SIEMENS

Operating instructions

SINAMICS

G130

AOP30 operator panel

Edition 11/2017

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SINAMICS G130
Advanced Operator Panel 30 (AOP30)

Operating Instructions

Firmware version V5.1

11/2017

A5E00331451A

Legal information

Warning notice system

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

⚠DANGER
indicates that death or severe personal injury **will** result if proper precautions are not taken.

⚠WARNING
indicates that death or severe personal injury **may** result if proper precautions are not taken.

⚠CAUTION
indicates that minor personal injury can result if proper precautions are not taken.

NOTICE
indicates that property damage can result if proper precautions are not taken.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The product/system described in this documentation may be operated only by **personnel qualified** for the specific task in accordance with the relevant documentation, in particular its warning notices and safety instructions. Qualified personnel are those who, based on their training and experience, are capable of identifying risks and avoiding potential hazards when working with these products/systems.

Proper use of Siemens products

Note the following:

⚠WARNING
Siemens products may only be used for the applications described in the catalog and in the relevant technical documentation. If products and components from other manufacturers are used, these must be recommended or approved by Siemens. Proper transport, storage, installation, assembly, commissioning, operation and maintenance are required to ensure that the products operate safely and without any problems. The permissible ambient conditions must be complied with. The information in the relevant documentation must be observed.

Trademarks

All names identified by ® are registered trademarks of Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Safety information

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1.1 General safety instructions

⚠WARNING

Electric shock and danger to life due to other energy sources

Touching live components can result in death or serious injury.

- Only work on electrical equipment if you are appropriately qualified.
- Always observe the country-specific safety rules for all work.

Generally, the following steps apply when establishing safety:

1. Prepare for disconnection. Notify all those who will be affected by the procedure.
2. Isolate the drive system from the power supply and take measures to prevent it being switched back on again.
3. Wait until the discharge time specified on the warning labels has elapsed.
4. Check that there is no voltage between any of the power connections, and between any of the power connections and the protective conductor connection.
5. Check that every auxiliary circuit is de-energized.
6. Ensure that the motors cannot move.
7. Identify all other dangerous energy sources, e.g. compressed air, hydraulic systems or water. Switch the energy sources to a safe state.
8. Check that the correct drive system is completely locked.

After you have completed the work, restore the operational readiness by following the above steps in the reverse order.

⚠WARNING

Electric shock due to connection to an unsuitable power supply

When equipment is connected to an unsuitable power supply, exposed components may carry a hazardous voltage that might result in serious injury or death.

- Only use power supplies that provide SELV (Safety Extra Low Voltage) or PELV (Protective Extra Low Voltage) output voltages for all connections and terminals of the electronics modules.

⚠WARNING

Electric shock due to equipment damage

Improper handling may cause damage to equipment. For damaged devices, hazardous voltages can be present at the enclosure or at exposed components; if touched, this can result in death or severe injury.

- Ensure compliance with the limit values specified in the technical data during transport, storage and operation.
- Do not use any damaged devices.

⚠WARNING

Electric shock due to unconnected cable shield

Hazardous touch voltages can occur through capacitive cross-coupling due to unconnected cable shields.

- Connect cable shields and unused conductors of power cables (e.g. brake conductors) at least on one side to the grounded housing potential.

⚠WARNING

Electric shock if there is no ground connection

For missing or incorrectly implemented protective conductor connection for devices with protection class I, high voltages can be present at open, exposed parts, which when touched, can result in death or severe injury.

- Ground the device in compliance with the applicable regulations.

⚠WARNING

Arcing when a plug connection is opened during operation

Opening a plug connection when a system is in operation can result in arcing that may cause serious injury or death.

- Only open plug connections when the equipment is in a voltage-free state, unless it has been explicitly stated that they can be opened in operation.

NOTICE

Property damage due to loose power connections

Insufficient tightening torques or vibration can result in loose power connections. This can result in damage due to fire, device defects or malfunctions.

- Tighten all power connections to the prescribed torque.
- Check all power connections at regular intervals, particularly after equipment has been transported.

⚠WARNING

Spread of fire from built-in devices

In the event of fire outbreak, the enclosures of built-in devices cannot prevent the escape of fire and smoke. This can result in serious personal injury or property damage.

- Install built-in units in a suitable metal cabinet in such a way that personnel are protected against fire and smoke, or take other appropriate measures to protect personnel.
- Ensure that smoke can only escape via controlled and monitored paths.

⚠WARNING

Failure of pacemakers or implant malfunctions due to electromagnetic fields

Electromagnetic fields (EMF) are generated by the operation of electrical power equipment, such as transformers, converters, or motors. People with pacemakers or implants in the immediate vicinity of this equipment are at particular risk.

- If you have a heart pacemaker or implant, maintain a minimum distance of 2 m from electrical power equipment.

⚠WARNING

Unexpected movement of machines caused by radio devices or mobile phones

When radio devices or mobile phones with a transmission power > 1 W are used in the immediate vicinity of components, they may cause the equipment to malfunction. Malfunctions may impair the functional safety of machines and can therefore put people in danger or lead to property damage.

- If you come closer than around 2 m to such components, switch off any radio devices or mobile phones.
- Use the "SIEMENS Industry Online Support App" only on equipment that has already been switched off.

⚠WARNING

Motor fire in the event of insulation overload

There is a greater load on the motor insulation as result of a ground fault in an IT system. If the insulation fails, it is possible that death or severe injury can occur as a result of smoke and fire.

- Use a monitoring device that signals an insulation fault.
- Correct the fault as quickly as possible so the motor insulation is not overloaded.

⚠WARNING

Fire due to inadequate ventilation clearances

Inadequate ventilation clearances can cause overheating of components with subsequent fire and smoke. This can cause severe injury or even death. This can also result in increased downtime and reduced service lives for devices/systems.

- Ensure compliance with the specified minimum clearance as ventilation clearance for the respective component.

⚠WARNING

Unrecognized dangers due to missing or illegible warning labels

Dangers might not be recognized if warning labels are missing or illegible. Unrecognized dangers may cause accidents resulting in serious injury or death.

- Check that the warning labels are complete based on the documentation.
- Attach any missing warning labels to the components, where necessary in the national language.
- Replace illegible warning labels.

NOTICE

Device damage caused by incorrect voltage/insulation tests

Incorrect voltage/insulation tests can damage the device.

- Before carrying out a voltage/insulation check of the system/machine, disconnect the devices as all converters and motors have been subject to a high-voltage test by the manufacturer, and therefore it is not necessary to perform an additional test within the system/machine.

⚠WARNING

Unexpected movement of machines caused by inactive safety functions

Inactive or non-adapted safety functions can trigger unexpected machine movements that may result in serious injury or death.

- Observe the information in the appropriate product documentation before commissioning.
- Carry out a safety inspection for functions relevant to safety on the entire system, including all safety-related components.
- Ensure that the safety functions used in your drives and automation tasks are adjusted and activated through appropriate parameterizing.
- Perform a function test.
- Only put your plant into live operation once you have absolutely guaranteed that the functions relevant to safety are operating correctly.

Note

Important safety instructions for Safety Integrated functions

If you want to use Safety Integrated functions, you must observe the safety instructions in the Safety Integrated manuals.

1.2 Handling the AOP30 backup battery

⚠WARNING

Risk of explosion and release of harmful substances

Improper handling of lithium batteries can result in an explosion of the batteries.

Explosion of the batteries and the released pollutants can cause severe physical injury.

Note the following points when handling lithium batteries:

- Replace used batteries in good time; see the chapter "Replacing the backup battery".
- Only replace the lithium battery with an identical battery or with a type recommended by the manufacturer.
- Do not throw lithium batteries into a fire, do not recharge, do not open, do not short-circuit, do not reverse the polarity, do not heat above 100 °C and protect from direct sunlight, moisture and condensation.

1.3 Handling electrostatic sensitive devices (ESD)

Electrostatic sensitive devices (ESD) are individual components, integrated circuits, modules or devices that may be damaged by either electric fields or electrostatic discharge.

NOTICE

Damage through electric fields or electrostatic discharge

Electric fields or electrostatic discharge can cause malfunctions through damaged individual components, integrated circuits, modules or devices.

- Only pack, store, transport and send electronic components, modules or devices in their original packaging or in other suitable materials, e.g. conductive foam rubber or aluminum foil.
- Only touch components, modules and devices when you are grounded by one of the following methods:
  - Wearing an ESD wrist strap
  - Wearing ESD shoes or ESD grounding straps in ESD areas with conductive flooring
- Only place electronic components, modules or devices on conductive surfaces (table with ESD surface, conductive ESD foam, ESD packaging, ESD transport container).

The necessary ESD protective measures are clearly illustrated in the following diagram:

- a = conductive floor surface
- b = ESD table
- c = ESD shoes
- d = ESD overall
- e = ESD wristband
- f = cabinet ground connection
- g = contact with conductive flooring

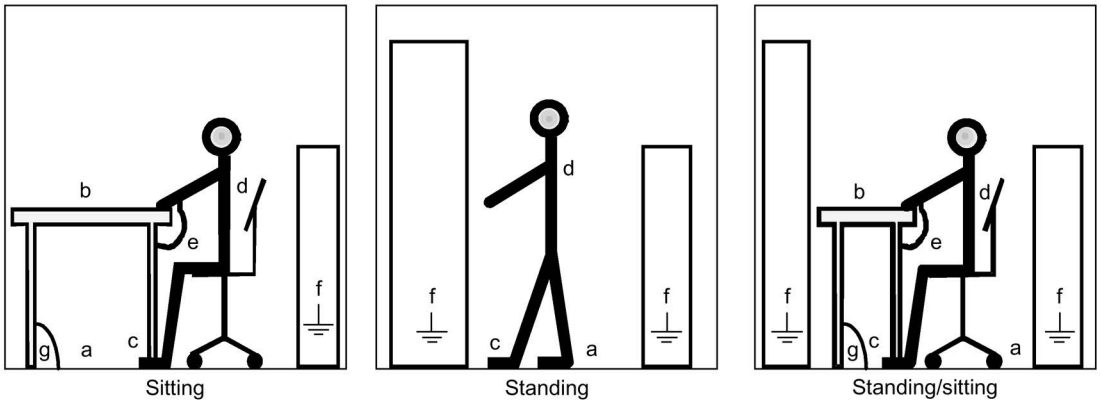


Figure 1-1 ESD protective measures

1.4 Industrial security

Note

Industrial Security

Siemens provides products and solutions with industrial security functions that support the secure operation of plants, systems, machines and networks.

