	S2
Adjacent binary value 2 text assignment	TBW2	56	S2
Adjacent binary value 3 text assignment	TBW3	57	S2
Adjacent binary value 4 text assignment	TBW4	58	S2
Upper alarm limit text assignment	TAO	59	S2
Upper warning limit text assignment	TWO	60	S2
Upper error limit text assignment	TFO	61	S2
Lower error limit text assignment	TFU	62	S2
Lower warning limit text assignment	TWU	63	S2
Lower alarm limit text assignment	TAU	64	S2
Text assignment for external faults	TFEX	65	S2
Text assignment for limit value suppression	TSTU	66	S2
Text assignment for correction mode	TNF	67	S2
Text assignment for system deviation (difference)	TXD	68	S2
Process–related name of adjacent analog value 1	TA11	69	S4
Process–related name of adjacent analog value 1	TA12	70	S4
Process–related name of adjacent analog value 2	TA21	71	S4
Process–related name of adjacent analog value 2	TA22	72	S4
Physical unit of setpoint	EHTW	73	S4
Physical unit of actual value	EHTY	74	S4
Physical unit of adjacent analog value 1	EHT1	75	S4
Physical unit of adjacent analog value 2	EHT2	76	S4
Forced manual mode text assignment	TZWH	77	S4
Hardware fault text assignment	THAW	78	S4
Text assignment “system deviation (difference) too high”	TXWG	79	S4
Adjacent analog value 3 text assignment	TAW3	80	S2
Adjacent analog value 4 text assignment	TAW4	81	S2
Adjacent analog value 5 text assignment	TAW5	82	S2
Group no./location no.	NRPL	83	ID
Value for command blocked display time	UZT	84	EA
Process–related name of RSKB	AT	85	S16

- Block list

```
   RSKB    1               09. 03. 89/ 09. 05. 08. P:  1*

 1 AA  YW    0.0000          #                   N      1
 2 AA  XWW   0.0000          #                   N      2
 3 AA  WW    0.0000          #                   N      3
 4 AA  XW    0.0000          #                   N      4
 5 AB  AO    0               #                   N      5
 6 AB  AU    0               #                   N      6
 7 AB  WO    0               #                   N      7
 8 AB  WU    0               #                   N      8
 9 AB  FO    0               #                   N      9
10 AB  FU    0               #                   N     10
11 AB  HAWF  0               #                   N     11
12 AB  XWGW  0               #                   N     12
13 AB  YFS   0               #                   N     13
14 AB  YFOE  0               #                   N     14
15 AB  SSV   0               #                   N     15
16 AB  SOEV  0               #                   N     16
17 AB  WNF   0               #                   N     17
18 AB  YNF   0               #                   N     18
19 AB  ZWHF  0               #                   N     19
20 AB  BBL   0               #                   N     20
21 AB  BGF   0               #                   N     21
22 AB  M09   0               #                   N     22
23 AB  M11   0               #                   N     23
24 AB  M12   0               #                   N     24
25 AB  NV1   0               #                   N     25
26 AB  NV2   0               #                   N     26
27 AB  BSPV  0               #                   N     27
28 AB  INEX  0               #                   N     28
29 AB  HDAC  0               #                   N     29
30 AB  LGSG  0               #                   N     30
31 AB  QUIT  0               #                   N     31
 1 EA  OA    100.00             P                      32
 2 EA  UA    0.0000             P                      33
 3 EA  OW    100.00             P                      34
 4 EA  UW    0.0000             P                      35
 5 EA  OF    100.00             P                      36
 6 EA  UF    0.0000             P                      37
 7 EA  HY    0.0000             P                      38
 8 EA  XE    100.00             P                      39
 9 EA  WBO   100.00             P                      40
10 PA  W     0.0000                            CB      41
11 EA  WBU   0.0000             P                      42
12 EA  XA    0.0000             P                      43
14 EA  YE    100.00             P                      44
14 EA  YBO   105.00             P                      45
15 PA  Y     0.0000                            CB      46
16 EA  YBU  -5.0000             P                      47
17 EA  YA    0.0000             P                      48
18 EA  AW1    15     0     0A   P                      49
19 EA  AW2    15     0     0A   P                      50
20 PA  AW3   0.0000                                    51
21 PA  AW4   0.0000                                    52
22 PA  AW5   0.0000                                    53
23 EA  LAYO  0.0000             P              C  Q    54
24 PB  E     0                                 CB      55
```

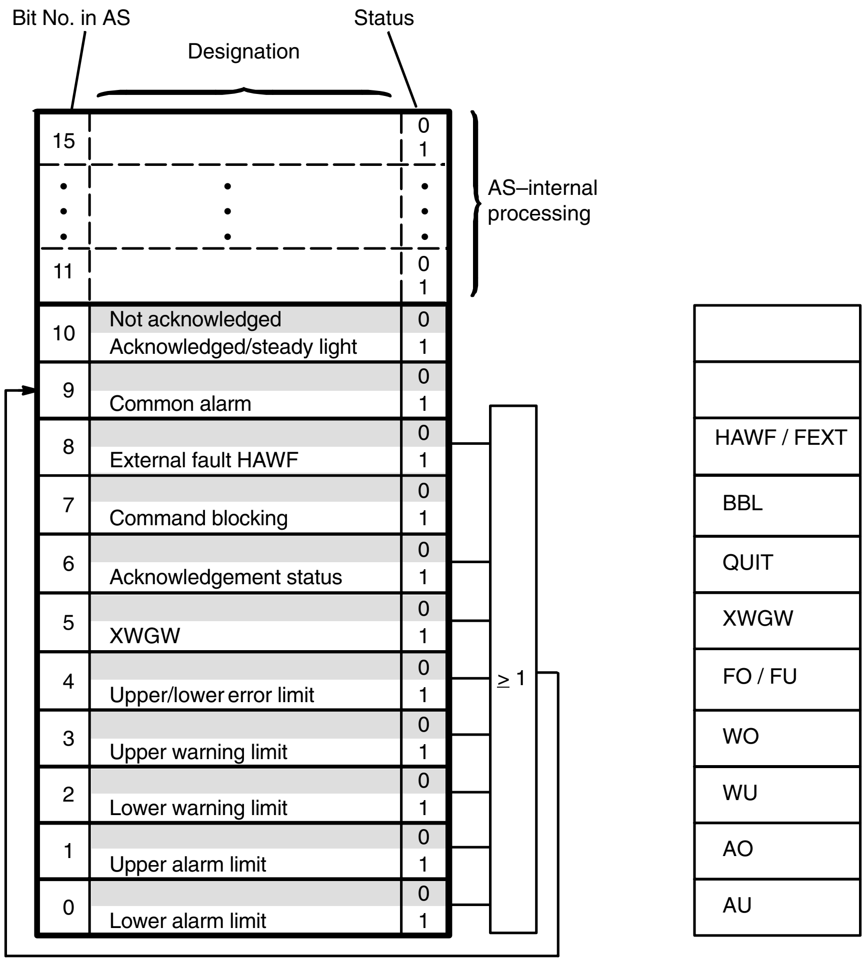
Block list (continued)

25	PB	I	0			CB	56
26	PB	A	0			CB	57
27	PB	H	0			CB	58
28	PB	SG	0			CB	59
29	PB	LG	0			CB	60
30	PB	QB	0			CB	61
31	EB	BW1	0	A	P		62
32	EB	BW2	0	A	P		63
33	EB	BW3	0	A	P		64
34	EB	BW4	0	A	P	C	65
35	EB	STU	0		P		66
36	EB	US	0		P		67
37	EB	FEXT	0		P		68
38	S2	TW	W				69
39	S2	TX	X				70
40	S2	TY	Y				71
41	S2	TEXT	E				72
42	S2	TINT	I				73
43	S2	TAC	A				74
44	S2	THD	H				75
45	S2	TFA	FA				76
46	S2	TFZ	FZ				77
47	S2	TSA	SA				78
48	S2	TSZ	SZ				79
49	S2	TSG	SG				80
50	S2	TLG	LG				81
51	S2	TQB	QB				82
52	S2	TBBL	BB				83
53	S2	TAW1	A1				84
54	S2	TAW2	A2				85
55	S2	TBW1	B1				86
56	S2	TBW2	B2				87
57	S2	TBW3	B3				88
58	S2	TBW4	B4				89
59	S2	TAO	AO				90
60	S2	TWO	WO				91
61	S2	TFO	FO				92
62	S2	TFU	FU				93
63	S2	TWU	WU				94
64	S2	TAU	AU				95
65	S2	TFEX	F				96
66	S2	TSTU	SU				97
67	S2	TNF	NF				98
68	S2	TXD	XW				99
69	S4	TA11	TA11				100
70	S4	TA12	TA12				101
71	S4	TA21	TA21				102
72	S4	TA22	TA22				103
73	S4	EHTW	EHTW				104
74	S4	EHTY	EHTY				105
75	S4	EHT1	EHT1				106
76	S4	EHT2	EHT2				107
77	S4	TZWH	ZWHD				108
78	S4	THAW	HAWF				109
79	S4	TXWG	XWGW				110

Block list (continued)

```
80 S2  TAW3  A3                                               111
81 S2  TAW4  A4                                               112
82 S2  TAW5  A5                                               113
83 ID  NRPL  0                                       C        114
84 EA  UZT   10.000              P                            115
85 S16 AT    *TECHNOLOG.NAME         16                       131
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

AO	Upper alarm limit
AU	Lower alarm limit
BBL	Command blocking
FO / FU	Upper/lower error limit
HAWF / FEXT	External hardware fault
QUIT	Acknowledgement status for module
WO	Upper warning limit
WU	Lower warning limit
XWGW	System deviation (negative deviation) too high

Fig. 9.196 Status word for the RSKB block

RZ

Input block for two–channel closed–loop controller module

Application

This block is used for the acquisition of analog and binary signals via one channel of a two–channel controller module (see Chap. 9.2).

☞ Current execution is only possible if an RZ and an RZA block are assigned to each channel of the controller module.

Method of Operation

The block converts the analog and binary values into values of system–internal representation. The controlled variable is present at the outputs 1 and 2 as a root–extracted or as a non–root–extracted physical quantity within the parameterized range (X1A, X1E).

The current actuator position (YR) and controller setpoint (W) are output as physical quantities via outputs 5 and 6. YR is represented between 0 and 100%, W within the range (X1A, X1E). The mode states are issued via outputs 7 to 11. Two analog values from unassigned inputs (of the controller module) are present as physical quantities within the measuring ranges (X2A, X2E, X3A, X3E) at outputs 3 and 4.

An additional binary value (BW) from an unassigned input (of the controller module) is issued at output 12. If an analog signal is outside the range, an alarm is issued via output 13 (XF).

If a double reading error occurs during signal acquisition (outputs 7 to 13), the fault bit (#) is entered in signal output 13 (XF). The old values remain unchanged and the respective value is marked with a fault bit if a double reading error (S 321) occurs during analog value acquisition.

A malfunction of a controller module is signalled via the associated output 14 (BGF). A control station malfunction is signalled via the associated output 15 (LGF).

The block number is parameterized via input 7, the module channel number related to the RZ block separately via input 8.

The driver should be removed or the associated XB switched off, as it should be inactive if one of the “BG number” or “KNR” parameters is changed.

- Configuration instructions

  RZ and RZA blocks pertaining to the same closed–loop control module should be installed in the execution sequence as close together as possible. This means that they can only be separated by the closed–loop control module. Distributing RZ and RZA blocks to beginning and end of a long execution sequence must be avoided.

Reason:

The execution time between RZ and RZA block has the same effect on the closed–loop control circuit as a dead time. The values aread by the RZ block will be declared invalid (S 321) if a test word written by the RZA block cannot be processed in the module before the RZ block performs the next access. The execution time of the 6DS1 402 or 6DS1 403 module cannot exceed 130 ms. Execution of an RZ block at the beginning of the cycle follows too quickly after the execution of the RZA block at the end of the cycle if the cycle is started immediately after the end of a cycle in the automation system. Even if there is sufficient time between the end of a cycle and the start of the next cycle in normal operation, this interval can be reduced to nearly zero (delayed cycle start) if additional computer time is required in the same cycle or in privileged cycles (e.g. installing, removing or displaying STEP program processing steps in NEMO). Cycle overload will only be indicated after a cycle has been omitted due to permanent cycle delay.

- System messages

S 305: No acknowledgement from module (incorrect address, incorrect jumper settings or defective)
S 313: Multiple addressing (incorrect jumper setting)
S 321: Module malfunction

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Root–extracted controlled variable	RX1	1	AA
Controlled variable	X1	2	AA
Analog value 1	X2	3	AA
Analog value 2	X3	4	AA
Actuator position	YR	5	AA [1)]
R module setpoint	W	6	AA
Manual ”1”	H	7	AB
Automatic ”1”	A	8	AB
Computer ”1”	C	9	AB
Correction external controller ”1”	N	10	AB
SPC: “1”/DDC: ”0”	SPC	11	AB
Binary value	BW	12	AB
Channel fault ”1”	XF	13	AB
Module fault ”1”	BGF	14	AB
Control station fault ”1”	LGF	15	AB
Upper range limit X1	X1E	1	EA
Upper range limit X1	X1A	2	EA
Upper range limit X2	X2E	3	EA
Upper range limit X2	X2A	4	EA
Upper range limit X3	X3E	5	EA
Upper range limit X3	X3A	6	EA
Module number	BGNR	7	I
Channel number on module	KNR	8	I

1) The manipulated variable is fed back if a controller module with continuous output (6DS1 403–8CA) is used.

- Cycle

  250 ms is the minimum processing cycle of the RZ/RZA blocks permitted for communication with the module.

- Block list

```
   RZ      1                 03. 03. 83/ 00. 09. 20. P: 1

 1 AA  RX1  0.0000           #                   N      9
 2 AA  X1   0.0000           #                   N     10
 3 AA  X2   0.0000           #                   N     11
 4 AA  X3   0.0000           #                   N     12
 5 AA  YR   0.0000           #                   N     13
 6 AA  W    0.0000           #                   N     14
 7 AB  H    0                #                   N     15
 8 AB  A    0                #                   N     16
 9 AB  C    0                #                   N     17
10 AB  N    0                #                   N     18
11 AB  SPC  0                #                   N     19
12 AB  BW   0                #                   N     20
13 AB  XF   0                #                   N     21
14 AB  BGF  0                #                   N     22
15 AB  LGF  0                #                   N     23
 1 EA  X1 E 100.00              P                       1
 2 EA  X1 A 0.0000              P                       2
 3 EA  X2 E 100.00              P                       3
 4 EA  X2 A 0.0000              P                       4
 5 EA  X3 E 100.00              P                       5
 6 EA  X3 A 0.0000              P                       6
 7 I   BGNR     0                                 C         7
 8 I   KNR      0                                 C         8
```

RZA

Output block for two–channel closed–loop controller modules

Application

This block is used for transferring the setpoint increment W (for SPC mode) or the actuating increment Y (for DDC mode), which normally comes from a controller block, to a channel of the controller module 6DS1 402 or 6DS1 403 (see Chap. 9.2).

☞ This block is only used together with an RZ block (cf. RZ block).

Method of Operation

The block transfers a normalized increment present at input 1 (W in SPC mode; Y in DDC mode) to the controller module. The highest resolution is 0,1%).

Input 2 has the following functions:

- DDC mode (without SPC jumper)
  SPDC = 0: Controller inhibit after analog signal monitoring response is effective.
  SPDC = 1: Controller inhibit after analog signal monitoring response is not effective; manual adjustment is possible.
- SPC mode (with SPC jumper)
  SPDC = 0: SPC mode
  SPDC = 1: Computer/manual mode; controller inhibit after analog signal monitoring response is not effective.

An additional unassigned binary value (BW) is transferred to the controller module via input 3. The module number is parameterized via input 4, the channel number related to the RZA block separately ia input 5.

If one of the “BGNR” or “KNR” parameters is changed, both parameters must be re–entered in the sequence “BG number – channel number”. The driver should be removed or the associated XB switched off, as it should be inactive during this operation.

BGF is set to “1” if a hardware failure occurs (QVZ, EANK, cycle time–out).

- System messages

  S 305: No acknowledgement from module (incorrect address, incorrect jumper settings or defective)
  S 313: Multiple addressing (incorrect jumper setting)

- Cycle

  250 ms is the minimum processing cycle of the RZ/RZA blocks permitted for communication with the module.

- Configuration instructions

  RZ and RZA blocks pertaining to the same closed–loop control module should be installed in the execution sequence as close together as possible. This means that they can only be separated by the closed–loop control module. Distributing RZ and RZA blocks to beginning and end of a long execution sequence must be avoided.

Reason:

The execution time between RZ and RZA block has the same effect on the closed–loop control circuit as a dead time. The values aread by the RZ block will be declared invalid (S 321) if a test word written by the RZA block cannot be processed in the module before the RZ block performs the next access. The execution time of the 6DS1 402 or 6DS1 403 module cannot exceed 130 ms. Execution of an RZ block at the beginning of the cycle follows too quickly after the execution of the RZA block at the end of the cycle if the cycle is started immediately after the end of a cycle in the automation system. Even if there is sufficient time between the end of a cycle and the start of the next cycle in normal operation, this interval can be reduced to nearly zero (delayed cycle start) if additional computer time is required in the same cycle or in privileged cycles (e.g. installing, removing or displaying STEP program processing steps in NEMO). Cycle overload will only be indicated after a cycle has been omitted due to permanent cycle delay.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Module fault	BGF	1	AB
Increment: W or Y	DC	1	EA
Controller inhibit DDC; manual compute/SPC mode SPC	SPDC	2	EB
Binary value	BW	3	EB
Module number	BGNR	4	I
Channel number on module	KNR	5	I

- Block list

```
  RZA     1                03. 03. 83/ 00. 10. 06. P: 1

1 AB  BGF  0               #                    N     6
1 EA  DC   0.0000            P                        1
2 EB  SPDC 0                 P                        2
3 EB  BW   0                 P                        3
4 I   BGNR     0                              C       4
5 I   KNR      0                              C       5
```


S

Operator communication block

Application

This block is used for operating and monitoring a sequence cascade in a process control system.

- Block tasks
  - Co–ordinating the sequence cascade
  - Mode selection
  - Displaying the sequence steps
  - Displaying the conditions related to the current step
  - Cascading operator communication blocks

- Structure of a sequencing control

  Apart from the operator communication block, which co–ordinates the sequence cascade, the following blocks are available:

  - Sequence stepper block
    The conditions and instructions of a sequence step are combined in this block.
  - Sequence branching block (OR branch)
    This block facilitates branching of a sequence cascade into various (up to 6) branches.
  - Sequence ending block
    This is the last block in a sequence cascade. It signals the end of the sequence to the operator communication block.
  - Multiplex block
    This block is used for multiplexing the STEP–M commands in a KS/KV block.

Method of Operation

- Operation requirements
  - A sequence cascade only becomes executable after an enabling signal (”1”) has been fed to the enabling input FR (enabling condition).
  - In addition, the sequence cascade must be switched on via the process communication keyboard (EI = 1 key). This sequence cascade then jumps to its first step and assumes STOP mode (ST). The required mode may then be selected via the process communication keyboard and the first step of the sequence cascade becomes “Current step” (AS).
  - The sequence cascade is switched off when the AU = 1 key is pressed. The state of the current step is retained. Restart is only possible if the EI = 1 key is pressed.
  - The sequence cascade stops and retains its current mode and status if the enabling condition has not been met during normal operation (enabling input FR = “0”).

☞ The sequence must be installed after an XB block. The XB block must be switched off when the controller is modified. No other block is allowed between the operator communication block and the first sequence step.

- Modes

  The following modes can be selected:

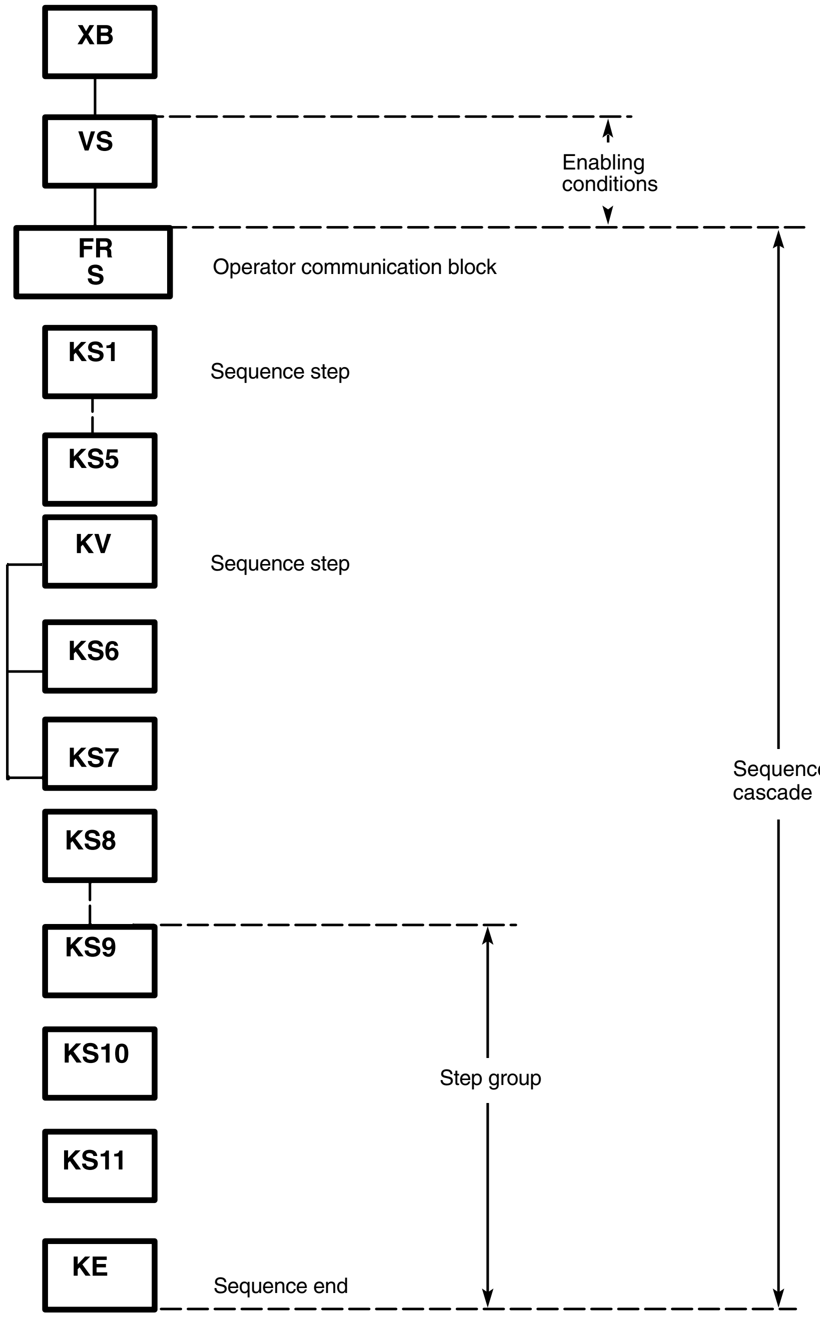
  – **Stop (ST)**
  The sequence cascade stops in this mode. The required mode can then be selected via the process communication keyboard.

  – **Automatic (A)**
  After the individual conditions of a step have been met, the sequence runs automatically in this mode.

  – **Step control with conditions (SM)**
  The sequence continues to the next step if all conditions for the current step have been met and the acknowledgement request (QS) has been acknowledged. The mode can only be selected after enabling input 7 (FRMB) has been parameterized with “1”.

  – **Step control without conditions (SO)**
  As in automatic mode; however; the step conditions are not considered and the sequence continues to the next step after acknowledgement (QS) has been issued. This mode can only be selected after enabling input 8 (FROB) has been parameterized with “1”.

  – **Step group control (SG)**
  The sequence cascade responds in the same manner as in automatic operation. The sequence stepper blocks, which have been parameterized in SG mode must, however, be acknowledged (AQ, as in SM mode).
  This mode can only be selected after enabling input 9 (FRSG) has been parameterized with “1”.



FR Enabling input
KE Sequence ending block
KS Sequence stepper block
KV Sequence branching block
S Operator communication block
VS STEP–M block
KS9 sequence stepper block parameterized as step group start

Fig. 9.197 Structure of a sequence cascade in a process control system

- Operational sequence of a sequence cascade

  The sequence is executed according to the mode selected. The operator communication block is automatically switched off and set to STOP mode after the sequence end has been reached.

- Step display

  The number of the following steps appears on the loop display (the step number is identical with the number of the sequence block):

- Set step (GS)

  All conditions for the step displayed after GS have been met and all commands issued.

- Current step (AS)

  Not all conditions for the step displayed after GS have been met or the QS key has not yet been depressed.

- Target step (ZS)

  Any target step within the sequence cascade can be selected via the process communication keyboard (ZS = key) if the system is in the SM, SO or SG modes. The current step is then replaced by the target step selected. The program then continues according to the mode selected and the display of the target step selected disappears.

- Condition display

  The loop display of the operator communication block shows the current step (AS) and up to 10 conditions as “0” or “1” states. The inputs of the condition displays must be configured in the respective sequence stepper blocks if these conditions are to be displayed (see Chapter 5).

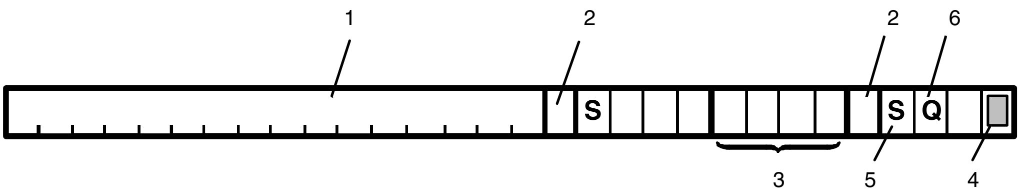
- Error display (*)

  A programmable error display (blinking asterisk) can be displayed together with the current step. For this function, the respective input of the associated sequence stepper block must be interconnected. The error display is mainly used for execution time monitoring.

- Cascading of operator communication blocks

  The mode inputs of the slaves must be interconnected with the mode outputs of the master if the mode of various operator communication blocks is to be switched on centrally by a master operator communication block. The slave’s mode input 14, which cannot be operator–controlled, is parameterized by “1”.

- Normalized representation in a group display



1 Name of the operator communication block, as in loop display
2 Separating blank
3 Number of the operator communication block
4 Blinking mark in the event of an error display
5 S for STOP
M for step control with conditions
O for step control without conditions
G for step group control
6 Q for acknowledged requests

Fig. 9.198 Operator communication block; normalized representation in a group display

The block is represented by 30 characters in a specific location of a group display. Input 15 (group display: no./location no.) must then be parameterized as follows:

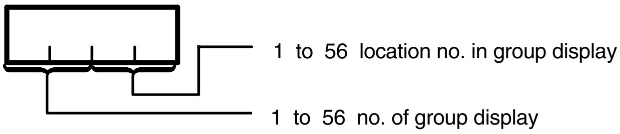


Fig. 9.199 Operator communication block; parameterization of input 15

Set input 15 (NRPL) to “0” if the normalized representation of a block in a group display is to be suppressed.

- Operator input using the process communication keyboard

  Eight keys (ST = 1, A = 1, SM = 1, SO = 1, SG = 1, EI = 1, AU = 1 and ZS =) will be assigned after the loop display has been selected and the “Operator input” (BE) key depressed.

  After the ZS = key has been depressed, the required target step may be entered as a sequence of numbers and terminated by pressing the execute key (◆). Inputs using the keys EI = 1, AU = 1, ST = 1, A = 1, SM = 1, SO = 1 and SG = 1 must be directly terminated by the execute key (◆).

ST=1	A=1	SM=1	SO=1	SG=1	EI=1	AU=1	ZS=

A Automatic
AU OFF
EI ON
SG Step group control
SM Step control with condition
ST Stop
SO Step control without condition
ZS Target step

Fig. 9.200 Operator communication block; automatic labeling of the process communication keyboard

- Normalized representation of the loop display

  Legend to Fig. 9.201:

Static data:
1 Mnemonic name and number of operator communication block
2 Process–related name of the operator communication block (the sequence cascade)
3 Mnemonic name of the steps (GS, AS, ZS)
4 Modes (ST, A, SM, SO, SG)
5 Mnemonic name (EI, AU, QS, FR)

Dynamic data:
6 Output of step number
7 Mode states
8 Operator communication block status
9 Acknowledgement request
10 Enable status
11 Condition states of the current step
12 Error display states

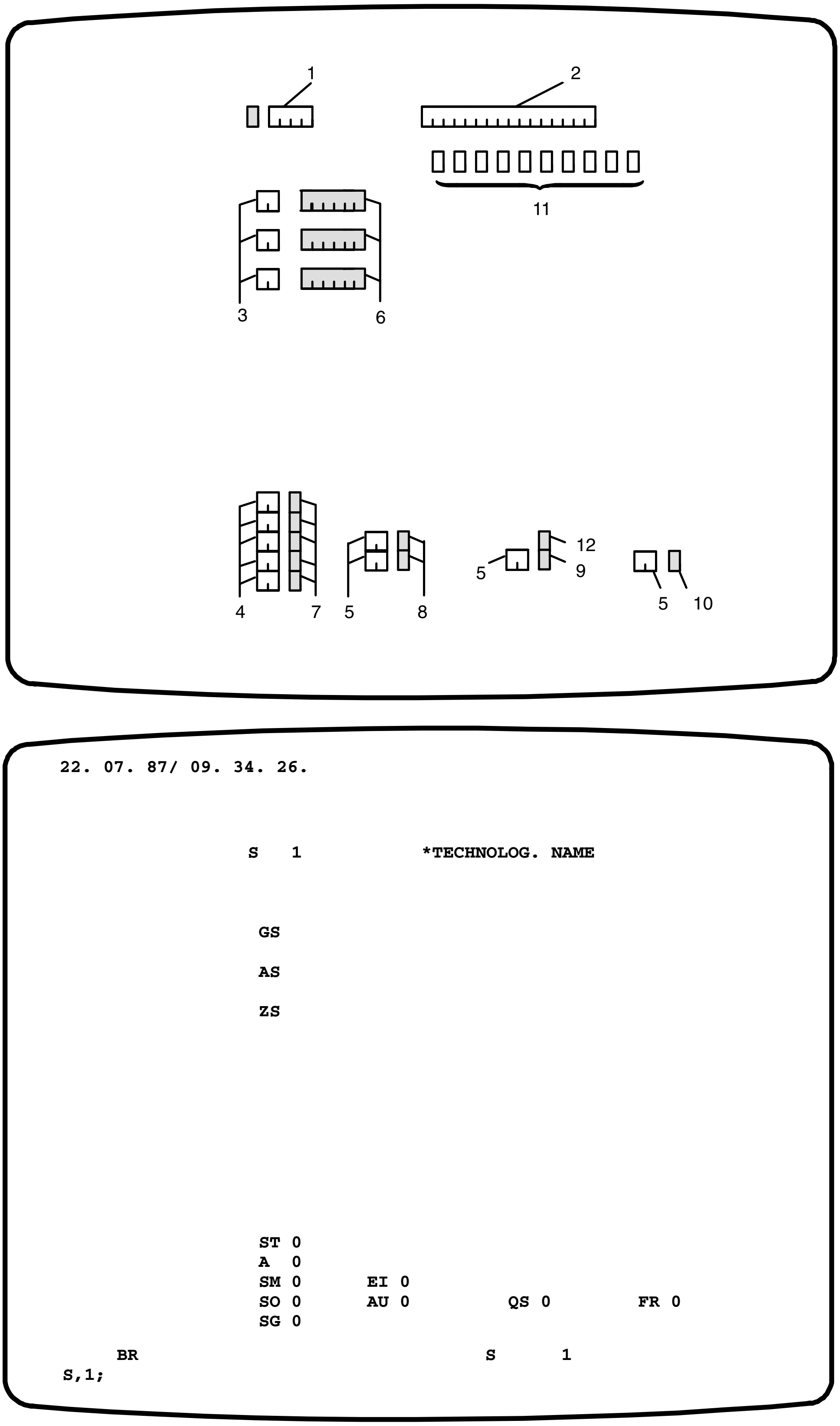


Fig. 9.201 S block; loop display

- Data structure (designation of inputs and outputs)

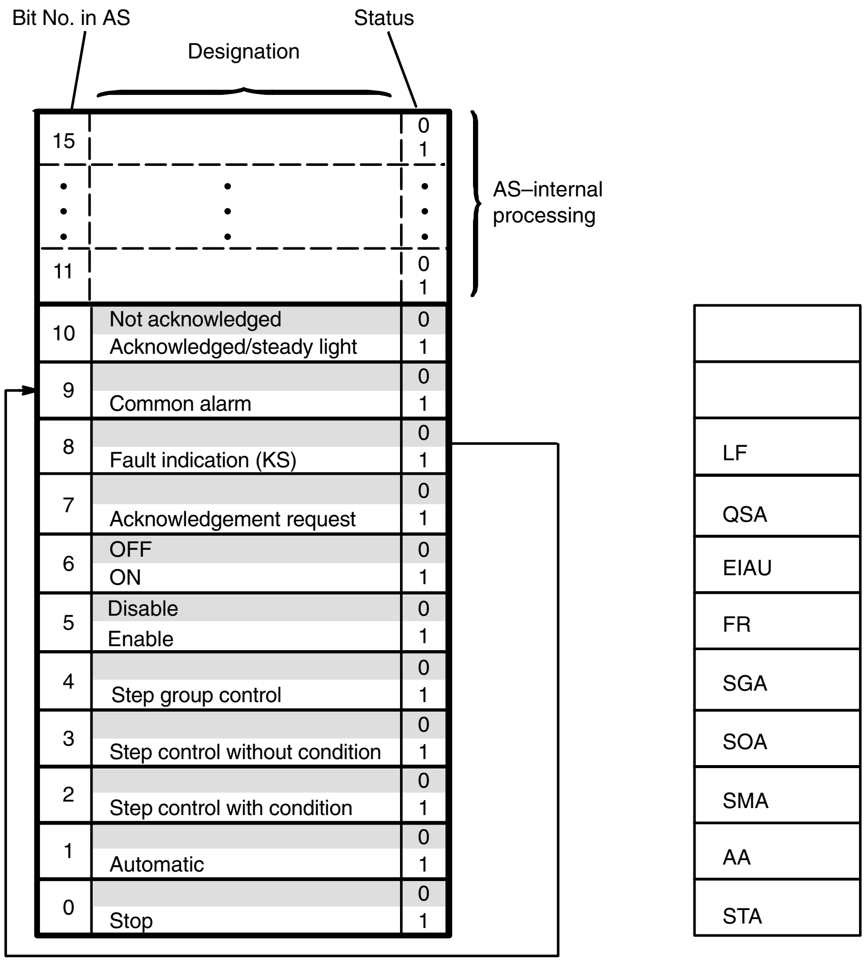
Meaning	Mnemonic name	Input/output No.	Type
ON: “1”/OFF: “0”	EIAU	1	AB
Acknowledgement request “1”	QSA	2	AB
Stop “1”	STA	3	AB
Automatic “1”	AA	4	AB
Step control with condition “1”	SMA	5	AB
Step control without condition “1”	SOA	6	AB
Step group control “1”	SGA	7	AB
Enabling “1”	FR	1	EB
Stop	ST	2	EBV
Automatic	A	3	EBV
Step control with condition	SM	4	EBV
Step control without condition	SO	5	EBV
Step group control	SG	6	EBV
Enabling step control with condition “1”	FRMB	7	EB
Enabling step control without condition “1”	FROB	8	EB
Enabling step group control	FRSG	9	EB
ON	EI	10	EBV
OFF	AU	11	EBV
Acknowledgement	QS	12	EBV
Disable output “1”	BS	13	EB
Slave “1”	SLV	14	EB
Group display: no.	NRPL	15	ID
Target step	ZS	16	EAV
Current step for display	AS	17	EAV
Cf. loop display	TGS	18	S2
”	TAS	19	S2
”	TZS	20	S2
”	TST	21	S2
”	TA	22	S2
”	TSM	23	S2
”	TS0	24	S2
”	TEI	25	S2
”	TAU	26	S2
”	TSG	27	S2
”	TQS	28	S2
”	TFR	29	S2
”	AT	30	S16

- Block list

```
   S       1                  03. 03. 83/ 00. 10. 36. P: 1

 1 AB  EIAU 0                 #                   N      30
 2 AB  QSA  0                 #                   N      31
 3 AB  STA  0                 #                   N      32
 4 AB  AA   0                 #                   N      33
 5 AB  SMA  0                 #                   N      34
 6 AB  SOA  0                 #                   N      35
 7 AB  SGA  0                 #                   N      36
 1 EB  FR   0                    P                        1
 2 EBV ST   1                                    CB       2
 3 EBV A    0                                    CB       3
 4 EBV SM   0                                    CB       4
 5 EBV SO   0                                    CB       5
 6 EBV SG   0                                    CB       6
 7 EB  FRMB 0                    P                        7
 8 EB  FROB 0                    P                        8
 9 EB  FRSG 0                    P                        9
10 EBV EI   0                                     B      10
11 EBV AU   1                                     B      11
12 EBV QS   0                                            12
13 EB  BS   0                    P                       13
14 EB  SLV  0                    P                       14
15 ID  NRPL     0                                C       15
16 EAV ZS   0.0000                               CB      16
17 EAV AS   0.0000                                 N     17
18 S2  TGS  GS                                           18
19 S2  TAS  AS                                           19
20 S2  TZS  ZS                                           20
21 S2  TST  ST                                           21
22 S2  TA   A                                            22
23 S2  TSM  SM                                           23
24 S2  TSO  SO                                           24
25 S2  TEI  EI                                           25
26 S2  TAU  AU                                           26
27 S2  TSG  SG                                           27
28 S2  TQS  QS                                           28
29 S2  TFR  FR                                           29
30 S16 AT   *TECHNOLOG.NAME            16                58
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

AA	Automatic
EIAU	ON/OFF
FR	Enable
LF	Internal element
QSA	Acknowledgement request
SGA	Step group control
SMA	Step control with condition
SOA	Step control without condition
STA	Stop

Fig. 9.202 Status word for the S block

S5KE

S5 linking receiver block

Application

This block is used as a driver block to receive message frames from SIMATIC programmable controllers. The link is established on TELEPERM M side via the interface module 6DS1 333–8AB. The interface module can be configured for one or two channels by jumper selection. Possible linking partners are e.g. SIMATIC S5–135U, S5–155U, S5–155H (always with the linking module CP 524, CP 525 or CP 544), SIMATIC S7–300 with CP 341, SIMATIC S7–400 with CP 441–2 or scales with the 3964(R) protocol and the RK 512 procedure.

