

# AXL E S3 DIO16 M12 6P

**Axioline E Sercos device, plastic housing,  
16 freely configurable inputs or outputs,  
24 V DC, M12 fast connection technology**



Data sheet  
8562\_en\_03

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## 1 Description

The Axioline E device is designed for use within a Sercos<sup>®</sup> network.

It is used to acquire and output digital signals.

### Sercos features

- Connection to Sercos network using M12 connectors (D-coded)
- Transmission speed 100 Mbps
- Minimum cycle time of 250  $\mu$ s
- 2 Ethernet ports (with integrated switch)
- Sercos communication profiles:  
SCP\_FixCFG\_02hex, SCP\_Diag, SCP\_NRTPC, SCP\_WDCon, SCP\_Sync\_02hex, SCP\_SIP, SCP\_TFTP, SPC\_Cyc
- Device description by means of SDDml
- Firmware can be updated
- Integrated web server for web-based management

### General 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](http://phoenixcontact.net/products).

**2 Table of contents**

1 Description ..... 1

2 Table of contents ..... 2

3 Ordering data ..... 3

4 Technical data ..... 4

5 Internal circuit diagram ..... 7

6 Pin assignment ..... 8

7 Connection example ..... 10

8 Connection notes ..... 10

9 Configuration via rotary encoding switch ..... 11

10 Local status and diagnostic indicators ..... 12

11 Sercos realtime connections ..... 15

12 Sercos profiles, classes and function groups ..... 15

13 Sercos parameter ..... 16

14 Password (IDN S-0-00267) ..... 19

15 IP address assignment ..... 19

16 Monitoring connection (connection setup, IDN S-0-1050.x.1) ..... 19

17 Electronic rating plate (IDNs S-0-1300.x.y) ..... 19

18 Substitute value behavior ..... 20

19 Diagnostics: I/O and channel errors ..... 21

20 Mapping the I/Os to Sercos ..... 21

21 Delivery state/default settings ..... 23

22 Restoring the default settings ..... 23

23 Firmware started ..... 23

24 Firmware update ..... 23

25 WBM - Web-based management ..... 23

26 Device description file (SDDml) ..... 23

### 3 Ordering data

| Description  | Type                         | Order No. | Pcs. / Pkt. |
|--|------------------------------|-----------|-------------|
| Axioline E Sercos device in a plastic housing with 16 freely configurable inputs or outputs, 24 V DC, M12 fast connection technology   | AXL E S3 DIO16 M12 6P        | 2701545   | 1           |
| Accessories  | Type                         | Order No. | Pcs. / Pkt. |
| 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           |
| 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  | Type                         | Order No. | Pcs. / Pkt. |
| User manual, English, Axioline E: system and installation  | UM EN AXL E SYS INST         | -         | -           |
| Application note, English:<br>Updating the firmware of AXL E devices using the Windows Explorer  | AH EN FIRMWARE UPDATE AXL E  | -         | -           |
| Quick start guide, English:<br>Startup of Axioline E Sercos devices with IndraWorks  | UM QS EN AXL E S3 INDRAWORKS | -         | -           |

#### Additional ordering data

For additional accessories, visit [phoenixcontact.net/products](http://phoenixcontact.net/products).

## 4 Technical data

### Dimensions (nominal sizes in mm)



|                    |  |
|--------------------|--|
| Width              | 60 mm  |
| Height             | 185 mm                                       |
| Depth              | 30.5 mm                                      |
| Note on dimensions | The height is 212 mm including fixing clips. |

### General data

|                                 |                  |
|---------------------------------|------------------|
| Housing material                | Pocan®           |
| Color                           | anthracite       |
| Weight                          | 480 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 Sercos

|                              |                                    |
|------------------------------|------------------------------------|
| Number                       | 2                                  |
| Connection method            | M12 connectors, D-coded            |
| Designation connection point | Copper cable                       |
| Number of positions          | 4                                  |
| Transmission speed           | 100 MBit/s (with auto negotiation) |

### Sercos

|                      |                            |
|----------------------|----------------------------|
| Equipment type       | Sercos slave               |
| Device profile       | FSP_IO                     |
| Sercos protocols     | Sercos, S/IP               |
| Additional protocols | HTTP, TFTP, FTP            |
| Specification        | Sercos specification 1.1.2 |

### Supply: Module electronics, sensors, and actuators ( $U_S$ )

|                              |  |
|------------------------------|--|
| 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  | 190 mA $\pm$ 15 % (at 24 V DC)                                     |
| Current consumption          | max. 12 A  |

### Supply: Actuators ( $U_A$ ) for additional devices

|                              |  |
|------------------------------|--|
| 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  | 3 mA $\pm$ 15 % (at 24 V DC)                                       |
| Current consumption          | max. 12 A  |

### Digital inputs

|  |                                 |
|--|---------------------------------|
| Number of inputs   | 16 (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. 1.2 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 $\mu$ s                  |
| Permissible conductor length to the sensor                     | 30 m                            |
| Overload protection, short-circuit protection of sensor supply | Yes                             |

### Digital outputs

|                                    |   |
|------------------------------------|---|
| Number of outputs                  | 16  |
| Connection method                  | M12 connector, double occupancy   |
| Connection method                  | 2, 3-wire   |
| Nominal output voltage             | 24 V DC (from voltage $U_S$ )   |
| Output voltage range               | 18 V DC ... 31.2 V DC   |
| Maximum output current per channel | 0.5 A   |
| Nominal load, ohmic                | 12 W (48 $\Omega$ ; with nominal voltage)                                   |
| Nominal load, inductive            | 12 VA (1.2 H; 48 $\Omega$ ; with nominal voltage)                           |
| Signal delay                       | max. 150 $\mu$ s (when switched on)<br>max. 200 $\mu$ s (when switched off) |
| Switching frequency                | max. 5500 per second (with at least 50 mA load current)                     |

