

# Manual

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

**0960 IOL 381-001**

**0960 IOL 381-001-PX0**

**0960 IOL 381-001-EEC**

**0960 IOL 385-001**

**0960 IOL 385-001-PX0**

**0960 IOL 385-001-EEC**

**0960 IOL 380-021**

**0960 IOL 380-021-PX0**

**0960 IOL 380-021-EEC**

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# 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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Belden Deutschland GmbH – Lumberg Automation™ reserves the right to make technical changes or changes to this manual at any time without notice.

## 1.2 Explanation of symbols

### 1.2.1 Using 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 information

Index	Created	Changed	Changed
Version number	Version 1.0	Version 1.1	Version 1.2
Date	July 2017	February 2018	September 2018
Name/department	Goebel/R&D	Goebel/R&D	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<sup>TM</sup> 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<sup>TM</sup> 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
$V_{Aux}$	$V_{Auxiliary}$ <sup>1)</sup> .
DI	Standard digital input
DO	Standard digital output
I/O	Input/Output
IOL	IO-Link
EEC	Extended environmental conditions

1).  $U_{Auxiliary}$  is the auxiliary 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 is  $-20^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  for the standard modules and  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  for the EEC variants in the extended temperature range. The module series is therefore highly suitable for direct field use in harsh industrial environments.

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

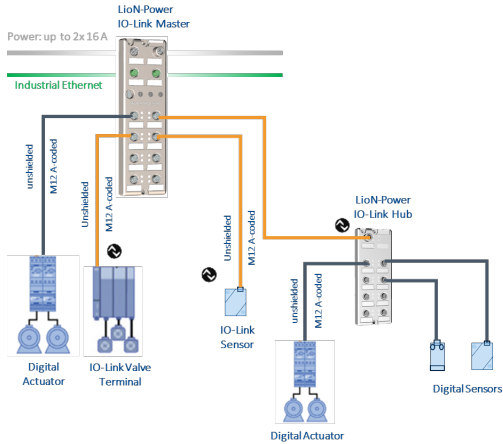
The LioN-P I/O Hub module series consists of different types of modules with different I/O functionality and different parameterization options (PX0). Modules with 16 digital inputs (16DI), 10 digital inputs/6 digital outputs (10DI/6DO) or 16 universal inputs/outputs (DIO) are available.

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 M12 A keyed connectors for the I/O signals and the IO-Link interface and, if necessary, M12 L keyed connectors for the power supply.

### 4.1 IO-Link basics

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 multiple 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	Note
934 992 002	0960 IOL 381-001	LioN-P 60, IO-Link Device, IO Hub - 16DI	IOL – M12 A	8x M12	
934 992 052	0960 IOL 381-001-PX0	LioN-P 60, IO-Link Device, IO Hub - 16DI	IOL – M12 A	8x M12	Reduced user parameters
934 992 050	0960 IOL 381-001-EEC	LioN-P 60, IO-Link Device, IO Hub - 16DI	IOL – M12 A	8x M12	Extended temperature range
935 001 001	0960 IOL 385-001	LioN-P 60, IO-Link Device, IO Hub - 10DI/6DO	IOL – M12 A	8x M12	
935 001 052	0960 IOL 385-001-PX0	LioN-P 60, IO-Link Device, IO Hub - 10DI/6DO	IOL – M12 A	8x M12	Reduced user parameters
935 001 050	0960 IOL 385-001-EEC	LioN-P 60, IO-Link Device, IO Hub - 10DI/6DO	IOL – M12 A	8x M12	Extended temperature range
934 994 001	0960 IOL 380-021	LioN-P 60, IO-Link Device, IO Hub - 16DIO	IOL – M12 A PWR – M12 L	8x M12	
934 994 052	0960 IOL 380-021-PX0	LioN-P 60, IO-Link Device, IO Hub - 16DIO	IOL – M12 A PWR – M12 L	8x M12	Reduced user parameters

Item number	Product designation	Description	IO-Link and power ports	IO ports	Note
934 994 050	0960 IOL 380-021-EEC	LioN-P 60, IO-Link Device, IO Hub - 16DIO	IOL – M12 A PWR – M12 L	8x M12	Extended temperature range

Table 2: Overview of module variants

#### 4.2.1.1 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.

#### 4.2.1.2 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.

#### 4.2.1.3 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 I/O 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.

For the intended use of an IO-Link Device – I/O hub, the connection to an IO-Link Master is absolutely necessary.



