

AXL E PB DI8 DO4 2A M12 6M

**Axioline E PROFIBUS device, metal housing,
8 inputs, 4 outputs, 24 V DC,
M12 fast connection technology**



Data sheet
8433_en_03

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1 Description

The Axioline E device is designed for use within a PROFIBUS network.

It is used to acquire and output digital signals.

The device is designed for use in systems manufacturing. It is suitable for use without a control cabinet under harsh industrial conditions. The Axioline E device can be used on tool platforms, directly on welding robots or in conveying technology, for example.

PROFIBUS features

- Connection to PROFIBUS DP using M12 connectors (B-coded)
- DP/V1 for Class 1 and Class 2 masters
- Data transmission speed of 9.6 kbps up to 12 Mbps (automatic detection)
- Rotary encoding switches for setting the PROFIBUS address
- Supported PROFIBUS addresses 0 to 126
- PROFIBUS features: Sync mode, Freeze mode, I & M functions
- Device description using GSD file

Axioline E features

- Connection of digital sensors and actuators to M12 connectors (A-coded)
- Diagnostic and status indicators
- Short-circuit and overload protection of the sensor supply
- IP65/67 degree of protection



This data sheet is only valid in association with the associated user manual.



Make sure you always use the latest documentation.
It can be downloaded from the product at phoenixcontact.net/products.

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3 Ordering data

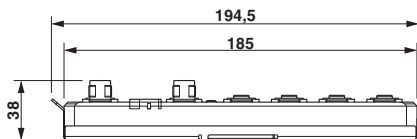
| Description | Type | Order No. | Pcs./Pkt. |
|--|----------------------------|-----------|-----------|
| Axioline E PROFIBUS device in a metal housing with 8 digital inputs and 4 digital outputs, each with a load capacity of 2 A, 24 V DC, M12 fast connection technology | AXL E PB DI8 DO4 2A M12 6M | 2701507 | 1 |
| Accessories | | | |
| An M12 screw plug for the unoccupied M12 sockets of the sensor/actuator cable, boxes and flush-type connectors (Protection and sealing elements) | PROT-M12 | 1680539 | 5 |
| Bus system T-plug, PROFIBUS, M12 B-coded male plug to M12 B-coded male plug and M12 B-coded female plug, shielded (Connector/Adapter) | SAC-M12T/2XM12 PB DP | 1507780 | 1 |
| Terminating resistor PROFIBUS M12 (Connector/Adapter) | SAC-5P-M12MS PB TR | 1507803 | 5 |
| Mounting plate for Axioline E metal devices (Assembly) | AXL E MP 60 | 2701761 | 1 |
| Snap-in markers, Sheet, white, unlabeled, can be labeled with: THERMOMARK CARD, BLUEMARK CLED, BLUEMARK LED, TOPMARK LASER, Mounting type: snapped into marker carrier, Lettering field: 7 x 10 mm (Marking) | UCT-EM (7X10) | 0830765 | 10 |
| Documentation | | | |
| User manual, English, Axioline E: system and installation | UM EN AXL E SYS INST | - | - |
| Application note, English, Startup of Axioline E PROFIBUS devices on a SIMATIC® S7 controller (for experienced S7 users) | AH EN S7 - AXL E PB PRO | - | - |

Additional ordering data

For additional accessories, visit phoenixcontact.net/products.

4 Technical data

Dimensions (nominal sizes in mm)



| | |
|--------|--------|
| Width | 60 mm |
| Height | 185 mm |
| Depth | 38 mm |

Note on dimensions

The height is 194.5 mm including the mounting plate. With fixing clips pulled out, the height is 212 mm. The depth is 38 mm including the mounting plate (30.5 mm without the mounting plate).

