

AXL F DI16/4 2F

**Axioline F digital input module, 16 inputs,
24 V DC, 2, 3 or 4-wire connection method**

Data sheet
7987_en_04

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1 Description

The module is designed for use within an Axioline F station.

It is used to acquire digital signals.

The filter times of the inputs can be set to increase noise immunity.

Filter times of 100 μ s allow the user to implement a counter function with a maximum input frequency of 5 kHz in the application.

Features

- 16 digital inputs according to EN 61131-2 type 1 and type 3
- 24 V DC, 2.4 mA
- Connection of sensors in 2, 3, and 4-wire technology
- Minimum update time < 100 μ s
- Filter times can be set in two increments: < 100 μ s or 500 μ s
- Maximum input frequency: 5 kHz
- Maximum permissible load current per sensor: 2 A
- Maximal permissible load current of the module: 4 A (2 A for each group of 8 inputs)
- Device type label stored
- Diagnostic and status indicators



This data sheet is only valid in association with the UM EN AXL F SYS INST user manual.



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

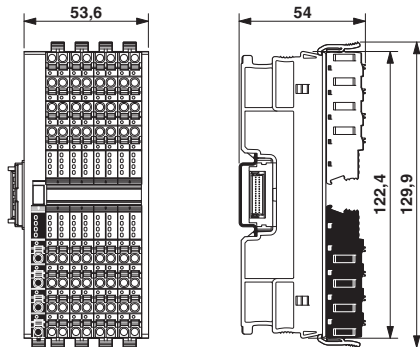
| | | |
|----------|--|----|
| 2 | Table of contents | |
| 1 | Description | 1 |
| 2 | Table of contents | 2 |
| 3 | Ordering data | 3 |
| 4 | Technical data | 3 |
| 5 | Internal circuit diagram | 6 |
| 6 | Terminal point assignment..... | 6 |
| 7 | Connection example..... | 6 |
| 8 | Local status and diagnostic indicators | 7 |
| 9 | Process data..... | 8 |
| 10 | Parameter, diagnostics and information (PDI) | 8 |
| 11 | Standard objects | 9 |
| | 11.1 Objects for identification (device rating plate)..... | 9 |
| | 11.2 Object for multilingual capacity..... | 10 |
| | 11.3 Diagnostics objects | 10 |
| | 11.4 Objects for process data management..... | 11 |
| 12 | Application objects | 12 |
| 13 | Device descriptions | 12 |

3 Ordering data

| Description | Type | Order No. | Pcs./Pkt. |
|---|----------------------------|-----------|-----------|
| Axioline F digital input module, 16 inputs, 24 V DC, 2, 3 or 4-wire connection method (including bus base module and connectors) | AXL F DI16/4 2F | 2688022 | 1 |
| Accessories | | | |
| Axioline F bus base module for housing type F (Replacement item) | AXL F BS F | 2688129 | 5 |
| Axioline F connector set (for e.g., AXL F DI16/4 2F) (Replacement item) | AXL CNS 8L-ORBG/D/UI/E1/E2 | 2700980 | 1 |
| Zack marker strip for Axioline F (device labeling), in 2 x 20.3 mm pitch, unprinted, 25-section, for individual labeling with B-STIFT 0.8, X-PEN, or CMS-P1-PLOTTER (Marking) | ZB 20,3 AXL UNPRINTED | 0829579 | 25 |
| Zack marker strip, flat, in 10 mm pitch, unprinted, 10-section, for individual labeling with M-PEN 0,8, X-PEN, or CMS-P1-PLOTTER (Marking) | ZBF 10/5,8 AXL UNPRINTED | 0829580 | 50 |
| Documentation | | | |
| User manual, English, Axioline F: System and installation | UM EN AXL F SYS INST | - | - |
| User manual, English, Axioline F: Diagnostic registers, and error messages | UM EN AXL F SYS DIAG | - | - |

4 Technical data

Dimensions (nominal sizes in mm)



| | |
|--------------------|---|
| Width | 53.6 mm |
| Height | 129.9 mm |
| Depth | 54 mm |
| Note on dimensions | The depth is valid when a TH 35-7.5 DIN rail is used (according to EN 60715). |

