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A BELDEN BRAND

# Manual

## LioN-P - IO-Link Device - I/O Hub

## 0960 IOL 381-001
## 0960 IOL 385-001
## 0960 IOL 380-021



Technical Support
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# Contents

# 1 About this Manual

## 1.1 General Information

Please read the assembly and operating instructions in this manual carefully before starting up the LioN-P modules. Keep the manual where it is accessible to all users.

The descriptions, illustrations, diagrams and examples used in this manual are intended solely as an explanation of application and operation.

Please contact us if you have any more detailed questions on installing and starting up the devices. We will be happy to help you.

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## 1.2 Explanation of Symbols

### 1.2.1 Handling Danger Information

Danger information is denoted as follows:

**Danger:** Means that death, serious physical injury, or substantial damage to property will occur if the required safety measures are not taken.

**Warning:** Means that death, serious physical injury, or substantial damage to property can occur if the required safety measures are not taken.

**Caution:** Means that minor physical injury or damage to property can occur if the required safety measures are not taken.

### 1.2.2 Use of General Information

General information is denoted as follows:

**Attention:** Contains important information on the product, on how to manage the product, or on the respective section of the documentation to which your special attention is being drawn.

## 1.3 Version release notes

| Index | Created | Changed | Changed |
|---|---|---|---|
| Version number | Version 1.0 | | |
| Date | July 2017 | | |
| Name/department | Goebel/R&D | | |

*Table 1: Overview of revisions to manual*

**Attention:** In the interest of product improvement and further development, BELDEN reserves the right to change technical data in this manual or changes to the product without prior notice.

# 2 Safety Instructions

## 2.1 Intended use

The devices described in this manual are decentralized input/output assemblies on a fieldbus IO network.

We adhere to all necessary safety standards when developing, producing, testing, and documenting our products. When you adhere to the handling specifications and safety instructions described for the configuration, assembly, and correct operation, there should not normally be any risks for people or equipment.

The modules fulfill the requirements of the EMC Directive (89/336/EEC, 93/68/EEC and 93/44/EEC) and the Low Voltage Directive (73/23/EEC).

The modules are designed to be used in the industrial sector. The industrial environment is distinguished by the fact that the consumer is not connected directly to the public low voltage network. Additional measures are required for use in residential areas or in business and commercial sectors.

**Attention:** This equipment may cause radio interference in residential areas. In this case the operator may be requested to carry out appropriate measures.

The proper and safe operation of this product depends on proper transportation, proper storage, assembly, and installation, and careful operation.

A completely assembled device housing is required for the proper operation of the modules. Only connect devices to the modules that fulfill the requirements of EN 61558-2-4 and EN 61558-2-6.

During the configuration, installation, start-up, maintenance, and testing of the devices, adhere to the safety and accident-prevention guidelines for the specific application.

Only install cables and accessories that fulfill the requirements and regulations for safety, electromagnetic compatibility, and, where applicable,

telecommunication end devices, as well as the specification information. Information on which cables and accessories are approved for installation can be obtained from Lumberg Automation™ or from the BELDEN website.

## 2.2 Qualified Personnel

The configuration, installation, start-up, maintenance, and testing of the devices may only be performed by a qualified electrician who is familiar with the safety standards of the automation technology.

The personnel requirements are based on the requirement profiles described by ZVEI, VDMA, or equivalent organizations.

Only electricians who are familiar with the content of this manual are authorized to install and maintain the devices described. These are persons who

- based on their technical training, knowledge, and experience, and their knowledge of the pertinent standards, can evaluate the work to be carried out and identify any potential risks or
- based on working for several years in a related sector, have the same level of knowledge as they would have from the relevant technical training.

Only Belden Deutschland GmbH – Lumberg Automation™ is permitted to make changes to the hardware or software of products that go beyond the scope of this manual.

**Warning:** Making unqualified changes to the hardware or software, or non-adherence to the warning information contained in this manual, can result in serious personal injury or damage to equipment.

# 3 Designations and synonyms

| | |
|---|---|
| LioN-P 30 | LioN-P devices with a width of 30 mm |
| LioN-P 60 | LioN-P devices with a width of 60 mm |
| Type A | IO-Link port specification (Class A) |
| Type B | IO-Link port specification (Class B) |
| I/O port | X1-X8 |
| I/O port pin 4 (C/Q) | Channel A of X1-X8 |
| I/O port pin 2 | Channel B of X1-X8 |
| $U_{Aux}$ | $U_{Auxiliary}$ **1).** |
| DI | Standard digital input |
| DO | Standard digital output |
| I/O | Input/Output |
| IOL | IO-Link |

**1).** $U_{Auxiliary}$ is the auxiliary power supply of the IO-Link master Class B.

# 4 System Description

The LioN-P (Lumberg I/O-Network Power) module series includes standalone field bus devices for decentralized use in tough industrial environments. The devices feature easy handling of I/O data in a higher-level bus system. They are especially suitable for use in machines and installations with a moderate I/O concentration over separate assemblies.

The LioN-P I/O module series has a very rugged metal housing made of die-cast zinc. The module electronics are fully protected from environmental influences by the fully sealed housing. The modules are available with IP65, IP67 and IP69k protection class ratings. The permissible temperature range for the modules is -30° C to +70° C. The module series is therefore ideally suited for direct field service in a tough industrial environment.

Despite the sturdy construction, the module series has compact dimensions and a low weight.

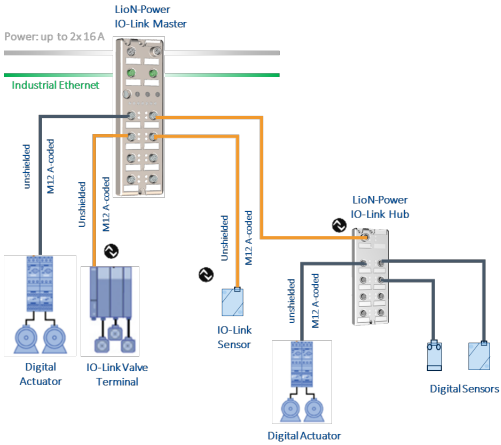
The LioN-P I/O hub module series consists of different types of modules with different I/O functionality. Modules with 16 digital inputs (16DI), 10 digital inputs/6 digital outputs (10DI/6DO) or 16 universal inputs/outputs (DIO) are available.

The modules with output functionality feature a failsafe function. During the configuration of these modules, the behavior of each output channel can be adjusted in case of interruption or loss of communication.

For electrical connection, the widely adopted M12 connector system is used with M12A keyed connectors for the I/O signals and the IO-Link interface and, if necessary, M12L keyed connectors for the power supply.

## 4.1 Basics of IO-Link

IO-Link is a globally standardized technology that enables communication between devices ranging from complex and intelligent sensors through to the central control unit. The IO-Link standard is specified according to the standard IEC 61131-9 and represents the basis of communication.




An IO-Link system consists of an IO-Link master and an IO-Link device (e.g. sensors, actuators, valves, I/O modules). An IO-Link master provides the interface to the higher-level controller and controls the communication to the connected IO-Link device. The connection between master and device can be achieved with a standard unshielded connection cable.

An IO-Link master can have several IO-Link ports. An IO-Link device can be connected to each port. Therefore, the connection is referred to as point-to-point communication.

# 4.2 Product Overview

## 4.2.1 Module variants

The following module variants are available:

| Item number | Product designation | Description | IO-Link and power ports | IO ports | available |
|---|---|---|---|---|---|
| 934 991 001 | 0960 IOL 384-001 | LioN-P 60, IO-Link device IO Hub - 8DI | IOL – M12 A | 8x M12 | tbd |
| 934 992 001 | 0960 IOL 381-001 | LioN-P 60, IO-Link device IO Hub - 16DI | IOL – M12 A | 8x M12 | Q4/2017 |
| 935 001 001 | 0960 IOL 385-001 | LioN-P 60, IO-Link device IO Hub - 10DI/6DO | IOL – M12 A | 8x M12 | tbd |
| 934 994 001 | 0960 IOL 380-021 | LioN-P 60, IO-Link device IO Hub - 16DIO | IOL – M12 A PWR – M12 L | 8x M12 | tbd |

*Table 2: Overview of module variants*

**IO-Link Device – I/O Hub – 8DI**

The IO-Link module 0960 IOL 384-001 with 8 digital inputs receives binary sensor signals from the process level and transfers them to the PLC control system via the IO-Link master and the higher-level field bus system. The sensors are supplied from the supply voltage (L+) provided by the IO-Link master. The module does not require a separate supply voltage connection.

