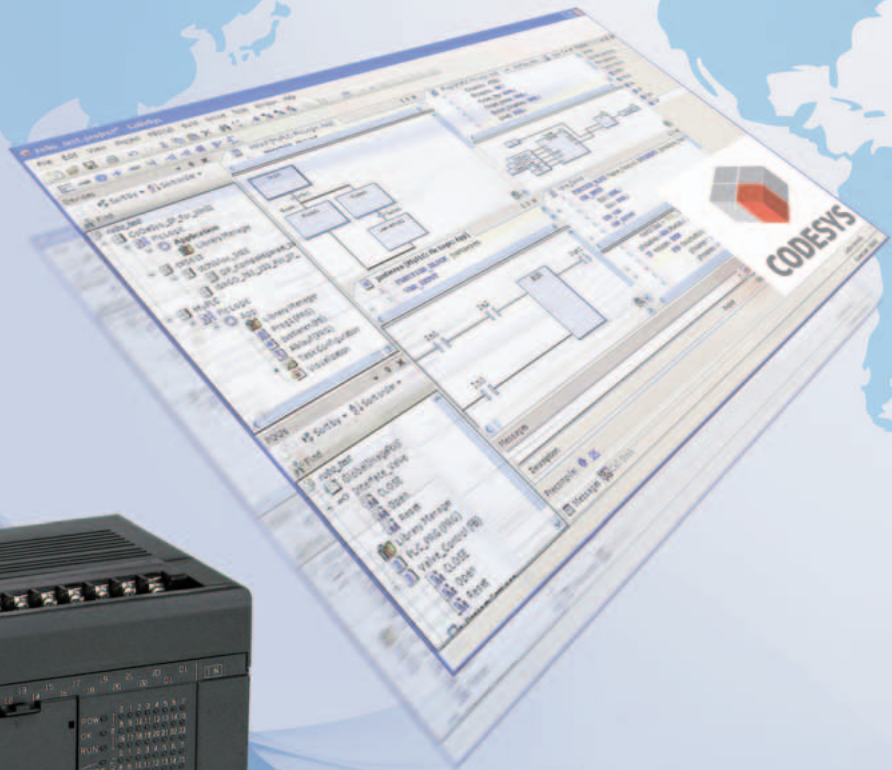


Programmable Logic Controllers

# MICRO-EHV+

Full compliance with  
the IEC61131-3 International Standard



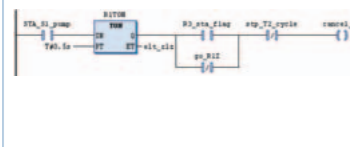

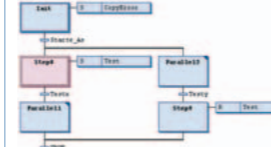
# Hitachi compact PLC MICRO-EHV+



“MICRO-EHV+” is an all-in-one type compact PLC packed with powerful functions.

## Full IEC compliant 3S CODESYS V3.5 platform

Standardized programming style with 5 programming languages (LD, FBD, IL, ST, SFC)

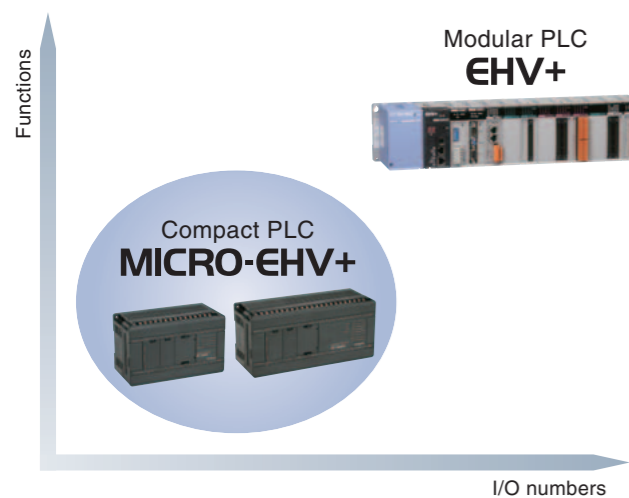
<b>LD</b> Ladder Diagram 	<b>FBD</b> Function Block Diagram 	<b>IL</b> Instruction List <pre>LD I0.0 AND I0.1 OUT Q0.0 END</pre>	<b>ST</b> Structured Text <pre>IF I0.0 THEN   Q0.0 := TRUE; ELSE   Q0.0 := FALSE; ENDIF</pre>	<b>SFC</b> Sequential Function Chart 
--	---	---	---	--

- No proprietary programming languages
- Easy start-up for users with;
  - no PLC experience or
  - experience of other manufacturer's programming language or
  - experience of high level programming languages
- Variable names for PLC, HMI, SCADA, and other I/O devices can be consolidated.
- Features Offline simulation function

## Powerful communication performance in one CPU

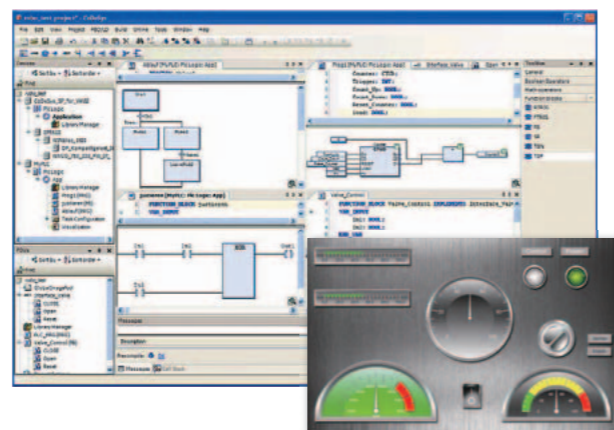
All models have Ethernet, serial, USB (host & device) communication ports as standard. Additional communication ports can be realized by option boards.

## Wide range of expansion units are available



## HX-CODESYS

Hitachi version of CODESYS  
by 3S-Smart Software Solutions GmbH



## MICRO-EHV+ Basic unit

User program memory 1,024kB  
Data memory (non-retain) 640kB  
Data memory (retain) 256kB

### 3 communication ports

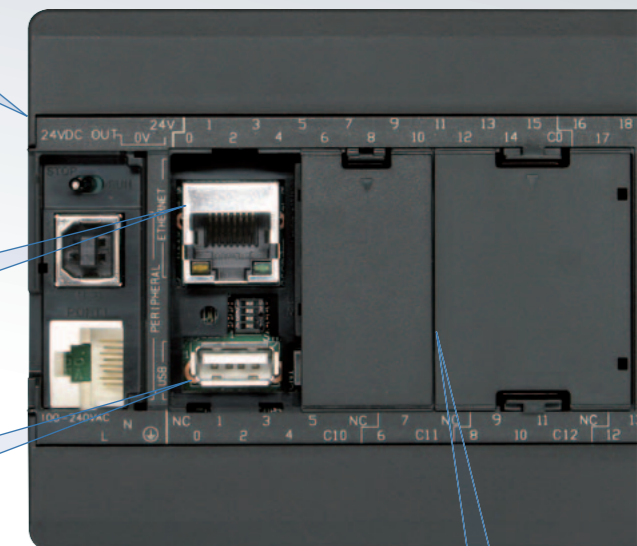
- Ethernet port (10BASE-T/100BASE-T)
- USB port (Ver.2.0 Full Speed 12Mbps)
- Serial port (RS-232C)

### USB host function

- Memory storage can be used for data logging, program upload/download.