### Digital outputs

|   |   |
|---|---|
| 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 $\mu$ A                         |
| Behavior with overload                                    | Auto restart                            |
| Reverse voltage resistance to short pulses                | Reverse voltage proof                   |
| Overcurrent shut-down                                     | min. 0.7 A                              |
| Overload protection, short-circuit protection of outputs  | Electronic                              |

### Electrical isolation/isolation of the voltage areas

| Test section   | Test voltage           |
|--|------------------------|
| 24 V supply (communications power/sensor supply, digital inputs/outputs)/ bus connection (Ethernet 1)      | 500 V AC, 50 Hz, 1 min |
| 24 V supply (communications power/sensor supply, digital inputs/outputs)/ bus connection (Ethernet 2)      | 500 V AC, 50 Hz, 1 min |
| 24 V supply (communications power/sensor supply, digital inputs/outputs)/ FE                               | 500 V AC, 50 Hz, 1 min |
| Bus connection (Ethernet 1)/FE   | 500 V AC, 50 Hz, 1 min |
| Bus connection (Ethernet 2)/FE   | 500 V AC, 50 Hz, 1 min |
| Bus connection (Ethernet 1)/bus connection (Ethernet 2)  | 500 V AC, 50 Hz, 1 min |
| 24 V supply (actuator supply)/24 V supply (communications power and sensor supply, digital inputs/outputs) | 500 V AC, 50 Hz, 1 min |
| 24 V supply (actuator supply)/bus connection (Ethernet 1)  | 500 V AC, 50 Hz, 1 min |
| 24 V supply (actuator supply)/bus connection (Ethernet 2)  | 500 V AC, 50 Hz, 1 min |
| 24 V supply (actuator supply)/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: $\pm 0.5$ kV/ $\pm 0.5$ kV (symmetrical/asymmetrical) |
| Conducted interference EN 61000-4-6/IEC 61000-4-6          | Criterion A; Test voltage 10 V  |

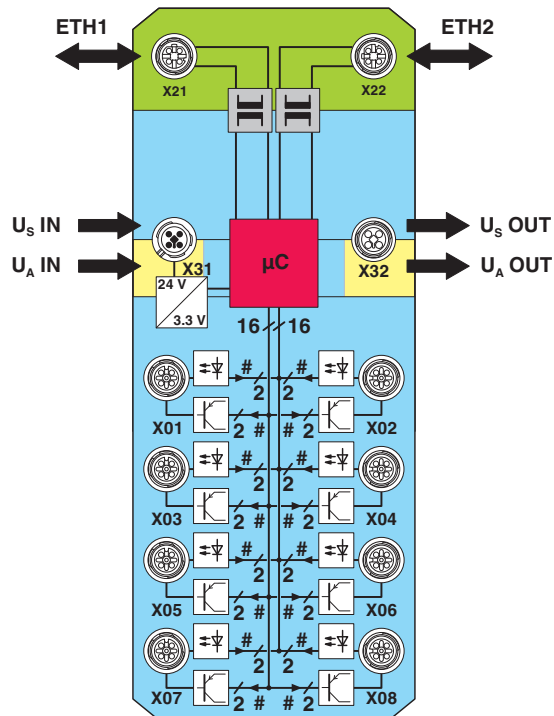
#### Noise emission test as per EN 61000-6-4

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

### Approvals

For the latest approvals, please visit [phoenixcontact.net/products](http://phoenixcontact.net/products).

## 5 Internal circuit diagram



Key:

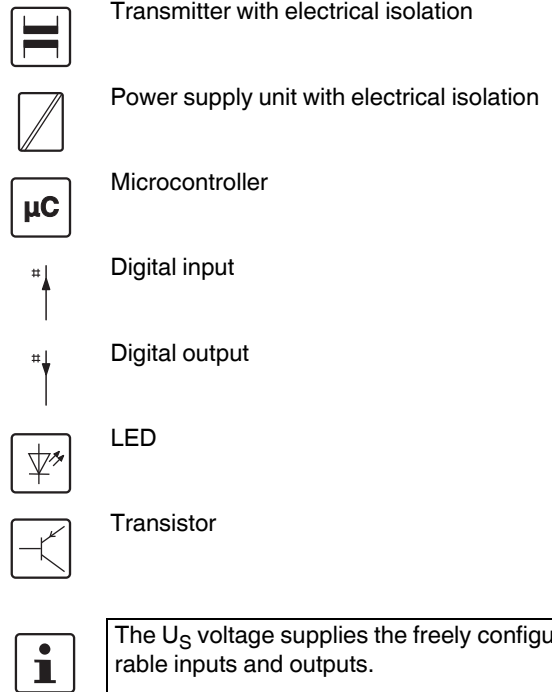


Figure 1 Internal wiring of connections

Key:

|              |         |
|--------------|---------|
| Green area:  | Network |
| Blue area:   | $U_S$   |
| Yellow area: | $U_A$   |

## 6 Pin assignment

### 6.1 Sercos and power supply connection



Figure 2 Connections for Sercos and power supply

| Designation              | Meaning  |
|--------------------------|--|
| Port 1 (X21)             | Ethernet port 1                                    |
| Port 2 (X22)             | Ethernet port 2                                    |
| U <sub>S</sub> IN (X31)  | Power supply IN (logic, sensors and actuators)     |
| U <sub>A</sub> IN (X31)  | Power Supply IN (actuators) for additional devices |
| U <sub>S</sub> OUT (X32) | Power supply OUT for additional devices            |
| U <sub>A</sub> OUT (X32) | Power supply OUT for additional devices            |



Ground the device by means of the mounting screws.