In order to protect plants, systems, machines and networks against cyber threats, it is necessary to implement – and continuously maintain – a holistic, state-of-the-art Industrial Security concept. Siemens products and solutions only represent one component of such a concept.

The customer is solely responsible for preventing unauthorized access to its plants, systems, machines and networks. Systems, machines and components should only be connected to the company's network or the internet if and to the extent necessary and with appropriate security measures (e.g. use of firewalls and network segmentation) in place.

Additionally, Siemens' guidance on appropriate security measures should be taken into account. For more information about Industrial Security, please visit:

Industrial Security (http://www.siemens.com/industrialsecurity).

Siemens' products and solutions undergo continuous development to make them more secure. Siemens strongly recommends to apply product updates as soon as available and to always use the latest product versions. Use of product versions that are no longer supported, and failure to apply latest updates may increase customer's exposure to cyber threats.

To stay informed about product updates, subscribe to the Siemens Industrial Security RSS Feed at:

Industrial Security (http://www.siemens.com/industrialsecurity).

⚠WARNING

Unsafe operating states resulting from software manipulation

Software manipulation (e.g. viruses, trojans, malware or worms) can cause unsafe operating states in your system that may lead to death, serious injury, and property damage.

- Keep the software up to date.
- Incorporate the automation and drive components into a holistic, state-of-the-art industrial security concept for the installation or machine.
- Make sure that you include all installed products into the holistic industrial security concept.
- Protect files stored on exchangeable storage media from malicious software by applying suitable protection measures, e.g. virus scanners.

Note

Industrial security Configuration Manual

You can find a Configuration Manual on the topic of industrial security at this address (https://support.industry.siemens.com/cs/ww/en/view/108862708).

General

2

Description

The user-friendly AOP30 operator panel is an optional input/output device for SINAMICS G130 converters. The operator panel can be used for commissioning, operation, and diagnostic purposes.

The AOP30 communicates with the SINAMICS drive via a serial interface (RS232) using the PPI protocol. The interface is a point-to-point connection. During communication, the AOP30 is the master and the connected drive is the slave.

Structure

The AOP30 is an operator panel with a graphical display and a touch-sensitive keypad. An RS232 interface is used as the interface to the drive unit. The device can be installed in a cabinet door (thickness: between 2 mm and 4 mm).

Features

- Display with green backlighting (resolution: 240 x 64 pixels)
- 26-key touch-sensitive keypad
- Connection for a 24 V DC power supply
- RS232 interface
- Time and date memory powered by internal battery backup
- 4 LEDs indicate the operating status of the drive unit:
  - RUN: green
  - ALARM: yellow
  - FAULT: red
  - LOCAL/REMOTE: green

Mechanical installation

3

The following diagrams and descriptions explain the conditions and procedures involved in the mechanical installation of the AOP30 operator panel.

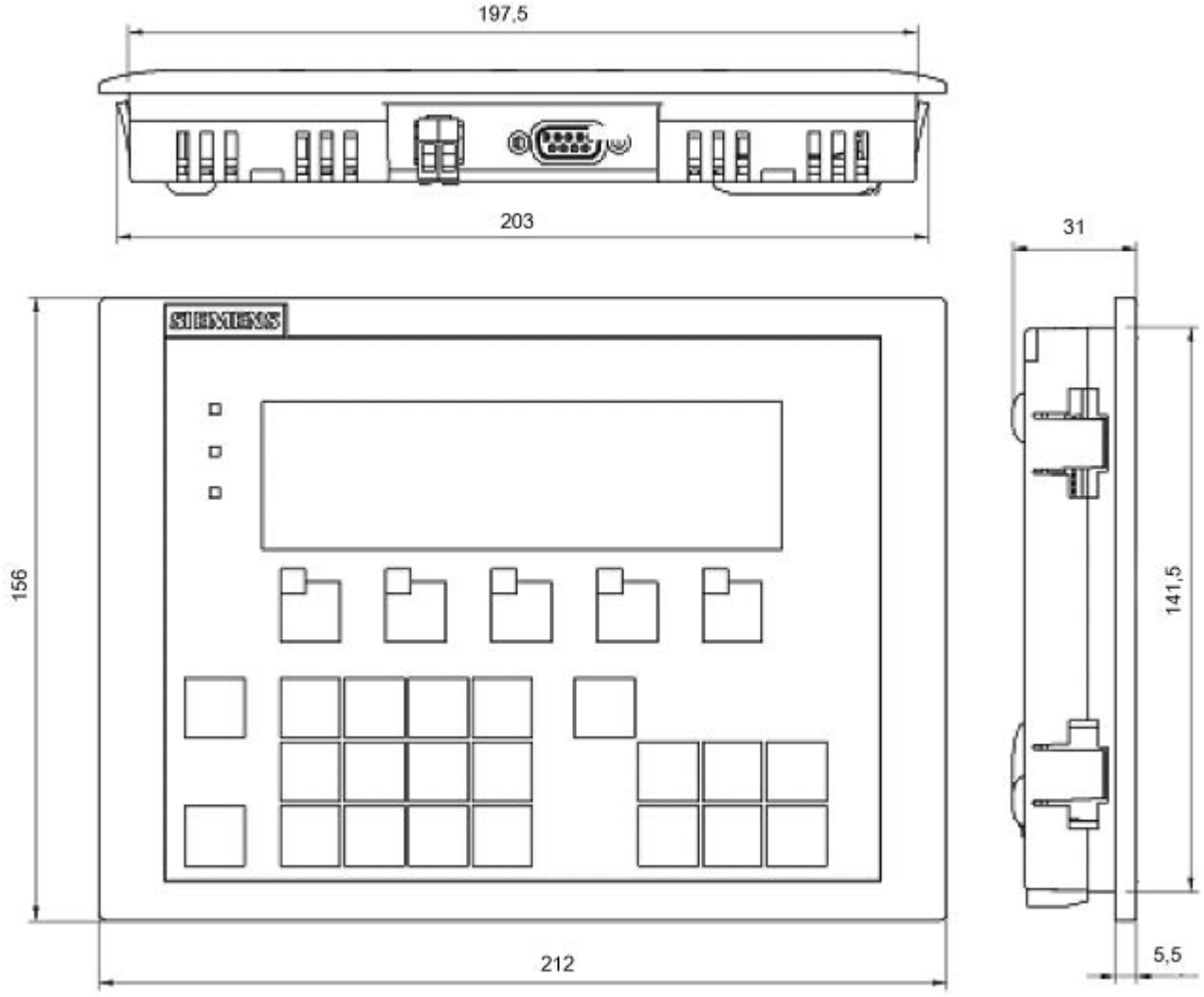


Figure 3-1 Dimension drawing of the AOP30 operator panel

Installing the operator panel (cabinet door thickness: 2 mm)

1. Cut out a 141.5 mm x 197.5 mm section in the cabinet door.
2. Fit the AOP30 operator panel in this cutout section from the outside.
3. Apply pressure to the four corners until the snap-in lugs lock into position.

Installing the operator panel (cabinet door thickness: 2 mm to 4 mm)

The following photos show the tensioning elements for the AOP30 operator panel for installation in cabinet doors (thickness: 2 mm to 4mm).

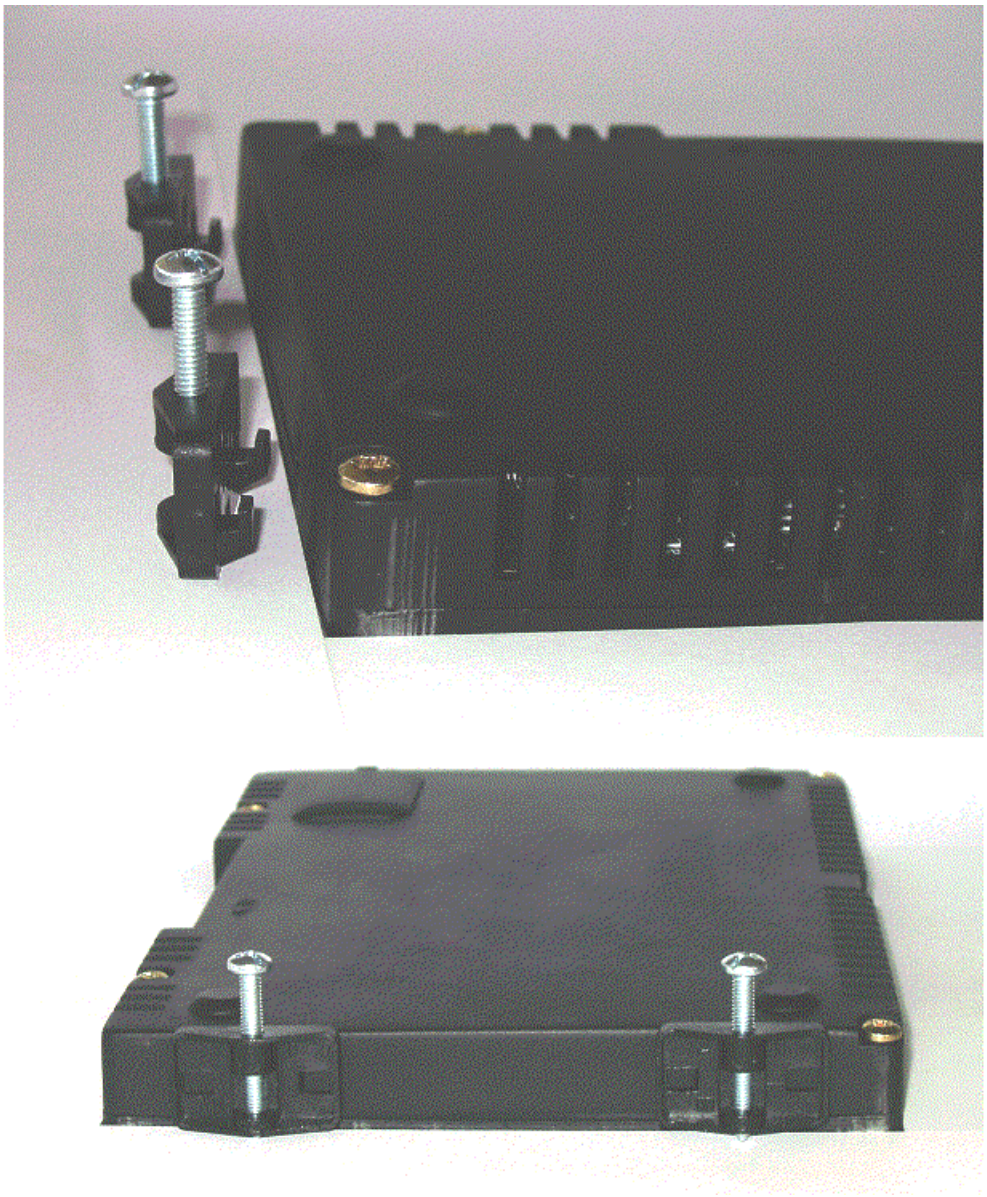


Figure 3-2 Tensioning elements for the AOP30 operator panel for installation in cabinet doors (thickness: 2 mm to 4 mm)

1. Cut out a 141.5 mm x 197.5 mm section in the cabinet door.
2. Fit the AOP30 operator panel in this cutout section from the outside.
3. Hook the tensioning elements into the openings provided.
4. Tighten the screws by hand to secure the tensioning elements.