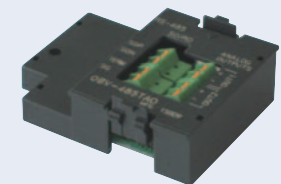
### User program is stored in non-volatile FLASH memory

Data is stored in volatile RAM memory Retained by battery.

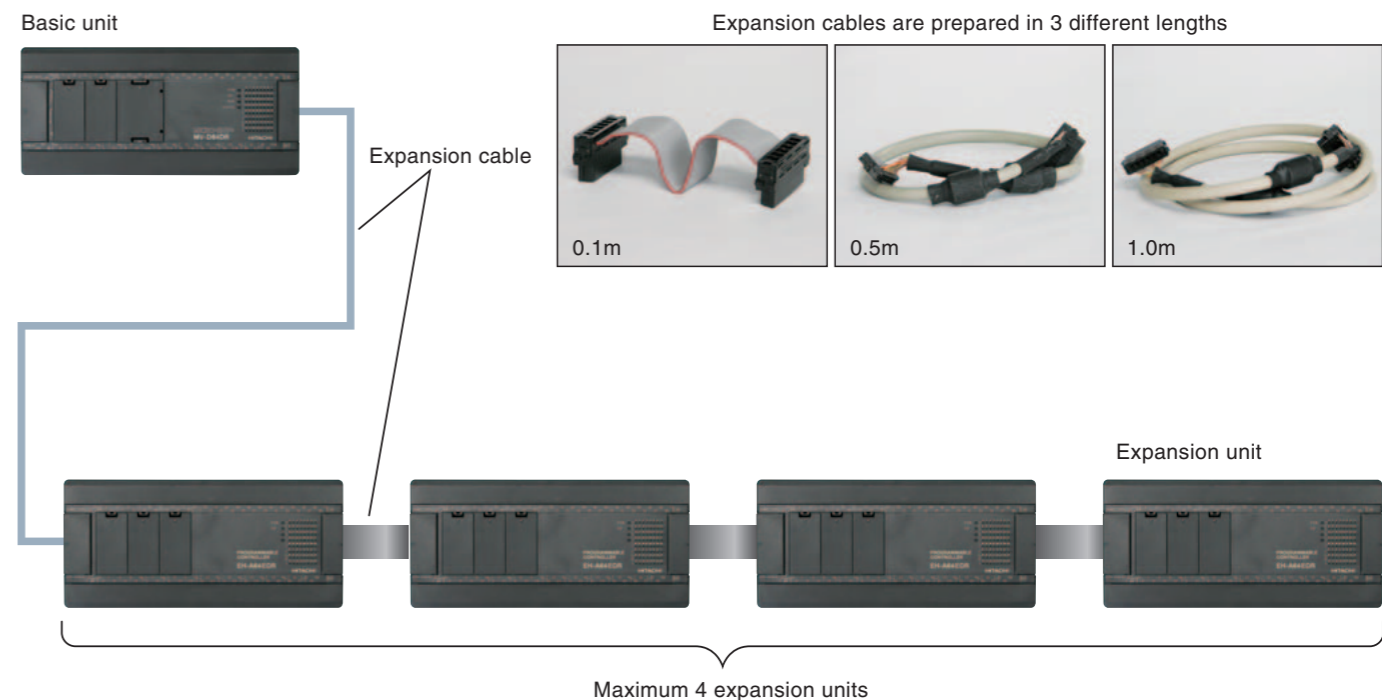


### Option board

- RS-485 port can be added as option



## No. of I/O is Max. 320 (using 64 pts expansion unit)





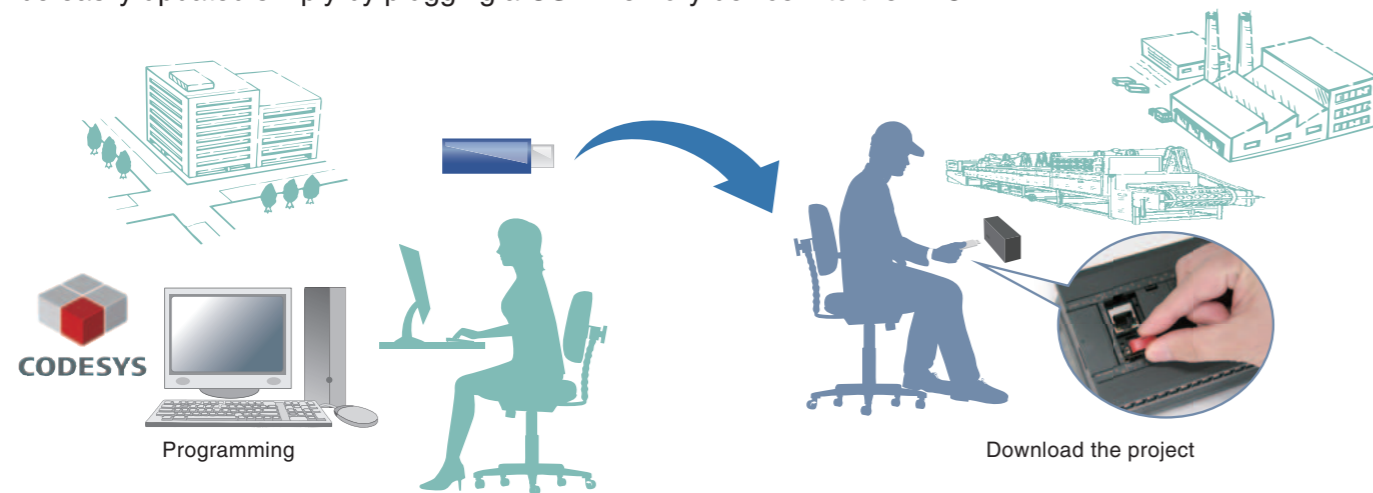
# Advantage in your application

## USB storage



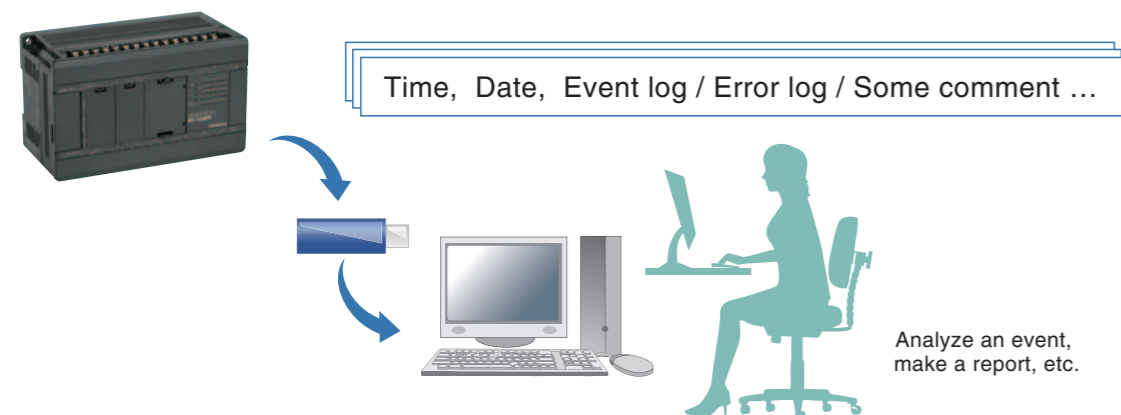
### Program Download/Upload without a PC connection

If end users don't have HX-CODESYS or are not familiar with PLC programming, the user-program can be easily updated simply by plugging a USB memory device into the PLC.