On AS 488/TM, the driver block S5KE is also used for receiving message frames from programmable controllers on the PROFIBUS–AG/AG.

Method of Operation

The driver block S5KE can process a maximum of 12 message frames per cycle due to the back–up size and processing limitation.

☞ One driver block is normally sufficient for each interface module. If various driver blocks are specified, they should be installed in the same processing cycle. Proper monitoring and fault processing require that the block is embedded in a processing cycle of ≤ 1 s.

- Parameters and their meaning

  The number of received jobs (message frames) to be processed (up to 12) in each driver call (cycle–dependant) is parameterized via input 1 (MAXT). The module's receive buffer length is 12 message frames (each with 128 bytes net data) for 2–channel operation. The communication time (message frame transfer time of all jobs to be processed during one call) should not exceed the AS cycle time.

  0 means that no message frames will be processed, and the block is used for monitoring only (cf. Section "Monitoring").

  The module number (.BGNR) is parameterized via input 2.

  It can be set to a value between 0 and 60 (base unit) or 100 to 160 (extension unit).

  Driver output BGF is set if an incorrect module number is selected on the module or in the driver block or if more than one module responds to the same BGNR.

- Monitoring of the interface unit in TELEPERM M

  The driver block monitors the interface module cyclically. An error message (STOE = 1) is issued if the module does not acknowledge. The driver is also monitored for detecting a failure in the AS 235 subsystem. The monitoring figure UEBW is a user–defined value for the monitoring time interval. This value should be selected such that the driver block is processed at least once during the interval. UEBW is parameterized via input 3 and can be any value between 1 and 32767.

  Example: "UEBW" = 254 (default value)
  $n \cdot 20$ ms = a with $n = 254 \rightarrow a = 5$ s

- Deleting and specifying GA/GB blocks

  When a data block (GA/GB) is deleted and re–specified, the receive driver addressing this block must likewise be deleted and re–specified.

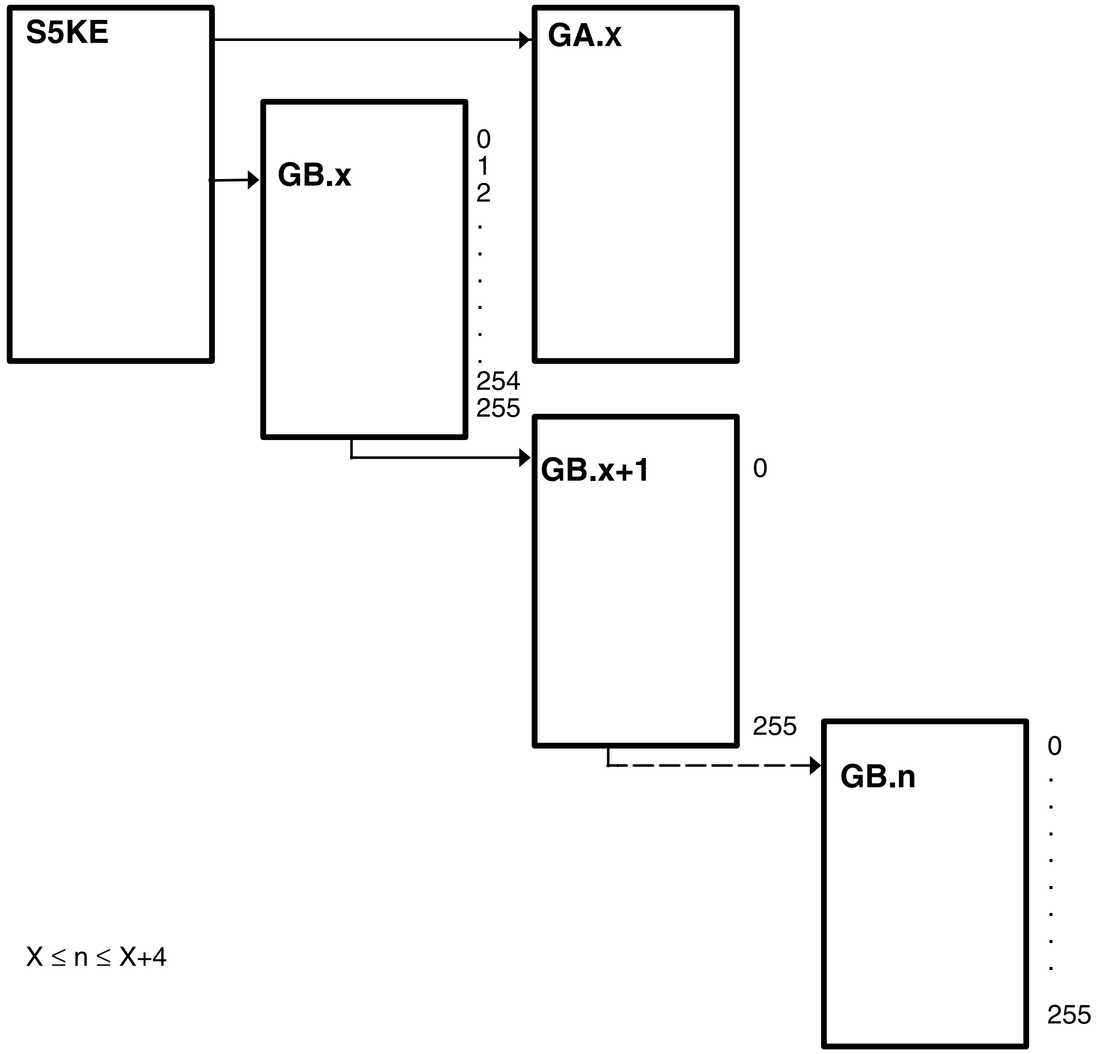


Fig. 9.203 Logic diagram

Four GB fields in ascending order are used for a message frame with 1024 bits. If the 1024–bit–message is not entered from the first location of the first GB field (GB.x), five contiguous GB fields must be specified.

- Transmitter configuration in SIMATIC S5

  Five SIMATIC S5 messages are transferred to the receiver block in each message frame header. The length of the message frame header is 10 bytes, bytes 1 and 2 always contain 00Hex.

  Remark:

  Only use numbers between 0 and 254 as block name.
  All blocks must be 256 words long.

Specification of the message frame header data from SIMATIC S5 definition:

– Type of instruction (byte 3 and 4 of S5 message frame)
  The driver block only recognizes the identifier “AD” (output instruction)
– AS 235 target address (bytes 5 and 6 of S5 message frame).
  The data received is stored in a GB or GA block for further processing. Byte 5 contains the GA or GB area, byte 6 the element number where the data is to be stored. If more than 256 binary values have been received, the receive job (= 1 long message frame with 1024 values/128 bytes) is written to a maximum of four GB fields in ascending order. The blocks must be defined before the receiver driver is installed in the processing sequence.

Conditions:	Block name	0 – 254
	Block length	256 (mandatory)

– Number of data (bytes 7 and 8 of S5 message frame). This value is always specified in data words (1 word = 2 bytes = 16 bits).
– Code for data type/co–ordination flag (bytes 9 and 10 of S5 message frame). There is only one data type in each message frame. The code corresponds to the co–ordination flag bit in byte 10 (see Table 1). Flag byte 9 is not interpreted, but must, however, differ from 0, as otherwise bytes 9 and 10 of the message frame from the CP 525 will contain FFH.

Data type (S5)	Code	Unit	Max. number/values per receive job
Binary value	0	16 values	1024
Fixed point value (16 bits)	1	1 value	64
Floating point value (32 bits)	2	1 value	32

Table 9.6 Data structure

– Data (follows immediately after the message frame header, bytes 11 up to 138). Up to 128 bytes can be used in a receive job (message) for data transfer.

☞ The byte–by–byte transfer of binary values (except flags) causes the high– and low–order byte to be swapped, i.e. the higher–order is the first in the sequence.

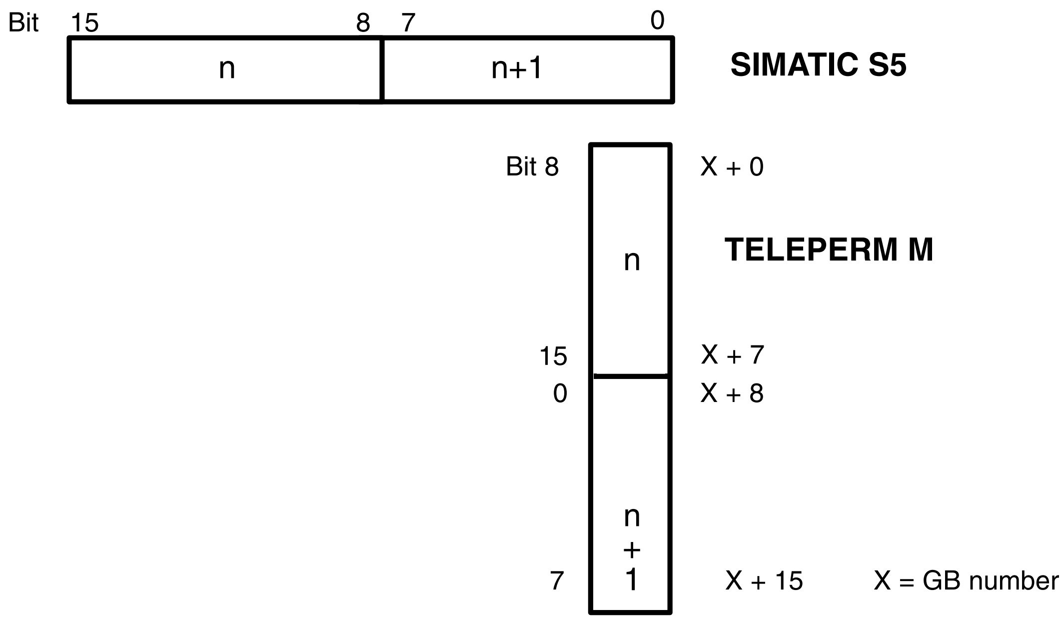


Fig. 9.204 Message frame structure

- Fault processing

Outputs 2 to 11 are set for fault detection:

BGF

Module fault (hardware)
Reaction: Execution is aborted, S 305

STOE

Module failure (software)
– Self–detection by interface module
– Monitoring function has responded
Reaction: Execution is aborted

PAF1, PAF2

The partner connected to channel 1 or channel 2 respectively is defective (USART fault at interface 1/2, e.g. incorrect baud rate, parity frame or overrun error).
Reaction: None

KF1, KF2

There is a fault in the link between partner 1/2 and the interface module (line fault at interface 1/2, e.g. character time–out 220 m, acknowledgement time–out 550 ms, return message time–out 5 s, check–sum error BCC 3964R after 5 repetitions, open–circuit).
Reaction: S 387

STF

Configuration fault
– Block cannot be found
– Incorrect block name (> 254)
– Block too short (< 256)
Reaction: The message is rejected and execution aborted.

STGA, STGB

(Appears together with STF). The configuration fault STF is caused by a GA or GB block. The nunber of the block responsible for the message is applied to output FBST.

Only numbers between 0 and 254 are permitted as block names!

EPU Receive buffer overflow
Reaction: Execution is continued.
The last message is rejected by the interface module if the buffer processing does not continue after a waiting time.
Remedial action: Check processing cycle.

Remark:

KF and PAF are not set in message–specific manner, they are indicated in all drivers accessing during the error bit output of the module firmware in the dual port RAM (no error interpretation related to the transmitter block).

- System messages

S 305 No acknowledgement from module (incorrect address, incorrect jumper settings or defective).
S 313 EANK, Multiple addressing, acknowledgement from module (incorrect jumper setting).
S 321 Module function disturbed
S 387 Malfunction on bus or link

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
”No.” of the defective block (No. 0 to 254!)	FBST	1	AA
Module fault	BGF	2	AB
Interface module fault	STOE	3	AB
Partner 1 defective	PAF1	4	AB
Partner 2 defective	PAF2	5	AB
Link 1 defective	KF1	6	AB
Link 2 defective	KF2	7	AB
Configuration fault	STF	8	AB
GA block configuration fault	STGA	9	AB
GB block configuration fault	STGB	10	AB
Receive buffer overflow	EPU	11	AB
Number of messages per cycle	MAXT	1	EA
Module number	BGNR	2	I
Monitoring figure	UEBW	3	ID

Execution time in AS cycle (depending on message frame length and number parameterized in MAXT): 2,9 to 20,3 ms.

- Block list

```
  S5KE    ORPA                                  P:   1

 1 AA   FBST 0.0000           #  P                   1
 2 AB   BGF  0                #  P                   2
 3 AB   STOE 0                #  P                   3
 4 AB   PAF1 0                #  P                   4
 5 AB   PAF2 0                #  P                   5
 6 AB   KF1  0                #  P                   6
 7 AB   KF2  0                #  P                   7
 8 AB   STF  0                #  P                   8
 9 AB   STGA 0                #  P                   9
10 AB   STGB 0                #  P                  10
11 AB   EPU  0                #  P                  11
 1 EA   MAXT 0.0000              P             C    12
 2 I    BGNR 0                                 C    13
 3 ID   UEBW 254                                    14
```

S5KS

S5 linking transmitter block

Application

This block is used as a driver block to transmit message frames to programmable controllers and other devices with the appropriate SIMATIC transport protocol. The link is established via the interface module 6DS1 333–8AB (for TELEPERM M AS 235 or CP 525 (for S5). The interface module is configured for one or two channels (hardware jumper). Possible linking partners are e.g. SIMATIC S5–135U, S5–155U, S5–155H (always with the linking module CP 524, CP 525 or CP 544), SIMATIC S7–300 with CP 341, SIMATIC S7–400 with CP 441–2 or scales with the 3964(R) protocol and the RK 512 procedure.

On AS 488/TM, the driver block S5KE is also used for sending message frames from programmable controllers on the PROFIBUS–AG/AG.

Method of Operation

The message frames transmitted by the driver block S5KS to the linking partners contain an input or an output instruction. The input command corresponds to an fetching message (the linking partner must therefore dispose of the corresponding processing functionality).
The automation system sends the data to the linking partner on an output command.

The buffer for transferred message frames is designed for a maximum of 2 * 6 message frames. The flow is determined on principle with the buffer size and the rendering or the transferring.

⚠ During the programming of the S5KS driver blocks, it is important to take care that the blocks for the same channel and the same module are always installed into the same channel and with the same sampling parameter! The S5KS blocks use a common transferring buffer. The full buffer length is only available in an one–channel operation.

- Parameters and their meaning

  A driver block must be specified for each message frame. The blocks are enabled via input 1 (FSE = 1).

  The module number (BGNR) is parameterized via input 2.

  It can be set to a value between 0 and 60 (base unit) or 100 to 145 (extension unit).

  Driver output BGF is set if an incorrect module number is selected on the module or in the driver block or if more than one module responds to the same BGNR.

  The channel number (1 or 2) is selected via input 3 (KNR). Single– or two–channel operation is possible.

  KNR = 1 Message frame transfer to partner 1 only.
  KNR = 2 Partner 2 exists: message frame transfer also to partner 2.
  No partner 2: message frame transfer to partner 1 only. Transfer occurs only after all messages defined by KNR = 1 have been processed. This facilitates priority–controlled execution of transmission requests.

- Description of functions

  The user generates the data structure by specifying data type, number and source/target address.

  The codes for data type (input 4, DAAR), block name (input 5, GAGB), element no. (input 6, ELNR) and number of data (input 7, ANZ) must be specified in this order. The data blocks must be specified before the drivers are installed. A block length of 256 must also be specified (mandatory).

Remark:
Only numbers between 0 and 254 are permitted as block names.

- Message frame structure in TELEPERM M from SIMATIC S5 definition

The driver block transfers a message frame with a message frame header consisting of 5 words/10 bytes. (Message frame length = message frame header for input instruction (ED), fetch message). The message frame header contains the following data:

– Command type
– Target in S5
– Number of data
– Co–ordination flag

<u>Command type</u>

Output command	AD [4]	Data block, overwrite data word in S5
Input command	ES	Read absolute address from S5
(fetch message frames)	ED [4]	Data block, read data word from S5
	EE	Read input image from S5
	EA	Read output image from S5
	EM	Read flag from S5
	EZ	Read counter value from S5 [1]
	ET	Read timer value from S5 [1]

The individual command types are distinguished by the mode (input 10, MODI).

<u>Target in S5</u>

Inputs 8 (PA1) and 9 (PA2) specify the address in S5. The input parameterization depends on the command type.

MODI (mode)	PA1	PA2
AD [2) 4)]	Data block	Data word
ED [2) 4)]	Data block	Data word
ES [3) 4)]	Higher–order byte	Lower–order byte
EE	0	No. of input byte
EA	0	No. of output byte
EM	0	No. of flag byte
ET [1]	0	No. of time word
EZ [1]	0	No. of counter word

Table 9.7 Allocation of addresses (PA1, PA2) and modes (MODI)

1) Counter and timer values are transferred as fixed point values. The code bits generated by S5 are not interpreted. The time value is given in multiples of one second.
2) DAAR (input 4) = 2 (floating point numbers, 32 bit format): even data word number for PA2. Floating point numbers must be stored on even word boundaries (0, 2, 4 ...) in SIMATIC S5, if they are to be transferred to TELEPERM M.
3) The values are to be specified as decimal number: 0–255.
4) Only these two modes are permitted for CP 525/CP 544 (SIMATIC U series).

The parameters 5 (GAGB) and 6 (ELNR) of the driver block are used to specify the source (AD, data output) or the target (ED, fetch message) in the AS 235.

A sufficient number of GA/GB data blocks of appropriate length has to be defined in the AS. Only numbers arranged in ascending order (0 to 254) are permitted as block names. The number of the first block must be entered in parameter 5 (GAGB).

Number of data (see Table 9.8)

The number (input 7, ANZ) depends on the data type (see Table 9.8). Up to 64 words (128 bytes) are available for data transfer. Each message contains only one data type (MODI).

Co–ordination flag

S5 expects the co–ordination flag (byte/bit) here. The transmitter driver always transfers ”H = FFFF” to S5.

DAAR	GAGB	ELNR	ANZ (≤ 64)
0: binary value	GB block no. 0 to 254	0 –255	1 to 1024 words (16 values/word)
1: fixed point number (16 bits)	GA block no. 0 to 254	0 –255	1 to 64 words (1 value/word)
2: floating point number (32 bits)	GA block no. 0 to 254	0 –255	1 to 32 words (1 value/2words)

Table 9.8 Parameterization of the S5KS transmitter driver

These specifications apply for input and output commands. As SIMATIC S5 does not verify the data type, it should be selected in expedient manner. In an output command, inputs 5 (GAGB) and 6 (ELNR) refer to the data source, in an input command (fetch command) they refer to the data target in the AS 235.

The parameters PA1 (input 8) and PA2 (input 9) specify the data target (output command) and the data source (input command/fetch message) in the S5.

- Link monitoring

The transmitter driver does not contain any mutual monitoring function between AS 235 and S5; this is performed by the S5KE receiver driver. A receiver driver must be specified for monitoring only if a data receiver driver (S5KE) is not required in the system. Input 1 (MAXT) of this driver is to be parameterized with 0.

- Deleting and specifying GA/GB blocks

When a data block (GA/GB) is deleted and re–specified, input 5 (GAGB) must be re–parameterized. If the number of data exceeds the block length, the system automatically uses the block of the same type with the next higher block number. This means that the data block fields (GA/GB) must also be specified before the driver block is installed in the processing cycle.

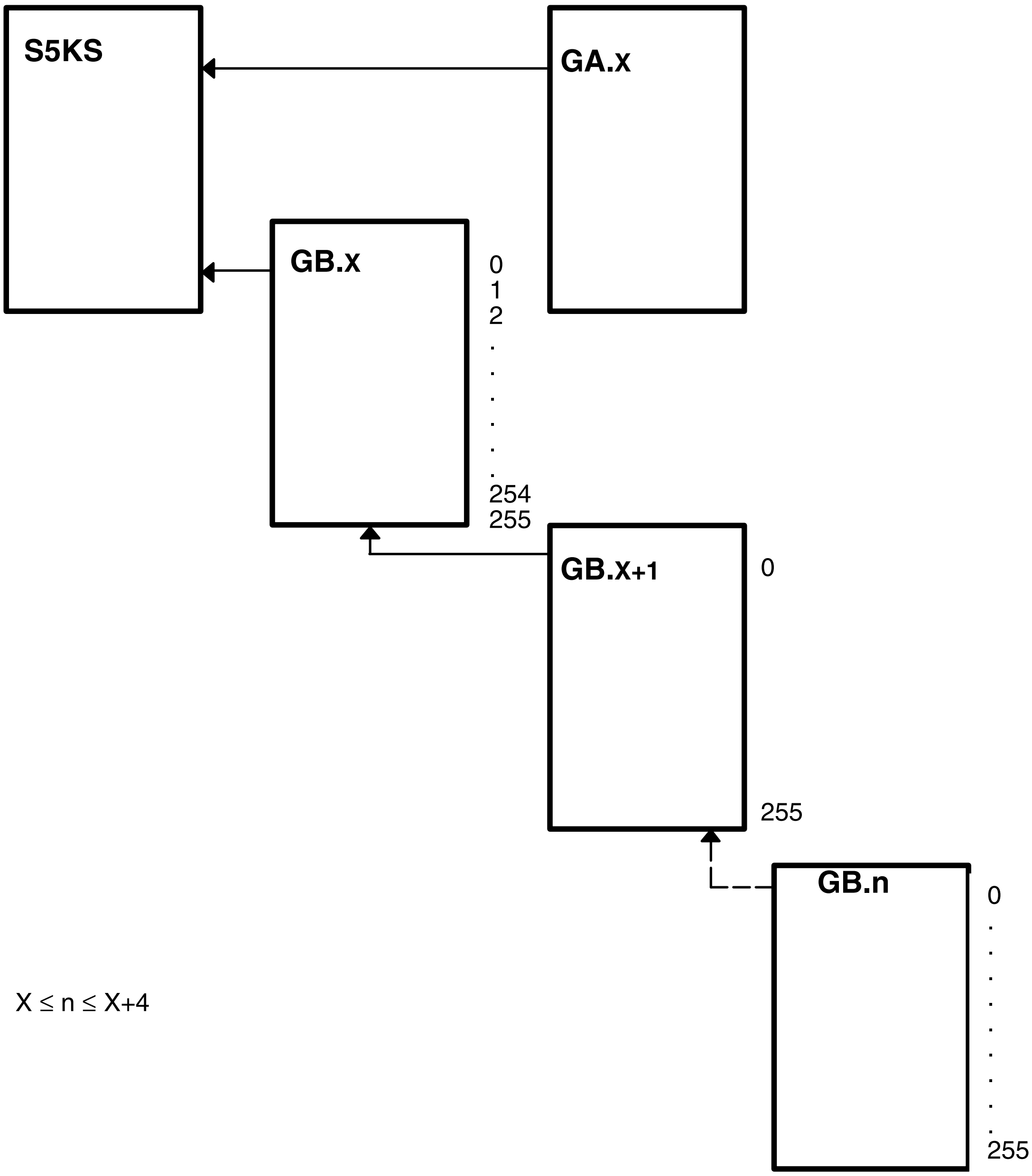


Fig. 9.205 Logic diagram

Four GB fields in ascending order are transferred for a message frame with 1024 bits. If the 1024–bit message frame is not entered from the first location of the first GB field (GB.x), five contiguous GB fields must be specified.

- Fault processing

  Outputs 2 to 14 are set for fault detection:

BGF	Module fault (ready time–out) Reaction: Execution is aborted, S 305
STOE	Interface module failure (self–detection) Reaction: Execution is aborted
KAFE	Second channel is missing (this output is set if the jumper has been configured for single–channel operation and channel 2 has been addressed by the S5KS block). Reaction: Error message when the second channel is addressed. Message frames are transferred to channel 1 (only after all message frames from the buffer have been transferred there (priority–dependant transmission).
KF1, KF2	There is a fault in the link between partner 1/2 and the interface module (line fault at interface 1/2, e.g. character time–out 220 ms, acknowledgement time–out 550 ms, return message frame time–out 5 s, check–sum error BCC 3964R after 5 repetitions, open–circuit). Reaction: S 387; the message frame is transferred to the interface module.
PAF1, PAF2	The partner connected to channel 1 or channel 2 respectively is defective (USART fault at interface 1/2, e.g. incorrect baud rate, parity, frame or overrun error). Reaction: The message frame is transferred to the interface module.
STF	Configuration fault 1. incorrect definition of GA/GB block: – Block cannot be found – Incorrect block number (> 254) – Block too short (< 256) 2. Incorrect parameterization of transmitter driver: – Incorrect number of data (floating point number ANZ > 32) 3. Fixed point overflow Range of the fixed point number to be transferred has been exceeded. Reaction: Execution is aborted.
STGA, STGB	(Appears together with STF). The configuration fault “STF” is caused by a GA or GB block. The number of the block responsible for the message is applied to output “FBST”.
TF1, TF2	Message time fault: S5 at channel 1 or channel 2 has not accepted the last message frame (an error number was contained in the reaction message frame). Reaction: None.
SPU1, SPU2	Transmit buffer overflow on interface module (channel 1 or 2) Reaction: Execution is aborted until the overflow bit in the channel concerned has been cleared: No message frames are transferred as long as the overflow bit is set.

Remark:

KF and PAF are not set in a message–specific manner; they are indicated in all drivers accessing during the error bit output of the module firmware in the dual port RAM (no error interpretation related to the transmitter block).

Output TF is only displayed by the driver block accessing first, as the driver resets the bit in the dual port RAM.

- System messages

S 308 Configuration error (user, see STF)
S 305 No acknowledgement from module (incorrect address, incorrect jumper settings or defective)
S 313 EANK, Multiple addressing/module acknowledgement (incorrect jumper setting).
S 387 Malfunction on bus or link

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Number of defective block	FBST	1	AA
Module fault	BGF	2	AB
Interface module fault	STOE	3	AB
Partner 1 defective	PAF1	4	AB
Partner 2 defective	PAF2	5	AB
Link 1 defective	KF1	6	AB
Link 2 defective	KF2	7	AB
Channel 2 missing	KAFE	8	AB
Message frame fault 1	TF1	9	AB
Message frame fault 2	TF2	10	AB
Configuration fault	STF	11	AB
GA block configuration fault	STGA	12	AB
GB block configuration fault	STGB	13	AB
Transmit buffer 1 overflow	SPU1	14	AB
Transmit buffer 2 overflow	SPU2	15	AB
Enabling transmitter: 1 = active, 0 = inactive	FSE	1	EB
Module number	BGNR	2	I
Channel number	KNR	3	I
1 = Message frames are sent to interface 1			
2 = Message frames are sent to interface 2			
Data type	DAAR	4	I
Block number	GAGB	5	I
Variable number	ELNR	6	I
Number of data (Table 9.8)	ANZ	7	I
Partner address 1	PA1	8	EA
Partner address 2	PA2	9	EA
Command mode	MODI	10	S2

Execution time in AS cycle (depending on message length)

Binary values: 3,09 to 18,1 ms
Fixed point number: 3 to 16,5 ms
Floating point number: 3,5 to 14 ms

- Block list

```
   S5KS    ORPA                                                  P:   1

  1 AA   FBST 0.0000           #  P                                   1
  2 AB   BGF  0                #  P                                   2
  3 AB   STOE 0                #  P                                   3
  4 AB   PAF1 0                #  P                                   4
  5 AB   FAF2 0                #  P                                   5
  6 AB   KF1  0                #  P                                   6
  7 AB   KF2  0                #  P                                   7
  8 AB   KAFE 0                #  P                                   8
  9 AB   TF1  0                #  P                                   9
 10 AB   TF2  0                #  P                                  10
 11 AB   STF  0                #  P                                  11
 12 AB   STGA 0                #  P                                  12
 13 AB   STGB 0                #  P                                  13
 14 AB   SPU1 0                #  P                                  14
 15 AB   SPU2 0                #  P                                  15
  1 EB   FSE  0                   P                                  16
  2 I    BGNR     0                              C                   17
  3 I    KNR      1                              C                   18
  4 I    DAAR     0                              C                   19
  5 I    GAGB   255                              C                   20
  6 I    ELNR     0                                                  21
  7 I    ANZ      1                              C                   22
  8 EA   PA1  0.0000              P                                  23
  9 EA   PA2  0.0000              P                                  24
 10 S2   MODI AD                                 C                   25
```


SKS

Status linking transmitter block

Application

The SKS block enables the user to transfer status information in a configurable manner to a higher–order system (OS, computer). The block can be used in stand–alone mode or perform status processing for a block created by the user. The block also imports information into the AS alarm hierarchy. The SKS responds as a user function block.

Method of Operation

The SKS block generates a status word from a maximum of nine binary inputs (0 to 8). A group alarm can be generated from bit 0 to 2 and 8 and entered in the hierarchy (cf. MODI, SAST). Acknowledgement is performed by

- selecting the SKS display or
- selecting the interconnected "user display" or
- external acknowledgement via QS input in the block list.

- Sources/targets
  - The status word is composed of
    - the individual data from bits 0 to 8 or
    - the individual bit information from bits 0 to 3 and 8 and a numeric value between 0 and 15 in the ANST parameter.
      SKS generates the corresponding bit combination for bits 4 to 7 from this number (Bit 4 corresponds to 2^0 up to bit 7 which corresponds to 2^3).
  - Bits 0 to 2 and 8 contain fault information and influence the blinking mark, dependent on MODI.
  - Bits 4 to 7 are general–purpose information bits for the user (e.g. states, modes, etc.) which are neither used in the AS nor in the OS hierarchy.
  - The status word is transferred to OS and computer in a standard format via the bus.
  - Status information is normally stored in the STAT status word of the SKS block. If the BADR parameter has been interconnected with the corresponding parameter, this information may also be stored in a different block. The internal STAT status word is corrected in this case.

- Acknowledgement

  Acknowledgement sets the status word acknowledgement bit (bit 10). A blinking mark is set to steady light until all faults have disappeared (mark disappears) or a new fault appears (mark starts blinking). A "1" in status bits 0 to 2 or in bit 8 is considered as a pending fault.