General data

| | |
|--|---|
| Color | traffic grey A RAL 7042 |
| Weight | 231 g (with connectors and bus base module) |
| Ambient temperature (operation) | -25 °C ... 60 °C |
| Ambient temperature (storage/transport) | -40 °C ... 85 °C |
| Permissible humidity (operation) | 5 % ... 95 % (non-condensing) |
| Permissible humidity (storage/transport) | 5 % ... 95 % (non-condensing) |
| 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) |

General data

| | |
|----------------------|--------------------------------------|
| Degree of protection | IP20 |
| Protection class | III, IEC 61140, EN 61140, VDE 0140-1 |
| Mounting position | Any (no temperature derating) |

Connection data

| | |
|--|---|
| Designation | Axioline F connector |
| Connection method | Push-in connection |
| Conductor cross section solid / stranded | 0.2 mm ² ... 1.5 mm ² / 0.2 mm ² ... 1.5 mm ² |
| Conductor cross section [AWG] | 24 ... 16 |
| Stripping length | 8 mm |



Please observe the information provided on conductor cross sections in the "Axioline F: system and installation" user manual.

Interface Axioline F local bus

| | |
|--------------------|-----------------|
| Connection method | Bus base module |
| Transmission speed | 100 MBit/s |

Communications power

| | |
|------------------------------------|------------------------------|
| Communications power U_{Bus} | 5 V DC (via bus base module) |
| Current consumption from U_{Bus} | max. 120 mA |
| Power consumption at U_{Bus} | max. 600 mW |

I/O supply

| | |
|--|--|
| Supply of digital input modules U_i | 24 V DC |
| Maximum permissible voltage range | 19.2 V DC ... 30 V DC (including all tolerances, including ripple) |
| Current consumption from U_i | max. 4 A (2 A or each group of 8 inputs) |
| Power consumption at U_i | typ. 240 mW (Without sensors), max. 120.8 W (Of which 800 mW with internal losses) |
| Surge protection of the supply voltage | Electronic (35 V, 0.5 s) |
| Polarity reversal protection of the supply voltage | Parallel diode; with external 5 A fuse (for startup only) |
| Protection | max. 8 A (polarity reversal protection up to 5 A) |



When using for the first time, protect the module with a 5 A fuse. If all the modules are correctly connected in the system, the 5 A fuse can be replaced by an 8 A fuse. you can now load the module up to 8 A.



NOTE: Damage to the electronics

Provide the module with an external fuse to protect it against polarity reversal. The power supply unit must be able to supply four times the nominal current of the external fuse, to ensure that it trips in the event of an error.

Digital inputs

| | |
|--------------------------------|---|
| Number of inputs | 16 |
| Connection method | Push-in connection |
| Connection method | 2, 3, 4-wire |
| Description of the input | EN 61131-2 types 1 and 3 |
| Nominal input voltage | 24 V DC |
| Nominal input current | 2.4 mA |
| Sensor current per channel | max. 2 A |
| Total sensor current | max. 2 A (per group) |
| Current flow | Linear until nominal current is reached, then constantly approx. 2.4 mA |
| Input voltage range "0" signal | -3 V DC ... 5 V DC |
| Input voltage range "1" signal | 11 V DC ... 30 V DC |

Digital inputs

| | |
|--|----------------------------|
| Input filter time | 500 µs (default), < 100 µs |
| Polarity reversal protection of the inputs | Electronic |
| Short-circuit protection for the sensor supply | Electronic, per group |
| Overload protection for the sensor supply | Electronic, per group |

Configuration and parameter data in a PROFIBUS system

| | |
|-----------------------------|--------|
| Required parameter data | 3 Byte |
| Need for configuration data | 6 Byte |

Error messages to the higher level control or computer system

| | |
|---------------------|-----|
| I/O supply failure | Yes |
| Overload of group 1 | Yes |
| Overload of group 2 | Yes |