NOTICE
Device damage caused by screws being tightened excessively The excessive tightening of the screws used to fix the tension jack can cause damage to the operator panel housing! • Tighten the screws used to fix the tension jack only hand-tight.

Connection

4

Interfaces

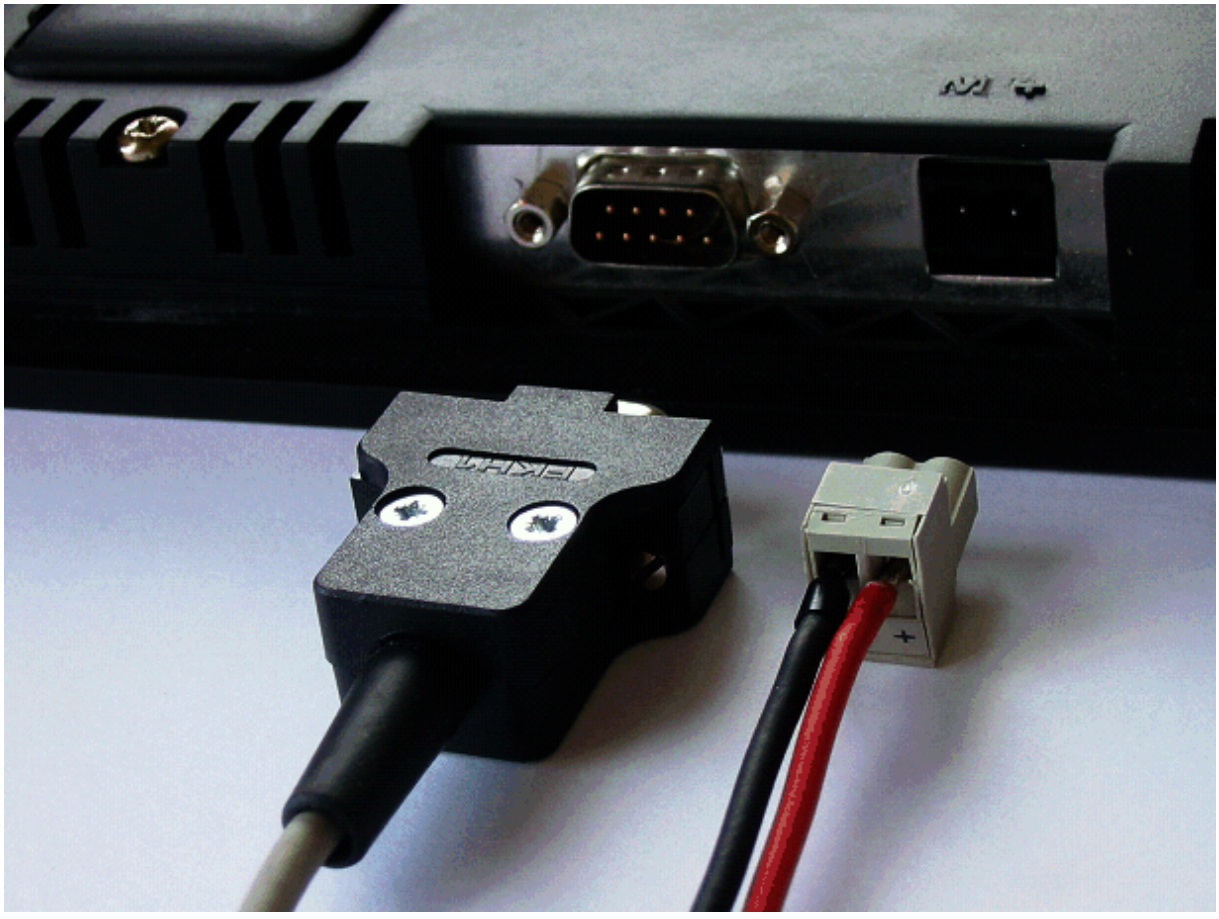


Figure 4-1 AOP30 interfaces

X524: Power supply

Table 4- 1 Power supply terminals

Terminal	Designation	Technical specifications
+	P24	24 VDC power supply
M	M	Ground

Max. connectable cross-section: 2.5 mm²

Note

Connectable voltage supply

Only a protective extra-low voltage of Class DVC A, (PELV) acc. to EN 61800-5-1 must be connected to the power supply.

X540: serial interface (RS232)

Table 4- 2 Serial interface (RS232) X540

Pin	Designation	Technical specifications
2	RxD	Receive data
3	TxD	Transmit data
5	Ground	Ground reference
Connector type: 9-pin SUB D socket		

Note

Maximum cable lengths

The maximum cable length is 10 m.

To ensure noise-free communication, you are advised to use a shielded cable and connect the cable shield to both connector housings.

NOTICE

Device damage caused by interchanged poles of the connected power supply

In the operator panel electronic circuitry, a connected cable shield may possibly be connected to the signal and P24 ground. If the power supply is connected with incorrect polarity, the P24 supply via the shield and signal ground will short-circuit. This can cause device damage.

- Connect the correct poles of the power supply.

Connection

The AOP30 is connected as follows:

1. Connect the power supply cable to the interface for the electronic power supply (X524).
2. Connect the standard cable to the serial RS232 interface (X540) of the Control Unit.

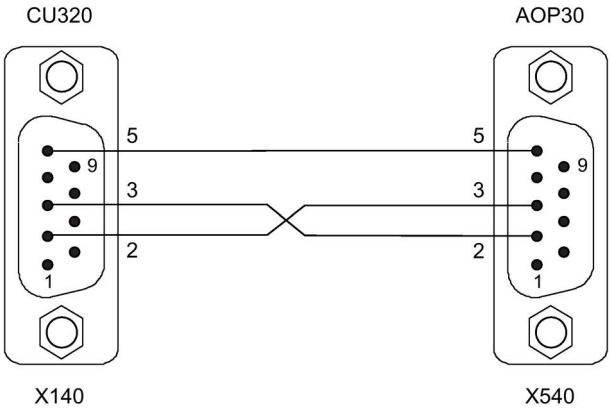


Figure 4-2 Signal cable between the Control Unit and AOP30

Note

Assignment of the connecting cable

The connection cable to AOP30 may only contain the three contacts which are shown in the drawing; a completely allocated cable may not be used.

Control via the operator panel

5

5.1 Operator panel (AOP30) overview and menu structure

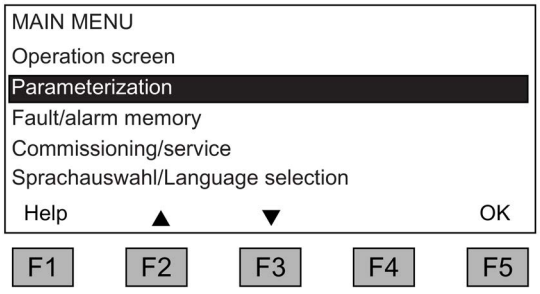
Description

The operator panel can be used for the following activities:

- Parameterization (commissioning)
- Monitoring status variables
- Controlling the drive
- Diagnosing faults and alarms

All the functions can be accessed via a menu.

Your starting point is the main menu, which you can always call up using the yellow MENU key:



Dialog screen for the main menu:
It can be accessed at any time with the "MENU" key.

Press "F2" or "F3" to navigate through the menu options in the main menu.

Note

AOP reset

If the AOP no longer reacts, you can trigger an AOP reset by simultaneously pressing the key and OFF buttons (longer than two seconds) and then releasing the OFF button.