  Acknowledgement is possible by:

  – Input QS = 1
  – selecting the SKS loop display which has been interconnected with BADR. (Interconnection with element 0 or the status word of this block if values are to be entered in this status word, see above). No acknowledgement = acknowledgement only with SKS display or external acknowledgement.
  – external acknowledgement via the bus;

- Representation on the screen

```
               SKS   1         *TECHNOLOG. NAME


         B0    0

         B1    0

         B2    0

         B3    0

         B4    0          2)

         B5    0          2)
         T1    0    T2AN  1)
         B6    0          2)

         B7    0          2)

         B8    0

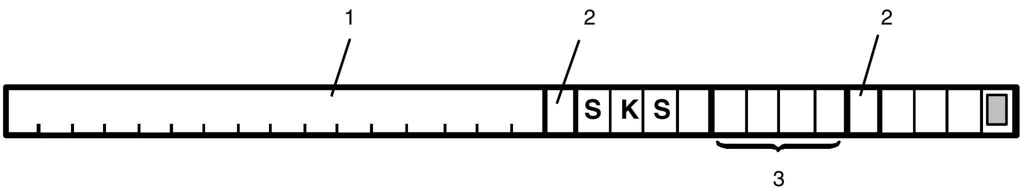


      BR
  SKS,1;
```

1) in mode MODI = 1 or 3
2) in mode MODI = 0 or 2

Fig. 9.206 SKS block

- Loop display information
  - States of all eight status bits and associated texts: (texts = TB0 to TB8, states B0 to B8)
  - Fault alarms (bits 0, 1, 2, 8) green on black if “0” white on red if “1”
  - Mode messages (bits 4 to 7) white on black
  - Analog values ANST and T2AN gelb
  - S16 string AT green
  - Type/BST name of SKS block
- Normalized representation in a group display



1 Process–related name
2 Blank
3 Number/name of SKS block

Fig. 9.207 SKS block, normalized representation in a group display

When SKS blocks are defined, any four alphanumeric characters can be used as block name. The block is installed in a cyclic level (ZYK 2 or ZYK 3) for processing.
Both blocks should be executed under the same XB if the SKS is executed together with a user–specific block.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
0 = block inactive 1 = block active	AUEI	1	EB
Binary value for status word bit 0	B0	2	EB
Binary value for status word bit 1	B1	4	EB
Binary value for status word bit 2	B2	6	EB
Binary value for status word bit 3	B3	8	EB
Binary value for status word bit 4	B4	10	EB
Binary value for status word bit 5	B5	12	EB
Binary value for status word bit 6	B6	14	EB
Binary value for status word bit 7	B7	16	EB
Binary value for status word bit 8	B8	18	EB
Text for binary value B0	TB0	3	S2
Text for binary value B1	TB1	5	S2
Text for binary value B2	TB2	7	S2
Text for binary value B3	TB3	9	S2
Text for binary value B4	TB4	11	S2
Text for binary value B5	TB5	13	S2
Text for binary value B6	TB6	15	S2
Text for binary value B7	TB7	17	S2
Text for binary value B8	TB8	19	S2
Status word for analog value; only integer part 0 to 15 at bits 4 to 7	ANST	20	EA
Text for ANST (S2) in OS log	T1AN	22	S2
Text for ANST (S4) in OS log	T2AN	23	S4
External acknowledgement input; 1 = external acknowledgement	QS	21	EB
Mode specification for external image acknowledgement/analog value display in status 0 = binary values only, no external image acknowledgem. 1 = binary values B0 to B3, B8 and analog value ANST; no external image acknowledgement 2 = binary values with external image acknowledgement 3 = binary values B0 to B3, B8 and analog value ANST; with external image acknowledgement	MODI	24	I
External image acknowledgem. connection/external status – interconnection with element 0 of a block; external image acknowledgement only – interconnection with element X (status word) of a block: external acknowledgement and status word in external [1)]	BADR	26	EA

1) If element X is behind the separating element, the interconnection must be executed in mode NEDA as "interconnection with one input".
e.g.:
```
NEDA;
A,SKS,---;
Q,26,type,block,no:E;
END;
```

Data structure (continued)

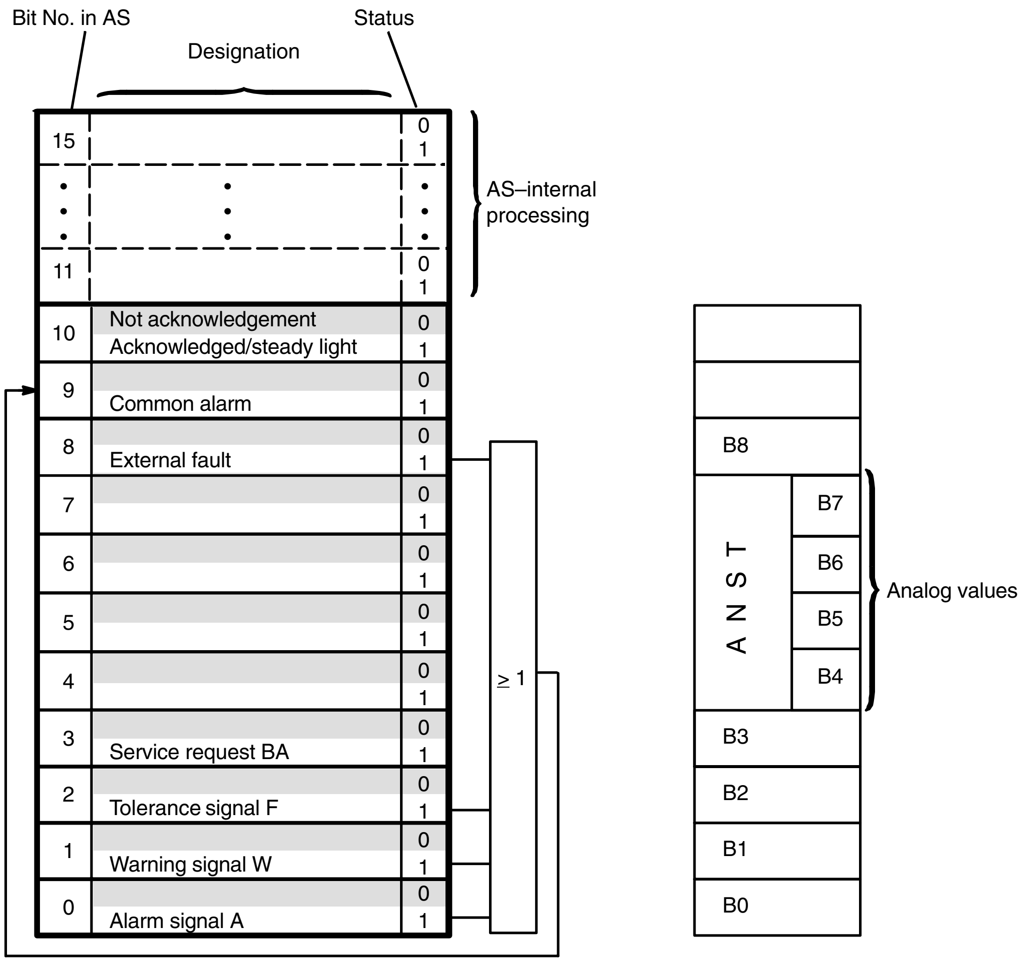
Meaning	Mnemonic name	Input/output No.	Type
Group display/location number specification; only block name, S16 string and mark are entered in the group display	NRPL	25	ID
S16 string inserted in group display	AT	27	S16
Common alarm, ORed of bits 0 to 2 and 8,	SAST	1	AB
Acknowledgement status of common alarm = 1 common alarm acknowledgement; mark = steady light = 0 acknowledgement request; mark = blinking	QSZU	2	AB

- Block list

```
   SKS      1

 1 AB  SAST 0                                      N      27
 2 AB  QSZU 0                                      N      28
 1 EB  AUEI 0                    P                         1
 2 EB  BO   0                    P                         2
 3 S2  TB0  B0                                             3
 4 EB  B1   0                    P                         4
 5 S2  TB1  B1                                             5
 6 EB  B2   0                    P                         6
 7 S2  TB2  B2                                             7
 8 EB  B3   0                    P                         8
 9 S2  TB3  B3                                             9
10 EB  B4   0                    P                        10
11 S2  TB4  B4                                            11
12 EB  B5   0                    P                        12
13 S2  TB5  B5                                            13
14 EB  B6   0                    P                        14
15 S2  TB6  B6                   P                        15
16 EB  B7   0                                             16
17 S2  TB7  B7                   P                        17
18 EB  B8   0                                             18
19 S2  TB8  B8                   P                        19
20 EA  ANST 0.0000               P                        20
21 EB  QS   0                    P                        21
22 S2  T1AN T1                                            22
23 S4  T2AN T2AN                                          23
24 I   MODI     0                                C        24
25 ID  NRPL     0                                C        25
26 EA  BADR 0.0000               P               C  Q     26
27 S16 AT       *TECHNOLOG.NAME       16                  35
```

- Status word



Status word in AS

Associated data elements in the block list of the SKS block [1])

B0 ... B8 Binary value for bits 0 ... 8 in the status word

[1]) Bits 0 to 8 of the status word are assigned in the case of the TML block as specified under the column “Status word in AS”.

Fig. 9.208 Status word for the TML/SKS block

SPEI

Buffer block

Application

This block is used for buffering analog values in the GA area (analog value buffer, up to 256 values).

Method of Operation

In each cycle, the analog value applied to X (= Y) is stored in the GA area. A total of ANZ values can be stored. The buffer starting address is the GA cell interconnected with GAA (GA address). The write pointer SZ ($0 \leq SZ \leq ANZ - 1$) indicates where the next value will be stored.

- Mode:
  - BA = 0: Cyclic buffer operation. Starting at GAA, ANZ values are stored. Output VOLL is set after the ANZth value has been stored. The next analog value overwrites the first value, etc.
  - BA = 1: Batch buffer operation. Starting at GAA, ANZ values are stored. Output VOLL is set after the ANZth value has been stored. No additional values are accepted.
  - RS = 1: Reset
    The write pointer SZ is set to zero, the current time (of the first value) is entered in ZSEC (1/8 seconds of hour) and ZSTD (hours of week). RS and VOLL are reset. Further operation as described above.
- Initialization behavior

  The SPEI block performs an initialization run if an upstream XB block is switched off and back on. The SPEI block is reset (same function as for reset: RS = 1).
- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Write pointer	SZ	1	AA
Time: 1/8 s/h	ZSEC	2	AA
Time: hours/week	ZSTD	3	AA
Output	Y	4	AA
Buffer full	VOLL	5	AB
Input	X	1	EA
Mode	BA	2	EB
Reset	RS	3	EB
GA address	GAA	4	EA [1)]
Number of values	ANZ	5	ID

1) Input can only be interconnected. This must be performed before the block is installed.

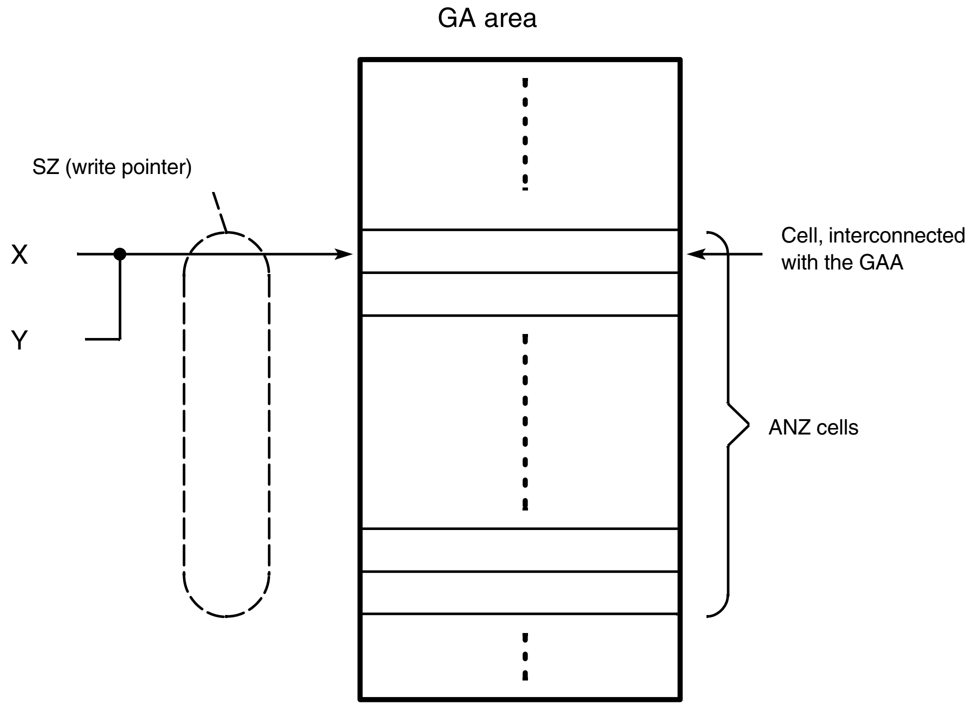


Fig. 9.209 Storage schedule of SPEI block

The data is read directly from the GA area.

- Block list

```
  SPEI    1                03. 03. 83/ 00. 11. 55. P: 1

1 AA  SZ   0.0000          #                   N     6
2 AA  ZSEC 0.0000          #                   N     7
3 AA  ZSTD 0.0000          #                   N     8
4 AA  Y    0.0000          #                   N     9
5 AB  VOLL 0               #                   N    10
1 EA  X    0.0000             P                      1
2 EB  BA   0                  P                      2
3 EB  RS   0                  P                      3
4 EA  GAA  0.0000                            C  Q    4
5 ID  ANZ      2                             C       5
```


SR

Recorder block

Application

The SR block facilitates overall representation of up to 4 series of measurements which are displayed as curves on the screen. Four pairs of limit values are used for measured value monitoring. Limit value violations are displayed on the screen.

Method of Operation

The block displays the measured values of four series of measurements as curves with 24 lines each within the measuring span (MAi and MEi, i = 1 to 4) on the VDU. The time basis can be individually selected for each series of measurements. The time used for averaging or after which the new value will be displayed (topmost display) is specified as multiples of the base cycle (cycle level, XB reduction) via the inputs UMSi. The old values are pushed down by one line.

The four series of measurements are processed sequentially. Each series of measurements can be activated or de–activated by a switch (binary variable EAXi; 1 = ON, 0 = OFF; interconnectable) or by operator input (EI = /EA =). EI/AU have the same priority as the EAXi parameters (ANDed). The upper and lower limits (OGi and UGi) of the mean values over the re–storing time (UMSi) are monitored.

The background color of the numerical new value (mean value) will be displayed in red if a limit value has been violated; the display will be red and blinking if a measuring range has been violated. An arrow will be displayed in the curve representation indicating limit value violations; it is directed to the left if UG has been violated and to the right if OG has been violated. A thick arrow will be shown for measuring range violations. Two binary outputs (GOi, GUi) exist for each series of measurements indicating a limit violation. The current mean value can be provided at analog output MWi for further processing.

A character field ATi which allows parameterization of up to 16 characters is available for free description for each series of measurements. There is also a 6–character field EHTi for specifying the physical quantity.

The parameter NRPL can be used to enter the SR block in the group display according to the standard for operator–controllable blocks. If a curve limit value is violated, a common indication will be given in the group display.

The TYP parameter can be used to modify the SR block execution.

TYP = 0: Processing of 4 curves with 24 values each without status
TYP = 1: Processing of 4 curves with 24 values each with status

Parameter specification and operator input is performed for the curves 1 to 4. Four curves and the associated parameters are displayed in the curve fields 1 to 4.

TYP = 2: Processing of 2 curves with 48 values each without status
TYP = 3: Processing of 2 curves with 48 values each with status

Parameter specification and operation for curves 1 and 3. 2 curves and their parameters are displayed in the curve fields 1 and 2 for curve 1; there is no parameter annotation in curve field 2 except the text string for curve 2. Curve 2 is displayed in the curve fields 3 and 4; there is no parameter annotation in curve field 4 except the text string for curve 4.

TYP = 4: Processing of one curve with 96 values without status
TYP = 5: Processing of one curve with 96 values with status

Parameter specification and operator input is performed for curve 1. One curve and the associated parameters are displayed in the curve fields 1 to 4 for curve 1; there is no parameter annotation in curve fields 2 to 4 except the text string for the curves 2 to 4.

Processing without status (typ 0, 2, 4)
The status is not processed as for operator–controllable blocks; neither does bus transfer take place.

Processing with status (typ 1, 3, 5)
The status is processed as for operator–controllable blocks; in the event of a change a bus transfer takes place.

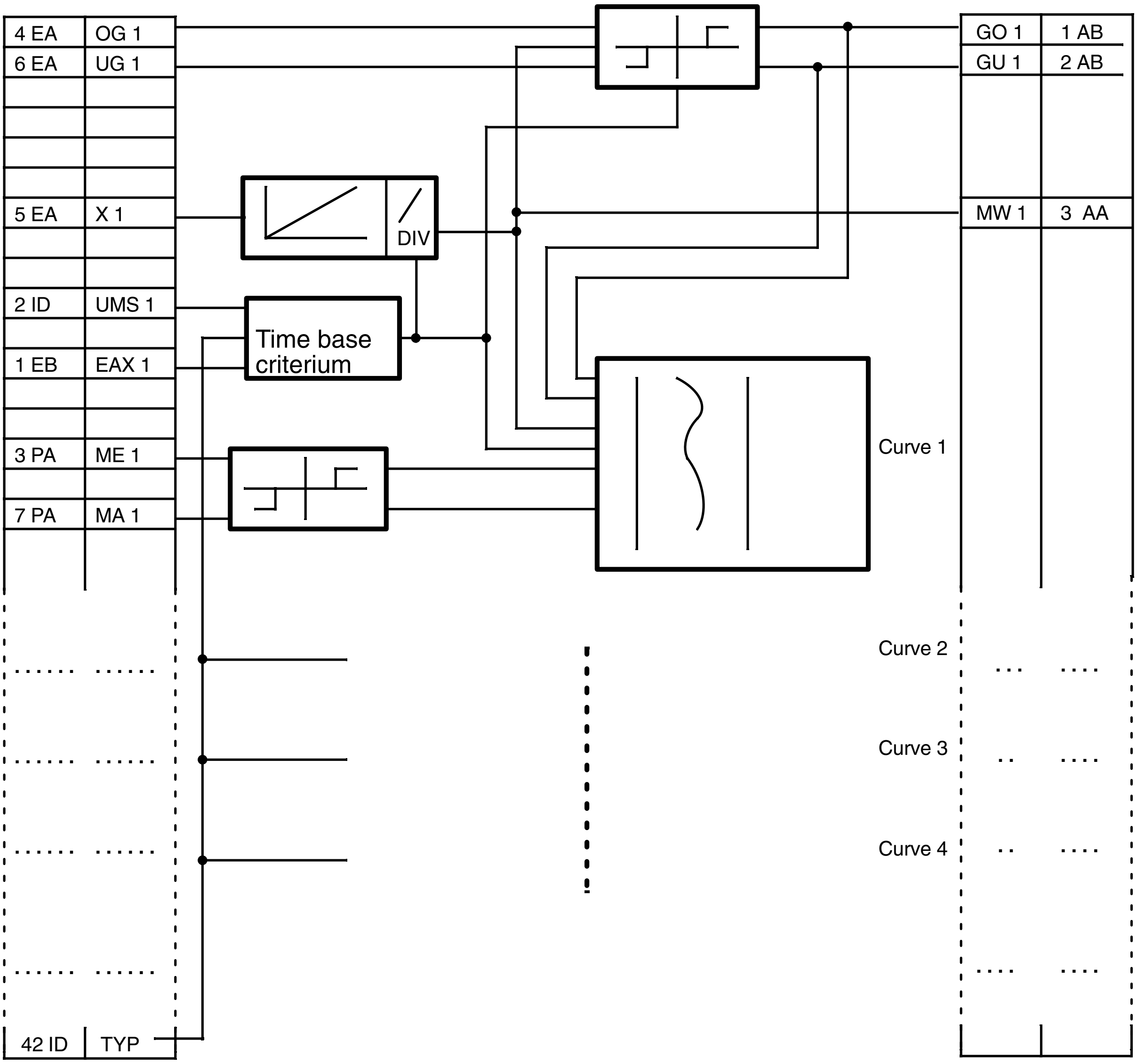
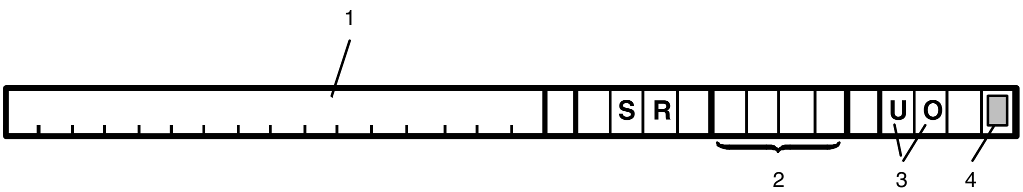


Fig. 9.210 SR block; logic diagram

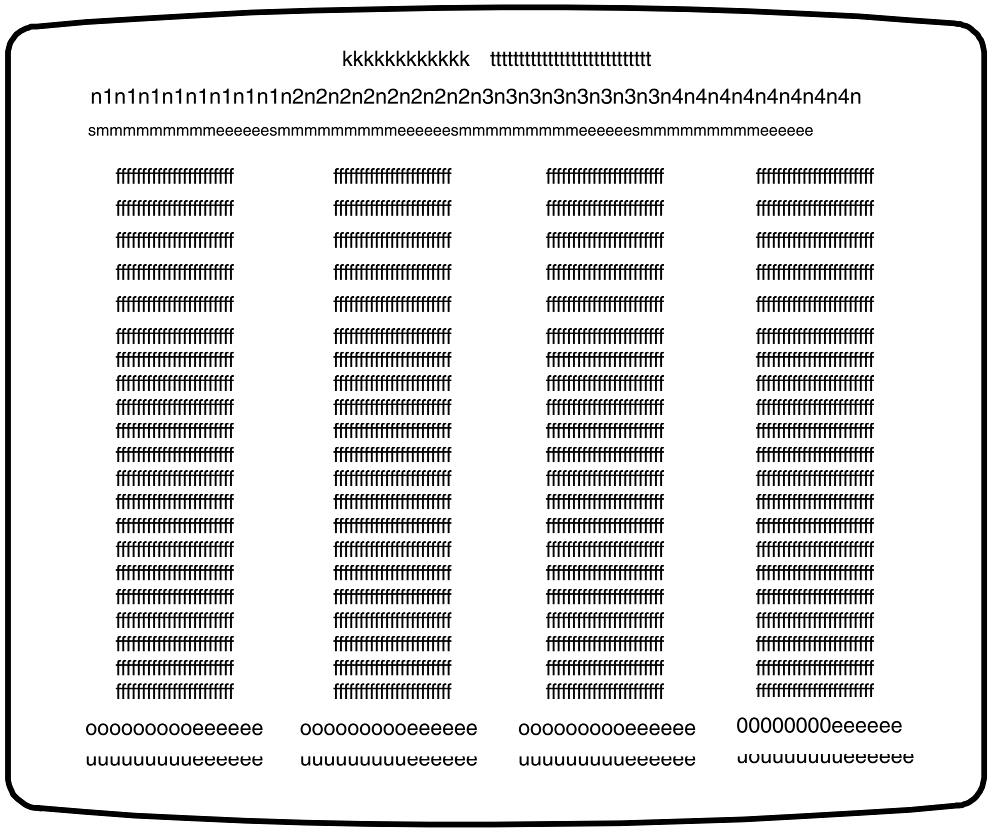
- Normalized representation in a group display



1 Process–related name
2 SR block name/number
3 Mode
Character U, if GU1 v GU2 v GU3 v GU4
Character O, if GO1 v GO2 v GO3 v GO4
4 Blinking mark if an alarm signal GO or GU is pending

Fig. 9.211 SR block; representation in a group display

- Normalized representation in a loop display



Static data:

kk ... kk = Mnemonic name and number of the SR block
tt ... tt = Process–related name of the SR block
s = Display ON/OFF switch
eeeeee = Physical unit of the measured values
n1 – n4 = Process–related names of the measured values
oo ... oo = Upper limit values
uu ... uu = Lower limit values

Dynamic data:

mm ... mm = Current mean values (digital display)
ff ... ff = Curve fields (analog display)

Fig. 9.212 SR block; loop display

The representation of the ON/OFF switches depends on the parameters EAXi, EI = i and AU = i.

EAXi	Curve (EI/AU)	Representation
0	OFF	Red blank
0	ON	Red 0 on green background
1	OFF	Green 1 on red background
1	ON	Green blank

- Operator input using the process communication keyboard

The alphanumeric keyboard is used to configure the SR block according to the standard configuration functions. After it has been selected, the SR block can be controlled via the process communication keyboard (PBT):

- Specification of the positions after the decimal point for numerical output on the display.
- Activation of the processing of one curve/all curves
- De–activation of the processing of one curve/all curves
- Deleting one curve field/all curve fields

The block is displayed in the basic assignment of the process communication keyboard according to GP or BR; the selection corresponds to the standard operator function. The recorder display is output after the SR.X block has been selected. If a variable is to be parameterized, “BE” selects the PBT assignment for operator input.

Representation on the PBT:

D1=	D2=	D3=	D4=	LO=	EI=	AU=	

AU	OFF
EI	ON
LO	Delete curve field
D1 ... 4	Digits 1 ... 4 after the decimal point

Fig. 9.213 SR block; automatic labeling of the process communication keyboard

Operator input is performed according to the following sequences:

Di = number	Number of digits after the decimal point for numeric mean value output of curve i.
LO = number	Deletion of a curve field in the next processing cycle (of all curve fields).
EI = number	Activation of the processing of one curve (all curves)
AU = number	De–activation of the processing of one curve (all curves)

EI and AU have the same priority as the EAXi parameters number = 1 to 4 (curves 1 to 4; ANDed).

- Checking the control parameters:

LO, EI, AU = number: Check number for 1 ≤ number ≤ 4
i = number – 4
Exception: number = 0
identical processing of all curves 1 to 4

D1, ..., D4 = number: Check number for 0 ≤ number ≤ 6

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Series of measurements 1 ON/OFF	EAX1	1	EB
Updating time series of measurements 1	UMS1	2	ID
Upper range limit 1	ME1	3	PA
Upper limit 1	OG1	4	EA
Measured value 1	X1	5	EA
Lower limit 1	UG1	6	EA
Lower range limit 1	MA1	7	PA
Curve name 1	AT1	8	S16
Physical unit 1	EHT1	9	S6
Number of digits after decimal point	D1	10	ID
Series of measurements 2 ON/OFF	EAX2	11	EB
Updating time series of measurements 2	UMS2	12	ID
Upper range limit 2	ME2	13	PA
Upper limit 2	OG2	14	EA
Measured value 2	X2	15	EA
Lower limit 2	UG2	16	EA
Lower range limit 2	MA2	17	PA
Curve name 2	AT2	18	S16
Physical unit 2	EHT2	19	S6
Number of digits after decimal point	D2	20	ID
Series of measurements 3 ON/OFF	EAX3	21	EB
Updating time series of measurements 3	UMS3	22	ID
Upper range limit 3	ME3	23	PA
Upper limit 3	OG3	24	EA
Measured value 3	X3	25	EA
Lower limit 3	UG3	26	EA
Lower range limit 3	MA3	27	PA
Curve name 3	AT3	28	S16
Physical unit 3	EHT3	29	S6
Number of digits after decimal point	D3	30	ID
Series of measurements 4 ON/OFF	EAX4	31	EB
Updating time series of measurements 4	UMS4	32	ID
Upper range limit 4	ME4	33	PA

Data structure (continued)

Meaning	Mnemonic name	Input/output No.	Type
Upper limit 4	OG4	34	EA
Measured value 4	X4	35	EA
Lower limit 4	UG4	36	EA
Lower range limit 4	MA4	37	PA
Curve name 4	AT4	38	S16
Physical unit 4	EHT4	39	S6
Number of digits after decimal point	D4	40	ID
Number in group display	NRPL	41	ID
Modification recorder	TYP	42	ID
Process–related name	AT	43	S16
Upper limit 1 violated	GO1	1	AB
Lower limit 1 violated	GU1	2	AB
Mean value 1	MW1	3	AA
Upper limit 2 violated	GO2	4	AB
Lower limit 2 violated	GU2	5	AB
Mean value 2	MW2	6	AA
Upper limit 3 violated	GO3	7	AB
Lower limit 3 violated	GU3	8	AB
Mean value 3	MW3	9	AA
Upper limit 4 violated	GO4	10	AB
Lower limit 4 violated	GU4	11	AB
Mean value 4	MW4	12	AA

- Parameter default values

EAXi	0B	, basic interconnection SBV.ORPA
UMi	0	
MEi	100.0	, basic interconnection SAV.ORPA
OGi	100.0	, basic interconnection SAV.ORPA
Xi	0.0	, basic interconnection SAV.ORPA
UGi	0.0	
MAi	0.0	
AT i	”CURVE NAME i ”	
AT	”PROCESS–REL.NAME”	
EHTi	”EHT.i”,	
GOi	0B	, basic interconnection SBV.ORPA
MWi	0	, basic interconnection SAV.ORPA
NRPL	0	
TYP	0	
L0, EI, AU	0	
RESE	0	
NRGP	0.0	
STAT	0.0	
IVAR(k)	0	
SUMI(j)	0.0	
KVF(k)	0	

- Block list

```
   SR      1                  03. 03. 83/ 00. 41. 49. P: 1

 1 AB  GO1  0                 #                   N     43
 2 AB  GU1  0                 #                   N     44
 3 AA  MW1  0.0000            #                   N     45
 4 AB  GO2  0                 #                   N     46
 5 AB  GU2  0                 #                   N     47
 6 AA  MW2  0.0000            #                   N     48
 7 AB  GO3  0                 #                   N     49
 8 AB  GU3  0                 #                   N     50
 9 AA  MW3  0.0000            #                   N     51
10 AB  GO4  0                 #                   N     52
11 AB  GU4  0                 #                   N     53
12 AA  MW4  0.0000            #                   N     54
 1 EB  EAX1 0                    P                       1
 2 ID  UMS1     0                                        2
 3 PA  ME1  100.00                              C        3
 4 EA  OG1  100.00               P              C        4
 5 EA  X1   0.0000               P                       5
 6 EA  UG1  0.0000               P              C        6
 7 PA  MA1  0.0000                              C        7
 8 S16 AT1  KURVENNAME 1            16                   8
 9 S   EHT1 EHT.1                    6                   9
10 ID  D1       0                               CB      10
11 EB  EAX2 0                    P                      11
12 ID  UMS2     0                                       12
13 PA  ME2  100.00                              C       13
14 EA  OG2  100.00               P              C       14
15 EA  X2   0.0000               P                      15
16 EA  UG2  0.0000               P              C       16
17 PA  MA2  0.0000                              C       17
18 S16 AT2  KURVENNAME 2            16                  18
19 S   EHT2 EHT.2                    6                  19
20 ID  D2       0                               CB      20
21 EB  EAX3 0                    P                      21
22 ID  UMS3     0                                       22
23 PA  ME3  100.00                              C       23
24 EA  OG3  100.00               P              C       24
25 EA  X3   0.0000               P                      25
26 EA  UG3  0.0000               P              C       26
27 PA  MA3  0.0000                              C       27
28 S16 AT3  KURVENNAME 3            16                  28
29 S   EHT3 EHT.3                    6                  29
30 ID  D3       0                               CB      30
31 EB  EAX4 0                    P                      31
32 ID  UMS4     0                                       32
33 PA  ME4  100.00                              C       33
34 EA  OG4  100.00               P              C       34
35 EA  X4   0.0000               P                      35
36 EA  UG4  0.0000               P              C       36
37 PA  MA4  0.0000                              C       37
38 S16 AT4  KURVENNAME 4            16                  38
39 S   EHT4 EHT.4                    6                  39
40 ID  D4       0                               CB      40
41 ID  NRPL     0                               C       41
42 ID  TYP      0                               C       42
43 S16 AT   TECHNOLOG. NAME         16                  65
```

STEP

Control block

Application

STEP blocks are used for the implementation of sequence and interlocking controllers.

Method of Operation

STEP blocks are user–specific blocks written in STEP M. A block can only be defined if the keyswitch of the process communication keyboard is in authorization level 3. STEP blocks may not be installed in a block sequence. This can only be performed via KS/VS connection blocks. Insertion into a block sequence is only possible after both blocks (STEP + call block) have been completely and correctly configured.

The following configuration instructions can be used for STEP blocks:

- **NEMO;**
- **D,STEP,pname;**
  - **instructions (STEP M)**
- **A,STEP,pname;**
  - **LS,lineno;**
  - **EI,lineno;instruction**
  - **ER,lineno;instruction**
- **L,STEP,pname;**
- **F;**
- **AE;**
- **DE;**
- **END;**

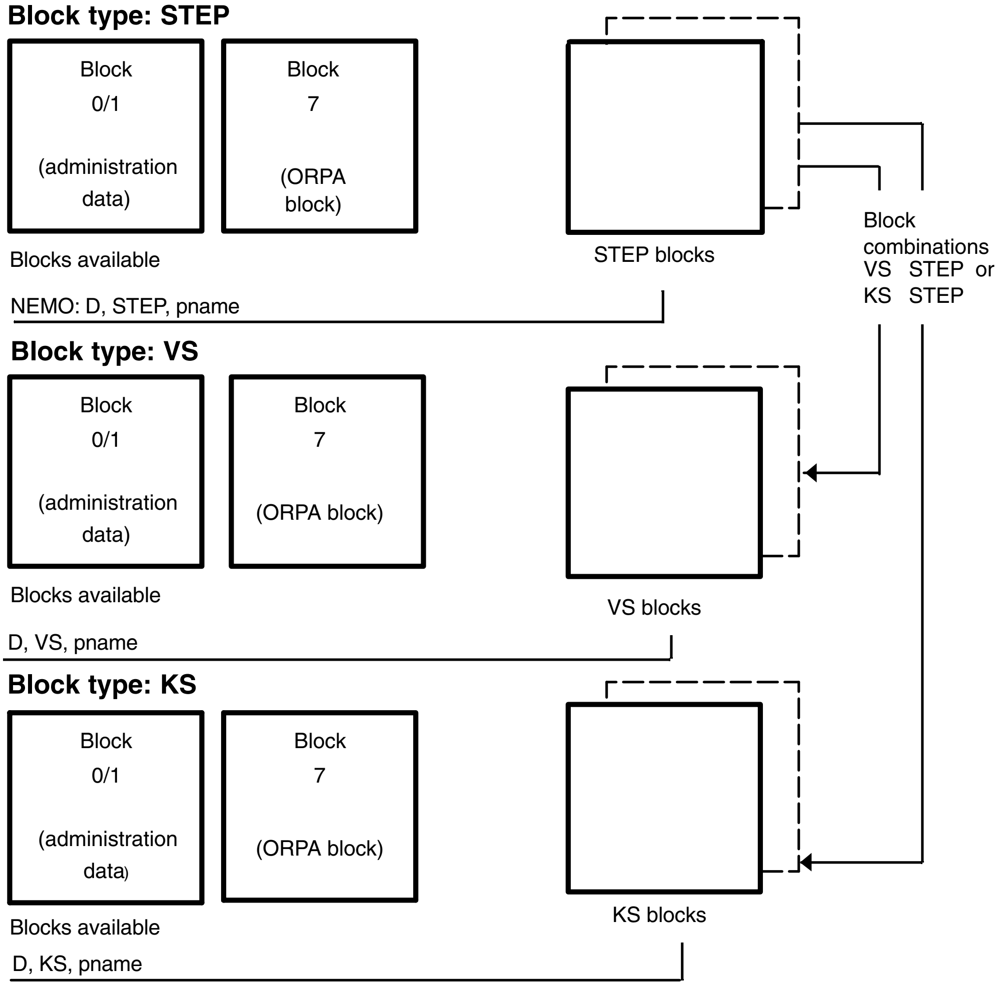


Fig. 9.214 Block structure

SUM

Adder block

Application

This block is used for adding, subtracting and inverting input variables.

Method of Operation

The block follows the equation:

Y = X1 + X2 – X3 – X4

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Output variable	Y	1	AA
Summand 1	X1	1	EA
Summand 2	X2	2	EA
Subtrahend 1	X3	3	EA
Subtrahend 2	X4	4	EA

- Block list

```
   SUM     1                 03. 03. 83/ 00. 13. 42. P: 1

 1 AA   Y    0.0000          #                   N      5
 1 EA   X1   0.0000             P                       1
 2 EA   X2   0.0000             P                       2
 3 EA   X3   0.0000             P                       3
 4 EA   X4   0.0000             P                       4
```

☞ Addition 32768 + 1 is not performed.