Electrical isolation/isolation of the voltage areas

| Test section | Test voltage |
|---|------------------------|
| 5 V communications power (logic), 24 V supply (I/O) | 500 V AC, 50 Hz, 1 min |
| 5 V supply (logic)/functional earth ground | 500 V AC, 50 Hz, 1 min |
| 24 V supply (I/O) / functional earth ground | 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 |
| 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 according to EN 61000-6-3

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

Approvals

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

5 Internal circuit diagram

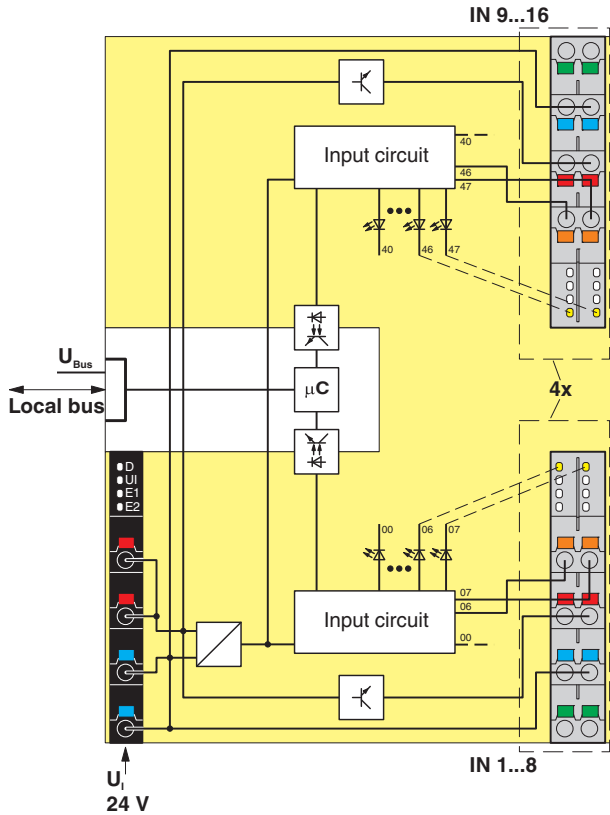


Figure 1 Internal wiring of the terminal points

Key:

- Local bus Axioline F local bus (hereinafter referred to as local bus)
- Microcontroller
- Transistor
- Optocoupler
- LED
- Power supply unit
- Electrically isolated areas
- Input circuit Input circuit

6 Terminal point assignment

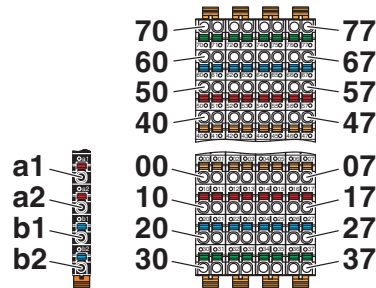


Figure 2 Terminal point assignment

| Terminal point | Color | Assignment | |
|-----------------------------|--------|---------------------------|---|
| Supply voltage input | | | |
| a1, a2 | Red | 24 V DC (U _I) | Supply for digital input modules (internally jumpered) |
| b1, b2 | Blue | GND | Reference potential of the supply voltage (internally jumpered) |
| Digital inputs | | | |
| 00 ... 07 | Orange | IN1 ... IN8 | Digital inputs 1 ... 8 |
| 40 ... 47 | Orange | IN9 ... IN16 | Digital inputs 9 ... 16 |
| 10 ... 17, 50 ... 57 | Red | 24 V DC (U _S) | Sensor supply |
| 20 ... 27, 60 ... 67 | Blue | GND | Reference potential for all channels |
| 30 ... 37, 70 ... 77 | Green | FE | Functional earth ground (FE) |