Menu structure of the operator panel

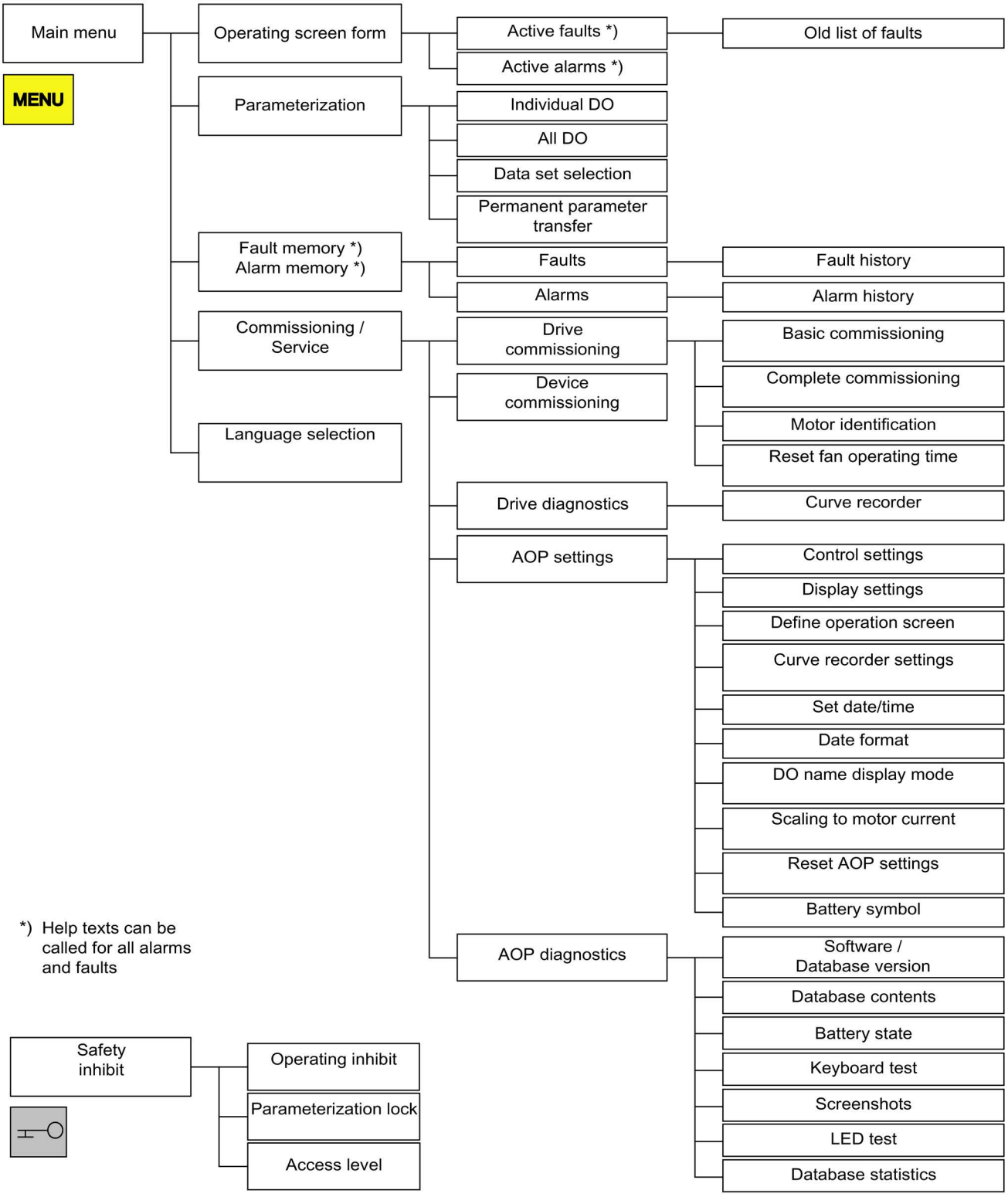


Figure 5-1 Menu structure of the operator panel

5.2 Menu: Operation screen

Description

The operation screen displays the most important status variables for the drive unit:

In the delivery condition, it displays the operating state of the drive, the direction of rotation, the time, as well as four drive variables (parameters) numerically and two in the form of a bar display for continuous monitoring.

There are two ways to reach the operation screen:

1. After the power supply has been switched on and the system has ramped up.
2. By pressing the MENU key and F5 "OK"

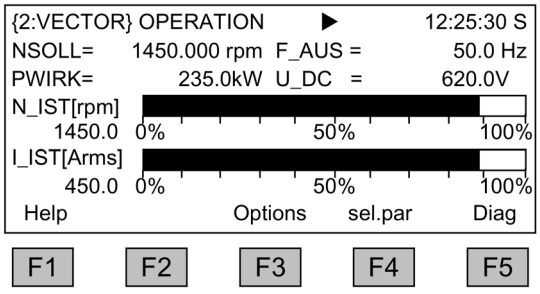


Figure 5-2 Operation screen

If a fault occurs, the system automatically displays the fault screen (see "Faults and alarms").

In LOCAL control mode, you can choose to enter the setpoint numerically (F2: setpoint).

With F3 "Extras", screen2 and CDS data set (see section CDS setting via AOP (Page 44)) can be selected.

The individual parameters of the operation screen can be selected using F4 "Sel. par." The corresponding parameter number of the short identifier is displayed using F1 "Help+" and a description of the parameter can be called up.

Settings

When you choose Commissioning / service –> AOP settings –> Define operation screen, you can adjust the display type and the values displayed as required (see "AOP settings").

5.3 Menu: Parameterization

You can adjust the device settings in the Parameterization menu.

The drive software is modular. The individual modules are called DOs ("drive objects").

The following DOs are available in the SINAMICS G130:

- CU: General parameters for the Control Unit
- VECTOR: Drive control
- TM31: The TM31 terminal module (optional)
- TM150: the TM150 temperature sensor module (optional)

Parameters with identical functions may exist with the same parameter number in more than one DO (e.g. p0002).

The AOP30 is used for operating devices that comprise more than one drive so that attention is focused on one drive (i.e. the "current" drive). The switchover is made in the main menu. The corresponding function key is labeled "Drive."

This drive determines the following:

- Operation screen
- Fault and alarm displays
- The controller (ON, OFF, …) of a drive

Depending on your requirements, you can choose between two AOP display types:

1. All parameters
   All the parameters present in the device are listed here. The DO to which the currently selected parameter belongs is displayed in curly brackets in the top left of the screen.
2. DO selection
   In this display, you can pre-select a DO Only the parameters for this DO are then listed. (The expert list display in STARTER only uses this DO view)

In both cases, the set access level governs which parameters are displayed. You can set the access level in the menu for inhibit functions, which can be called up using the key button.

The parameters for access levels 1 and 2 are sufficient for simple applications.

At access level 3 ("Expert"), you can change the structure of the function by interconnecting BICO parameters.

In the Data set selection menu, you can choose which of the data sets chosen is currently DISPLAYED on the operator panel.
Data set parameters are indicated by a "c", "d", "m", "e", or "p" between the parameter number and parameter designator.

When a data set parameter is changed, the data set selection dialog appears.

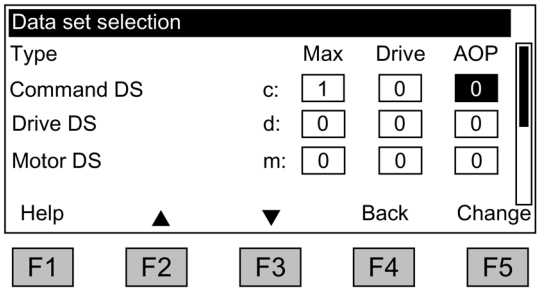


Figure 5-3 Data set selection

Explanation of the operator control dialog

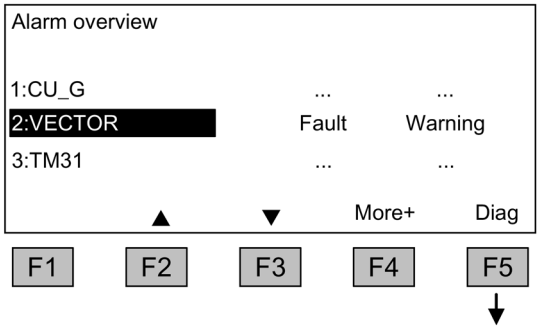
- "Max" shows the maximum number of data sets parameterized (and thereby available for selection) in the drive.
- "Drive" indicates which data set is currently active in the drive.
- "AOP" indicates which particular data set is currently being displayed in the operator panel.

5.4 Menu: Fault/alarm memory

When you select the menu, a screen appears containing an overview of faults and alarms that are present.

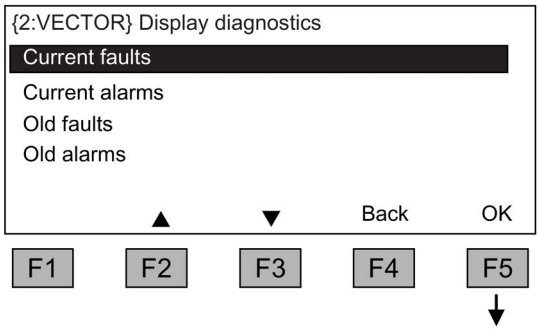
For each drive object, the system indicates whether any faults or alarms are present. ("Fault" or "Alarm" appears next to the relevant drive object).

In the graphic below, you can see that at least one active fault/alarm is present for the "VECTOR" drive object. No faults/alarms are indicated for the other drive objects.



Fault/alarm memory

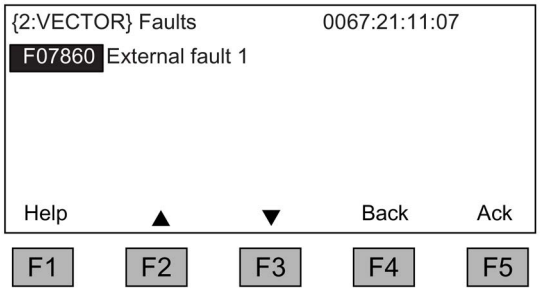
When you navigate to the line with active alarms/faults and then press the F5 <Diag> key, the system displays a screen in which you have to select the current or old alarms/faults.



Display diagnosis

When you navigate to the required line and then press the F5 <OK> key, the corresponding faults/alarms are displayed.

The list of current faults is selected here as an example.



Display of current faults

A maximum of eight current faults are displayed along with their fault number and name of the fault.

To display additional help regarding the cause of the problem and how to solve it, choose F1 <Help>.

To acknowledge the faults, choose F5 <Ack.>. If a fault cannot be acknowledged, the fault remains.

5.5 Menu commissioning / service

5.5.1 Drive commissioning

This option enables you to re-commission the drive from the main menu.

Basic Commissioning

Only the basic commissioning parameters are queried and stored permanently.

Complete commissioning

Complete commissioning with motor and encoder data entry is carried out. Following this, key motor parameters are recalculated from the motor data. The parameter values calculated during previous commissioning are lost.

In a subsequent motor identification procedure, the calculated values are overwritten.

Motor identification

The selection screen for motor identification appears.

Reset fan operating time

The actual operating hours of the fan in the power unit is displayed.

After a fan replacement, the operating hours counter for monitoring the fan operating time must be reset.

5.5.2 Device commissioning

Device commissioning

In this menu, you can enter the device commissioning status directly. This is the only way that you can reset parameters to the factory setting for example.

5.5.3 Drive diagnostics

Curve recorder

The curve recorder provides a slow trace function, which monitors a signal trend.
A signal selected via a parameter is shown in the form of a curve.

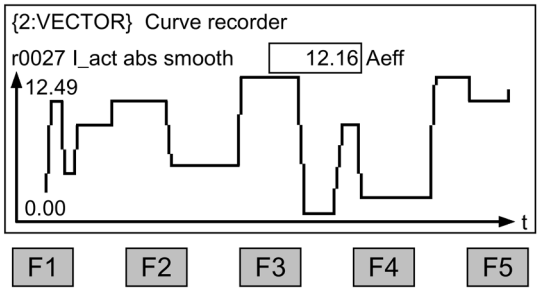


Figure 5-4 Curve recorder

The curve recorder-relevant settings are changed by pressing the F5 key or via the "Commissioning / Service – AOP settings - Curve recorder-relevant settings" menu.