General data

| | |
|---------------------------------|------------------|
| Housing material | Zinc die-cast |
| Weight | 750 g |
| Ambient temperature (operation) | -25 °C ... 60 °C |



CAUTION: Risk of burns

If the device is used at an ambient temperature above 50°C, the contact temperature of metal surfaces may exceed 70°C.

| | |
|--|---|
| Ambient temperature (storage/transport) | -25 °C ... 85 °C |
| Permissible humidity (operation) | 5 % ... 95 % |
| Permissible humidity (storage/transport) | 5 % ... 95 % |
| Air pressure (operation) | 70 kPa ... 106 kPa (up to 3000 m above sea level) |
| Air pressure (storage/transport) | 70 kPa ... 106 kPa (up to 3000 m above sea level) |
| Degree of protection | IP65/IP67 |
| Protection class | III, IEC 61140, EN 61140, VDE 0140-1 |

Connection data

| | |
|-------------------|---------------|
| Connection method | M12 connector |
|-------------------|---------------|

Interface PROFIBUS DP

| | |
|------------------------------|--|
| Number | 2 |
| Connection method | 2x M12 connectors, B-coded |
| Designation connection point | Copper cable |
| Number of positions | 5 |
| Transmission speed | 9,6 kBit/s ... 12 MBit/s (Automatic baud rate detection) |
| Transmission physics | PROFIBUS-DP-compliant copper cable |

PROFIBUS DP

| | |
|--------------------|----------------|
| Equipment type | PROFIBUS slave |
| PROFIBUS protocols | DP V1 |

Supply: Module electronics and sensors (U_S)

| | |
|------------------------------|--|
| Connection method | M12 connector (T-coded) |
| Number of positions | 4 |
| Supply voltage | 24 V DC |
| Nominal supply voltage range | 18 V DC ... 31.2 V DC (including all tolerances, including ripple) |
| Typical current consumption | 110 mA ±15 % (at 24 V DC) |
| Current consumption | max. 12 A |

Supply: Actuators (U_A)

| | |
|------------------------------|--|
| Connection method | M12 connector (T-coded) |
| Number of positions | 4 |
| Supply voltage | 24 V DC |
| Nominal supply voltage range | 18 V DC ... 31.2 V DC (including all tolerances, including ripple) |
| Typical current consumption | 30 mA ±15 % (at 24 V DC) |
| Current consumption | max. 12 A |

Digital inputs

| | |
|--|---------------------------------|
| Number of inputs | 8 (EN 61131-2 types 1 and 3) |
| Connection method | M12 connector, double occupancy |
| Connection method | 2, 3, 4-wire |
| Nominal input voltage | 24 V DC |
| Nominal input current | typ. 3 mA |
| Sensor current per channel | typ. 0.75 mA (from U_S) |
| Total sensor current | max. 0.6 A (per device) |
| Input voltage range "0" signal | -30 V DC ... 5 V DC |
| Input voltage range "1" signal | 11 V DC ... 30 V DC |
| Input filter time | < 1000 μ s |
| Permissible conductor length to the sensor | 30 m |
| Overload protection, short-circuit protection of sensor supply | Yes |

Digital outputs

| | |
|---|---|
| Number of outputs | 4 |
| Connection method | M12 connector, (A-coded) |
| Connection method | 2, 3-wire |
| Nominal output voltage | 24 V DC (from voltage U_A) |
| Maximum output current per channel | 2 A |
| Nominal load, ohmic | 12 W (48 Ω ; with nominal voltage) |
| Nominal load, inductive | 12 VA (1.2 H; 48 Ω ; with nominal voltage) |
| Signal delay | max. 150 μ s (when switched on) max. 200 μ s (when switched off) |
| Switching frequency | max. 5500 per second (with at least 50 mA load current) |
| Switching frequency | max. 1 per second (with inductive load) |
| Limitation of the voltage induced on circuit interruption | -28 V ... -17 V |
| Output voltage when switched off | max. 1 V |
| Output current when switched off | max. 20 μ A |
| Behavior with overload | Auto restart |
| Reverse voltage resistance to short pulses | Reverse voltage proof |
| Overcurrent shut-down | min. 2.2 A |
| Overload protection, short-circuit protection of outputs | Electronic |