7 Connection example

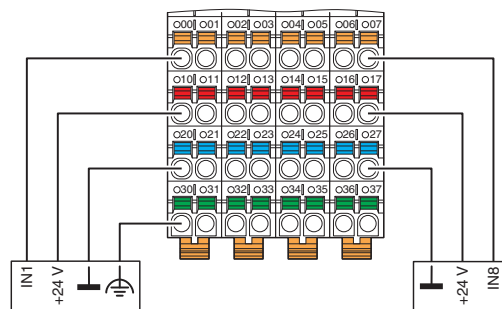
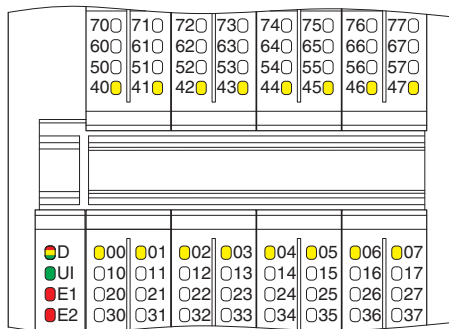


Figure 3 Connection using 4 and 3-wire technology

8 Local status and diagnostic indicators



E1 and E2 LEDs: Inputs 1 to 8 form group 1, inputs 9 to 16 form group 2. If an error occurs on at least one of the inputs of a group, this will be indicated with the corresponding LED.

Figure 4 Local status and diagnostic indicators

| Designation | Color | Meaning | State | Description |
|-------------------------|--------------------------|--|-----------------------|---|
| D | Red/ yellow/ green | Diagnostics of local bus communication | | |
| | | Run | Green ON | The device is ready for operation, communication within the station is OK. All data is valid. There are no faults. |
| | | Active | Green flashing | The device is ready for operation, communication within the station is OK. The data is not valid. Valid data from the controller/higher-level network not available. There is no fault in the module. |
| | | Device application not active | Flashing green/yellow | The device is ready for operation, communication within the station is OK. Output data cannot be outputted and/or input data cannot be read. There is a fault on the periphery side of the module.. |
| | | Ready | Yellow ON | The device is ready for operation but did not detect a valid cycle after power-on. |
| | | Connected | Yellow flashing | The device is not (yet) part of the active configuration. |
| | | Reset | Red ON | The device is ready for operation but has lost the connection to the bus head. |
| | | Not connected | Flashing red | The device is ready for operation but there is no connection to the previously existing device. |
| Power down | OFF | Device in (power) reset. | | |
| UI | Green | U _{Input} | ON | Supply for digital input modules is present. |
| | | | OFF | Supply for digital input modules is not present. |
| E1 | Red | I/O error in group 1 | ON | Breakdown or overload/short-circuit of the sensor supply of group 1. |
| | | | OFF | No I/O error. |
| E2 | Red | I/O error in group 2 | ON | Breakdown or overload/short-circuit of the sensor supply of group 2. |
| | | | OFF | No I/O error. |
| 00 ... 07, 40 ... 47 | Yellow | Status of the inputs | ON | Input is set. |
| | | | OFF | Input is not set. |

9 Process data

I/O data is mapped in the Motorola format.

IN process data

| Byte | 0 | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Channel | 8 | 7 | 6 | 5 | 4 | 3 | 2 | 1 |
| Terminal point | 07 | 06 | 05 | 04 | 03 | 02 | 01 | 00 |

| Byte | 1 | | | | | | | |
|----------------|----|----|----|----|----|----|----|----|
| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
| Channel | 16 | 15 | 14 | 13 | 12 | 11 | 10 | 9 |
| Terminal point | 47 | 46 | 45 | 44 | 43 | 42 | 41 | 40 |

10 Parameter, diagnostics and information (PDI)

Parameter and diagnostic data as well as other information is transmitted via the PDI channel of the Axioline F station.

The standard and application objects stored in the module are described in the following section.

The following applies to all tables below:

Please refer to the UM EN AXL F SYS INST for an explanation of the object codes and data types.

| Abbreviation | Meaning |
|--------------|------------------------|
| A | Number of elements |
| L | Length of the elements |
| R | Read |
| W | Write |



Every visible string is terminated with a zero terminator (00_{hex}). The length of a visible string element is therefore one byte larger than the amount of user data.



For detailed information on PDI and the objects, please refer to the UM EN AXL F SYS INST user manual.