The value of the parameter selected in the curve recorder-relevant settings is output on the display in addition to the curve and updated every 0.5 ... 24.5 seconds (parameterizable). With a slowly running time basis (as of 20 minutes/figure), the time basis value flashes in the header in the 1 s-cycle alternately with the text "slow X".

Assignment of the function keys F1 to F5 is not normally displayed so that the space can be fully utilized to display the curve. Pressing a function key shows the key assignments. If no further key is pressed within 5 seconds, the labeling will disappear again.

The curve can be scaled automatically or manually. This is selected with key F3 "scale+" - F2 "Auto/Manual" followed by confirmation with F5 "OK."

- **Auto**

  The scaling of the curve changes dynamically, it is oriented to the maximum value (for example, 12.49) and minimum value (for example, 0.00) visible in the display at the actual point in time. Scaling can be changed step-by-step by pressing buttons F2 and F3. If measured value noise is shown with an excessively high resolution as a result of the automatic scaling, then the resolution can be reduced in four steps by pressing button F2. As a result, the automatic scaling is deactivated. However, if the measured value leaves the display area, then this is extended. Automatic scaling can be reselected by pressing button F3.

- **Manually**

  After selecting manual scaling and confirmation with "OK", a window opens in which the maximum and minimum limits for scaling can be set.

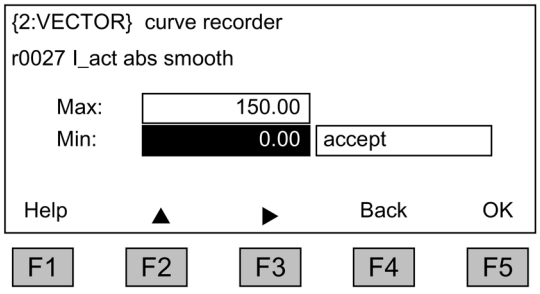


Figure 5-5 Curve recorder - manual scaling

After setting and applying the limits, you switch to the curve recorder and manual scaling is used.

If the current measured values are outside the displayable range, the range will automatically be extended.

Note

Changing the parameter for the curve recorder in manual scaling

When the parameter for the curve recorder is changed the following occurs with manual scaling:

- If the current parameter has lower values than the currently set scaling, the scaling will be retained.
- If the current parameter has higher values than the currently set scaling, the scaling will be adjusted automatically.

Help on the curve recorder can be opened with key F1.

The curve recorder is exited by pressing the MENU button.

Note

No recording of data

The values displayed in the recorder are not recorded and saved, they are only used for display until the screen form is exited.

5.5.4 AOP settings

Control settings

This defines the settings for the control keys in LOCAL mode (see "Operation / Control via the operator panel / Operation via the operator panel").

Display settings

In this menu, you set the lighting, brightness, and contrast for the display.

Define operation screen

In this menu, you can switch between five operation screens. You can set the parameters to be displayed.

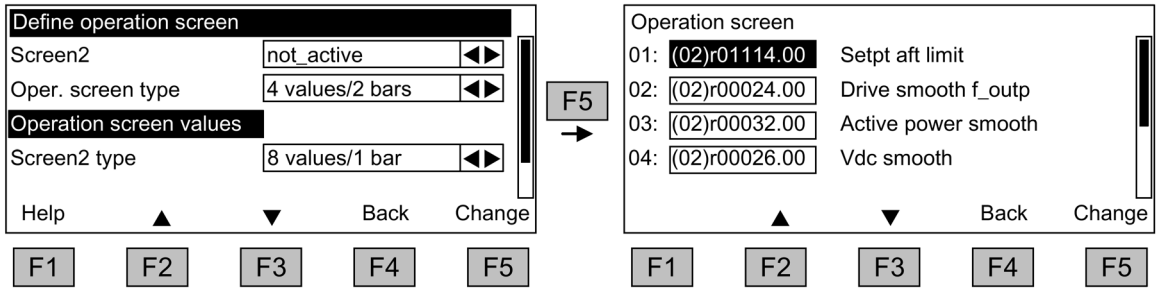


Figure 5-6 Define operation screen

The following screenshot shows how entries are assigned to the screen positions:

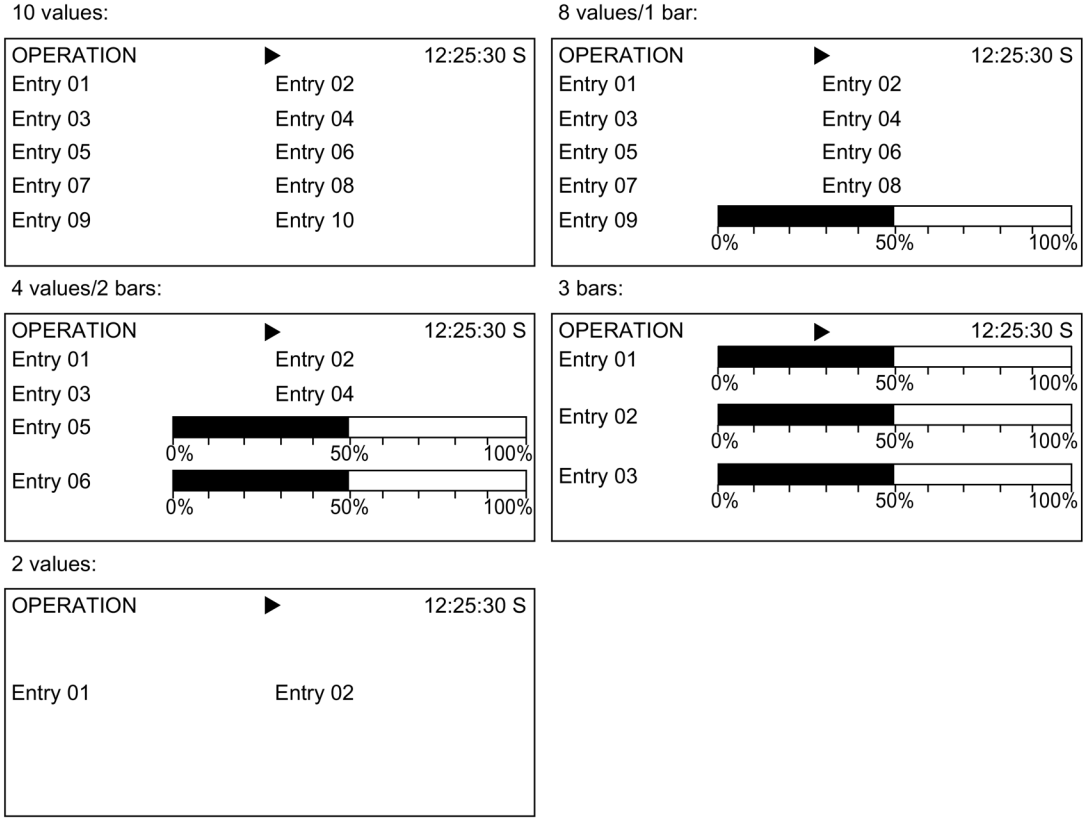


Figure 5-7 Layout of entries on the operation screen

Lists of signals for the operating screen form

The following tables list some of the main signals for the operation screen along with the associated reference variables and default settings for fast commissioning.

VECTOR object

Table 5- 1 List of signals for the operation screen - VECTOR object

Signal		Parameter	Short name	Unit	Scaling (100 %=...) See table below
Factory setting (entry no.)					
Speed setpoint upstream of ramp-function generator	(1)	r1114	NSETP	1/min	p2000
Output frequency	(2)	r0024	F_OUT	Hz	Reference frequency
Power smoothed	(3)	r0032	PACTV	kW	r2004
DC link voltage smoothed	(4)	r0026	U_DC	V	p2001
Actual speed value smoothed	(5)	r0021	N_ACT	1/min	p2000
Absolute actual current, smoothed	(6)	r0027	I_IST	A	p2002
Motor temperature	(7)	r0035 [1)]	T_MOT	°C	p2006
Converter temperature	(8)	r0037	T_LT	°C	p2006
Actual torque smoothed	(9)	r0031	M_ACT	Nm	p2003
Converter output voltage smoothed	(10)	r0025	C_OUT	V	p2001
For diagnostic purposes					
Speed setpoint smoothed		r0020	NSETP	1/min	p2000
Control factor smoothed		r0028	AUSST	%	Reference modulation depth
Field-producing current component		r0029	IDACT	A	p2002
Torque-producing current component		r0030	IQACT	A	p2002
Converter overload Degree of thermal overload		r0036	LTI2T	%	100 % = Shutdown
Speed actual value motor encoder		r0061	N_ACT	1/min	p2000
Speed setpoint after the filter		r0062	NSETP	1/min	p2000
Actual speed smoothed		r0063	N_ACT	1/min	p2000
Control deviation		r0064	NDIFF	1/min	p2000
Slip frequency		r0065	FSCHL	Hz	Reference frequency
Output frequency		r0066	F_OUT	Hz	Reference frequency
Output voltage		r0072	UACT	V	p2001
Control factor		r0074	AUSST	%	Reference modulation depth
Torque-generating actual current		r0078	IQACT	A	p2002
Actual torque value		r0080	M_ACT	Nm	p2003
For further diagnostic purposes					
Fixed speed setpoint effective		r1024		1/min	p2000
Active motorized potentiometer setpoint		r1050		1/min	p2000
Resulting speed setpoint		r1119	NSETP	1/min	p2000
Speed controller output		r1508	NREGY	Nm	p2003
I component of speed controller		r1482	NREGI	Nm	p2003
PROFIBUS setpoint		r2050	PBSOL	1/min	p2000

[1)] If a temperature sensor has not been installed, a value of –200 °C is displayed.