### Data logging to USB storage

Logging data can be stored on to a USB memory device using a specific library. Logging data can then be analyzed or edited remotely.

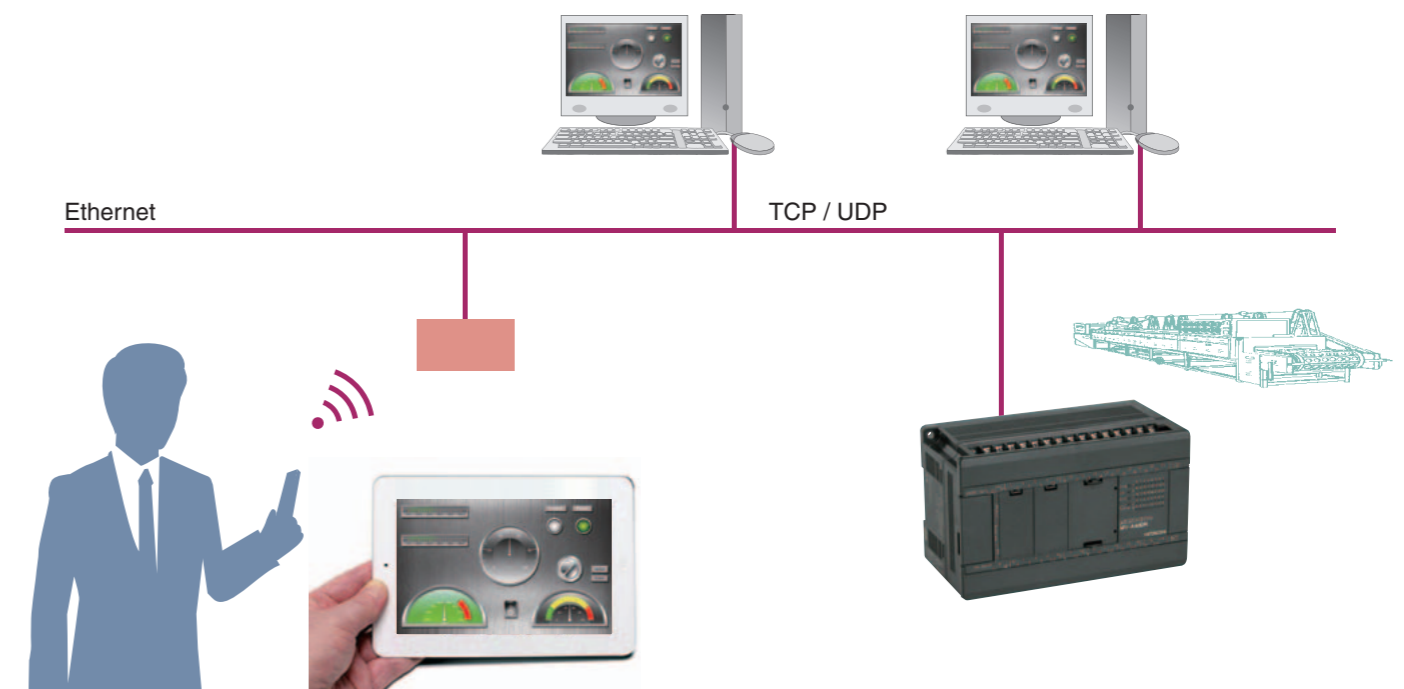


Note : Using USB memory does not mean to expand MICRO-EHV+ CPU memory .

## Web visualization



Worldwide access to MICRO-EHV+ via an Internet browser. I/O data can be monitored like HMI via a PC, Smartphone or Tablet.



### Functionality

- Visualization over Internet / Intranet
- Web Server is adopted as standard
- JavaScript Execution

### Purpose

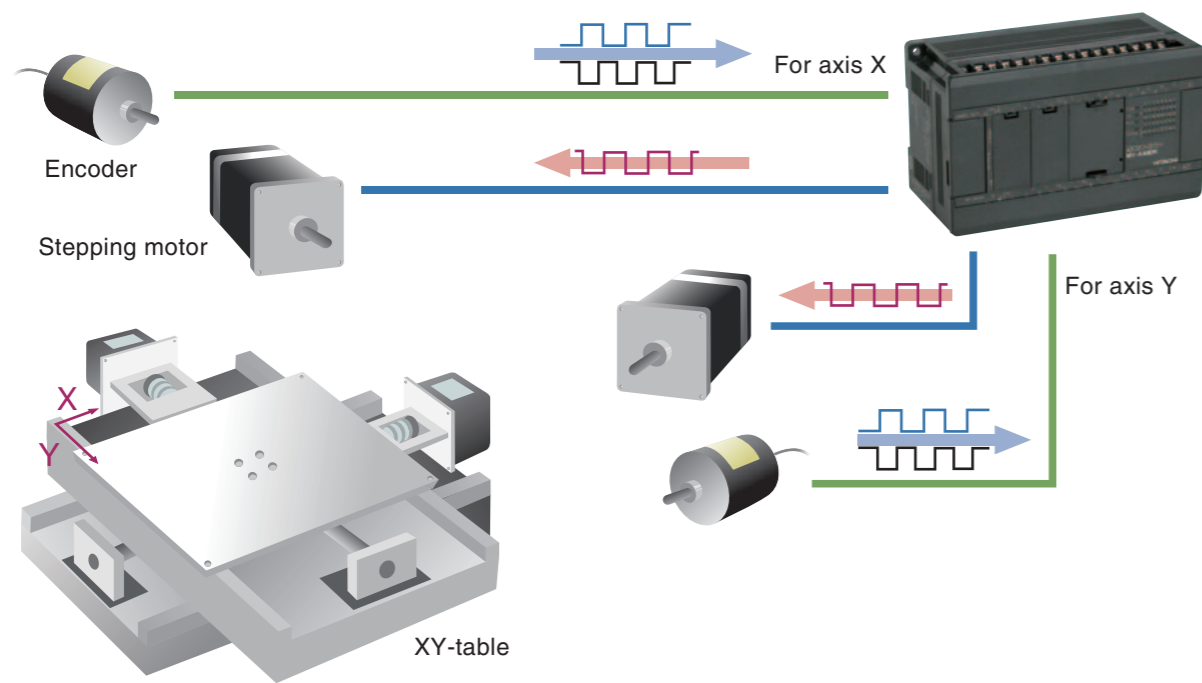
- Remote maintenance
- Diagnostics
- Remote control

