SmartWire-DT
Modules IP67

E·T·N

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Original operating manual
The German-language edition of this document is the original operating manual.

Translation of the original operating manual
All editions of this document other than those in German language are translations of the original operating manual.

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Danger!
Dangerous electrical voltage!

Before commencing the installation

- Disconnect the power supply of the device.

- Ensure that devices cannot be accidentally restarted.

- Verify isolation from the supply.

- Earth and short circuit.

- Cover or enclose neighbouring units that are live.

- Follow the engineering instructions (AWA/IL) of the device concerned.

- Only suitably qualified personnel in accordance with EN 50110-1/-2 (VDE 0105 Part 100) may work on this device/system.

- Before installation and before touching the device ensure that you are free of electrostatic charge.

- The functional earth (FE) must be connected to the protective earth (PE) or to the potential equalisation. The system installer is responsible for implementing this connection.

- Connecting cables and signal lines should be installed so that inductive or capacitive interference does not impair the automation functions.

- Install automation devices and related operating elements in such a way that they are well protected against unintentional operation.

- Suitable safety hardware and software measures should be implemented for the I/O interface so that a line or wire breakage on the signal side does not result in undefined states in the automation devices.

- Ensure a reliable electrical isolation of the low voltage for the 24 volt supply. Only use power supply units complying with IEC 60364-4-41 (VDE 0100 Part 410) or HD 384.4.41 S2.

- Deviations of the mains voltage from the rated value must not exceed the tolerance limits given in the specifications, otherwise this may cause malfunction and dangerous operation.

- Emergency stop devices complying with IEC/EN 60204-1 must be effective in all operating modes of the automation devices. Unlatching the emergency-stop devices must not cause restart.

- Devices that are designed for mounting in housings or control cabinets must only be operated and controlled after they have been installed with the housing closed. Desktop or portable units must only be operated and controlled in enclosed housings.

- Measures should be taken to ensure the proper restart of programs interrupted after a voltage dip or failure. This should not cause dangerous operating states even for a short time. If necessary, emergency-stop devices should be implemented.

- Wherever faults in the automation system may cause damage to persons or property, external measures must be implemented to ensure a safe operating state in the event of a fault or malfunction (for example, by means of separate limit switches, mechanical interlocks etc.).

Table of contents

0 About this manual

This manual provides information on SmartWire-DT I/O modules
EU1E-SWD… and EU2E-SWD…

0.1 Target group

This manual, MN120006EN, is intended for engineers, electricians, and
automation technicians. Electrical engineering and physics-related
knowledge and skills will be required in order to be able to commission the
corresponding devices.
In addition, readers must be familiar with how to use the SmartWire-DT
system.

0.2 Further manuals for this device

For more information on the aforementioned modules, as well as for general
information on SmartWire-DT, please refer to:

• Instruction leaflet IL0120005ZU

and to the following manual:

• "SmartWire-DT The system" – MN05006002Z-EN

➡ These documents can be downloaded for free from the Internet
in the form of PDF files.

They can be quickly located at
http://www.eaton.eu ➞ **Customer Support** ➞ **Download
Center – Documentation** by entering the document number
(e.g., "05006002") as a search term into the **Quick Search**
field.

0.3 Writing conventions

Symbols used in this manual have the following meanings:

▶ Indicates instructions to be followed.

0.3.1 Hazard warnings of material damages

> *NOTICE*
> Warns about the possibility of material damage.

0.3.2 Hazard warnings of personal injury

> **CAUTION**
> Warns of the possibility of hazardous situations that may possibly cause slight injury.

> **WARNING**
> Warns of the possibility of hazardous situations that could result in serious injury or even death.

> **DANGER**
> Warns of hazardous situations that result in serious injury or death.

0.3.3 Tips

→ Indicates useful tips.

1 Input/output modules EU1E-SWD… and EU2E-SWD…

1.1 Introduction

SmartWire-DT I/O modules EU1E-SWD… and EU2E-SWD… (hereafter referred to as "I/O modules" for short) are used to connect additional sensors and actuators outside of control panels and directly on machines or in systems. These sensors and actuators may include, for instance, units that do not feature integrated SmartWire-DT capabilities.

A range of modules with digital or analog inputs and outputs are available.

Following is a description of the I/O modules' general characteristics and information on their use. For additional module-specific information, please refer to the module descriptions that start in chapter 2.

1.2 Surface mounting

EU1E-SWD…
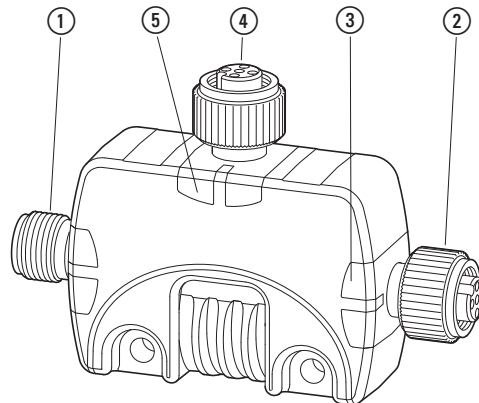
Figure 1: Connection EU1E-SWD…
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1
⑤ I/O status indicators

EU2E-SWD…
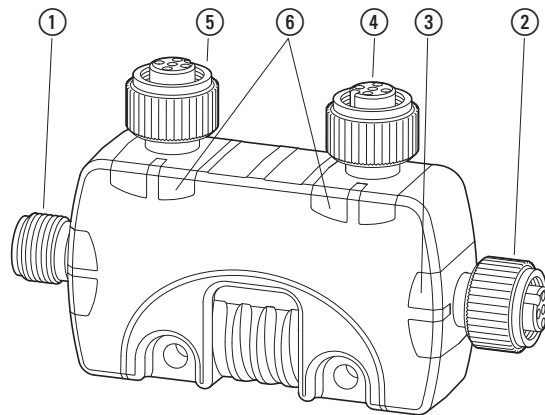
Figure 2: Connection EU2E-SWD…
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X2
⑤ I/O connection X1
⑥ I/O status indicators

1.3 Engineering

The SmartWire-DT I/O modules are meant for connecting additional sensors and actuators that do not feature integrated SmartWire-DT capabilities. When installed, these modules are placed in the immediate vicinity of the corresponding sensors or actuators, which significantly reduces the remaining wiring. As for the connections to the SmartWire-DT communication system and to the sensors and actuators, these are made using an SWD4-…LR5… five-conductor round cable with M12 plug connectors. In addition, an SWD4-RC5-10 bus termination resistor needs to be connected at the end of the SmartWire-DT network.

Current consumption

M12 cables are approved for a current consumption level of up to 4 A. In this case, the total current consumption level is equal to the sum of the SmartWire-DT modules' current consumption level and the connected sensors'/actuators' current consumption level.

The I/O modules draw power for their communication electronics and for the connected sensors and actuators from the SmartWire-DT 24 V network supply.

> → For specifications regarding the I/O modules current consumption levels, please refer to the table in the appendix on page 105.

A voltage of 24 V DC is supplied at the M12 I/O connectors as well in order to power any connected sensors.

If the I/O modules and the connected sensors/actuators current consumption exceeds 4 A, please make sure to add an additional EU1S-SWD-PF1-1 module.

You can use the SWD-Assist planning and commissioning program to calculate the current consumption levels in your system.

➜ SWD-Assist can be downloaded for free at:

http://downloadcenter.moeller.net

➜ For information on power supply specifics, please refer to the SmartWire-DT System Manual, MN05006002Z-EN.

The maximum permissible current draw for each M12 socket used to power connected sensors or actuators is 70 mA. The supply is short-circuit-proof and protected against overload. If the module in question features outputs (digital or analog), these outputs will also be short-circuit proof and protected against overload. In both cases, if there is an overload situation, the module will automatically switch back on once the overload situation is eliminated. Moreover, the PLC program will be notified of the overload situation via separate diagnostic messages.

Sensor current monitoring

One of the options provided by the I/O module parameters in the PLC configuration is monitoring the sensor power supply's current consumption level. This feature can be used in a couple of ways:

➜ Proper termination of open I/O connectors with accessory SWD4-ACAP-10
When installed, this cap will draw a small amount of current from the 24 V sensor supply. If the cap is not screwed in place and the sensor current monitoring feature is enabled, a diagnostic message will be generated.

➜ Monitoring the current consumption of connected sensors/actuators
If sensors with a constant current consumption level > 0.5 mA are connected, a diagnostic message will be generated for the relevant I/O connector in the event of a fault (current consumption < 0.5 mA).
This message can also be used to indicate malfunctioning sensors and actuators in the user program when the current consumption level is too low.

1.4 Installation

1.4.1 Mounting

The I/O modules can be installed in a variety of ways:

- Resting in place – e.g., inside cable ducts
- With screw fixing – use M4 screws and a tightening torque < 1 Nm
- Mounted on a DIN-rail
- Mounted on profiled busbars
- Mounted with an IEC20 (M20) installation clip
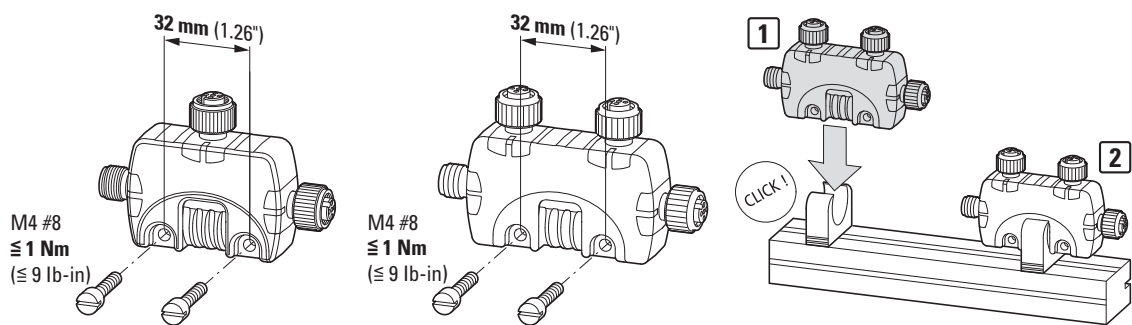
Figure 3: Mounting options

1.4.2 Connection

▶ Connect the five-conductor SmartWire-DT round cable to the SWD IN and SWD OUT connectors. To do so, use SWD4-…LR5-2S cables.
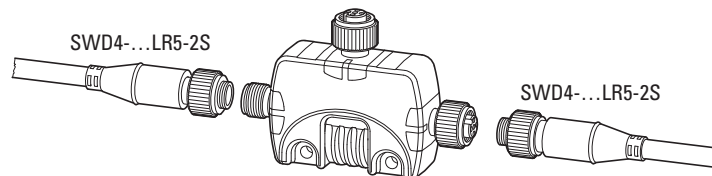
Figure 4: Connection to SmartWire-DT

▶ Use I/O connector X1 to connect the sensors/actuators to the five-conductor SmartWire-DT round cable. To do so, use SWD4-…LR5… cables (one M12 plug, one M12 socket) or cable SWD4-..LR5-S (one M12 plug, one open cable end) for a direct connection to sensors/actuators.
  If you will be connecting two sensors/actuators to a single M12 I/O connector, use an appropriate SWD4-SP-… splitter.
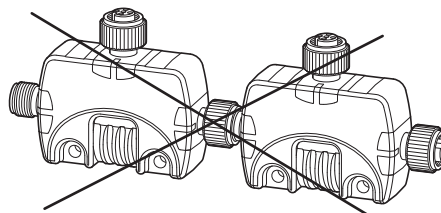
1.5 Parameter definition

The IP67 SmartWire-DT I/O modules can be configured flexibly, with the available configuration options depending on the specific part no. being used. The type of parameter configuration will vary depending on the selected SmartWire-DT coordinator (gateway, PLC, etc.). For special instructions for the CANopen and EtherCAT protocols, please refer to the I/O module descriptions. When using these protocols, the modules need to be configured by entering the appropriate parameter values.

→ The individual sections describe the structure behind the parameter data and explain how to figure out what the correct parameter data should be.
For additional information, please refer to "Fieldbus-specific characteristics" in the "Parameter configuration" section for each individual module.
For general information on the EtherCAT fieldbus system, please refer to → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus", Page 85.

1.6 Commissioning

Once the power supply on the SmartWire-DT coordinator is switched on, the green SmartWire-DT diagnostic LED on the SmartWire-DT modules will flash. Once all addresses have been assigned on the network, the LED will show a solid green light instead. The inputs' status can be checked directly on the module by looking at the corresponding indicators.

→ For more information on how addresses are assigned in a SmartWire-DT network, please refer to the information in manual MN05006002Z-EN, "SmartWire-DT – The System", and to the specific manuals for the SmartWire-DT coordinators.

1.6.1 Exchange of modules

After the modules are replaced and the voltage is switched on, the address assignment process must run again.

1.6.2 Device status

The individual SmartWire-DT modules will indicate their device status with the help of the green diagnostic LED (name: SWD).

Table 1:   Messages conveyed with the "SWD" SmartWire-DT diagnostic LED

Color	State	Message
green	Continuous light	Device is operating error-free.
	flashing (1 Hz)	• addressing process in progress • after gateway power On • after actuation of the configuration button on the gateway • Module not in current configuration. • invalid type
	flashing (3 Hz)	Device reports a diagnosis. (see section "Programming", subsection "Diagnostics").

1.7 Interoperability requirements

The modules' interoperability is guaranteed for the following SmartWire-DT coordinator versions and higher:

SWD coordinator	Baud rates of up to 250 kB	
	Firmware version	Device version
EU5C-SWD-CAN	1.30	03
EU5C-SWD-DP	1.30	04
EU5C-SWD-EIP-MODTCP	1.10	03
EU5C-SWD-PROFINET	1.4.4.0	–
EU5C-SWD-POWERLINK	1.0.12.0	–
EU5C-SWD-ETHERCAT	1.01	–
XV1…	1.0	01
XC-152E…	1.0	01

➜ If necessary, please download the latest device description files from the EATON website.

They can be quickly located at http://www.eaton.eu **→ Customer Support → Download Center – Documentation** by entering "SWD" as a search term into the **Quick Search** field.