**IO-Link Device – I/O Hub – 16DI**

The IO-Link module 0960 IOL 381-001 with 16 digital inputs receives binary sensor signals from the process level and transfers them to the PLC control system via the IO-Link master and the higher-level field bus system. The sensors are supplied from the supply voltage (L+) provided by the IO-Link master. The module does not require a separate supply voltage connection.

**IO-Link Device – I/O Hub – 16DIO**

The IO-Link module 0960 IOL 381-021 with 16 universal digital inputs or outputs receives binary sensor signals from the process level and transfers them to the PLC control system via the IO-Link master and the higher-level field bus system. The sensors and actuators are supplied with power from the M12-L power connection. The sensors and actuators are electrically isolated from the IO-Link interface.

**IO-Link Device – I/O Hub – 10DI/6DO**

The IO-Link module 0960 IOL 385-001 with 10 digital inputs and 6 digital outputs receives binary sensor signals from the process level and transfers them to the PLC control system via the IO-Link master and the higher-level field bus system. The inputs and outputs are electrically isolated. The sensors are supplied from the supply voltage (L+) provided by the IO-Link master. The actuators are supplied with power via the master's Class B extended power supply (2L+). The module is operated with a Class B master port and therefore does not require a separate supply voltage connection.

# 5 Assembly and Wiring

## 5.1 General Information

Mount the module on a flat surface using 2 screws (M4x25/30) for LioN-P. The torque required here is 1 Nm. Use washers compliant with DIN 125 for all types of mounting, maintaining a distance of **149.3 to 150.8 mm** between the mounting holes.

Using a standardized M12 connecting lead, connect the IO-Link interface of the IO module to the IO-Link master. In the case of modules with additional power supply input, connect the M12 connector to the DC power supply provided for the purpose.

**Attention:** For diverting interference current and EMC immunity, the modules are equipped with a ground connection with an M4 thread. This is labeled with the symbol for the ground and the designation "XE".

**Attention:** Connect the module to the reference ground with a low impedance electrical connection. When using a grounded mounting surface, you can make the connection directly via the fixing screws.

**Attention:** If the mounting surface is not grounded, use a ground strap or a suitable PE line. Connect the ground strap or the PE conductor the grounding point using an M4 screw and, if possible, place a serrated washer underneath the fixing screw.

**Attention:** For UL application:

Be sure to use a UL-certified cable with a suitable evaluation to connect the devices (CYJV or PVVA). To program the control, please refer to the OEM information, and only use suitable accessories.

**Attention:** For UL application:

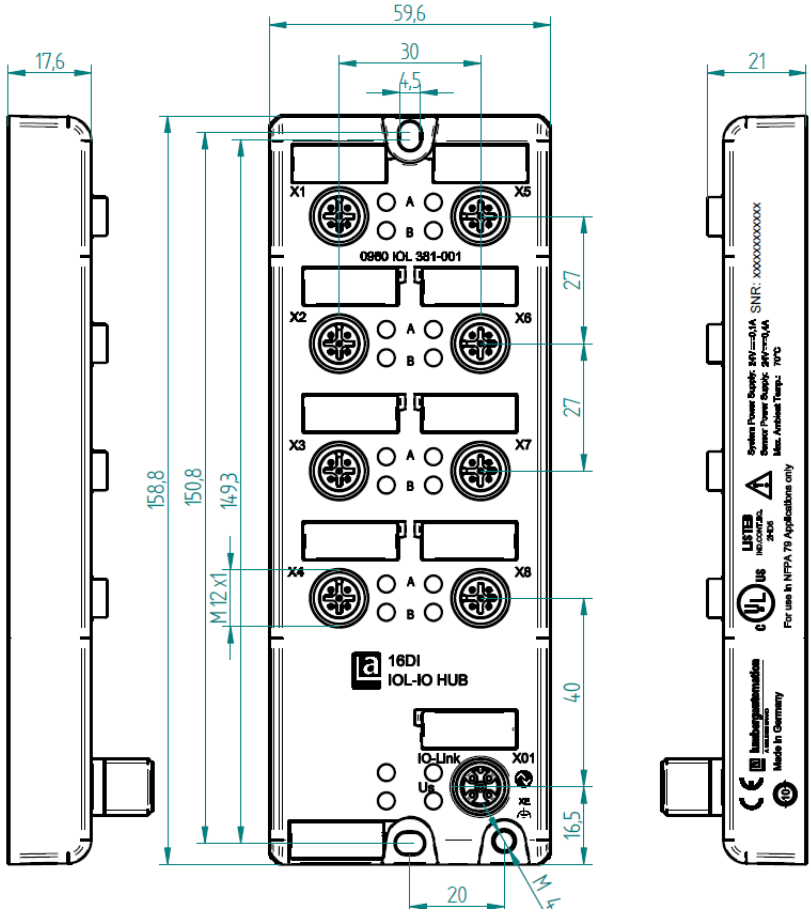
The installation and operation of the modules is only permitted for interior use. Please observe the maximum installation and operating height of 2000 m above sea level. Approved up to a maximum pollution degree of 2.

**Warning:** Terminals, housings of field-wired terminal boxes or components may exceed a temperature of +60° C.

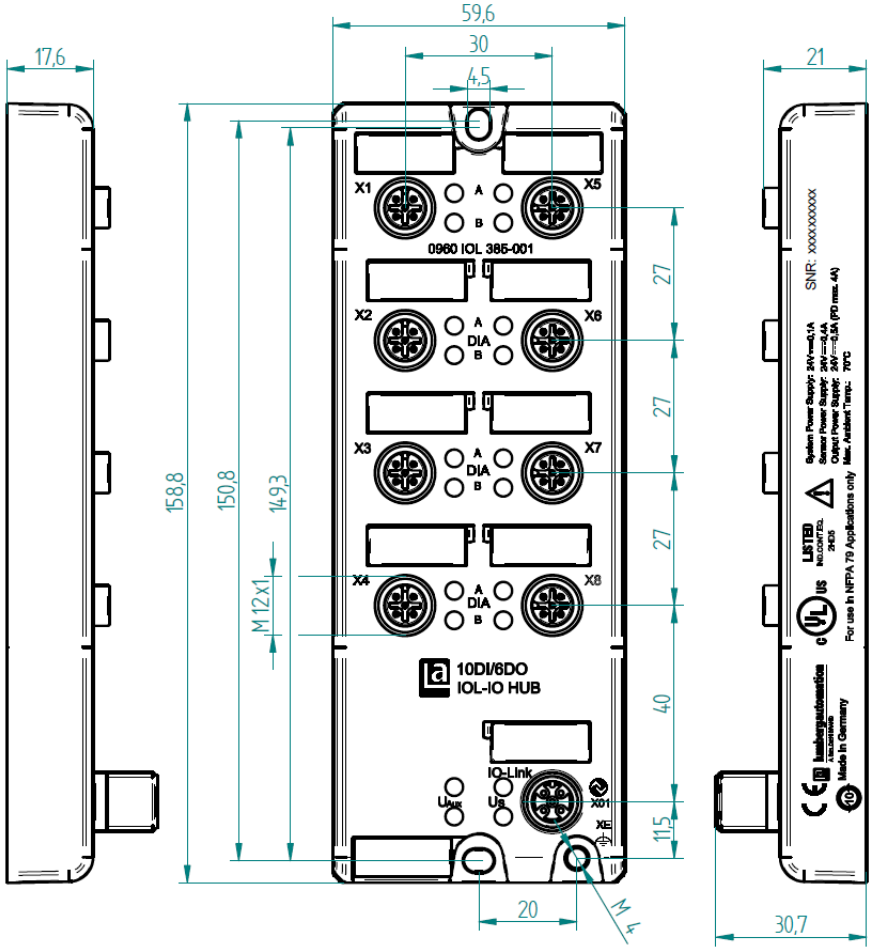
**Warning:** Any work on the electrical wiring of the modules may only be carried out when they are disconnected from the power supply.