### Simple automation system



### Application Example – Position control

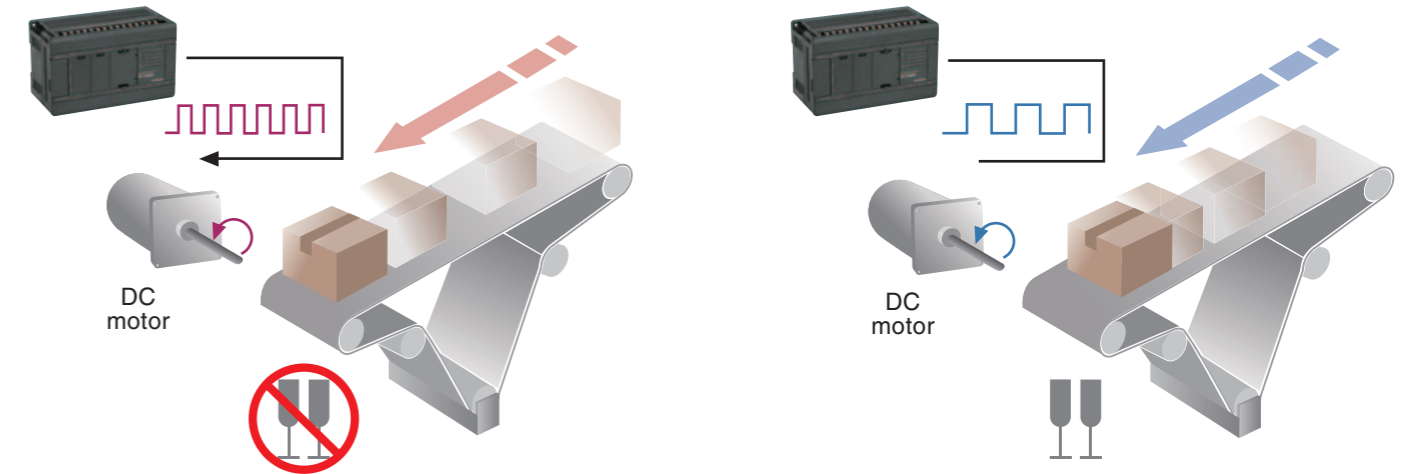
Using the built in High-speed counter and pulse train output a simple position control system can be achieved without the need for a dedicated motion controller.



- High-speed counter    Single counter / Max. 5ch, 100kHz, 32bits  
                                   2 phase counter / Max. 2ch, 60kHz, 32bits
- Pulse train output    Max. 3ch, 65kHz

### Application Example – Speed control using PWM output

Speed control can be achieved without a dedicated speed control unit.

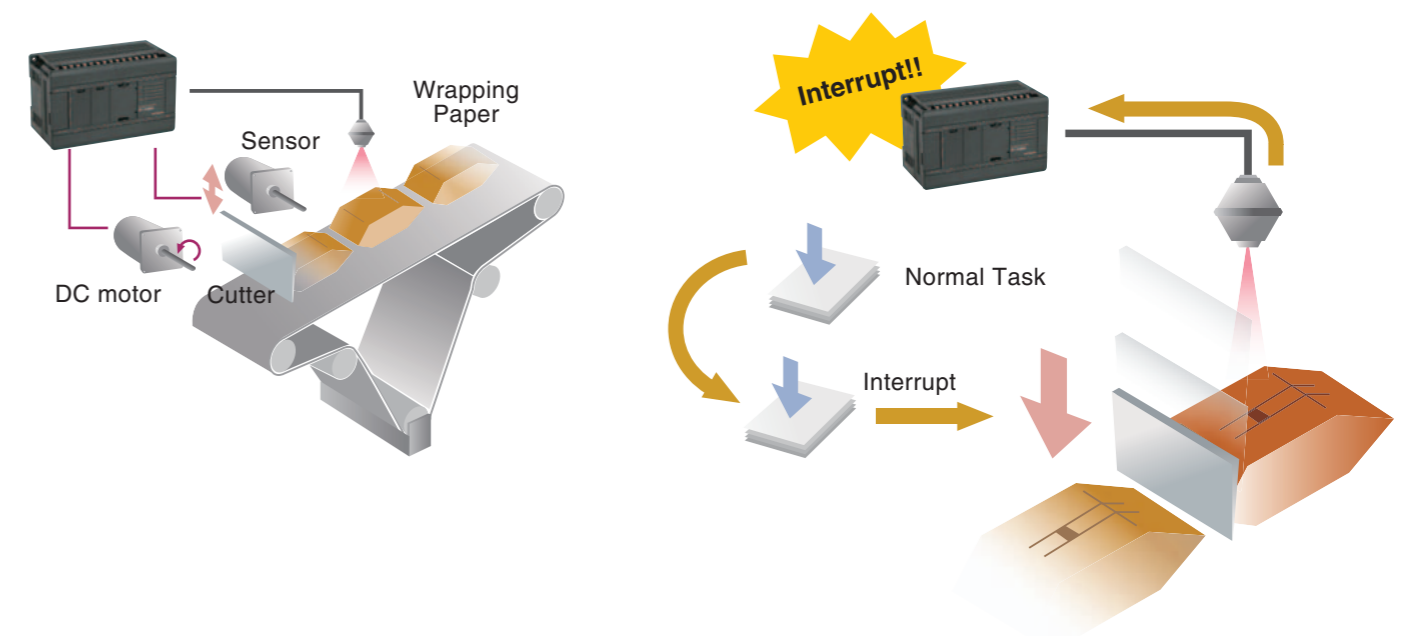


Conveyor speed can be changed depending on the contents of packages.

- PWM output            Max. 3ch, 65kHz

### Application Example – Interrupt input

Specific processing can be executed without jitter.



- Interrupt input        Max. 5ch



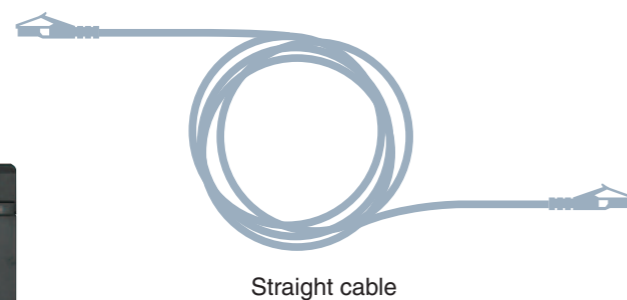
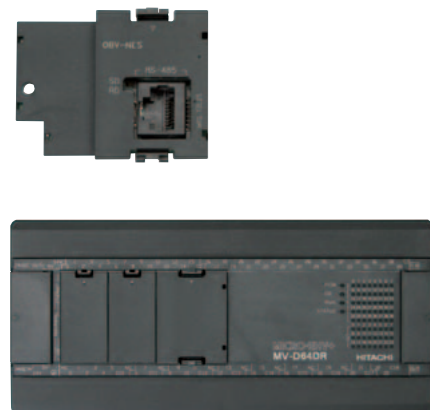
### Easy communication with Hitachi Inverter



Economical Inverter  
**NE-S1**

MICRO-EHV+ can be used as a controller for multiple Hitachi inverters. The new option board OBV-NES can turn the MICRO-EHV+ into the ideal controller for the Hitachi NE-S1 series inverter. Communication is achieved using a standard Cat. 5 LAN cable.