### 6.2 Sercos pin assignment



Figure 3 Pin assignment, D-coded

| Pin | Ethernet port 1 (X21) | Ethernet port 2 (X22) |
|-----|-----------------------|-----------------------|
| 1   | TX+                   | TX+                   |
| 2   | RX+                   | RX+                   |
| 3   | TX-                   | TX-                   |
| 4   | RX-                   | RX-                   |



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<sub>S</sub>/U<sub>A</sub>



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

| Pin | IN                         | OUT                        | Conductor colors |
|-----|----------------------------|----------------------------|------------------|
| 1   | +24 V DC (U <sub>S</sub> ) | +24 V DC (U <sub>S</sub> ) | Brown            |
| 2   | GND (U <sub>A</sub> )      | GND (U <sub>A</sub> )      | White            |
| 3   | GND (U <sub>S</sub> )      | GND (U <sub>S</sub> )      | Blue             |
| 4   | +24 V DC (U <sub>A</sub> ) | +24 V DC (U <sub>A</sub> ) | Black            |



6.4 Connecting inputs and outputs

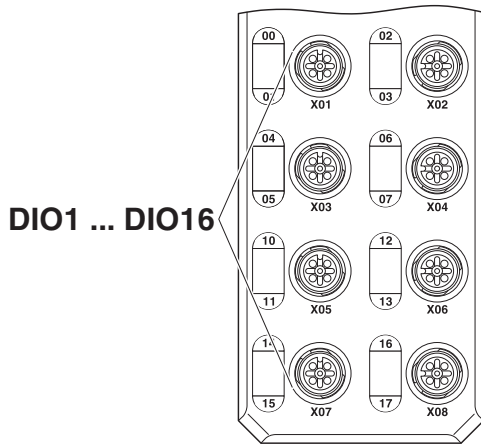


Figure 5 Input and output connections

| Designation                  | Meaning                 |
|------------------------------|-------------------------|
| DIO1 ... DIO16 (X01 ... X08) | Inputs/outputs 1 ... 16 |

6.5 Pin assignment of the inputs and outputs



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

| Pin | Input/output socket          |
|-----|------------------------------|
| 1   | +24 V DC ( $U_S$ )           |
| 2   | Input/output 2, 4, 6, ... 16 |
| 3   | GND                          |
| 4   | Input/output 1, 3, 5, ... 15 |
| 5   | FE                           |

## 7 Connection example

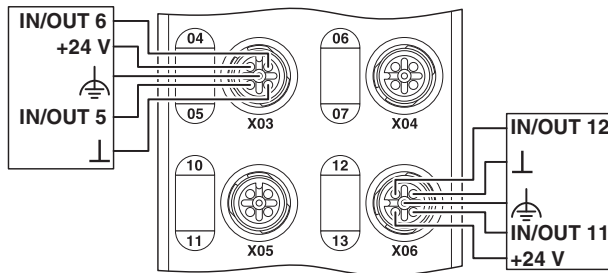


Figure 7 Example of connection of sensors and actuators

## 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 Sercos 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

You can configure the address assignment and other functions using rotary encoding switches.

After modifying the switch position, restart the device, as the modification to the switch position does not take effect during operation.



Figure 8 Rotary encoding switch

The code results from the sum of S1 x 10 plus S2 x 1. The image shows the code and therefore Sercos address 77 (7 x 10 + 7).

| S1       | S2       | Code       | Function                            |
|----------|----------|------------|-------------------------------------|
| 0        | 0        | 00         | Remote address assignment (Default) |
| 0 ... 15 | 0 ... 09 | 01 ... 159 | Manual address assignment           |
| 0        | F        | 0F         | Resetting to the default settings   |
| Other    |          |            | Reserved                            |

### 9.1 Manual address assignment

#### Switch position 01 ... 159

The devices are automatically assigned addresses by the Sercos master via remote address assignment as standard. Set the Sercos address manually with this switch position. Remote address assignment, e.g., via an engineering tool, is deactivated.

### 9.2 Resetting to the default settings

#### Switch position 0F

All settings are reset to the delivery state.



The device is ready for operation after powering up, as soon as the RDY LED lights up green.

A connection to the device however cannot be established in this switch position. As soon as the RDY LED lights up green, a new switch position can be selected on the rotary encoding switch and the device can be restarted.

### 9.3 Reserved/invalid switch position

The device starts with the previous settings, e.g., with the settings that were valid before the device was restarted.

## 10 Local status and diagnostic indicators

### 10.1 Indicators for Ethernet ports and power supply

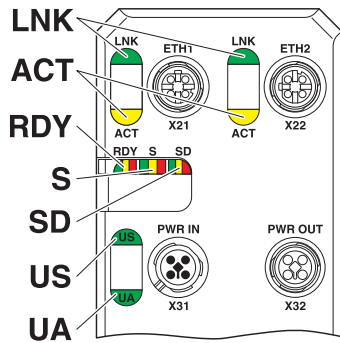


Figure 9 Indicators for Ethernet ports and power supply

| Designation | Color                              | Meaning  | State                        | Description  |
|-------------|------------------------------------|----------|------------------------------|--|
| LNK 1/2     | Green                              | Link     | Green ON                     | Connection present at port 1/2.  |
|             |                                    |          | OFF                          | Connection not present at port 1/2.  |
| ACT 1/2     | Yellow                             | Activity | Yellow ON                    | Data transmission present at port 1/2.   |
|             |                                    |          | OFF                          | Data transmission not present at port 1/2.   |
| RDY         | Green/<br>yellow/<br>red           | Ready    | Green ON                     | Device is ready for operation.   |
|             |                                    |          | Yellow flashing              | Firmware update is being performed.  |
|             |                                    |          | Flashing<br>green/<br>yellow | Over- or undervoltage at $U_S$   |
|             |                                    |          |                              | Temperature of the device is in the critical area.<br>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. |          |                              |  |