# 5.2 External Dimensions

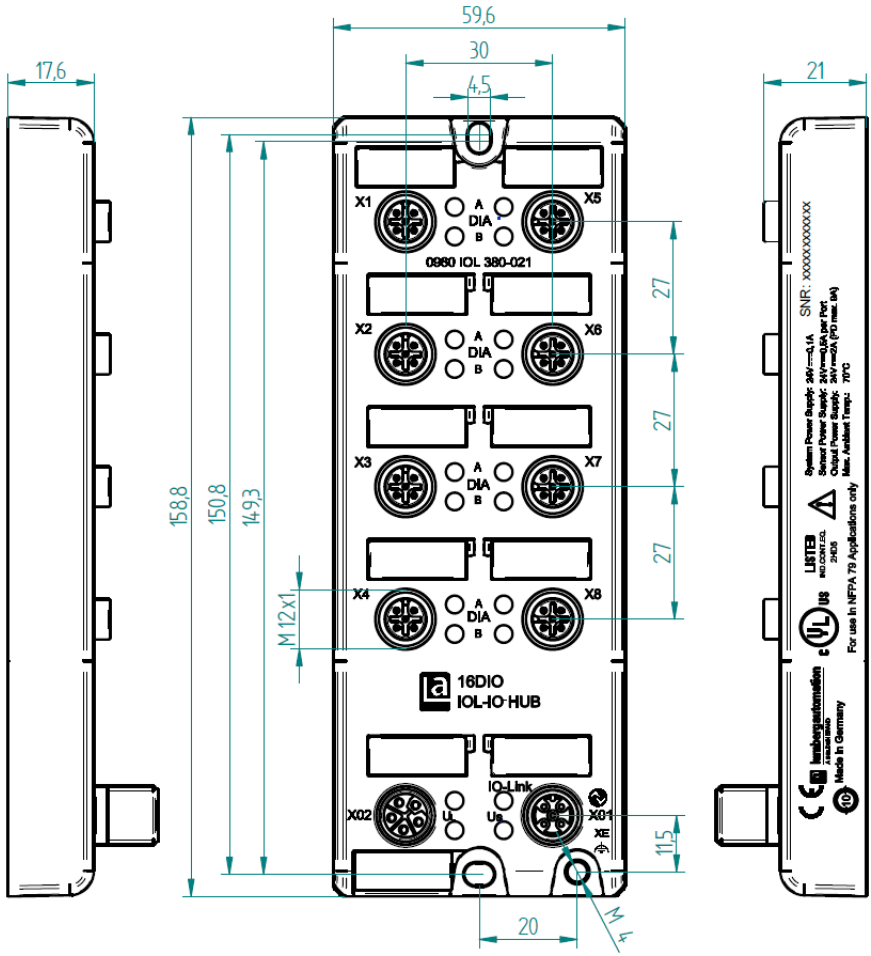
## 5.2.1 Module 0960 IOL 381-001



## 5.2.2 Module 0960 IOL 385-001



## 5.2.3 Module 0960 IOL 380-021



# 5.3 Port Assignments

All the contact arrangements shown in this chapter show the frontal view of the connection area for the connectors.

## 5.3.1 IO-Link interface

- Design: M12 connector, 5-pin, A-coded
- Color coding: black


Figure 1: Schematic diagram port X1

| Pin | 16DI (Class A) | 16DIO (Class A) | 10DI/6DO (Class B) | Function |
|---|---|---|---|---|
| 1 | +24 V DC<br>(L+) | +24 V DC<br>(L+) | +24 V DC<br>(L+) | Supply voltage<br>From IO-Link master |
| 2 | nc | nc | +24 V DC<br>(2L+) | Additional<br>Supply voltage<br>From IO-Link master |
| 3 | GND<br>(L-) | GND<br>(L-) | GND<br>(L-) | Reference potential<br>to L+ |
| 4 | C/Q<br>(IO-Link) | C/Q<br>(IO-Link) | C/Q<br>(IO-Link) | IO-Link data channel |
| 5 | nc | nc | GND<br>(2M) | Reference potential<br>to 2L+ |

*Table 3: IO-Link interface*

## 5.3.2 Ports for Sensors/Actuators

- Design: M12 socket, 5-pin, A-coded
- Color coding: black

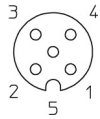



Figure 2: Schematic diagram ports X1 to X8

| Pin | 16DI | 16DIO | 10DI/6DO | Function |
|---|---|---|---|---|
| 1 | +24 V DC<br>(L+) | +24 V DC<br>($U_S$) | +24 V DC<br>(L+) | Sensor supply |
| 2 | IN B | IN / OUT B | IN / OUT | Dig. I/O |
| 3 | GND<br>(L-) | GND<br>($U_S$ and $U_A$) | GND | Reference potential |
| 4 | IN A | IN / OUT A | IN / OUT | Dig. I/O |
| 5 | FE | FE | FE | Functional earth |

*Table 4: IO port*

## 5.3.3 Power supply with M12 Power

- Design: M12 connector, 5-pin, L-coded
- Color coding: gray

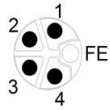



Figure 3: Schematic diagram M12 L-coded (male)

| Pin | 16DI | 16DIO | 10DI/6DO | Function |
|---|---|---|---|---|
| 1 | - | +24 V DC<br>($U_S$) | - | Sensor supply voltage |
| 2 | - | GND<br>($U_L$) | - | Reference potential<br>($U_L$) |

| Pin | 16DI | 16DIO | 10DI/6DO | Function |
|---|---|---|---|---|
| 3 | - | GND ($U_S$) | - | Reference potential ($U_S$) |
| 4 | - | +24 V DC ($U_L$) | - | Actuator supply voltage |
| 5 | - | FE | - | Functional earth |

*Table 5: Power supply*

**Attention:** Only use power supply units for the system/sensor and actuator supply that correspond to PELV (protective extra low voltage) or SELV (safety extra low voltage). Power supplies according to EN 61558-2-6 (transformers) or EN 60950-1 (switching power supply units) fulfill these requirements.

# 6 Configuration and Startup

The BELDEN IO-Link device modules are operated with an IO-Link master using both versions 1.0 and 1.1. To use the modules with a 1.0 master, a special equipment description file (IODD) is required. BELDEN IO-Link master supports only the standard 1.1 version.

The data storage mechanism is only supported in conjunction with an IO-Link master with the standard 1.1 version.

Further information on configuration and startup procedure can be found in the respective fieldbus protocol-specific IO-Link master documentation as well as in the Quick Connection Guide LioN-P IO-Link I/O Hub.

# 7 Assignment of process data

This chapter describes the assignment of the process data of the controller to the I/O channels.

The process data length is invariable for all Belden IO-Link I/O modules. The following tables show the structure of the data. It is not possible to configure the process data length.

## 7.1 16DI modules: 0960 IOL 381-001

### 7.1.1 Input Data

This module supplies a total of four bytes of input data, the input process image is mapped in the first two bytes as follows:

**Standard Belden Mapping, (LioN-P mapping)**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | Port 4B | Port 4A | Port 3B | Port 3A | Port 2B | Port 2A | Port 1B | Port 1A |
| Byte 1 | Port 8B | Port 8A | Port 7B | Port 7A | Port 6B | Port 6A | Port 5B | Port 5A |
| Byte 2 | DIAG channel | | | | MD-AE | MD-SE | MD-LVA | MD-LVS |
| Byte 3 | PRM-MODE | ID | | | | | | |

*Table 6: Input process data*

**Mapping LioN-P Legacy (LioN-Classic)**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | Port 8A | Port 7A | Port 6A | Port 5A | Port 4A | Port 3A | Port 2A | Port 1A |
| Byte 1 | Port 8B | Port 7B | Port 6B | Port 5B | Port 4B | Port 3B | Port 2B | Port 1B |
| Byte 2 | DIAG channel | | | | MD-AE | MD-SE | MD-LVA | MD-LVS |
| Byte 3 | PRM-MODE | ID | | | | | | |

*Table 7: Input process data*

The following applies here:

- 1A ... 8A: Actual condition of input channel A (contact pin 4) of the M12 socket connections 1 to 8.
- 1B ... 8B: Actual condition of input channel B (contact pin 2) of the M12 socket connections 1 to 8.