**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°.



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



**Warning:** For UL application (max. ambient temperature +70° C):

Use temperature-resistant cables with following properties:

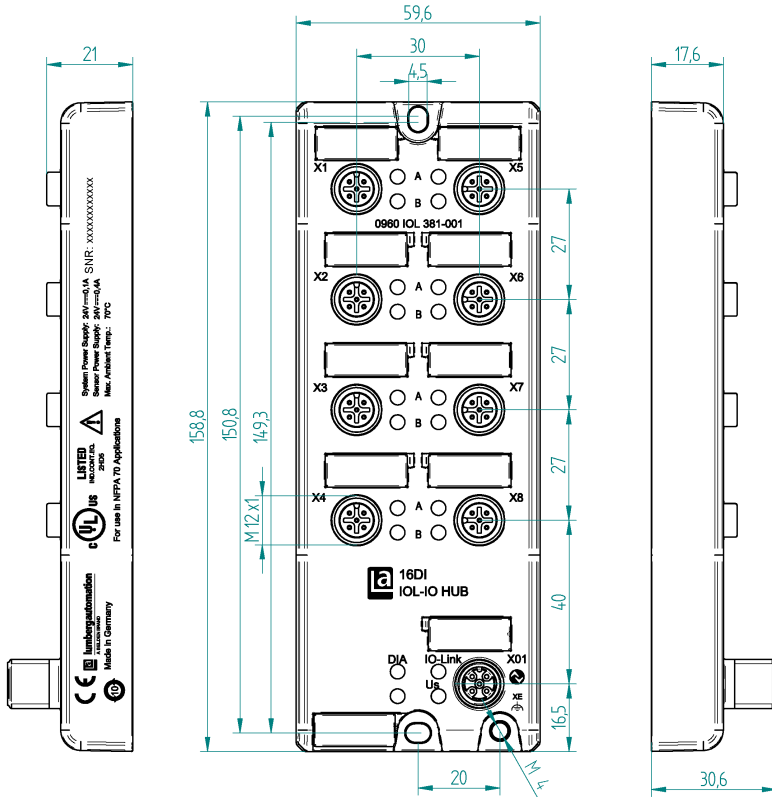
For modules of type 0960 IOL 380-021 and 0960 IOL 380-021-xxx -> heat resistance up to at least 103° C.

For modules of type 0960 IOL 385-001 and 0960 IOL 385-001-xxx -> heat resistance up to at least 80° C.