| Designation | Color  | Meaning               | State                  | Description  |
|-------------|--|-----------------------|------------------------|--|
| S           | Green/<br>orange/<br>red                         | Sercos                | Flashing orange (2 Hz) | Identification (bit 15 in device control (C-Dev)), used for address assignment and configuration errors. |
|             |  |                       | Orange ON              | CP0  |
|             |  |                       | Flashing orange/green  | CP1:<br>250 ms green, 2750 ms orange   |
|             |  |                       | Flashing orange/green  | CP2:<br>250 ms green, 250 ms orange,<br>250 ms green, 2250 ms orange                                     |
|             |  |                       | Flashing orange/green  | CP3:<br>250 ms green, 250 ms orange,<br>250 ms green, 250 ms orange,<br>250 ms green, 1750 ms orange     |
|             |  |                       | Green ON               | CP4  |
|             |  |                       | Green flashing         | Loop back activated  |
|             |  |                       | Flashing red/orange    | User error   |
|             |  |                       | Flashing red/green     | MST loss   |
|             |  |                       | Red ON                 | Communication error  |
|             |  |                       | Flashing red (2 Hz)    | Watchdog error   |
|             |  |                       | OFF                    | NRT mode; no Sercos communication  |
|             |  |                       | SD                     | Green/<br>orange/<br>red   |
| Orange ON   | Sub device is on the parameterization level (PL) |                       |                        |  |
| Red ON      | Error in the sub device (C1D)                    |                       |                        |  |
| OFF         | Sub device is not active.                        |                       |                        |  |
| US          | Green/<br>red                                    | U <sub>Sensorik</sub> | 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 <sub>Aktorik</sub>  | ON                     | Actuator voltage present.  |
|             |  |                       | OFF                    | Actuator voltage not present.  |

10.2 Input and output indicators

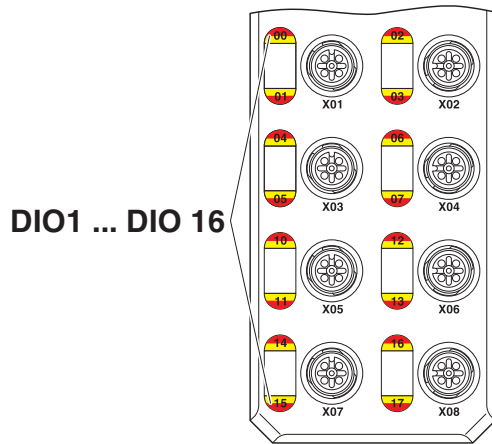


Figure 10 Input and output indicators

| Designation             | Color      | Meaning   | State     | Description                              |
|-------------------------|------------|---|-----------|--|
| 00 ... 07,<br>10 ... 17 | Yellow     | Status of the inputs and outputs when used as an input  | ON        | Input is set.                            |
|                         |            |   | OFF       | Input is not set.                        |
| 00 ... 07,<br>10 ... 17 | Yellow/red | Status of the inputs and outputs when used as an output | 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 Sercos realtime connections

The device supports a maximum of two realtime data connections (S-0-1050.0.x and S-1050.1.x), with a maximum of one consumer and one producer connection.

## 12 Sercos profiles, classes and function groups

The following Sercos profiles, classes, and function groups are implemented in the device.

### 12.1 Sercos device profile (GDP: Generic device profile)

- Basic device profile (GDP\_Basic)
  - Diagnostics (FG\_Diagnosis)
  - Administration (FG\_Administration)
  - Device identification (FG\_Identification)
- Revisions (GDP\_Rev)
- Password (GDP\_PWD)
- Diagnostic records (GDP\_DiagT)
- Extended diagnostic records (GDP\_DiagTAdv)
- Restart (GDP\_RST)

### 12.2 Sercos communication model (SCP: Sercos communication profiles)

- Fixed configuration (SCP\_FixCFG\_02hex)
- Diagnostics (SCP\_Diag)
- Non-realtime channel (SCP\_NRTPC)
- Consumer connection monitoring (SCP\_WDCon)
- Synchronous and isochronous producer and consumer data (SCP\_Sync\_02hex)
- Support for SCP\_SIP and SCP\_TFTP, TFTP is only active if it was activated via WBM.
- Cyclic data exchange (SCP\_Cyc)

### 12.3 Sercos function model (FSP: Function specific profile IO)

- I/O function model (FSP\_IO)

### 13 Sercos parameter

The following table lists all Sercos parameters (S and P parameters) with important features that have been implemented in the device.