## 7.1.2 Output Data

This module also supplies four bytes of output data.

**Standard Belden mapping, (LioN-P mapping)/LioN-P legacy (LioN Classic) mapping**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | | | | | | | | |
| Byte 1 | | | | | | | | |
| Byte 2 | | | | | | | | |
| Byte 3 | PRM-ST | | | | | | | |

*Table 8: Output process data*

# 7.2 10DI/6DO modules: 0960 IOL 385-001

## 7.2.1 Input Data

This module supplies a total of four bytes of input data, the input process image is mapped in the first two bytes as follows:

**Standard Belden Mapping, (LioN-P mapping)**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | Port 4B | Port 4A | Port 3B | Port 3A | Port 2B | Port 2A | Port 1B | Port 1A |
| Byte 1 | | | | | | | Port 5B | Port 5A |
| Byte 2 | DIAG channel | | | | MD-AE | MD-SE | MD-LVA | MD-LVS |
| Byte 3 | PRM mode | ID | | | | | | |

*Table 9: Input process data*

**Mapping LioN-P Legacy (LioN-Classic)**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | | | | Port 5A | Port 4A | Port 3A | Port 2A | Port 1A |
| Byte 1 | | | | Port 5B | Port 4B | Port 3B | Port 2B | Port 1B |
| Byte 2 | DIAG channel | | | | MD-AE | MD-SE | MD-LVA | MD-LVS |
| Byte 3 | PRM mode | ID | | | | | | |

*Table 10: Input process data*

The following applies here:

- 1A ... 8A: Actual condition of input channel A (contact pin 4) of the M12 socket connections 1 to 8.
- 1B ... 8B: Actual condition of input channel B (contact pin 2) of the M12 socket connections 1 to 8.

## 7.2.2 Output Data

This module also supplies four bytes of output data, the output process image is mapped in the first two bytes as follows:

### Standard Belden Mapping, (LioN-P mapping)

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | | | | | | | | |
| Byte 1 | Port 8B | Port 8A | Port 7B | Port 7A | Port 6B | Port 6A | | |
| Byte 2 | | | | | | | | |
| Byte 3 | PRM-RST | | | | | | | |

*Table 11: Output process data*

### Mapping LioN-P Legacy (LioN-Classic)

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | Port 8A | Port 7A | Port 6A | | | | | |
| Byte 1 | Port 8B | Port 7B | Port 6B | | | | | |
| Byte 2 | | | | | | | | |
| Byte 3 | PRM-RST | | | | | | | |

*Table 12: Output process data*

The following applies here:

- 1A ... 8A: Actual status of output channel A (contact pin 4) of the M12 socket connections 1 to 8.
- 1B ... 8B: Actual status of output channel B (contact pin 2) of the M12 socket connections 1 to 8.

# 7.3 16DIO modules: 0960 IOL 380-021

## 7.3.1 Input Data

This module supplies a total of four bytes of input data, the input process image is mapped in the first two bytes as follows:

**Standard Belden Mapping, (LioN-P mapping)**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | Port 4B | Port 4A | Port 3B | Port 3A | Port 2B | Port 2A | Port 1B | Port 1A |
| Byte 1 | Port 8B | Port 8A | Port 7B | Port 7A | Port 6B | Port 6A | Port 5B | Port 5A |
| Byte 2 | DIAG channel | | | | MD-AE | MD-SE | MD-LVA | MD-LVS |
| Byte 3 | PRM-MODE | ID | | | | | | |

*Table 13: Input process data*

**Mapping LioN-P Legacy (LioN-Classic)**

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | Port 8A | Port 7A | Port 6A | Port 5A | Port 4A | Port 3A | Port 2A | Port 1A |
| Byte 1 | Port 8B | Port 7B | Port 6B | Port 5B | Port 4B | Port 3B | Port 2B | Port 1B |
| Byte 2 | DIAG channel | | | | MD-AE | MD-SE | MD-LVA | MD-LVS |
| Byte 3 | PRM-MODE | ID | | | | | | |

*Table 14: Input process data*

The following applies here:

- 1A ... 8A: Actual condition of input channel A (contact pin 4) of the M12 socket connections 1 to 8.
- 1B ... 8B: Actual condition of input channel B (contact pin 2) of the M12 socket connections 1 to 8.

## 7.3.2 Output Data

This module also supplies four bytes of output data, the output process image is mapped in the first two bytes as follows:

### Standard Belden Mapping, (LioN-P mapping)

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | Port 4B | Port 4A | Port 3B | Port 3A | Port 2B | Port 2A | Port 1B | Port 1A |
| Byte 1 | Port 8B | Port 8A | Port 7B | Port 7A | Port 6B | Port 6A | Port 5B | Port 5A |
| Byte 2 | | | | | | | | |
| Byte 3 | PRM-RST | | | | | | | |

*Table 15: Output process data*

### Mapping LioN-P Legacy (LioN-Classic)

| | Bit 7 | Bit 6 | Bit 5 | Bit 4 | Bit 3 | Bit 2 | Bit 1 | Bit 0 |
|---|---|---|---|---|---|---|---|---|
| Byte 0 | Port 8A | Port 7A | Port 6A | Port 5A | Port 4A | Port 3A | Port 2A | Port 1A |
| Byte 1 | Port 8B | Port 7B | Port 6B | Port 5B | Port 4B | Port 3B | Port 2B | Port 1B |
| Byte 2 | | | | | | | | |
| Byte 3 | PRM-RST | | | | | | | |

*Table 16: Output process data*

The following applies here:

- 1A ... 8A: Actual condition of input channel A (contact pin 4) of the M12 socket connections 1 to 8.
- 1B ... 8B: Actual condition of input channel B (contact pin 2) of the M12 socket connections 1 to 8.

### Specifications for Byte 2 and Byte 3

| | |
|---|---|
| **MD-LVS** | Module diagnosis – system/sensor power supply voltage too low |
| **MD-LVA** | Module diagnosis – actuator power supply voltage ($U_A$) too low |
| **MD-SE** | Module diagnosis – Sensor error (short-circuit or overload) |
| **MD-AE** | Module diagnosis – actuator error (short-circuit or overload) |
| **DIAG-PORT** | Port release notes (1-8) of the MD-AE (or MD-SE channel release notes, if available) |
| **ID** | ID byte for identification of a tool change, 0 = not used, ID = 1-127 |
| **PRM-MODE** | Possible values |
| | **1** User configuration active, different from the standard settings |
| | **0** Standard configuration active |
| **PRM-RST** | Reset to factory settings for configuration 50 ms after detection of the signal “1”. |

# 8 Parameterization of the IO-Link hub modules

The parameters set during system commissioning are transferred to the device. The device and also the master store these parameters. In case of a module exchange, the stored parameters can then be automatically transferred to the new module. The behavior of the master and device is defined at the IO-Link master port.

## 8.1 IO-Link data storage

The BELDEN IO-Link I/O modules and the BELDEN IO-Link masters support the data storage functionality. All user-configurable parameters are stored on the module and on the master. (Exception: ident number index 0x60)

## 8.2 IO-Link block configuration

IO-Link offers the facility to transfer all parameter data from the controller as a block. Block communication is activated by the command "ParamDownLoadStart", index 0x02, subindex 0, 3. Following successful configuration, deactivation is performed by means of the command "ParamDownLoadEnd", index 0x02, subindex 0, 4.

The BELDEN IO-Link device I/O modules support the block configuration described.

## 8.3 IO-Link factory reset

The module can be reset to the factory settings in two ways.