Configuration data

| | |
|---------------------|-------|
| ID number | 0E60 |
| Input address area | 8 Bit |
| Output address area | 8 Bit |

Electrical isolation/isolation of the voltage areas

| Test section | Test voltage |
|---|------------------------|
| 24 V supply (communications power and sensor supply, digital inputs)/ bus connection | 500 V AC, 50 Hz, 1 min |
| 24 V supply (communications power and sensor supply, digital inputs)/FE | 500 V AC, 50 Hz, 1 min |
| Bus connection / FE | 500 V AC, 50 Hz, 1 min |
| 24 V supply (actuator supply, digital outputs)/ 24 V supply (communications power and sensor supply, digital inputs) | 500 V AC, 50 Hz, 1 min |
| 24 V supply (actuator supply, digital outputs)/bus connection | 500 V AC, 50 Hz, 1 min |
| 24 V supply (actuator supply, digital outputs)/FE | 500 V AC, 50 Hz, 1 min |

Mechanical tests

| | |
|--|--|
| Vibration resistance in acc. with EN 60068-2-6/IEC 60068-2-6 | 5g |
| Shock in acc. with EN 60068-2-27/IEC 60068-2-27 | 30g, 11 ms period, half-sine shock pulse |
| Continuous shock according to EN 60068-2-27/IEC 60068-2-27 | 10g |

Conformance with EMC Directive 2004/108/EC

Noise immunity test in accordance with EN 61000-6-2

| | |
|--|---|
| Electrostatic discharge (ESD) EN 61000-4-2/IEC 61000-4-2 | Criterion B; 6 kV contact discharge, 8 kV air discharge |
| Electromagnetic fields EN 61000-4-3/IEC 61000-4-3 | Criterion A; Field intensity: 10 V/m |
| Fast transients (burst) EN 61000-4-4/IEC 61000-4-4 | Criterion B, 2 kV |
| Transient surge voltage (surge) EN 61000-4-5/IEC 61000-4-5 | Criterion B; DC supply lines: ± 0.5 kV/ ± 0.5 kV (symmetrical/asymmetrical) |
| Conducted interference EN 61000-4-6/IEC 61000-4-6 | Criterion A; Test voltage 10 V |

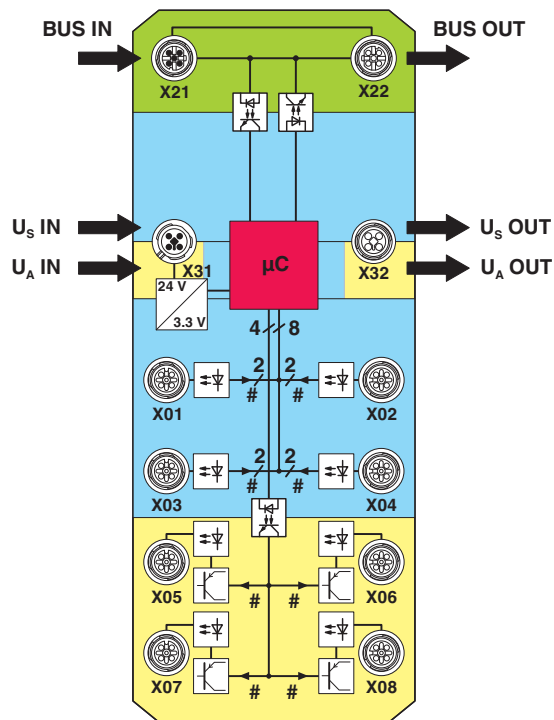
Noise emission test as per EN 61000-6-4

| | |
|--|---------|
| Radio interference properties EN 55022 | Class A |
|--|---------|

Approvals

For the latest approvals, please visit phoenixcontact.net/products.