| IDN (Identification number) | Name   | Default values    | Unit    |
|-----------------------------|--|-------------------|---------|
| S-0-0014                    | Interface status   | -                 | -       |
| S-0-0015.0.0                | Telegram type  | -                 | -       |
| S-0-0017                    | IDN list of all operation data                           | -                 | -       |
| S-0-0021                    | IDN list of invalid operation data for CP2               | -                 | -       |
| S-0-0022                    | IDN list of invalid operation data for CP3               | -                 | -       |
| S-0-0025                    | IDN list of all procedure commands                       | -                 | -       |
| S-0-0095                    | Diagnostic message                                       | -                 | -       |
| S-0-0099                    | Reset class 1 diagnostic (process command)               | -                 | -       |
| S-0-0127                    | CP3 transition check (process command)                   | -                 | -       |
| S-0-0128                    | CP4 transition check (process command)                   | -                 | -       |
| S-0-0267                    | Password   | PW170875          | -       |
| S-0-0279                    | IDN-list of password protected data                      | -                 | -       |
| S-0-0390                    | Diagnostic number  | -                 | -       |
| S-0-398                     | IDN list of configurable data as producer                | -                 | -       |
| S-0-399                     | IDN list of configurable data as consumer                | -                 | -       |
| S-0-1000                    | SCP type & version                                       | -                 | -       |
| S-0-1002                    | Communication cycle time ( $t_{Scyc}$ )                  | -                 | $\mu$ s |
| S-0-1003                    | Allowed MST losses in CP3/CP4                            | 10                | -       |
| S-0-1005                    | Minimum feedback processing time ( $t_5$ )               | -                 | $\mu$ s |
| S-0-1006                    | ATO transmission starting time ( $t_1$ )                 | -                 | $\mu$ s |
| S-0-1007                    | Feedback acquisition capture point ( $t_4$ )             | -                 | $\mu$ s |
| S-0-1008                    | Command value valid time ( $t_3$ )                       | -                 | $\mu$ s |
| S-0-1009                    | Device control (C-Dev) offset in MDT                     | -                 | -       |
| S-0-1010                    | Length of MDTs   | -                 | -       |
| S-0-1011                    | Device status (S-Dev) offset in AT                       | -                 | -       |
| S-0-1012                    | Length of ATs  | -                 | -       |
| S-0-1013                    | SVC offset in MDT  | -                 | -       |
| S-0-1014                    | SVC offset in AT   | -                 | -       |
| S-0-1015                    | Ring delay   | -                 | $\mu$ s |
| S-0-1016                    | Slave delay  | -                 | $\mu$ s |
| S-0-1017                    | NRT transmission time                                    | -                 | $\mu$ s |
| S-0-1019                    | MAC address  | 00.A0.45.xx.xx.xx | -       |
| S-0-1020                    | IP address   | 192.168.0.20      | -       |
| S-0-1020.0.1                | Current IP address                                       | 192.168.0.20      | -       |
| S-0-1021                    | Subnet mask  | 255.255.255.0     | -       |
| S-0-1021.0.1                | Current subnet mask                                      | 255.255.255.0     | -       |
| S-0-1022                    | Gateway address  | 192.168.0.1       | -       |
| S-0-1022.0.1                | Current gateway address                                  | 192.168.0.1       | -       |
| S-0-1023                    | SYNC jitter  | -                 | $\mu$ s |
| S-0-1024                    | SYNC delay measuring procedure command (process command) | -                 | -       |
| S-0-1026                    | Version of communication hardware                        | -                 | -       |
| S-0-1027.0.1                | Requested MTU  | -                 | -       |
| S-0-1027.0.2                | Effective MTU  | -                 | -       |



| IDN (Identification number) | Name                                     | Default values   | Unit |
|-----------------------------|--|--|------|
| S-0-1028                    | Error counter MST-P/S                    | -  | -    |
| S-0-1031                    | Test pin assignment port 1 and port 2    | -  | -    |
| S-0-1035                    | Error counter port1 and port2            | -  | -    |
| S-0-1036                    | Inter frame gap                          | -  | -    |
| S-0-1037                    | Slave jitter                             | -  | -    |
| S-0-1040                    | Sercos address                           | 1  | -    |
| S-0-1041                    | AT command value valid time (t9)         | -  | µs   |
| S-0-1044                    | Device control                           | -  | -    |
| S-0-1045                    | Device status                            | -  | -    |
| S-0-1047                    | Maximum consumer activation time (t11)   | -  | µs   |
| S-0-1048                    | Procedure command – Activate IP settings | -  | -    |
| S-0-1050.x.1                | Connection setup                         | -  | -    |
| S-0-1050.x.2                | Connection number                        | -  | -    |
| S-0-1050.x.3                | Telegram assignment                      | -  | -    |
| S-0-1050.x.4                | Max. length of connection                | -  | -    |
| S-0-1050.x.5                | Current length of connection             | -  | -    |
| S-0-1050.x.6                | Configuration list                       | -  | -    |
| S-0-1050.x.8                | Connection control                       | -  | -    |
| S-0-1050.x.10               | Producer cycle time                      | -  | µs   |
| S-0-1050.x.11               | Allowed data losses                      | -  | -    |
| S-0-1050.x.12               | Error counter data losses                | -  | -    |
| S-0-1050.x.20               | IDN allocation of real-time bit          | -  | -    |
| S-0-1050.x.21               | Bit allocation of real-time bit          | -  | -    |
| S-0-1051                    | Image of connection setups               | -  | -    |
| S-0-1300.0.1                | Component name                           | Sercos block terminal  | -    |
| S-0-1300.0.2                | Vendor name                              | Phoenix Contact  | -    |
| S-0-1300.0.3                | Vendor code                              | 200  | -    |
| S-0-1300.0.4                | Device name                              | AXL E S3 DIO16 M12 6P  | -    |
| S-0-1300.0.5                | Device ID                                | 2701545  | -    |
| S-0-1300.0.7                | Function revision                        | -  | -    |
| S-0-1300.0.8                | Hardware revision                        | -  | -    |
| S-0-1300.0.9                | Software revision                        | -  | -    |
| S-0-1300.0.10               | Firmware loader revision                 | -  | -    |
| S-0-1300.0.11               | Order number                             | 2701545  | -    |
| S-0-1300.0.12               | Serial number                            | xxxx...  | -    |
| S-0-1300.0.13               | Manufacturing date parameter             | YYYY-MM-DD T HH:MM:SS Z  | -    |
| S-0-1300.0.14               | QA date                                  | YYYY-MM-DD T HH:MM:SS Z<br>(date and time of final manufacturing test)                         | -    |
| S-0-1300.0.20               | Operational hours                        | Operating hours counter  | h    |
| S-0-1300.0.21               | Service date                             | YYYY-MM-DD T HH:MM:SS Z<br>(date and time of a service)  | -    |
| S-0-1301                    | List of GDP classes & version            | 0101 <sub>hex</sub>  | -    |
| S-0-1302.0.1                | FSP type & version                       | 00010001 <sub>hex</sub>  | -    |
| S-0-1302.0.2                | Function groups                          | S-0-1500.0.0 (IO bus coupler)<br>S-0-1502.0.0 (Digital output)<br>S-0-1503.0.0 (Digital input) | -    |
| S-0-1302.0.3                | Application type                         | -  | -    |
| S-0-1303.0.01*              | Diagnosis trace configuration            | -  | -    |
| S-0-1303.0.02               | Diagnosis trace control                  | -  | -    |