1.8 Detailed descriptions

The individual I/O modules, as well as the required accessories, are
described in greater detail starting in chapter 2:

2 Digital modules

2.1 EU1E-SWD-1DX

2.1.1 Introduction

SmartWire-DT module EU1E-SWD-1DX features one digital input that can be used to integrate sensors into a SmartWire-DT network. The M12 I/O plug connector provides 24 V DC power for connected devices. The input's status is indicated with the help of LEDs. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.1.2 Surface mounting

Figure 5: Connections of the module EU1E-SWD-1DX

① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1
⑤ Input status indicator

2.1.3 Engineering

2.1.3.1 Plug configuration - connection X1

Pin	Configuration
1	24V
2	Not used
3	0V
4	IO
5	Not used

2.1.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

2.1.4 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off

2.1.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 sensor current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 sensor current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

2.1.5 Programming

2.1.5.1 Inputs/Outputs

The module has one input byte.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	–	I0

Bit	Designation	Meaning
0	I0	Status input 0
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

2.1.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x23	Sensor power supply overload, short-circuit at connector X1
0x1B	No sensor connected to connector X1 (if current monitoring has been configured)

2.2 EU1E-SWD-2DX

2.2.1 Introduction

SmartWire-DT module EU1E-SWD-2DX features two digital inputs that can be used to integrate various sensors into a SmartWire-DT network. The M12 I/O plug connector provides 24 V DC power for connected devices. The inputs' status is indicated with the help of LEDs. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.2.2 Surface mounting
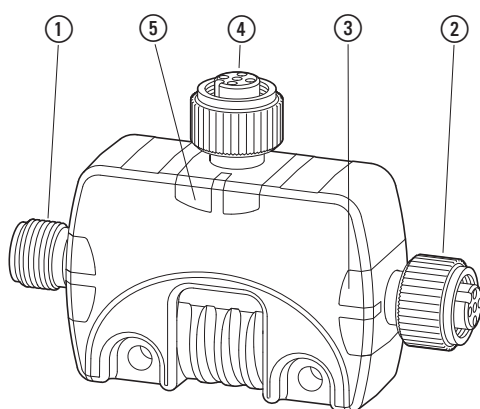
Figure 6: Connections of the module EU1E-SWD-2DX
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1
⑤ Input status indicators

2.2.3 Engineering

2.2.3.1 Plug configuration - connection X1

Pin	Configuration
1	24V
2	I1
3	0V
4	I0
5	Not used
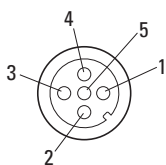
2.2.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

2.2.4 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off

2.2.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 sensor current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 sensor current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

2.2.5 Programming

2.2.5.1 Inputs/Outputs

The module has one input byte.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	I1	I0

Bit	Designation	Meaning
0	I0	Status input 0
1	I1	Status input 1
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

2.2.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x23	Sensor power supply overload, short-circuit at connector X1
0x1B	No sensor connected to connector X1 or malfunctioning sensor (if current monitoring has been configured)

2.3 EU1E-SWD-1XD

2.3.1 Introduction

SmartWire-DT module EU1E-SWD-1XD features one output that can be used to integrate actuators into a SmartWire-DT network. The M12 I/O plug connector provides 24 V DC power for connected devices. The output's status is indicated with the help of LEDs. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.
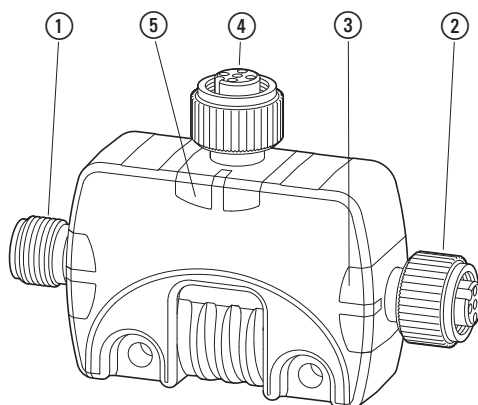
2.3.2 Surface mounting
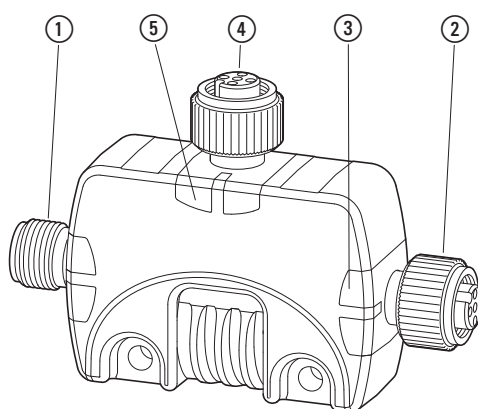
Figure 7: Connections of the module EU1E-SWD-1XD

① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1
⑤ Output status indicator

2.3.3 Engineering

2.3.3.1 Plug configuration - connection X1

Pin	Configuration
1	24V
2	Not used
3	0V
4	Q0
5	Not used

2.3.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power an actuator. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

2.3.4 Parameter definition

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Actuator current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off

2.3.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Actuator current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 actuator current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Actuator current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 actuator current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

2.3.5 Programming

2.3.5.1 Inputs/Outputs

The module has one input byte and one output byte.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

Outputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	–	–	–	–	–	–	–	Q0

Bit	Designation	Meaning
0	Q0	Actuation output Q0
1	Not used	–
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

2.3.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x13	Overload, short-circuit at output
0x23	Actuator power supply overload, short-circuit at connector X1
0x1B	No actuator connected to connector X1 or malfunctioning actuator (if current monitoring has been configured)

2.4 EU1E-SWD-2DD

2.4.1 Introduction

SmartWire-DT module EU1E-SWD-2DD features two configurable digital inputs/outputs that can be used to integrate various sensors/actuators into a SmartWire-DT network. The M12 I/O plug connector provides 24 V DC power for connected devices. The inputs'/outputs' status is indicated with the help of LEDs. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.4.2 Surface mounting

Figure 8: Connections of the module EU1E-SWD-2DD
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1
⑤ I/O status indicators

2.4.3 Engineering

2.4.3.1 Plug configuration - connection X1

Pin		Configuration
	1	24V
	2	I1/Q1
	3	0V
	4	I0/Q0
	5	Not used

2.4.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors/actuators. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

2.4.3.3 Data profiles, parameter configuration

The I/O module features two data profiles that provide a varying amount of information in the cyclical data depending on the application in question.

Data profile selection

Profile	Input byte 0	Output byte 0	Default
Profile 1	X	–	–
Profile 2	X	X	X

If profile 2 is selected, the number of outputs and the way they are assigned to the I/O connector can be defined in an additional step. Depending on the coordinator being used, the profile will need to be selected in the programming system or in the SWD-Assist planning and commissioning program.

Profile	Connection X1	
	Pin 4	Pin 2
Profile 1	I0	I1
Profile 2 (The appropriate parameters need to be configured in order to define whether each pin will function as an input or output)	I0	I1
	I0	Q1
	Q0	I1
	Q0	Q1

Additional device-specific parameters:

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Sensor current monitoring ON/OFF ($\rightarrow$ Section 1.3, „Engineering", page 8)	off
Input/output configuration (profile 2 only)	–	–
Channel 1: Input 1 is an output.	Used to configure input 1 (connector X1, pin 4) as an input or output	input
Channel 2: Input 2 is an output.	Used to configure input 2 (connector X1, pin 2) as an input or output	input

2.4.3.4 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Profile selection: SDO object 2102subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Data profile	Value [hex]
Profile 1	0x0010
Profile 2 (default setting)	0x0030

Sensor current monitoring, I/O selection: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 sensor current monitoring 0: Off 1: On	–	–	0: I/Q1 = I1 1: IQ1 = Q1	0: I/Q0 = I0 1: IQ0 = Q0
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring, I/O selection: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 sensor current monitoring 0: Off 1: On	–	–	0: I/Q1 = I1 1: IQ1 = Q1	0: I/Q0 = I0 1: IQ0 = Q0
Default setting	0	0	0	0	0	0	0	0

2.4.4 Programming

2.4.4.1 Inputs/Outputs

The module has one input byte and one output byte.
The availability and evaluation of the inputs/outputs will depend on the data profile and the parameter configuration being used.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	I1	I0

Bit	Designation	Meaning
0	I0	Input 0 status (if configured as an input; otherwise 0)
1	I1	Input 1 status (if configured as an input; otherwise 0)
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

Outputs

Byte 0 (profile 2 only):

Bit	7	6	5	4	3	2	1	0
Designation	–	–	–	–	–	–	Q1	Q0

Bit	Designation	Meaning
0	Q0	Actuation output Q0
1	Q1	Actuation output Q1
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

2.4.4.2 Diagnostics

In the event of a diagnosis the module reports the following error causes
(0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x13	Overload, short-circuit on at least one output
0x23	Sensor/actuator power supply overload, short-circuit at connector X1
0x1B	No sensor connected to connector X1 (if current monitoring has been configured)

2.5 EU2E-SWD-2DX

2.5.1 Introduction

SmartWire-DT module EU2E-SWD-2DX features two digital inputs that can be used to integrate various sensors into a SmartWire-DT network.
There is a separate M12 I/O connector for each input. The M12 I/O plug connectors provide 24 V DC power for connected devices. The inputs' status is indicated with the help of LEDs. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.
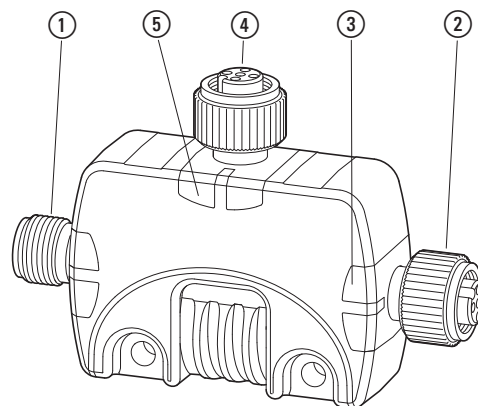
2.5.2 Surface mounting
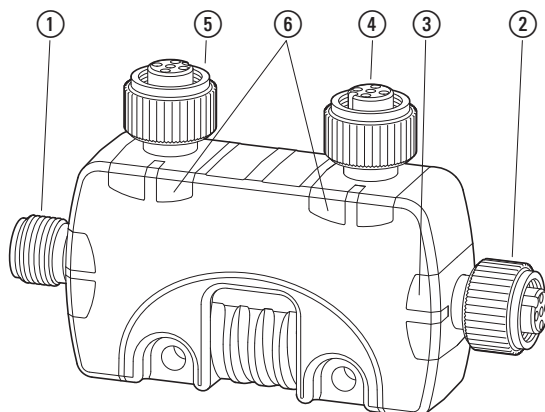
Figure 9: Connections of the module EU2E-SWD-2DX
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X2
⑤ I/O connection X1
⑥ Input status indicators

2.5.3 Engineering

Pinout for connectors X1 and X2:

Pin		Pinout for connector X1	Pinout for connector X2
	1	24V	24V
	2	Not used	Not used
	3	0V	0V
	4	I0	I1
	5	Not used	Not used
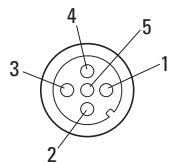
2.5.3.1 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

2.5.4 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off
Current monitoring on I/O connector X2	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off

2.5.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	X2 sensor current monitoring 0: Off 1: On	X1 sensor current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	X2 sensor current monitoring 0: Off 1: On	X1 sensor current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

2.5.5 Programming

2.5.5.1 Inputs/Outputs

The module has one input byte.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	I1	I0

Bit	Designation	Meaning
0	I0	Status input 0
1	I1	Status input 1
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

2.5.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x23	Sensor power supply overload, short-circuit at connector X1
0x24	Sensor power supply overload, short-circuit at connector X2
0x1B	No sensor connected to connector X1 (if current monitoring has been configured for connector X1)
0x1C	No sensor connected to connector X2 (if current monitoring has been configured for connector X2)

2.6 EU2E-SWD-4DX

2.6.1 Introduction

SmartWire-DT module EU2E-SWD-4DX features four digital inputs that can be used to integrate various sensors into a SmartWire-DT network. The M12 I/O plug connectors provide 24 V DC power for connected devices. The inputs' status is indicated with the help of LEDs.

Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.6.2 Surface mounting
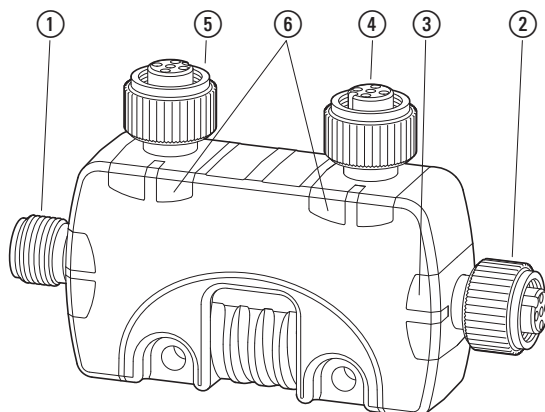
Figure 10:Connections of the module EU2E-SWD-4DX

① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X2
⑤ I/O connection X1
⑥ Input status indicators

2.6.3 Engineering

2.6.3.1 Pinout for connectors X1 and X2

Pin		Pinout for connector X1	Pinout for connector X2
	1	24V	24V
	2	I1	I3
	3	0V	0V
	4	I0	I2
	5	Not used	Not used
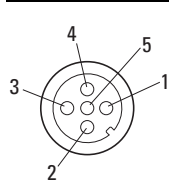
2.6.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

2.6.4 Parameter definition

Depending on the coordinator being used, the module's parameters will need to be configured in the programming system or in the SWD-Assist planning and commissioning program.

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Sensor current monitoring ON/OFF (⟶ Section 1.3, „Engineering", page 8)	off
Current monitoring at I/O connection X2	Sensor current monitoring ON/OFF (⟶ Section 1.3, „Engineering", page 8)	off

2.6.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	X2 sensor current monitoring 0: Off 1: On	X1 sensor current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: ⟶ Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	X2 sensor current monitoring 0: Off 1: On	X1 sensor current monitoring 0: Off 1: On	–	–	–	–
Default setting	0	0	0	0	0	0	0	0

2.6.5 Programming

2.6.5.1 Inputs/Outputs

The module has one input byte.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	I3	I2	I1	I0

Bit	Designation	Meaning
0	I0	Status input 0
1	I1	Status input 1
2	I2	Status input 2
3	I3	Status input 3
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

2.6.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes
(0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x23	Sensor power supply overload, short-circuit at connector X1
0x24	Sensor power supply overload, short-circuit at connector X2
0x1B	No sensor connected to connector X1 (if current monitoring has been configured for connector X1)
0x1C	No sensor connected to connector X2 (if current monitoring has been configured for connector X2)

2.7 EU2E-SWD-2DD

2.7.1 Introduction

SmartWire-DT module EU2E-SWD-2DD features two digital inputs/outputs that can be used to integrate various sensors and actuators into a SmartWire-DT network. There is a separate connector available for each input/output. The M12 I/O plug connectors provide 24 V DC power for connected devices. The inputs'/outputs' status is indicated with the help of LEDs.
Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

2.7.2 Surface mounting

Figure 11:Connections of the module EU2E-SWD-2DD
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X2
⑤ I/O connection X1
⑥ Input status indicators

2.7.3 Engineering

2.7.3.1 Pinout for connectors X1 and X2

Pin		Pinout for connector X1	Pinout for connector X2
	1	24V	24V
	2	Not used	Not used
	3	0V	0V
	4	I0, Q0	I1, Q1
	5	Not used	Not used
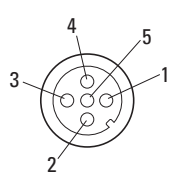
2.7.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

2.7.3.3 Data profiles, parameter configuration

Data profile selection

Profile	Input byte 0	Output byte 0	Default
Profile 1	X	–	–
Profile 2	X	X	X

If data profile 2 is selected, the number of outputs and the way they are assigned to the I/O connector can be defined in an additional step. Depending on the coordinator being used, the profile will need to be selected in the programming system or in the SWD-Assist planning and commissioning program.

