REDUCED VERSION FOR WEB

SIEMENS

Smart Information Delivery

EM1.8D, EM1.8R, EM1.8U Desigo Essentials I/O Extension Modules Data Sheet

November 25, 2024

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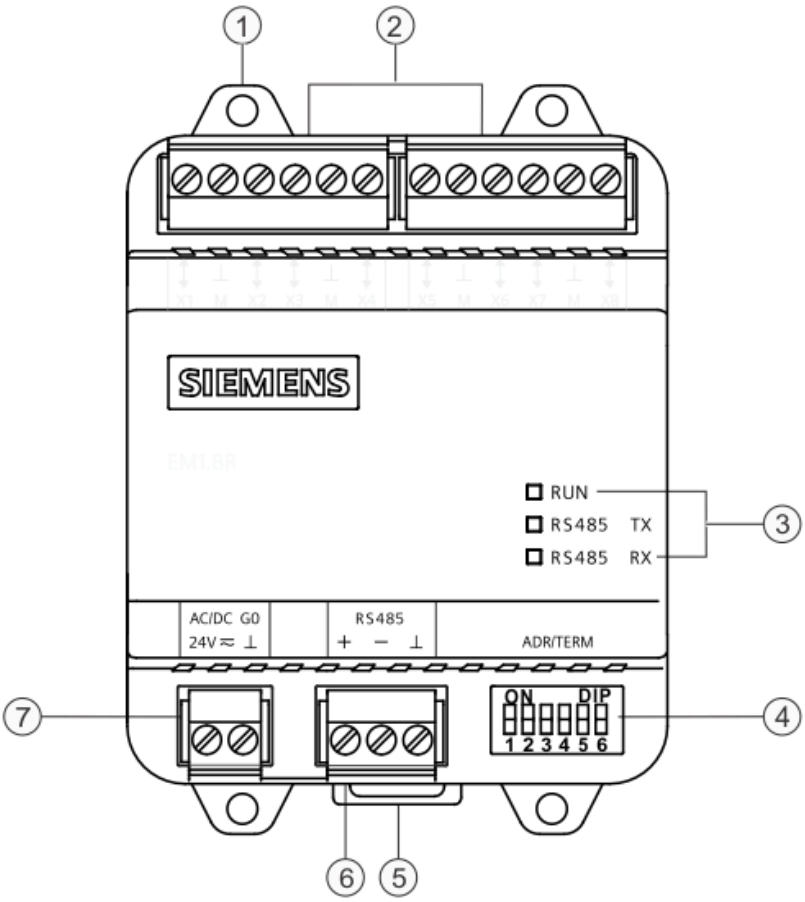
1 | Title Page

EM1.8D, EM1.8R and EM1.8U can be connected to any Modbus controllers. Their high combination flexibility meets the requirements of various industrial applications.

- AC 24 V or DC 24 V power supply
- EM1.8D: 8 digital inputs
- EM1.8R: 8 relay outputs (NO contacts)
- EM1.8U: 8 universal inputs and outputs (analog inputs/outputs or digital inputs, configurable)
- Product documentation QR codes printed on the device for easy reference at any time

3 | Mechanical design



Serial No.	Description
1	Mounting holes (4 in total, for surface/wall mounting)
2	• EM1.8D: 8 digital inputs • EM1.8R: 8 relay outputs • EM1.8U: 8 universal inputs and outputs
3	LED indicators: • RUN: Device status indicator • RS485 TX, RS485 RX: Communication status indicator • See "LED indicator" for more information about LED indicators
4	A 6-position DIP switch for setting communication parameters:

Serial No.	Description
	• Positions 1...5 are used to set the Modbus communication address of the device. The bit order of the five positions is 1 to 5. The lowest bit is 1 (2^0); the highest is 5 (2^4). The following example shows Modbus address "3": 
5	Pull-down hole for disassembly (DIN rail mounting)
6	RS485 interface for Modbus communication with the controller
7	Power input

LED indicator

LED	Color	Status	Description
RUN	Green	Flash	Device starting up or waiting to be discovered by the controller
		Continuously ON	Device works normally
	Red	Continuously ON	Hardware or software fault
	Alternating red and green	Flash	Firmware upgrade* in progress
	Yellow	Flash	Firmware error; firmware download required
RS485 TX	Yellow	Flash	Data sending on the bus
RS485 RX	Yellow	Flash	Data receiving on the bus

* See detailed information on firmware upgrade in document A6V14300949.