T

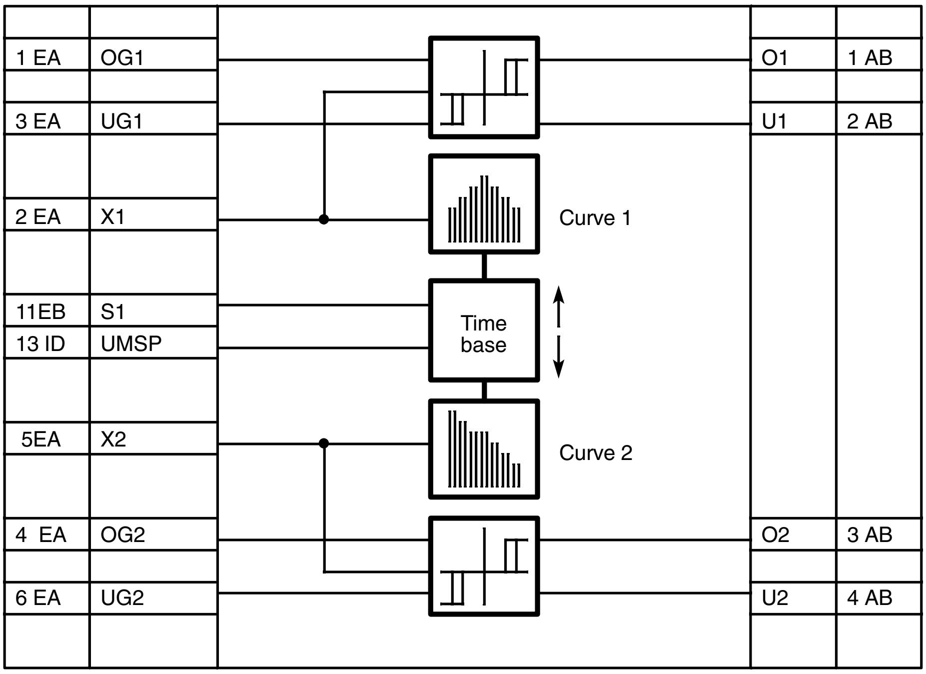
Trend block

Application

This block is used to display the trends of two measured values as bar diagrams. The time base of the trend representation can be selected between 1.625 seconds and 36 hours.

Method of Operation

On the VDU, the block shows the trend (coarse time sequence) of two measured values as an envelope curve of 13 bars for each value within the measuring limits MA and ME. The two curves have a common time base.



S1	Display inhibit	Oi	Upper alarm signal
OGi	Upper limit value	Ui	Lower alarm signal
UGi	Lower limit value	UMSP	Updating time
Xi	Measured value		

Fig. 9.215 T block; logic diagram

The updating time UMSP (input 13) defines the time interval (in seconds) between two consecutive display of the value (first bar from the right). The bars are then shifted to the left by one position.

During the time interval selected, a mean value is generated from various individual values. The number of these individual values depends on the updating time UMSP selected for the T block and on the scan time (TA) of the associated XB block (see the following list).

Scan time [TA/s] of the associated XB block	Updating time [s] UMSP 1	2	10	20	40	60	120	240	
0,125	8	16	80	160	320	480	960	1920	
0,25	4	8	40	80	160	240	480	960	Number of
0,5	2	4	20	40	80	120	240	480	individual values
1	1	2	10	20	40	60	120	240	
2	–	1	5	10	20	30	60	120	

In order to achieve an expedient display, the following must be true
UMSP > TA

If input 13 (UMSP) is parameterized with zero, the trend display will be updated in the scan time cycle (TA).

Using
TA = 0,125 and
UMSP = 9999 s
the time base of the trend display can assume the following values:

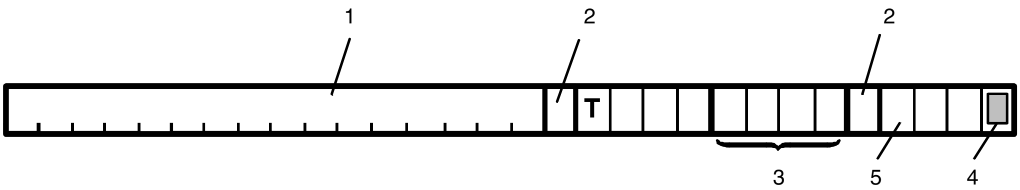
Min.: 13 x 0,125 s = 1,625 s
Max.: 13 x 9999 s = 129987 s = 36 hours

The resolution of the bars displayed is 1.6% of the parameterized measuring range. The trend display can be disabled (input 11 = “1”) or enabled (input 11 = “0”) via display inhibit S1 (input 11).

If updating time (UMSP) or scan time (TA) of the associated XB is changed, input 11 must be set to “1” and then back to “0”. Apart from the trend representation, an upper (OG) and lower (UG) limit value of the two measured values (X1 and X2) are monitored.

In systems linked together by a bus, the parameterization US = “1” (12EB) suppresses the status output to a central operation and monitoring system.

- Normalized representation in a group display



1 Process–related name of the T block, as in loop display
2 Separating blank
3 Number of the trend block
4 Blinking mark if an alarm signal (GO, GU) is waiting
5 Blank

Fig. 9.216 Trend block; normalized representation in the loop display

The block is represented by 30 characters in a specific location of a group display. Input 14 (group display: no./location no.) must then be parameterized as follows:

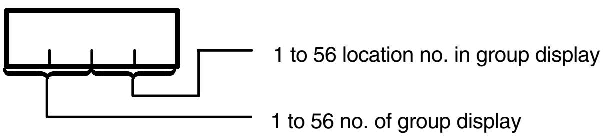


Fig. 9.217 Trend block; parameterization of input 14

Set input 14 (NRPL) to “0” if the normalized representation of a block in a group display is to be suppressed.

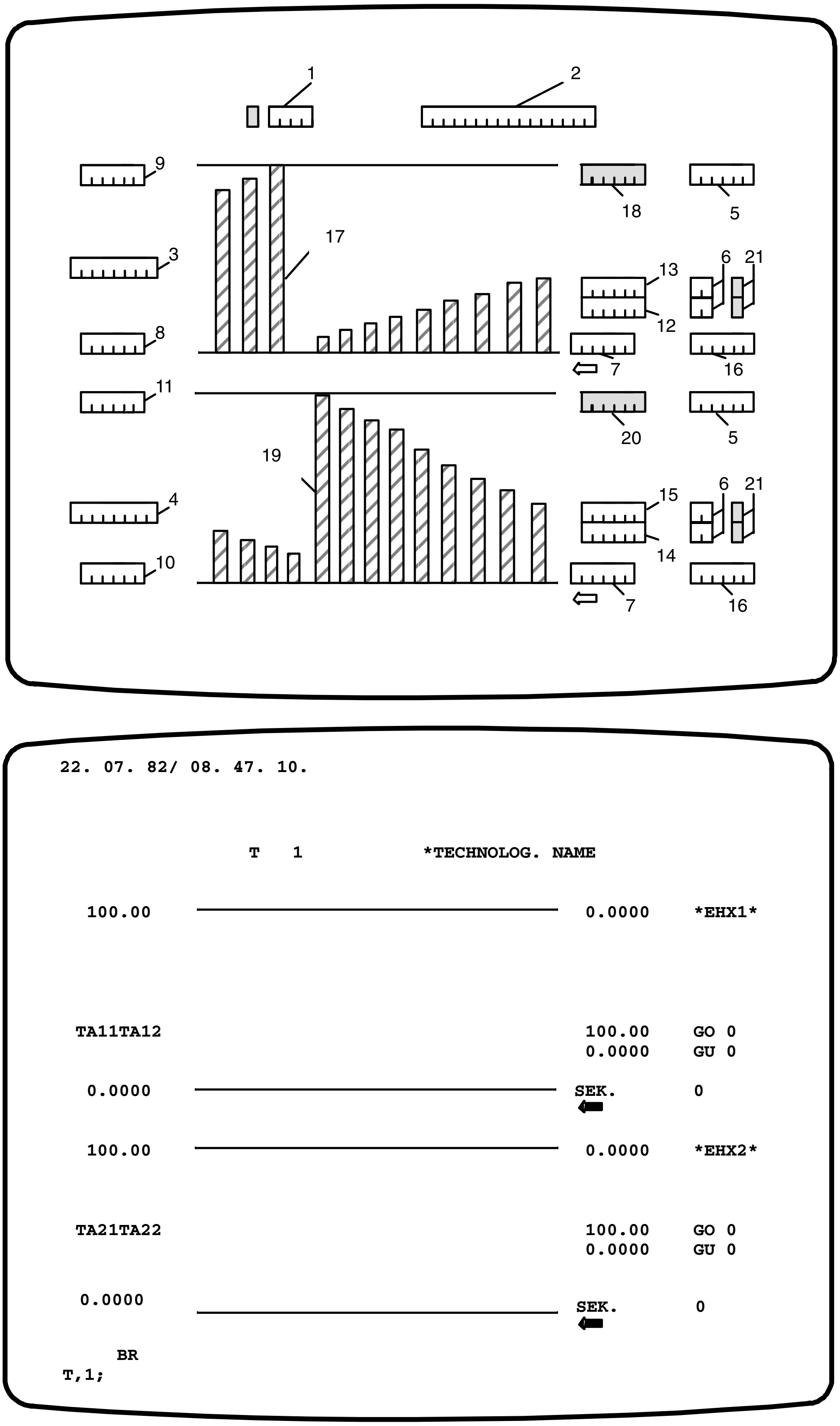


Fig. 9.218 T block; loop display

Legend to Fig. 9.218:

Static data:

1 Mnemonic name and number of the trend block
2 Process–related name of the trend block (AT)
3 Process–related name of the 1st measured value (TA11, TA12)
4 Process–related name of the 2nd measured value (TA21, TA 22)
5 Physical unit of the measured values (EHX1, EHX2)
6 Alarm signals GO, GU (TGO; TGU) [1)]
7 Unit of the updating time (EHTZ) (preferable seconds: SEC)
8 Lower range limit 1 (MA1)
9 Upper range limit 1 (ME1)
10 Lower range limit 2 (MA2)
11 Upper range limit 2 (ME2)
12 Lower limit value 1 (UG1)
13 Upper limit value 1 (OG1)
14 Lower limit value 2 (UG2)
15 Upper limit value 2 (OG2)
16 Updating time (in seconds, UMSP)

Dynamic data:

17 Measured value/curve 1 (analog display)
18 Measured value 1 (digital display)
19 Measured value/curve 2 (analog display)
20 Measured value 2 (digital display)
21 Alarm states (”1” = limit value violation)

1) Pre–defined mnemonic names

- Operator input using the process communication keyboard

  No keys will be assigned after the loop display has been selected and the “Operator input” (BE) key depressed.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Upper alarm signal 1	O1	1	AB
Lower alarm signal 1	U1	2	AB
Upper alarm signal 2	O2	3	AB
Lower alarm signal 2	U2	4	AB
Upper limit value 1	OG1	1	EA
Measured value 1 (curve 1)	X1	2	EA
Lower limit value 1	UG1	3	EA
Upper limit value 2	OG2	4	EA
Measured value 2 (curve 2)	X2	5	EA
Lower limit value 2	UG2	6	EA
Upper range limit 1	ME1	7	EA
Lower range limit 1	MA1	8	EA
Upper range limit 2	ME2	9	EA
Lower range limit 2	MA2	10	EA
Display inhibit	S1	11	EB
Status output suppression	US	12	EB
Updating time /sec.	UMSP	13	ID [1]
Group display: No./location no.	NRPL	14	ID
Cf. loop display	TGO1	15	S2
”	TGU1	16	S2
”	TGO2	17	S2
”	TGU2	18	S2
”	EHX1	19	S4
”	TA11	20	S4
”	TA12	21	S4
”	EHX2	22	S4
”	TA21	23	S4
”	TA22	24	S4
”	EHTZ	25	S4
”	AT	26	S16

[1] in seconds ($1 \leq$ UMSP ≤ 9999)

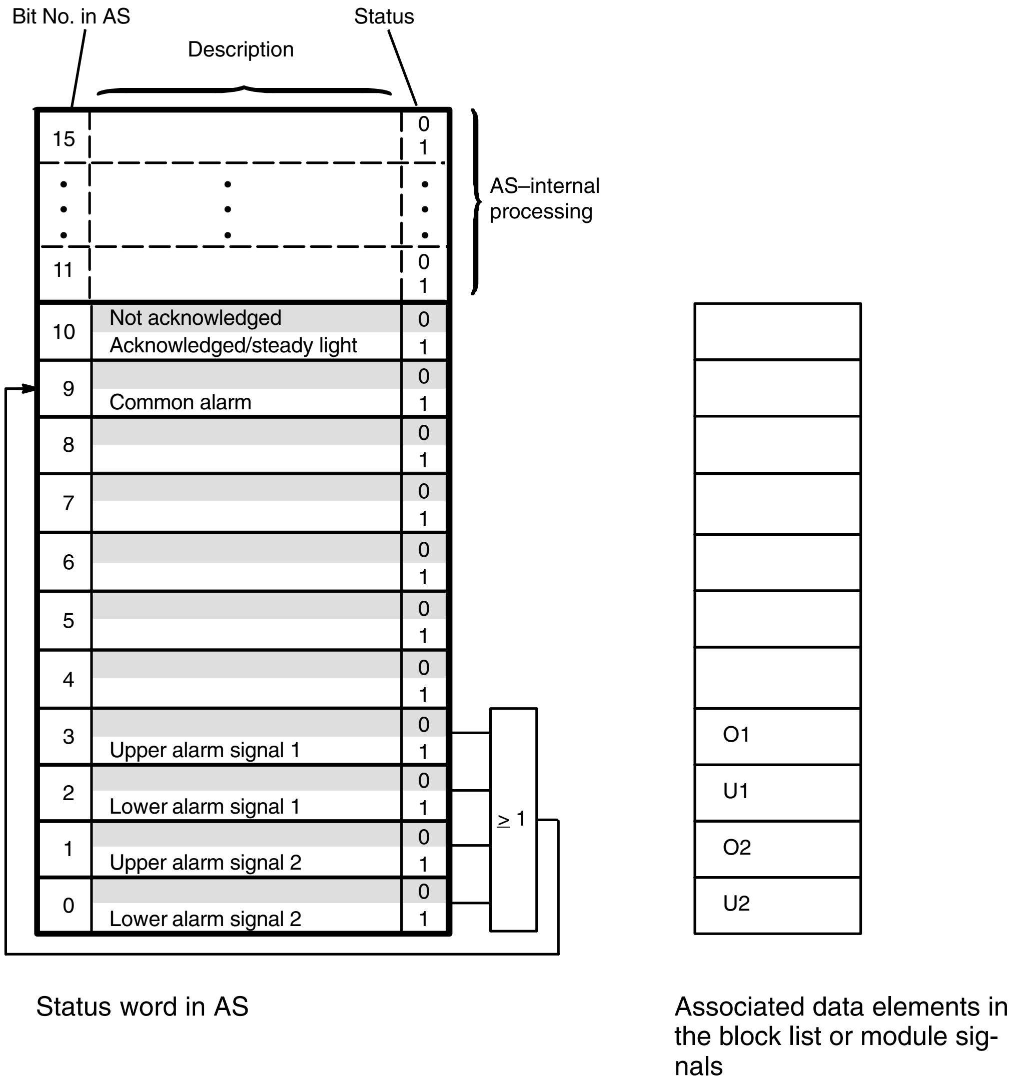
The scan time TA of the associated XB block will be used as updating time if UMSP = 0.

- Block list

```
   T       1                  15. 08. 84/ 10. 46. 28. P: 1

 1 AB  O1   0                 #                   N      26
 2 AB  U1   0                 #                   N      27
 3 AB  O2   0                 #                   N      28
 4 AB  U2   0                 #                   N      29
 1 EA  OG1  100.00               P                        1
 2 EA  X1   0.0000               P                        2
 3 EA  UG1  0.0000               P                        3
 4 EA  OG2  100.00               P                        4
 5 EA  X2   0.0000               P                        5
 6 EA  UG2  0.0000               P                        6
 7 EA  ME1  100.00               P                        7
 8 EA  MA1  0.0000               P                        8
 9 EA  ME2  100.00               P                        9
10 EA  MA2  0.0000               P                       10
11 EB  S1   1                    P                       11
12 EB  US   0                    P                       12
13 ID  UMSP     0                               C        13
14 ID  NRPL     0                               C        14
15 S2  TGO1 GO                                           15
16 S2  TGU1 GU                                           16
17 S2  TGO2 GO                                           17
18 S2  TGU2 GU                                           18
19 S   EHX1 *EHX1*                   6                   19
20 S4  TA11 TA11                                         20
21 S4  TA12 TA12                                         21
22 S   EHX2 *EHX2*                   6                   22
23 S4  TA21 TA21                                         23
24 S4  TA22 TA22                                         24
25 S   EHTZ SEK.                     6                   25
26 S16 AT   *TECHNOLOG. NAME        16                   54
```

- Status word



O1, 2 Upper alarm signal 1, 2
U1, 2 Lower alarm signal 1, 2

Fig. 9.219 Status word for the T block

TANZ

Test display block

Application

This block is used for monitoring binary and analog variables. It facilitates selective operation of variables.

Method of Operation

Up to 16 analog and 16 binary variables can be shown within a standard display. Each variable has its fixed location within the display where the variable and its source address are shown. The source address output can be selectively suppressed for each individual variable.

The number of decimal digits (up to 16) including decimal point and sign and the format (fixed or floating point) can be specified for the analog variables. This selection then applies for all analog variables.

Any characters and a selection of colors can be allocated to the binary states 0 and 1. This selection applies to all binary values.

The analog and binary variables are allocated by interconnection. Variables which have not been interconnected are not displayed (location is not addressed). The interconnection can be deleted by zero parameterization (..., N).

The variables can be parameterized via the process communication keyboard by:

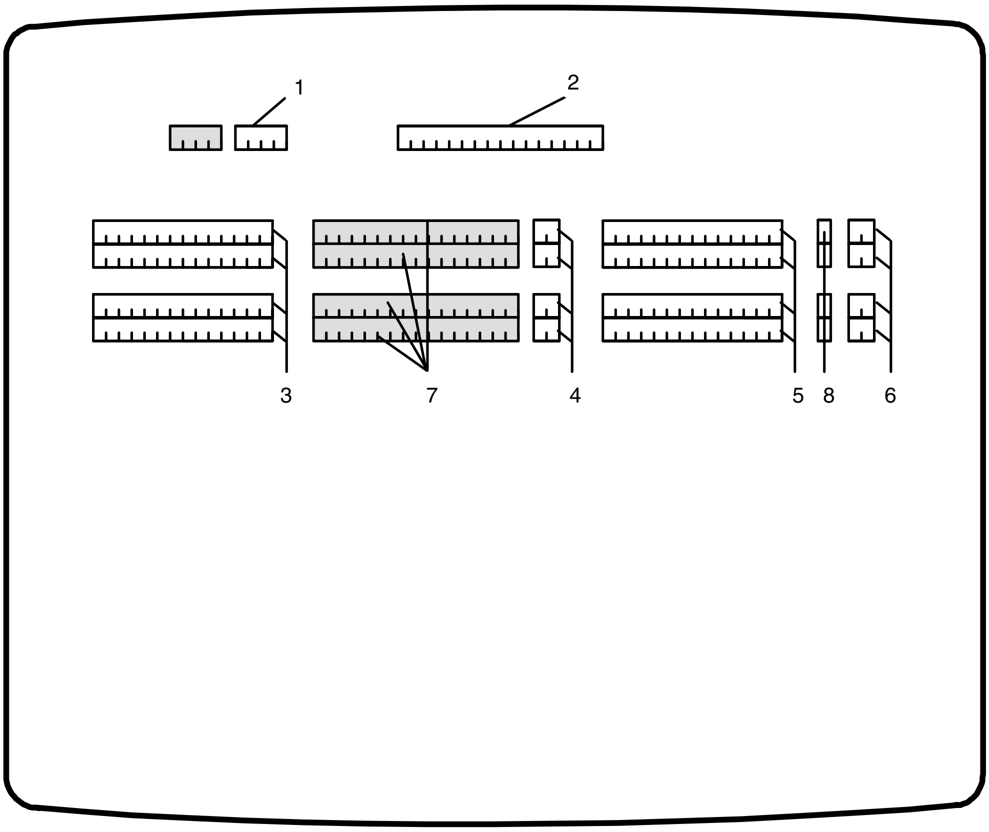
– selecting the variable as a location number on the display
– entering the binary or analog variable value

The location number of a variable is shown in reverse display after the variable has been selected for operator input. This selection is valid until a new location number (operator input to a different variable) or location 0 is entered. The location numbers are output after the variables. Each individual variable can be specified as operator–controllable (parameterization).

A separate LAYOUT block can be assigned by interconnection to each TANZ block. This LAYOUT block is called when the TANZ display is displayed for the first time (statically superimposed image) and can be used for user–specific annotation or graphical background of ths standard loop display.

It is not possible to select the same test output block from both operator positions at the same time (system inhibit).

☞ The display block cannot be inserted in a processing cycle.




```
       TANZ    2          TESTANZEIGE-BST

SUM    1 Y              2723.7
                                          XB    1 EIAU   1 18

SUM    1 X1             2722.2    3
SUM    1 X2             1.5699    4

MUL    1 Y              1.5699

MUL    1 X1             20.000    8

MUL    1 X2             .07849

ASL    1 Y             -1.0000

ASL    1 X1             3.0000    14        ASL    1 S     1

ASL    1 X2            -1.0000    15
```

Fig. 9.220 Test display block; normalized representation in a loop display

Legend to Fig. 9.220:

Static data:

1 Mnemonic name and number/name of the test display block
2 Process–related name of the test display block
3 Source addresses of the analog values
4 Location numbers of the analog values
5 Source addresses of the binary values

Dynamic data:

6 Location numbers of the binary values
7 Analog values in fixed or floating point representation
8 Binary values in parameterized character/color representation

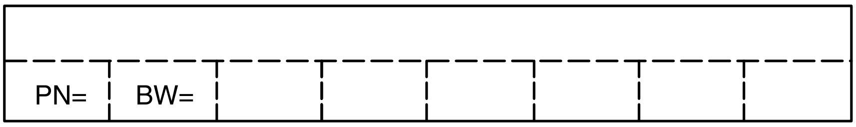
- Operator input using the process communication keyboard

  Two keys (PN =, BW =) will be assigned after the loop display has been selected and the “Operator input” (BE) key depressed. The PN = key is used to enter the location number of the selected variable. This location number is shown in reverse display. The selection remains until PN = is pressed again.

  The BW = key can then be used to specify a value for the selected variable.

  ☞ Process–related check of the input does **not** take place.

  The operator input (BW =) is disabled if PN = 0.



BW Preset value
PN Set location number

Fig. 9.221 TANZ block; automatic labeling of the process communication block

- Operator input using the configuration keyboard

Selection of analog value representation

The selection of analog value representation consists of a code for the color mode and the number type (fixed/floating point).

– AMOD	0 + n:	Floating point representation Total number of locations in the process display = 16
	8 + n:	Fixed point representation. The parameter DEST specifies the number of digits after the decimal point (DEST ← 14). Total number of locations in the process display = 16.
	16 + n:	Floating point representation. Total number of locations in the process display = 12
	24 + n:	Fixed point representation. The parameter DEST specifies the number of digits after the decimal point (DEST ← 10). Total number of locations in the process display = 12.

The following combinations can be used dor color mode (n):

n = 0:	foreground	white	background	black
= 1:	”	green	”	black
= 2:	”	yellow	”	black
= 3:	”	blue	”	black
= 4:	”	red	”	black
= 5:	”	white	”	red
= 6:	”	black	”	green
= 7:	”	black	”	yellow

The element VMOD influences the operability of the displayed variable.

– VMOD	= 0:	Default setting after “D,...” or zero interconnection of an element. Otherwise the same as 1.
	= 1:	Variable and source address are displayed; no output of operator position number. The variable is not operator–controllable. Pre–setting after interconnection of the associated variable if variable mode “0” has been entered.
	= 2:	The variable is displayed; source address and operator position number are not displayed. The variable is not operator–controllable.
	= 3:	Variable and operator position number are displayed; the source address is not displayed. The variable is operator–controllable.
	= 4:	Variable, operator position number and source address are displayed. The variable is operator–controllable.

Better parameterization can be achieved if a character and colour combination is allocated to the digital states 0 and 1 of the displayed digital values. These allocations are valid for all 16 binary values.

– BIZ0: Character binary status 0
– MOD0 Color mode binary status 0
(color combination as for AMOD)
– BIZ1: Character binary status 1
– MOD1: Color mode binary status 1
(color combination as for AMOD)

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Analog value 1 – location 1	AV1	1	EA
Analog value 2 – location 2	AV2	2	EA
Analog value 3 – location 3	AV3	3	EA
Analog value 4 – location 4	AV4	4	EA
Analog value 5 – location 5	AV5	5	EA
Analog value 6 – location 6	AV6	6	EA
Analog value 7 – location 7	AV7	7	EA
Analog value 8 – location 8	AV8	8	EA
Analog value 9 – location 9	AV9	9	EA
Analog value 10 – location 10	AV10	10	EA
Analog value 11 – location 11	AV11	11	EA
Analog value 12 – location 12	AV12	12	EA
Analog value 13 – location 13	AV13	13	EA
Analog value 14 – location 14	AV14	14	EA
Analog value 15 – location 15	AV15	15	EA
Analog value 16 – location 16	AV16	16	EA
Binary value 1 – location 17	BV1	17	EB
Binary value 2 – location 18	BV2	18	EB
Binary value 3 – location 19	BV3	19	EB
Binary value 4 – location 20	BV4	20	EB
Binary value 5 – location 21	BV5	21	EB
Binary value 6 – location 22	BV6	22	EB
Binary value 7 – location 23	BV7	23	EB
Binary value 8 – location 24	BV8	24	EB
Binary value 9 – location 25	BV9	25	EB
Binary value 10 – location 26	BV10	26	EB
Binary value 11 – location 27	BV11	27	EB
Binary value 12 – location 28	BV12	28	EB
Binary value 13 – location 29	BV13	29	EB
Binary value 14 – location 30	BV14	30	EB
Binary value 15 – location 31	BV15	31	EB
Binary value 16 – location 32	BV16	32	EB
Analog variable representation mode	AMOD	33	I
Number of decimal digits of analog variable	DEST	34	I
Character for binary status 0	BIZ0	35	S
Color mode for binary status 0	MOD0	36	I
Character for binary status 1	BIZ1	37	S
Color mode for binary status 1	MID1	38	I
LAYOUT block source address	LAYO	39	EA
Output mode for locations 1 to 32	VMOD	40	I
Process–related name	AT	41	S16

- Block list

```
   TANZ    1                   03. 03. 83/ 00. 19. 06. P: 1

 1 EA  AV1  0.0000                               C  Q     1
 2 EA  AV2  0.0000                               C  Q     2
 3 EA  AV3  0.0000                               C  Q     3
 4 EA  AV4  0.0000                               C  Q     4
 5 EA  AV5  0.0000                               C  Q     5
 6 EA  AV6  0.0000                               C  Q     6
 7 EA  AV7  0.0000                               C  Q     7
 8 EA  AV8  0.0000                               C  Q     8
 9 EA  AV9  0.0000                               C  Q     9
10 EA  AV10 0.0000                               C  Q    10
11 EA  AV11 0.0000                               C  Q    11
12 EA  AV12 0.0000                               C  Q    12
13 EA  AV13 0.0000                               C  Q    13
14 EA  AV14 0.0000                               C  Q    14
15 EA  AV15 0.0000                               C  Q    15
16 EA  AV16 0.0000                               C  Q    16
17 EB  BV1  0.0000                               C  Q    17
18 EB  BV2  0.0000                               C  Q    18
19 EB  BV3  0.0000                               C  Q    19
20 EB  BV4  0.0000                               C  Q    20
21 EB  BV5  0.0000                               C  Q    21
22 EB  BV6  0.0000                               C  Q    22
23 EB  BV7  0.0000                               C  Q    23
24 EB  BV8  0.0000                               C  Q    24
25 EB  BV9  0.0000                               C  Q    25
26 EB  BV10 0.0000                               C  Q    26
27 EB  BV11 0.0000                               C  Q    27
28 EB  BV12 0.0000                               C  Q    28
29 EB  BV13 0.0000                               C  Q    29
30 EB  BV14 0.0000                               C  Q    30
31 EB  BV15 0.0000                               C  Q    31
32 EB  BV16 0.0000                               C  Q    32
33 I   AMOD      0                               C       33
34 I   DEST      0                               C       34
35 S   BIZ0 0                                            35
36 I   MOD0      0                               C       36
37 S   BIZ1 1                                            37
38 I   MOD1      0                               C       38
39 EA  LAYO 0.0000                               C  Q    39
40 I   VMOD                 33                   C       40
         0       4
         1       0
         2       0
         3       0
         4       0
         5       0
         6       0
         7       0
         8       0
         9       0
        10       0
        11       0
        12       0
        13       0
        14       0
        15       0
```

Block list (continued)

```
   TANZ    1                  03. 03. 83/ 00. 20. 30. P: 2

40 I   VMOD                    33                C       40
         16      0
         17      0
         18      0
         19      0
         20      0
         21      0
         22      0
         23      0
         24      0
         25      0
         26      0
         27      0
         28      0
         29      0
         30      0
         31      0
         32      0
41 S16 AT   TECHNOLOG.NAME     16                        49
```

TOB

Dead band block

Application

This block is used for generating responds thresholds for analog differences, e.g. system deviations.

Method of Operation

The input variable is fed to the output via a dead–band (neutral threshold). The block's gain is 1 outside the dead band.

The block follows the functions:

Y = X – TOBU   for X < TOBU
Y = 0   for TOBU ≤ X ≤ TOBO
Y = X – TOBO   for X > TOBO

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/Output No.	Type
Output value	Y	1	AA
Input value	X	1	EA
Upper dead band	TOBU	2	EA
Lower dead band	TOBO	3	EA

- Block list

```
   TOB     1               03. 03. 83/ 00. 21. 51. P: 1

 1 AA  Y    0.0000         #  P               N     4
 1 EA  X    0.0000            P                     1
 2 EA  TOBU 0.0000            P                     2
 3 EA  TOBO 0.0000            P                     3
```

TOZ

Dead time block

Application

This block is used for simulating controlled systems and generating transfer and dwell time values as feedforward control.

Method of Operation

The block operates in a similar manner to a shift register. It uses up to ten steps, i.e. the input variable can be shifted by up to ten time stages. The actual dead time results from the product of the number of time stages and the execution time TA (cf. XB block).

The number of time stages is specified at input 4 ($0 \leq T \leq 10$). The time resolution of the block output signal depends on the processing cycle applied to the block.

The block has the transfer function:

$$\frac{Y(s)}{X(s)} = e^{-s \cdot T}$$

where **T** = dead time constant and **s** = Laplace Operator

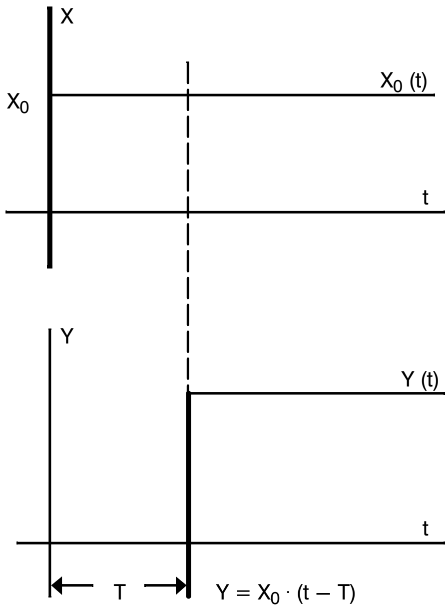
- Follow–up mode

  The output signal Y is corrected to the value YN in this mode; the “Correction” input (YNF) must be set to “1”.

- Initialization behavior

  The TOZ block performs an initialization run after a higher–order XB block has been switched off and back on. All old values in the memory and the Y value are corrected to the current X value.

- Response to a sudden change of the input variable



t Time
T Dead time constant
X Input variable
Yo Output value

Fig. 9.222 Dead time block; step response

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Output value	Y	1	AA
Input variable	X	1	EA
Correction input variable	YN	2	EA
Correction	YNF	3	EB
T/TA: $0 \leq T \leq 10$	T	4	EA

- Block list

```
   TOZ      1                 03. 03. 83/ 00. 22. 39. P: 1

 1 AA  Y    0.0000            #                   N      5
 1 EA  X    0.0000               P                       1
 2 EA  YN   0.0000               P                       2
 3 EB  YNF  0                    P                       3
 4 EA  T    0.0000               P                       4
```

TUEB

Test monitoring block

Application

This block is used for sequence monitoring of TML blocks. It performs

– cyclic sequence monitoring
– single program execution monitoring

Method of Operation

Up to 248 TUEB blocks may be defined; each monitoring block is assigned to a TML program. Only one TUEB block can be defined for each TML program. All TUEB blocks may be active simultneously, i.e. up to 248 TML programs can be monitored at the same time. Only one TUEB block can be displayed at each operator position.

The TML block to be monitored is defined as **`D,TUEB,xx;`** or **`A,TUEB,xx;`** by interconnecting the UBST (**`Q,1,...;`**) parameter with the block to be monitored. Up to 16 monitoring points can be defined for each TUEB block. All TML annotation lines with more than 3 characters can be monitoring points (points are specified as line numbers). The TUEB blocks are operator–controlled via the process communication keyboard.

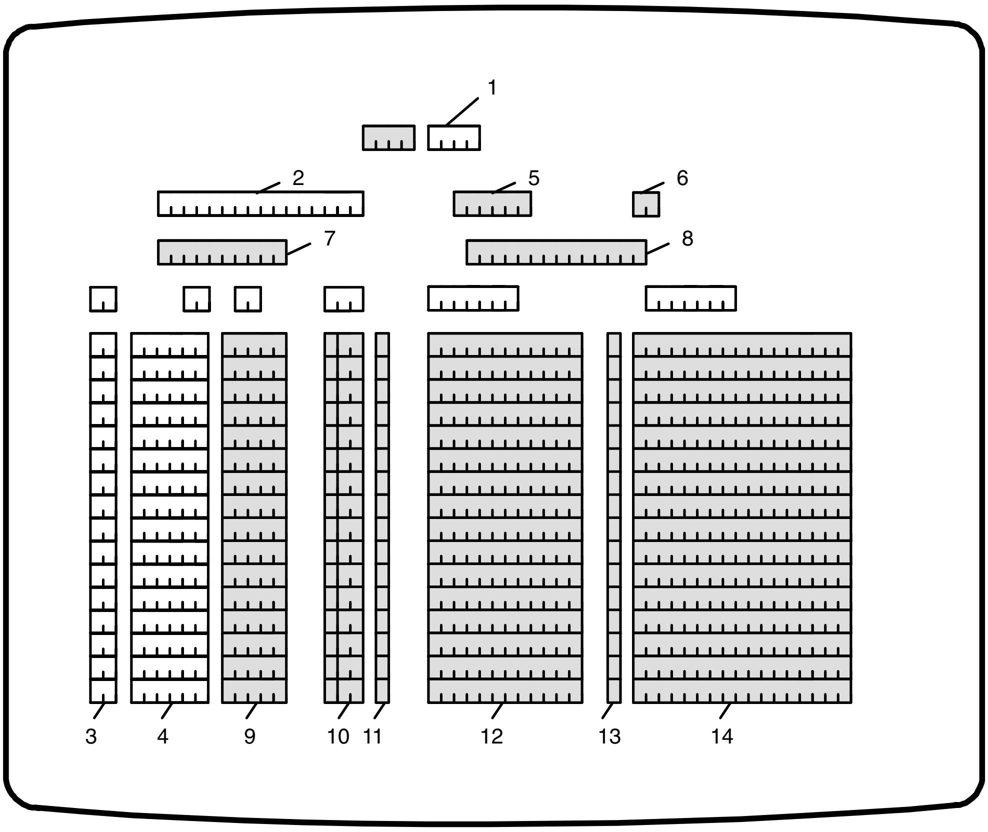
If a parameterized TUB block is enabled (FR = 1), test entries are made in the program code of the TML block to be tested. These entries will be deleted when the block is disabled (SP = 1).