Profile	Connection X1		Connection X2	
	Pin 4	Pin 2	Pin 4	Pin 2
Profile 1	I0	–	I1	–
Profile 2 (The appropriate parameters need to be configured in order to define whether each pin will function as an input or output.)	I0	–	I1	–
	I0	–	Q1	–
	Q0	–	I1	–
	Q0	–	Q1	–

Additional device-specific parameters:

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off
Current monitoring on I/O connector X2	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off
Channel 1: Input 1 is an output Default setting: Input	Used to configure input 1 (connector X1, pin 4) as an input or output	input
Channel 2: Input 2 is an output Default setting: Input	Used to configure input 2 (connector X2, pin 4) as an input or output	input

2.7.3.4 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Profile selection: SDO object 2102subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Data profile	Value [hex]
Profile 1	0x0010
Profile 2 (default setting)	0x0030

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 sensor current monitoring 0: Off 1: On	–	–	0: I/Q1 = I1 1: IQ1 = Q1	0: I/Q0 = I0 1: IQ0 = Q0
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	–	X1 sensor current monitoring 0: Off 1: On	–	–	0: I/Q1= I1 1: IQ1 = Q1	0: I/Q0= I0 1: IQ0 = Q0
Default setting	0	0	0	0	0	0	0	0

2.7.4 Programming

2.7.4.1 Inputs/Outputs

The module has one input byte and one output byte.
The availability and evaluation of the inputs/outputs will depend on the data profile and the parameter configuration being used.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	I1	I0

Bit	Designation	Meaning
0	I0	Input 0 status (if configured as an input; otherwise 0)
1	I1	Input 1 status (if configured as an input; otherwise 0)
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

Outputs

Byte 0 (profile 2 only):

Bit	7	6	5	4	3	2	1	0
Designation	–	–	–	–	–	–	Q1	Q0

Bit	Designation	Meaning
0	Q0	Actuation output Q0
1	Q1	Actuation output Q1
2	Not used	–
3	Not used	–
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

2.7.4.2 Diagnostics

In the event of a diagnosis the module reports the following error causes
(0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x13	Overload, short-circuit on at least one output
0x23	Sensor/actuator power supply overload, short-circuit at connector X1
0x24	Sensor/actuator power supply overload, short-circuit at connector X2
0x1B	No sensor/actuator connected to connector X1 (if current monitoring has been configured for connector X1)
0x1C	No sensor/actuator connected to connector X2 (if current monitoring has been configured for connector X2)

2.8 EU2E-SWD-4DD

2.8.1 Introduction

SmartWire-DT module EU2E-SWD-4DD features four digital inputs/outputs that can be used to integrate various sensors into a SmartWire-DT network. The M12 I/O plug connectors provide 24 V DC power for connected devices. The inputs' status is indicated with the help of LEDs. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.
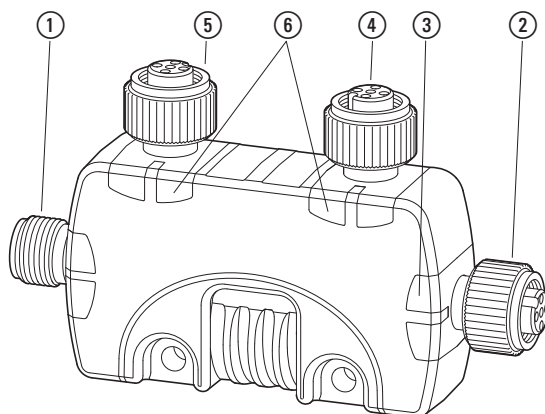
2.8.2 Surface mounting
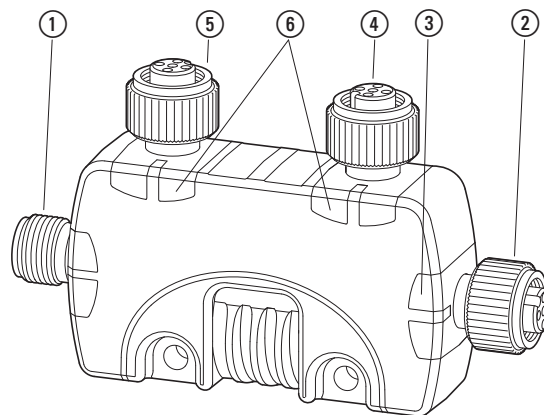
Figure 12: Connections of the module EU2E-SWD-4DD
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X2
⑤ I/O connection X1
⑥ Input status indicators

2.8.3 Engineering

2.8.3.1 Pinout for connectors X1 and X2

Pin		Pinout for connector 1	Pinout for connector 2
	1	24V	24V
	2	I1, Q1	I3, Q3
	3	0V	0V
	4	I0, Q0	I2, Q2
	5	Not used	Not used
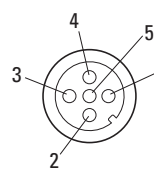
2.8.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

2.8.3.3 Data profiles, parameter configuration

Data profile selection

Profile	Input byte 0	Output byte 0	Default
Profile 1	X	–	–
Profile 2	X	X	X

If data profile 2 is selected, the number of outputs and the way they are assigned to the I/O connector can be defined in an additional step. Depending on the coordinator being used, the profile will need to be selected in the programming system or in the SWD-Assist planning and commissioning program.

Profile	Connection X1		Connection X2	
	Pin 4	Pin 2	Pin 4	Pin 2
Profile 1	I0	I1	I2	I3
Profile 2 (The appropriate parameters need to be configured in order to define whether each pin will function as an input or output.)	I0	I1	I2	I3
	I0	I1	I2	Q3
	I0	I1	Q2	I3
	I0	I1	Q2	Q3
	I0	Q1	I2	I3
	I0	Q1	I2	Q3
	I0	Q1	Q2	I3
	I0	Q1	Q2	Q3
	Q0	I1	I2	I3
	Q0	I1	I2	Q3
	Q0	I1	Q2	I3
	Q0	I1	Q2	Q3
	Q0	Q1	I2	I3
	Q0	Q1	I2	Q3
	Q0	Q1	Q2	I3
	Q0	Q1	Q2	Q3

Additional device-specific parameters:

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off
Current monitoring on I/O connector X2	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off
Channel 1: Input 1 is an output.	Used to configure input 1 (connector X1, pin 4) as an input or output	input
Channel 2: Input 2 is an output.	Used to configure input 2 (connector X1, pin 2) as an input or output	input
Channel 3: Input 3 is an output.	Used to configure input 3 (connector X2, pin 4) as an input or output	input
Channel 4: Input 4 is an output.	Used to configure input 4 (connector X2, pin 2) as an input or output	input

2.8.3.4 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Profile selection: SDO object 2102subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Data profile	Value [hex]
Profile 1	0x0010
Profile 2 (default setting)	0x0030

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	X2 sensor current monitoring 0: Off 1: On	X1 sensor current monitoring 0: Off 1: On	0: I/Q3 = I3 1: IQ3 = Q3	0: I/Q2 = I2 1: IQ2 = Q2	0: I/Q1 = I1 1: IQ1 = Q1	0: I/Q0 = I0 1: IQ0 = Q0
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	–	–	X2 sensor current monitoring 0: Off 1: On	X1 sensor current monitoring 0: Off 1: On	0: I/Q3 = I3 1: IQ3 = Q3	0: I/Q2 = I2 1: IQ2 = Q2	0: I/Q1 = I1 1: IQ1 = Q1	0: I/Q0 = I0 1: IQ0 = Q0
Default setting	0	0	0	0	0	0	0	0

2.8.4 Programming

2.8.4.1 Inputs/Outputs

The module has one input byte and one output byte.
The availability and evaluation of the inputs/outputs will depend on the data profile and the parameter configuration being used.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	I3	I2	I1	I0

Bit	Designation	Meaning
0	I0	Input 0 status (if configured as an input; otherwise 0)
1	I1	Input 1 status (if configured as an input; otherwise 0)
2	I2	Input 2 status (if configured as an input; otherwise 0)
3	I3	Input 3 status (if configured as an input; otherwise 0)
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

Outputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	–	–	–	–	Q3	Q2	Q1	Q0

Bit	Designation	Meaning
0	Q0	Actuation output Q0
1	Q1	Actuation output Q1
2	Q2	Actuation output Q2
3	Q3	Actuation output Q3
4	Not used	–
5	Not used	–
6	Not used	–
7	Not used	–

2.8.4.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x13	Overload, short-circuit on at least one output
0x23	Sensor power supply overload, short-circuit at connector X1
0x24	Sensor power supply overload, short-circuit at connector X2
0x1B	No sensor connected to connector X1 (if current monitoring has been configured for connector X1)
0x1C	No sensor connected to connector X2 (if current monitoring has been configured for connector X2)

2 Digital modules
2.8 EU2E-SWD-4DD

3 Analog module

3.1 EU1E-SWD-1AX-1

3.1.1 Introduction

SmartWire-DT module EU1E-SWD-1AX-1 features one analog input that can be used to integrate analog sensors with a 0-10 V voltage input into a SmartWire-DT network. The M12 I/O plug connector provides 24 V DC power for connected devices. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

3.1.2 Surface mounting

Figure 13:Connections of the module EU1E-SWD-1AX-1
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1

3.1.3 Engineering

3.1.3.1 Plug configuration - connection X1

Pin		Configuration
	1	24V
	2	0V
	3	0V
	4	IA0
	5	Not used

3.1.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

3.1.4 Parameter definition

Parameter	Meaning	Default
Current monitoring I/O connection X1	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off

In addition, the module makes it possible to set up an averaging function and to adjust the rate at which the analog value reading sent from the module to the SmartWire-DT network will be refreshed.

Parameter	Meaning		Default
Averaging	On/Off	Averaging over n measuring cycles if averaging is configured	On
Reading refresh rate	20 ms	4 measurement cycles	100 ms
	100 ms	20	
	200 ms	40	
	500 ms	100	

3.1.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring, measuring settings: SDO object 2110subx (x = Position of module within the SmartWire-DT network, with the range being 1 - 99))

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	Averaging 0: Off 1: On	Reading update 00: 20 ms 01: 100 ms 10: 200 ms 11: 500 ms		Not used	Not used	Not used	Not used
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring, measuring settings: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	Averaging 0: Off 1: On	Reading update 00: 20 ms 01: 100 ms 10: 200 ms 11: 500 ms		Not used	Not used	Not used	Not used
Default setting	0	0	0	0	0	0	0	0

3.1.5 Programming

3.1.5.1 Inputs/Outputs

The module has one input byte for the network/module status and one input word for the sensor's analog value.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

The analog input has a resolution of 12 bits. The analog value will be transmitted as an unsigned 16-bit value. The exact addressing used for the data will depend on the selected programming system.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IW0	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X

3.1.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x23	Sensor power supply overload, short-circuit at connector X1
0x1B	No sensor connected to connector X1 (if current monitoring has been configured)
0x14	Internal device fault

3.2 EU1E-SWD-1AX-2

3.2.1 Introduction

SmartWire-DT module EU1E-SWD-1AX-2 features one analog input that can be used to integrate analog sensors with a 0-20 mA current input into a SmartWire-DT network. The M12 I/O plug connector provides 24 V DC power for connected devices. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.
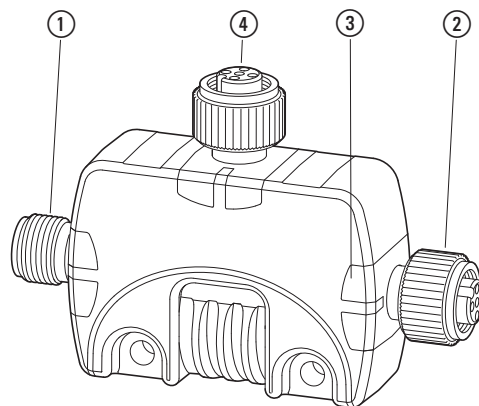
3.2.2 Surface mounting
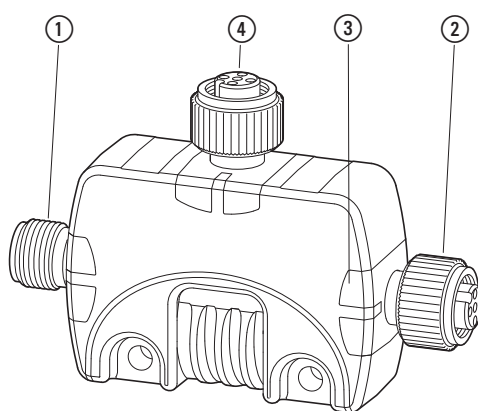
Figure 14: Connections of the module EU1E-SWD-1AX-2
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1

3.2.3 Engineering

3.2.3.1 Plug configuration - connection X1

Pin		Configuration
	1	24V
	2	0V
	3	0V
	4	QA0
	5	Not used

3.2.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

3.2.4 Parameter definition

Parameter	Meaning	Default
Current monitoring I/O connection X1	Sensor current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off

In addition, the module makes it possible to set up an averaging function and to adjust the rate at which the analog value reading sent from the module to the SmartWire-DT network will be refreshed.

Parameter	Meaning		Default
Averaging	On/Off	Averaging over n measuring cycles if averaging is configured	On
Reading refresh rate	20 ms	4 measurement cycles	100 ms
	100 ms	20	
	200 ms	40	
	500 ms	100	

3.2.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring, measuring settings: SDO object 2110subx (x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	Averaging 0: Off 1: On	Reading update 00: 20 ms 01: 100 ms 10: 200 ms 11: 500 ms		Not used	Not used	Not used	Not used
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring, measuring settings: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	Averaging 0: Off 1: On	Reading update 00: 20 ms 01: 100 ms 10: 200 ms 11: 500 ms		Not used	Not used	Not used	Not used
Default setting	0	0	0	0	0	0	0	0

3.2.5 Programming

3.2.5.1 Inputs/Outputs

The module has one input byte for the network/module status and one input word for the sensor's analog value.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

The analog input has a resolution of 12 bits. The analog value will be transmitted as an unsigned 16-bit value. The exact addressing used for the data will depend on the selected programming system.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IW0	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X

3.2.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x13	Current input overload (I > 23 mA)
0x23	Sensor power supply overload, short-circuit at connector X1
0x1B	No sensor connected to connector X1 (if current monitoring has been configured)
0x14	Internal device fault

3.3 EU1E-SWD-1XA-1

3.3.1 Introduction

SmartWire-DT module EU1E-SWD-1XA-1 features one analog output that can be used to integrate actuators with a 0-10 V voltage output into a SmartWire-DT network. The M12 I/O plug connector provides 24 V DC power for connected devices. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.