11 Standard objects

11.1 Objects for identification (device rating plate)

| Index (hex) | Object name | Object type | Data type | A | L | Rights | Meaning | Contents |
|--------------------------|-----------------|-------------|----------------|---|--------|--------|----------------------------|--|
| Manufacturer | | | | | | | | |
| 0001 | VendorName | Var | Visible String | 1 | 16 | R | Vendor name | Phoenix Contact |
| 0002 | VendorID | Var | Visible String | 1 | 7 | R | Vendor ID | 00A045 |
| 0003 | VendorText | Var | Visible String | 1 | 49 | R | Vendor text | Components and systems for industrial automation |
| 0012 | VendorURL | Var | Visible String | 1 | 30 | R | Vendor URL | http://www.phoenix-contact.com |
| Module - general | | | | | | | | |
| 0004 | DeviceFamily | Var | Visible String | 1 | 15 | R | Device family | I/O digital IN |
| 0006 | ProductFamily | Var | Visible String | 1 | 33 | R | Product family | Axioline - High speed I/O system |
| 000E | CommProfile | Var | Visible String | 1 | 4 | R | Communication profile | 633 |
| 000F | DeviceProfile | Var | Visible String | 1 | 5 | R | Device profile | 0010 |
| 0011 | ProfileVersion | Record | Visible String | 2 | 11; 20 | R | Profile version | 2011-12-07; Basis - Profil V2.0 |
| 003A | VersionCount | Array | Unsigned 16 | 4 | 4 * 2 | R | Version counter | 0006 0001 0000 0000 _{hex} |
| Module - special | | | | | | | | |
| 0005 | Capabilities | Array | Visible String | 1 | 8 | R | Features | Nothing |
| 0007 | ProductName | Var | Visible String | 1 | 16 | R | Product name | AXL F DI16/4 2F |
| 0008 | SerialNo | Var | Visible String | 1 | 11 | R | Serial number | xxxxxxxx (e. g., 1234512345) |
| 0009 | ProductText | Var | Visible String | 1 | 37 | R | Product text | 16 digital inputs, adjustable filter |
| 000A | OrderNumber | Var | Visible String | 1 | 8 | R | Order No. | 2688022 |
| 000B | HardwareVersion | Record | Visible String | 2 | 11; 3 | R | Hardware version | e. g., 2011-02-04; 00 |
| 000C | FirmwareVersion | Record | Visible String | 2 | 11; 3 | R | Firmware version | 0000-00-00; -- |
| 000D | PChVersion | Record | Visible String | 2 | 11; 6 | R | Parameter channel version | 2010-01-08; V1.00 |
| 0037 | DeviceType | Var | Octet string | 1 | 8 | R | Module identification | 00 80 00 02 00 00 00 D0 _{hex} |
| Use of the device | | | | | | | | |
| 0014 | Location | Var | Visible String | 1 | 59 | R/W | Location | Can be filled out by the user. |
| 0015 | EquipmentIdent | Var | Visible String | 1 | 59 | R/W | Equipment identifier | Can be filled out by the user. |
| 0016 | ApplDeviceAddr | Var | Unsigned 16 | 1 | 2 | R/W | Application device address | Can be filled out by the user. |

11.2 Object for multilingual capacity

| Index (hex) | Object name | Object type | Data type | A | L | Rights | Meaning | Contents |
|-------------|-------------|-------------|----------------|---|------|--------|----------|----------------|
| 0017 | Language | Record | Visible String | 2 | 6; 8 | R | Language | en-us; English |

11.3 Diagnostics objects

| Index (hex) | Object name | Object type | Data type | A | L | Rights | Assignment/content |
|-------------|-------------|-------------|-----------|---|---------------------|--------|--------------------|
| 0018 | DiagState | Record | | 6 | 2; 1; 1; 2; 1; 1 | R | Diagnostic state |

Diagnostics state (0018_{hex}: DiagState)

This object is used for a structured message of an error.

