SIEMENS

Operating Instructions

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ET 200PA SMART I/O modules

10

10.1 Module overview

The following I/O modules are available in the ET 200PA SMART system:

Module	Article no.	Article no. (with conformal coating)
Digital input module DI16xDC24V	6ES7650-8DK70-0AA0	6ES7650-8DK70-1AA0
Digital input module DI32xDC24V	6ES7650-8DK80-0AA0	6ES7650-8DK80-1AA0
Digital output module DO16xDC24V/0.5A	6ES7650-8EK70-0AA0	6ES7650-8EK70-1AA0
Digital output module DO32xDC24V/0.5A	6ES7650-8EK80-0AA0	6ES7650-8EK80-1AA0
Analog input module AI8x13Bit	6ES7650-8AE60-0AA0	6ES7650-8AE60-1AA0
Analog input module AI8x16Bit	6ES7650-8AK60-0AA0	6ES7650-8AK60-1AA0
Analog input module AI16x16Bit	6ES7650-8AK70-0AA0	6ES7650-8AK70-1AA0
Analog input module AI8xTC/4xRTD	6ES7650-8AR60-0AA0	6ES7650-8AR60-1AA0
Analog input module AI 8 x 16-bit HART[1]	6ES7650-8AT60-0AA0	6ES7650-8AT60-1AA0
Analog output module AO8x12Bit	6ES7650-8BK60-0AA0	6ES7650-8BK60-1AA0
Analog output module AO 8 x 16-bit HART[1]	6ES7650-8BT60-0AA0	6ES7650-8BT60-1AA0

[1] Available as of PCS 7 V9.0 SP2 and the corresponding update collection

In addition to the ET 200PA SMART I/O modules specified in this table, the following modules can also be used in an ET 200PA SMART system.

- Numerous S7-300 standard I/O modules and HART analog modules that are also approved for use in an ET 200PA SMART in the list of released modules PCS 7 (as of V8.1).
- Numerous counter modules and point-to-point couplings which are also approved for use in an ET 200PA SMART in the list of released modules PCS 7 (as of V8.1).

If you are using modules from the S7-300 series of modules, you can find information for them in the following manuals:

- Automation System S7-300, Module Data (http://support.automation.siemens.com/WW/view/en/8859629)
- ET 200M, Signal Modules for Process Automation (http://support.automation.siemens.com/WW/view/en/7215812)
- ET 200M Distributed I/O Device HART Analog Modules (http://support.automation.siemens.com/WW/view/en/22063748)

Note

The ET 200PA SMART I/O modules function only in an ET 200PA SMART station conjunction with an IM 650 interface module.
If the ET 200PA SMART modules are located behind an ET 200M interface module or an S7-300 CPU, the function of the ET 200PA SMART modules is not available. The ET 200PA SMART modules indicate this by a red SF LED (group error LED) flashing at 2 Hz.
The ET 200PA SMART modules do not affect the ET 200M / S7-300 bus. This means other modules of the ET 200M / S7 300 station remain operable without restriction.

Redundant use

All ET 200PA SMART modules can be used redundantly with the following exceptions:

- Analog input module AI 8 x 13 Bit cannot be used in a redundant configuration.
- Analog input module AI8xTC/4 x RTD can only be used in a redundant configuration for voltage measurement and thermocouple measurement. Only with redundant encoders for thermocouple measurement, however.
- Analog output module AO 8 x 12 Bit can only be used in a redundant configuration for current output.

In redundant mode, the modules are present in duplicate and are configured and operated redundantly.

Redundant use is only permitted when using two identical modules (same article number).

You can find additional information on the subject of redundancy in the Automation System S7-400H Fault-Tolerant Systems (http://support.automation.siemens.com/WW/view/en/1186523) manual

Parameter assignment

You configure the modules via the respective parameter assignment dialogs in HW Config. Once you have defined all parameters, transfer the parameters from the programming device to the CPU. The CPU passes the parameters to the respective modules at a change of operating mode from STOP → RUN.