OBV-NES



**NE-S1**

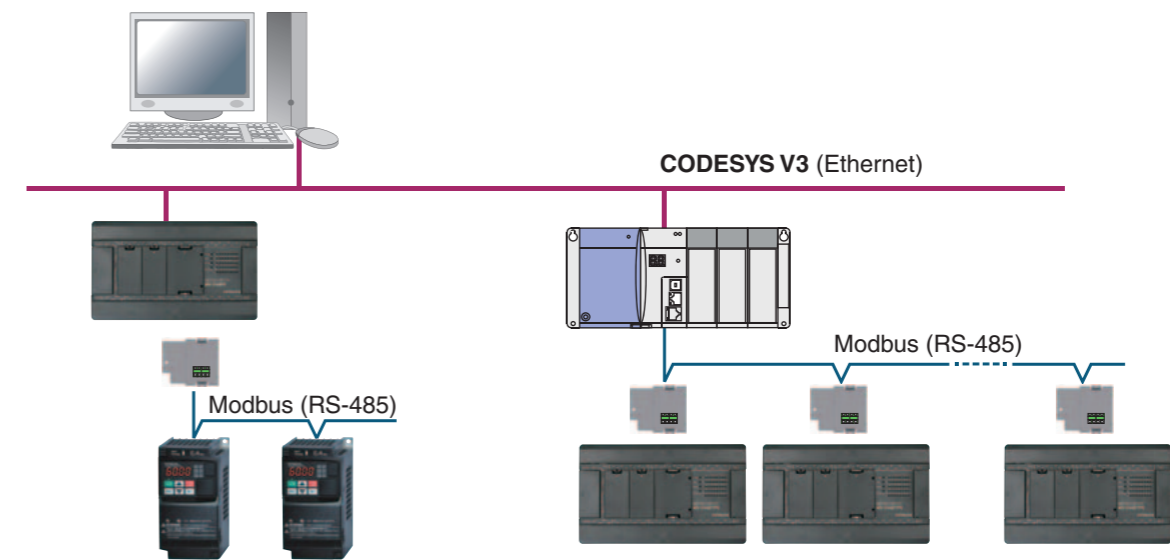
By using RJ-45 splitter, multi-drop connection will be achieved easily.



### Compliance with Fieldbus Standards



MICRO-EHV+ supports Modbus-TCP (master / slave), Modbus-RTU (master / slave) and EtherCAT® master.



I/O extension using Hitachi EH-150 series I/O modules in combination with the EH-IOCA EtherCAT® slave module.



**EH-IOCA**

- EtherCAT® slave controller for EHV+
- Supported EH-150 I/O modules are DI/O, AI/O, Counter and POS.
  - Available base units are EH-BS3A/5A/6A/8A/11A. (total 22 slots)

EtherCAT is registered trade mark and patented technology, licenced by Beckhoff Automation GmbH, Germany.

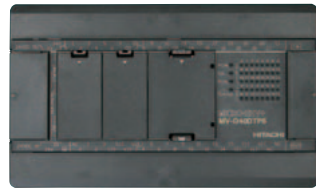
# Overview of products lineup

## Basic units

### 40 points type

DC power supply (24V),  
DC input 24pts,  
TR output 16pts (source)  
with short circuit protection

#### MV-D40DTPS



DC power supply (24V),  
DC input 24pts,  
TR output 16pts (sink)

#### MV-D40DT



DC power supply (24V),  
DC input 24pts,  
RY output 16pts

#### MV-D40DR



AC power supply (100/200V),  
DC input 24pts,  
RY output 16pts

#### MV-A40DR



### 64 points type

DC power supply (24V),  
DC24V input 40pts,  
TR output 24pts (source)  
with short circuit protection

#### MV-D64DTPS



DC power supply (24V),  
DC24V input 40pts,  
TR output 24pts (sink)

#### MV-D64DT



DC power supply (24V),  
DC24V input 40pts,  
RY output 24pts

#### MV-D64DR



AC power supply (100/200V),  
DC24V input 40pts,  
RY output 24pts

#### MV-A64DR



## Expansion units (Digital I/O)

### 8 points type



- EH-D8ED** : DC power supply (24V), DC input 8pts
- EH-D8ER** : DC power supply (24V), RY output 8pts
- EH-D8ETPS** : DC power supply (24V),  
TR output 8pts (source) with short circuit protection
- EH-D8ET** : DC power supply (24V), TR output 8pts (sink)
- EH-D8EDR** : DC power supply (24V), DC input 4pts, RY output 4pts
- EH-D8EDTPS** : DC power supply (24V), DC input 4pts,  
TR output 4pts (source) with short circuit protection
- EH-D8EDT** : DC power supply (24V), DC input 4pts, TR output 4pts (sink)

### 14 points type



- EH-D14EDT** : DC power supply (24V), DC input 8pts, TR output 6pts (sink)
- EH-D14EDTP** : DC power supply (24V), DC input 8pts, TR output 6pts (source)
- EH-D14EDTPS** : DC power supply (24V), DC input 8pts,  
TR output 6pts (source) with short circuit protection
- EH-D14EDR** : DC power supply (24V), DC input 8pts, RY output 6pts
- EH-A14EDR** : AC power supply (100/200V), DC input 8pts, RY output 6pts

### 16 points type



- EH-D16ED** : DC power supply (24V), DC input 16pts
- EH-D16ER** : DC power supply (24V), RY output 16pts
- EH-D16ETPS** : DC power supply (24V),  
TR output 16pts (source) with short circuit protection
- EH-D16ET** : DC power supply (24V), TR output 16pts (sink)

### 28 points type



- EH-D28EDT** : DC power supply (24V), DC input 16pts,  
TR output 12pts (sink)
- EH-D28EDTP** : DC power supply (24V), DC input 16pts,  
TR output 12pts (source)
- EH-D28EDTPS** : DC power supply (24V), DC input 16pts,  
TR output 12pts (source) with short circuit protection
- EH-D28EDR** : DC power supply (24V), DC input 16pts,  
RY output 12pts
- EH-A28EDR** : AC power supply (100/200V), DC input 16pts,  
RY output 12pts

### 64 points type



- EH-D64EDT** : DC power supply (24V), DC input 40pts,  
TR output 24pts (sink)
- EH-D64EDTPS** : DC power supply (24V), DC input 40pts,  
TR output 24pts (source) with short circuit protection
- EH-D64EDR** : DC power supply (24V), DC input 40pts,  
RY output 24pts
- EH-A64EDR** : AC power supply (100/200V), DC input 40pts,  
RY output 24pts



## Expansion units (Analog I/O)

### Analog



**EH-D6EAN** : DC power supply (24V), Analog input 4pts, Analog output 2pts  
**EH-A6EAN** : AC power supply (100/200V), Analog input 4pts, Analog output 2pts

### RTD



**EH-D6ERTD** : DC power supply (24V), RTD input 4pts, Analog output 2pts  
**EH-D4ERTD** : DC power supply (24V), RTD input 4pts  
**EH-A6ERTD** : AC power supply (100/200V), RTD input 4pts, Analog output 2pts  
**EH-A4ERTD** : AC power supply (100/200V), RTD input 4pts

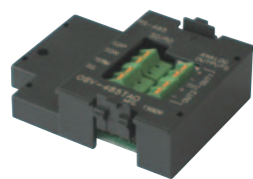
### Thermocouple



**EH-D6ETC** : DC power supply (24V), Thermocouple input 4pts, Analog output 2pts  
**EH-D4ETC** : DC power supply (24V), Thermocouple input 4pts

## Options

### Communication board



**OBV-NES** : RS-485, 1 port  
**OBV-485A** : RS-485, 1 port and Analog input, 2ch.  
**OBV-AIO** : Analog Input, 2ch. and Analog Output, 2ch.  
**OBV-485TAI** : RS-485, 1 port and Analog Input, 2ch.  
**OBV-485TAO** : RS-485, 1 port and Analog Output, 2ch.