4 | Type summary

Type	Stock number	Input	Output
EM1.8D	S55370-C203	8 digital inputs	
EM1.8R	S55370-C205	8 relay outputs	
EM1.8U	S55370-C204	8 universal inputs and outputs, with configurable analog inputs/outputs and digital inputs	

⇨ The baud rate in bps is recognized automatically as one of the following values: 9600, 19200, 38400 and 115200.

⇨ The transmission mode is recognized automatically as one of the following: 1-8-E-1, 1-8-O-1, 1-8-N-2 and 1-8-N-1.

⇨ After a successful pairing, the module works normally (the RUN LED turns to green (continuously ON)).

6.6.5 | Manual configuration of communication parameters for EM1.8U in a Modbus debugging tool (e.g., Modbus Poll)

If a 3rd-party Modbus controller cannot configure EM1.8U, you need to perform the following steps to configure the extension module via a Modbus debugging tool.

1. Initialize the extension module. See Initialization of multiple extension modules on the same bus for details.
2. Connect the extension module with the PC where the debugging tool is installed using an RS485 communication cable.
3. In the debugging tool, configure the baud rate and transmission mode following the configurations in the Modbus controller.
4. In the debugging tool, configure the communication address to be the same one that you've set via the DIP switch during the initialization period.

   ⇨ The module is connected to the Modbus debugging tool successfully.
5. Write parameters into registers 4x0100...4x0107 to configure signal types for channels X1...X8 of the module. The signal type value written into registers ranges from 0 to 10. See "Appendix A: Modbus registers" for more information.

   ⇨ The signal types will be configured successfully in several seconds. Don't power off EM1.8U during this period.
6. Disconnect the module from the debugging tool by unplugging the RS485 communication cable.
7. Connect the module with the 3rd-party controller.

6.6.6 | Fault detection and correction

- Register addresses 4x0009...4x0016 (value reliability of channels UIO 1...8) match with register addresses 4x0001...4x0008 (channels UIO1...8) respectively. A channel value is abnormal if its corresponding reliability is not "0". See the following table for detailed error codes.

Code		Reliability description (registers 4x0009...4x0016)	Value change (registers 4x0001...4x0008)
Decimal	Hexadecimal		
32762	0x7FFA	Other error	0
32763	0x7FFB	No sensor	0
32764	0x7FFC	Under range	Keeps the last valid value
32765	0x7FFD	Short circuit*	Keeps the last valid value
32766	0x7FFE	Over range	Keeps the last valid value
0	0x0000	No error	Changes to the valid value

* If a terminal is configured as 0…20 mA or DC 0...10 V input, the occurrence of short circuit doesn't generate error code 0x7FFD. The reliability value remains "0" (no error).

6.6.7 | Factory reset

Two ways are available:

- Set positions 1...5 of the DIP switch to **OFF** and then reboot the device.
- Set register address 4x0320 to "0xcafe" (Enable), and then save this reset command by setting register address 4x0315 (Bus configuration command) to "1" (toggle bit).
- If you do not want to perform the factory reset, set the register address to "0xcac0" (Disable), and then set register address 4x0315 to "1".

NOTICE

After the factory reset, all terminal configurations of EM1.8U are also cleared.

6.7 | Maintenance

The module is maintenance-free, apart from cleaning at regular intervals.

6.8 | Open Source Software (OSS)

Software license overview

These devices use Open Source Software (OSS). All Open Source Software components used in the product (including copyrights and licensing agreement) are available at http://siemens.com/bt/download.