Parameter reassignment in runtime

Parameter reassignment in runtime is possible for all ET 200PA SMART modules.

Input modules do not change the process input value while they are being re-configured.

Diagnostics and diagnostic messages

I/O modules with diagnostic capability have assignable and non-assignable diagnostic messages.

You only receive assignable diagnostic messages if you have enabled the diagnostics using the module-specific parameter assignment dialog of HW Config.

Non-assignable diagnostic messages are always provided by the module regardless of whether the diagnostics is enabled.

Pending diagnostic information is displayed via the group error display (SF LED).

Diagnostic interrupts are only signaled by the I/O modules if "Diagnostic interrupt" is enabled via the respective parameter assignment dialog.

Group error display (SF LED)

The group error display (SF LED) of the ET 200PA SMART modules indicates the following:

- Operation of the ET 200PA SMART module centrally in an S7-300 system or an ET 200M station. In this case, the SF LED flashes at 2 Hz. The ET200PA SMART module is not ready for operation.
  All the remaining modules can be operated without restriction.
- Error state of the respective module in the case of modules with diagnostic capability The SF LED lights up as soon as diagnostic information of a module is detected. It goes out when all causes of the diagnostic information (errors) are eliminated.

Internal module defects are indicated for modules with and without diagnostic capability. The SF-LED lights up when a module defect has been detected.

10.2 Digital input modules

Overview of properties

The table below presents the ET 200PA SMART digital input modules based on their most important properties.

Table 10-1 ET 200PA SMART digital input modules

	Module	
	DI 16 x DC24V	DI 32 x DC24V
Properties	6ES7650-8DK70-xAA0	6ES7650-8DK80-xAA0
Number of inputs	16 Isolated in groups of 16	32 Isolated in groups of 16
Rated input voltage	24 V DC	24 V DC
Suitable for...	2-/3-/4-wire proximity switches (BEROs)	
Configurable diagnostics	Yes	No
Diagnostic interrupt	Yes	No
Adjustable input delays	Yes, for entire module	No

Short-circuit of the sensor supply Vs

The status LED of the sensor supply goes out in the event of a short-circuit of the sensor supply Vs, irrespective of the parameter assignment.

Wire break

In order for a wire break to be detected even in case of "0" signal, a resistance of 10 to 18 kilohms must be wired parallel to the sensor contacts.

10.3 Digital output modules

Overview of properties

The table below presents the ET 200PA SMART digital output modules based on their most important properties.

Table 10-5 Digital output modules

Properties	Module	
	DO16 x 24V/0.5A	DO32 x 24V/0.5A
	6ES7650-8EK70-xAA0	6ES7650-8EK80-xAA0
Number of outputs	16 Isolated in groups of 16	32 Isolated in groups of 8
Output current	0.5 A	0.5 A
Rated load voltage	24 V DC	24 V DC
Suitable for	Solenoid valves, DC contactors and signal lamps	
Configurable diagnostics	Yes	No
Diagnostic interrupt	Yes	No
Substitute value output	Yes (channel-specific)	No

10.3.1 Digital output module DO 32 x DC 24 V/ 0.5 A

Article numbers

Standard module: 6ES7 650-8EK80-0AA0

Module with conformal coating: 6ES7 650-8EK80-1AA0

Properties

The DO 32 x DC 24 V/0.5 A is characterized by the following properties:

- 32 outputs, isolated in groups of 8
- Output current 0.5 A
- Rated load voltage 24 V DC
- Suitable for solenoid valves, DC contactors and signal lamps
- Group error display (SF LED)