When the test lines are executed, the accumulator status is buffered and may be viewed in the display cycle. The block to be monitored is executed in the sequence in which it has been defined or installed (PROGRAM, CHECK, subroutine etc.).

It is not possible to select the same TUEB block from both operator positions at the same time; different TUEB blocks may be selected.

The TML compiler (NEMO) cannot be used for a TML block as long as the monitoring function is activated for this block. It can be used without parameter modification after the monitoring function has been disabled. The test points previously defined might, however, have changed place in the TML in the meantime. New parameterization is then required for the test points concerned.

An alarm (see I&C fault alarms) occurring in the monitored TML block is also indicated in the TUEB block together with the number of the line in which the alarm has been detected.




```
                    TUEB    1

     BST : PROB.   TT       MO : 1        SP

     ANZ :  302                ZEILE  :  21

UP      ZN  DZ      BIN     ANALOG            ADRESSE

 1       4     1     0B #    0.0000        #
 2
 3       6     1     0B #    2726.0
 4
 5       9     1     1B      2726.0
 6
 7      11     1     1B      3.0000
 8
 9
10      13     4     1B      0.0000
11
12      15     4     1B      10863.
13
14      18     1     1B      0.0000
15
16      20     1     0B      0.0000
```

Fig. 9.223 TUEB block; loop display

Legend to Fig. 9.223

Static data:

1 Mnemonic name and number/name of the test monitoring block
2 Mnemonic name and number/name of the monitored block
3 Test point number
4 Test point line numbers

Dynamic data:

5 Mode display
6 Status display ”FR”/”SP”
7 Error number
8 Line number related to error number
9 Program run counter states
10 Digital accumulator states
11 Digital accumulator fault recognition
12 Analog accumulator states (floating point representation)
13 Analog accumulator fault recognition
14 Analog accumulator states (address representation)

Representations 12 and 14 are alternative.

Monitored TML–program for loop display

```
I D,PROBLEM,TT;
I TAKE;
I MUX GA1;
I/*test point 1*/;
I GA1+1=:GA1;
I/*test point 2*/;
I MUXGB.1 ;
I NOTGBO=:GBO;
I/*test point 3*/;
I 3=:LAO;
I/*test point 4*/;
 DO LAO;
I/*test point 5*/;
I GA2+1=:GA2;
I/*test point 6*/;
 END DO;
I GBO=:LBO;
I/*test point 7*/;
I NOT LBO=GBO;
I/*test point 8*/;
I LA5=:LA6;
I DE;
```

- Operator input using the process communication keyboard

  Seven keys (FR = 1, SP = 1, RS = 1, MO =, UP =, ZN =, AM = 1) will be assigned after the loop display has been selected and the “Operator input” (BE) key depressed.

  Meaning of the keys

  FR = 1: Enabling the monitoring function; assigning the line numbers; entering the test mode conditions into the TML block.

  SP = 1: Disabling the monitoring function after it has been previously enabled (FR = 1). Stopping the instruction run counter; removing the test mode condition from the TML block.

  RS = 1: Clearing the instruction run counter and the buffer for flags, analog and binary values.

  MO = x: Pre–selection of the TML block test mode. This operator input is only permitted in the status SP = 1.

  MO = 0: Monitoring all TML block runs. The instruction run timers continue counting. Enabling by FR = 1; end of monitoring by SP = 1.

  MO =1: Monitoring one run of the TML block. The instruction run timers continue counting. Enabling by FR = 1; the SP status is automatically selected after test point 16 has been passed; test entries will not be cleared (shown by blinking “SP”). A new execution can be started with FR = 1.

  ☞ Proper functioning is only ensured if test point 16 has been entered; otherwise processing takes place as in mode = 0. Test points which occur in the program after the 16th test point cannot be processed.

  UP = n: Selection of a test point ($1 \leq n \leq 16$) in the process display for further operation (ZN). UP = 0 can be used to disable an entry by ZN input (no test point selected). The number of the selected test point is shown in the process image in reverse display.

  ZN = a: Specification of a TML line number to be monitored in the monitored TML block. The value is entered in the test point selected by UP = n.
  ZN = 0 can be used to clear an entry in the test point selected.

  AM = 1 : Toggling the output mode for analog values between floating point and address representation.

FR=1	SP=1	RS=1	MO=	UP=	ZN=	AM=1	

AM Output mode
FR Enabling of test monitoring
MO Monitoring mode
RS Reset flag
SP Inhibit/end of test monitoring
UP Selection of monitoring test no.
ZN Specification of line number

Fig. 9.224 TUEB block; automatic labeling of the process communication keyboard

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Source address of TML block to be tested	UBST	1	EA
Enabling test monitoring	FR	2	PB
Disabling/end test monitoring	SP	3	PB
Reset display	RS	4	PB
Monitoring mode	MO	5	I
Test point no. selection	UP	6	I
Line number specification	ZN	7	ID
Output mode	AM	8	PB

- Block list

```
   TUEB    1                  03. 03. 83/ 00. 23. 19. P: 1

 1 EA   UBST                                  C  Q      1
 2 PB   FR    0                               CB        2
 3 PB   SP    1                               CB        3
 4 PB   RS    0                               CB        4
 5 I    MO        0                           CB        5
 6 I    UP        0                           CB        6
 7 ID   ZN        0                           CB        7
 8 PB   AM    0                               CB        8
```

TVB

Block for partial subgroup control and preselector control of binary arithmetic modules

Application

This block is used for signal acquisition and transfer from and to the binary arithmetic module (see Chap. 9.2).
The TVB block is required if operator–process communication and process monitoring of a partial subgroup control or a preselector control implemented on the binary arithmetic module are to be performed from AS 235.
Up to four TVB blocks (up to 2 partial subgroup controls and up to 2 preselector controls) can be assigned to each binary arithmetic module.

Method of Operation

- Common functions

  The TVB block can only be used together with a BRBK block. The interconnection must be established from the BRBK block, depending on the control mode requirements. The block name is displayed in the BRBK block element for control purposes. The control mode can only be altered after this interconnection has been cleared.
  Input TEVL defines whether a partial subgroup control (TEVL = 1) or a preselector control (TEVL = 2) is to be processed.
  Block processing is inhibited if a control mode has not been selected.
  Block input KNR specifies the channel used for processing the selected control mode.

  ☞ The user must ensure that the required function has been implemented on the module. The system does not perform any check.

  Some of the signals read by the module are stored in internal elements and can be read directly using TML.
  Á binary field with at least 12 elements can be interconnected with input GBE so that the signals can be interconnected with standard blocks. The signals are stored in parallel in this field.
  Impulse–type module signals (THBA, THBH and TBBL for partial subgroup control and HVW1, HVW2 and HVW3 for preselector control) are extended in the TVB block for the purposes of better representation. The extension time, which is specified in seconds in the UZT element, is started after each 0/1 transition.

- STO mode

  Operator inputs are rejected in “STO” status.

- Partial subgroup control mode (element TEVL = 1)

  Signals from the TVB block in the module

  The TVB block transfers the following input signals to the module:

A	Manual command “automatic”	(only effective if FHD = 1)
H	Manual command “manual”	(only effective if FHD = 1)
QB	Acknowledgement	
FHD	Enable manual mode	
BAA	Automatic command “automatic”	

BAH	Automatic command “manual”
BABT	Automatic command “operation”
BAST	Automatic command “shutdown”
ZWH	Forced manual

Inputs A, H and QB are reset subsequently.
Input QB is transferred to the module like as an A or H manual command without enabling signal (FHD = 0).

Signals from the module to the TVB block

Some of the signals from the module are stored in outputs, some in internal elements.

FUFE	Malfunction		
TH	Status “manual”		
TA	Status “automatic”		
THBH	Feedback manual command “manual”		(1) (2)
THBA	Feedback manual command “Automatic”		(1) (2)
TST	Status “shutdown”		
TBT	Status “operation”		
TBAB	Feedback automatic command “operation”		(2)
TBAS	Feedback automatic command “shutdown”		(2)
TZWH	Feedback forced manual		
TBBL	Command blocked		(1)
TBAA	Feedback automatic command “automatic mode”		(2)
TBAH	Feedback automatic command “manual mode”		(2)
TLAR	Lamp “automatic”	steady light	(2)
TLAB	Lamp “automatic”	blinking	(2)
TLHR	Lamp “manual”	steady light	(2)
TLHB	Lamp “manual”	blinking	(2)
TLSR	Lamp “fault”	steady light	(2)
TLSB	Lamp “fault”	blinking	(2)

(1) Signal is extended
(2) Signal is also stored in the binary field if input GBE has been interconnected.

Binary field assignment:

Element	Signal
0	THBH
1	THBA
2	TBAH
3	TBAA
4	TBAS
5	TBAB
6	TLHB
7	TLHR
8	TLAR
9	TLAB
10	TLSR
11	TLSB

- Preselector control mode (element TEVL = 2)

  Input BART defines the preselector control mode. Three modes are possible:

  1 = preselection 1–out–of–2 using 1 key
  2 = preselection 1–out–of–2 using 2 keys
  3 = preselection 1–out–of–2 using 3 keys

☞ The user must ensure that the mode selected matches the mode configured on the module. A check is not performed.

Signals from the TVB block to the module

The TVB block transfers the following input signals to the module:

V1	Preselection 1
V2	Preselection 2 (mode 2 or 3 only)
V3	Preselection 3 (mode 3 only)

Signals from the module to the TVB block

Some of the signals from the module are stored in outputs, some in internal elements.

VW1	Feedback output command generating set 1	
VW2	Feedback output command generating set 2	
VW3	Feedback output command generating set 3	
HVW1	Manual operator input preselection 1	(1) (2)
HVW2	Manual operator input preselection 2	(1) (2)
HVW3	Manual operator input preselection 3	(1) (2)
LVW1	Lamp, steady light, preselection 1	(2)
LVW2	Lamp, steady light, preselection 2	(2)
LVW3	Lamp, steady light, preselection 3	(2)

(1) Signal is extended
(2) Signal is also stored in the binary field if input GBE has been interconnected

Binary field assignment:

Element	Signal
0	HVW1
1	LVW1
2	HVW2
3	LVW2
4	HVW3
5	LVW3

- Parameterization

  At input 1 (TEVL), the user defines whether a partial subgroup control (TEVL = 1) or a preselector control (TEVL = 2) is to be processed. Block processing is disabled if a control mode has not been selected (TEVL = 0).

  Input 2 (KNR) is used for specifying the channel for the control mode selected.

  ☞ The user must ensure that the required function has been implemented on the module. The system does not perform any check.

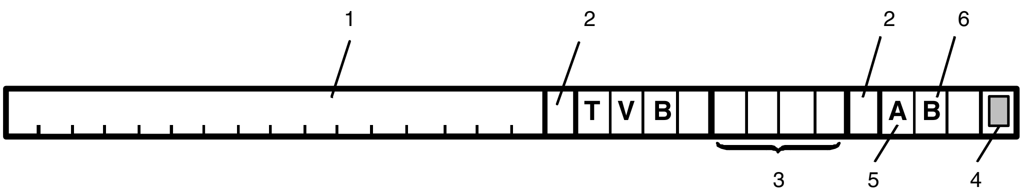
  Status transfer via the bus is suppressed if input 3 (US) has been set to 1. Status message frame will then no longer be transferred to the OS (the last bus message frame resets the message).

  Input 4 (FHD) is used for enabling (FHD = 1) or disabling (FHD = 0) the operator input function (A/H or V1/V2/V3).

  A binary field with at least 12 elements can be interconnected with input 5 (GBE). The internal module signals are stored in parallel in this field.
  A LAYOUT block can be interconnected with input 7 (LAYO) in order to supplement the loop display. This block is activated cyclically when the TVB loop display is selected.

  Impulse–type module signals (THBA, THBH and TBBL for partial subgroup control and HVW1, HVW2 and HVW3 for preselector control) are extended in the TVB block for the purposes of better representation. The extension time, which is specified in seconds in the UZT element, is started after each 0/1 transition.

- Normalized representation in a group display



1 Process–related name of the TVB block (as in loop display)
2 Separating blank
3 Name/number of TVB block
4 Loop message field: grouping of the alarm signals “module fault”, TBBL and TZHW as a blinking mark
5 Block mode: manual/automatic mode
6 block mode: operation/shutdown

Fig. 9.225 TVB block; normalized representation in a group display

Items 4, 5 and 6 are only effective if partial subgroup control has been selected.

The block is represented by 30 characters in a specific location of a group display. Input 6 NRPL (group display: no./location no.) must then be parameterized as follows:

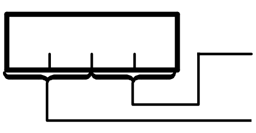


Fig. 9.226 TVB block; parameterization of input 6

```
                TVB    1           TEILSTEUERUNNG


                                         TA11TA12
                                         A1 123.00      EHT1

                                         A2 234.00      EHT2
                                         TA21TA22




BEFEHL               ZUSTAND
      0  A           0
      0  H           0
      0  STILLST.    0                             B1 0
      0  BETRIEB     0              BBL    0       B2 1
         ZW.HAND     0              FUFE   0       B3 0
   QB                                              B4 0
```

Fig. 9.227 TVB block; loop display (partial subgroup control)

```
                TVB    1           VORWAHLSTEUERUNG


                                         TA11TA12
                                         A1 123.00      EHT1

                                         A2 234.00      EHT2
                                         TA21TA22





                                                   B1 0
                                                   B2 1
                                                   B3 0
                V1 0    V2 0    V3 0               B4 0
```

Fig. 9.228 TVB block; loop display (preselector control BART = 3)

- Operator input using the process communication keyboard

A=1	H=1	QB=1					

A Automatic
H Manual mode
QB Acknowledgement

Fig. 9.229 TVB block; automatic labeling of the process communication keyboard during partial subgroup control

V=1							

V Manual command, preselection 1

Fig. 9.230 TVB block; automatic labeling of the process communication keyboard during preselector control, BART = 1

V1=1	V2=1						

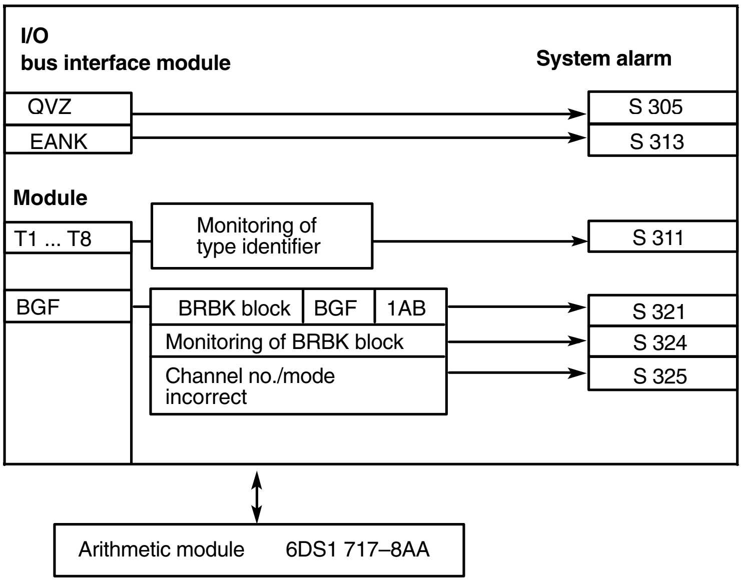
V1, V2 Manual command, preselection 1, 2

Fig. 9.231 TVB block; automatic labeling of the process communication keyboard using preselector control, BART = 2

V1=1	V2=1	V3=1					

V1, V2, V3 Manual command, preselection 1, 2, 3

Fig. 9.232 TVB block; automatic labeling of the process communication keyboard during preselector control, BART = 3



T1 ... T8	Type identifier of the module
QVZ	Time–out
EANK	Multiple addressing
BGF	Module fault

Fig. 9.233 TVB block; alarm logic

- System messages

  S 305 Time–out from module (incorrect address, defective)
  S 311 Incorrect module type
  S 321 Module malfunction/defect (cycle error)
  S 324 BRBK block has failed
  S 325 Not assigned to any BRBK block

- Block sequence

  In order to avoid synchronization errors, the TVB block should be installed before the BRBK block in the same processing cycle. Assignment must be performed in the BRBK block.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Automatic state	TA	1	AB (T)
Manual state	TH	2	AB (T)
Operation state	TBT	3	AB (T)
Shutdown state	TST	4	AB (T)
Forced manual state	TZWH	5	AB (T)
Malfunction	FUFE	6	AB (T)
Command blocked	TBBL	7	AB (T)
Output command preselection generating set 1	VW1	8	AB (V)
Output command preselection generating set 2	VW2	9	AB (V)
Output command preselection generating set 3	VW3	10	AB (V)
Control type	TEVL	1	I (A)
Channel number	KNR	2	I (A)
Status suppression	US	3	EB (A)
Enable manual control	FHD	4	EB (A)
Reference to an internal binary field for internal signal states	GBE	5	EB (A)
Location number for group display entry	NRPL	6	I (A)
Connection for a LAYOUT block to be inserted into a loop display	LAYO	7	EA (A)
Delay time for impulse–type module signals	UZT	8	I (A)
Adjacent analog value 1	AW1	9	EA (A)
Adjacent analog value 2	AW2	10	EA (A)
Adjacent binary value 1	BW1	11	EB (A)
Adjacent binary value 2	BW2	12	EB (A)
Adjacent binary value 3	BW3	13	EB (A)
Adjacent binary value 4	BW3	14	EB (A)
Name of adjacent analog value 1	TAW1	15	S2 (A)
Name of adjacent analog value 2	TAW2	16	S2 (A)
Name of adjacent binary value 1	TBW1	17	S2 (A)
Name of adjacent binary value 2	TBW2	18	S2 (A)
Name of adjacent binary value 3	TBW3	19	S2 (A)
Name of adjacent binary value 4	TBW4	20	S2 (A)
Process–related name 1 of adjacent analog value 1	TA11	21	S4 (A)
Process–related name 2 of adjacent analog value 1	TA12	22	S4 (A)
Unit of adjacent analog value 1	EHT1	23	S4 (A)
Process–related name 1 of adjacent analog value 2	TA21	24	S4 (A)
Process–related name 2 of adjacent analog value 2	TA22	25	S4 (A)
Unit of adjacent analog value 2	EHT2	26	S4 (A)

(A) : General purpose element
(T) : Elements of the partial subgroup control function
(V) : Elements of the preselector control function

Data structure (continued)

Meaning	Mnemonic name	Input/Output No.	Type
Name of the associated BRBK block	BRBK	27	S4 (A)
Optical separation	___	28	S16 (A)
Manual command ”automatic”	A	29	PB (T)
Manual command ”manual”	H	30	PB (T)
Acknowledgement	QB	31	PB (T)
Automatic command ”automatic”	BAA	32	EB (T)
Automatic command ”manual”	BAH	33	EB (T)
Automatic command ”operation”	BABT	34	EB (T)
Automatic command ”shutdown”	BAST	35	EB (T)
Forced manual	ZWH	36	EB (T)
Texts for loop display and PBT labeling			
Text ”COMMAND” part 1	T1BE	37	S4 (T)
Text ”COMMAND” part 2	T2BE	38	S4 (T)
Text ”STATE” part 1	T1ZU	39	S4 (T)
Text ”STATE” part 2	T2ZU	40	S4 (T)
Text ”SHUTDOWN” part 1	T1ST	41	S4 (T)
Text ”SHUTDOWN” part 2	T2ST	42	S4 (T)
Text ”OPERATION” part 1	T1BT	43	S4 (T)
Text ”OPERATION” part 2	T2BT	44	S4 (T)
Text ”FORCED MANUAL” part 1	T1ZW	45	S4 (T)
Text ”FORCED MANUAL” part 2	T2ZW	46	S4 (T)
Text ”BBL”	TXBB	47	S4 (T)
Text ”FUFE”	TXFF	48	S4 (T)
Text ”A”	TXA	49	S2 (T)
Text ”H”	TXH	50	S2 (T)
Text ”QB”	TXQB	51	S2 (T)
Optical separation	___	52	S16 (A)
Manual command preselection 1	V1	53	PB (V)
Manual command preselection 2	V2	54	PB (V)
Manual command preselection 3	V3	55	PB (V)
Mode	BART	56	I (V)
Automatic command preselection 1	BAV1	57	EB (V)
Automatic command preselection 2	BAV2	58	EB (V)
Automatic command preselection 3	BAV3	59	EB (V)
Texts for loop display and PBT labeling			
Text ”V1”	TXV1	60	S2 (V)
Text ”V2”	TXV2	61	S2 (V)
Text ”V3”	TXV3	62	S2 (V)
Process–related name	AT	63	S16 (A)

(A) : General–purpose element
(T) : Elements of the partial subgroup control function
(V) : Elements of the preselector control function

- Block list

```
   TVB     ORPA               11. 01. 89/ 14. 12. 53. P: 1*

 1 AB  TA   0                 #  P                      63
 2 AB  TH   0                 #  P                      64
 3 AB  TBT  0                 #  P                      65
 4 AB  TST  0                 #  P                      66
 5 AB  TZWH 0                 #  P                      67
 6 AB  FUFE 0                 #  P                      68
 7 AB  TBBL 0                 #  P                      69
 8 AB  VW1  0                 #  P                      70
 9 AB  VW2  0                 #  P                      71
10 AB  VW3  0                 #  P                      72
 1 I   TEVL     0                               C        1
 2 I   KNR      1                               C        2
 3 EB  US   0                    P                       3
 4 EB  FHD  1                    P                       4
 5 EB  GBE  0                 A  P              C  Q     5
 6 I   NRPL  0                                  C        6
 7 EA  LAYO 15     0     0A      P              C  Q     7
 8 I   UZT  10                                           8
 9 EA  AW1  15     0     0A      P                       9
10 EA  AW2  15     0     0A      P                      10
11 EB  BW1  0             A      P                      11
12 EB  BW2  0             A      P                      12
13 EB  BW3  0             A      P                      13
14 EB  BW4  0             A      P                      14
15 S2  TAW1 A1                                          15
16 S2  TAW2 A2                                          16
17 S2  TBW1 B1                                          17
18 S2  TBW2 B2                                          18
19 S2  TBW3 B3                                          19
20 S2  TBW4 B4                                          20
21 S4  TA11 TA11                                        21
22 S4  TA12 TA12                                        22
23 S4  EHT1 EHT1                                        23
24 S4  TA21 TA21                                        24
25 S4  TA22 TA22                                        25
26 S4  EHT2 EHT2                                        26
27 S4  BRBK                                       N     27
28 S16 ---- ------------------      16            N     28
29 PB  A    0                                    B      29
30 PB  H    0                                    B      30
31 PB  QB   0                                    B      31
32 EB  BAA  0                    P                      32
33 EB  BAH  0                    P                      33
34 EB  BABT 0                    P                      34
35 EB  BAST 0                    P                      35
36 EB  ZWH  0                    P                      36
37 S4  T1BE BEFE                                        37
38 S4  T2BE HL                                          38
39 S4  T1ZU ZUST                                        39
40 S4  T2ZU AND                                         40
41 S4  T1ST STIL                                        41
42 S4  T2ST LST.                                        42
43 S4  T1BT BETR                                        43
44 S4  T2BT IEB                                         44
45 S4  T1ZW ZW.H                                        45
46 S4  T2ZW AND                                         46
47 S4  TXBB BBL                                         47
```

Block list (continued)

```
   TVB     ORPA               11. 01. 89/ 14. 13. 35. P: 1*

48 S4  TXFF FUFE                                         48
49 S2  TXA  A                               C            49
50 S2  TXH  H                               C            50
51 S2  TXQ  QB                              C            51
52 S16 ———— —————————————————       16        N          52
53 PB  V1   0                                B           53
54 PB  V1   0                                B           54
55 PB  V3   0                                B           55
56 I   BART     3                           C            56
57 EB  BAV1 0                    P                       57
58 EB  BAV2 0                    P                       58
59 EB  BAV3 0                    P                       59
60 S2  TXV1 V1                              C            60
61 S2  TXV2 V2                              C            61
62 S2  TXV3 V3                              C            62
63 S16 AT   *TECHNOLOG.NAME*        16                  110
```

Allocation of the TVB driver module designations to the designations of the binary arithmetic module 6DS1 717

☞ Multiply–used for inputs and outputs are distinguished by different channels (cf. parameter KNR = input 2). The driver block can exchange data with one channel only.

Driver		Module		Meaning
Mnemonic name	Input/ output	Internal name	Flag number	
V1	53 PB	VW1VL1	M,10,1	Preselection channel 1 [1]
V2	54 PB	VW2VL1	M,10,2	Preselection channel 1 [1]
V3	55 PB	VW3VL1	M,10,3	Preselection channel 1 [1]
FHD	4 EB	FHDVL1	M,10,4	Preselection channel 1 [1]
A H QB	29 PB 30 PB 31 PB	BHATE1	M,10,5	Partial subgroup control K1 [1]
FHD	4 EB	FHDTE1	M,10,6	Partial subgroup control K1 [1]
V1	53 PB	VW1VL2	M,10,7	Preselection channel 2 [2]
V2	54 PB	VW2VL2	M,10,8	Preselection channel 2 [2]
V3	55 PB	VW3VL2	M,10,9	Preselection channel 2 [2]
FHD	4 EB	FHDVL2	M,10,10	Preselection channel 2 [2]
A H QB	29 PB 30 PB 31 PB	BHATE2	M,10,11	Partial subgroup control K2 [2]
FHD	4 EB	FHDTE2	M,10,12	Partial subgroup control K2 [2]
BAH	33 EB	BAHTE1	M,11,9	Automatic command “manual” [3]
BAA	32 EB	BAATE1	M,11,10	Automatic command “automatic” [3]
ZWH	36 EB	ZWHTE1	M,11,11	Forced manual [3]
BAST	35 EB	BASTE1	M,11,12	Automatic command “shutdown” [3]
BABT	34 EB	BABTE1	M,11,13	Automatic command “operation” [3]
BAV1	57 EB	BAV1V1	M,11,14	Command “preselection 1” [4]
BAV2	58 EB	BAV2V1	M,11,15	Command “preselection 2” [4]
BAV3	59 EB	BAV3V1	M,11,16	Command “preselection 3” [4]
BAH	33 EB	BAHTE2	M,13,13	Automatic command “manual” [5]
BAA	32 EB	BAATE2	M,13,14	Automatic command “automatic” [5]

[1] Manual control inputs, preselector and partial subgroup control channel 1
[2] Manual control inputs, preselector and partial subgroup control channel 2
[3] TE 1
[4] VL 1
[5] TE 2

Allocation: TVB driver to binary arithmetic module; signal direction central unit → module

Driver		Module		Meaning
Mnemonic name	Input/ output	Internal name	Flag number	
ZWH	36 EB	ZWHTE2	M,13,15	Forced manual [5)]
BAST	35 EB	BASTE2	M,13,16	Automatic command “shutdown” [5)]
BABT	34 EB	BABTTE2	M,14,1	Automatic command “operation” [5)]
BAV1	57 EB	BAV1V2	M,14,2	Command “preselection 1” [6)]
BAV2	58 EB	BAV2V2	M,14,3	Command “preselection 2” [6)]
BAV3	59 EB	AV3V2	M,14,4	Command “preselection 3” [6)]
FUFE	6 AB	TFUFE1 (M1TE0)	M,18,1	Malfunction [7)]
TH	2 AB	TH1 (M1TE1)	M,18,2	Manual mode [7)]
TA	1 AB	TA1	M,18,3	Automatic mode [7)]
TBBL	7 AB	TBBL1 (M1TE4)	M,18,14	Command blocked [7)]
TZWH	5 AB	TZWHV1	M,18,15	Forced manual, interconnected [7)]
TST	4 AB	TST1 (M1TE5)	M,19,2	Shutdown [7)]
TBT	3 AB	TBT1	M,19,3	Operation [7)]
FUFE	6 AB	TFUFE2 (M2TE0)	M,20,1	Malfunction [8)]
TH	2 AB	TH2 (M2TE1)	M,20,2	Manual mode [8)]
TA	1 AB	TA2	M,20,3	Automatic mode [8)]
TBBL	7 AB	TBBL2 (M2TE4)	M,20,14	Command blocked [8)]
TZWH	5 AB	TZWHV2	M,20,15	Forced manual, interconnected [8)]
TST	4 AB	TST2 (M2TE5)	M,21,2	Shutdown [8)]
TBT	3 AB	TBT2	M,21,3	Operation [8)]
VW1	8 AB	VW1V1 (M1VL1)	M,22,1	Preselection 1 [9)]
VW2	9 AB	VW2V1	M,22,2	Preselection 2 [9)]

5) TE 2
6) VL 1
7) Partial subgroup control channel 1
8) Partial subgroup control channel 2
9) Preselection channel 1

Allocation: TVB driver to binary arithmetic module; signal direction module → central unit (continued)

Driver		Module		Meaning
Mnemonic name	Input/ output	Internal name	Flag number	
VW3	10 AB	VW3V1	M,22,3	Preselection 3 [9)]
VW1	8 AB	VW1V2 (M2VL1)	M,24,1	Preselection 1 [10)]
VW2	9 AB	VW2V2	M,24,2	Preselection 2 [10)]
VW3	10 AB	VW3V2	M,24,3	Preselection 3 [10)]

9) Preselection channel 1
10) Preselection channel 2

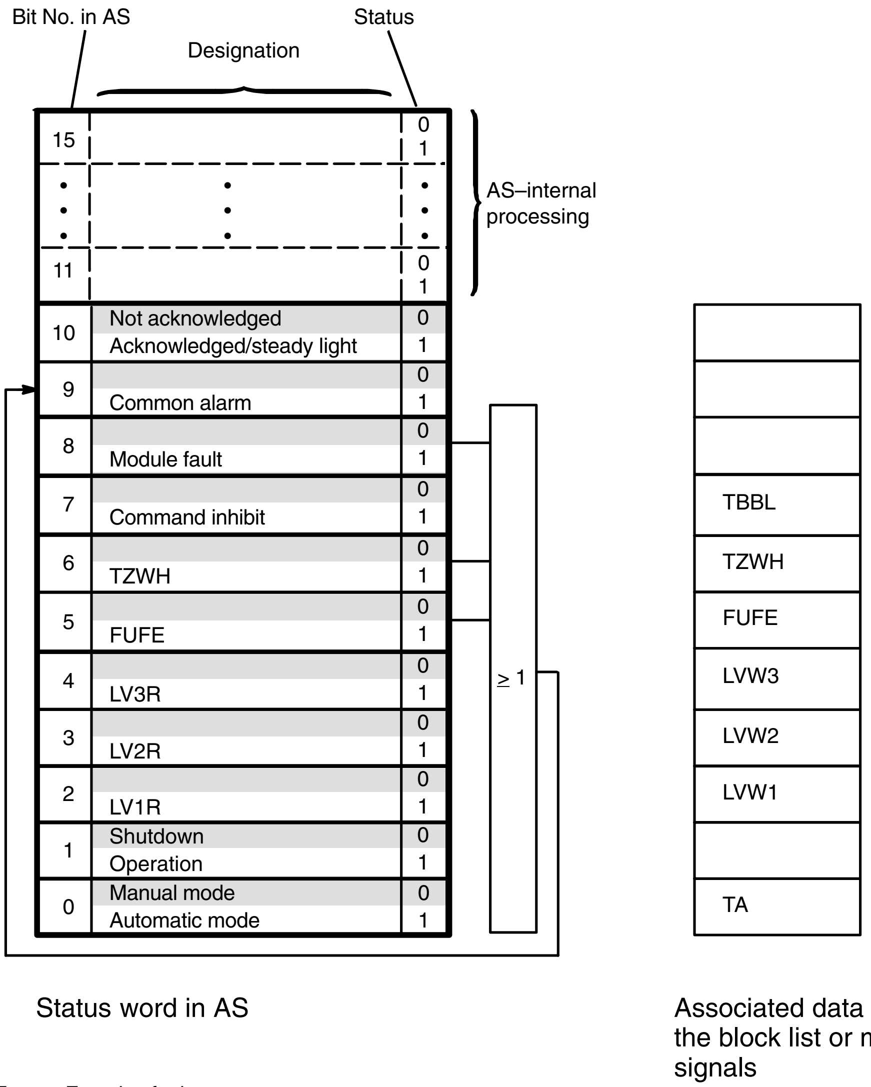
Allocation: TVB driver to binary arithmetic module; signal direction module → central unit (continued)

Allocation of the TVB driver module designations to the designations of the binary arithmetic module (continued)

Driver	Module		Meaning	Function
Mnemonic Input/ name output	Internal name	Flag number		
ident. to ESG 1	MESG2	M,35,1	9 groups	ESG channel 2
ident. to ESG 1		:	9 groups	ESG channel 2
ident. to ESG 1		M,43,16	9 groups	ESG channel 2
ident. to ESG 1	MESG3	M,44,1	9 groups	ESG channel 3
ident. to ESG 1		:	9 groups	ESG channel 3
ident. to ESG 1		M,52,16	9 groups	ESG channel 3
ident. to ESG 1	MESG4	M,53,1	9 groups	ESG channel 4
ident. to ESG 1		:	9 groups	ESG channel 4
ident. to ESG 1		M,61,16	9 groups	ESG channel 4
ident. to ESG 1	MESG5	M,62,1	9 groups	ESG channel 5
ident. to ESG 1		:	9 groups	ESG channel 5
ident. to ESG 1		M,70,16	9 groups	ESG channel 5

Allocation: TVB driver to binary arithmetic module

- Status word



FUFE	Function fault
LVW1 ... 3	Lamp, steady light, preselection 1 ... 3
TA	Automatic state
TBBL	Command blocking
TZWH	Forced manual state

Fig. 9.234 Status word for the TVB block

UBR

Multi–purpose binary routing block

Application

This block is used for interconnecting up to 16 binary outputs with GB/GM data blocks.

Method of Operation

The multi–purpose binary routing block has 16 EB (E1 to E16) and one EB input GBA. The block reads the (interconnected or parameterized) inputs E1 to E16 and re–routes these values to a GB field. Input GBA is interconnected with the GB address to which the value from E1 is to be routed. The values from E2 to E16 are routed to the next higher GB cells.
The block may not be installed before GBA has been interconnected.