5 Internal circuit diagram



Key:

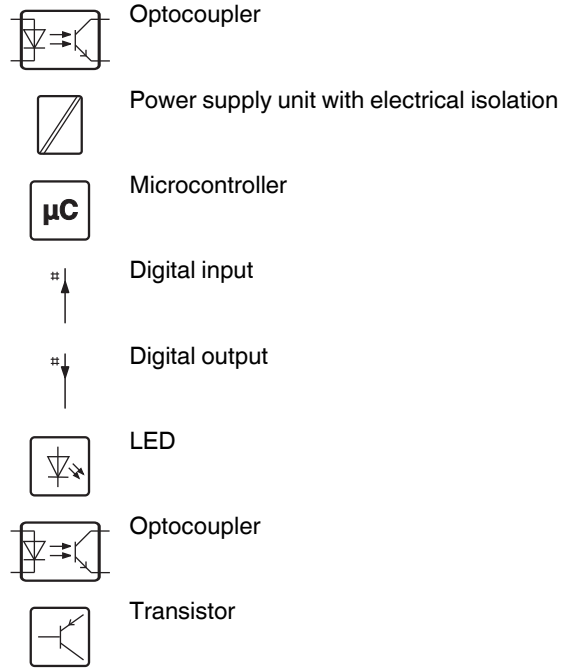


Figure 1 Internal wiring of connections

Key:

Green area: Network
 Blue area: U_S
 Yellow area: U_A

6 Pin assignment

6.1 PROFIBUS and power supply connection

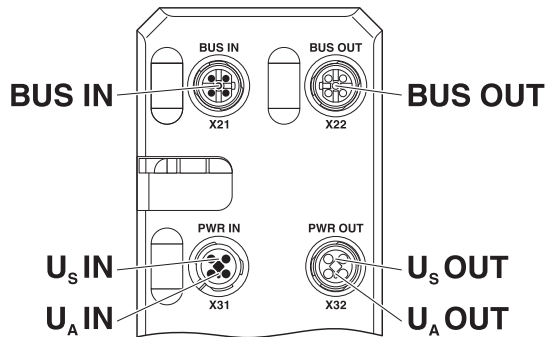


Figure 2 Connections for PROFIBUS and power supply

| Designation | Meaning |
|--------------------------|---|
| BUS IN (X21) | PROFIBUS IN |
| BUS OUT (X22) | PROFIBUS OUT |
| U _S IN (X31) | Power supply IN (logic and sensors) |
| U _A IN (X31) | Power supply IN (actuators) |
| U _S OUT (X32) | Power supply OUT for additional devices |
| U _A OUT (X32) | Power supply OUT for additional devices |



Ground the device by means of the mounting screws of the fixing clips or the mounting plate or the DIN rail.

6.2 PROFIBUS pin assignment

The bus is connected via two B-coded M12 plug-in plugs. The incoming bus (IN) is a plug and the outgoing bus (OUT) is a socket.

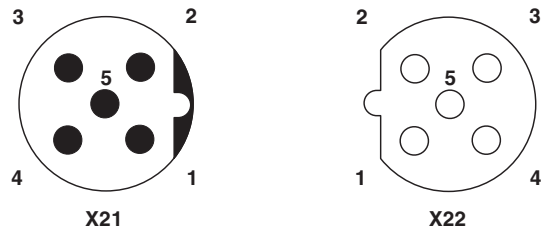


Figure 3 PROFIBUS pin assignment, B-coded

| Pin | Signal | Specification | Description |
|-----|-----------------|---------------|--------------------------|
| 1 | VP | V | 5 V termination resistor |
| 2 | RxD / TxD-N (A) | A, RS-485, PD | Inverted bus cable |
| 3 | DGND | V | 0 V |
| 4 | RxD / TxD-P (B) | B, RS-485, PU | Non-inverted bus cable |
| 5 | Not used | - | - |

- A = A line
- B = B cable
- RS-485 = RS-485 level, bidirectional
- V = Power supply
- PU = Pullup
- PD = Pulldown



The shield is connected to FE in the device.



The thread is used for additional shielding.