3.3.2 Surface mounting

Figure 15:Connections of the module EU1E-SWD-1XA-1
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1

3.3.3 Engineering

3.3.3.1 Plug configuration - connection X1

Pin	Pin	Configuration
	1	24V
	2	0V
	3	0V
	4	QA0
	5	Not used

3.3.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power the actuator. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

3.3.4 Parameter definition

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Actuator current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off

3.3.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	Not used	Not used	Not used	Not used	Not used	Not used	Not used
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	Not used	Not used	Not used	Not used	Not used	Not used	Not used
Default setting	0	0	0	0	0	0	0	0

3.3.5 Programming

3.3.5.1 Inputs/Outputs

The module has one input byte for the network/module status and one output word for the actuator's analog value.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

Outputs

The analog output has a resolution of 12 bits. The analog value will be transmitted as an unsigned 16-bit value. The exact addressing used for the data will depend on the selected programming system.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
QW0	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X

3.3.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x13	Overload, short-circuit at analog output
0x23	Actuator power supply overload, short-circuit at connector X1
0x1B	No actuator connected to connector X1 (if current monitoring has been configured)

3.4 EU1E-SWD-1XA-2

3.4.1 Introduction

SmartWire-DT module EU1E-SWD-1XA-2 features one analog output that can be used to integrate actuators with a 0-20 mA current output into a SmartWire-DT network. The M12 I/O plug connector provides 24 V DC power for connected devices. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.
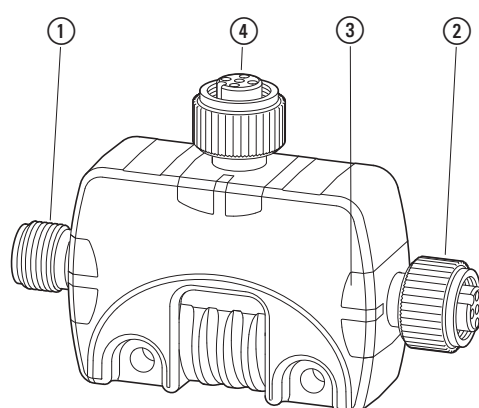
3.4.2 Surface mounting

Figure 16:Connections of the module EU1E-SWD-1XA-2
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X1

3.4.3 Engineering

3.4.3.1 Plug configuration - connection X1

Pin		Configuration
	1	24V
	2	0V
	3	0V
	4	QA0
	5	Not used
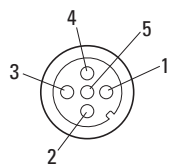
3.4.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power connected sensors. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

3.4.4 Parameter definition

Parameter	Meaning	Default
Current monitoring I/O connection X1	Actuator current monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off

3.4.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	Not used	Not used	Not used	Not used	Not used	Not used	Not used
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	Not used	Not used	Not used	Not used	Not used	Not used	Not used
Default setting	0	0	0	0	0	0	0	0

3.4.5 Programming

3.4.5.1 Inputs/Outputs

The module has one input byte for the network/module status and one output word for the sensor's analog value.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

Outputs

The analog output has a resolution of 12 bits. The analog value will be transmitted as an unsigned 16-bit value. The exact addressing used for the data will depend on the selected programming system.

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
QW0	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X

3.4.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x13	Overload, short-circuit at analog output
0x23	Actuator power supply overload, short-circuit at connector X1
0x1B	No actuator connected to connector X1 (if current monitoring has been configured)

3.5 EU2E-SWD-2PT

3.5.1 Introduction

SmartWire-DT module EU2E-SWD-2PT features two analog inputs that can be used to integrate Pt100, Pt1000, or Ni1000 temperature sensors into a SmartWire-DT network. The SmartWire-DT diagnostic LED is used to signal the network's/module's status.
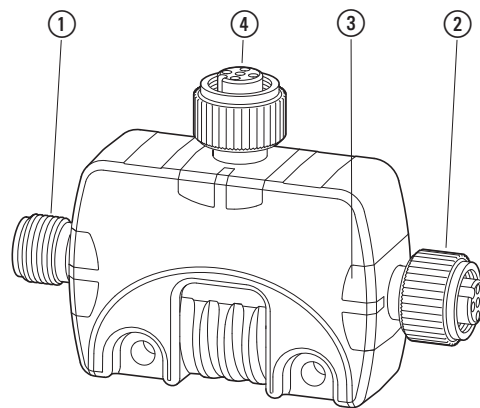
3.5.2 Surface mounting
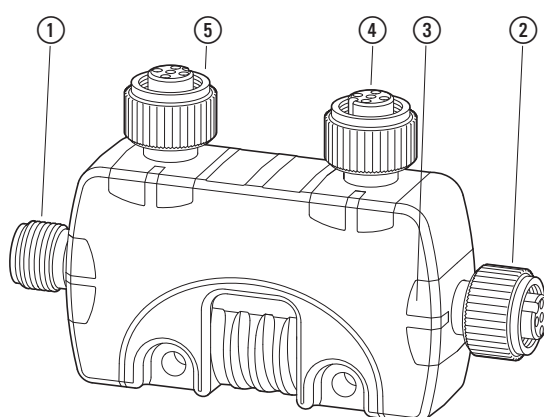
Figure 17:Connections of the module EU2E-SWD-2PT
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ I/O connection X2
⑤ I/O connection X1

3.5.3 Engineering

3.5.3.1 Pinout for connectors X1 and X2

Pin	Pinout for connector X1	Pinout for connector X2
1	Pin for protective cap SWD4-ACAP-10	Pin for protective cap SWD4-ACAP-10
2	B0	b1
3	0V	0V
4	A0	A1
5	a0	a1
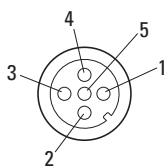
3.5.3.2 Power supply

None.

3.5.4 Parameter definition

With the programming system's control configurator, you can define the sensor model, measured value refresh rate and analog input representation. Select the desired model, and the reading representation and refresh rate. Unused temperature channels must remain set according to the following table.

Parameter	Meaning	Default
Protective cap monitoring on connector X1	Protective cap monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off
Protective cap monitoring on connector X2	Protective cap monitoring ON/OFF (→ Section 1.3, „Engineering", page 8)	off
Sensor type at connector X1	Not used Pt100 Pt1000 Ni1000	Not used
Sensor type at connector X2	Not used Pt100 Pt1000 Ni1000	Not used
Measuring range	Pt100, Pt1000: -50 °C - +200 °C NI1000: -50 °C - +150 °C Pt100, Pt1000: -50 °C - +400 °C NI1000: -50 °C - +200 °C	Pt100, Pt1000: -50 °C - +200 °C NI1000: -50 °C - +150 °C
Measurement display	0.1 °C 0.1 °F Binary value 0 - 4095	0.1 °C
Reading refresh rate	0.25 s 1 s 2.5 s 10 s	0.25 s

3.5.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Sensor current monitoring: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Parameter byte 1: Sensor selection

Bit	7	6	5	4	3	2	1	0
Meaning	Not used	Not used	Not used	Not used	Sensor selection for input 2 00: not used 01: Pt100 10: Pt1000 11: Ni1000		Sensor selection for input 1 00: not used 01: Pt100 10: Pt1000 11: Ni1000	
Default setting	0	0	0	0	0	0	0	0

Parameter byte 2: Sensor current monitoring, reading options

Bit	7	6	5	4	3	2	1	0
Meaning	Not used	Protective cap monitoring on connector X2 0: Off 1: On	Protective cap monitoring on connector X1 0: Off 1: On	Temperature range 1: Pt100, Pt1000: -50 °C - +200 °C NI1000: -50 °C - +150 °C 2: Pt100, Pt1000: -100 °C - +400 °C NI1000: -50 °C - +200 °C	Reading update 00: 0.25 s 01: 1 s 10: 2.5 s 11: 10 s		Reading representation 00: 0.1 °C 01: 0.1 °F 10: Binary value 11: not used	
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring: device index: sub-index 22

Parameter byte 1: Sensor selection

Bit	7	6	5	4	3	2	1	0
Meaning	Not used	Not used	Not used	Not used	Sensor selection for input 2 00: not used 01: Pt100 10: Pt1000 11: Ni1000		Sensor selection for input 1 00: not used 01: Pt100 10: Pt1000 11: Ni1000	
Default setting	0	0	0	0	0	0	0	0

Parameter byte 2: Sensor current monitoring, reading options

Bit	7	6	5	4	3	2	1	0
Meaning	Not used	Protective cap monitoring on connector X2 0: Off 1: On	Protective cap monitoring on connector X1 0: Off 1: On	Temperature range 1: Pt100, Pt1000: -50 °C - +200 °C NI1000: -50 °C - +150 °C 2: Pt100, Pt1000: -100 °C - +400 °C NI1000: -50 °C - +200 °C	Reading update 00: 0.25 s 01: 1 s 10: 2.5 s 11: 10 s		Reading representation 00: 0.1 °C 01: 0.1 °F 10: Binary value 11: not used	
Default setting	0	0	0	0	0	0	0	0

3.5.5 Programming

3.5.5.1 Inputs/Outputs

The module has one input byte for the network/module status and two input words for the temperature sensors' analog values.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Meaning
0	Not used	–
1	Not used	–
2	Not used	–
3	Not used	–
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm
5	Not used	–
6	PRSNT	0: Module not available 1: Module available
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
IW0	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X
IW1	–	–	–	–	X	X	X	X	X	X	X	X	X	X	X	X

The temperature value has a resolution of 12 bits. The content of inputs IW0 and IW1 will depend on the value selected for the **Format** parameter.
If the selected format is **°C** (degrees Celsius) or **°F** (degrees Fahrenheit), the value will be represented as a signed decimal value with a resolution of 0.1 degrees. If **Binary value** is selected, the temperature sensor's raw scale value will be transmitted.

Data addressing depends on the chosen programming system.

Temperature range	Sensor type	Temperature	Indicated value at selected representation		
		°C	°C	°F	Binary value
1	Pt100/Pt1000	-50 - +200	-500 - +2000	-580 - +3920	0 - 4095
2	Pt100/Pt1000	-100 - +400	-500 - +4000	-580 - +7520	0 - 4095
1	NI1000	-50 - +150	-500 - +1500	-580 - +3020	0 - 4095
2	NI1000	-50 - +200	-500 - +2000	-580 - +3920	0 - 4095

3.5.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x17	Out-of-range high reading on at least one temperature input
0x18	The lower measuring range limit is being fallen below at at least one temperature input
0x1B	No protective cap connected to connector X1
0x1C	No protective cap connected to connector X2

3 Analog module
3.5 EU2E-SWD-2PT

4 Counter module

4.1 EU1E-SWD-1CX-1

4.1.1 Introduction

SmartWire-DT module EU1E-SWD-1CX-1 features one counter input that can be used to integrate a simple counter, an up/down counter, or an incremental encoder into a SmartWire-DT network. The M12 I/O plug connector provides optional 24 V DC power. Finally, the SmartWire-DT diagnostic LED is used to signal the network's/module's status.
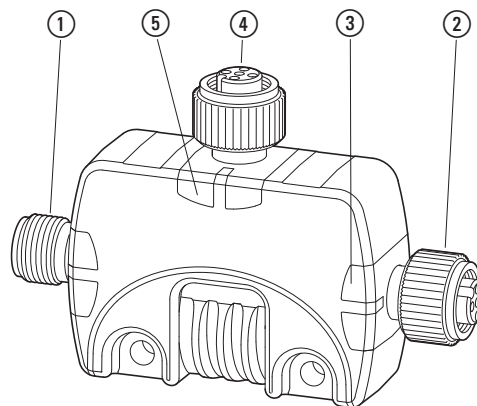
4.1.2 Surface mounting

Figure 18:Connections of the module EU1E-SWD-1CX-1
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED
④ X1 counter connector
⑤ Counter status indicator

4.1.3 Engineering

4.1.3.1 Plug configuration - connection X1

Connector X1 can be used to connect a unipolar 24 V incremental encoder or a 24 V universal counter.

Pin	Pinout for incremental encoder connection	Pinout for simple / up/ down counter connection
1	24V	24V
2	Encoder signal B	Direction
3	0V	0V
4	Encoder signal A	Count pulse
5	Reference	Reference

4.1.3.2 Power supply

The module provides 24 V DC at pins 1 and 3 in order to power a connected counter. The maximum current limit is 70 mA. The supply is short-circuit-proof and protected against overload.

4.1.3.3 Data profiles, parameter configuration

The counter module features three data profiles that provide a varying amount of information in the cyclic data depending on the application in question. Data not found in the cyclic data can also be accessed using acyclical data communications. The desired data profile needs to be selected in the PLC configuration.

Profile	IB0 Status	IW0, IW1 Counter value	IW2 Frequency [Hz]	QB0 Counter controller	QW0, QW1 Initial counter value	Default setting
1	X	X	–	X	–	X
2	X	X	X	X	–	–
3	X	X	X	X	X	–

4.1.4 Parameter definition

Parameter	Meaning	Default
Current monitoring on I/O connector X1	Sensor current monitoring ON/OFF (⟶ Section 1.3, „Engineering", page8)	off

In addition, the counter's operating mode can be pre-selected as well.

Parameter	Meaning			Default
Counter operating mode	**Incremental encoder**	Scan, simple		Incremental encoder, simple scan
		Scan, double		
		scan, four-way		
	Meter	Scan, simple		
		Scan, double		
Frequency measurement	**No frequency measurement**			no frequency measurement
	Frequency measurement	Gate time: 100 ms		
		Gate time: 200 ms		
		Gate time: 500 ms		
		Gate time: 1,000 ms		

4.1.4.1 Fieldbus-specific characteristics

When using programming systems with a PLC configurator that does not provide parameter configuration support, the user will need to enter the required parameter values.

Field bus CANopen

Profile selection: SDO object 2102subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Data profile	Value [hex]
Profile 1	0X00a0D190
Profile 2	0X00A0D290
Profile 3	0XE1A0D290

Sensor current monitoring, counter options: SDO object 2110subx
(x = Position of module within the SmartWire-DT network, with the range being 1 - 99)

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	–	Frequency measurement 000: No frequency measurement 001: Frequency measurement, gate time: 100 ms 010: Frequency measurement, gate time: 200 ms 011: Frequency measurement, gate time: 500 ms 100: Frequency measurement, gate time: 1,000 ms			Counter operating mode 000: Incremental encoder, simple scan 001: Incremental encoder, double scan 010: Incremental encoder, four-way scan 011: Counter, simple scan 100: Counter, double scan		
Default setting	0	0	0	0	0	0	0	0

Field bus EtherCAT

Option byte: → Chapter 8, "Using SmartWire-DT modules with the EtherCAT field bus"

Sensor current monitoring, counter options: device index: sub-index 22

Bit	7	6	5	4	3	2	1	0
Meaning	X1 sensor current monitoring 0: Off 1: On	–	Frequency measurement 000: No frequency measurement 001: Frequency measurement, gate time: 100 ms 010: Frequency measurement, gate time: 200 ms 011: Frequency measurement, gate time: 500 ms 100: Frequency measurement, gate time: 1,000 ms			Counter operating mode 000: Incremental encoder, simple scan 001: Incremental encoder, double scan 010: Incremental encoder, four-way scan 011: Counter, simple scan 100: Counter, double scan		
Default setting	0	0	0	0	0	0	0	0

4.1.5 Programming

The module has one input byte for the network/module status, up to two input words for the counter value, and, optionally, two output words for an initial counter value. The referencing functionality is implemented the exact same way for both incremental encoders and simple counters. In other words, counter resetting can be implemented with an external sensor.