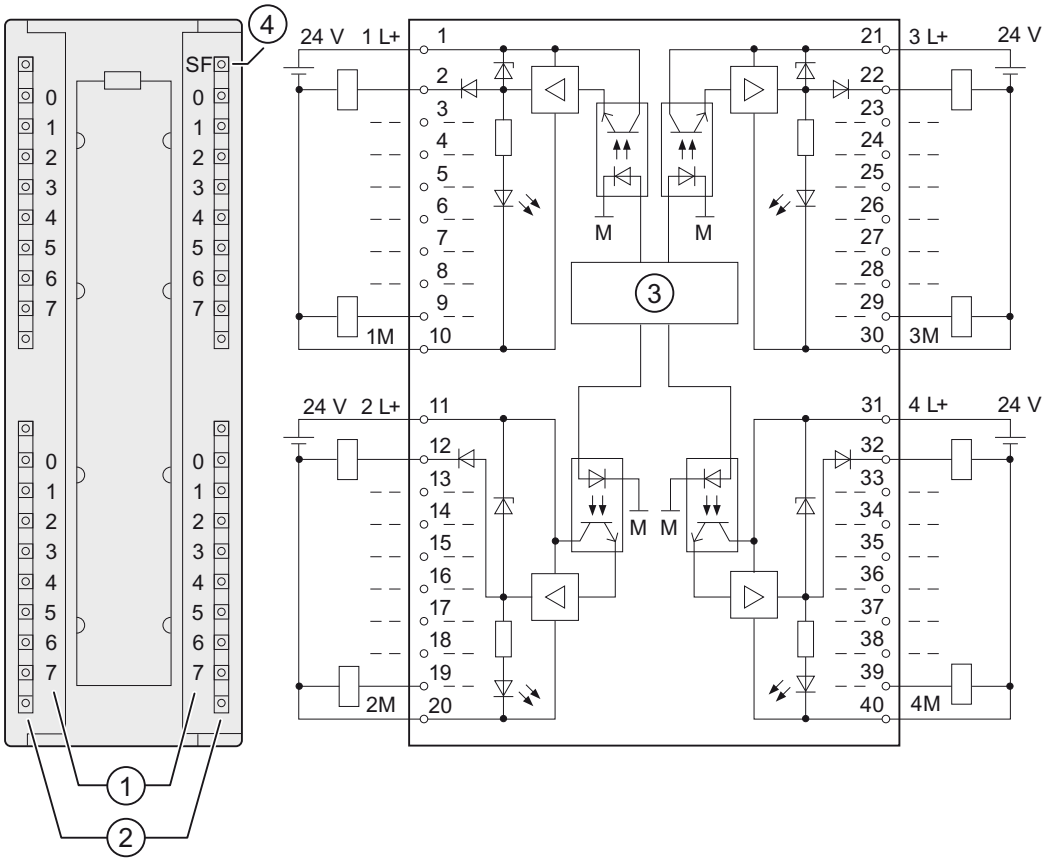
Use of the module with high-speed counters

Note the following when using the module in combination with high-speed counters:

Note

When the 24 V supply voltage is connected via a mechanical contact, the outputs of the DO 32 x DC 24 V/0.5 A have the "1" signal for approximately 50 µs due to the circuit.

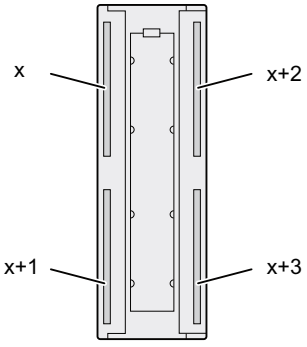
Wiring and block diagram of the DO 32 x DC 24 V/ 0.5 A



① Channel number
② Status display - green
③ Backplane bus interface
④ Group error display - red (SF LED)