| IDN (Identification number) | Name                              | Default values | Unit |
|-----------------------------|-----------------------------------|----------------|------|
| S-0-1303.0.03               | Diagnosis trace state             | -              | -    |
| S-0-1303.0.10               | Diagnosis trace buffer no1        | -              | -    |
| S-0-1303.0.11               | Diagnosis trace buffer no2        | -              | -    |
| S-0-1303.0.12**             | Diagnosis trace buffer no3        | -              | -    |
| S-0-1305.0.1                | Sercos current time               | -              | -    |
| S-0-1350                    | Reboot device                     | -              | -    |
| S-0-1500                    | IO bus coupler                    | -              | -    |
| S-0-1500.0.1                | IO control                        | -              | -    |
| S-0-1500.0.2                | IO status                         | -              | -    |
| S-0-1500.0.3                | List of module type codes         | -              | -    |
| S-0-1500.0.5                | Container output data             | -              | -    |
| S-0-1500.0.9                | Container input data              | -              | -    |
| S-0-1500.0.19               | Parameter channel receive         | -              | -    |
| S-0-1500.0.20               | Parameter channel transmit        | -              | -    |
| S-0-1500.0.32               | IO diagnostic message             | -              | -    |
| S-0-1500.0.33               | Current IO diagnostic message     | -              | -    |
| S-0-1502                    | I/O function group digital output | -              | -    |
| S-0-1502.0.1                | Name of IO FG                     | -              | -    |
| S-0-1502.0.2                | Configuration of IO FG            | -              | -    |
| S-0-1502.0.3                | Channel quantity PDOOUT           | -              | -    |
| S-0-1502.0.4                | Channel width PDOOUT              | -              | -    |
| S-0-1502.0.5                | PDOOUT                            | -              | -    |
| S-0-1502.0.15               | Channel quantity DIAGIN           | -              | -    |
| S-0-1502.0.16               | Channel width DIAGIN              | -              | -    |
| S-0-1502.0.17               | DIAGIN                            | -              | -    |
| S-0-1502.0.22               | Fallback value output             | -              | -    |
| S-0-1502.0.23               | Min. delay time                   | -              | -    |
| S-0-1502.0.24               | Max. delay time                   | -              | -    |
| S-0-1503                    | IO function group digital input   | -              | -    |
| S-0-1503.0.1                | Name of IO FG                     | -              | -    |
| S-0-1503.0.2                | Configuration of IO FG            | -              | -    |
| S-0-1503.0.7                | Channel quantity PDIN             | -              | -    |
| S-0-1503.0.8                | Channel width PDIN                | -              | -    |
| S-0-1503.0.9                | PDIN                              | -              | -    |
| S-0-1503.0.15               | Channel quantity DIAGIN           | -              | -    |
| S-0-1503.0.16               | Channel width DIAGIN              | -              | -    |
| S-0-1503.0.17               | DIAGIN                            | -              | -    |
| S-0-1503.0.23               | Min. delay time                   | -              | -    |
| S-0-1503.0.24               | Max. delay time                   | -              | -    |

\* The content of IDN S-0-1303.0.01 is limited to one IDN (S-0-1500.x.33 Current IO diagnostic message); this is why only one additional diagnostic trace is implemented (S-0-1303.0.12 Diagnostic trace buffer no3).

\*\* IDN S-0-1303.0.12 diagnostic trace buffer no3 contains one IDN, which is configured in the S-0-1303.0.01 diagnostic trace configuration in such a way that the content of S-0-1303.0.12 is determined with the S-0-1500.x.33 Current IO Diagnostic Message.

## 14 Password (IDN S-0-00267)

In the default setting some parameters of the device are write-protected with a password. If you try to change password-protected parameters without lifting the write protection, error 7009<sub>hex</sub> is output via the service channel (operation data is password write-protected).

The password can be changed and the write protection can be activated or deactivated via IDN S-0-0267. Passwords can only comprise UTF8 characters without spaces and are stored retentively.

The default password is PW170875.

The list of password-protected parameters can be found in IDN S-0-0279.