Normalization for VECTOR object

Table 5- 2 Normalization for VECTOR object

Size	Scaling parameter	Default for quick commissioning
Reference speed	100% = p2000	p2000 = Maximum speed (p1082)
Reference voltage	100% = p2001	p2001 = 1000 V
Reference current	100% = p2002	p2002 = Current limit (p0640)
Reference torque	100% = p2003	p2003 = 2 x rated motor torque
Reference power	100% = r2004	r2004 = (p2003 x p2000 x π) / 30
Reference frequency	100% = p2000/60	
Reference modulation depth	100 % = Maximum output voltage without overload	
Reference flux	100 % = Rated motor flux	
Reference temperature	100% = p2006	p2006 = 100°C

TM31 object

Table 5- 3 List of signals for the operation screen – TM31 object

Signal	Parameter	Short name	Unit	Scaling (100 % = ...)
Analog input 0 [V, mA]	r4052[0]	AI_UI	V, mA	V: 100 V / mA: 100 mA
Analog input 1 [V, mA]	r4052[1]	AI_UI	V, mA	V: 100 V / mA: 100 mA
Analog input 0, scaled	r4055[0]	AI_%	%	as set in p200x
Analog input 1, scaled	r4055[1]	AI_%	%	as set in p200x

Curve recorder settings

In this menu, the following settings can be made:

Parameter selection

You can select here the parameter whose signal is to be displayed in the form of a trend curve in the curve recorder.

Interpolation (factory setting: No), serves for the better display of rapidly changing quantities.

- **No:** Only the measured values are displayed as points, without a connecting line between the points.
- **1:** The measured values are connected with a vertical line.
- **2:** The measured values are connected with a line, offset at the center.

Time base (factory setting: 2 minutes/screen)

The rate of the signal acquisition in minutes per screen is set. The value can be changed in integer multiples of 2. If an odd value is entered, the value will be rounded up. After changing the time basis the recording is started again.

Background recording (factory setting: No)

- **YES:** Values are still recorded, even if the display screen is exited. When the screen is entered again, the recorded prehistory is displayed.
- **NO:** The recording is stopped when the curve recorder is exited.

Y scale mode (factory setting: Auto), specifies the representation of the trend

- **Auto:** Scaling is done automatically (making the best possible use of the display height).
- **Manual:** Scaling is done manually by entering the range limits MIN/MAX. If, in this mode, values that are outside the defined window occur, the limit is automatically adapted for the display so that actual measured values can always be recorded.

Setting the date/time (for date stamping of error messages)

In this menu, you set the date and time.

You can also set whether and/or how the AOP and drive unit are to be synchronized. Synchronization of the AOP with the drive enables error messages to be date- and time-stamped.

Note

Display format for the time

The drive unit displays the time in parameter r3102 in the UTC format (days/milliseconds since 1970-01-01).

Under "Additional settings", settings for synchronization can be made:

Synchronization (factory setting: None)

- **None**
  The times for the AOP and drive unit are not synchronized.
- **AOP -> Drive**
  - If you activate this option, the AOP and drive unit are synchronized immediately whereby the current AOP time is transferred to the drive unit.
  - The current AOP time is transferred to the drive unit every time the AOP is started.
  - Depending on the set synchronization interval, the current AOP time is transferred to the drive unit.

Note

Flashing "S"

If the AOP detects a difference between RAM and ROM during synchronization to the drive unit, this is indicated by a flashing "S" at the top right in the display or, if operator input and/or parameter assignment has been disabled, by a flashing key symbol.

- **Drive -> AOP**
  - If you activate this option, the AOP and drive unit are synchronized immediately whereby the current drive unit time is transferred to the AOP.
  - The current drive unit time is transferred to the AOP every time the AOP is started.
  - Depending on the set synchronization interval, the current drive unit time is transferred to the AOP.

Note

Time-of-day master

The time in the drive must be set by a clock master (e.g. SIMATIC).

Synchronization interval

The interval for time synchronization is set from 1 hour (factory setting) to 99 hours.

For the interval, the time in the AOP from the time of the last change of the interval is decisive.

Daylight saving (factory setting: No)

- **No**
  The time does not automatically change over to daylight-saving time.
- **Yes**
  Selection is only possible if synchronization is set to "None" or "AOP -> Drive".
  The time is then automatically set to summer or winter time.
  After the changeover - for synchronization "AOP -> Drive" - synchronization is immediately carried out, irrespective of the synchronization interval set.

Changes to the synchronization must be saved with "Save".

Date format

In this menu, the date format can be set:

- **DD.MM.YYYY**: European date format
- **MM/DD/YYYY**: North American date format

DO name display mode

In this menu, you can toggle the display of the DO-name between the standard abbreviation (e.g., VECTOR) and a DO-name of your choice (e.g. motor_1).

User-defined DO name (factory setting: No)

- **Yes:** The "User-defined DO-name" stored in parameter p0199 is displayed instead of the standard DO abbreviation.
- **No:** The standard DO abbreviation is displayed.

Scaling to motor current

In this menu, the reference variable for the bar-type display of parameter r0027 (absolute actual current value smoothed) can be changed over in the operating screen forms.

Scaling to motor current (factory setting: No)

- **Yes:** The bar display of parameter r0027 in the operating screen form is displayed with reference to parameter p0305 (rated motor current).
- **No:** The bar display of parameter r0027 in the operating screen form is displayed with reference to parameter p2002 (reference current).

Reset AOP settings

When you choose this menu option, the AOP factory settings for the following are restored:

- Language
- Display (brightness, contrast)
- Operating screen
- Control settings

Note

Restoring the factory setting

When you reset parameters, all settings that are different to the factory settings are reset immediately. This may cause the cabinet unit to switch to a different, unwanted operational status.

For this reason, you should always take great care when resetting parameters.

Battery symbol

In this menu, the battery symbol can be activated so that it is displayed in the operating screen form. When the display is activated, then the battery symbol is shown instead of the time of day seconds display. It displays the battery voltage in 20 % steps. If the display was received in the last 20 %, then the battery symbol flashes in order to indicate that the battery must be replaced.

Battery symbol (factory setting: NO)

- **Yes:** The battery symbol is shown at the top right of the operating screen form - at the time of day seconds display.
- **No:** The battery symbol is not displayed in the operating screen form.

5.5.5 AOP diagnostics

Software/database version

You can use this menu to display the firmware and database versions.

The database version must be compatible with the drive software status (you can check this in parameter r0018).

Database contents

For service purposes, the contents of the database are displayed in the screen form.

Battery status

In this menu, you can display the battery voltage numerically (in Volts) or as a bar display. The battery ensures that the data in the database and the current time are retained.

When the battery voltage is represented as a percentage, a battery voltage of ≤ 2.30 V is equal to 0%, and a voltage of ≥ 3 V to 100%.

The data is secure up to a battery voltage of 2.30 V.

- If the battery voltage is ≤ 2.45 V, the message "Battery weak - replace soon" is displayed in the status bar.
- If the battery voltage is ≤ 2.30 V, the system displays the following message: "Battery defect - replace immed."
- If the time and/or database are not available after the system has been switched off for a prolonged period due to the voltage being too low, the loss is established by means of a CRC check when the system is switched on again. This triggers a message instructing the user to replace the battery and then load the database and/or set the time.

For instructions on how to change the battery, see "Maintenance and servicing".

Keyboard test

In this screen, you can check whether the keys are functioning properly. Keys that you press are represented on a symbolic keyboard on the display. You can press the keys in any order. You cannot exit the screen (F4 – "back") until you have pressed each key at least once.

Note

Exit keyboard test

Alternatively, you can exit the keyboard test screen by pressing any key and holding it down.

Screenshots

A screenshot is created by simultaneously pressing keys "1" and "+/-" - and then the display flashes 2 times, one after the other. A maximum of 8 screenshots can be managed.

The list of the saved screenshots is displayed in the "Screenshots" menu item.

The screenshot is selected from the list and is displayed by pressing F5.

While the screenshot is being displayed, the identifier and the time stamp are displayed flashing in the title line every 5 seconds.

By pressing any function key F1 ... F5, the function key assignment is displayed for 5 seconds.

- The display is exited by pressing F4 and the list of screenshots is redisplayed.
- By pressing the F5 key once and then pressing F5 "Clear" again to confirm, the displayed screenshot will be deleted and the list of screenshots will be displayed again.

To clear all of the screenshots, in the list of screenshots, press F5 for longer than 1 second - and confirm the following prompt with "Yes".

If there are gaps in the list of screenshots, then they are populated with new screenshots from the top to the bottom. When the list is full, then the oldest chronological entry in the list is overwritten.

Note

Battery buffering

The screenshots are saved to the memory, buffered by a battery - and are also available after the power supply has been switched-off and switched-on again.

When the AOP30 is switched off and the battery is too weak - or when changing the batteries - a buffer time of approximately 30 minutes applies.

LED test

In this screen, you can check that the four LEDs are functioning properly.

Database statistics

For service purposes, the database statistics are displayed in the screen form.

5.6 Sprachauswahl/Language selection

The operator panel downloads the texts for the different languages from the drive.

You can change the language of the operator panel via the "Sprachauswahl/Language selection" menu.

Note

Additional languages for the display

Languages in addition to the current available languages in the display are available on request.

5.7 Operation via the operator panel (LOCAL mode)

You activate the control keys by switching to LOCAL mode. If the green LED in the LOCAL/REMOTE key does not light up, the key is not active.

Note

OFF in REMOTE

If the "OFF in REMOTE" function is activated, the LED in the LOCAL-REMOTE key flashes.

For LOCAL master control, all of the supplementary setpoints are deactivated.

After the master control has been transferred to the operator panel, the BICO interconnections at bit 0 to bit 10 of the control word of the sequence control are not effective (refer to function diagram 2501).

Note

Message "Other device has master control"

If STARTER has master control, then when pressing the LOCAL-REMOTE button, the "Other device has master control" message is displayed, and the master control transfer is rejected.

5.7.1 LOCAL/REMOTE key

Activating the LOCAL mode: Press the LOCAL key.

LOCAL mode: LED lights up

REMOTE mode: LED does not light up: the ON, OFF, JOG, direction reversal, faster, and slower keys are not active.

Settings: MENU – Commissioning/Service – AOP Settings – Control Settings

Save LOCAL mode (factory setting: yes)

- **Yes**: The "LOCAL" or "REMOTE" operating mode is saved when the power supply is switched off and restored when the power supply is switched back on.
- **No**: "LOCAL" or "REMOTE" operating mode is not saved. "REMOTE" is active when the supply voltage is switched back on.

OFF in REMOTE (factory setting: No)

- **Yes**: The OFF key functions in REMOTE mode even if the drive is being controlled by external sources (fieldbus, customer terminal strip, NAMUR terminal strip).
  WARNING This function is not an EMERGENCY STOP function!
- **No**: The OFF key only functions in LOCAL mode.