6.3 Pin assignment of the power supply U_S/U_A

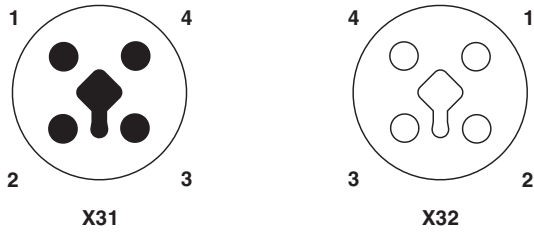


Figure 4 Pin assignment of the power supply, T-coded

| Pin | IN | OUT | Conductor colors |
|-----|--------------------|--------------------|------------------|
| 1 | +24 V DC (U_S) | +24 V DC (U_S) | Brown |
| 2 | GND (U_A) | GND (U_A) | White |
| 3 | GND (U_S) | GND (U_S) | Blue |
| 4 | +24 V DC (U_A) | +24 V DC (U_A) | Black |

6.4 Connecting inputs and outputs

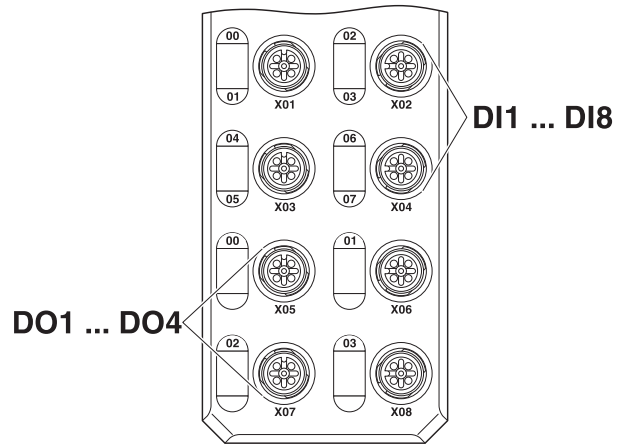


Figure 5 Input and output connections

| Designation | Meaning |
|---------------------------|-----------------|
| DI1 ... DI8 (X01 ... X04) | Inputs 1 ... 8 |
| DO1 ... DO4 (X05 ... X08) | Outputs 1 ... 4 |

6.5 Pin assignment of the inputs and outputs

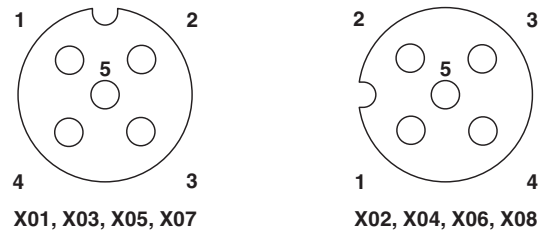


Figure 6 Pin assignment of the inputs and outputs, A-coded

| Pin | Input socket | Output socket |
|-----|--------------------|-------------------|
| 1 | +24 V DC (U_S) | Not used |
| 2 | Input 2, 4, 6, 8 | Not used |
| 3 | GND | GND |
| 4 | Input 1, 3, 5, 7 | Output 1, 2, 3, 4 |
| 5 | FE | FE |

7 Connection example

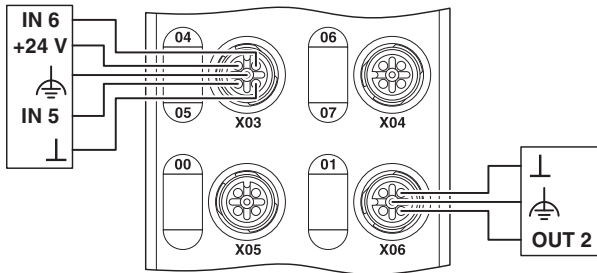


Figure 7 Example of connection of sensors and actuators

8 Connection notes



Note: data corruption or loss

Implement the FE connection using mounting screws, in order to ensure immunity to interference.



NOTE: device damage

To ensure IP65/IP67 protection, cover unused sockets with protective caps.