| 0018 _{hex} : DiagState (Read) | | | | | |
|--|----------------|-----------------|----------------------|----------------------------------|--------------------------|
| Subindex | Data type | Length in bytes | Meaning | Contents | |
| 0 | Record | 8 | Diagnostic state | Complete diagnostics information | |
| 1 | Unsigned 16 | 2 | Error number | 0 ... 65535 _{dez} | |
| 2 | Unsigned 8 | 1 | Priority | 00 _{hex} | No error |
| | | | | 01 _{hex} | Error |
| | | | | 02 _{hex} | Warning |
| | | | | 81 _{hex} | Error removed |
| | | | | 82 _{hex} | Warning eliminated |
| 3 | Unsigned 8 | 1 | Channel/group/module | 00 _{hex} | No error |
| | | | | 01 _{hex} | Group 1 (inputs 1 to 8) |
| | | | | 02 _{hex} | Group 2 (inputs 9 to 16) |
| | | | | FF _{hex} | entire device |
| 4 | Unsigned 16 | 2 | Error code | See table below | |
| 5 | Unsigned 8 | 1 | More follows | 00 _{hex} | |
| 6 | Visible String | 1 | Text | 00 _{hex} | |



The message with the priority 81_{hex} or 82_{hex} is a one-time internal message to the bus coupler that is implemented onto the error mechanisms of the higher-level system by the bus coupler.

Error and status of the local status and diagnostics indicators

| Subindex | 2 | 3 | 4 | | | | |
|---|----------|----------------------|------------|-----------------------|-----|-----|-----|
| Error | Priority | Channel/group/module | Error code | LED | | | |
| | hex | hex | hex | D | UI | E1 | E2 |
| No error | 00 | 00 | 0000 | Green ON | ON | OFF | OFF |
| I/O supply failure | 01 | FF | 3412 | Flashing green/yellow | OFF | OFF | OFF |
| Sensor supply overload for inputs 1 to 8 (group 1) | 01 | 01 | 2211 | Green ON | ON | ON | OFF |
| Sensor supply overload for inputs 9 to 16 (group 2) | 01 | 02 | 2211 | Green ON | ON | OFF | ON |



After all errors have been eliminated, it is automatically reset.

11.4 Objects for process data management

| Index (hex) | Object name | Object type | Data type | A | L | Rights | Assignment |
|-------------|--------------|------------------|--------------|---|---------|--------|--|
| 0025 | PDIN | Var | Octet string | 1 | 2 | R | Input process data |
| 003B | PDIN_Descr | Array of Records | | 3 | 8; 2; 2 | R | Description of the IN process data |
| 003C | PDOOUT_Descr | Array of Records | | 3 | 8; 2; 2 | R | Description of the output process data |

The objects 003B_{hex} and 003C_{hex} are only applicable to tools.

IN process data (0025_{hex}: PDIN)

You can read the IN process data of the module with this object.

The structure corresponds to the representation in the "Process data" section.

| 0025 _{hex} : PDIN (Read) | | | |
|-----------------------------------|--------------|-----------------|--------------------|
| Subindex | Data type | Length in bytes | Meaning |
| 0 | Octet string | 2 | Input process data |

12 Application objects

| Index (hex) | Object name | Object type | Data type | A | L | Rights | Assignment |
|-------------|--------------|-------------|------------|---|---|--------|-------------|
| FF8F | Input_Filter | Var | Unsigned 8 | 1 | 1 | R/W | Filter time |

Filter time (FF8F_{hex}: Input_Filter)

You parameterize the filter time of the module with this object.

| FF8F _{hex} : Input_Filter (read, write) | | | | |
|--|-----------|-----------------|-----------------------------|----------|
| Subindex | Data type | Length in bytes | Contents | |
| 0 | Var | 1 | 00 _{hex} (Default) | 500 µs |
| | | | 01 _{hex} | < 100 µs |

13 Device descriptions

The device is described in the device description files.

The device descriptions for controllers from Phoenix Contact are included in PC Worx and the corresponding service packs.

The device description files for other systems are available for download at phoenixcontact.net/products in the download area of the bus coupler used.