The following IDNs are password protected:

| IDN      | Description     |
|----------|-----------------|
| S-0-1020 | IP address      |
| S-0-1021 | Subnet mask     |
| S-0-1022 | Gateway address |



If the password is read via the service channel, the device will send the password as a string with 3 "\*" characters (UTF8 code 0x2A) if the write protection is activated or as a string with 3 "\$" characters (UTF8-Code 0x24) if the write protection is deactivated and not as plain text.

### 14.1 Change password

To change the password, the currently active password, the new password, and, for confirmation, the new password again must be sent to the device, each separated by a space. Changing the password automatically activates write protection for all password-protected parameters.

### 14.2 Activate write protection

There are three methods for activating password-protected write protection:

- Switch the power supply off and back on. Once the device is restarted, write protection is activated.
- Overwrite the password parameter with something other than the password.
- Change the existing password.

### 14.3 Deactivate write protection

The write protection is deactivated by overwriting the password parameter with the current password.

## 15 IP address assignment

The IP address is changed via the following IDNs:

| IDN      | Description   |
|----------|---|
| S-0-1020 | IP address  |
| S-0-1021 | Subnet mask   |
| S-0-1022 | Gateway address                                     |
| S-0-1048 | Procedure Command - activation of the IP parameters |

The IP address can be changed via the Sercos parameter S-0-1020.

The subnet mask can be changed via parameter S-0-1021 and the gateway address via parameter S-0-1022.

The IDN S-0-1048 is used to activate the IP address via Sercos.



All parameters are password-protected. For further information, please refer to the "Password" section.



The modified IP address parameters are not stored retentively on the device. In the case of a voltage reset, these parameters need to be re-transmitted.

## 16 Monitoring connection (connection setup, IDN S-0-1050.x.1)

The following connection monitoring mechanisms are supported (bit 0 and bit 1 of IDN S-0-1050.x.1):

- Producer cycle, synchronous operation (00<sub>bin</sub>)
- Asynchronous operation without watchdog (10<sub>bin</sub>)

## 17 Electronic rating plate (IDNs S-0-1300.x.y)

The electronic rating plate comprises the IDNs S-0-1300.x.y. See the table in the "Sercos parameter" section.

## 18 Substitute value behavior

The Axioline E Sercos devices support the substitute value behavior for outputs. If Sercos communication fails, all device outputs are set to the parameterized substitute values. The configuration and behavior of the substitute values can be defined via parameters S-0-1502.0.02 and S-0-1502.0.22.

The following substitute values are supported:

| Substitute value         | Description  | Configuration  |
|--------------------------|--|--|
| Reset all                | All outputs are set to "0".  | <b>S-0-1502.0.02</b> "Configuration of IO FG" bit 6 = 0 (fallback) and <b>S-0-1502.0.22</b> "Fallback value output" with the value "0" parameterized for all process data bits.                      |
| Set all                  | All outputs are set to "1".  | <b>S-0-1502.0.02</b> "Configuration of IO FG" bit 6 = 0 (fallback) and <b>S-0-1502.0.22</b> "Fallback value output" parameterized with the value "1" for all process data bits.                      |
| Hold last value          | All outputs keep the last value.                                     | If <b>S-0-1502.0.02</b> "Configuration of IO FG" bit 6 = 1 (freeze) is parameterized.  |
| Switch replacement value | All outputs are set to an application-specific, parameterized value. | <b>S-0-1502.0.02</b> "Configuration of IO FG" bit 6 = 0 (fallback) and <b>S-0-1502.0.22</b> "Fallback value output" are parameterized with the application-specific value for all process data bits. |

## 19 Diagnostics: I/O and channel errors

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

Diagnostic messages are enabled by default, but can be disabled via a parameter on startup.

The Sercos master is informed that diagnostic information that has been entered.

If at least one item of diagnostic information has been stored, this is indicated by the S and SD LEDs.

The following Sercos diagnostic messages are indicated by the Sercos slave:

- Overtemperature of the device
- Surge voltage of  $U_S$
- Overload of  $U_S$
- Unterspannung von  $U_S$
- Short-circuit or overload of an output

I/O and channel errors are mapped in the following diagnostic IDNs according to Sercos specifications.

| IDN         | Description                   |
|-------------|-------------------------------|
| S-0-0095    | Diagnostic message            |
| S-0-0390    | Diagnostic number             |
| S-1500.0.32 | IO diagnostic message         |
| S-1500.0.33 | Current IO diagnostic message |
| S-1303.0.10 | Diagnostic trace buffer no 1  |
| S-1303.0.11 | Diagnostic trace buffer no 2  |
| S-1303.0.12 | Diagnostic trace buffer no 3  |

## 20 Mapping the I/Os to Sercos

The device has just one Sercos module and therefore only has one structure instance 0.

The I/Os are assigned to the structure instances and IO function groups according to the Sercos IO profile.

The following function groups are defined:

| Function group (FG_IO) | Name                             |
|------------------------|----------------------------------|
| S-0-1502               | IO function group digital output |
| S-0-1503               | IO function group digital input  |

The cyclical data of the Sercos device is mapped to the IDNs S-0-1502 and S-0-1503 according to FSP\_IO.