- Data structure (designation of inputs and outputs)

Meaning		Mnemonic name	Input/output No.	Type	Configuration details
Input	1	E1	1	EB	
Input	2	E2	2	EB	
Input	3	E3	3	EB	
Input	4	E4	4	EB	
Input	5	E5	5	EB	
Input	6	E6	6	EB	
Input	7	E7	7	EB	
Input	8	E8	8	EB	
Input	9	E9	9	EB	
Input	10	E10	10	EB	
Input	11	E11	11	EB	
Input	12	E12	12	EB	
Input	13	E13	13	EB	
Input	14	E14	14	EB	
Input	15	E15	15	EB	
Input	16	E16	16	EB	
Target address		GBA	17	EB	Can only be interconnected

- Block list

```
   UBR      1                   03. 03. 83/ 00. 24. 26. P: 1

 1 EB  E1    0                     P                        1
 2 EB  E2    0                     P                        2
 3 EB  E3    0                     P                        3
 4 EB  E4    0                     P                        4
 5 EB  E5    0                     P                        5
 6 EB  E6    0                     P                        6
 7 EB  E7    0                     P                        7
 8 EB  E8    0                     P                        8
 9 EB  E9    0                     P                        9
10 EB  E10   0                     P                       10
11 EB  E11   0                     P                       11
12 EB  E12   0                     P                       12
13 EB  E13   0                     P                       13
14 EB  E14   0                     P                       14
15 EB  E15   0                     P                       15
16 EB  E16   0                     P                       16
17 EB  GBA                         P              C  Q     17
```

V

Ratio block

Application

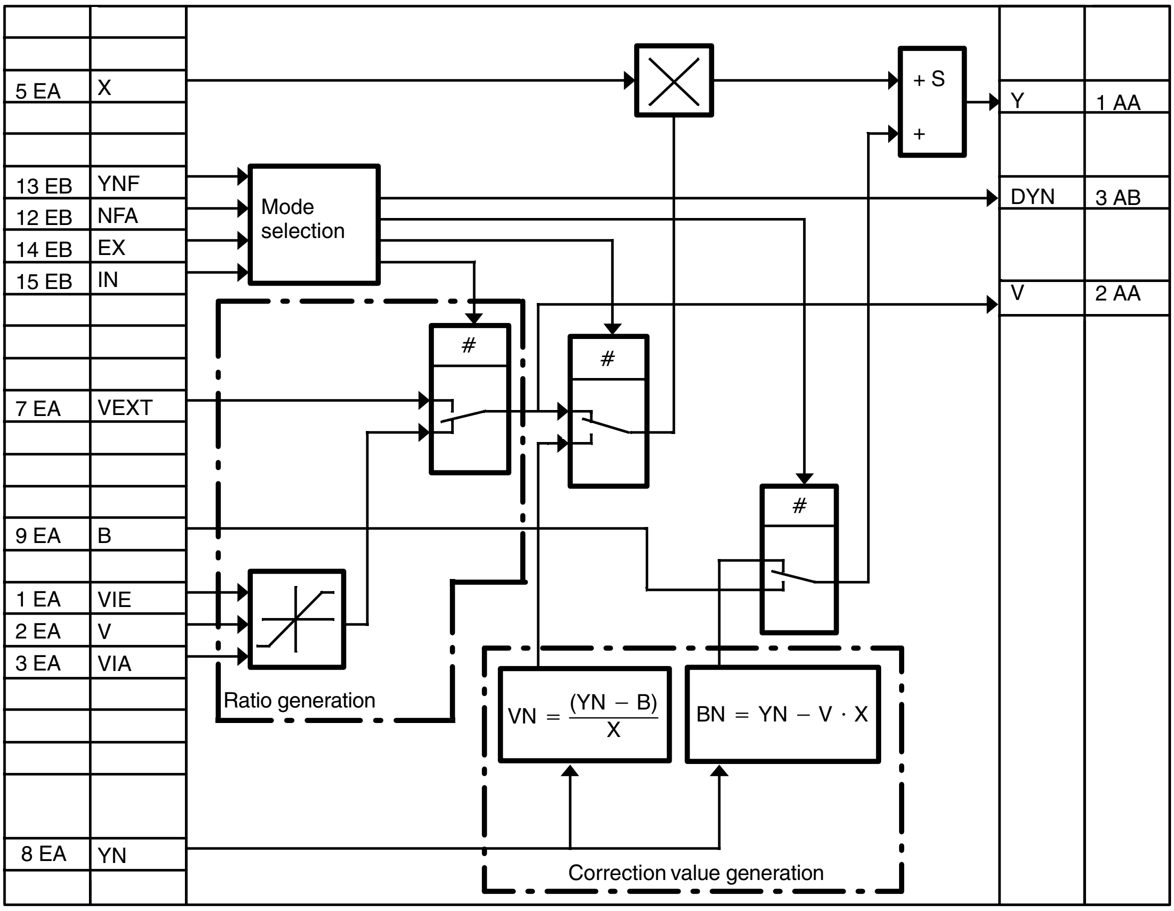
This block is used either for ratio generation (e.g. ratio control) and as the segment actuator in a synchro control, or to influence the reference variable of a cascade.

Method of Operation

The block follows the equation:

$Y = V \cdot X + B$

The input variable X is multiplied by the ratio factor V or VEXT and shifted by the constant “Bias” (B).



B	Bias (constant value)	VIA	Lower range value of internal ratio factor
DYN	Output for dynamic correction	VIE	Upper range value of internal ratio factor
EX	External ratio factor (mode)	X	Measured value
IN	Internal ratio factor (mode)	Y	Output value
NFA	Correction mode	YN	Output correction value
VA	Effective ratio factor	YNF	Output value correction
V	Internal ratio factor	VEXT	External ratio factor

Fig. 9.235 Ratio block; logic diagram

- Ratio control

  The internal ratio factor (V) is limited to its range (VIE–VIA). Depending on the PBT operator input (EX, IN), the internal (V) or external (VEXT) ratio factor will be used to generate the output variable Y. The effective ratio factor VA is available as the output signal. The internal ratio factor V is corrected to the external ratio factor VEXT in EX mode.

- Mode selection

  An impulse appears at output (DYN) for one cycle (TA) when the system is switched from IN to EX. This output signal can be used for bumpless changeover (of a controller, for example). V is also effective during this cycle after the next VEXT has been reached.

  The output value Y can be corrected to the value YN in correction mode (YNY). This correction (bumpless transition) is performed via VN (NFA = 0) or BN (NFA = 1), and depends on the NFA input (Correction mode).

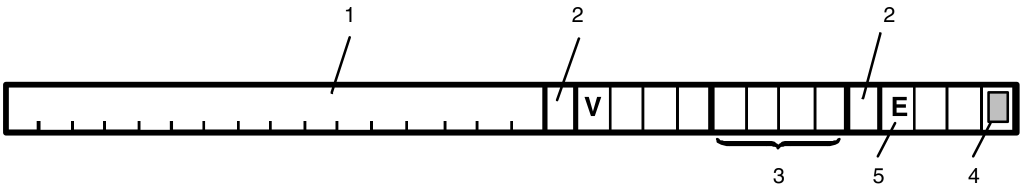
- Generation of the correction value

  There are two possibilities depending on the correction modes VN and BN:

  a) Correction via $V = VN$: $Y = YN = VN \cdot X + B$ i.e. $VN = (YN - B)/X$

  b) Correction via $B = BN$: $Y = YN = V \cdot X + BN$ i.e. $BN = YN - V \cdot X$

- Normalized representation in the group display



1 Process–related name of the ratio block, as in loop display
2 Separating blank
3 Ratio block number
4 Blinking mark if alarm signal “External fault” has occcurred
5 E for external ratio factor

Fig. 9.236 Ratio block; normalized representation in the group display

The block is represented by 30 characters at a specific location of a group display. Input 21 (group display: no./location no.) must then be parameterized as follows:

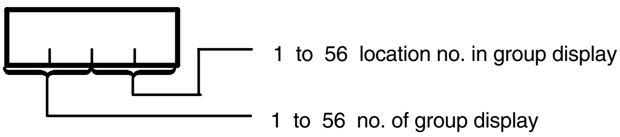


Fig. 9.237 Ratio block; parameterization of input 21

Set input 21 (NRPL) to “0” if the normalized representation of a block in a group display is to be suppressed.

- Normalized representation of the loop display

  The loop display contains static and dynamic data for the operator.

  Legend for Fig. 9.238:

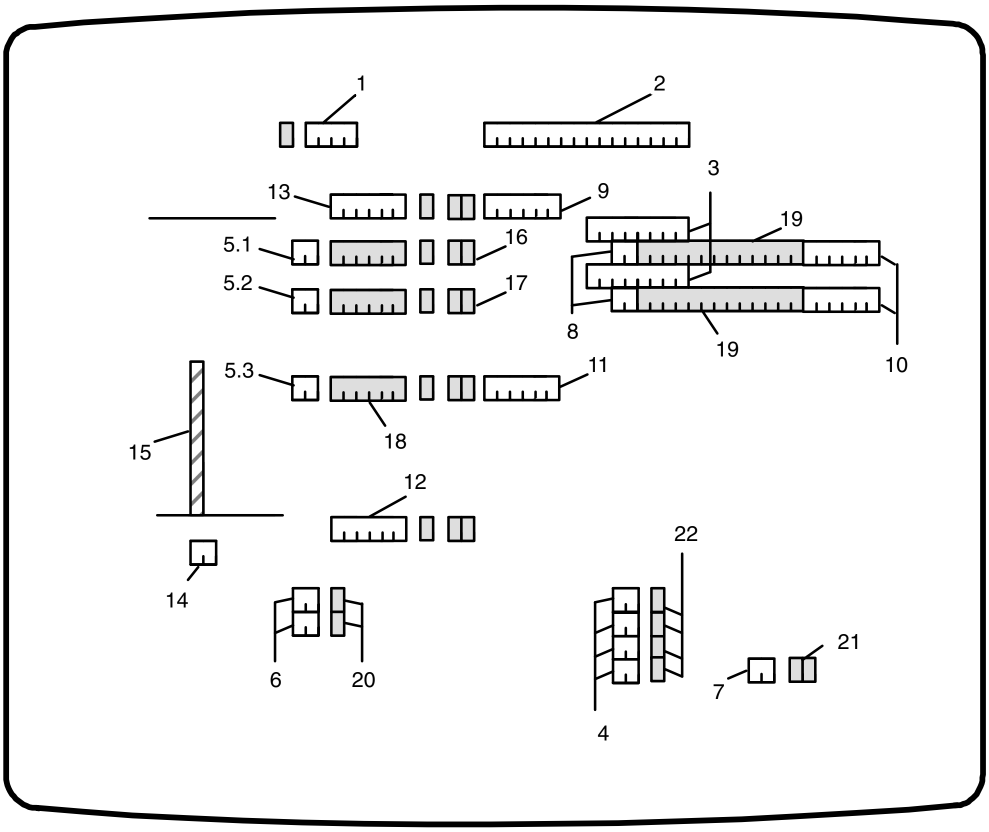
Static data:

1 Mnemonic name and number of the ratio block
2 Process–related name of the ratio block (AT)
3 Process–related name of adjacent analog values (TA11, TA12, TA21)
4 Process–related mnemonic name of adjacent binary values B1 to B4 (TBW1 to TBW4) [1)]
5.1 Ratio block size (TX) [1)]
5.2 " (TY) [1)]
5.3 " (TV) [1)]
6 Mode (EX, IN) (TE, TI) [1)]
7 Alarm signal "External fault" [1)]
8 Process–related name of adjacent analog values A1, A2 [1)]
9 Physical unit of the output value Y
10 Physical unit of the adjacent analog values (EHT1, EHT2)
11 Physical unit of the ratio factor (EHT)
12 Lower display limit of the input variable X (XA)
13 Upper display limit of the input variable X (XE)
14 Mnemonic name of the bar X [1)]

Dynamic data:

15 Input value X in bar representation (analog display)
16 Measured value X (digital display)
17 Output value Y (digital display)
18 Ratio factor V (digital display)
19 Digital display of the adjacent analog values
20 Operating states EX, IN: "0" means that the associated mode has been switched off;
"1" means that it has been switched on.
21 Status "External fault"; "1" fault has occurred
22 Status of the adjacent digital values

1) Pre–defined mnemonic name




```
01. 01. 81/ 00. 14. 27.


                 V     1          *TECHNOLOG. NAME


         ──────────   100.00      *EHTY*
                                          TA11TA12
                  X   0.0000                A1            *EHT1*
                                          TA21TA22
                  Y   0.0000                A2            *EHT2*



                  V   0.0000      *EHT*




         ──────────   0.0000
            X

                 EX 0                       B1
                 IN 1                       B2
                                            B3
                                            B4         F 0


     BR                                 V      1
V,1;
```

Fig. 9.238 Ratio block; loop display

- Operator input using the process communication keyboard

  Three keys (V =, EX = 1 and IN = 1) will be assigned after the loop display has been selected and the “Operator input” (BE) key depressed.

  After the (V =) key has been depressed, a sequence of numbers may be entered and terminated by pressing the execute key (◈). The “More” (↑) or ”Less” (↓) keys may be pressed to continue without previously entering figures. The execute key (◈), normally required for termination, need not be pressed in this case.

  The change is approximately 1% of the measuring span per processing cycle.

  If a greater change is required, the appropriate ”More” (↑) or “Less” (↓) key is to be pressed together with the “High–Speed” (~) key. The change is then approximately 10% of the measurring span per processing cycle.

  Key inputs using EX = 1 and IN = 1 must be directly terminated by the execute key (◈).

V=	EX=1	IN=1					

EX External setpoint (mode)
IN Internal setpoint (mode)
V Ratio factor

Fig. 9.239 V block; automatic labeling of process communication keyboard

- Data structure (designation of inputs and outputs)

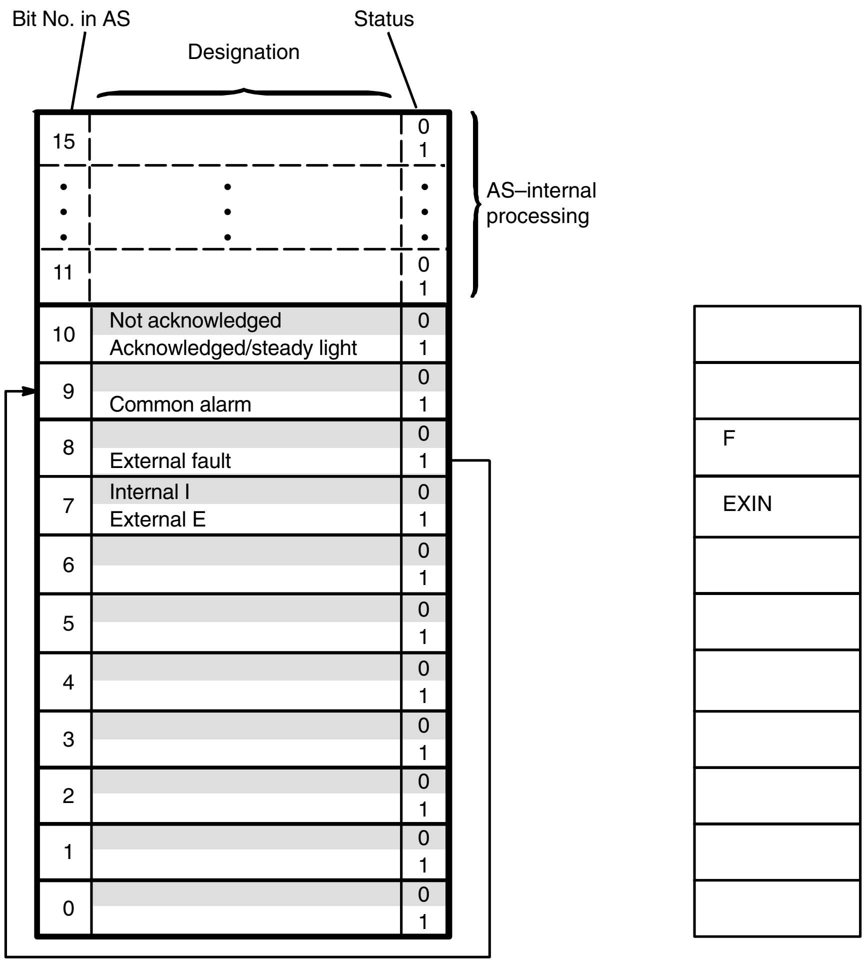
Meaning	Mnemonic name	Input/output No.	Type
Output value	Y	1	AA
Effective ratio factor	VA	2	AA
Dynamic correction output	DYN	3	AB
Upper ratio range limit	VIE	1	EA
Internal ratio	V	2	EAV
Lower ratio range limit	VIA	3	EA
Upper range limit	XE	4	EA
Measured value	X	5	EA
Lower range limit	XA	6	EA
External ratio	VEXT	7	EA
Correction input	YN	8	EA
Bias	B	9	EA
Adjacent analog value 1	AW1	10	EA
Adjacent analog value 2	AW2	11	EA
Correction mode VN: ”0”, BN: ”1”	NFA	12	EB
Correction	YNF	13	EB
External	EX	14	EBV
Internal	IN	15	EBV
Adjacent binary value 1	BW1	16	EB
Adjacent binary value 2	BW2	17	EB
Adjacent binary value 3	BW3	18	EB
Adjacent binary value 4	BW4	19	EB
External fault	F	20	EB
Group display: No./location no.	NRPL	21	ID
Cf. loop display	TV	22	S2
”	TX	23	S2
”	TY	24	S2
”	TE	25	S2
”	TI	26	S2
”	TAW1	27	S2
”	TAW2	28	S2
”	TBW1	29	S2
”	TBW2	30	S2
”	TBW3	31	S2
”	TBW4	32	S2
”	TF	33	S2
”	EHT	34	S
”	EHTY	35	S
”	TA11	36	S4
”	TA12	37	S4
”	EHT1	38	S
”	TA21	39	S4
”	TA22	40	S4
”	EHT2	41	S
”	AT	42	S16

- Block list

```
   V       1                 03. 03. 83/ 00. 25. 50. P: 1

 1 AA  Y    0.0000           #                   N      42
 2 AA  VA   0.0000           #                   N      43
 3 AB  DYN  0                #                   N      44
 1 EA  VIE  100.00              P                        1
 2 EAV V    0.0000                             CB        2
 3 EA  VIA  0.0000              P                        3
 4 EA  XE   100.00              P                        4
 5 EA  X    0.0000              P                        5
 6 EA  XA   0.0000              P                        6
 7 EA  VEXT 0.0000              P                        7
 8 EA  YN   0.0000              P                        8
 9 EA  B    0.0000              P                        9
10 EA  AW1   15    0     0A     P                       10
11 EA  AW2   15    0     0A     P                       11
12 EB  NFA  0                   P                       12
13 EB  YNF  0                   P                       13
14 EBV EX   0                                   B       14
15 EBV IN   0                                   B       15
16 EB  BW1  0             A     P                       16
17 EB  BW2  0             A     P                       17
18 EB  BW3  0             A     P                       18
19 EB  BW4  0             A     P                       19
20 EB  F    0                   P                       20
21 ID  NRPL     0                              C        21
22 S2  TV   V                                           22
23 S2  TX   X                                           23
24 S2  TY   Y                                           24
25 S2  TE   EX                                          25
26 S2  TI   IN                                          26
27 S2  TAW1 A1                                          27
28 S2  TAW2 A2                                          28
29 S2  TBW1 B1                                          29
30 S2  TBW2 B2                                          30
31 S2  TBW3 B3                                          31
32 S2  TBW4 B4                                          32
33 S2  TF   F                                           33
34 S   EHT  *EHT**                 6                    34
35 S   EHTY *EHTY*                 6                    35
36 S4  TA11 TA11                                        36
37 S4  TA12 TA12                                        37
38 S   EHT1 *EHT1*                 6                    38
39 S4  TA21 TA21                                        39
40 S4  TA22 TA22                                        40
41 S   EHT2 *EHT2*                 6                    41
42 S16 AT   *TECHNOLOG.NAME       16                    55
```

- Status word



Status word in AS

Associated data elements in the block list or module signals

F External fault
EXIN External/internal mode (internal element)

Fig. 9.240 Status word for the V block

VM

Flag block

Application

This block is used as the flag for binary input signals (flip–flop).

Method of Operation

The block functions according to Fig. 9.241.

☞ The flag function is centrally processed and is available for all blocks with flag functions (VM, VS and KS).

Reset	Set	Toggle	A/GMA	NA
I	X	X	0	1
–	I	X	1	0
–	–	I	*	*

X Not relevant
– No input signal transition from ”0” to ”1”
* Previous state is toggled
I Input signal transition from ”0” to ”1”

Fig. 9.241 Flag states

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Flag value	A	1	AB
Inverted flag value	NA	2	AB
Set flag: ”0” → ”1”	SETZ	1	EB
Reset flag: ”0” → ”1”	RSET	2	EB
Toggle flag: ”0” → ”1”	KIP	3	EB
Flag. no.	GMA	4	EB [1]

[1] Interconnect input with flag (**Q,4,GM,...;**)

- Block list

```
  VM      1                  03. 03. 83/ 00. 27. 45. P: 1

 1 AB  A     0               #                   N      5
 2 AB  NA    0               #                   N      6
 1 EB  SETZ  0                  P                       1
 2 EB  RSET  0                  P                       2
 3 EB  KIP   0                  P                       3
 4 EB  GMA                                        Q     4
```

VN

Inverter block

Application

This block is used for inverting binary signals

Method of Operation

The block follows the equation:

A = NOT E

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Output value	A	1	AB
Input value	E	1	EB

- Block list

```
   VN      1                03. 03. 83/ 00. 30. 53. P: 1

 1 AB   A    0              #                   N      2
 1 EB   E    0                 P                       1
```


VO

OR block

Application

This block is used for logic OR operations of binary signals

Method of Operation

The block follows the equation:

A = E1 v E2 v E3

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Output value	A	1	AB
Input value 1	E1	1	EB
Input value 2	E2	2	EB
Input value 3	E3	3	EB

- Block list

```
   VO       1                  03. 03. 83/ 00. 31. 31. P: 1

 1 AB   A    0                 #                   N       4
 1 EB   E1   0                    P                        1
 2 EB   E2   0                    P                        2
 3 EB   E3   0                    P                        3
```

VS

STEP M connection block

Application

This block is used for “inserting” a STEP M block for operations with a high processing depth.

Method of Operation

In contrast to blocks with a fixed function (VU, SUM, R, etc.), this block allows customized programming of the block function using the instructions of the STEP M language. The VS block can only be used together with a STEP M block.

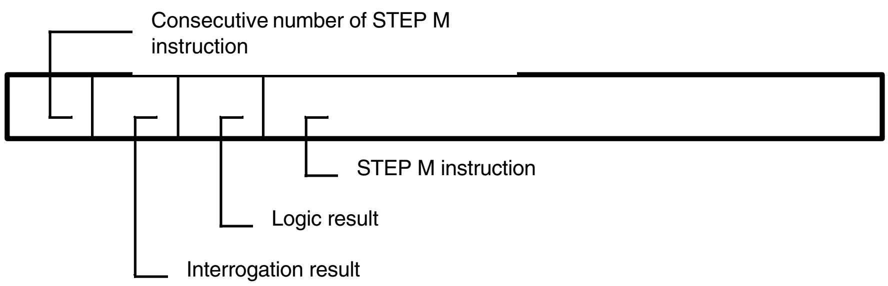


Fig. 9.242 Representation of request and operation results in a STEP block

- Features

  The following functions may be performed using STEP M instructions

  – Addressing of binary input/output GB areas
  – Addressing of function blocks
  – Addressing of flags
  – Addressing of timers
  – Operations with or without parenthesis
  – Function multiplexing

  The status of the request and operation results is displayed if a STEP block is output in an AS 235 automation subsystem.

- Combination of different instruction types of the STEP M language

  Depending on the request/logic operation instructions, the resulting signal states of peripheral or function blocks and their associated combinations are used to generate the logic operation results. These results initiate reactions (set or reset commands etc.) which are transferred to peripheral devices or function blocks.

- Specification of STEP M instructions

  An instruction consists of an operation part and an operand part. The operation part describes the function to be performed. The operand part contains the specifications required for the operation.

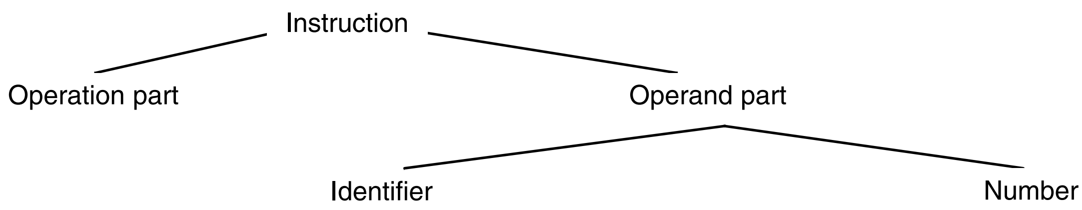


Fig. 9.243 STEP M block; command structure

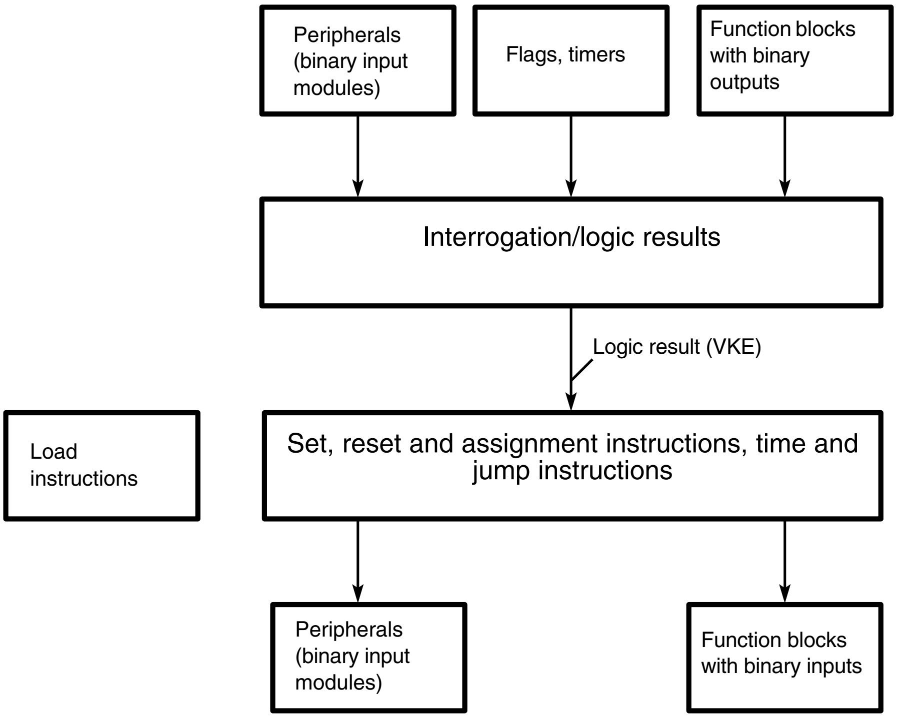


Fig. 9.244 Step M block; combination of instruction types

- Operands

  The following operands can be addressed in STEP M language;

  E GB area (binary input)
  A GB area (binary output)
  M Flag
  T Timer
  B – Outputs of the VS block
  – Ausgänge von Funktionsbausteinen

- Operationen

  Die mit der STEP–M–Sprache möglichen Operationen sind unter dem Bausteintyp STEP beschrieben.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Output value 1	AW1	1	AB
Output value 2	AW2	2	AB
Output value 3	AW3	3	AB
Output value 4	AW4	4	AB
STEP program to be called	STEU	1	EA 1)
Multiplex input 1	GAX	2	EA 1)
" 2	GBX	3	EB 1)
" 3	GMX	4	EB 1)
" 4	GTX	5	EA 1)
" 5	DSX	6	EA 1)
Multiplex "1"	MPX	7	PB

1) Interconnect with "Q", as address (`Q,inputno,tname,bname,0;`)

- Block list

```
  VS      1                 03. 03. 83/ 00. 32. 19. P: 1

1 AB  AW1  0                #                   N      29
2 AB  AW2  0                #                   N      30
3 AB  AW3  0                #                   N      31
4 AB  AW4  0                #                   N      32
1 EA  STEU 0.0000                             C   Q     1
2 EA  GAX  0.0000                             C   Q     2
3 EB  GBX  0                                  C   Q     3
4 EB  GMX  0                                  C   Q     4
5 EA  GTX  0.0000                             C   Q     5
6 EA  DSX  0.0000                             C   Q     6
7 PB  MPX  0                                            7
```

VU

AND block

Application

This block is used for logic AND operations of binary signals.

Method of Operation

The block follows the equation:

A = E1 & E2 & E3

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Output value	A	1	AB
Input value 1	E1	1	EB
Input value 2	E2	2	EB
Input value 3	E3	3	EB

- Block list

```
   VU      1                 03. 03. 83/ 00. 33. 11. P: 1

 1 AB   A    0               #                   N      4
 1 EB   E1   0                  P                       1
 2 EB   E2   0                  P                       2
 3 EB   E3   0                  P                       3
```

VZ

Time delay block

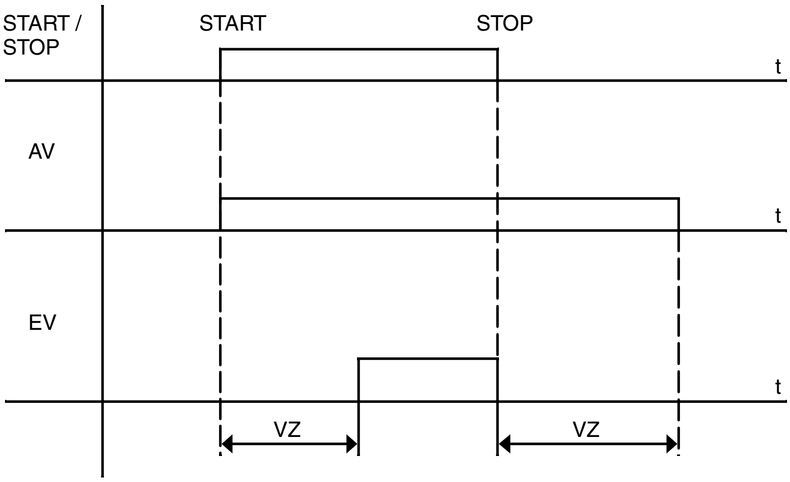
Application

This block is used for delaying closing and breaking actions

Method of Operation

The block operation is shown in the logic diagram. The delay time (VZ) can be selected between 0 and 32767 seconds (decimal positions are truncated).

☞ The time counter function is processed centrally and is available for all blocks (VZ, VS, KS) with a time counter function (timer).



AV Breaking delay
EV Closing delay
t Time
VZ Delay time

Fig. 9.245 Time delay block; logic diagram

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Breaking delay	AV	1	AB
Closing delay	EV	2	AB
START: ”0” → ”1”/STOP: ”1” → ”0”	STRT	1	EB
Delay time (s)	VZ	2	PA
Delay time counter no.	GTA	3	EA [1)]

[1)] Interconnecting input with timer (`Q,3,GT,...;`)

- Block list

```
  VZ      1               03. 03. 83/ 00. 34. 00. P: 1

 1 AB  AV   0             #                   N      4
 2 AB  EV   0             #                   N      5
 1 EB  STRT 0                P                       1
 2 PA  VZ   0.0000                                   2
 3 EA  GTA  0.0000                             Q     3
```

SYST. WART

Service and test block

Application

The function block consists of

– a menu–driven activation program and
– service subroutines

The **activation program `SYST.WART;`** offers a PICTURE which permits a maximum of 50 service functions to be entered.

The block can be selected and controlled via the configuration keyboard. It is not superimposed on the PBT since SYST.WART only performs functions which are reserved for configuration/programming purposes.

SYST.WART contains the following service subroutines:

```
                 TEST- UND WARTUNGSFUNKTIONEN

    1.  STARTBAUSTEINE XB SCHALTEN
    2.  KOPPELAUSKUNFT
    3.  SYSTEM-SCHALTER
    4.  NEMO-AUSGABE MIT PASSWORT
    5.  PROGRAMM-KOPIE VERWALTEN
    6.  NAMEN/KENNUNGEN AENDERN
    7.  BAUDRATENEINSTELLUNG
    8.  SL.CTML REGENERIEREN
    9.  BAUSTEINE NACHLADEN
   10.  SELEKTIV ARCHIVIEREN
   11.  TYPENVORGABE AUF PBT
   12.  ZYKLUS VERTAUSCHEN
   13.  KOPPLUNGEN LOESCHEN




                 FUNKTIONSANWAHL MIT   MP = NR
```

Fig. 9.246 Test and service programs in SYST.WART (example)

SYST.WART is not initiated in any processing level. Activation of CHECK or PICTURE performs the necessary execution of the initiated functions.

⚠ The SYS.WART block **cannot** be called with `CALL type.block;` by other blocks (e.g. PROBLEM)!

☞ The order of the service programs output in the menu display of SYST.WART may change due to added service programs!

Entering MP = no. in operator input mode (BE) activates the required **service program**. The menu containing the information related to the function selected is displayed.

The required details are directly displayed if the selected menu is to be used solely as an information function.

Additional parameters or alternatives for the function selected are requested by operator–controllable parameters, which are explained in the display. The display is modified or replaced according to the parameters entered.

Each service subroutine display permits an operator input “MP = no.” which interrupts the current routine and branches to the initialization program (MP = 0) or a different service program.

The initialization program and the released service subroutines are part of the system software.

Depending on the menu item selected, parameters which have been entered previously are either displayed or reset when they are selected.

The system temporarily reserves memory space in the user RAM when the individual menu items are called. The data records created are provided immediately with a delete identifier. Parameters entered for a specific menu item therefore only remain valid until the AS is reset.

Apart from short test routines which are executed on the operator input level, service subroutines obtain their computing time from the cyclic level ZYK4.

The block can neither be copied nor inserted in a group display. It does not possess a status word and cannot be controlled via OS.

The parameters of the individual menu items are kept in internal SL type system lists.

- Description of the service subroutines

1 Selecting the XB initialization blocks (XBUM)

This function modifies the EIAU parameter of the XB initialization blocks installed in the user system. The function can be used, for example, for testing a user–related structure which utilizes drivers to the field devices without a connection of the associated hardware. An excessive number of I&C alarms is created in STA mode, influencing the time reaction of the machine such that a useful test is no longer possible. XBUM offers the following modes:

```
                    STARTBAUSTEINE XB SCHALTEN

UM=1 : AUCH VERQUELLTE EINGÄNGE ÄNDERN ? JA [NEIN]
ZE=  : ZYKLUS EINSTELLEN  (0=ALLE ZYKLEN)
AU=1 : AUSSCHALTEN + ZUSTAND SICHERN, WENN NOCH NICHT GES.
EI=1 : EINSCHALTEN + ZUSTAND SICHERN, WENN NOCH NICHT GES.
AE=1 : ALT-ZUSTAND EINTRAGEN, FALLS GESICHERT
ZS=1 : AKTUELLEN ZUSTAND SICHERN
       NUR PARAMETRIERTE XB.*.EIAU WERDEN GESCHALTET


ZYKLUS AU EI AE GESICHERT : DATUM/UHRZEIT
→  1
→  2
→  3
→  4
→  5


ACHTUNG:  AS RÜCKSETZEN LÖSCHT GESICHERTEN ZUSTAND!
          EIAU UMSCHALTUNG NUR, WENN KEINE P-KENNUNG!

                   UEBERSICHT : MP = 0
```

Fig. 9.247 Call: Switch XB initialization blocks

The following information is displayed after the operator input **ZE=0;** and **AU=1;**.

ZYKLUS	AU	EI	AE	GESICHERT:	DATUM/	UHRZEIT
→ 1	*			MIT AU=1:	15.06.89/	12.23.48
→ 2	*			MIT AU=1:	15.06.89/	12.23.48
→ 3	*			MIT AU=1:	15.06.89/	12.23.48
→ 4	*			MIT AU=1:	15.06.89/	12.23.48
→ 5	*			MIT AU=1:	15.06.89/	12.23.48

⚠ Resetting AS clears the saved status. EIAU should only be changed over if no P code exists.

All XBs in all cycle levels are subsequently de–activated and the old status is saved.

☞ If the XB blocks have been switched off and back again with the functions AU = and EI =, note that the function blocks which execute an “initialization run” are set into basic mode (controller are for example in mode MANUAL and INTERNAL).

Switching over interconnected XB blocks modifies the source, i.e. in this case the input EIAU of the XB block is not non–interacting. Modifications in interconnected inputs can be suppressed or enabled respectively via the key “UM = 1”. The current setting can be distinguished by color emphasizing of the alternatives JA (yes) or NEIN (no) and by the output of a text. The inputs AU, EI, AE and ZS do only apply for the cycle preset with “ZE =” which is marked by an arrow output in the information table of the screen.