Inputs

Byte 0:

Bit	7	6	5	4	3	2	1	0
Designation	SUBST	PRSNT	–	DIAG	–	–	–	–

Bit	Designation	Meaning	Applies to operating mode	
			Incremental encoder	Simple counter, up/down counter
0	AcRef	0: – 1: Referencing active	X	X
1	Ref	Reference status (can be reset) 0: Not referenced 1: Referenced	X	X
2	RS	Reference signal 0: Counter not at reference mark 1: Counter at reference mark	X	X

3	ZC	Zero crossing; can be reset with ZCA in output byte 0 0: Counter value ≠ 0 1: Counter value = 0	X	X
4	DIAG	0: no diagnostic alarm 1: Diagnostic alarm	X	X
5	Not used	–	–	–
6	PRSNT	0: Module not available 1: Module available	X	X
7	SUBST	0: Configured module present 1: universal module EU1M-SWD-NOP present	X	X

The counter value will be transmitted as a 32-bit value.

Address	Bit															
IW0	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
IW1	15	14	13	12	11	10	9	8	7	6	5	24	3	2	1	0

Frequency measurement

If the "frequency measurement" function is selected when configuring the counter operating mode, the measured frequency (number of counter pulses per measuring period) will be output based on the selected measuring period. The frequency value will be output as a 16-bit value in Hz in the cyclic process data. To use this option, make sure to select data profile 2 or higher.

Address	Bit															
IW2	15	14	13	12	11	10	9	8	7	6	5	24	3	2	1	0

Outputs

The module has one output byte that contains control information for the referencing process and for resetting the counter. Optionally, the counter's initial value can also be set.

Control byte QB0

Bit	Designation	Meaning	Applies to operating mode	
			Incremental encoder	**Simple counter, up/down counter**
0	Hold	Stops the counting process 0: Counter enable 1: Interrupt counting	X	X
1	ActRef	Starts the referencing process 0: Referencing inactive 1: Start referencing process Setting this bit will directly result in the **ActRef** bit in status byte IB0 being set as well.	X	X
2	RefMode	Referencing operating mode 0: once The first time the reference mark is crossed, the counter will be set to its initial value. 1: permanent The counter will be set to its initial value every time the reference mark is crossed.	X	X
3	Reset	If there is a 0 → 1 transition, the counter will be set to its initial value.	X	X
4	ZCA	Zero crossing reset 0: If there is a 0 → 1 transition, bit **ZC** in status byte 0 will be cleared. 1: Clears bit **ZC** in status byte IB0	X	X
5	Not used	–	–	–
6	Not used	–	–	–
7	Not used	–	–	–

Initial value

Normally, the counter will be set to its initial value when the reference mark is reached during referencing. The default initial value is 0, but it can be changed by the user. In order to change it, the new 32-bit initial value needs to be written to output words QW0 and QW1. These words will be available in the cyclical data only if data profile 3 is selected.

Address	Bit															
QW0	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
QW1	15	14	13	12	11	10	9	8	7	6	5	24	3	2	1	0

Data addressing depends on the chosen programming system.

4.1.5.1 Function

Referencing
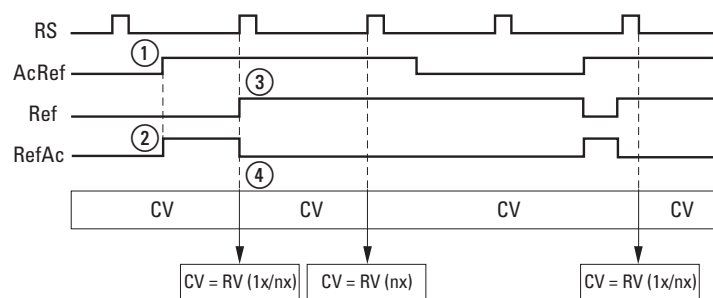
Figure 19: Referencing

Table 2: Meaning of the signals

Signal	Description
RS	Reference encoder signal
AcRef	Activate Referencing
Ref	Referenced
RefAc	Referencing activated
CV	Counter value
RV	Reference value
CV = RV	The reference value overwrites the count value when setting (1x/nx): once (1x) or permanent (nx) (nx): permanent

Referencing can be carried out once or repeatedly. Generally speaking, the **Activate Referencing** (**AcRef**) output bit must be set in order to detect the reference signal (1). The module will then respond by setting the **Referencing Activated** (**RefAc**) input bit (2). This bit can be read.

If a reference pulse (3) occurs, input bit **RefAc** will be set to the 0 signal and the counter's value will be overwritten with the initial value (4). If another reference pulse occurs afterwards, the counter's value will be overwritten with the initial value only if the **RefMod** parameter (bit 2) has been set to 1.

X1, X2, X4 edge evaluation of counter pulses
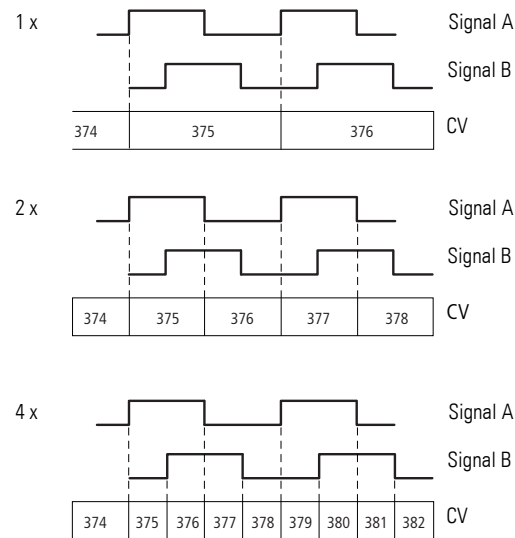
Figure 20:Edge evaluation
CV = Counter value
1 x = simple, 2 x = double, 4 x = four-way

4.1.5.2 Diagnostics

In the event of a diagnosis the module reports the following error causes (0 is set for bit 4 in the input byte):

Value [hex]	Meaning
0x23	Sensor power supply overload, short-circuit at connector X1
0x1B	No sensor connected to connector X1 (if current monitoring has been configured)
0x14	Internal device fault

5 Universal module

5.1 EU1M-SWD-NOP

5.1.1 Introduction

Universal module EU1M-SWD-NOP can be installed as a placeholder for IP67 modules that have been configured in a system but that will only be actually installed in the system if the latter is expanded. The aim here is to engineer and program the full extent of envisaged expansion in the PLC's user program while not (yet) installing the corresponding hardware.
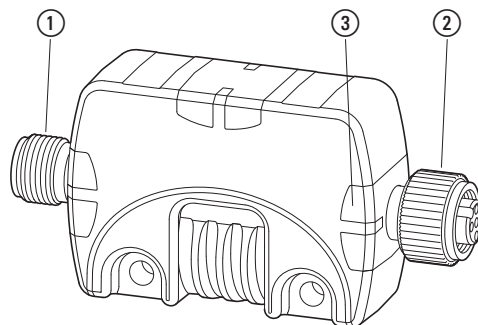
5.1.2 Surface mounting

Figure 21:Connections of the module EU1M-SWD-NOP
① SmartWire-DT connection SWD IN
② SmartWire-DT connection SWD OUT
③ SmartWire-DT diagnostics LED

5.1.3 Engineering

Universal modules are used as placeholders in systems. This means that the SmartWire-DT modules that will later take their place are the ones that actually need to be configured in the PLC configurator. When this is done, all the corresponding input/output information will be available and the PLC program will be able to process it. The user program can detect the presence of a universal module being used as a placeholder for the module that is actually set up in the PLC configuration (bit 4 and bit 7 in the first input byte's input table). At a later date the universal modules can be replaced with the intended device to extend system functionality without having to alter program or hardware configuration. To facilitate this functionality, the PLC's user software and control configuration must fulfill a number of prerequisites.

Procedure:

▶ In the PLC's control configuration, program the SmartWire-DT modules that will be required at a later date in addition to the ones that will be installed and used immediately. In addition, the "Can be replaced with universal module" parameter needs to be enabled for the modules that will be required at a later date.

▶ In the user program, query whether the originally configured SmartWire-DT module is installed or whether a universal module is installed (the SUBST bit in status byte IB0 will have a value of 1 if there is a universal module installed). The program flow must be controlled according to this information.

▶ Install the universal module instead of the planned module in the hardware configuration. If the universal module is later replaced with the originally planned SmartWire-DT module, press the **Config.** button on the gateway in order to incorporate the new module into the SmartWire-DT network.

5.1.4 Programming

Universal modules do not have any input/output data of their own.
The user program will instead show the data corresponding to the configured module. the SUBST bit (bit 7) in status byte IB0 (SUBST = Substitute) will be set in order to let the PLC know that there is a universal module instead of the module configured in the PLC.

5.1.4.1 Diagnostics

If the universal module is plugged in, the module will not send any diagnostic messages.

6 Power supply

6.1 EU1S-SWD-PF1-2

6.1.1 Introduction

SmartWire-DT module EU1S-SWD-PF1-2 can be used as an additional feeder module for feeding the 24 V DC supply voltage required for the SmartWire-DT network. This voltage is used to power both SmartWire-DT modules and connected sensors and actuators.
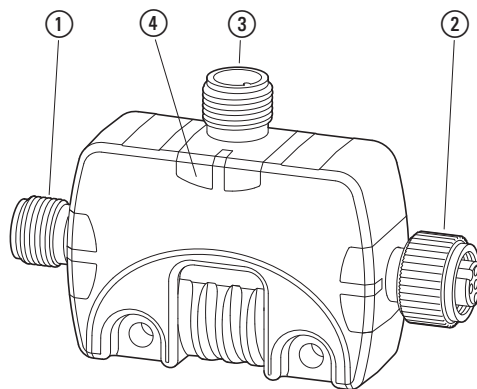
6.1.2 Surface mounting

Figure 22:Connections of the module EU1S-SWD-PF1-2
① SmartWire-DT connection IN
② SmartWire-DT connection OUT
③ 24-V-DC connection POW IN
④ 24-V status display

6.1.3 Engineering

Supply

The supply voltage is fed at the POW IN M12 plug connector. The 24 V DC voltage being fed must be galvanically isolated from other feeder modules in the relevant SmartWire-DT network.

cable protection

The M12 cables are sized for a maximum current load of 4 A. To fuse the 24 VDC supply at the connector for POW IN, use the following in accordance with DIN VDE 0641 Part 11, IEC/EN 60898 or UL 508 and CSA-22.2 No. 14:

- Miniature circuit-breaker 24 V DC rated operational current 4 A; trip type B or
- Fuse 4 A, utilization category gL/gG

If there will be a transition from the M12 cable to the SmartWire-DT ribbon cable later on, the fuse's specifications must be adjusted accordingly, as the ribbon cable has a reduced ampacity of 3 A (CE) / 2 A (UL).

➜ Please refer to the information in the "SmartWire-DT - The System" manual, MN05006002Z-EN.

6.1.3.1 Plug configuration - connection X1

Pin	Configuration
1	24 V DC
2	Not used
3	0V
4	Not used
5	Not used

7 Accessories

7.1 EU2A-SWD-PBWN

7.1.1 Introduction

SmartWire-DT module EU2A-SWD-PBWN can be used to set up a local SmartWire-DT network.

7.1.2 Surface mounting
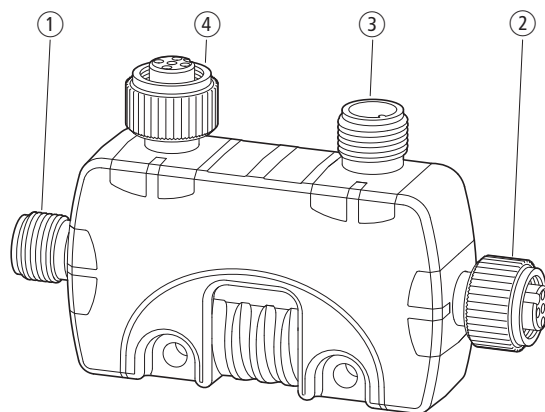
Figure 23: Connections of the module EU2A-SWD-PBWN

① SmartWire-DT connection IN
② SmartWire-DT connection OUT
③ SmartWire-DT - local network IN
④ SmartWire-DT - local network OUT

7.1.3 Engineering

Module EU2A-SWD-PBWN can be used to connect SmartWire-DT modules if a SmartWire-DT network deviates from the usual line topology. The length of the resulting local network must not exceed 10 m.
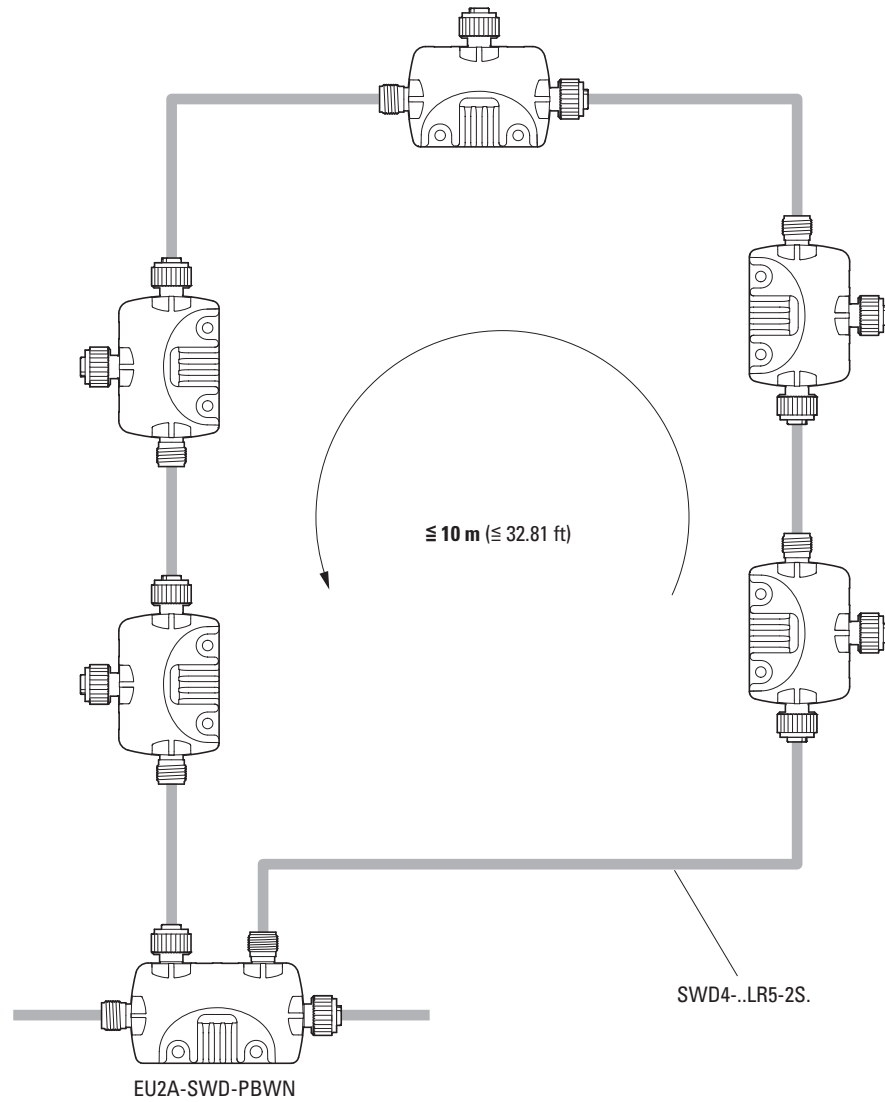
Figure 24:Local network

Please use SWD4-…LR5-2S SmartWire-DT cables to connect the modules in a local network.