### Battery



**MV-BAT**  
 For data memory retention. 1750mAh.

## Programming software “HX-CODESYS”

### ● Five programming language editors

The user can freely select among the 5 programming languages of the IEC61131-3 standard according to the intended purpose and the programmer's skills and experience.

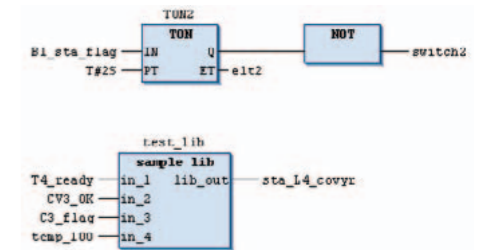
#### LD

Ladder Diagram



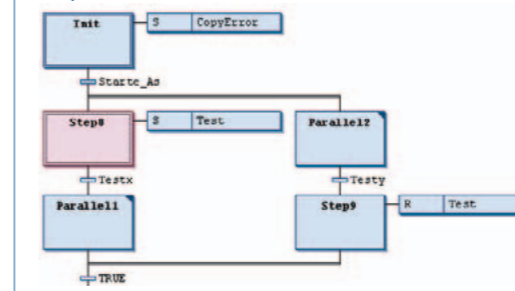
#### FBD

Function Block Diagram



#### SFC

Sequential Function Chart



#### IL

Instruction List

```
LD      bVar
ST      inst1.IN
JMP    m1
CAL     inst1(
      PT:=t1,
      ET:=>tout1)
LD      inst1.Q
ST      inst2.IN
```

#### ST

Structured Text

```
1  a := a + 1;
2  tl(IN:=FALSE, PT:= T#5S);
3  tl(IN:=TRUE);
4  FOR i := 0 TO count DO
5  test_l_int();
6  END_FOR
7  IF value < 7 THEN
8  WHILE value < 8 DO
9  value:=value+1;
10 END_WHILE;
11 END_IF;
```

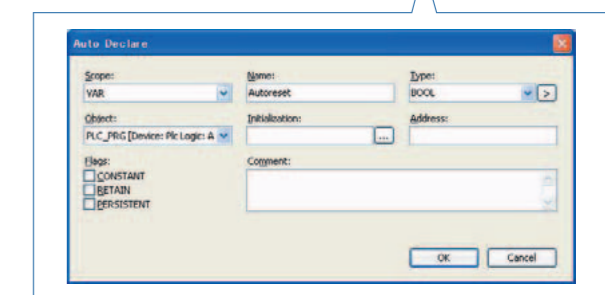
### ● Easy and efficient programming

#### Structured Programming

Task configuration and structured-based editors on POU (Program Organization Unit) enable flexible programming.

#### Programming with variable names

Programming with variable name enables you to be free from I/O addressing of PLC.



## ● Debugging and commissioning features

Many of user-friendly debugging and commissioning features are supported.

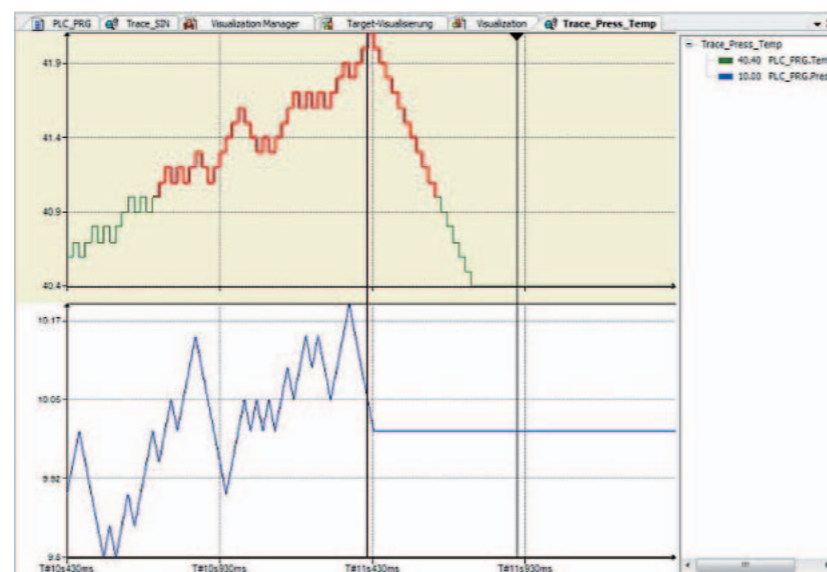
- Monitoring
- Forcing of variables
- Break points
- Single step execution
- Single cycle execution
- Flow control
- Online change
- Incremental compile
- Incremental download
- Sampling trace
- Simulation
- and much more.

Expression	Type	Value	Prepared value
StartTime	TIMF	T#0ms	
MODE	GEN_MODE	GEN_MODE_SAWTOO...	
BASE	BOOL	FALSE	TRUE
PERIOD	TIME	T#1s	
CYCLES	INT	100	15
AMPLITUDE	INT	1000	
RESET	BOOL	FALSE	
OUT	INT	-280	

```

13 D(IN:=INT_TO_REAL(S6.Out 440) , TM:=10 , RESET:=FALSE );
14 B(ENABLE:=TRUE, TIMELOW:=t#4s , TIMEHIGH:=t#8s);
15 ispecialsinus -833 :- S12.Out 639 - S11.OUT 1472 ;
16 RETURN
    
```

Forcing of variables



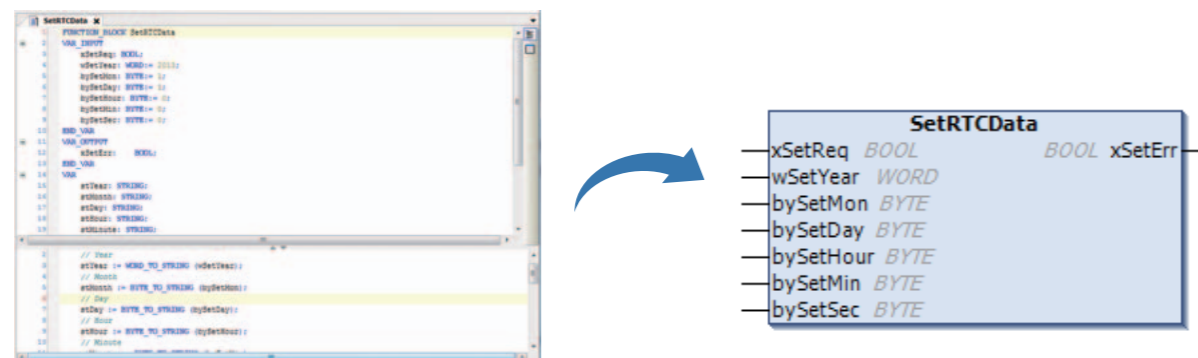
Sampling trace

## ● Library

For efficient programming, libraries are a convenient tool. Through the use of libraries, overall programming time can be shortened.

HX-CODESYS already contains many built-in libraries for various purposes.

The user can create their own library from a collection of commonly used sub-routines. Re-use of such objects can save time in programming and testing.