OSS document ID	Device
A6V14816232	EM1.8D
A6V14816234	EM1.8R
A6V14816236	EM1.8U

8 | Technical data

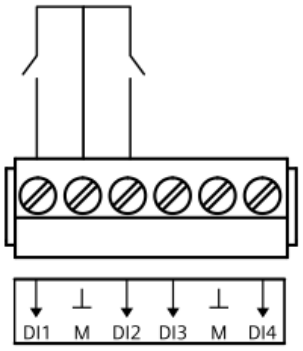
8.1 | Power supply

Power supply	
Operating voltage (24 V ⎓, ⊥)	AC 24 V (+20 %, -15 %) DC 24 V (±10 %)
Frequency	50/60 Hz (AC only)
Screw terminals for wire cross sections	Max. 2.5 mm^2 (14 AWG)
External supply line protection	Max 4 A slow wire fuse or circuit breaker type B, C or D.

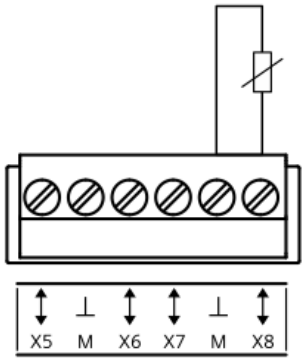
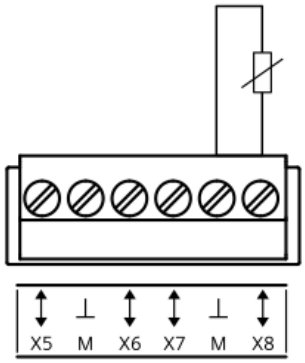
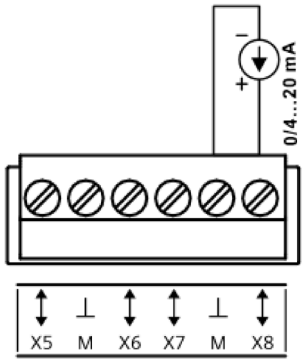
8.2 | Power consumption (for transformer planning)

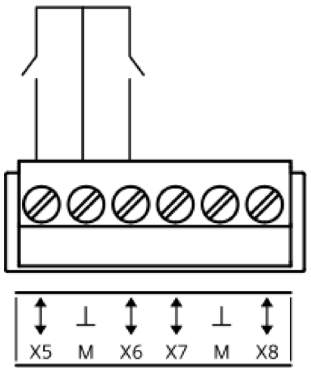
Power consumption, excluding connected field devices	AC 24 V	DC 24 V
EM1.8D	4.5 VA	3.6 W
EM1.8R	6.5 VA	5.2 W
EM1.8U	4.5 VA	3.6 W

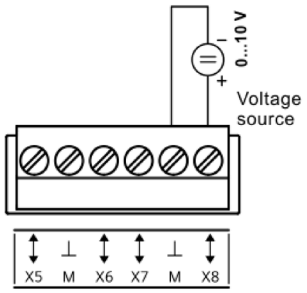
8.3 | Input (EM1.8D only)

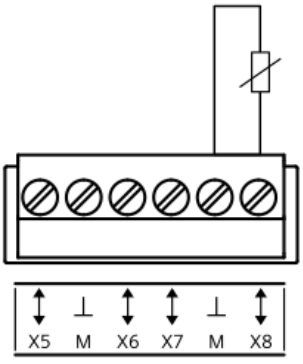
Digital input (pulse type unsupported)		
Technical data		Wiring diagram (for reference only)
Terminals to be connected to	DI1...DI8	
Contact query voltage	DC 18…25 V	
Contact query current	6 mA	
Contact resistance for open contacts	Min. 50 kΩ	
Contact resistance for closed contacts	Max. 200 Ω	

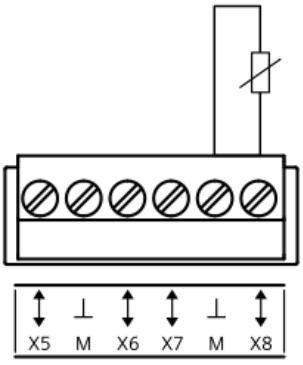
8.4 | Input (EM1.8U only)

NTC 10 K (3892 K)		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	X1…X8	
Temperature range	-40...115 °C	
Input range	680 kΩ…180 Ω	
Resolution (25 °C)	0.1 °C	
PT 1000 (3850 ppm/K), LG Ni 1000 (5000 ppm/K)		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	X1…X8	
Temperature range	-50...150 °C (LG Ni 1000) -50...180 °C (PT 1000)	
Input range	780...1800 Ω	
Resolution	0.5 °C	
0/4…20 mA		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	X1…X8	
Measurement range	0/4...20 mA	
Input range	0/1.6...22.4 mA	
Resolution	6 uA	
Input impedance	< 500 Ω	WARNING! No internal over-current protection!