> *NOTICE*
>
> The addressing cable is split in module EU2A-SWD-PBWN and is then routed through the local network.
> If there is a module missing from the local network (or if a plug on the EU2A-SWD-PBWN module is disconnected), only the modules up to the point where the cable's continuity is interrupted will be detected when reading a new configuration (when the configuration button on the SmartWire-DT coordinator is pressed).
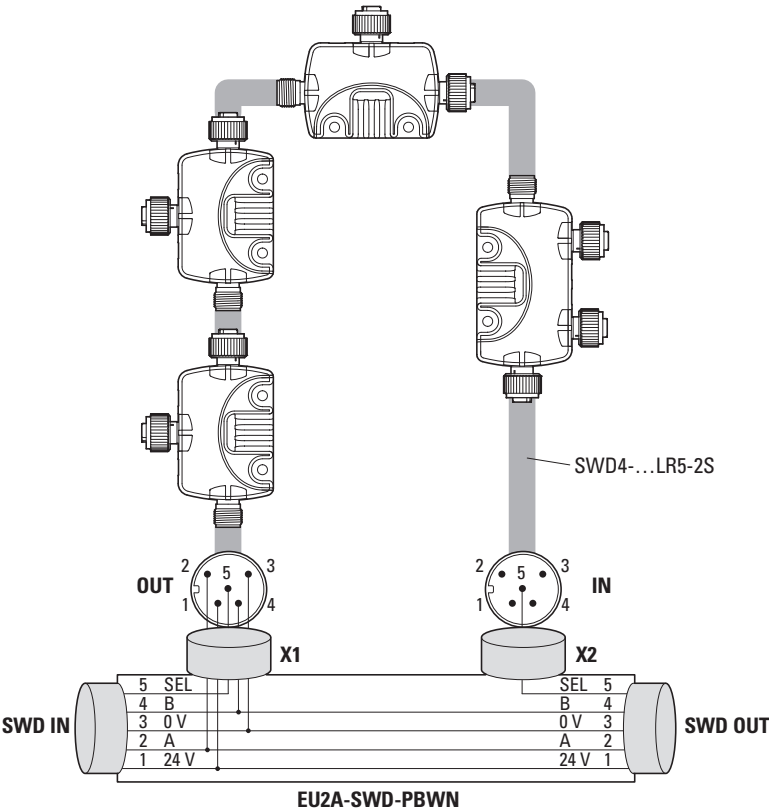
Figure 25:

7.1.3.1 Plug configuration - connection OUT, IN

Pin	Configuration OUT	Configuration IN
1	24 V DC	Not used
2	Communication cable A	Not used
3	0V	Not used
4	Communication cable B	Not used
5	Addressing cable SEL OUT	Addressing cable SEL IN

7 Accessories
7.1 EU2A-SWD-PBWN

8 Using SmartWire-DT modules with the EtherCAT field bus

The EtherCAT PLC configurator needs device description files in XML format (ESI files, where ESI = EtherCAT Slave Information) for configuration purposes (for selecting and configuring SmartWire-DT modules). In addition to process data information, these ESI files also contain a series of elements for each SmartWire-DT module, such as a module ID (Product Code), configuration data (CFG), device options (Options), and additional device parameters (Parameters).

If a SmartWire-DT module is installed, the configuration software (e.g., Twin-CAT; ➔ see also below) will assign these data sets to each module as follows (all values in hexadecimal format):

Module 1: Index 0x8000 (example)

- Module ID (Product Code): Sub-index 06
- Configuration data (CFG): Sub-index 20
- Device options (Options): Sub-index 21
- Device parameters (Parameters): Sub-index 22

The gateway needs the module ID (Product Code) in sub-index 06 and the configuration data (CFG) in sub-index 20 for identification and configuration purposes. **Do not modify** this data!

In contrast, the device options (Options) in sub-index 21 and the device parameters (Parameters) in sub-index 22 can be modified if necessary.

Device options

The device options (Options) in sub-index 21 are identical for all SmartWire-DT modules. They contain two pieces of information that can be modified:

Bit 1: Module is optional/not optional

Bit 4: Module can be replaced/cannot be replaced with a universal module

The corresponding option byte contains additional information that should not be modified.

Table 3:   Option byte

Bit	Meaning	Note
0	Module features extended parameters	Do not change this bit's value!
1	Module is optional	FALSE (0): Data communications on the SmartWire-DT network will continue even if the module is missing. TRUE (1): No data communications on the SmartWire-DT network if the module is missing (default setting).
2	CRC8 checksum	Do not change this bit's value!
3	Data format	Do not change this bit's value!
4	Can be replaced with universal module	FALSE (0): It is not permitted for the device to be replaced with a universal module (default setting). TRUE(1): It is permitted for the device to be replaced with a universal module.

Bit	Meaning	Note
5	reserved	Do not change this bit's value!
6	Module features data profiles	Do not change this bit's value!
7	Module supports acyclical data communications	Do not change this bit's value!

Since the EtherCAT configurator only allows for whole bytes to be written, the required value needs to be determined individually and the corresponding option byte must then be overwritten.

Example

Analog module EU5E-SWD-2A2A has the following entries:

C PS	CoE	0x8000:06	0x01060504 (17171716)	Product code EU5E-SWD-2A2A
C PS	CoE	0x8000:20	0x00E1D110 (14799120)	CFG EU5E-SWD-2A2A
C PS	CoE	0x8000:21	0x83 (131)	Options EU5E-SWD-2A2A
C PS	CoE	0x8000:22	0x5002 (20482)	Parameters EU5E-SWD-2A2A

Option byte receives a value of 0x83.

Bit	Meaning	Note	Default	New
0	Module features extended parameters	Do not change this bit's value!	1	1
1	Module is optional	FALSE (0): Data communications on the Smart-Wire-DT network will continue even if the module is missing. TRUE (1): No data communications on the SmartWire-DT network if the module is missing (default setting).	1	0
2	CRC8 checksum	Do not change this bit's value!	0	0
3	Data format	Do not change this bit's value!	0	0
4	Can be replaced with universal module	FALSE (0): It is not permitted for the device to be replaced with a universal module (default setting). TRUE (1): It is permitted for the device to be replaced with a universal module.	0	0
5	reserved	Do not change this bit's value!	0	0
6	Module features data profiles	Do not change this bit's value!	0	0
7	Module supports acyclical data communications	Do not change this bit's value!	1	1

If you wanted data communications on the SmartWire-DT network to continue even when the module is not present, bit 1 would need to be set to 0. The option byte's new value would then be 0x81.
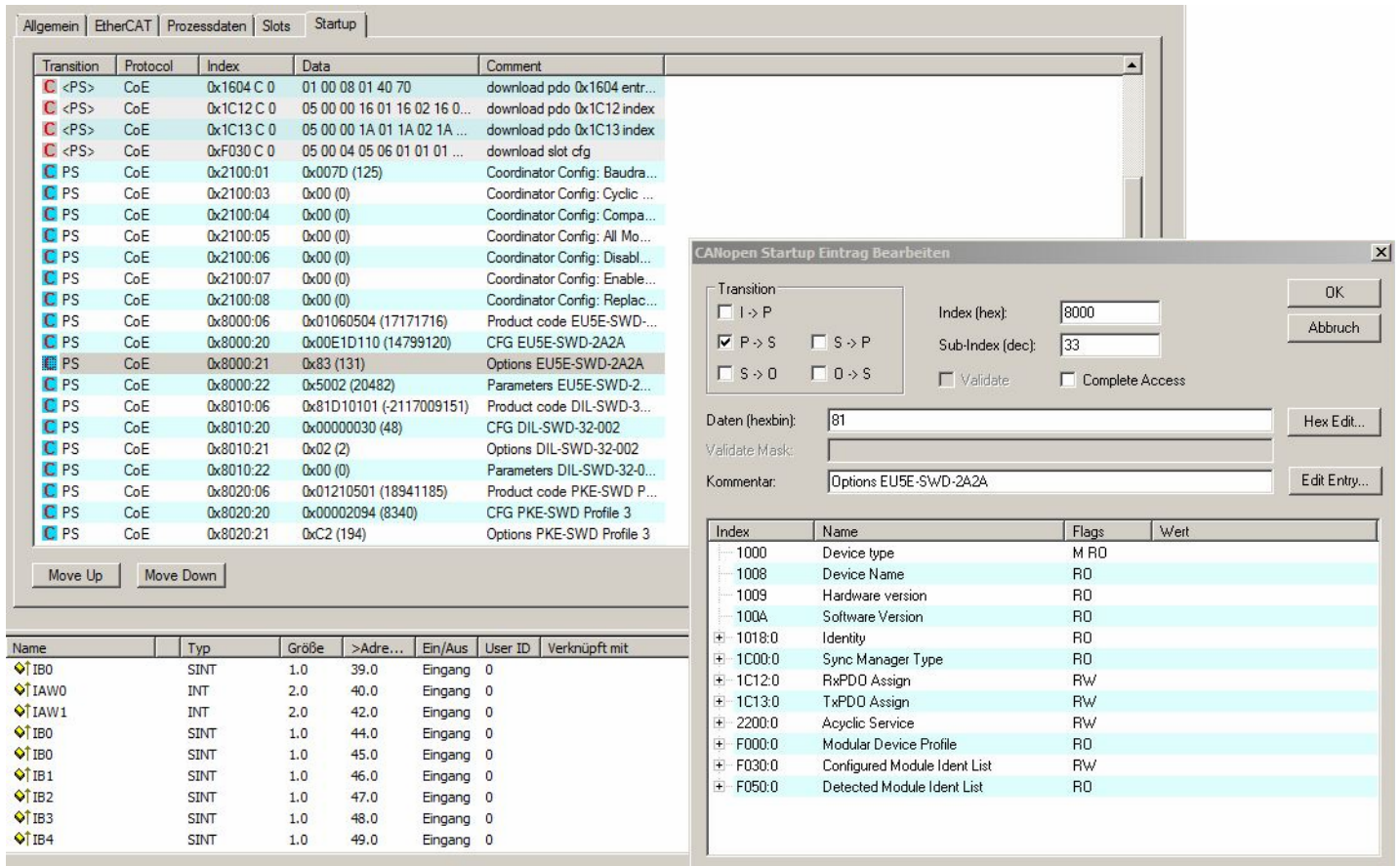
Figure 26:   Changing the value of the option byte for module EU5E-SWD-2A2A

Device parameter

Device parameters are module-specific and make it possible to individually modify module properties. For example, they can be used to select the type of sensor (Pt100, Pt100, Ni1000) and the temperature range in temperature modules. These parameters, together with their corresponding values, are described in the documentation for the individual modules. The values need to be entered the same way as previously with the option byte.

What needs to be considered here is that a length byte, which defines the total length of the parameter data including the length bytes, always precedes the parameter bytes. The presentation of the parameter data depends on the programming system used, and also, in part, on the structure of the parameter data.

Programming system TwinCAT

If the modules have 1, 2 or 4 bytes including the length bytes, they are shown in the overview as a hexadecimal value, otherwise in ascending order.

Example 1: EU5E-SWD-2A2A analog module

`C PS    CoE    0x8000:22   0x5002 (20482)    Parameters EU5E-SWD-2A2A`

The module has a parameter byte and also a length byte.

The **low byte** contains the length value 0 x 02 (1 parameter length byte + 1 parameter byte).

→ Please do not change this value!

The **high byte** contains the parameter value 0x 50 (all 0 - 10 V, average value generation for the analog inputs switched on at 100 ms)

Example 2: EU5E-SWD-4PT temperature acquisition module

`C PS    CoE    0x8050:22   03 00 00    Parameters EU5E-SWD-4PT`

The module has two parameter bytes and one length byte as well, so a total of three bytes. In this case, no hexadecimal values is shown in TwinCat Manager, but instead the values are output in the byte series, so the exact opposite of the hexadecimal presentation.