NOTE: Damage to the electronics

Only supply the sensors with the voltage U_S provided at the terminal points.



NOTE: Damage to the electronics

Observe the correct polarity of the supply voltages U_S and U_A in order to prevent damage to the device.



NOTE: Malfunction

When connecting the sensors and actuators, observe the assignment of the connections to the PROFIBUS input and output data.



Secure the device to a level surface or to a profile. Do not use this device to bridge gaps, in order to prevent forces being transmitted via the device.



Use standard M5 screws with toothed lock washer and self-locking nuts. Observe the maximum torque of the screws.

9 Configuration via rotary encoding switch

Addresses are set using two rotary coding switches. Switch x10 is used to set the position in tens (x10) and switch x1 is used to set the position in units (x1). The address can be set between 1 and 126.

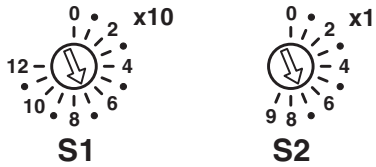


Figure 8 PROFIBUS rotary encoding switch

| S1 | S2 | Code | Function |
|----------|---------|------------|--|
| 0 | 0 | 00 | Reserved |
| 0 ... 12 | 1 ... 5 | 01 ... 125 | Manual address assignment |
| 12 | 6 | 126 | Setting the slave address (set slave address command) |
| 12 | 7 | 127 | Reserved |
| 12 | 8 | 128 | Reserved |
| 12 | 9 | 129 | Reserved |



A new address value is only applied on device power up.

10 Local status and diagnostic indicators

10.1 Indicators for bus and power supply

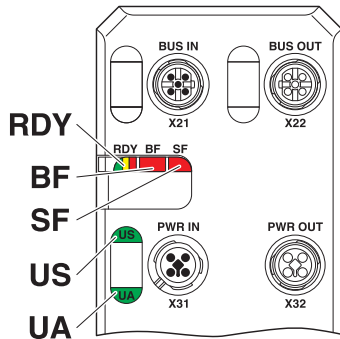


Figure 9 LEDs for bus and power supply

| Designation | Color | Meaning | State | Description |
|-------------|------------------------------------|-------------|------------------------------|---|
| RDY | Green/ yellow/ red | Ready | Green ON | Device ready to operate |
| | | | Yellow flashing | Firmware update is being performed. |
| | | | Flashing green/ yellow | Over- or undervoltage at U_S |
| | | | | Temperature of the device is in the critical area. |
| | | | | Failure of the actuator supply U_A |
| | | | | Surge voltage/undervoltage of the actuator supply U_A And red US LED: sensor supply overload |
| | | | Red ON | Rotary encoding switches are set to an invalid/reserved position. |
| OFF | Device is not ready for operation. | | | |
| BF | Red | Bus Fault | Red ON | No communication on PROFIBUS |
| | | | | Device is starting up. |
| | | | | No baud rate detected by device. |
| | | | Red flashing | Device has not been configured by the master. |
| | | | | Device configuration does not match. |
| | | | | Invalid parameter data received from the master. |
| | | | | Invalid bus address The device is in the clear or stop state. The outputs are in the safe state. |
| OFF | No error | | | |
| SF | Red | Group error | Red ON | Device-specific diagnostics present, e.g., short circuit at the I/O devices. |
| | | | | Hardware is faulty. |
| | | | | Device data or parameter data do not match. |
| | | | OFF | No error |

| Designation | Color | Meaning | State | Description |
|-------------|---------------|-----------------------|-------------|---|
| US | Green/ red | U _{Sensorik} | Green ON | Communications power/sensor voltage present |
| | | | OFF | Communications power/sensor voltage not present or too low. |
| | | | Red ON | Sensor voltage overload |
| UA | Green | U _{Aktorik} | ON | Actuator voltage present. |
| | | | OFF | Actuator voltage not present. |