1. By activating the IO-Link specified system command “Restore factory settings.” The command requires that 0x82 is written to the index 0x02, subindex 0.
2. By setting the output bit "PRM-RST" in the process data, byte 3, b7. The requirement in that case is that the command is activated in the parameter General Device Settings, index 0x40, subindex 3.

# 8.4 16DI module: 0960 IOL 381-001

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0000 | 8 | Vendor ID1 (MSB) | R | 1 | UINT8 | 0x016A (362dec) |
| 0x0000 | 9 | Vendor ID2 (LSB) | R | 1 | UINT8 | |
| 0x0000 | 10 | Device ID1 (MSB) | R | 1 | UINT8 | 0x381001 |
| 0x0000 | 11 | Device ID2 | R | 1 | UINT8 | |
| 0x0000 | 12 | Device ID3 (LSB) | R | 1 | UINT8 | |

*Table 17: Direct Parameter 1*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x00C | 1 | Parameters (write)<br>Access (opt.) | R/W | 1 bit | Boolean | 0 |
| 0x00C | 2 | Data storage look | R/W | 1 bit | Boolean | Lock parameter upload<br>0: unlocked, 1: locked<br>Default:0 |
| 0x00C | 3 | Local parameterization (opt.) | R/W | 1 bit | Boolean | 0 |
| 0x00C | 4 | Local user interface (opt.) | R/W | 1 bit | Boolean | 0 |

*Table 18: Device access locks*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0010 | 0 | Vendor name | R | 64 | String | BELDEN Deutschland GmbH |
| 0x0011 | 0 | Vendor text | R | 64 | String | www.beldensolutions.com |
| 0x0012 | 0 | Product name | R | 64 | String | 0960 IOL 381-001 |
| 0x0013 | 0 | Product ID | R | 64 | String | 934992001 |
| 0x0014 | 0 | Product description | R | 64 | String | LioN-P IO-Link I/O Hub, 16DI |
| 0x0015 | 0 | Serial number | R | 16 | String | Production/user serial number |
| 0x0016 | 0 | Hardware revision | R | 64 | String | 01 |
| 0x0017 | 0 | Firmware revision | R | 64 | String | 01 |
| 0x0018 | 0 | Application Specific tag | R/W | 32 | String | 0 (default) |

*Table 19: Identification*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0040 | 1-16 | General device settings | R/W | 1 | Boolean | 0 |
| 0x0041 | 1-16 | General diagnosis settings | R/W | 1 | Boolean | 0 |
| | | | | | | |
| 0x0043 | 1-16 | Input filter | R/W | 16 | UINT8 | 3 ms |
| 0x0044 | 1-16 | Input signal extension | R/W | 16 | UINT8 | Off |
| 0x0045 | 1-16 | Input logic setting | R/W | 16 | UINT8 | Normal |
| | | | | | | |
| 0x0048 | 1-16 | User serial number | R/W | 16 | String | 0 |

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0049 | 1-16 | Electrical node ID tag | R/W | 16 | String | 0 |
| | | | | | | |
| 0x0060 | 1 | Tool identification | R/W | 1 | | 0 (b7: res. + b6 ... b0) |

*Table 20: Device parameters (individual)*

# 8.5 10DI/6DO module: 0960 IOL 385-001

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0000 | 8 | Vendor ID1 (MSB) | R | 1 | UINT8 | 0x016A (362dec) |
| 0x0000 | 9 | Vendor ID2 (LSB) | R | 1 | UINT8 | |
| 0x0000 | 10 | Device ID1 (MSB) | R | 1 | UINT8 | 0x385001 |
| 0x0000 | 11 | Device ID2 | R | 1 | UINT8 | |
| 0x0000 | 12 | Device ID3 (LSB) | R | 1 | UINT8 | |

*Table 21: Direct Parameter 1*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x000C | 1 | Parameter (write) access (opt.) | R/W | 1 bit | Boolean | 0 |
| 0x000C | 2 | Data storage look | R/W | 1 bit | Boolean | Lock parameter upload<br>0: unlocked, 1: locked<br>Default:0 |

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x000C | 3 | Local parameterization (opt.) | R/W | 1 bit | Boolean | 0 |
| 0x000C | 4 | Local user interface (opt.) | R/W | 1 bit | Boolean | 0 |

*Table 22: Device access locks*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0010 | 0 | Vendor name | R | 64 | String | BELDEN Deutschland GmbH |
| 0x0011 | 0 | Vendor name | R | 64 | String | www.beldensolutions.com |
| 0x0012 | 0 | Product name | R | 64 | String | 0960 IOL 385-001 |
| 0x0013 | 0 | Product ID | R | 64 | String | 935001001 |
| 0x0014 | 0 | Product description | R | 64 | String | LioN-P IO-Link I/O Hub, 10DI/6DO |
| 0x0015 | 0 | Serial number | R | 16 | String | Production/user serial number |
| 0x0016 | 0 | Hardware revision | R | 64 | String | 01 |
| 0x0017 | 0 | Firmware revision | R | 64 | String | 01 |
| 0x0018 | 0 | Application Specific tag | R/W | 32 | String | 0 (default) |

*Table 23: Identification*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0040 | 1-16 | General device settings | R/W | 1 | Boolean | 0 |
| 0x0041 | 1-16 | General diagnosis settings | R/W | 1 | Boolean | 0 |
| | | | | | | |
| 0x0043 | | Input filter | R/W | 16 | UINT8 | 3ms |
| 0x0044 | | Input signal extension | R/W | 16 | UINT8 | Off |
| 0x0045 | | Input logic setting | R/W | 16 | UINT8 | Normal |
| 0x0046 | 1-16 | Fail safe settings | R/W | 16 | UINT8 | low |
| | | | | | | |
| 0x0048 | | User serial number | R/W | 16 | String | 0 |
| 0x0049 | | Electrical node ID tag | R/W | 16 | String | 0 |
| | | | | | | |
| 0x0060 | | Tool identification | R/W | 1 | | 0 (b7: res. + b6 … b0) |

*Table 24: Device parameters (individual)*

# 8.6 16DIO module: 0960 IOL 380-021

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0000 | 8 | Vendor ID1 (MSB) | R | 1 | UINT8 | 0x016A (362dec) |
| 0x0000 | 9 | Vendor ID2 (LSB) | R | 1 | UINT8 | |
| 0x0000 | 10 | Device ID1 (MSB) | R | 1 | UINT8 | 0x380021 |
| 0x0000 | 11 | Device ID2 | R | 1 | UINT8 | |
| 0x0000 | 12 | Device ID3 (LSB) | R | 1 | UINT8 | |

*Table 25: Direct Parameter 1*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x00C | 1 | Parameters (write)<br>Access (opt.) | R/W | 1 bit | Boolean | 0 |
| 0x00C | 2 | Data storage look | R/W | 1 bit | Boolean | Lock parameter upload<br>0: unlocked, 1: locked<br>Default:0 |
| 0x00C | 3 | Local parameterization (opt.) | R/W | 1 bit | Boolean | 0 |
| 0x00C | 4 | Local user interface (opt.) | R/W | 1 bit | Boolean | 0 |

*Table 26: Device access locks*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0010 | 0 | Vendor name | R | 64 | String | BELDEN Deutschland GmbH |
| 0x0011 | 0 | Vendor text | R | 64 | String | www.beldensolutions.com |
| 0x0012 | 0 | Product name | R | 64 | String | 0960 IOL 380-021 |
| 0x0013 | 0 | Product ID | R | 64 | String | 934994001 |
| 0x0014 | 0 | Product description | R | 64 | String | LioN-P IO-Link I/O Hub, 16DIO |
| 0x0015 | 0 | Serial number | R | 16 | String | Production/user serial number |
| 0x0016 | 0 | Hardware revision | R | 64 | String | 01 |
| 0x0017 | 0 | Firmware revision | R | 64 | String | 01 |
| 0x0018 | 0 | Application Specific tag | R/W | 32 | String | 0 (default) |