LOCAL/REMOTE also during operation (factory setting: No)

- **Yes**: You can switch between LOCAL and REMOTE when the drive is switched on (motor is running).
- **No**: Before the system switches to LOCAL, a check is carried out to determine whether the drive is in the operational status. If so, the system does not switch to local and outputs the error message "Local mode during operation not possible". Before the system switches to REMOTE, the drive is switched off and the setpoint is set to 0.

5.7.2 ON key / OFF key

ON key: always active in LOCAL when the operator input inhibit is deactivated.

OFF key: in the factory setting, acts as OFF1 = ramp-down at the deceleration ramp (p1121); when n = 0: voltage disconnection (only if a main contactor is installed)
The OFF key is effective in the LOCAL mode and when the "OFF in REMOTE" function is active.

Settings: Menu – Commissioning / Service – AOP Settings – Control Settings

Red OFF key acts as: (factory setting: OFF1)

- **OFF1**: Ramp-down on the deceleration ramp (p1121)
- **OFF2**: Immediate pulse block, motor coasts to a standstill
- **OFF3**: Ramp-down on the emergency stop ramp (p1135)

5.7.3 Switching between clockwise and counter-clockwise rotation

Settings: MENU – Commissioning/Service – AOP Settings – Control Settings

Switching between CCW/CW (factory setting: no)

- **Yes**: Switching between CW/CCW rotation by means of the CW/CCW key possible in LOCAL mode
- **No**: The CW/CCW key has no effect in LOCAL mode

For safety reasons, the CW/CCW key is disabled in the factory setting (pumps and fans must normally only be operated in one direction).

In the operation status in LOCAL mode, the current direction of rotation is indicated by an arrow next to the operating mode.

Note

Activation of CCW/CW changeover

You have to make additional settings when switching between CW/CCW rotation.

5.7.4 Jog

Settings: MENU – Commissioning/Service – AOP settings – Control settings

JOG key active (factory setting: No)

- **Yes**: The jog key is effective in the LOCAL mode in the state "ready to power-up" (not in "operation"). The speed that is set in parameter p1058 is approached.
- **No**: The JOG key has no effect in the LOCAL mode

5.7.5 Increase setpoint / decrease setpoint

You can use the Increase and Decrease keys to enter the setpoint with a resolution of 1% of the maximum speed.

You can also enter the setpoint numerically. To do so, press F2 in the operation screen. The system displays an field for entering the required speed. Enter the required value using the numeric keypad. Press F5 "OK" to confirm the setpoint.

When you enter values numerically, you can enter any speed between the minimum speed (p1080) and the maximum speed (p1082).

Setpoint entry in LOCAL mode is unipolar. You can change the direction of rotation by pressing the key that allows you to switch between CW/CCW rotation.

- CW rotation and "Increase key" mean:
  The displayed setpoint is positive and the output frequency is increased.
- CCW rotation and "Increase key" mean:
  The displayed setpoint is negative and the output frequency is increased.

5.7.6 AOP setpoint

Settings: MENU – Commissioning/Service – AOP Settings – Control Settings

Save AOP setpoint (factory setting: no)

- **Yes**: In LOCAL mode, the last setpoint (once you have released the INCREASE or DECREASE key or confirmed a numeric entry) is saved.
  The next time you switch the system on in LOCAL mode, the saved value is selected. This is also the case if you switched to REMOTE in the meantime or the power supply was switched off.
  When the system is switched from REMOTE to LOCAL mode while the drive is switched on (motor is running), the actual value that was last present is set as the output value for the motorized potentiometer setpoint and saved.
  If the system is switched from REMOTE to LOCAL mode while the drive is switched off, the motorized potentiometer setpoint that was last saved is used.
- **No**: On power-up in LOCAL mode, the speed is always set to the value entered under "AOP starting setpoint". When the system is switched from REMOTE to LOCAL mode while the drive is switched on (motor is running), the actual value that was last present is set as the output value for the AOP setpoint.

AOP setpoint ramp-up time (factory setting: 10 s)

AOP setpoint ramp-down time (factory setting: 10 s)

- **Recommendation**: set as ramp-up/ramp-down time (p1120/p1121).
  Changing the ramp-up/ramp-down times does not affect the settings for parameters p1120 and p1121 because this is an AOP-specific setting.

AOP starting setpoint (factory setting: 0.000 rpm)

The AOP starting setpoint is the speed setpoint which is active when the drive is switched on (with AOP30 - "ON" key). This setpoint is valid on condition that the system setting "Save setpoint" is set to "NO".

Note

Internal ramp-function generator

The internal drive ramp-function generator is always active.

5.7.7 Lock AOP LOCAL mode

Settings: MENU – Commissioning/Service – AOP settings – Control settings

Save AOP local mode (factory setting: no)

- **Yes**: Deactivates the "Control via operator panel" function, thereby disabling the LOCAL/REMOTE key.
- **No**: Activates the LOCAL/REMOTE key.

Note

Lock LOCAL

LOCAL functionality can also be inhibited on the drive by means of the p0806 parameter (BI: Inhibit master control).

5.7.8 Acknowledge error from the AOP

Settings: MENU – Commissioning/Service – AOP Settings – Control Settings

Acknowledge error from the AOP (factory setting: yes)

- **Yes**: Errors can be acknowledged via the AOP.
- **No**: Errors cannot be acknowledged via the AOP.

5.7.9 CDS setting via AOP

Settings: MENU – Commissioning/Service – AOP settings – Control settings

CDS changeover via AOP (factory setting: No)

- **Yes**: In the LOCAL mode, in the operating screen form the active CDS can the changed by one. This is helpful, if operation via an AOP would not be possible due to the fact that a standard telegram is active.
  When CDS0 or 2 is active, "CDS+1" switches to CDS1 or CDS3.
  When CDS1 or 3 is active, "CDS-1" switches to CDS0 or CDS2.
- **No**: In the LOCAL mode, in the operating screen form the active CDS cannot be changed by one.

5.7.10 Operator input inhibit / parameterization inhibit

To prevent users from accidentally actuating the control keys and changing parameters, you can activate an operator input / parameters disable using a key pushbutton. Two key icons appear in the top right of the display when these inhibit functions are enabled.

Table 5- 4 Display of operator input/parameters disable

Inhibit type	Online operation	Offline operation
No inhibit		
Operator input inhibit		
Parameters disable		
Operator input inhibit + parameters disable		

Settings

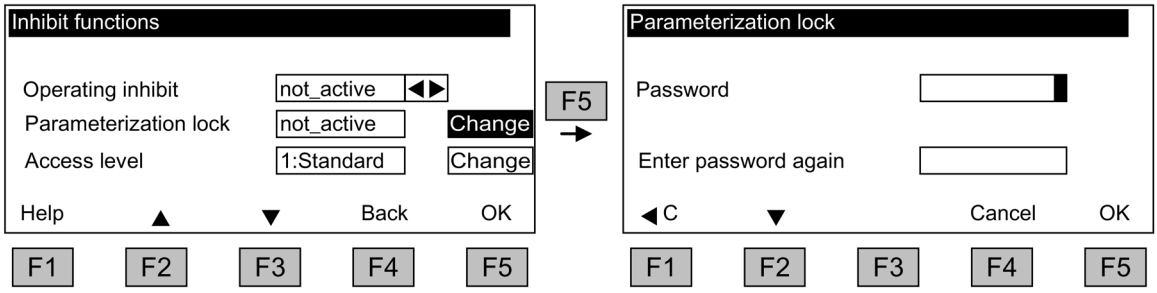


Figure 5-8 Set inhibit functions

The "Operator input inhibit" setting can be changed directly via <F5> "Change" once you have selected the selection field.

When "Parameterization inhibit" is activated, you have to enter a numeric password (repeat this entry). You must also enter this password when deactivating "Parameterization inhibit".

Operator input inhibit (factory setting: not active)

- **Active**: The parameters can still be viewed, but a parameter value cannot be saved (message: "Note: operator input inhibit active"). The OFF key (red) is enabled. The LOCAL, REMOTE, ON (green), JOG, CW/CCW, INCREASE, and DECREASE keys are disabled.

Parameterization inhibit (factory setting: not active)

- **Active**: Parameters cannot be changed unless a password is entered. The parameterization process is the same as with the operator input inhibit. If you try and change parameters, the message "Note: Parameterization inhibit active" is displayed. All the control keys can, however, still be actuated.

Access level (factory setting: Expert):

The different parameters required for this complex application are filtered so that they can be displayed as clearly as possible. You select them according to the access level.

An expert level, which must only be used by expert personnel, is required for certain actions.

Note

Copy from RAM to ROM

When the operator input inhibit or parameterization inhibit is activated, a "Copy from RAM to ROM" is automatically executed to back the parameter settings up in non-volatile memory on the memory card.

5.8 Faults and alarms

Indicating faults and alarms

If a fault occurs, the drive displays the fault and/or alarm on the operator panel. Faults are indicated by the red "FAULT" LED and a fault screen is automatically displayed. You can use the F1 Help function to call up information about the cause of the fault and how to remedy it. You can use F5 Ack. to acknowledge a stored fault.

Alarms are indicated by means of the yellow "ALARM" LED. The system also displays a note in the status bar providing information on the cause.

What is a fault?

A fault is a message from the drive indicating an error or other exceptional (unwanted) status that causes the drive to shutdown. This could be caused by a fault within the converter or an external fault triggered, for example, by the winding temperature monitor for the motor. The faults are displayed and can be reported to a higher-level control system via PROFIBUS. In the factory default setting, the message "converter fault" is also sent to a relay output. Once you have rectified the cause of the fault, you have to acknowledge the fault message.

What is an alarm?

An alarm is the response to a fault condition identified by the drive. It does not result in the drive being switched off and does not have to be acknowledged. Alarms are "self acknowledging", that is, they are reset automatically when the cause of the alarm has been eliminated.

Fault and alarm displays

Every fault and alarm is entered in the fault/alarm buffer along with time the error occurred. The time stamp refers to the system time (r2114).

You can call up an overview screen that displays the current status of faults and/or alarms for every drive object in the system by choosing MENU – Fault memory / alarm memory.

A context menu featuring the "Back" and "Quit" options appears when you press F4 "Next". The function required can be selected using F2 and F3 and executed by pressing F5 "OK". The "Acknowledge" function sends an acknowledgement signal to each drive object. The red FAULT LED extinguishes once all the faults have been acknowledged.