2 Information regarding the linking block status

This subroutine informs of all linking blocks and links existing within the system.

```
                    KOPPELAUSKUNFT

        1  AKS                         5 AKE
                    ANWAHL
        2  BKS                         6 BKE
                    UNTERMENUE
        3  ZKS                         7 ZKE
                    UM = NR
        4  MKS                         8 PLPS

              9 STATUS / KLARTEXT

        PROTOKOLL ALLER KOPPLUNGEN : AK=1



        AUSGEARBEITET : AG= 0 : SICHTGERAET  AG=0
                            1 : DRUCKER 1
                            2 : DRUCKER 2

     UEBERSICHT : MP = 0
```

Fig. 9.248 Call: Link information

A separate submenu (1 to 9) exists for each link type, in which displays a cross reference list of all data significant for this type.

These include (according to type)

- Block type and block number
- Bus and device number
- Link type (CD or DI)
- Fast or slow channel

Information regarding the linking blocks is displayed when AG = 0 has been selected.

The information may also be printed via the device specified.
The message “Drucker aktiv” (”printer active”) is displayed in this case.

Entering AK = 1 prints a log of all links in the sequence on menu items 1 to 9. Each new items begins on a new page.

The operator input AK = 1 is only allowed on preselected printers. It will be rejected by F 410 on a preselected monitor.

Example of AKS block (UM = 1)

```
                           VERWEISLISTE AKS

BST.NR.   BUS/TN    EMPF.     KAN.   BST.NR.   BUS/TN    EMPF   KAN.
AKS.1                         L
AKS.3     0/004     AKE.33    S
AKS.6     0/004     AKE.66    L


                UEBERSICHT: MP = 0  BLAETTERN BL = 1
```

Example of AKE block (UM = 5)

```
                          VERWEISLISTE AKE

BST.NR.   BUS/TN    SENDER    BA     BST.NR.   BUS/TN    SENDER BA
AKE.4     0/000     AKS.4     DI
AKE.6     0/004     AKS.2     DI
AKE.9     0/004     AKS.1     DI


               UEBERSICHT : MP = 0  BLAETTERN BL = 1
```

3 System switch

This subroutine facilitates menu–driven enabling and disabling of the following functions:

– **Creating an additional I&C alarm (LTM)**

If an LTM occurs after WB = 1 has been entered, an additional alarm line is displayed showing the block causing the failure.

This is particulary useful if a faulty block is addressed by a (nested) subroutine call during the TML program test. Block type, block name and (for user programs) line number of the fault are displayed in the message line.

A relative byte address instead of the line number is displayed if the fault occurs in a system program.

The next entry “WB = 1” changes the mode. The currently active mode is displayed.

– **Enabling/disabling for bus configuration**

Entering “BS = 1/0” enables/disables bus configuration authorization. This function can be used to prevent other AS 230/AS 235 users from logging on for central bus configuration.

This eliminates possible malfunctions caused by external configuration input (in particular in on line process operation).

The next entry effects bit 273 in GB.ORPA. The set status is displayed.

– **State of cycle level 5 under STO**

Entering STO currently stops all five user levels, i.e. cyclic and acyclic execution of the entire process are interrupted.

Up to now, process output as a reaction to this entry (activating a subordinate hardware level, for example) has not been directly possible.

Entering “Z5 = 1” stops or continues execution of level 5. This function enables the user to use the field devices even if STO has been selected.

The selected mode is displayed in the operator input field. This information is also displayed as “Z5” instead of “ST” in the message line.
The input effects bit 232 in GB.ORPA.

– **S–RAM check sum verification**

Check sum verification of the system RAM (S–RAM) can be activated/de–activated by entering PR = 1. The input has an effect on bit 222 in GB.ORPA. The selected status is displayed.

– **Status messages per second**

“ST = no” permits selection of the status message frame transmission frequency. The number of status message frames is not limited if no = 0; transmission is performed as before. The number of status message frames is limited to “no” if a value between 1 and 255 has been selected for “no”. The input has an effect on the first analog value in the FSA.ORPA block. The selected value is also displayed FSA.ORPA.

☞ A delayed status message frame contains the time of transmission.

```
                    SYSTEM - SCHALTER

                                                     ZUSTAND
ERWEITERTE LEITTECHNIKMELDUNGEN  WB = 1       EIN

ZYKLUS   5 : ZUSTAND BEI "STO"   Z5 = 1       START

BEDIENSPERRE  FUER  BUS          BS=NR        FREI

            ANMELDEART : BS = 0  FREI
                              1  GESPERRT

PRUEFUNG BLOCKPARITY SYSTEM-RAM  PR=1         AUS

STATUS-TELEGRAMME PRO SEKUNDE    ST=          0



                   UEBERSICHT : MP = 0
```

Fig. 9.249 Call: System switch

4 NEMO output with password

Protects user programs against unauthorized read access

Application

The subroutine can be used for enabling disabled user programs for output in NEMO (**A,...;**) or for disabling enabled programs. Disabled programs have been provided with a password and are protected against **A,..;** and **L,..;** input in NEMO.

Method of operation

NRUE is a menu–driven image program. Input errors are displayed in the message field in plaintext. NEMO **must** be terminated if “NEMO” is selected via another operator input terminal. The program to be protected should not be active (as for NEMO). The program should be protected in STO mode or prior to being inserted into the execution sequence.

Entering “TN =” selects four characters for the type name; entering “BN =” selects four characters for the block name. REST, PROB, LAYO or STEP must be entered for the type name; CHEC, PICT or PROG is requested as input for the block name.

Entering “FR = 1” selects enabling, “SP = 1” disabling.

A password consisting of up to 16 characters can be entered by “PW =”. The password is not displayed.

“AK = 1” either provides the selected program with a password and locks the program against being read or inquires the password of a disabled program which will be released once the correct password has been entered.

- **Busy message/ fault message**

  Busy message and fault message are displayed in the lower image part, the former as a white text on a green background, the latter as a white text on a red background.

  Possible busy message:

  AUFTRAG TAETIG

  Possible error messages:

AUSGABE A,... IST BEREITS GESPERRT !	Program has a password
AUSGABE A,... IST BEREITS FREIGEGEBEN !	Program has no password
FALSCHES PASSWORT !	Wrong password entered
PROGRAMM IST SYSTEM-PROGRAMM !	Only user programs permitted
BAUSTEIN NICHT VORHANDEN !	Check type and block name
BAUSTEIN NICHT ABLAUFFAEHIG !	Program contains errors → NEMO
NEMO-COMPILER NOCH AKTIV !	Terminate NEMO
FR=1 ODER SP=1 FEHLT !	No selection made


```
                    NEMO-AUSGABE MIT PASSWORT

PROGRAMM ZUR AUSGABE IN NEMO FREIGEGEBEN/SPERREN

TN =      TYP-NAME
BN =      BAUSTEIN-NAME
FR = 0    NEMO-AUSGABE FREIGEGEBEN
SP = 0    NEMO-AUSGABE SPERREN
PW =      PASSWORT EINGEBEN
AK = 0    FREIGEBEN/SPERREN AKTIVIEREN









                     UEBERSICHT : MP = 0
```

Fig. 9.250 Call: NEMO output with password

5 Change names and codes

This function is used for editing various code bits of parameters and block types, type names, block names, parameter names or text strings in image or log instructions.

The location to be edited is selected by entering either the current type name (TN =), block name (BN =), parameter name (PN =) or the current character string (ZS =). You have to make as many entries as are required for identifying the location to be edited. For example, specifying the old type name is sufficient for editing a type name. The block name is automatically set to ORPA if a parameter name has been entered. Selecting an input alternative immediately after a selection defines whether a type name (BA = 1), a block name (BA = 2), or a parameter name (this includes a character string) (BA = 3) is to be modified. The virtual keyboard of the process communication keyboard is re–assigned after each change of the input alternative in order to enable the currently valid new names and codes to be entered.

A character string can contain up to 40 characters. All other names with four characters (without leading blanks) are accepted and displayed in left–justified fashion in the output fields on the screen.

A parameter may not only contain a new name but also an interconnection with a parameter (S string) whose string is considered as a name (indirect name assignment). Parameter number and target index are separated by a hyphen when an interconnection is entered (e.g. "**NS=5–2;**"). Only the interconnection address can be changed, not the name (S string) of a name interconnection. "**NS=0;**" cancels the interconnection, and the parameter name defaults to ????. A new parameter name may subsequently be entered (NN =).

Only a character string which is contained in the selected block as a programmed text (e.g. character string after TML command "TXH,'..."") can be entered, not a parameter name, when a type without definable blocks (e.g.: LAYOUT) or a block number < 7 (e.g. PICT) is selected. Texts can thus be modified for foreign languages without actually editing the program using NEMO.

All valid entries and modifications are accepted into the display fields on the screen. An error message is displayed in the input line if an invalid entry has been made.

```
                  NAMEN / KENNUNGEN ÄNDERN

TN= TYPNAME                TYPKENNUNGEN
BN= BAUSTEINNAME
PN= PARAMETERNAME          PAR.KENN.

BA= BEDIENALTERNATIVE 0    0 = ALTE NAMEN (ANWAHL)
                           1 = NEUER TYPNAME, NEUE TYPKENN.
                           2 = NEUER BAUSTEINNAME
                           3 = NEUER PAR.NAME, PAR-KENNUNGEN

NN= NEUER NAME (TYP, BAUSTEIN ODER PARAMETER)

NS= NEUE VERSCHALTUNG PAR.NAME (NS=NUMMER, NS=NUMMER-INDEX)
                               (NS=0 ! KEINE VERSCHALTUNG)
NZ= NEUER ZEICHENSTRING

 C= CHECK                     }  1 = KENNUNG SETZEN
 B= BEDIENBAR                 }  0 = KENNUNG RÜCKSETZEN
 N= NICHT PARAMETRIERBAR

                  UEBERSICHT : MP = 0
```

Fig. 9.251 Call: Change names/codes

⚠ Only valid and meaningful names should be used when assigning new block or parameter names (program and element names must begin with a letter).

☞ Block parameters are not changed when a block name is modified and the CHECK block is not called either.

6 Baud rate selection

This function enables the user to adjust the baud rates of the individual channels to the connected standard devices.

The values currently set are displayed when the function is selected.

New values can be entered into the operator–control parameters. They only become effective after they have been released by entering FG = 1. Operator inputs via the process communication keyboard are only possible if the keyboard interface has been set to 1200 bits/s.

The system default values (without user–related configuration) are:

T1 =	T2 =	1200 bits/s	limited to	$\leq$ 4800 Bd
D1 =	D2 =	600 bits/s	limited to	$\leq$ 2400 Bd
M1=	M2=	600 bits/s	limited to	$\leq$ 2400 Bd

After a restart with the user system

```
                       BAUDRATENEINSTELLUNG

                      PLATZ 1            PLATZ 2

TASTATUR       :  T1  = 1200 BAUD    T2=  1200 BAUD
DRUCKER        :  D1  =  600 BAUD    D2=   600 BAUD
MATRIXDRUCKER  :  M1  =  600 BAUD    M2=   600 BAUD


           FREIGABE   :   FG = 1









           UEBERSICHT :   MP = 0
```

Fig. 9.252 Call: Baud rate selection

7 Regenerate SL.CTML

Recovery of a TML program that has been aborted by a restart during an editing session.

The system creates a program copy named SL.CTML when a TML program is tested (insert/replace instruction lines).

If a –deliberate or inadvertent– restart is performed in this state, the system cannot recognize the program stored under CTML by its old name.

This function enables the system to be presented with the missing information. The program exited under CTML can then be made available to the user in its old form.

“Pseudo DE [$0000]” is automatically inserted if a program is aborted without DE having been entered. The entries on the last page will be lost if DE has not been entered after the penultimate page.

```
                     SL.CTML REGENERIEREN


                    BAUSTEIN    TYP

        NAME     :  BS=                TY=

        NUMMER   :  BN=                TN=

      KEIN REGENERIERBARER SL.CTML VORHANDEN



                       FREIGABE : FG = 1




                     UEBERSICHT : MP = 0
```

Fig. 9.253 Call: Regenerate SL.CTML

The system enters the known information into the above–mentioned parameters. They complete the missing parameters and activate the function with FG = 1.

The following message is issued after an attempt has been made to recreate a program which had not been terminated by “**DE;**” when the interrupt occurred:

ACHTUNG LETZTE SEITE UEBERPRUEFEN !
(CAUTION! CHECK LAST PAGE)

Call the program under NEMO and terminate it properly.

8 Reload blocks

Load reloadable blocks without restart

The “intelligent” load function enables reloadable diskettes which have been created using the “selective filing” function (the logic complement) to be loaded without a restart (on–line) into the target system after they have passed various checks. It also enables a detailed directory of the diskette to be output. Direct page selection and forward and backward scrolling through the directory are possible.

The directory is used for performing various tests of the individual blocks before the diskette content is loaded. These tests (P) provide the following results (R):

- P : Does the block type (Bst.0 and ORPA) exist in the system or on the diskette?
  R : The diskette cannot be loaded if the block type cannot be found.
- P : The type number in the system must be free if the block contains a data description (Bst.0).
  R : The diskette cannot be loaded if this is not true.
- P : Does the block number with the same name and the same internal block number already exist?
  R : Inquiry, whether the old or the new block is to be deleted.
- P : Does the block number with the same name and a different internal block number already exist?
  R : The system asks for the new block name.
- P : Does the block number with a different name and the same internal block number already exist?
  R : The diskette cannot be loaded

All possible entries are displayed or requested by prompts.

The load function cannot be executed if bus configuration from a PC has been selected.

A reloadable diskette which has not been created by “selective filing” can only be loaded by a restart. It is neither possible to issue a directory of such a diskette nor to test it. Restart and subsequent loading of such a diskette must be acknowledged or can be prevented by aborting the request.


```
   BAUSTEINE NACHLADEN             SEITE :  VON

FORM  :                        ANZAHL BST  :
AR    :                        ARCHIVIERT  :           BYTE
DATUM :                        FREIER RAM  :  2971526  BYTE

LFDNR TYP.BSNA TYP/BSNR LAENGE LFDNR TYP.BSNA TYP/BSNR LAENGE





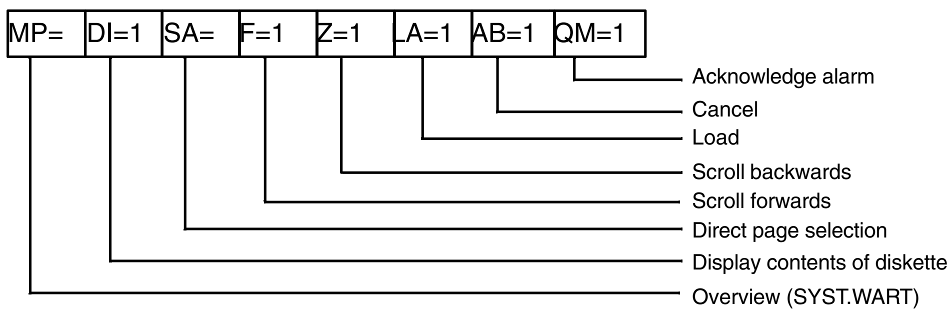




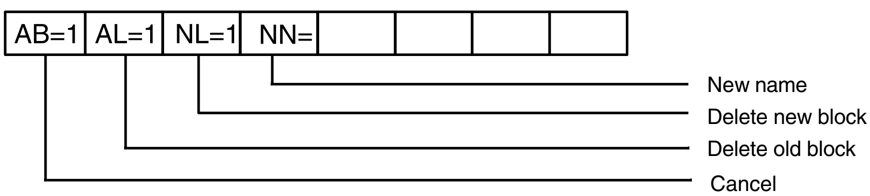

DISK.INHALT DI=1  LADEN LA=1  QUITTIEREN QM=1 ABBRUCH AB=1
SEITENANWAHL SA=NR   UEBERSICHT : MP = 0  BLAETTERN F=1/Z=1
```

Fig. 9.254 ***Call: Reload blocks***

PBT labeling:



PBT labeling (extension)



Messages:

```
'KEINE LADERFUNKTIONEN MOEGLICH!
 ZWISCHENSPEICHER KANN NICHT ANGELEGT WERDEN !'
'DISKETTEN-FUNKTIONEN BEI BUS-STRUKTURIERUNG NUR MIT AS ALS STRUKTU-
 RIERMASCHINE MOEGLICH!'
'LESEN VON DISKETTE'
'DISKETTE UNKLAR / FORMATFEHLER'
'DISKETTEN-LAUFWERK UNKLAR'
'KEINE DISKETTENANSCHALTUNG VORHANDEN'
'LESEFEHLER - FORMATSCHALTER AUF ANSCHALTUNG PRUEFEN'
'LESEFEHLER VON DISKETTE'
'DISKETTEN-LAUFWERK BELEGT. ZUGRIFF ZUR ZEIT NICHT MOEGLICH'
'KEINE AS 230/235-DISKETTE'
'KEINE HD - DISKETTE'
'DISKETTE LEER'
'DISKETTE NICHT NACHLADBAR'
'DISKETTE KANN NUR MIT WIEDERANLAUF GELADEN WERDEN'
'DISKETTE KANN NUR MIT WIEDERANLAUF GELADEN WERDEN, ABBRUCH MIT AB=1
 LADEN MIT QM=1'
'DISKETTE NICHT LADBAR.  SPEICHER ZU KLEIN'
'LADEN ABGEBROCHEN!'
'DISKETTE WURDE GEWECHSELT !  ABBRUCH !'
'LADEN ABGEBROCHEN ! FREIER RAM WURDE GEAENDERT !'
'TYP:typ    I  ABBRUCH ! BAUSTEIN NICHT LADBAR.
 BST : bst  I  TYP-NAME NICHT VORHANDEN.'
'DISKETTE NICHT LADBAR. TYP : typ BELEGT'
'TYP : typ  I  ABBRUCH !  BAUSTEIN NICHT LADBAR.
 BST : bst  I  TYP-NAME FALSCH.'
'TYP : typ  I  ABBRUCH !  BAUSTEIN NICHT LADBAR.
 BST : bst  I  INTERNE NUMMER BEREITS BELEGT.'
'TYP : typ  I  BAUSTEIN BEREITS VORHANDEN.
 BST : bst  I  LOESCHEN ALTEN BST. : AL=1  NEUEN BST. : NL=1'
'TYP : typ  I  BAUSTEINAME BEREITS BELEGT !
 BST : bst  I  NEUER NAME  :  NN='
```

9 Selective filing (SELA)

Create reloadable blocks on diskette

Application

This function is used for selecting individual blocks and writing these blocks onto a reloadable diskette.

Display: Example with error messages

```
SELEKTIV ARCHIVIEREN    (NACHLADBARE DISKETTE ERZEUGEN)
BAUSTEINAUSWAHL NACH:   RA=0  (BT, RAM)   TY=1  (BT, TYP)

      VT= XXX  VON  TYP      | AB= ALLE BAUSTEINE
      VB= XXX       BAUSTEIN | BO=   BIS ORPA
      BT= XXX  BIS  TYP      | NO=   NACH ORPA
      BB= ORPA      BAUSTEIN |

LADEART: SE=1 ONLINE LADBAR(NUR HD-DISK)NL=0 NUR OFFLINE LADBAR
ABBRUCH ! OFFENER EINGANG BAUST.: XXX .ORPA EL.NR.:   1



DI=0  TEST                     DISKETTE:LEER

      DRIVE-TYP                80 TR/DS-HD
      DISK-TYP                 80 TR/DS-HD

PR=0                     ARCHIVIERBARKEIT PRUEFEN
AR=OTTO                  ARCHIVIERNAME (MAX.16 ZEICHEN)
AU=0                     DISKETTE UEBERSCHREIBEN
                       UEBERSICHT : MP = 0
```

Fig. 9.255 Call: Selective filing

Method of operation

The operator position remains disabled during block test and access to the diskettes. Operator input errors are displayed in plaintext.

- Valid blocks

Only blocks of the system types APRO, BILD, FA, FB, FC, FSA, GA, GB, GM, GT, LAYO, PROB, REST and STEP are permitted.

Blocks with a type number > 154 and an internal block number > 7 can only be filed if they do not contain any indirect parameters (EBV, EAV, EDV, AA, AAD, AB, AT). Interconnected inputs are only permitted with TY = 1 (BT, RAM) selection; they must point to a block inside the area that is to be filed.

☞ All outputs and inputs of block 7 (ORPA) are permitted. Only the restrictions regarding interconnections apply.

The first block to be filed must be physically located before the last block (cf. **`BT,RAM;`**). Access within a TML, STEP or image/log program is not checked. Blocks outside the specified area should not be addressed in this case.

- Block selection according to **`BT,RAM;`**

The block selection according to **`BT,RAM;`** is set by RA = 1. Entering VT = selects the type name, VB the block name of the starting block. BT selects the type name and BB = the block name of the end block. VT and BT or VB and BB must be the same if only one block is to be selected. System blocks may not be located between beginning and end block. The physical location of the first block to be filed must be before the physical location of the last block.

- Block selection according to **`BT,type;`**

The block selection according to **`BT,type;`** is set by TY = 1. Entering VT = selects the type name, VB = the block name of the starting block. BB = selects the block name of the end block. VT and BT or VB and BB must be the same if blocks from block 0 onwards are to be selected. The first block to be filed must have the smaller internal block number.
Entering NO = 1 selects all blocks of a type with the internal block number > 7.
Entering BO = 1 selects all blocks of a type with the internal block number < 7.
Entering AB = 1 selects all blocks of a specific type.

- Select diskette loading method

  The loading method defines how a diskette is to be reloaded in a target system. SE =1 always creates an HD diskette which can be reloaded in on–line mode. Such a diskette contains a directory of all filed blocks (note switch in GB.ORPA). A diskette which can be reloaded in on–line mode is reloaded by an intelligent loading program in on–line mode. Reloaded blocks are then available without further restart. The diskette has the reload code “L+”. Up to 9600 blocks can be filed on one diskette.

  NL = 1 always creates a reloadable HD or SD diskette which can be reloaded in off–line mode. Such a diskette can only be reloaded with a subsequent restart. The system is then in STO mode. The diskette does not contain a directory of the filed blocks.

  Diskette type and drive type are selected by the switches in GB.ORPA (GB260 and GB261). 35–track, 80–track or HD diskettes can be created. The diskette has the reload code “LA”.

- Checking the block validity

  The validity of the blocks to be filed can be checked before filing is started in order to prevent faults to occur during filing. Type and block name(s) (VT, VB, BT, BB) of the block(s) to be filed must be entered, the diskette loading method be selected properly and a blank diskette for filing be inserted in the diskette drive in order to be able to check a block (or blocks). The blocks are checked for validity (see valid blocks), for block position selection according to RA = 1 (**`BT,RAM;`**) or TY = 1 (**`BT,type;`**), and for the number of blocks or the storage capacity of the diskette. A plaintext error message is issued if invalid selections are detected.

- Filing, overwrite diskette

  Entering **`AR=name;`** activates the filing process. “name” can be any character string with up to 16 characters. The system first checks the diskette contents. An error message “Diskette voll ! Überschreiben mit AU = 1” (”Diskette full! enter AU = 1 to overwrite data”) is issued if the diskette contains data. The diskette data will be overwritten after **`AU=1;`** has been entered. The blocks are checked (as for PR = 1) and written onto the diskette. The operator position is disabled during the whole filing process. Filing is aborted and a plaintext error message issued if a fault is detected during block check or diskette access. The diskette content is displayed once filing is finished.

- Display diskette content

  Entering **`DI=1;`** displays the diskette content without exiting operator input mode.

- Busy message

  Busy message and fault message are displayed in the centre of the screen, the former as white text on a green background, the latter as a white text on a red background. The block currently being processed is displayed during block check or filing. This block remains displayed as long as the subsequent block has not yet been filed. Block name and element number (in the case of an interconnection) are displayed if a block cannot be filed.

Possible error messages during operator input:

	Legend:
"ANFANGS–TYP" NICHT VORHANDEN	STARTING TYPE CANNOT BE FOUND
"ANFANGS–BAUSTEIN" NICHT VORHANDEN	STARTING BLOCK CANNOT BE FOUND
"ENDE–TYP" NICHT VORHANDEN	END TYPE CANNOT BE FOUND
"ENDE–BAUSTEIN" NICHT VORHANDEN	END BLOCK CANNOT BE FOUND

Possible error messages during block check:

ABBRUCH ! UNZULAESSIGER BAUSTEIN : xxxx.yyyy, if the block contains illegal data accesses.
ABBRUCH ! UNZULAESSIGER BAUSTEIN : xxxx.yyyy EL.NR. : zzzz, if an element has been interconnected with TY = 1, or has been interconnected with a block before the starting block or after the end block.
ABBRUCH ! OFFENER EINGANG BAUST. : xxxx.yyyy EL.NR. : zzzz, if an element has been interconnected with a deleted block or if an invalid parameter (EBV, EAV, etc.) exists.

ABBRUCH ! ANFANGSBAUSTEIN NICHT VORHANDEN
ABBRUCH ! ENDEBAUSTEIN NICHT VORHANDEN
BAUSTEIN–ANZAHL /–LAENGEN ZU GROSS FUER 1 DISKETTE !
ABBRUCH ! BAUSTEIN LIEGT IM S–RAM : xxxx.yyyy
ABBRUCH ! UNZULAESSIGER BAUSTEIN : xxxx.yyyy

Legend:
ABORTED! INVALID BLOCK:
ABORTED! INVALID:
ABORTED! OPEN INPUT BLOCK
ABORTED! STARTING BLOCK CANNOT BE FOUND
ABORTED! END BLOCK CANNOT BE FOUND
NUMBER OF BLOCKS/LENGTH EXCEEDS CAPACITY OF 1 DISKETTE
ABORTED! BLOCK IS IN THE S RAM
ABORTED! INVALID BLOCK

Error messages during diskette access:

KEINE HD–DISKETTE
ABBRUCH ! ENDEBAUSTEIN VOR ANFANGSBAUSTEIN !
KEINE ARCHIVIERUNG AUF SYSTEMDISKETTE !
DISK–TYP UNGLEICH DRIVE–TYP !
FLOPPY–LAUFWERK BELEGT. ZUGRIFF ZUR ZEIT NICHT MOEGLICH
ABBRUCH ! DISKETTE WURDE GEWECHSELT !
DISKETTE VOLL! UEBERSCHREIBEN MIT AU=1
LESEFEHLER – FORMATSCHALTER AUF ANSCHALTUNG PRUEFEN
DISKETTE NICHT FORMATIERT ! / FORMATFEHLER
DISKETTE MIT SCHREIBSCHUTZ !
MINI–DISK–ANSCHALTUNG UNKLAR
DISKETTE NICHT FORMATIERT ! / FORMATFEHLER
FLOPPY–LAUFWERK UNKLAR
MINI–ANSCHALTUNG UNKLAR
LESEFEHLER / SCHREIBFEHLER VON DISKETTE
KEINE DISKETTE AS230/231/235 / MS236
DISKETTENFORMAT FALSCH

Legend:

NO HD DISKETTE
ABORTED! END BLOCK BEFORE STARTING BLOCK
NO FILING ON SYSTEM DISKETTE
DISKETTE TYPE AND DRIVE TYPE ARE INCOMPATIBLE
FLOPPY DISK BUSY; ACCESS NOT POSSIBLE
ABORTED! DISKETTE HAS BEEN CHANGED
DISKETTE FULL! ENTER AU = 1 TO OVERWRITE
READ ERROR; CHECK FORMAT SWITCH ON INTERFACE MODULE
UNFORMATTED DISKETTE / FORMAT ERROR
DISKETTE WRITE–PROTECTED
MINI–DISK INTERFACE NOT READY
UNFORMATTED DISKETTE / FORMAT ERROR
FLOPPY DISK DRIVE NOT READY
MINI INTERFACE NOT READY
READ ERROR / WRITE ERROR FROM DISKETTE
NO AS230/231/235/MS236 DISKETTE
INCORRECT DISKETTE FORMAT

Possible busy messages:

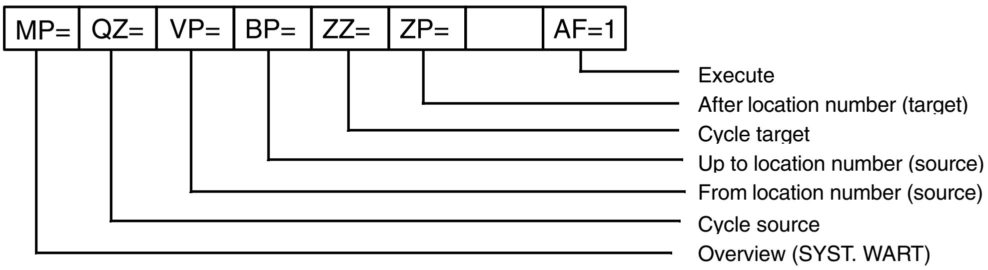
AUFTRAG TAETIG (JOB BUSY)	for **DI=1;**, **AR=name;**, **PR=1;**
AUFTRAG BEENDET (JOB TERMINATED)	for **DI=1;**, **AR=name;**
BAUSTEINPRUEFUNG TAETIG (BLOCK CHECK BUSY)	for **PR=1;**
BAUSTEINPRUEFUNG BEENDET (BLOCK CHECK TERMINATED)	for **PR=1;**

10 Cycle Swapping

Modifying the execution sequence of blocks

This function enables individual blocks or block groups which are installed in a processing level to be moved from one cycle to another. On–line execution must be de–activated and the AS must be in STO mode. The blocks to be moved are selected by specifying cycle (**`QZ=no;`**) and location number (**`VP=no;/BP=no;`**) of the associated processing list (**`B;`**). The target position is also defined by cycle number (**`ZZ=no;`**) and location number (**`ZP=no;`**). The blocks are always inserted after the specified location number. Location number "**`ZP=0;`**" must be specified if the blocks are to be inserted at the beginning of the processing sequence.

PBT labeling:



Messages:

	Legend:
`'typ.bst FEHLER BEIM AUSFUEGEN !'`	type.block ERROR WHEN DELETING
`'typ.bst FEHLER BEIM EINFUEGEN !'`	type.block ERROR WHEN INSERTING
`'ANLAGE NICHT IN "STO" !'`	SYSTEM NOT IN STO MODE
`'EINGABE "VP" UNZULAESSIG !'`	ILLEGAL INPUT "VP"
`'EINGABE "ZP" UNZULAESSIG !'`	ILLEGAL INPUT "ZP"
`'„ZP" ZWISCHEN "VP" UND "BP" !'`	"ZP" BETWEEN "VP" AND "BP"
`'SPEICHER VOLL !'`	MEMORY FULL
`'ZWEITER BEDIENPLATZ Z.Z. AKTIV !'`	SECOND OPERATOR POSITION ACTIVE

```
                      ZYKLUS VERTAUSCHEN

                BAUSTEINE IM ZYKLUS VERTAUSCHEN

QUELL–ZYKLUS   VON   PLATZNR.   BIS    PLATZNR.
   QZ = 0            VP = 0            BP = 0



ZIEL–ZYKLUS    ZIEL  PLATZNR.
   ZZ = 0            ZP = 0


                     AUSFÜHREN
                     AF = 0




                      UEBERSICHT: MP = 0
```

Fig. 9.256 Call: Cycle swapping

11 Delete links

Service routine for deleting logged–on links from a block.

This function enables logged–on links to be deleted individually or globally from the local blocks and lists. The following combinations are possible:

AKS, BKS, MKS, ZKS:

One	device from one	transmitter block [1)]
All	devices from one	transmitter block
One	device from all	blocks of a type [1)]
All	devices from all	blocks of a type

1) Not in CD mode

AKE, BKE, MKE, ZKE, PLPS:

One	device from one	receiver block
One	device from all	blocks of a type
All	devices from all	blocks of a type

Status and plaintext link list (STAL, MELL) :

One	device from all	links
All	devices from all	links

Global:

One	device from all	links
All	devices from all	links

☞ Logged on links are only deleted in the local machine, not in the communication partner.

The cleared links are logged. The printer can be selected.

DR = 0 No log
DR = 1 Logging printer position 1
DR = 2 Logging printer position 2

Valid input values:

TY	′ALLE′, ′AKS′, ′BKS′, ′MKS′, ′ZKS′, ′AKE′, ′BKE′, ′MKE′, ′ZKE′, ′PLPS′, ′STAL′, ′MELL′
BN	′ALLE′ , 1 ... 7
BS	′ALLE′ , 0 ... 253
TN	′ALLE′ , 0 ... 253

Messages:	**Legend:**
SENDER IN CD MODE	TRANSMITTER IN CD MODE
BST MIT TNR NICHT GEKOPPELT	BLOCK AND DEVICE ARE NOT LINKED
DRUCKER BELEGT	PRINTER BUSY
DRUCKER NICHT VORHANDEN	PRINTER NOT CONNECTED

```
                    KOPPLUNGEN LOESCHEN


                      EIGENES SYSTEM
KOPPLUNGSTYP   TY= ---- BAUSTEINNR. BS= ----


                      KOPPELPARTNER
BUSNUMMER   BN= ----    TEILNEHMERNR.  TN= ----


DRUCKER     DR = 0      AUSFÜHREN      AF = 0

DR = 0  :   KEIN PROTOKOLL
     1  :   PROTOKOLLDRUCKER  PLATZ 1
     2  :   PROTOKOLLDRUCKER  PLATZ 2



               UEBERSICHT  :   MP = 0
```

Fig. 9.257 Typical screen representation (example)

GELOESCHTE KOPPLUNGEN 15.03.90/ 12.34.56 P . 123 *

BAUSTEIN	KOPPELPARTNER	BT/TN	BAUSTEIN	KOPPELPARTNER	BT/TN
AKS.1234	AKE .1230	0/002	AKS.1234	AKE .1234	0/002
AKS.1240	AKE . 34	0/007	AKS.1240	AKE . 34	0/009
AKE. 1	AKS . 12	2/020	AKE. 2	AKS . 16	2/020
PLPS.KOP2		4/123	PLPS.KOP3		3/123
MELDELISTE		3/011	MELDELISTE		3/016
MELDELISTE		3/012	MELDELISTE		3/011
STATUSLISTE		1/001	STATUSLISTE		0/001

Fig. 9.258 Typical log representation (example)

12 Managing a program copy

Creating and managing a program copy for NEMO programs (TML, STEP, LAYOUT).

This function is used to create a program copy of a faultlessly compiled program. You may, for instance, extend the program copy and test the extension. Afterwards either the program copy becomes the new original program and the old program is deleted or the old original version is retained and the program copy is deleted.

A program copy is created after the original type/block name (OT =, OB =) and KA = 1 has been entered. The original program, e.g. TEST.PROGRAM is protected against modifications in "NEMO" via an inhibit flag. Afterwards the program copy may be modified in "NEMO". After the program copy has been compiled faultlessly, the original program can be replaced by the program copy in the execution system using the swap command AT = 1. The program copy then runs without any further modifications instead of the original program.
The active status is output on the screen. The program copy is now also protected against modifications, but with STEP programs it may be tested using "NEMO". If the copy is to be modified/extended once more or if it contains logic errors, the swapped program sequence must be reversed again via the command AT = 1.
After the exchange, the original program runs again so that the program copy can be modified. Finally, either the old program (original program) must be deleted (using the command OL = 1) or the copy (using the command KL = 1).
If the old program is deleted, the program copy becomes the new original program automatically.