*Table 27: Identification*

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0040 | 1-16 | General device settings | R/W | 1 | Boolean | 0 |
| 0x0041 | 1-16 | General diagnosis settings | R/W | 1 | Boolean | 0 |
| | | | | | | |
| 0x0043 | 1-16 | Input filter | R/W | 16 | UINT8 | 3 ms |
| 0x0044 | 1-16 | Input signal extension | R/W | 16 | UINT8 | Off |
| 0x0045 | 1-16 | Input logic setting | R/W | 16 | UINT8 | Normal |
| 0x0046 | 1-16 | Fail safe settings | R/W | 16 | UINT8 | low |
| | | | | | | |

| Index | Subindex | Parameter | Access | Data length [byte] | Data type | Default value |
|---|---|---|---|---|---|---|
| 0x0048 | 1-16 | User serial number | R/W | 16 | String | 0 |
| 0x0049 | 1-16 | Electrical node ID tag | R/W | 16 | String | 0 |
| | | | | | | |
| 0x0060 | 1 | Tool identification | R/W | 1 | | 0 (b7: res. + b6 ... b0) |

*Table 28: Device parameters (individual)*

# 8.7 Description of parameter data

## 8.7.1 Parameter – General device settings

Cannot access individual subindexes.

| Index | Subindex/ Data length 1 bytes | Bit number | Parameter |
|---|---|---|---|
| 0x40 | 1 | 0 | I/O data mapping, 0 = LioN-P (A/B, A/B, …, channel order),<br>1 = LioN-Classic<br>(A, A, A … channel / B, B, B, … channel order) |
| 0x40 | 2 | 1 | DIS-AE-AR: Disable actuator error auto restart , 0 = false, 1 = true<br>**(only modules with DO function, otherwise do not use)** |
| 0x40 | 3 | 2 | DIS-PRM-RST: Disable Z-parameter factory reset, 0 = false, 1 = true |
| 0x40 | 4 | 3 | Reserved: do not use |
| 0x40 | 5 | 4 | Reserved: do not use |
| 0x40 | 6 | 5 | Reserved: do not use |
| 0x40 | 7 | 6 | Reserved: do not use |
| 0x40 | 8 | 7 | Reserved: do not use |

## 8.7.2 Parameter – General diagnosis settings

Cannot access individual subindexes.

| Index | Subindex/ Data length 1 bytes | Bit number | Parameters for peripheral IO-Link diagnostics |
|---|---|---|---|
| 0x41 | 1 | 0 | Switch off transmission of the peripheral diagnosis using the IO-Link protocol, **0 = false**,<br>1 = true<br>(peripheral diagnoses in the input data are always available.) |
| 0x41 | 2 | 1 | DIS-AE-WO-VA: Disable actuator error without $U_A$: **0 = false**, 1 = true<br>**(only modules with DO function, otherwise do not use)** |
| 0x41 | 3 | 2 | DIS-LVA: Disable low voltage actuator power ($U_A$ = $U_{Auxiliary}$) diagnosis: **0 = false**, 1 = true<br>**(only modules with DO function, otherwise do not use)** |
| 0x41 | 4 | 3 | Reserved: do not use |
| 0x41 | 5 | 4 | Reserved: do not use |
| 0x41 | 6 | 5 | Reserved: do not use |
| 0x41 | 7 | 6 | Reserved: do not use |
| 0x41 | 8 | 7 | Reserved: do not use |

| $U_A$ | Dependencies of actuator error parameter settings | | AE diagnosis / LVA diagnosis |
|---|---|---|---|
| NOK < 5 V<br>OK > 18 V | **DIS-AE-WO-VA**<br>1 = true | **DIS-LVA**<br>1 = true | |
| NOK | 0 | 0 | Yes (at least one output set logically) / Yes |
| NOK | 0 | 1 | Yes (at least one output set logically) / No |
| NOK | 1 | 0 | No (at least one output set logically) / Yes |
| NOK | 1 | 1 | No (at least one output set logically) / No |
| OK | 0 | 0 | Yes (overload or short-circuit) / Yes |
| OK | 0 | 1 | Yes (overload or short-circuit) / No |
| OK | 1 | 0 | No (overload or short-circuit) / Yes |

| $U_A$ | Dependencies of actuator error parameter settings | | AE diagnosis / LVA diagnosis |
|---|---|---|---|
| OK | 1 | 1 | No (overload or short-circuit) / No |

*Table 29: Description re index 0x41, subindex 1 + 2*

## 8.7.3 Parameter – Input filter

An input filter time is specified by the parameter setting.

The filter times are variably configurable for each channel via the device parameter 0x43.

| Index | Subindex Data length 16 bytes | Bit number | IO channel / port | Parameter value |
|---|---|---|---|---|
| 0x43 | 1 | 0-3 | 0 / X1A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 2 | 0-3 | 1 / X1B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 3 | 0-3 | 2 / X2A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 4 | 0-3 | 3 / X2B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 5 | 0-3 | 4 / X3A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 6 | 0-3 | 5 / X3B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 7 | 0-3 | 6 / X4A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 8 | 0-3 | 7 / X4B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 9 | 0-3 | 8 / X5A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 10 | 0-3 | 9 / X5B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 11 | 0-3 | 10 / X6A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 12 | 0-3 | 11 / X6B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 13 | 0-3 | 12 / X7A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 14 | 0-3 | 13 / X7B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 15 | 0-3 | 14 / X8A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x43 | 16 | 0-3 | 15 / X8B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |

### 8.7.4 Parameter – Input signal extension

The parameter setting specifies a minimum input switching time.

This minimum switching time is used for both the Logic-1 and Logic-0 status.

The switching time extensions are variably configurable for each channel via the device parameter index 0x44.

| Index | Subindex Data length 16 bytes | Bit number | IO channel / port | Parameter |
|---|---|---|---|---|
| 0x44 | 1 | 0-3 | 0 / X1A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 2 | 0-3 | 1 / X1B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 3 | 0-3 | 2 / X2A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 4 | 0-3 | 3 / X2B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 5 | 0-3 | 4 / X3A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 6 | 0-3 | 5 / X3B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 7 | 0-3 | 6 / X4A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 8 | 0-3 | 7 / X4B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 9 | 0-3 | 8 / X5A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 10 | 0-3 | 9 / X5B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 11 | 0-3 | 10 / X6A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 12 | 0-3 | 11 / X6B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 13 | 0-3 | 12 / X7A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 14 | 0-3 | 13 / X7B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 15 | 0-3 | 14 / X8A | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |
| 0x44 | 16 | 0-3 | 15 / X8B | 0= Off, 1 = 0.5 ms, 2 = 1 ms, 3 = 2 ms, 4 = 3 ms |

## 8.7.5 Parameter - Input logic settings (NO/NC)

The parameter determines whether the switched input is displayed as logic 1 (normal mode) or alternatively as logic 0 (inverted mode).

| Index | Subindex Data length 16 bytes | Bit number | IO channel / port | Parameter |
|---|---|---|---|---|
| 0x45 | 1 | 0 | 0 / X1A | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 2 | 0 | 1 / X1B | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 3 | 0 | 2 / X2A | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 4 | 0 | 3 / X2B | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 5 | 0 | 4 / X3A | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 6 | 0 | 5 / X3B | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 7 | 0 | 6 / X4A | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 8 | 0 | 7 / X4B | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 9 | 0 | 8 / X5A | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 10 | 0 | 9 / X5B | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 11 | 0 | 10 / X6A | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 12 | 0 | 11 / X6B | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 13 | 0 | 12 / X7A | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 14 | 0 | 13 / X7B | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 15 | 0 | 14 / X8A | NO (Normally Open) = 0, NC (Normally Closed) = 1 |
| 0x45 | 16 | 0 | 15 / X8B | NO (Normally Open) = 0, NC (Normally Closed) = 1 |

## 8.7.6 Parameter – fail-safe settings

**Attention:** Only modules with DO function, otherwise do not use.

The parameters setting determines the behavior of the digital outputs in the event of a communication loss. Each channel can be configured individually.

| Index | Subindex Data length 16 bytes | Bit number | IO channel / port | Parameter |
|---|---|---|---|---|
| 0x46 | 1 | 0-1 | 0 / X1A | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 2 | 0-1 | 1 / X1B | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 3 | 0-1 | 2 / X2A | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 4 | 0-1 | 3 / X2B | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 5 | 0-1 | 4 / X3A | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 6 | 0-1 | 5 / X3B | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 7 | 0-1 | 6 / X4A | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 8 | 0-1 | 7 / X4B | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 9 | 0-1 | 8 / X5A | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 10 | 0-1 | 9 / X5B | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 11 | 0-1 | 10 / X6A | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 12 | 0-1 | 11 / X6B | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 13 | 0-1 | 12 / X7A | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 14 | 0-1 | 13 / X7B | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 15 | 0-1 | 14 / X8A | 0 = low, 1 = high, 2 = hold last |
| 0x46 | 16 | 0-1 | 15 / X8B | 0 = low, 1 = high, 2 = hold last |

### 8.7.7 Parameter – User serial number

This parameter allows the user to set a user-specific serial number. The user-specific serial number will be emitted right after the identification parameter, index 0x15, has been read.