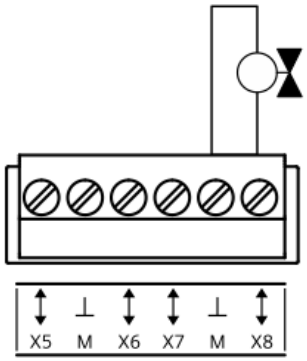
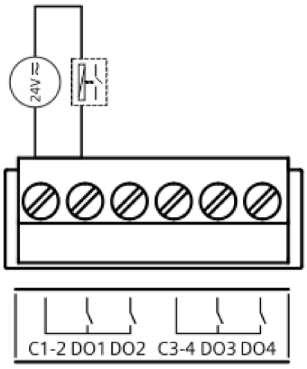
Digital input (pulse type unsupported)		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	X1…X8	
Contact query voltage	DC 15 V	
Contact query current	1 mA; 6 mA initial current	
Contact resistance for open contacts	Min. 50 kΩ	
Contact resistance for closed contacts	Max. 200 Ω	

DC 0…10 V		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	X1…X8	
Voltage range	0...10 V	
Resolution	4 mV	
Input impedance	> 100 kΩ	

Resistance measurement R1000		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	X1…X8	
Resistance range	700...1800 Ω	
Resolution	0.6 Ω	

Resistance measurement R10000		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	X1…X8	
Resistance range	1.8...100 kΩ	
Resolution	0.5 kΩ	

8.5 | Output

DC 0...10 V (EM1.8U only)		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	X1…X8	
Voltage range	0...10 V	
Accuracy	100 mV	
Output current	Max. 1 mA	
Relay output *)		
Technical data		**Wiring diagram (for reference only)**
Terminals to be connected to	DO1…DO8	
Contact type	Monostable, normally open	
Switching voltage	AC 24 V (-15 %, +20 %) DC 12…30 V	
Rated current (resistive/inductive)	AC 3 A (resistive) / 2 A (inductive, cos phi 0.6) DC 3 A (resistive)	
Min. current load (AC 20 V)	30 mA	
Min. current load (DC 12 V)	50 mA	
Max. switch-on current	3 A, max. 1 s	
Contact life	100,000 switchings @AC 24 V, 3 A (resistive)	
Max. external supply line protection	Max 4 A slow wire fuse or circuit breaker type B, C or D.	

*) I/O extension modules are SELV devices and do not support direct connection to AC 230 V devices. The connection between the modules and any AC 230 V device must be made via an intermediate relay.

8.6 | Interface

Interface	
RS485	For connection to Desigo automation stations or third-party Modbus controllers

8.7 | Connection terminals

Connection terminals	
Cu-wire or Cu-strand with ferrule	1 x 0.6...2.5 mm^2 (14...19 AWG) 2 x 0.6...1.0 mm^2 (17...19 AWG)
Cu-strand without ferrule	1 x 0.6...2.5 mm^2 (14...19 AWG) 2 x 0.6...1.5 mm^2 (16...19 AWG)
Stripping length	7...8 mm (0.28...0.31 in)
Screws	M2.5, tightening torque 0.5 Nm (0.37 lb-ft)
Max. cable length	• RS485 communication cable length[1) 2) 3)]: • ◦ 300 m (1000 ft) (without repeaters) ◦ 1000 m (3300 ft) (with repeaters) • Resistance-type analog input cable length[4)]: 30 m (100 ft) • Digital input, analog input (non-resistance type), and analog output cable length[4)]: 100 m (330 ft)