The length byte is 3, the two parameter bytes 0, which means that no temperature sensor has been defined (pre-setting)

Changing parameter values

The parameters are changed the same way that option bytes as changed. Press on the **Edit** button to open the dialog where you can change the parameter values. Here, irrespective of the number of parameter data, the values in the hexadecimal presentation are output in ascending order; so
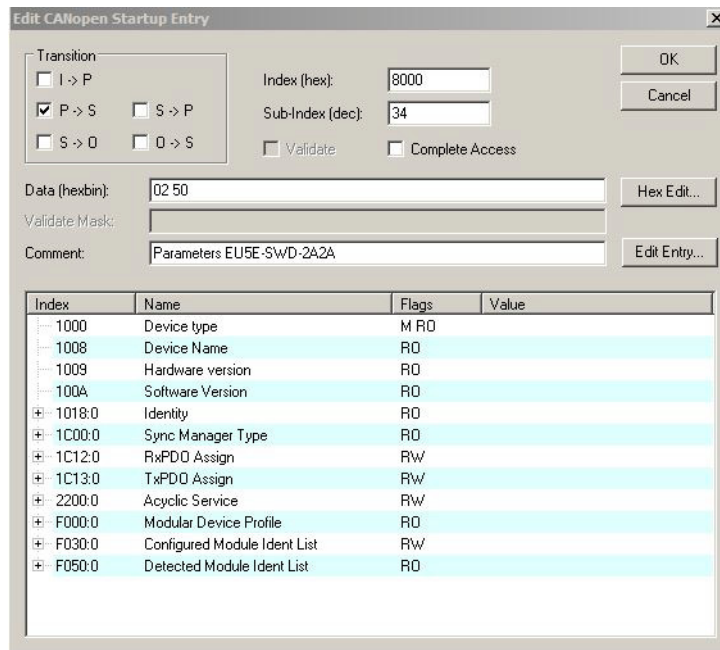
Length byte

Parameter byte 1:

Parameter byte 2

…

For the two examples above, this means:

- EU5E-SWD-2A2A module:
  - Length byte: 2
  - Parameter byte 1: 50
- EU5E-SWD-4PT module:
  - Length byte: 3
  - Parameter byte 1: 00
  - Parameter byte 2: 00

Figure 27:   Dialog window in which parameter values are entered or changed

9 Appendix

9.1 Technical Data

9.1.1 Digital modules

	EU1E-SWD-1DX	EU1E-SWD-2DX	EU2E-SWD-2DX	EU2E-SWD-4DX	EU1E-SWD-2DD	EU2E-SWD-4DD
General						
Standards	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178
Dimensions (W x H x D)	85.6 mm x 20.1 mm x 56.9 mm	85.6 mm x 20.1 mm x 56.9 mm	85.6 mm x 20.1 mm x 56.9 mm	85.6 mm x 20.1 mm x 56.9 mm	85.6 mm x 20.1 mm x 56.9 mm	85.6 mm x 20.1 mm x 56.9 mm
Weight	0.07 kg	0.07 kg	0.09 kg	0.09 kg	0.07 kg	0.09 kg
Mounting	Screw (M4), clips (M20)	Screw (M4), clips (M20)	Screw (M4), clips (M20)	Screw (M4), clips (M20)	Screw (M4), clips (M20)	Screw (M4), clips (M20)
Mounting position	any	any	any	any	any	any
Ambient mechanical conditions						
Degree of protection (IEC/EN 60529)	IP67	IP67	IP67	IP67	IP67	IP67
Vibrations (IEC/EN 61131-2:2008)						
constant amplitude 3.5 mm	5 - 8.4 Hz	5 - 8.4 Hz	5 - 8.4 Hz	5 - 8.4 Hz	5 - 8.4 Hz	5 - 8.4 Hz
constant acceleration, 1 g	8.4 - 150 Hz	8.4 - 150 Hz	8.4 - 150 Hz	8.4 - 150 Hz	8.4 - 150 Hz	8.4 - 150 Hz
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 30 g/11 ms	9 Impact resistances	9 Impact resistances	9 Impact resistances	9 Impact resistances	9 Impact resistances	9 Impact resistances
Drop to IEC/EN 60068-2-31	50 mm	50 mm	50 mm	50 mm	50 mm	50 mm
Free fall, packaged (IEC/EN 60068-2-32)	0.3 m	0.3 m	0.3 m	0.3 m	0.3 m	0.3 m
Electromagnetic compatibility (EMC)						
Overvoltage category	II	II	II	II	II	II
Pollution degree	3	3	3	3	3	3
Electrostatic discharge (IEC/EN 61131-2:2008)						
Air discharge (Level 3)	8 kV	8 kV	8 kV	8 kV	8 kV	8 kV
Contact discharge (Level 2)	4 kV	4 kV	4 kV	4 kV	4 kV	4 kV
Electromagnetic fields (IEC/EN 61131-2:2008)						
80 - 1000 MHz	10 V/m	10 V/m	10 V/m	10 V/m	10 V/m	10 V/m
1.4 - 2 GHz	3 V/m	3 V/m	3 V/m	3 V/m	3 V/m	3 V/m
2 - 2.7 GHz	1 V/m	1 V/m	1 V/m	1 V/m	1 V/m	1 V/m

9.1 Technical Data

	EU1E-SWD-1DX	EU1E-SWD-2DX	EU2E-SWD-2DX	EU2E-SWD-4DX	EU1E-SWD-2DD	EU2E-SWD-4DD
Radio interference suppression (SmartWire-DT) EN 55011	Class A	Class A	Class A	Class A	Class A	Class A
Burst (IEC/EN 61131-2:2008, Level 3)						
Supply cables	2 kV	2 kV	2 kV	2 kV	2 kV	2 kV
Signal cables	1 kV	1 kV	1 kV	1 kV	1 kV	1 kV
SmartWire-DT cables	1 kV	1 kV	1 kV	1 kV	1 kV	1 kV
Surge (IEC/EN 61131-2:2008, Level 1)						
Supply cables	0.5 kV	0.5 kV	0.5 kV	0.5 kV	0.5 kV	0.5 kV
I/O cables	1 kV	1 kV	1 kV	1 kV	1 kV	1 kV
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	10 V	10 V	10 V	10 V	10 V	10 V
Ambient climatic conditions						
Operating ambient temperature (IEC 60068-2)	-25 - +70 °C	-25 - +70 °C	-25 - +70 °C	-25 - +70 °C	-25 - +70 °C	-25 - +70 °C
Condensation	permissible	permissible	permissible	permissible	permissible	permissible
Storage	-40 - +70 °C	-40 - +70 °C	-40 - +70 °C	-40 - +70 °C	-40 - +70 °C	-40 - +70 °C
SmartWire-DT interface						
Module type	SmartWire-DT module (slave)	SmartWire-DT module (slave)	SmartWire-DT module (slave)	SmartWire-DT module (slave)	SmartWire-DT module (slave)	SmartWire-DT module (slave)
Baud rate setting	automatic	automatic	automatic	automatic	automatic	automatic
Status display SmartWire-DT	LED green	LED green	LED green	LED green	LED green	LED green
Connection						
SWD IN	M12 plug, 5 pole	M12 plug, 5 pole	M12 plug, 5 pole	M12 plug, 5 pole	M12 plug, 5 pole	M12 plug, 5 pole
SWD OUT	M12 socket, 5 pin	M12 socket, 5 pin	M12 socket, 5 pin	M12 socket, 5 pin	M12 socket, 5 pin	M12 socket, 5 pin
Current consumption (24 V SWD supply)	50 mA	55 mA	64 mA	72 mA	58 mA	75 mA
Connection supply and I/O						
M12 socket						
Quantity	1	1	2	2	1	2
Sensor supply current per M12 socket	max. 70 mA	max. 70 mA	max. 70 mA	max. 70 mA	max. 70 mA	max. 70 mA
Digital inputs						
Quantity	1	2	2	4	max. 2	max. 4
Input current	normally 4 mA at 24 V DC	normally 4 mA at 24 V DC	normally 4 mA at 24 V DC	normally 4 mA at 24 V DC	normally 4 mA at 24 V DC	normally 4 mA at 24 V DC
Voltage level to IEC/EN 61131-2						
Limit value type 1	Low < 5 V DC; High > 15 V DC	Low < 5 V DC; High > 15 V DC	Low < 5 V DC; High > 15 V DC	Low < 5 V DC; High > 15 V DC	Low < 5 V DC; High > 15 V DC	Low < 5 V DC; High > 15 V DC

	EU1E-SWD-1DX	EU1E-SWD-2DX	EU2E-SWD-2DX	EU2E-SWD-4DX	EU1E-SWD-2DD	EU2E-SWD-4DD
Debounce	High -> Low typ. < 0.2 ms	High -> Low typ. < 0.2 ms	High -> Low typ. < 0.2 ms	High -> Low typ. < 0.2 ms	High -> Low typ. < 0.2 ms	High -> Low typ. < 0.2 ms
	Low -> High typ. < 0.2 ms	Low -> High typ. < 0.2 ms	Low -> High typ. < 0.2 ms	Low -> High typ. < 0.2 ms	Low -> High typ. < 0.2 ms	Low -> High typ. < 0.2 ms
Status display inputs LED	yellow	yellow	yellow	yellow	yellow	yellow
Digital semiconductor outputs						
Number	–	–	–	–	max. 2	max. 4
Output current	–	–	–	–	≦ 0.5 A	≦ 0.5 A
Short-circuit tripping current	–	–	–	–	max. 1.2 A over 3 ms	max. 1.2 A over 3 ms
Lamp load RLL	–	–	–	–	≦ 3 W	≦ 3 W
Overload proof	–	–	–	–	yes, with diagnostics	yes, with diagnostics
Switching capacity	–	–	–	–	EN 60947-5-1 utilization category DC-13	EN 60947-5-1 utilization category DC-13
Status display outputs	–	–	–	–	LED, yellow	LED, yellow
Sensor/actuator power supply						
Supply voltage	U_e - 0.16 V	U_e - 0.16 V	U_e - 0.16 V	U_e - 0.16 V	U_e - 0.16 V	U_e - 0.16 V
Output current per M12 I/O socket	70 mA	70 mA	70 mA	70 mA	70 mA	70 mA
Short-circuit / overload proof	yes, with diagnostics	yes, with diagnostics	yes, with diagnostics	yes, with diagnostics	yes, with diagnostics	yes, with diagnostics
Electrical isolation						
Input to SmartWire-DT	no	no	no	no	no	no
Output from SmartWire-DT	–	–	–	–	no	no
Input to input	no	no	no	no	no	no
Output to input	–	–	–	–	no	no
Output to output	–	–	–	–	no	no

9 Appendix
9.1 Technical Data

9.1.2 Analog modules

	EU1E-SWD-1AX-1	EU1E-SWD-1AX-2	EU1E-SWD-1XA-1	EU1E-SWD-1XA-2	EU2E-SWD-2PT
General					
Standards	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178
Dimensions (W x H x D)	85.6 mm x 56.9 mm x 20.1 mm	85.6 mm x 56.9 mm x 20.1 mm	85.6 mm x 56.9 mm x 20.1 mm	85.6 mm x 56.9 mm x 20.1 mm	85.6 mm x 56.9 mm x 20.1 mm
Weight	0.07 kg	0.07 kg	0.07 kg	0.07 kg	0.09 kg
Mounting	Screw (M4), clips (M20)	Screw (M4), clips (M20)	Screw (M4), clips (M20)	Screw (M4), clips (M20)	Screw (M4), clips (M20)
Mounting position	any	any	any	any	any
Ambient mechanical conditions					
Degree of protection (IEC/EN 60529)	IP67	IP67	IP67	IP67	IP67
Vibrations (IEC/EN 61131-2:2008)					
constant amplitude 3.5 mm	5 - 8.4 Hz	5 - 8.4 Hz	5 - 8.4 Hz	5 - 8.4 Hz	5 - 8.4 Hz
Constant acceleration, 1 g	8.4 - 150 Hz	8.4 - 150 Hz	8.4 - 150 Hz	8.4 - 150 Hz	8.4 - 150 Hz
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 30 g/11 ms	9 Impact resistances	9 Impact resistances	9 Impact resistances	9 Impact resistances	9 Impact resistances
Drop to IEC/EN 60068-2-31	50 mm	50 mm	50 mm	50 mm	50 mm
Free fall, packaged (IEC/EN 60068-2-32)	0.3 m	0.3 m	0.3 m	0.3 m	0.3 m
Electromagnetic compatibility (EMC)					
Overvoltage category	II	II	II	II	II
Pollution degree	3	3	3	3	3
Electrostatic discharge (IEC/EN 61131-2:2008)					
Air discharge (Level 3)	8 kV	8 kV	8 kV	8 kV	8 kV
Contact discharge (Level 2)	4 kV	4 kV	4 kV	4 kV	4 Kv
Electromagnetic fields (IEC/EN 61131-2:2008)					
80 - 1000 MHz	10 V/m	10 V/m	10 V/m	10 V/m	10 V/m
1.4 - 2 GHz	3 V/m	3 V/m	3 V/m	3 V/m	3 V/m
2 - 2.7 GHz	1 V/m	1 V/m	1 V/m	1 V/m	1 V/m
Radio interference suppression (SmartWire-DT) EN55011	Class A	Class A	Class A	Class A	Class A
Burst (IEC/EN 61131-2:2008, Level 3)					
Supply cables	2 kV	2 kV	2 kV	2 kV	2 kV
Signal cables	1 kV	1 kV	1 kV	1 kV	1 kV
SmartWire-DT cables	1 kV	1 kV	1 kV	1 kV	1 kV
Surge (IEC/EN 61131-2:2008, Level 1)					
Supply cables	0.5 kV	0.5 kV	0.5 kV	0.5 kV	0.5 kV
I/O cables	1 kV	1 kV	1 kV	1 kV	1 kV
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	10 V	10 V	10 V	10 V	10 V

	EU1E-SWD-1AX-1	EU1E-SWD-1AX-2	EU1E-SWD-1XA-1	EU1E-SWD-1XA-2	EU2E-SWD-2PT
Ambient climatic conditions					
Operating ambient temperature (IEC 60068-2)	-25 - +70 °C	-25 - +70 °C	-25 - +70 °C	-25 - +70 °C	-25 - +70 °C
Condensation	permissible	permissible	permissible	permissible	permissible
Storage	-40 - +70 °C	-40 - +70 °C	-40 - +70 °C	-40 - +70 °C	-40 - +70 °C
SmartWire-DT interface					
Module type	SmartWire-DT module (slave)	SmartWire-DT module (slave)	SmartWire-DT module (slave)	SmartWire-DT module (slave)	SmartWire-DT module (slave)
Baud rate setting	automatic	automatic	automatic	automatic	automatic
Status display SmartWire-DT	LED green	LED green	LED green	LED green	LED green
Connection					
SWD IN	M12 plug, 5 pole	M12 plug, 5 pole	M12 plug, 5 pole	M12 plug, 5 pole	M12 plug, 5 pole
SWD OUT	M12 socket, 5 pin	M12 socket, 5 pin	M12 socket, 5 pin	M12 socket, 5 pin	M12 socket, 5 pin
Current consumption (24 V SWD supply)	30 mA	30 mA	40 mA	50 mA	35 mA
Connection supply and I/O					
M12 socket (quantity)	1	1	1	1	2
Analog inputs					
Number	1	1			
Parameter definition					
Averaging	adjustable	adjustable			
Voltage					
Input voltage	0 - 10 V				
Input resistance	20 kΩ				
Current					
Input current		0 - 20 mA			
Input resistance		< 225 Ω			
Resolution	12 Bit	12 Bit			
Conversion time	20 ms	20 ms			
Cumulative error	±1 % (of measurement range)	±1 % (of measurement range)			
Repetition accuracy	±0.5 V (of measurement range)	±0.5 % (of measurement range)			
Electric strength	±30 V	±30 V			
Analog outputs					
Number			1	1	
Parameter definition					
Voltage					
Output voltage			0 - 10 V		
Max. output current			10 mA		