## Specifications

### Basic units

40 points type



64 points type



I/O external connection : Removable type screw terminal block (M3)

### [CPU specification]

Item	40 points type	64 points type
Platform	CODESYS Runtime V3.5 SP3 Patch4	
Boolean execution speed	0.54µs/instruction	
User Program memory	1MB	
Source file memory	1MB	
Data memory (non retain)	640KB	
Data memory (retain)	256KB	
Programming languages	IEC61131-3 compliant 5 languages (LD, FBD, SFC, IL, ST)	
No. of expansion unit	4	
No. of I/O (using 64pts exp. units)	296 ( In 184 / Out 112 )	320 ( In 200 / Out 120 )
Special I/O	Single phase counter	Max. 5ch, 100kHz
	2 phase counter	Max. 2ch, 60kHz
	Pulse train output	Max. 3ch, 65kHz
	PWM output	Max. 3ch, 65kHz
	Interrupt	Max. 5 ch
I/O updating cycle	Refresh processing (depends on each task cycle)	
USB	Device function	For programming. Built-in USB 2.0 Full speed
	Host function	USB stick can be used for a copy of project and data logging
Ethernet	UDP/IP, TCP/IP	Programming, General purpose, Modbus-TCP server/client, EtherCAT <sup>®</sup> master
Serial	RS-232C (Built-in)	General purpose, Modbus-RTU master and slave
	RS-485 (Option)	General purpose, Modbus-RTU master and slave
Web visualization function	Support	
RTC	Built-in	
Battery	Optional	



# Components list

## [Basic units]



No.	Class	Model Name	Specification				Mass (g)	Power consumption (A)		
			Power	Input	Output	Remarks		100V AC	264V AC	24V DC
1	40 points	MV-D40DTPS	24V DC	DC24V x 24	Transistor x 16 (short circuit protection)	Source	460	-	-	0.4
2		MV-D40DT	24V DC	DC24V x 24	Transistor x 16	Sink	460	-	-	0.4
3		MV-D40DR	24V DC	DC24V x 24	Relay x 16		500	-	-	0.4
4		MV-A40DR	100/200V AC	DC24V x 24	Relay x 16		570	0.2	0.1	-
5	64 points	MV-D64DTPS	24V DC	DC24V x 40	Transistor x 24 (short circuit protection)	Source	600	-	-	0.5
6		MV-D64DT	24V DC	DC24V x 40	Transistor x 24	Sink	600	-	-	0.5
7		MV-D64DR	24V DC	DC24V x 40	Relay x 24		655	-	-	0.5
8		MV-A64DR	100/200V AC	DC24V x 40	Relay x 24		710	0.2	0.1	-

## [Expansion units]

Expansion units



No.	Class	Model Name	Specification				Mass (g)	Power consumption (A)		
			Power	Input	Output	Remarks		100V AC	264V AC	24V DC
1	8 points	EH-D8ED	24V DC	24VDC x 8	-		260	-	-	0.16
2		EH-D8ER	24V DC	-	Relay x 8		280	-	-	0.16
3		EH-D8ETPS	24V DC	-	Transistor x 8 (short circuit protection)	Source	260	-	-	0.16
4		EH-D8ET	24V DC	-	Transistor x 8	Sink	260	-	-	0.16
5		ED-D8EDTPS	24V DC	24VDC x 4	Transistor x 4 (short circuit protection)	Source	260	-	-	0.16
6		EH-D8EDT	24V DC	24VDC x 4	Transistor x 4	Sink	260	-	-	0.16
7		EH-D8EDR	24V DC	24VDC x 4	Relay x 4		300	-	-	0.16
8		EH-D14EDTPS	24V DC	24VDC x 8	Transistor x 6 (short circuit protection)	Source	300	-	-	0.16
9	14 points	EH-D14EDTP	24V DC	24VDC x 8	Transistor x 6	Source	300	-	-	0.16
10		EH-D14EDT	24V DC	24VDC x 8	Transistor x 6	Sink	300	-	-	0.16
11		EH-D14EDR	24V DC	24VDC x 8	Relay x 6		400	-	-	0.16
12		EH-A14EDR	100/200V AC	24VDC x 8	Relay x 6		400	0.2	0.06	-

## [Expansion units]

No.	Class	Model Name	Specification				Mass (g)	Power consumption (A)		
			Power	Input	Output	Remarks		100V AC	264V AC	24V DC
13	16 Points	EH-D16ED	24V DC	24VDC x 16	-		260	-	-	0.13
14		EH-D16ER	24V DC	-	Relay x 16		300	-	-	0.11
15		EH-D16ETPS	24V DC	-	Transistor x 16 (short circuit protection)	Source	260	-	-	0.04
16		EH-D16ET	24V DC	-	Transistor x 16	Sink	260	-	-	0.03
17	28 Points	EH-D28EDTPS	24V DC	24VDC x 16	Transistor x 12 (short circuit protection)	Source	500	-	-	0.2
18		EH-D28EDTP	24V DC	24VDC x 16	Transistor x 12	Source	500	-	-	0.2
19		EH-D28EDT	24V DC	24VDC x 16	Transistor x 12	Sink	500	-	-	0.2
20		EH-D28EDR	24V DC	24VDC x 16	Relay x 12		500	-	-	0.3
21		EH-A28EDR	100/200 V AC	24VDC x 16	Relay x 12		600	0.2	0.06	-
22	64 Points	EH-D64EDTPS	24V DC	24VDC x 40	Transistor x 24 (short circuit protection)	Source	640	-	-	0.4
23		EH-D64EDT	24V DC	24VDC x 40	Transistor x 24	Sink	640	-	-	0.4
24		EH-D64EDR	24V DC	24VDC x 40	Relay x 24		640	-	-	0.5
25		EH-A64EDR	100/200 V AC	24VDC x 40	Relay x 24		720	0.4	0.2	-
26	Analog	EH-D6EAN	24V DC	Analog x 4	Analog x 2		300	-	-	0.16
27		EH-A6EAN	100/200 V AC	Analog x 4	Analog x 2		400	0.1	0.06	-
28	RTD	EH-D6ERTD	24V DC	RTD x 4	Analog x 2		300	-	-	0.16
29		EH-D4ERTD	24V DC	RTD x 4	-		300	-	-	0.16
30		EH-A6ERTD	100/200 V AC	RTD x 4	Analog x 2		400	0.1	0.06	-
31		EH-A4ERTD	100/200 V AC	RTD x 4	-		400	0.1	0.06	-
32	TC	EH-D6ETC	24V DC	Thermocouple x 4	Analog x 2		300	-	-	0.16
33		EH-D4ETC	24V DC	Thermocouple x 4	-		300	-	-	0.16
34	Expansion cable	EH-MCB10						1.0 m		
35		EH-MCB05						0.5 m		
36		EH-MCB01						0.1 m		
37	Option board	OBV-NES						RS-485 (2wire, RJ-45), 1ch.		
38		OBV-485A						RS-485 (4wire, RJ-45), 1 port and 10-bit Analog input, 2ch. (terminal block)		
39		OBV-AIO						10-bit Analog Input, 2ch. And 10-bit Analog Output, 2ch. (terminal block)		
40		OBV-485TAI						RS-485 (2wire, terminal block), 1 port and 10-bit Analog Input, 2ch. (terminal block)		
41		OBV-485TAO						RS-485 (2wire, terminal block), 1 port and 10-bit Analog Output, 2ch. (terminal block)		
42	Battery	MV-BAT						For data memory back-up. 3.0V / 1,750mAh		

## [Programming software]

Item	Model	Specifications	Remarks
Integrated development environment HX-CODESYS	HX-CDS	Integrated development environment in conformance with IEC61131-3	*1

\*1: A cable for connecting the PC to the CPU (A-mini B type USB cable or LAN cable) must be obtained by the customer.