1)	It is recommended to use 3-wire EIA-485 shielded twisted-pair cables with a characteristic impedance of 100...130 Ω, a capacitance of < 100 pF/m between the wires and < 200 pF/m between the wires and the shield.
2)	The shield of the shielded twisted-pair cable must be connected to building earth in the mounting panel at one end to ensure that there is no large voltage difference between the reference grounds.
3)	In case of long distance and/or high baud rate or EMC, consider end-of-line 120-Ohm resistors on both sides (according to RS485 rules) and add isolated repeaters.
4)	Be aware that the cable resistance and the influence of EMC as well as the hum increases with the length of the cable and has an impact on the accuracy of the analogue value. If the maximum cable length can be reached in an application depends on factors like selection of cable type, dimension, shielding, wiring, distance to high power devices, the requirements regarding measurement and control accuracy etc. and is in the responsibility of the customer.

8.8 | Conformity

Protection classification	
Protection classification as per EN 60730-1 Automatic action: Degree of pollution Overvoltage category	 Type 1 2 II
Safety class	Class III
Degree of protection of housing to EN 60529	IP20

Ambient conditions Products in electrical cabinets or in room applications	
Climatic ambient conditions	
Transport and storage (in packaging) as per IEC EN 60721-3-1 / IEC EN 60721-3-2	Temperature -25...+70 °C (-13...158 °F) Air humidity 5...95 % (non-condensing)
Operation as per IEC/EN 60721-3-3	Operation in enclosed dry locations, having no temperature or humidity control Temperature -5...+50 °C (23...122 °F) Air humidity 5...95 % (non-condensing)
Mechanical ambient conditions	
Transport (in transport packaging) as per IEC/EN 60721-3-2	Class 2M4
Operation as per IEC/EN 60721-3-3	Class 3M11
Standards, directives and approvals	
Product standard	IEC/EN 60730-1 Automatic electrical controls
Product family standards	EN 61000-6-2 EN 61000-6-3
Electromagnetic compatibility	For use in residential, commercial and industrial environments
EU conformity (CE)	See EU declaration of conformity A5W00744646A*)
UKCA conformity	See UKCA declaration of conformity A5W00757649A*)
RCM conformity	See RCM declaration of conformity A5W00744647A*)
Environmental compatibility	The Environmental Product Declaration (A5W00744636A*)) contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).

*) The documents can be downloaded at the following Internet address:
www.siemens.com/bt/download

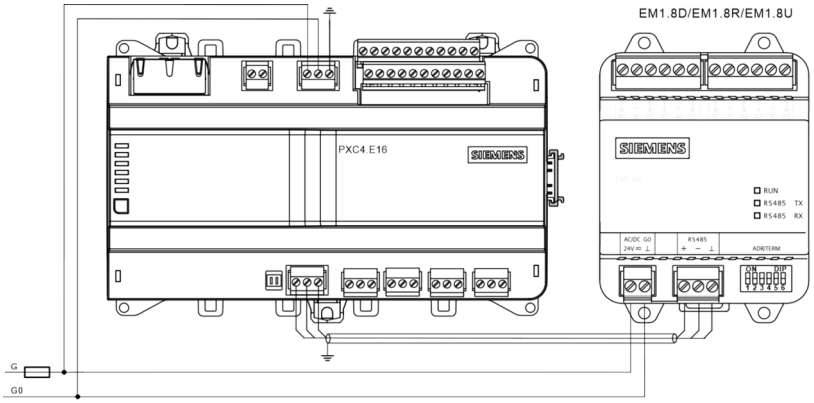
8.9 | General

General	
Dimensions	See "Dimensions (mm)"
Weight without packaging	• EM1.8D: 127 g • EM1.8R: 158 g • EM1.8U: 127 g
Weight with packaging	• EM1.8D: 163 g • EM1.8R: 195 g • EM1.8U: 164.5 g

9 | Wiring diagram

9.1 | Connect to the controller

The wiring diagram may vary slightly if the connected controller is different. Following is an example of connecting the extension module to Desigo automation stations:



Connect to Desigo automation stations (PXC 4/5/7/… controller)

NOTICE

See "Technical data" for the wiring of each I/O port on a single device.

NOTICE

Dynamically adjust the fuse size and power supply according to system requirements.

10 | Dimensions (mm)