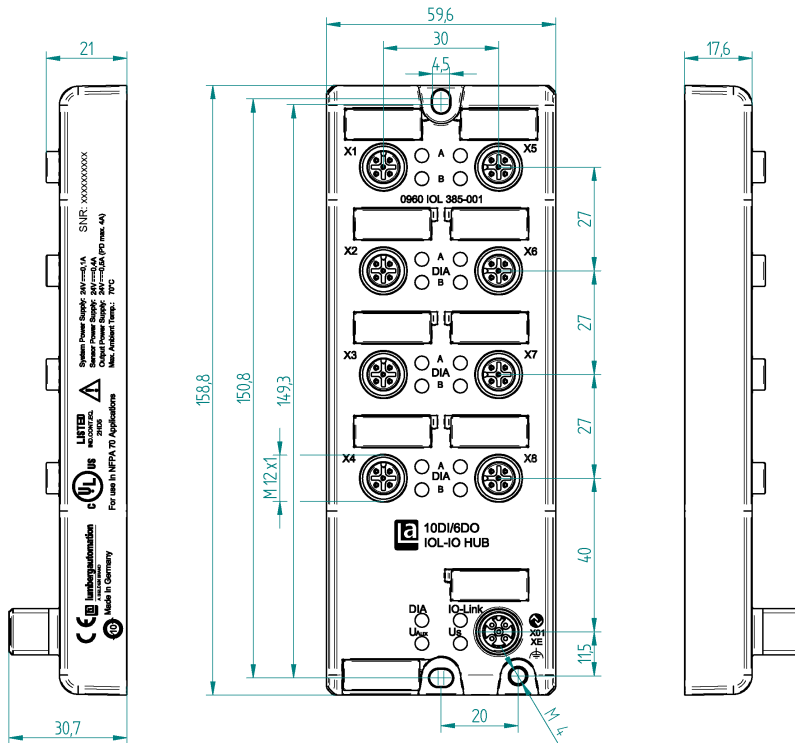


## 5.2 External dimensions

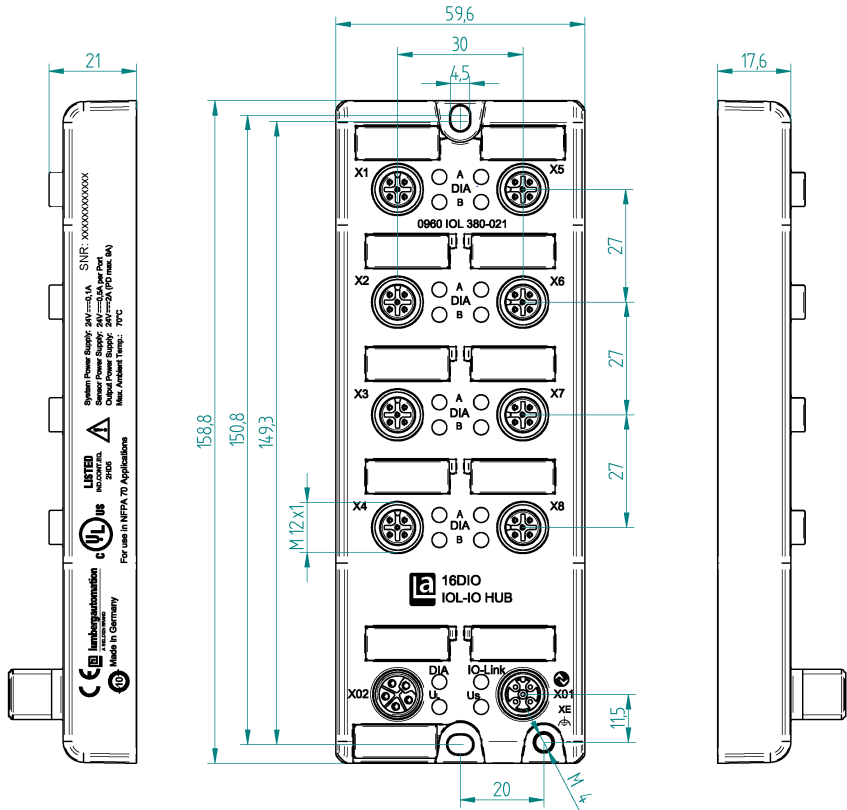
### 5.2.1 Dimensions – 16DI variant



## 5.2.2 Dimensions – 10DI/6DO variant



### 5.2.3 Dimensions – 16DIO variant



## 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, type A keyed
- ▶ Color coding: black

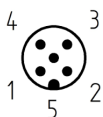


Figure 1: Schematic diagram port X1

Pin	16DI (Class A) 0960 IOL 381-001	16DIO (Class A) 0960 IOL 380-021	10DI/6DO (Class B) 0960 IOL 385-001	Function
1	+24 V DC (L+)	+24 V DC (L+)	+24 V DC (L+)	Supply voltage From the IO-Link master
2	nc	nc	+24 V DC (2L+)	Additional Supply voltage From the IO-Link master
3	GND (L-)	GND (L-)	GND (L-)	Reference potential to L+
4	C/Q (IO-Link)	C/Q (IO-Link)	C/Q (IO-Link)	IO-Link data channel
5	nc	nc	GND (2M)	Reference potential to 2L+

Table 3: IO-Link interface

### 5.3.2 Ports for sensors/actuators

- ▶ Design: M12 socket, 5-pin, type A keyed
- ▶ Color coding: black

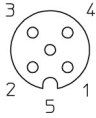


Figure 2: Schematic diagram ports X1 to X8

Pin	16DI 0960 IOL 381-001	16DIO 0960 IOL 380-021	10DI/6DO 0960 IOL 385-001	Function	
Port	X1-X8	X1-X8	X1-X5	X6-X8	
1	+24 V DC	+24 V DC	+24 V DC	n.c.	Sensor supply
2	IN B	IN / OUT B	IN B	OUT B	Dig. I/O
3	GND	GND ( $U_S$ and $U_A$ )	GND	$GND_{AUX}$	Reference potential
4	IN A	IN / OUT A	IN A	OUT A	Dig. I/O
5	FE	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

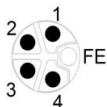


Figure 3: Schematic diagram M12 type L keyed (male)

Pin	16DI 0960 IOL 381-001	16DIO 0960 IOL 380-021	10DI/6DO 0960 IOL 385-001	Function
1	-	+24 V DC (U <sub>S</sub> )	-	Sensor supply voltage
2	-	GND (U <sub>L</sub> )	-	Reference potential (U <sub>L</sub> )
3	-	GND (U <sub>S</sub> )	-	Reference potential (U <sub>S</sub> )
4	-	+24 V DC (U <sub>L</sub> )	-	Actuator supply voltage
5	-	FE	-	Functional earth

Table 5: Power supply

**i 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 from version 1.1. 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 the 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.