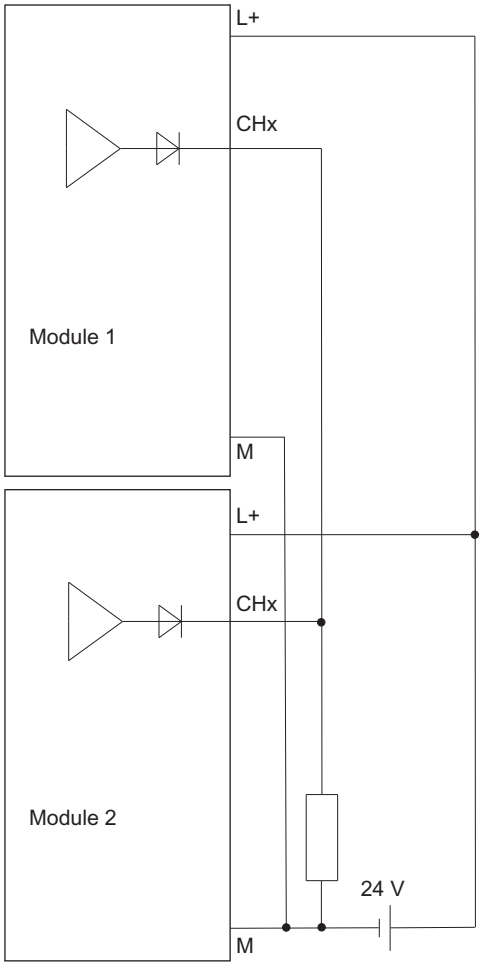
Terminal assignment

The figure below shows the assignment of the channels to the addresses (output byte x to output byte x+3).



Redundant use

The redundant control is possible without external protection circuit. Both signal modules must have the same reference potential M.



Technical specifications of the DO 32 x DC 24 V/ 0.5 A

Technical specifications	
Dimensions and weight	
Dimensions W x H x D (mm)	40 x 125 x 120
Weight	Approx. 300 g
Module-specific data	
Number of outputs	32
Cable length • Unshielded • Shielded	 Max. 600 m Max. 1000 m
Voltages, currents, potentials	
Rated load voltage L+	24 V DC

Technical specifications	
Reverse polarity protection	No
Total current of outputs (per group)	
• Horizontal mounting position Up to 40 °C Up to 60 °C	 Max. 4 A Max. 3 A
• Vertical mounting position Up to 40 °C	 Max. 2 A
Electrical isolation • Between channels and backplane bus	 Yes
• Between channels in groups of	Yes 8
Isolation, designed for basic isolation • Between different circuits	 75 V DC / 60 V AC
Isolation tested with	500 V AC or 707 V DC, type test
Current consumption • From backplane bus • From load voltage L+ (no load)	 Max. 60 mA Max. 100 mA
Power loss of the module	Typ. 9.3 W
Status, interrupts, diagnostics	
Status display	Green LED per channel
Group error display (SF LED)	Yes
Diagnostic interrupts	None
Diagnostic functions	None
Actuator selection data	
Output voltage • When signal "1" is present	 Min. L+ (-1.3 V)
Output current	
• When signal "1" is present Rated value Permitted range	 0.5 A 5 mA to 0.6 A
• When signal "0" is present (residual current)	Max. 0.5 mA
Output delay (with resistive load)	
• At "0" to "1" transition	Max. 200 µs
• At "1" to "0" transition	Max. 300 µs
Load resistance range	48 Ω to 4 kΩ
Lamp load	Max. 5 W
Connection of 2 outputs in parallel	
• For redundant control of a load	Supported
• For performance increase	Not supported
Control of a digital input	Supported
Switching frequency	
• With resistive load	Max. 100 Hz

Technical specifications	
• With inductive load according to IEC 947-5-1, DC 13	Max. 0.5 Hz
• With lamp load	Max. 10 Hz
Internal limiting of the inductive trip voltage to	Typ. L+ (-53 V)
Short-circuit protection of the output	Yes, electronic
• Response threshold	Typ. 1 A
Connection of the actuators	Using a 40-pin front connector

10.3.2 Digital output module DO 16 x DC 24 V/0.5 A

Article numbers

Standard module: 6ES7 650-8EK70-0AA0

Module with conformal coating: 6ES7 650-8EK70-1AA0

Properties

The DO 16 x DC 24 V/0.5 A is characterized by the following properties:

- 16 outputs, isolated in groups of 4 channels
- Output current 0.5 A
- Rated load voltage 24 V DC
- Suitable for solenoid valves, DC contactors and signal lamps
- Wire break detection at "0" and "1" signal
- Group error display (SF LED)
- Configurable diagnostics
- Configurable diagnostic interrupt
- Configuration in Run (CiR) supported