10.2 Input and output indicators

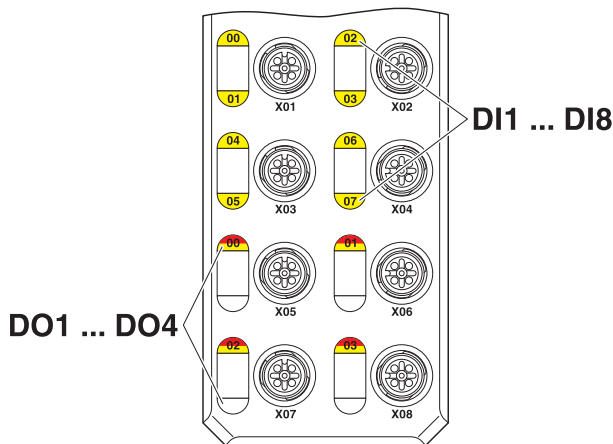


Figure 10 Input and output indicators

| Designation | Color | Meaning | State | Description |
|-------------|------------|-----------------------|-----------|--|
| 00 ... 07 | Yellow | Status of the inputs | ON | Input is set. |
| | | | OFF | Input is not set. |
| 00 ... 03 | Yellow/red | Status of the outputs | Yellow ON | Output is set. |
| | | | Red ON | Output is short circuited or overloaded. |
| | | | OFF | Output is not set. |



The numbering of the LEDs is as follows: the first number specifies the byte, the second number specifies the bit.

11 Process data

11.1 Assignment of the terminal points to the IN process data

The I/O data are mapped are follows:

| Input process data | | | | | | | | |
|--------------------|--------|----|-----|----|-----|----|-----|----|
| Byte | Byte 0 | | | | | | | |
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| IN | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |
| Connection | X04 | | X03 | | X02 | | X01 | |
| Pin | 2 | 4 | 2 | 4 | 2 | 4 | 2 | 4 |
| DI | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |

Key:

Bit: Process data assignment

IN: LED marking

DI: Input of the device

11.2 Assignment of the terminal points to the OUT process data

The I/O data are mapped as follows:

| Output process data | | | | | | | | |
|---------------------|--------|---|---|---|-----|-----|-----|-----|
| Byte | Byte 0 | | | | | | | |
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| OUT | - | - | - | - | 03 | 02 | 01 | 00 |
| Connection | - | - | - | - | X08 | X07 | X06 | X05 |
| Pin | - | - | - | - | 4 | 4 | 4 | 4 |
| DO | - | - | - | - | 4 | 3 | 2 | 1 |

Key:

Bit: Process data assignment

OUT: LED marking

DO: Output of the device

11.3 Status module

The device has a status module in slot 1.

The status is mapped as follows.

| Bit 31 ... bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|------------------|--|----------|---|---------------|----------|---------------|
| Reserved | Supply of the module electronics and sensors (U _S) | | Supply of the actuators (U _A) | | Outputs | |
| Reserved | Undervoltage | Overload | Undervoltage | Short-circuit | Overload | Short-circuit |

12 Parameterization

This section provides a detailed description of the format of the parameters for the input and output devices.

This may be useful when setting parameters using acyclic services or if there is no user interface for the simple selection of parameters.

| Byte | Meaning |
|-----------|------------------|
| 1 ... 7 | DP standard |
| 8 ... 10 | DP/V1 standard |
| 11 ... 12 | Module parameter |

| Module parameter | | | |
|------------------|---|-----------------|--|
| Byte | Meaning | Contents | |
| 11 | Behavior of the device | Bit 0 and Bit 1 | Substitute value behavior |
| | | Bit 1 | 00 _{bin} : "0" is output to all output bits |
| | | | 01 _{bin} : "1" is output to all output bits |
| | | | 10 _{bin} : hold last value |
| | | | 11 _{bin} : substitute value |
| Other | Reserved | | |
| 12 | Substitute values of individual channels 1 ... 4 | Bit 0 | Substitute value for channel 1 (X05.00) |
| | | Bit 1 | Substitute value for channel 2 (X06.01) |
| | | Bit 2 | Substitute value for channel 3 (X07.02) |
| | | Bit 3 | Substitute value for channel 4 (X08.03) |
| | | Other | Reserved |