☞ A program copy can only be made if
- NEMO is not selected at any operator terminal
- the original program has been compiled faultlessly
- the original program is not protected by a password

The following type names are used for the program copy:

– TML programs	RESTART or PROBLEM
– STEP programs	STEP
– Display/logging	LAYOUT

The block name of the program copy is automatically preset with K235. The operator input KB = is only enabled if the block name K235 is assigned. A block name must be specified. The program copy is created after the operator input KA = 1. The block name must start with letters as in usual with NEMO. Special characters are not permitted in the block name.

All flags are output as plaintext messages. Additionally, they are output as F... error messages.

Possible error messages during operator input:

	Legend:
NAMENSVORGABE GESPERRT !	NAME PRESETTTING INHIBITED
PROGRAMM IST MIT PASSWORT GESPERRT !	PROGRAM PROTECTED BY PASSWORD
KOPIE BEREITS ANGELEGT !	COPY ALREADY EXISTS
KEIN KOPIEBAUSTEIN VORHANDEN !	NO COPY BLOCK AVAILABLE
PROGRAMM IST SYSTEM-PROGRAMM !	PROGRAM IS SYSTEM PROGRAM
ORIGINAL VON NEMO-COMPILER BELEGT !	ORIGINAL PROG. IS ASSIGNED TO NEMO COMPILER
KOPIE VON NEMO-COMPILER BELEGT !	COPY ASSIGNED TO NEMO COMPILER
KEIN FREIER BAUSTEIN VORHANDEN !	NO FREE BLOCK AVAILABLE
BAUSTEINNAME NICHT ZULAESSIG !	BLOCK NAME NOT PERMISSIBLE
KEIN BAUSTEIN ANGEWAEHLT !	NO BLOCK SELECTED

BAUSTEIN NICHT VORHANDEN !	BLOCK DOES NOT EXIST
BITTE MIT KB= BAUSTEIN-NAMEN EINGEBEN !	ENTER BLOCK NAME USING KB =
BAUSTEIN NICHT ABLAUFFAEHIG !	BLOCK CANNOT BE EXECUTED

```
                    PROGRAMM-KOPIE VERWALTEN

  FUER RESTART,PROBLEM,STEP,LAYOUT,CHECK,PICTURE,PROGRAM
   +-------------------------+-------------------------+
   |         ORIGINAL        |           KOPIE         |
   |                         |                         |
   | OT=     TYP-NAME        |         TYP-NAME        |
   | OB=     BAUSTEIN-NAME   | KB=     BAUSTEIN-NAME   |
   +-------------------------+-------------------------+

 KA=1  KOPIE ANLEGEN

 AT=1  AS-BEARBEITUNG TAUSCHEN: ORIGINAL <-> KOPIE

 KL=1  KOPIE LOESCHEN, ORIGINAL BLEIBT

 OL=1  ORIGINAL LOESCHEN, KOPIE WIRD NEUES ORIGINAL


                  UEBERSICHT:  MP = 0
```

Fig. 9.259   Call: Managing a program copy

⚠ After a restart due to a voltage recovery or a start–up after ZRS or RSOF, the program original will be automatically set active.

13 Type presetting via PBT

This function is used to freely preset the type name sequence output on PBT. Presettings are made for each operator terminal separately. Individual types may be output several times and “gaps” may be created on the keyboard. An internal data record containing the preset data is created for each operator terminal. Up to 256 entries are possible.

☞ The enable mechanism via the block FB.ORPA stops functioning for this terminal.

Loop display representation (example)

```
                  TYPENVORGABE AUF PBT

            AKTIVE PBT-BESCHRIFTUNG : FB.ORPA

   BEDIENPLATZ : 1  PBT-ZEILE : 1  ANZEIGE : STANDARD

   |  M  |  R  |  V  |     |     |     |     |     |
    T1=   T2=   T3=   T4=   T5=   T6=   T7=   T8=

      TE=   TASTE EINFUEGEN
      TL=   TASTE LOESCHEN

      ZA=   PBT-ZEILE ANWAEHLEN
      F =1  BLAETTERN VORWAERTS
      Z =1  BLAETTERN RUECKWAERTS

      BU=1  BEDIENPLATZ UMSCHALTEN
      SE=1  STANDARDEINSTELLUNG LADEN
      AE=1  AKTUELLE EINSTELLUNG LADEN
      PL=1  PBT-ZEILEN LOESCHEN
      VL=1  VORGABE LOESCHEN

      FG=1  FREIGABE


                UEBERSICHT : MP = O
```

Fig. 9.260 Type presetting on PBT, log

Operator input

Ttn = typ — Key labeling
Presetting of a type name. Only types with process–controllable elements may be specified (tn = key number, 1 ≤ tn ≤ 8)

TE = tn — Insert key
Generates a blank key. From the specified key onwards, all assigned keys are shifted by one position to the right (1 ≤ tn ≤ 8).

TL = tn — Delete key
Cleans the specified key labeling and compresses the presetting (1 ≤ tn ≤ 8)

ZA = zn — Select PBT line
Display the specified PBT line (zn) on the screen (1 ≤ tn ≤ 32)

F = 1	Scroll forwards line by line
Z = 1	Scroll backwards line by line
BU = 1	Switch over operator terminal
SE = 1	Load standard presetting. Creates a presetting corresponding to the standard sequence
AE = 1	Load active setting The sequence is accepted according to the active labeling (either FB.ORPA or default).
PL = 1	Delete PBT line Delete all 256 entries in the editor area
VL = 1	Delete presetting Delete presetting specific to an operator terminal; return to standard output via FB.ORPA.
FG = 1	Enable Activate displayed presetting

XA

Acyclic processing block

Application

The XA block is inserted before each group of function blocks which is to be executed together. It disables/enables these block sequences once.

Method of Operation

The execution of the subsequent block up to the next XA, XB or ENDE block (system block) is enabled when input XA is set. The alarm level is started when a “1” is written to the source of the XA input if the XA block has been installed in the alarm level (ZYK1).

The block resets the XA input automatically, i.e. the sequence is enabled once only, unless XA is set again. The block can be installed in any level. It is especially suitable to enable/disable blocks on the alarm level.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Execution ON = 1/OFF = 0	XA	1	EB
Process–related name	AT	2	S16

- Block list

```
   XA      1                  03. 03. 83/ 00. 34. 45. P: 1

 1 EB  XA                                         Q     1
 2 S16 AT  0                  16                        4
```


XB

Cyclic processing block

Application

This block is used before each group of function blocks which are to be executed together. It disables/enables these blocks and enables every n–th cycle.

Method of Operation

Input EIAU is used for enabling or disabling the execution of the subsequent function blocks up to the next XB, XA or ENDE block (system block). The processing cycle (BZ) and base cyclic offset (GV) are specified by the scan parameter (AP).

There is the following relationship between AP, BZ and GV:

AP = BZ + GV where	AP	scan parameter
	BZ	processing cycle
	GV	base cycle offset

AP is parameterized as follows:

$BZ = 2^n$ with $n = 0, 1, 2, 3$ etc.

$GV = 0, 1, 2 \ldots 2^{n-1}$

The following block sequence is enabled (processed) for all BZ cycles:

$TA = T0 \cdot BZ0$

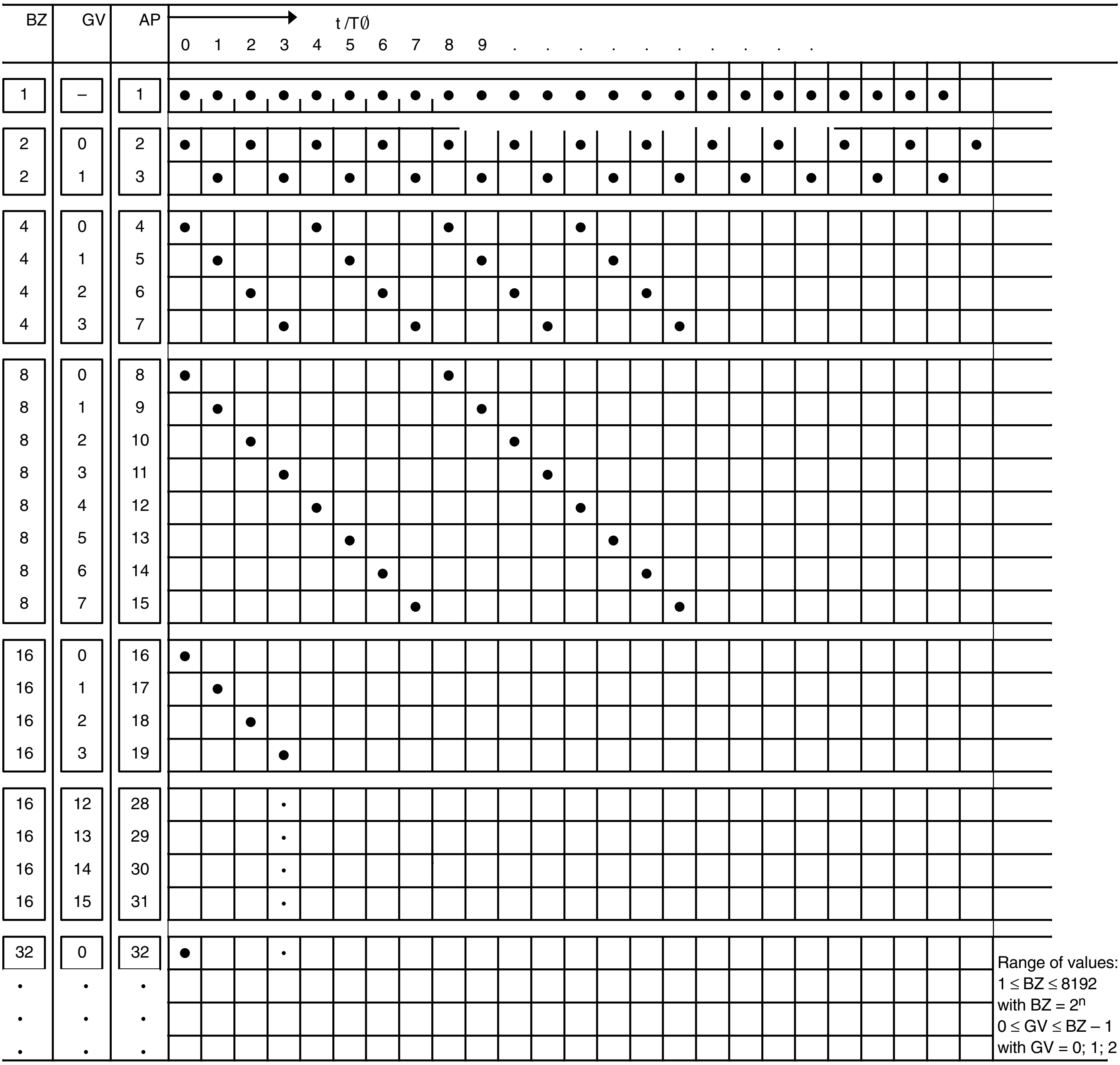
TA is the scan time of the subsequent blocks; it specifies the time schedule used for their execution.

GV indicates the cycle out of $BZ = 2^n$ cycles in which the sequence will be enabled. This helps to avoid a cycle overload by the simultaneous execution of all blocks.

Execution in the base cycles does not require any XB blocks.

For the AS 235 automation subsystems, the base cycle time T0 is:

1/8 s or 1 s, depending on the level containing the block.

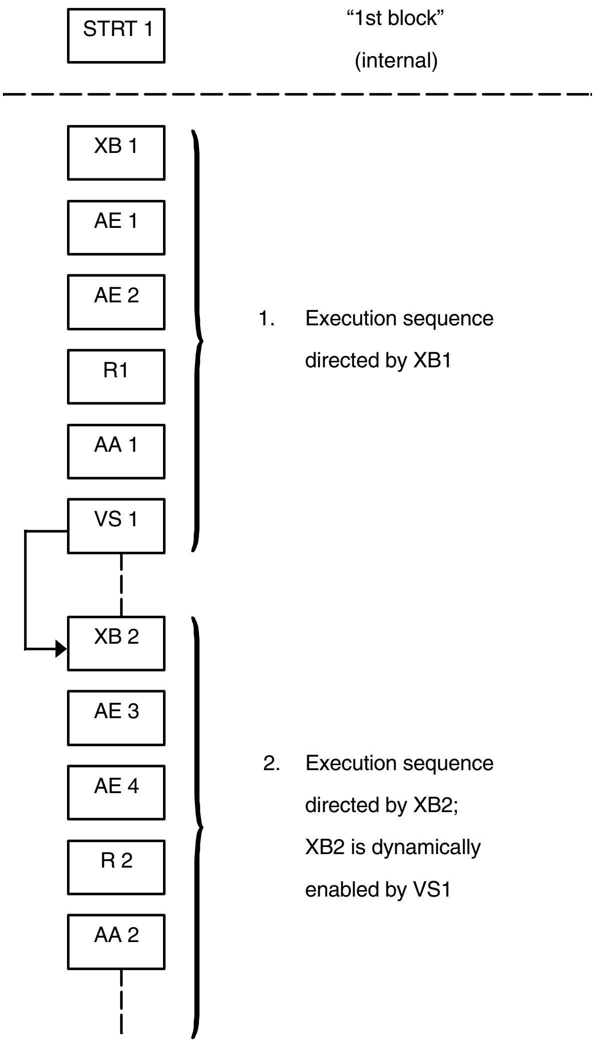


The dot ● indicates the cycle t/T0, where XB enables execution.

Fig. 9.261 Processing block; processing cycle (BZ), base cycle offset (GV) and scan parameter (AP)

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Execution ON = “1”/OFF = “0”	EIAU	1	EB
Scan parameter	AP	2	ID
Process–related name	AT	3	S16



AA Analog output block
AE Analog input block
R Controller block
VS STEP M block
XB Processing block

Fig. 9.262 XB block in processing sequences

- Block list

```
   XB       1                 03. 03. 83/ 00. 35. 36. P: 1

 1 EB  EIAU 0                 P                          1
 2 ID  AP        1                                       2
 3 S16 AT                           16                   6
```

XZ

Time starting block

Application

This block is used for time–dependent activating (output A). An interconnection with a XB block permits switching of block sequences for example.

Method of Operation

When the block is active (input 1 “EIAU = 1”), the closing condition (“ZSTA/WSTA”) or the breaking condition (“ZSTO/WSTO”) is tested and the signal output A is set according to this result. The time of day in seconds ($0 \leq t \leq 86399$) is entered as the starting time via input 2 (ZSTA). To use the higher resolution in cycle 2 (1/8 sec), the starting and stopping time may also be specified in fractions of a second.

The starting mode is parameterized as follows via input 3 (”WSTA”)

“WSTA = 0” :	Daily time start
“WSTA = 1” :	Time start every Sunday
“WSTA = 2” :	Time start every Monday
“WSTA = 3” :	Time start every Tuesday
“WSTA = 4” :	Time start every Wednesday
“WSTA = 5” :	Time start every Thursday
“WSTA = 6” :	Time start every Friday
“WSTA = 7” :	Time start every Saturday

Inputs 4 and 5 (“ZSTO/WSTO”) are used to enter the breaking conditions (see closing conditions). Input 6 (RS) can be used to select a single start.

“RS = 0” :	Normal clock operation (between two time values)
“RS = 1” :	The system sets input 1 (EIAU) to 0 (switched off) after the XZ block has been executed. The block is thus executed once, whether or not the time condition has been met.
ZSTO = ZSTA :	Signal output A has never been set.
WSTO = WSTA :	Signal output A is set to the day specified by WSTA after the time condition has been met.

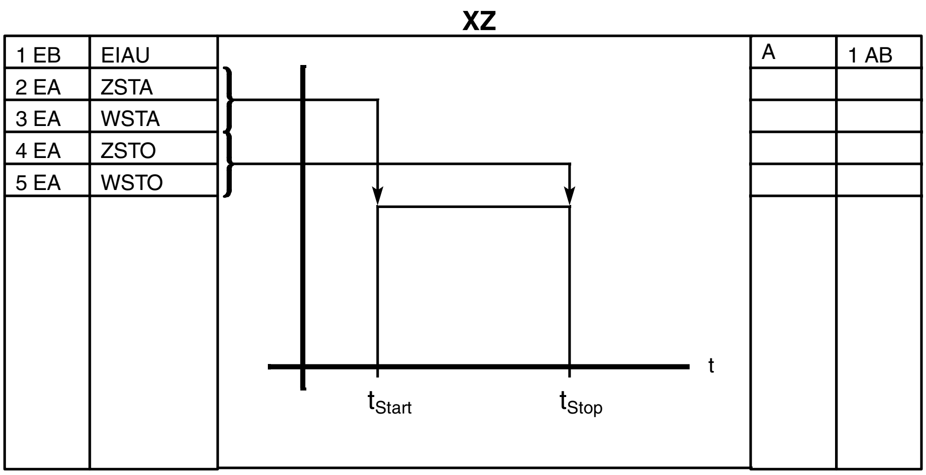


Fig. 9.263 XZ block; block diagram

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Time–dependent output signal	A	1	AB
Block ON/OFF	EIAU	1	EB
Starting block [1)]	ZSTA	2	EA
Starting mode/starting day	WSTA	3	EA
Stopping time	ZSTO	4	EA
Stopping mode/stopping day	WSTO	5	EA
Reset signal	RS	6	EB

- Block list

```
   XZ      1                 03. 03. 83/ 00. 36. 21. P: 1

 1 AB  A      0              #                   N      7
 1 EB  EIAU   0                 P                       1
 2 EA  ZSTA   0.0000            P                       2
 3 EA  WSTA  -5.0000            P                       3
 4 EA  ZSTO   0.0000            P                       4
 5 EA  WSTO  -5.0000            P                       5
 6 EB  RS     0                 P                       6
```

1) The parameterized starting time must be unequal to a full minute (plus or minus one second) otherwise the output signal is set twice.

ZE

Metering pulse input block

Application

This block is used for acquiring one channel of a metering pulse input module, e.g. a metering pulse input module with 8 channels (see Chap. 9.2 for module).

Method of Operation

As selected by the scan cycle defined by the higher–order XB block, the ZE block processes one channel (16 bit counter) of the metering pulse input module and presents the counter value at output 1AA. The associated counter is reset when the data is read.

Cyclic processing:
Output UEBL (2AB) is set to 1 and a system error message issued if the maximum count of 32767 is exceeded. ZW follows with 0.

If one of the “BG number” or “KNR” parameters is changed, both parameters must be re–entered in the sequence “BG number – channel number”. The driver should be removed or the associated XB switched off since it should be inactive during this operation.

System messages

S 305 No acknowledgement from module (incorrect address, incorrect jumper settings or defective).
S 313 Multiple addressing (incorrect jumper setting).
S 320 Overflow

ZW will be set to 0 and BGF to 1 if a hardware alarm (S 305, S 313) occurs during acquisition.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Counter value	ZW	1	AA
Overflow	UEBL	2	AB
Module fault	BGF	3	AB
Module number	BGNR	1	I
Channel number	KNR	2	I

- Block list

```
  ZE      1              03. 03. 83/ 00. 37. 08. P: 1

1 AA  ZW   0.0000        #                       3
2 AB  UEBL 0             #                       4
3 AB  BGF  0             #                       5
1 I   BGNR     0                       C         1
2 I   KNR      0                       C         2
```


ZKE

Character linking receiver block

Application

This block is used for receiving up to four S16 character strings from a different AS subsystem.

Method of Operation

The ZKE block is used for receiving four S16 character strings transferred by a ZKS block in a different bus device. Only numbers between 1 and 4095 are permitted for the definition of the block name.

The transmitting device/block and the mode (direct communication DI or common data CD link) are defined by one of the following configuration instructions:

– KD, busno, deviceno, ZKS, blockno;
– KC, busno, deviceno, ZKS, blockno;

The parameterization will only be accepted without error message if the transmitter block has previously been defined.

The character strings are directly entered into the addresses specified. Installation in the execution sequence is only necessary if a link monitoring function has been configured via parameter UEBW. The parameter defines the maximum number of block runs, after which a communication (value transmission) is expected.

If the number of runs parameterized via UEBW has been attained without updating, the error output FKOP is set to “1”. Each updating sets AKT to “1” and FKOP to “0”. The RESE input (or interconnection of AKT with an XA block) is used to reset AKT to “0”.

☞ A ZKS block only transmits to one ZKE boock per coupled bus/device number at a time. If a second ZKE block is coupled to the same ZKS block in one AS system, only the last coupled ZKE block receives data from the ZKS block.

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
Communication error – no updating within the selected monitoring time	FKOP	1	AB
Values have been updated (set with each incoming message)	AKT	2	AB
Mode code (0 = CD/1 = DI)	BA	3	AB
RESET input: AKT is cleared after each block execution	RESE	1	EB
Monitoring time in processing cycles. Re–started for each message (→ FKOP)	UEBW	2	ID
Bus/device number of transmitter block (bus no · 100 + device no.)	BUSX	3	ID
Transmitter block number	BSTX	4	S4
Target address for 1st string	STR1	5	EA
Target address for 2nd string	STR2	6	EA
Target address for 3rd string	STR3	7	EA
Target address for 4th string	STR4	8	EA

- Block list

```
   ZKE     1                03. 03. 83/ 00. 37. 54. P: 1

 1 AB  FKOP 0                                 N      9
 2 AB  AKT  0                                 N     10
 3 AB  BA   1                                 N     11
 1 EB  RESE 0              P                         1
 2 ID  UEBW     0                          C         2
 3 ID  BUSX     0                             N      3
 4 S4  BSTX                                   N      4
 5 EA  STR1                  FC  ORPA  0  C  Q       5
 6 EA  STR2                  FC  ORPA  0  C  Q       6
 7 EA  STR3                  FC  ORPA  0  C  Q       7
 8 EA  STR4                  FC  ORPA  0  C  Q       8
```

ZKS

Character linking transmitter block

Application

Senden von max. vier S16–Zeichenstrings von einem AS–System an max. 6 bzw. 32 Empfänger (ZKE–Bausteine).

Method of Operation

The ZKS block is used for transmitting up to four interconnected S16 character strings to different bus devices. Depending on the mode (CD or DI), these values are received by ZKE blocks in:

– up to 6 bus devices (DI communication) or
– up to all bus devices with identical number (CD communication).

Like all other blocks, the ZKS block is installed in an acyclic or cyclic sequence cascade (cf. XA/XB block). Only numbers between 1 and 4095 are permitted for the definition of the block name.

CD mode is only permitted for function blocks between no. 1 and 16 in bus devices 0 to 31. In CD mode, a block number may only be assigned to one AKS, BKS or ZKS transmitter block for each bus linked. The definition of the operating mode (configuration instruction **`KC,...;`** or **`KD,...;`**) takes place during interconnection of the receiving blocks. The output STOE = 1 indicates that the local N8 local bus interface has not accepted the transmission request. The ZKS block does not detect any faults on the bus (e.g. bus connector not connected).
The cyclic message traffic is monitored at the receiver end.

No more than 10 ZKS blocks should be installed in a processing sequence under the same scan parameter. All transmitter blocks using the same bus channel should be executed in the same cycle in order to avoid transmission failures due to simultaneous interrupts.

⚠ An interconnection with a bus coupler to a device on another bus must be made via the slower channel (KANR = 1).

- Data structure (designation of inputs and outputs)

Meaning	Mnemonic name	Input/output No.	Type
“Mode” code (0 = CD/1 = DI)	BA	1	AB
Number of logged on devices	ANZ	2	AA
Fault output – message not transmitted	STOE	3	AB
Source address for 1st string	STR1	1	EA
Source address for 2nd string	STR2	2	EA
Source address for 3rd string	STR3	3	EA
Source address for 4th string	STR4	4	EA
Channel ID for DI communication (0 = fast channel/1 = slow channel)	KANR	5	EBV
Number of strings to be transferred	ANZW	6	I
Bus/device of logged on	BUS1	7	ID
	⋮	⋮	⋮
receivers 1–6 (DI communication only)	BUS6	12	ID
Block number of logged on	BST1	13	S4
	⋮	⋮	⋮
receivers 1–6 (DI communication only)	BST6	18	S4

- Block list

```
   ZKS     1              03. 03. 83/ 00. 38. 37. P: 1

 1 AB  BA   1                              N     19
 2 AA  ANZ  0.0000                         N     20
 3 AB  STOE 0                              N     21
 1 EA  STR1                FC  ORPA  0  C  Q      1
 2 EA  STR2                FC  ORPA  0  C  Q      2
 3 EA  STR3                FC  ORPA  0  C  Q      3
 4 EA  STR4                FC  ORPA  0  C  Q      4
 5 EBV KANR 0                                     5
 6 I   ANZW     4                         C       6
 7 ID  BUS1     0                          N      7
 8 ID  BUS2     0                          N      8
 9 ID  BUS3     0                          N      9
10 ID  BUS4     0                          N     10
11 ID  BUS5     0                          N     11
12 ID  BUS6     0                          N     12
13 S4  BST1                                N     13
14 S4  BST2                                N     14
15 S4  BST3                                N     15
16 S4  BST4                                N     16
17 S4  BST5                                N     17
18 S4  BST6                                N     18
```

9.4 Memory Requirements and Execution Time

Block	Memory requirements (bytes)			Execution time	Comments
	Min.	+Par.	Max.	(ms)	
A	86	3	89	1,09	
A110	82	16	98	0,51	BA1 = BA2 = 1
				0,93	BA1 = BA2 = 2
				(11,20)	BGF = 1
AA	27	6	33	0,69	
				(7,95)	BGF=1
AAF	50	28	78	1,60	
				12,11	FM–AA module removed
ABR	103	4	107	1,9	
				(3,4)	Max. binary value output
ABS	18	4	22	0,22	
AE	35	4	39	0,67	
				(7,10)	BGF = 1
AEF	98	36	134	2,70	TYP = 0 (4 channel)
				8,81	FM–AE module removed
				3,18	TYP = 1 (2 channel)
				14,11	FM–AE module removed
AKE	83	2	85	0,25 + 4,6	Cyclical monitoring and N8 processing
AKS	398	113	511	4,80	
APRO	80	—	80	0,41	MPX = 0 (with empty
				0,63	MPX = 1 PROBLEM)
AR	114	64	178	3,35	
				(9,10)	BGF = 1
ASL	26	9	35	0,22	
B	226	38	264	1,23	GPU = 0
				2,50	GPU = 1
BAF	22	5	27	2,23	2 byte
				13,20	If ANBY > number of binary output modules installed without gap
BAU	19	—	19	0,42	
				(7,60)	BGF = 1
BCA	20	4	24	0,90	
BCE	21	—	21	1,44	
BEF	24	5	29	1,87	2 byte
				+ 0,55	Plus additional 2 bytes each if ANBY
				9,27	> number of binary input modules installed without gap
BEI	19	—	19	0,50	BTYP = 1, 2
				0,83	BTYP = 4
				(7,30)	BGF = 1
BILD	68	22	90	0,90	Without image output;
				3,00	with empty layout
				3,20	MPX = 1
BKE	83	2	85	0,25 + 4,6	Cyclical monitoring and N8 processing
BKS	1194	129	1323	2,20	Transfer time field interconnection
				6,20	Transfer time individual interconnection

Table (continued)

Block	Memory requirements (bytes)			Execution time	Comments
	Min.	+Par.	Max.	(ms)	
BRA	47	—	47	0,59	
				(7,81)	BGF = 1
BRBK	153	—	153	2,4	
				(4,4)	Max. binary value output
BU8	93	—	93	0,89	
				(19,05)	BGF = 1
BU16	165	—	165	1,49	
				(20,25)	BGF = 1
BW	34	3	37	0,37	
C	76	4	80	0,56	
DIF	32	12	44	0,85	
				0,61	T = 0
DIV	22	12	34	0,31	
				7,04	Divisor = 0
DR	108	10	118	2,66	
				(30,55)	BGF = 1
DZ	306	49	355	3,10	
				(17,50)	BGF = 1
E110	86	—	86	0,49	Without bit change
				0,77	With bit change
				(7,70)	BGF = 1
EAR	8	4	12	0,21	
EBR	8	—	8	0,19	
EG	179	25	204	1,85	
				(16,55)	BGF = 1
EK	280	32	312	4,60	Continuous mode
				4,70	Inching mode
				(23,00)	BGF = 1
EM	208	19	227	2,80	
				(22,70)	BGF = 1
EU	209	39	248	3,00	
				(22,75)	BGF = 1
EV	56	25	281	3,75	
				(23,90)	BGF = 1
EXP	18	4	22	1,30	
F	257	65	322	1,83	
FM	71	1	72	2,00	FAN = 1/2
				(19,90)	BGFA/BGFB = 1
				3,26	FAN = 4
				(36,70)	BGFA/BGFB = 1
				(40,70)	BGFA = BGFB = 1
FN	401	132	533	2,93	
				1,78	STU = 1
FUTA	40	—	40	——	is not installed

Table (continued)

Block	Memory requirements (bytes)			Execution time	Comments
	Min.	+Par.	Max.	(ms)	
G	238	12	250		For minimum configuration: G, KA, KB, KE, KA, KB, KE
				7,64	Without time–out
				13,60	With time–out
				+ 0,39	Per additional KB
GK	383	13	396		For minimum configuration: GK, KAK, KBK, KEK, KAK, KBK, KEK
				4,18	Advance condition required
				5,40	Advance condition required
GP	40	—	707	——	is not installed
GW	23	12	35	0,2	
HA	86	11	97	1,30	
HUP	152	32	184	3,4	
INKU	30	8	38	0,54	
INT	38	21	59	0,50	
KA	12	4	16	s. G	
KAK	12	—	12	s. GK	
KB	132	18	150	s. G	
KBK	132	18	150	s. GK	
KE	16	—	16	s. G/S	
KEK	12	—	12	s. GK	
KS	234	38	272	s. S	
KV	90	—	90	s. S	
LAYO	—	—	—	——	is not installed
LN	22	8	30	2,30	
M	176	61	237	1,35	
MAX	44	12	56	0,38	
MEL	74	9	108	0,35	No message output
				30,00	Per message output to printer
MIN	44	12	56	0,41	
MKS	230	14	244	3,14	Without bit change
				4,25	With bit change
MPX	48	14	62	0,20	
MSB	254	23	277	3,27	
MUL	22	12	34	0,26	
PICT	—	—	—	——	is not installed

Table (continued)

Block	Memory requirements (bytes)			Execution time	Comments
	Min.	+Par.	Max.	(ms)	
PKF	160	2 + 384 je Seite		I :	Without message output to message line/bus/printer:
				2,01 + 0,75	1 message generation per additional message
				1,30 7,05	No message generation in the event of a buffer overflow
				II :	Per message output
				13,95 17,00 19,30	to message line to bus to printer
PKM	868	2	886	I :	With 1 interconnected PKF:
				3,47 + 0,36	1 enabled binary value per additional enabled binary value
				II :	With 2 interconnected PKF:
				4,92 + 0,61	1 enabled binary value per additional enabled binary value
				0,65	for I and II : all binary values BGF = 1
				(8,60)	
PLG	66	52	118	0,76	is not installed
PLPS	928	8	936	I: 33	Y initialization per parameter
				II: 1,6 +0,1	Read job 1 parameter for each additional parameter
				III: 2,3 +0,5	Read job parameter for each additional parameter
				0,76	
				——	is not installed
				——	is not installed
				0,36	with empty LAYOUT
PROB	—	—	118	0,51	
PROG	—	—	—	——	+ Run–time of the subroutine
PROT	71	19	90		PROBxxx is not installed
PT	22	8	30		

Table (continued)

Block	Memory requirements (bytes)			Execution time	Comments
	Min.	+Par.	Max.	(ms)	
R	340	80	420	3,30	
RAD	26	9	35	1,97	
RE	501	75	576	6,94	
				(32,00)	BGF = 1
RK	532	104	646	11,60	
				(31,40)	BGF = 1
REN	320	23	392	2,35	
				(9,6)	Max. binary value output
RN	427	127	554	3,60	
RNAM	30	—	30	——	is not installed
RSK	296	47	343	6,1	
				(9,5)	Max. binary value output
RSKB	415	75	490	3,3	
RZ	102	24	126	3,00	
				(14,20)	BGF = 1
RZA	27	6	33	1,10	
				(28,40)	BGF = 1

Table (continued)

Block	Memory requirements (bytes)			Execution time	Comments
	Min.	+Par.	Max.	(ms)	
S	212	6	218	I: 4,57	Minimum configuration (without KV): S, KS, KE
				II : 7,92	Minimum configuration (with KV; AVZW = 1) S, KS, KV, KS, KE
				+ 5,40	Per additional branch KV
				+ 0,39	for I and II: per additional KS
S5KE	2094	4	2098	1,65	No message received
				I :	Binary value:
				3,14	1 messages (16 values each)/s
				19,00	12 messages (16 values each)/s
				21,35	1 messages (1024 values each)/s
				144,70	6 messages (1024 values each)/s
				II :	Fixed point number:
				3,35	1 message (1 value each)/s
				34,35	12 messages (1 value each)/s
				18,80	1 message (64 values each)/s
				107,15	6 messages (64 values each/s
				III :	Floating point number:
				3,75	1 message (1 value each)/s
				32,80	12 messages (1 value each)/s
				14,05	1 message (32 values each)/s
				78,80	6 messages (32 values each)/s
S5KS	98	9	107		AD mode :
				I :	Binary value :
				3,50	16 binary values
				19,00	1024 binary values
				II :	Fixed point number:
				4,10	1 value
				19,00	64 values
				III :	Floating point number:
				4,50	1 value
				14,95	32 values
				3,05	ED mode (for I,II,III)
				(16,30)	BGF = 1
SKS	126	15	141	1,6	Idle run if no status is sent
				3,2	For sending change with status

Table (continued)

Block	Memory requirements (bytes)			Execution time	Comments
	Min.	+Par.	Max.	(ms)	
SPEI	45	4	49	0,47	
SR	532	76	608	0,85	No curve display
				2,85	1 curve with 24 values each
				+ 2,15	per additional curve
STEP	—	—	—	——	is not installed [1]
SUM	30	16	46	0,35	
T	232	42	274	1,26	Trend display OFF
				3,06	Trend display ON
TANZ	218	—	218	——	is not installed
TOB	26	12	38	0,30	
TOZ	76	13	89	0,55	
TUEB	362	—	362	——	is not installed
TVB	336	22	358	1,97	Preselector
				2,28	Subgroup control
UBR	74	16	90	0,90	
V	207	49	256	1,01	
VM	39	4	43	0,46	
VN	15	1	16	0,19	
VO	23	3	26	0,24	
VS	88	—	112	0,70	with empty STEP
VU	23	3	26	0,24	
VZ	29	5	34	0,30	
XA	34	1	35	0,21	EIAU = 0
				0,31	EIAU = 1
XB	39	1	40	0,37	EIAU = 0
				0,64	EIAU = 1
XZ	35	18	53	0,18	EIAU = 0
				1,31	EIAU = 1
ZE	24	—	24	0,35	
				(8,50)	BGF = 1
ZKE	99	1	100	0,25 + 4,50	Cycle monitoring and N8 processing functions
ZKS	206	1	207	2,67	

No additional output time is required in AS 235 for operator–controllable blocks.

[1] Execution time values of STEP instructions:
Instructions UE, UM, etc. 3,5 microsec.
Instructions UB ... approx. 30,0 microsec. depends on pointer position

Calculation of memory requirements:

The memory requirements listed under “+Par.” are only required if interconnectable inputs (Q,...) have been parameterized (P,...).