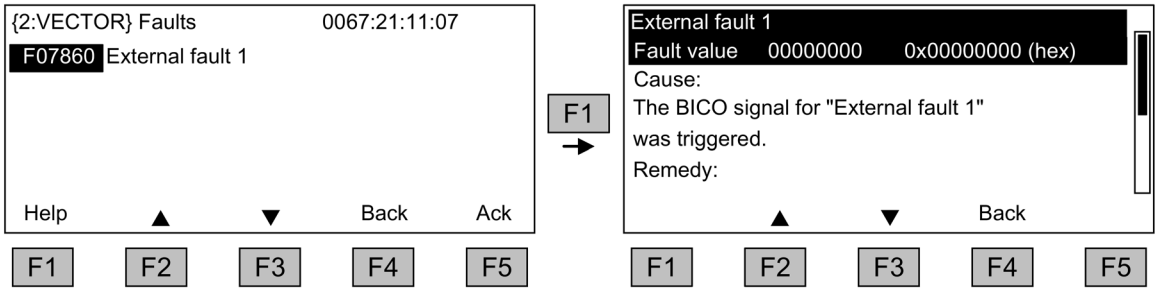


Figure 5-9 Fault screen

You can use F5 Ack. to acknowledge a stored fault.

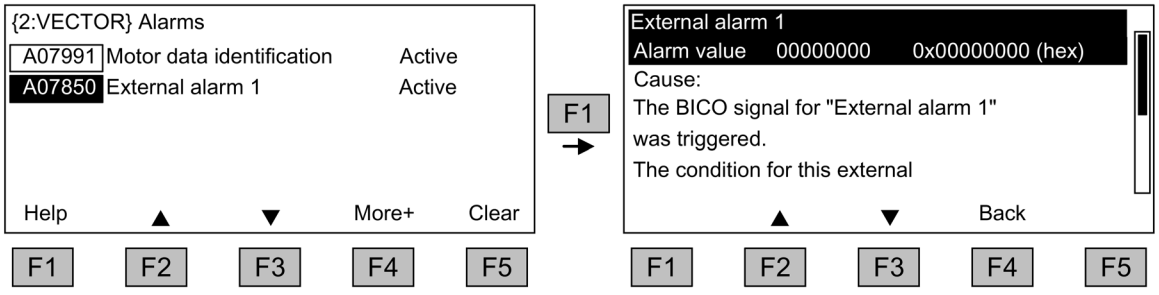


Figure 5-10 Alarm screen

Alarms that are no longer active are removed from the alarm memory with F5 Clear.

5.9 Saving the parameters permanently

Description

If parameters are changed using the operator panel (confirm with OK in the Parameter editor), the new values are initially stored in the volatile memory (RAM) of the drive. An "S" flashes in the top right of the AOP display until they are saved to a permanent memory. This indicates that at least 1 parameter has been changed and not yet stored permanently.

Two methods are available for permanently saving parameters that have been changed:

- To store the parameters permanently, choose <MENU> <Parameterization> <OK> <Permanent parameter transfer>.
- When confirming a parameter setting with OK, press the OK key for more than 1 s. The system displays a message asking you whether the setting is to be saved in the EEPROM.
  If you press "Yes", the system saves the setting in the EEPROM. If you press "No", the setting is not saved permanently and the "S" starts flashing to indicate this fact.

For both options, **all** changes that have not yet been saved permanently are stored in the EEPROM.

5.10 Parameterization errors

If a fault occurs when reading or writing parameters, a popup window containing the cause of the problem is displayed.

The system displays:

Parameter write error (d)pxxxx.yy:0xnn

and a plain-text explanation of the type of parameterization error.

Maintenance and servicing

6

6.1 Replacing the backup battery

Replacing the backup battery

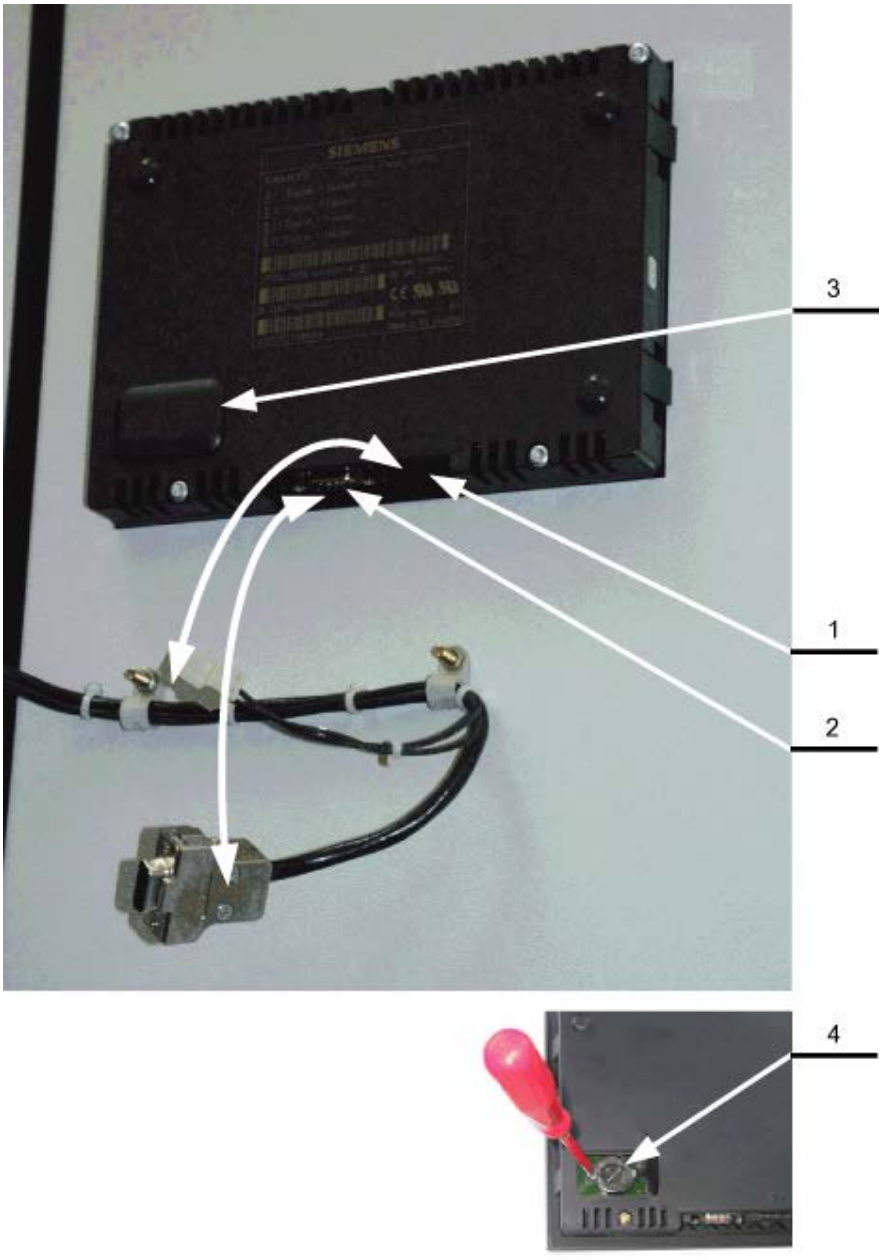


Figure 6-1 Replacing the backup battery

1. Disconnect the 24 V DC power supply cable.
2. Disconnect the communication cable on the operator panel.
3. Open the cover of the battery compartment.
4. Remove the old battery.
5. Insert the new battery.
6. Carry out any other work by reversing the sequence.

Table 6- 1 Technical specifications of the backup battery

Type	CR2032 3 V lithium battery
Manufacturer	Maxell, Sony, Panasonic
Nominal capacity	220 mAh
Self-discharge at 20 °C	1 %/year
Service life (in backup mode)	> 1 year at 70 °C; >1.5 years at 20 °C
Service life (in operation)	> 2 years

Note

Replace battery within one minute

The battery must be replaced within one minute to ensure that no AOP settings are lost.

Note

Battery disposal

The battery must be disposed of in accordance with the applicable country-specific guidelines and regulations.

6.2 Downloading new operator panel firmware from the PC

Description

Firmware might need to be loaded to the AOP if the AOP functionality needs to be upgraded.

If, once the drive has powered up, the memory card is found to contain a newer version of the firmware, a message will appear on the AOP30 prompting you to load the new firmware. You should click "YES" in response to this prompt.
The firmware will then be loaded automatically on the operator panel and the following dialog screen will appear.

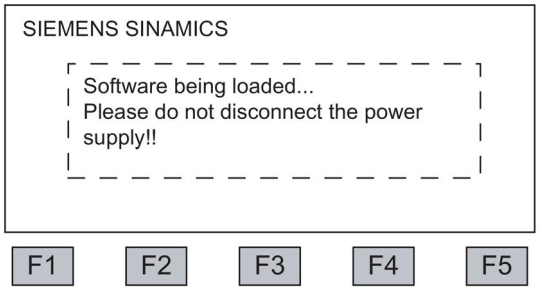


Figure 6-2 Dialog screen: loading firmware

If the firmware cannot be loaded successfully, it can be loaded using the following manual method.

The load program LOAD_AOP30 and the firmware file can be found on the CD.

Loading the firmware

1. Establish the RS232 connection from the PC to the AOP30.
2. Provide the supply voltage (24 VDC).
3. Start the LOAD_AOP30 program on the PC.
4. Choose the PC interface (COM1, COM2).
5. Choose and open the firmware (AOP30.H86).
6. Follow the instructions in the status window of the program and connect the power supply for the AOP30 while pressing the red key (O).
7. The load procedure is started automatically.
8. Switch the power on (switch the power supply off and then back on).

Technical specifications

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Table 7- 1 Technical specifications

Power supply	24 V DC (20.4 V to 28.8 V)
Current requirements - Without backlighting - With maximum backlighting	 <100 mA <200 mA
Data interface	RS232 interface, PPI protocol
Back-up battery	3 V lithium CR2032
Operating temperature	0 to 55°C
Storage and transport temperature	-25 to +70°C
Degree of protection	IP20 (inside cabinet) IP55 (outside cabinet)
Certification	cULus CE
Product standard	EN 61800-5-1
Dimensions	Information on this can be found in the "Mechanical installation" section
Weight	0.55 kg

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Additional information

Siemens:
www.siemens.com

Industry Online Support (service and support):
www.siemens.com/online-support

IndustryMall:
www.siemens.com/industrymall

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