13 I&M functions

The following Information & Maintenance functions are supported:

I&M 0

| I&M data | Access / data type | Presets |
|-----------------------|--------------------|---|
| MANUFACTURER_ID | Read / 2 bytes | B0 _{hex} (Phoenix Contact GmbH & Co. KG) |
| ORDER_ID | Read / 20 bytes | - |
| SERIAL_Number | Read / 16 bytes | - |
| HARDWARE_Revision | Read / 2 bytes | - |
| SOFTWARE_Revision | Read / 4 bytes | - |
| REVISION_Counter | Read / 2 bytes | 0000 _{hex} (reserved) |
| PROFILE_ID | Read / 2 bytes | F600 _{hex} (generic device) |
| PROFILE_SPECIFIC_TYPE | Read / 2 bytes | 0003 _{hex} (IO module) |
| IM_VERSION | Read / 2 bytes | 0102 _{hex} (Version 1.2) |
| IM_SUPPORTED | Read / 2 bytes | 000E _{hex} (I&M 1 ... 3) |

I&M 1

| I&M data | Access / data type | Presets |
|--------------|-----------------------|------------------------------|
| TAG_FUNCTION | Read/write / 32 bytes | "20 _{hex} " (empty) |
| TAG_LOCATION | Read/write / 22 bytes | "20 _{hex} " (empty) |

I&M 2

| I&M data | Access / data type | Presets |
|-------------------|-----------------------|------------------------------|
| INSTALLATION_DATE | Read/write / 16 bytes | "20 _{hex} " (empty) |
| RESERVED | Read/write / 38 bytes | 0 _{hex} |

I&M 3

| I&M data | Access / data type | Presets |
|------------|-----------------------|------------------------------|
| DESCRIPTOR | Read/write / 54 bytes | "20 _{hex} " (empty) |

14 Sync/freeze mode

The device supports sync and freeze mode.

The functions must be activated by the PROFIBUS master in the parameter data.

Input and output data is written or read at defined times with the sync and freeze commands.

If the device receives a sync command from the PROFIBUS master at any given time, the current OUT process data is transferred and frozen until the next sync command.

Similarly, the states of the inputs are transferred on the respective freeze command and are frozen until the next freeze command.

15 Diagnostic alarms

PROFIBUS enables the PROFIBUS device to store diagnostic information together with the error location and error type.

In the default upon delivery the alarms are enabled, however, they can be disabled with parameters on startup.

An incoming alarm informs the PROFIBUS device that diagnostic information has been entered.

When the diagnostic information has been removed, an outgoing alarm is sent to the device.

If at least one piece of diagnostic information is stored, the SF LED is on. If no diagnostic information is present, the SF LED is off.

The following PROFIBUS diagnostic messages are indicated by the PROFIBUS device:

- Overtemperature of the device
- Surge voltage of U_S
- Overload of U_S
- Surge voltage of U_A
- Undervoltage of U_A
- Short circuit of U_A
- Short circuit of an output
- Output overload

16 Monitoring

A process data watchdog is integrated into the device to avoid uncontrolled setting/resetting of outputs in the event of an error.

If device outputs are set, the controlling process must be able to access the device.

In the event of an error, e.g., bus cable interrupted or function error in the controlling process, the device can respond appropriately via the process data watchdog.

When activating the process data watchdog, it is started by the first write process and the next write process is expected within the timeout period. During error-free operation, the write process is performed during the timeout period and the watchdog is restarted (triggered).



Reading calls do not trigger the process data watchdog.

If there is no triggering during the timeout period, an error occurred. Two responses follow:

- All outputs are set to the configured substitute value.
- The BF LED indicates the corresponding state.

17 Substitute value behavior

If PROFIBUS communication fails or if no valid process data is received from the PROFIBUS master, all device outputs are set to the parameterized substitute values.