The device supports the following IDNs as configurable data:

| In a producer connection       | In a consumer connection |
|--------------------------------|--------------------------|
| S-0-1500.0.2                   | S-0-1500.0.1             |
| S-0-1500.0.9                   | S-0-1500.0.1             |
| FG_IO.x.9                      | FG_IO.x.5                |
| FG_IO.x.13                     | FG_IO.x.11               |
| S-0-0390                       | S-0-0390                 |
| This information is stored in: |                          |
| S-0-0187                       | S-0-0188                 |

**20.1 Assignment of the terminal points to the OUT process data (S-0-1502.0.05)**

The I/O data is mapped as follows:

| Output process data (S-0-1502.0.05) |        |    |     |    |     |    |     |    |        |    |     |    |     |    |     |    |
|-------------------------------------|--------|----|-----|----|-----|----|-----|----|--------|----|-----|----|-----|----|-----|----|
| Byte                                | Byte 0 |    |     |    |     |    |     |    | Byte 1 |    |     |    |     |    |     |    |
| Bit                                 | 7      | 6  | 5   | 4  | 3   | 2  | 1   | 0  | 7      | 6  | 5   | 4  | 3   | 2  | 1   | 0  |
| OUT                                 | 07     | 06 | 05  | 04 | 03  | 02 | 01  | 00 | 17     | 16 | 15  | 14 | 13  | 12 | 11  | 10 |
| Connection                          | X04    |    | X03 |    | X02 |    | X01 |    | X08    |    | X07 |    | X06 |    | X05 |    |
| Pin                                 | 2      | 4  | 2   | 4  | 2   | 4  | 2   | 4  | 2      | 4  | 2   | 4  | 2   | 4  | 2   | 4  |
| DO                                  | 8      | 7  | 6   | 5  | 4   | 3  | 2   | 1  | 16     | 15 | 14  | 13 | 12  | 11 | 10  | 9  |

Key:

- Bit: Process data assignment
- OUT: LED marking
- DO: Output of the device

**20.2 Assignment of the terminal points to the IN process data (S-0-1503.0.09)**

The I/O data is mapped as follows:

| Input process data (S-0-1503.0.09) |        |    |     |    |     |    |     |    |        |    |     |    |     |    |     |    |
|------------------------------------|--------|----|-----|----|-----|----|-----|----|--------|----|-----|----|-----|----|-----|----|
| Byte                               | Byte 0 |    |     |    |     |    |     |    | Byte 1 |    |     |    |     |    |     |    |
| Bit                                | 7      | 6  | 5   | 4  | 3   | 2  | 1   | 0  | 7      | 6  | 5   | 4  | 3   | 2  | 1   | 0  |
| IN                                 | 07     | 06 | 05  | 04 | 03  | 02 | 01  | 00 | 17     | 16 | 15  | 14 | 13  | 12 | 11  | 10 |
| Connection                         | X04    |    | X03 |    | X02 |    | X01 |    | X08    |    | X07 |    | X06 |    | X05 |    |
| Pin                                | 2      | 4  | 2   | 4  | 2   | 4  | 2   | 4  | 2      | 4  | 2   | 4  | 2   | 4  | 2   | 4  |
| DI                                 | 8      | 7  | 6   | 5  | 4   | 3  | 2   | 1  | 16     | 15 | 14  | 13 | 12  | 11 | 10  | 9  |

Key:

- Bit: Process data assignment
- IN: LED marking
- DI: Input of the device

**20.3 Assignment of the DIAGIN process data (S-0-1502.0.17/S-0-1503.0.17)**

4 bytes of DIAG IN data are available per function group.

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



Not all diagnostic data are mapped in the process data, see chapter "Diagnostics: I/O and channel errors".

**20.4 Configuration of digital inputs and outputs**

A channel, whether an input or an output, is configured by using the IN or OUT process data according to the channel function. Parameterization is not necessary.



If the channel is used as an output, the status of the channel is also mapped to the IN process data. This can be useful, e.g., for diagnostic purposes. If the channel is used as an input, the channel cannot simultaneously be used as an output.

## 21 Delivery state/default settings

By default upon delivery, the following functions and features are available:

### IP settings

Sercos address: 1  
 IP address: 192.168.0.20  
 Subnet mask: 255.255.255.0  
 Gateway address: 192.168.0.1

### Firmware update

Firmware update on next re-start: deactivated  
 TFTP server IP address: 192.168.210.211  
 Firmware file name: FIRMWARE.NXF

### Web-based Management (WBM)

User name: admin  
 Password: private

## 22 Restoring the default settings

The following options are available for restoring the default settings:

### Rotary encoding switch

Switch position 0F, for further information see section "Configuration via rotary coding switch".

### Web-based Management (WBM)

Navigate to "Manage > Default settings" and follow the instructions.

## 23 Firmware started

Once you have connected the power, the firmware is started.

After completion of the firmware boot process, the RDY LED lights up green.

## 24 Firmware update

In order to update the firmware of the device, the device must be provided with a firmware container via a TFTP server or it must be loaded onto the device via FTP. Any FTP client or TFTP server can be used for this. The update must always be initiated by the web-based management. When carrying out the firmware update, the RDY LED flashes yellow.

## 25 WBM - Web-based management

The device has a web server, which generates the required pages for web-based management and, depending on the requirements of the user, sends them to a standard web browser. Web-based management can be used to access static information (e.g., technical data, MAC address) or dynamic information (e.g., IP address, status information).

### Calling web-based management

The device web server can be addressed using the IP address if configured accordingly. The homepage (web page) of the device is accessed by entering the URL "http://ip-address".

Example: http://192.168.0.20

The default user name is "admin", the default password is "private".



If you cannot access the WBM pages, check the connection settings in your browser and deactivate the proxy, if set.

## 26 Device description file (SDDml)

A configuration file (SDDml) is provided for parameterization in an engineering system.

Parameterization can then be carried out by the Sercos master.

If several versions of the configuration file are available, make sure that you are working with the file version that corresponds to the firmware/hardware version used.



For the latest device description files, visit [phoenixcontact.net/products](http://phoenixcontact.net/products).

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