If the contents of index 0x48 are equal to zero, the production serial number will be emitted on index 0x15.

| Index | Subindex/Data length 16 bytes | Bit number | Parameter |
|---|---|---|---|
| 0x48 | 1-16 | 16 x 0 ... 7 | User serial number (default: 16 x 0x00) |

### 8.7.8 Parameter – Electrical Node ID Tag

| Index | Subindex/Data length 16 bytes | Bit number | Parameter |
|---|---|---|---|
| 0x49 | 1-16 | 16 x 0 ... 7 | Electrical Node ID Tag, ASCII text<br>(Default: 16 x 0x00) |

*Table 30: User-specific description*

### 8.7.9 Parameter – Identification

| Index | Subindex/Data length 1 bytes | Bit number | Parameter |
|---|---|---|---|
| 0x60 | 1 | 0 ... 6 | Identification |

*Table 31: ID for detecting correct tool change*

The parameter (index 0x60) is outside the data storage range.

# 9 Diagnostic Properties of the Modules

The modules offer the following diagnostic messages dependent on their function.

## 9.1 Device Status

<table>
<tr><th>Index</th><th>Sub Index / Data length 1 Byte</th><th>Length</th><th>Parameter</th></tr>
<tr><td>0x24</td><td>0</td><td>Octet</td><td>
<table>
<tr><th>Value</th><th>Definition</th></tr>
<tr><td>0</td><td>Device is operating properly.</td></tr>
<tr><td>1</td><td>Maintenance-Required</td></tr>
<tr><td>2</td><td>Out-of-Specification</td></tr>
<tr><td>3</td><td>Functional-Check</td></tr>
<tr><td>4</td><td>Failure</td></tr>
<tr><td>5-255</td><td>Reserved</td></tr>
</table>
Table 32: R only: Contains the current status of the device.
</td></tr>
</table>

# 9.2 Device status in detail

<table>
<tr><th>Index</th><th>Subindex / data length N x ArrayT</th><th>Length</th><th>Parameter</th></tr>
<tr><td>0x25</td><td>1-24</td><td>ArrayT</td><td>
<table>
<tr><th>Subindex</th><th>Object name</th><th>Data type</th><th>Comment</th></tr>
<tr><td>1</td><td>Error_Warning_1</td><td>3 octets</td><td rowspan="4">All octets 0x00: no error/warning<br>Octet 1: Event qualifier<br>Octet 2, 3: Event code</td></tr>
<tr><td>2</td><td>Error_Warning_2</td><td>3 octets</td></tr>
<tr><td>3</td><td>Error_Warning_3</td><td>3 octets</td></tr>
<tr><td>4</td><td>Error_Warning_4</td><td>3 octets</td></tr>
<tr><td>:</td><td>:</td><td>:</td><td>:</td></tr>
<tr><td>n</td><td>Error_Warning_n</td><td>3 octets</td><td></td></tr>
</table>
Table 33: R only: Contains the extended status of the device.
</td></tr>
</table>

<table>
<tr><th>Bits</th><th>Description</th></tr>
<tr><td>b7 ... b6</td><td>Mode</td><td>
<table>
<tr><th>Value</th><th>Definition</th></tr>
<tr><td>0</td><td>Reserved</td></tr>
<tr><td>1</td><td>Event single shot</td></tr>
<tr><td>2</td><td>Event disappears</td></tr>
<tr><td>3</td><td>Event appears</td></tr>
</table>
</td></tr>
<tr><td>b5 ... b4</td><td>Type</td><td>
<table>
<tr><th>Value</th><th>Definition</th></tr>
<tr><td>0</td><td>Reserved</td></tr>
<tr><td>1</td><td>Notification</td></tr>
<tr><td>2</td><td>Warning</td></tr>
<tr><td>3</td><td>Error</td></tr>
</table>
</td></tr>
<tr><td>b3</td><td>Source</td><td>
<table>
<tr><th>Value</th><th>Definition</th></tr>
<tr><td>0</td><td>Device (remote)</td></tr>
<tr><td>1</td><td>Master (local)</td></tr>
</table>
</td></tr>
<tr><td>b2 ... b0</td><td>Instance</td><td>
<table>
<tr><th>Value</th><th>Definition</th></tr>
<tr><td>0</td><td>Unknown</td></tr>
<tr><td>1 ... 3</td><td>Reserved</td></tr>
<tr><td>4</td><td>Application</td></tr>
<tr><td>5 ... 7</td><td>Reserved</td></tr>
</table>
</td></tr>
</table>

*Table 34: Event qualifier*

| Event code | Type | Device status | Description |
|---|---|---|---|
| 0x5111 | Warning | 2 | Low voltage sensor (US) |
| 0x5112 | Warning | 2 | Low voltage actuator (UAux) * |
| 0x7710 | Error | 4 | Sensor error (short circuit) |
| 0x8CB0 | Error | 4 | Actuator error X1A * |
| 0x8CB1 | Error | 4 | Actuator error X1B * |
| 0x8CB2 | Error | 4 | Actuator error X2A * |
| 0x8CB3 | Error | 4 | Actuator error X2B * |
| 0x8CB4 | Error | 4 | Actuator error X3A * |
| 0x8CB5 | Error | 4 | Actuator error X3B * |
| 0x8CB6 | Error | 4 | Actuator error X4A * |
| 0x8CB7 | Error | 4 | Actuator error X4B * |
| 0x8CB8 | Error | 4 | Actuator error X5A * |
| 0x8CB9 | Error | 4 | Actuator error X5B * |
| 0x8CBA | Error | 4 | Actuator error X6A * |
| 0x8CBB | Error | 4 | Actuator error X6B * |
| 0x8CBC | Error | 4 | Actuator error X7A * |
| 0x8CBD | Error | 4 | Actuator error X7B * |
| 0x8CBE | Error | 4 | Actuator error X8A * |
| 0x8CBF | Error | 4 | Actuator error X8B * |

*Table 35: Event codes for peripheral errors*

*) (only modules with DO functions, otherwise do not use.)

| Error code | Description |
|---|---|
| 0x8011 | Index not available |
| 0x8012 | Subindex not available |
| 0x8023 | Access denied |
| 0x8033 | Parameter length overrun |
| 0x8034 | Parameter length underrun |
| 0x8035 | Function not available |

*Table 36: Error codes for access management*

# 10 IO-Link IODD

There is an IODD device description file available for every BELDEN IO-Link device. The IODD file contains a variety of information about system integration, including communication properties, device parameters, and identification, process and diagnostic data.

## 10.1 Device description file download

You can find the matching device description file in each case in the BELDEN download area at:

http://www.beldensolutions.com

or in the IO-Link Community download area at

https://ioddfinder.io-link.com.

**Attention:** We recommend that you download and install the most up-to-date version of the relevant IODD from the download area.

# 11 Firmware update

A firmware update is currently only possible via a special IO-Link master (1-port master) using special software.

## 11.1 Support for the update process

The update process is supported by BELDEN Support and BELDEN Production. The update is performed using the IO-Link interface.

At a later point in time, it will be possible to update the modules using the BELDEN IO-Link Master.