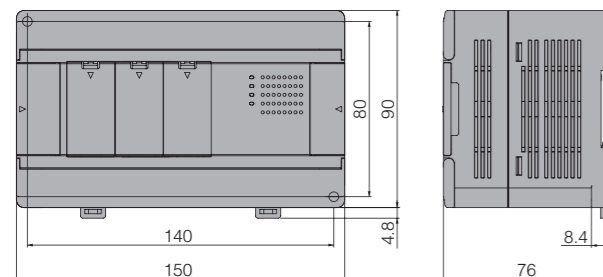
[General specifications]

Item	Specification	
Power supply type	AC	DC
Power voltage	100/110/120 V AC (50/60 Hz), 200/220/240 V AC (50/60 Hz)	24 V DC
Power voltage fluctuation	85 to 264 V AC wide range	19.2 to 30 V DC
Operating ambient temp.	0 to 55 °C	
Storage ambient humidity	5 to 95% RH ( no condensation)	
Vibration resistance	Conforming to IEC(EN) 62231-2 (147m/s <sup>2</sup> , 3 times in each 3 directions X, Y, Z)	
Noise resistance	<ul style="list-style-type: none"> <li>○ Noise voltage 1,500 Vpp, Noise pulse width 100ns, 1μs (Noise input by a noise simulator across input terminal of a power module according to measuring method of Hitachi-IES.)</li> <li>○ Based on IEC 61131-2 ( not applied for input modules)</li> <li>○ Static noise: 3,000V at electrode part</li> </ul>	
Certifications	CE,RCM	
Insulation resistance	20MΩ minimum between AC terminal and frame ground (FE) terminal (based on 500V DC megger)	
Dielectric withstand voltage	1,500V AC for 1 minute between AC input terminal and frame ground (FE) terminal	
Ground	Class D grounding ( grounding with the power supply module)	
Usage environment	No corrosive gases, no excessive dust	
Structure	Attached on an open wall	
Cooling	Natural air cooling	

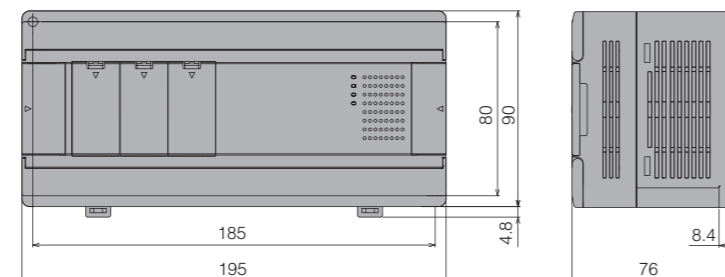
[Dimensions]

[Unit : mm]

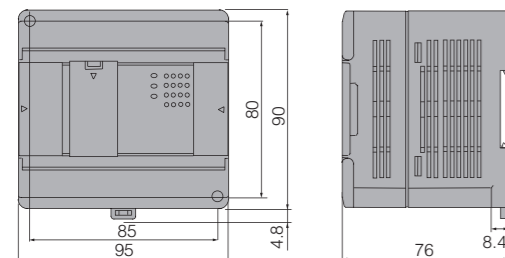
40 points type basic unit



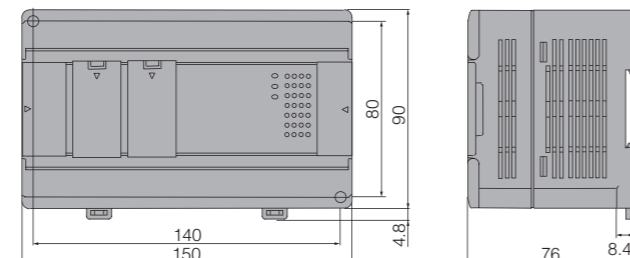
64 points type basic/expansion unit



8/14/16/analog/RTD/TC expansion unit



28 points expansion unit



MEMO

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---



# Network



## Germany

**Hitachi Europe GmbH,**  
Industrial Components & Equipment Group  
Am Seestern 18 (Euro Center)  
D-40547 Düsseldorf, GERMANY  
TEL: (+49) (211) 5283-0  
FAX: (+49) (211) 5283-649  
<http://www.hitachi-eu.com/>  
<http://www.hitachi-ds.com/>

## U.S.A

**Hitachi America, Ltd.**  
Industrial Components & Equipment Division  
50 Prospect Avenue,  
Tarrytown, NY 10591-4698  
TEL: +1 (914) 332-5800  
FAX: +1 (914) 332-5555  
<http://www.hitachi-america.us/ice/>

## China

**Hitachi Industrial Equipment Systems  
(CHINA) Co., Ltd.**  
(Shanghai Office)  
Industrial Equipment Systems Division  
12th Floor, Rui Jin Building No. 205,  
Maoming Road (S) Shanghai, 200020  
TEL: +86 (21) 5489-2378  
FAX: +86 (21) 3356-5070  
(Beijing Office)  
14th Floor Beijing Fortune Building,  
5 Dong San Huan Bei Lu,  
Chao Yang District, Beijing 100004  
TEL: +86 (10) 6590-8180  
FAX: +86 (10) 6590-8189

**Hitachi Industrial Equipment Systems  
(Hong Kong) Co., Ltd.**  
(Hong Kong Office)  
6th Floor, North Tower, World Finance Centre,  
Harbour City, Canton Road, Tsim Sha Tsui,  
Kowloon Hong Kong.  
TEL: +852-2735-9218  
FAX: +852-2735-6793

**Taiwan Hitachi Asia Pacific Co., Ltd.**  
3rd Floor, Hung Kuo Building No.167  
Tun-Hwa North Road, Taipei (105), Taiwan  
TEL: (+886) (2) 2514-3666  
FAX: (+886) (2) 2514-7664

## Singapore

**Hitachi Asia Ltd.**  
Industrial Components & Equipment Division  
No.30 Pioneer Crescent  
#10-15, West Park Bizcentral  
Singapore 628560  
TEL: (+65) (6305)-7400  
FAX: (+65) (6305)-7401  
<http://www.hitachi.com.sg/>

## Thailand

**Hitachi Asia (Thailand) Co., Ltd.**  
18th Floor, Ramaland Building,  
952 Rama IV Road, Bangrak  
Bangkok 10500  
TEL: (+66) (2) 632-9292  
FAX: (+66) (2) 632-9299  
<http://www.hitachi.co.th/>

## Australia

**Hitachi Australia Pty Ltd.**  
Suite 801, Level 8, 123 Epping Road,  
North Ryde, NSW, 2113, Australia  
TEL: (+61) (2) 9888-4100  
FAX: (+61) (2) 9888-4188  
<http://www.hitachi.com.au/>

Information in this brochure is subject to change without notice.

## Hitachi Industrial Equipment Systems Co., Ltd.

For further information, please contact your nearest sales representative.



**ISO 14001**  
JQA-EM5428



**ISO 9001**  
JQA-1000

The MICRO-EHV+ PLCs are produced at the factory registered under the ISO 14001 standard for environmental management system and the ISO 9001 standard for quality management system.