	EU1E-SWD-1AX-1	EU1E-SWD-1AX-2	EU1E-SWD-1XA-1	EU1E-SWD-1XA-2	EU2E-SWD-2PT
Current					
Output current				0 - 20 mA	
Load resistance				< 500 Ω	
protected against overload/short-circuit proof			yes	yes	
Resolution			12 Bit	12 Bit	
Conversion time			20 ms	20 ms	
Cumulative error			±1 % (of measurement range)	±1 % (of measurement range)	
Repetition accuracy			±0.5 % (of measurement range)	±0.5 % (of measurement range)	
Temperature inputs					
Number	–	–	–	–	2 (2-, 3-wire connection, screened, length < 10 m)
Parameter definition					
Temperature sensor	–	–	–	–	Pt100, Pt1000, Ni1000
Averaging	–	–	–	–	adjustable
Temperature range	–	–	–	–	Setting 1: Pt100, Pt1000: -50 °C - +200 °C Ni1000: -50 °C - +150 °C Setting 2: Pt100, Pt1000: -100 °C - + 400 °C Ni1000: -50 °C - +200 °C
Resolution					0.1°
Conversion time					50 ms
Application Style					°C, °F, nonlinear
Cumulative error					±1 % (of measurement range)
Repetition accuracy					±0.5 % (of measurement range)
Potential isolation					
Input to SmartWire-DT	no	no	–	–	no
Output from SmartWire-DT	–	–	no	no	–
Input to input	–	–	–	–	no
Output to input	–	–	–	–	–
Output to output	–	–	–	–	–

9.1.3 Accessories

	SWD4-SFL8-12	SWD4-SML8-12	SWD4-RC5-10
General			
Standards	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178	IEC/EN 61131-2, EN 50178
Dimensions (W x H x D)	35 mm x 83 mm x 40 mm	35 mm x 83 mm x 40 mm	
Weight	0.06 kg	0.06 kg	0.02 kg
Mounting position	any	any	any
Ambient mechanical conditions			
Degree of protection (IEC/EN 60529)	IP20	IP20	IP67
Vibrations (IEC/EN 61131-2:2008)			
constant amplitude 3.5 mm	5 - 8.4 Hz	5 - 8.4 Hz	5 - 8.4 Hz
constant acceleration, 1 g	8.4 - 150 Hz	8.4 - 150 Hz	8.4 - 150 Hz
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 30 g/11 ms	9 Impact resistances	9 Impact resistances	9 Impact resistances
Drop to IEC/EN 60068-2-31	50 mm Drop height	50 mm Drop height	50 mm Drop height
Free fall, packaged (IEC/EN 60068-2-32)	0.3 m	0.3 m	0.3 m
Electromagnetic compatibility (EMC)			
Overvoltage category	II	II	III
Pollution degree	2	2	3
Electrostatic discharge (IEC/EN 61131-2:2008)			
Air discharge (Level 3)	8 kV	8 kV	8 kV
Contact discharge (Level 2)	4 kV	4 kV	4 kV
Electromagnetic fields (IEC/EN 61131-2:2008)			
80 - 1000 MHz	10 V/m	10 V/m	10 V/m
1.4 - 2 GHz	3 V/m	3 V/m	3 V/m
2 - 2.7 GHz	1 V/m	1 V/m	1 V/m
Radio interference suppression (SmartWire-DT) EN55011	Class A	Class A	Class A
Burst (IEC/EN 61131-2:2008, Level 3)			
Supply cables	2 kV	2 kV	2 kV
SmartWire-DT cables	1 kV	1 kV	1 kV
Surge (IEC/EN 61131-2:2008, Level 1)			
Supply cables	0.5 kV	0.5 kV	0.5 kV
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	10 V	10 V	10 V
Ambient climatic conditions			
Operating ambient temperature (IEC 60068-2)	-25 - +70 °C	-25 - +70 °C	-25 - +70 °C
Condensation	not permissible	not permissible	permissible
Storage	-40 - +70 °C	-40 - +70 °C	-40 - +70 °C
Relative humidity (non-condensing)	5 - 95 %	5 - 95 %	5 - 95 %

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9.1 Technical Data

	SWD4-SFL8-12	SWD4-SML8-12	SWD4-RC5-10
SmartWire-DT interface			
Connection			
SWD IN	Plug, 8-pole	M12 plug, 5 pole	M12 plug, 5 pole
Insertion cycles	≧ 200	≧ 100	≧ 100
SWD OUT	M12 socket, 5 pin	Plug, 8-pole	
Insertion cycles	≧ 100	≧ 200	
Current consumption (24 V SWD supply)	–	–	17 mA
Connection supply			
Connection type	Push in terminals	Push in terminals	
solid	0.2 - 1.5 (AWG24-16)	0.2 - 1.5 (AWG24-16)	
Stranded with ferrule (minimum section length 8 mm)	0.25 - 1.5 (AWG24-16)	0.25 - 1.5 (AWG24-16)	
Protection against polarity reversal DC-IN	yes	–	–

9.1.4 PBWN

	EU2A-SWD-PBWN
General	
Standards	IEC/EN 61131-2, EN 50178
Dimensions (W x H x D)	98.0 mm x 56.9 mm x 20.1 mm
Weight	0.09 kg
Mounting	Screw (M4), clips (M20)
Mounting position	any
Ambient mechanical conditions	
Degree of protection (IEC/EN 60529)	IP67
Vibrations (IEC/EN 61131-2:2008)	
constant amplitude 3.5 mm	5 - 8.4 Hz
constant acceleration 1 g	8.4 - 150 Hz
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 30 g/11 ms	9 Impact resistances
Drop to IEC/EN 60068-2-31	50 mm Drop height
Free fall, packaged (IEC/EN 60068-2-32)	0.3
Electromagnetic compatibility (EMC)	
Overvoltage category	II
Pollution degree	3
Electrostatic discharge (IEC/EN 61131-2:2008)	
Air discharge (Level 3)	8 kV
Contact discharge (Level 2)	4 kV
Electromagnetic fields (IEC/EN 61131-2:2008)	
80 - 1000 MHz	10 V/m
1.4 - 2 GHz	3 V/m
2 - 2.7 GHz	1 V/m
Radio interference suppression (SmartWire-DT) EN55011	Class A
Burst (IEC/EN 61131-2:2008, Level 3)	
Supply cables	2 kV
Signal cables	1 kV
SmartWire-DT cables	1 kV
Surge (IEC/EN 61131-2:2008, Level 1)	
Supply cables	0.5 kV
I/O cables	1 kV
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	10 V
Ambient climatic conditions	
Operating ambient temperature (IEC 60068-2)	-25 - +70 °C
Condensation	permissible
Storage	-40 - +70 °C

	EU2A-SWD-PBWN
SmartWire-DT interface	
SWD IN	M12 plug, 5 pole
SWD OUT	M12 socket, 5 pin
Connection SmartWire-DT branch	
OUT	M12 socket, 5 pin
IN	M12 plug, 5 pole

9.1.5 EU1S-SWD-PF1-2

	EU1S-SWD-PF1-2
General	
Standards	IEC/EN 61131-2, EN 50178
Dimensions (W x H x D)	85.6 mm x 20.1 mm x 56.9 mm
Weight	0.1 kg
Mounting	Screw (M4), clips (M20)
Mounting position	any
Ambient mechanical conditions	
Degree of protection (IEC/EN 60529)	IP67
Vibrations (IEC/EN 61131-2:2008)	
constant amplitude 3.5 mm	5 - 8.4 Hz
constant acceleration 1 g	8.4 - 150 Hz
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 30 g/11 ms	9 Impact resistances
Drop to IEC/EN 60068-2-31	50 mm Drop height
Free fall, packaged (IEC/EN 60068-2-32)	0.3
Electromagnetic compatibility (EMC)	
Overvoltage category	II
Pollution degree	3
Electrostatic discharge (IEC/EN 61131-2:2008)	
Air discharge (Level 3)	8 kV
Contact discharge (Level 2)	4 kV
Electromagnetic fields (IEC/EN 61131-2:2008)	
80 - 1000 MHz	10 V/m
1.4 - 2 GHz	3 V/m
2 - 2.7 GHz	1 V/m
Radio interference suppression (SmartWire-DT) EN55011	Class A
Burst (IEC/EN 61131-2:2008, Level 3)	
Supply cables	2 kV
SmartWire-DT cables	1 kV
Surge (IEC/EN 61131-2:2008, Level 1)	
Supply cables	0.5 kV
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	10 V
Ambient climatic conditions	
Operating ambient temperature (IEC 60068-2)	-25 - +70 °C
Condensation	permissible
Storage	-40 - +70 °C

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9.1 Technical Data

	EU1S-SWD-PF1-2
SmartWire-DT interface	
Module type	-
Baud rate setting	-
Status display SmartWire-DT	-
Connection	
SWD IN	M12 plug, 5 pole
SWD OUT	M12 socket, 5 pin
Current consumption (24 V SWD supply)	-
Supply $U_{POW\ IN}$	
Connection	M12 plug, 5 pole
Supply voltage UPow in	24 V DC -15 % - +20 %
Supply voltage residual ripple	$\leqq$ 5 %
Protection against polarity reversal	yes
max. current	4 A
Short-circuit strength	no, external fuse
Heat dissipation	normally 1 W
Potential isolation	no
IP67 slave rated operating voltage	U_{POWIN} - 0.2 V

9.1.6 EU1E-SWD-NOP

	EU1E-SWD-NOP
General	
Standards	IEC/EN 61131-2, EN 50178
Dimensions (W x H x D)	85.6 mm x 56.9 mm x 20.1 mm
Weight	0.07 kg
Mounting	Screw (M4), clips (M20)
Mounting position	any
Ambient mechanical conditions	
Degree of protection (IEC/EN 60529)	IP67
Vibrations (IEC/EN 61131-2:2008)	
constant amplitude 3.5 mm	5 - 8.4 Hz
constant acceleration 1 g	8.4 - 150
Mechanical shock resistance (IEC/EN 60068-2-27) semi-sinusoidal 30 g/11 ms	9 Impact resistances
Drop to IEC/EN 60068-2-31	50 mm Drop height
Free fall, packaged (IEC/EN 60068-2-32)	0.3 m
Electromagnetic compatibility (EMC)	
Overvoltage category	II
Pollution degree	3
Electrostatic discharge (IEC/EN 61131-2:2008)	
Air discharge (Level 3)	8 kV
Contact discharge (Level 2)	4 kV
Electromagnetic fields (IEC/EN 61131-2:2008)	
80 - 1000 MHz	10 V/m
1.4 - 2 GHz	3 V/m
2 - 2.7 GHz	1 V/m
Radio interference suppression (SmartWire-DT) EN55011	Class A
Burst (IEC/EN 61131-2:2008, Level 3)	
Supply cables	2 kV
Signal cables	1 kV
SmartWire-DT cables	1
Surge (IEC/EN 61131-2:2008, Level 1)	
Supply cables	0.5
I/O cables	1
Radiated RFI (IEC/EN 61131-2:2008, Level 3)	10
Ambient climatic conditions	
Operating ambient temperature (IEC 60068-2)	-25 - +70 °C
Condensation	permissible
Storage	-40 - +70 °C

9 Appendix
9.1 Technical Data

	EU1E-SWD-NOP
SmartWire-DT interface	
Module type	SmartWire-DT module (slave)
Baud rate setting	automatic
Status display SmartWire-DT	LED green
Connection	
SWD IN	M12 plug, 5 pole
SWD OUT	M12 Socket, 5-pole
Current consumption (24 V SWD supply)	17 mA

9.1.7 Current consumption
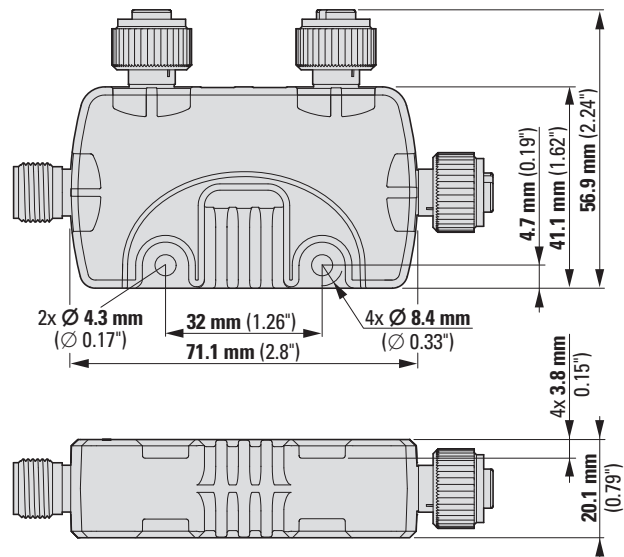
Table 4:   Current consumption

Device	Current consumption [mA]
EU1E-SWD-1DX	50
EU1E-SWD-1XD	54
EU1E-SWD-2DX	55
EU1E-SWD-2DD	58
EU2E-SWD-2DX	55
EU2E-SWD-2DD	58
EU2E-SWD-4DX	72
EU2E-SWD-4DD	75
EU1E-SWD-1AX-1	30
EU1E-SWD-1AX-2	30
EU1E-SWD-1XA-1	40
EU1E-SWD-1XA-2	50
EU2E-SWD-2PT	35
SWD4-RC5-10	17
EU2A-SWD-PBWN	0
EU1E-SWD-NOP	40

9.2 Dimensions

9.2.1 EU1E-SWD-…
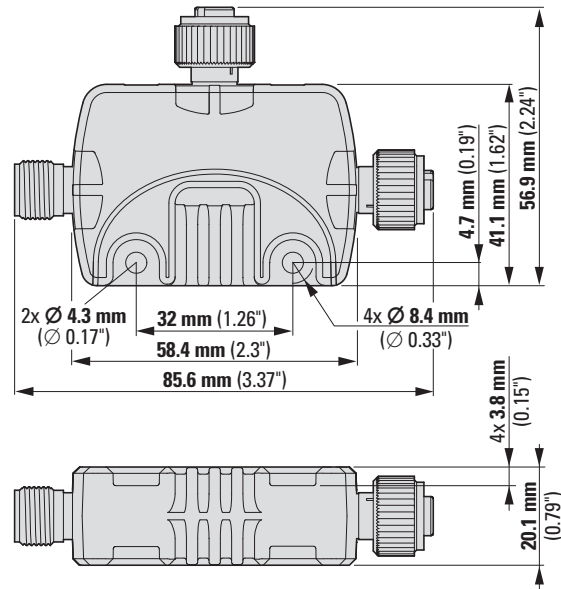
9.2.2 EU2E-SWD-…

9.2.3 EU1M-SWD-N0P
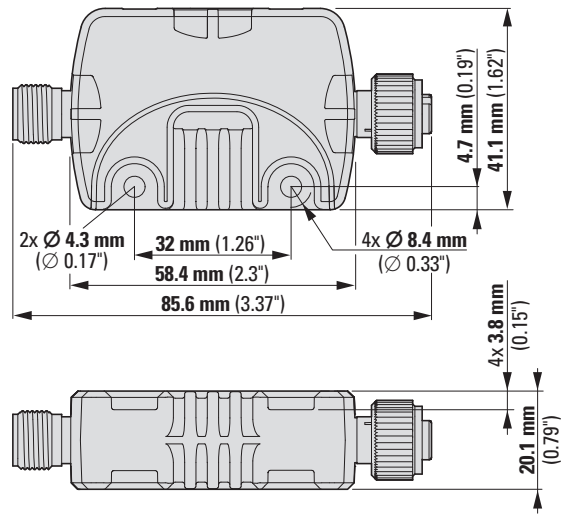
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9.2 Dimensions