# 12 Technical Data

## 12.1 General

| | |
|---|---|
| Ambient temperature during operation | -30° C … +70° C |
| Ambient storage temperature | -40° C … +85° C |
| Ambient humidity | 98% RH<br>(for UL applications 80% PRH) |
| Weight | Approx. 280 g |
| Housing material | Die-cast zinc |
| Casting compound | WEVO PU 552 FL/10<br>Hardener 300 RE |
| Protection class:<br>Plugged in and properly screwed together (according to DIN EN 60529) | IP65<br>IP67<br>IP69k |
| Pollution degree (pollution) | 3 |
| Flammability class | UL 94 |
| Vibration, sinusoidal | EN 60068-2-6<br>5-500 Hz / 15 g |
| Shock, semi-sinusoidal EN 60068-2-27 | EN 60068-2-27<br>50 g / 11 ms |
| EMC immunity, EMC interference emission | EN 61000-6-2<br>EN 61000-6-4 |
| Torques<br>Fixing screws M4/M6<br>M12 connector | <br>1.0 Nm<br>0.5 Nm |
| Installation position | Any |
| Approvals | CE, UL, IO-Link |

*Table 37: General information*

## 12.2 IO-Link interface

| | |
|---|---|
| Specification | IO-Link Spec. v1.1.2 |
| Physical transmission | IO-Link, 24 V<br>Half duplex |
| Transfer rate<br>Com3 | COM 3 (230.4 kBaud) |
| Limitation<br>IO-Link expansion | max. 20 m |
| IO-Link standard<br>8/16DI variant<br>10DI/6DO variant<br>16DIO | IEC 61131-9<br>Class A<br>Class B<br>Class A + M12 L |
| Process data | 4 bytes input data<br>4 bytes output data |
| Frame type | Type_2_V |
| Cycle time | Max. 2 ms |

*Table 38: Information on the bus system*

## 12.3 Power Supply for the Module Electronics/ Sensors

| | |
|---|---|
| Nominal voltage $U_S$ | 24 V DC |
| Nominal voltage range | 19.2 - 28.8 V DC<br>(SELV/PELV to EN60950 - 1) |
| Max. voltage range | 18 – 30 V DC |
| Power consumption/supply | Max. 100 mA |
| Reverse polarity protection | Yes |
| Overload protection | Yes |
| Fuse | An external fuse is recommended! |

| | |
|---|---|
| Voltage level of the sensor power supply | Min. ($U_S$ – 1.5 V) |
| Power consumption of sensors | Max. 700 mA (at $T_U$ = 30° C) per module |
| Operational indicator ($U_S$) | LED green, 18 V <= $U_S$ <= 30 V<br>LED red, $U_S$ < 18 V |

*Table 39: Information on the power supply for the module electronics/ sensors*

# 12.4 Power Supply for the Actuators

| | |
|---|---|
| Nominal voltage $U_L$ | 24 V DC |
| Nominal voltage range | 19.2 - 28.8 V DC<br>(SELV/PELV to EN60950 - 1) |
| Max. voltage range | 18 – 30 V DC |
| Reverse polarity protection | Yes |
| Overload protection | Yes |
| Fuse | An external fuse is recommended! |
| Electric isolation | Yes |
| Operational indicator ($U_L$) | Green LED, 18 V <= $U_L$ <= 30 V<br>LED red, $U_L$ < 18 V |

*Table 40: Release notes on the power supply for the actuators*

# 12.5 Digital inputs

## 12.5.1 Variants: 0960 IOL 381-001, 0960 IOL 385-001

| | |
|---|---|
| Standard digital input (16DI) | Type 1<br>In accordance with IEC 61131-2 |
| Standard digital input (10DI/6DO) | Type 3<br>In accordance with IEC 61131-2 |

| | |
|---|---|
| Input current at 24 V DC | Typically 4.6 mA (type 1) |
| Input channels | 10 (10DI/6DO)<br>16 (16DI) |
| Input type | Normally open<br>p-switching |
| Input filter | Configurable via software<br>Off, 0.5 ms, 1 ms, 2 ms, 3 ms (default) |
| Input pulse extension | Configurable via software<br>Off (default), 0.5 ms, 1 ms, 2 ms, 3 ms |
| Sensor power supply off L+ | Dependent on IO-Link master<br>Max. 700 mA per module |
| Sensor power supply overload protection | Yes |
| Status indicator | Yellow LED for channel A<br>White LED for channel B |
| Diagnosis indicator | $U_S$ red/flashing |

*Table 41: Release notes on the inputs*

## 12.5.2 Variants: 0960 IOL 380-021

| | |
|---|---|
| Standard digital input (8/16DIO) | Type 3<br>In accordance with IEC 61131-2 |
| Input current at 24 V DC | Typically 5.3 mA |
| Input channels | 16 x |
| Input type | Normally open<br>p-switching |
| Input filter | Configurable via software<br>Off, 0.5 ms, 1 ms, 2 ms, 3 ms (default) |
| Input pulse extension | Configurable via software<br>Off (default), 0.5 ms, 1 ms, 2 ms, 3 ms |
| Sensor power supply from M12-L | max. 500 mA per port |
| Sensor power supply overload protection | Yes |

| | |
|---|---|
| Status indicator | Yellow LED for channel A<br>White LED for channel B |
| Diagnosis indicator | $U_S$ red/flashing |

*Table 42: Release notes on the inputs*

# 12.6 Digital outputs

## 12.6.1 Variants: 0960 IOL 385-001 (Class B module)

| | |
|---|---|
| Output current per channel | Max. 500 mA |
| Signal level of the outputs:<br>Signal status “1”<br>Signal status “0” | <br>Min. ($U_L$ – 1 V)<br>Max. 2 V |
| Current limitation 2L+ (Class B)<br>3x8-121<br>3x9-121<br>1x9-xxx | Data refers to the IO-Link master Class B outputs<br>Max. 1.6 A pro port<br>Max. 2 A pro port<br>Max. 4 A per module |
| Output channels | 6 (10DI/6DO) |
| Output type | p-switching |
| Output overload protection | Yes |
| Fail safe condition | Configurable via software<br>Low (default), high, hold last |
| Status indicator | Yellow LED for channel A<br>White LED for channel B |
| Diagnosis indicator | LED red per channel |

*Table 43: Release notes on the outputs*

## 12.6.2 Variants: 0960 IOL 380-021

| | |
|---|---|
| Output current per channel | Max. 2 A |
| Signal level of the outputs:<br>Signal status “1”<br>Signal status “0” | <br>Min. ($U_L$ – 1 V)<br>Max. 2 V |

| | |
|---|---|
| Current limitation<br>M12-L<br>M12-L limited by $U_L$ | <br>16 A<br>9 A |
| Output channels | 16 (16DIO) |
| Output type | p-switching |
| Output overload protection | Yes |
| Fail safe condition | Configurable via software<br>Low (default), high, hold last |
| Status indicator | Yellow LED for channel A<br>White LED for channel B |
| Diagnosis indicator | LED red per channel |

*Table 44: Release notes on the outputs*

# 13 Displays

## 13.1 LEDs

| LED | LED color | Description |
|---|---|---|
| COM | Off | Module unpowered |
| | Green | No communication |
| | Flashing green | Communication OK |
| | Red | Communication line overload |
| $U_S$ | Off | Module unpowered |
| | Green | System/sensor supply voltage OK |
| | Red | System/sensor supply voltage < 18 V |
| | Blinking red | Sensor supply overload |
| $U_L(U_{Aux})$ | Off | Actuator power supply unpowered |
| | Green | Actuator supply voltage OK |
| | Red | Actuator supply voltage < 18 V |
| X1-X8 (A/DIA) | Off | Channel A – signal = ‘0’/OFF |
| | Yellow | Channel A – signal = ‘1’/ON |
| | Red | Peripheral error (sensor or actuator overload/short-circuit) |
| X1-X8 (B/DIA) | Off | Channel B – signal = ‘0’/OFF |
| | White | Channel B – signal = ‘1’/ON |
| | Red | Peripheral error (sensor or actuator overload/short-circuit) |

*Table 45: Information on LED colors*

Note:

In the case of the 16DI module, there are no red channel LEDs present.

# 14 Accessories

Information on general accessories is available on the Internet at:

http://www.beldensolutions.com