### Explanations of the abbreviations used:

<b>1A ... 8A:</b>	Current status of input/output channel A (pin 4) of the M12 connectors 1 to 8.		
<b>1B ... 8B:</b>	Current status of input/output channel B (pin 2) of M12 connectors 1 to 8.		
<b>MD-LVS</b>	Module diagnosis – system/sensor power supply voltage too low		
<b>MD-LVA</b>	Module diagnosis – actuator power supply voltage ( $V_A$ ) too low		
<b>PD-SE</b>	Port diagnosis – sensor error (short-circuit or overload)		
<b>PD-AE</b>	Port diagnosis – actuator error (short-circuit or overload)		
<b>DIAG-PORT</b>	Port release notes (1–8) of the PD-AE diagnosis (or PD-SE channel release notes, if available)		
<b>ID</b>	ID byte for identification of a tool change, 0 = default, ID = 0–127		
<b>PRM-MODE</b>	Possible values		
	<table> <tr> <td><b>1</b></td> <td>User configuration active, different</td> </tr> </table>	<b>1</b>	User configuration active, different
<b>1</b>	User configuration active, different		



0 from the standard settings  
Standard configuration active

**PRM-RST**

Reset to factory settings for configuration 50 ms after detection of the signal “1”.

**7.1 16DI modules: 0960 IOL 381-001(-EEC)****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-PORT				PD-AE	PD-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-PORT				PD-AE	PD-SE	MD-LVA	MD-LVS
Byte 3	PRM-MODE	ID						

Table 7: Input process data

### 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-RST							

Table 8: Output process data

## 7.2 16DI modules: 0960 IOL 381-001-PX0

### 7.2.1 Input Data

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

	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-PORT				PD-AE	PD-SE	MD-LVA	MD-LVS
Byte 3	0	ID						

Table 9: Input process data

## 7.2.2 Output Data

This module also supplies four bytes of output data.

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0								
Byte 1								
Byte 2								
Byte 3								

Table 10: Output process data

## 7.3 10DI/6DO modules: 0960 IOL 385-001(-EEC)

### 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 5B	Port 5A
Byte 2	DIAG-PORT				PD-AE	PD-SE	MD-LVA	MD-LVS
Byte 3	PRM mode	ID						

Table 11: 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	Port3B	Port 2B	Port 1B
Byte 2	DIAG-PORT				PD-AE	PD-SE	MD-LVA	MD-LVS
Byte 3	PRM mode	ID						

Table 12: Input process data

### 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								
Byte 1	Port 8B	Port 8A	Port 7B	Port 7A	Port 6B	Port6A		
Byte 2								
Byte 3	PRM-RST							

Table 13: 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 14: Output process data***7.4 10DI/6DO modules: 0960 IOL 385-001-PX0****7.4.1 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:

	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-PORT				PD-AE	PD-SE	MD-LVA	MD-LVS
Byte 3	0	ID						

*Table 15: Input process data*

## 7.4.2 Output Data

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

	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	Port6A		
Byte 2								
Byte 3								

Table 16: Output process data

## 7.5 16DIO modules: 0960 IOL 380-021(-EEC)

### 7.5.1 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-PORT				PD-AE	PD-SE	MD-LVA	MD-LVS
Byte 3	PRM-MODE	ID						

*Table 17: 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-PORT				PD-AE	PD-SE	MD-LVA	MD-LVS
Byte 3	PRM-MODE	ID						

*Table 18: Input process data*

## 7.5.2 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 19: 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 20: Output process data



## 7.6 16DIO modules: 0960 IOL 380-021-PX0

### 7.6.1 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:

	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-PORT				PD-AE	PD-SE	MD-LVA	MD-LVS
Byte 3	0	ID						

Table 21: Input process data

### 7.6.2 Output Data

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

	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								

Table 22: Output process data

## **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 on 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 parameterization**

IO-Link features the option 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	Sub-Index	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	0x381002
0x0000	11	Device ID2	R	1	UINT8	
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 23: Direct Parameter 1

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	1	Parameters (write) Access (opt.)	R/W	1 bit	Boolean	0
0x00C	2	Data storage lock	R/W	1 bit	Boolean	Lock parameter upload 0: unlocked, 1: locked 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 24: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000E	2	PD input descriptor	R	3	UINT8	0x010507
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010
0x000F	1	PD output descriptor	R	3	UINT8	0x010107

*Table 25: Common Profile parameter*



**Attention:** 16DI module with common profile from software version V3.x.x.x (available from Q1/2019)

Index	Sub-Index	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	934992002
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	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)
0x0018	0	Application Specific tag	R/W	32	String	***
0x0019	0	Electrical node ID	R/W	32	String	***
0x001A	0	Location tag	R/W	32	String	***

Table 26: Identification

Index	Sub-Index	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	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0060	1	Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

Table 27: Device parameters (individual)

## 8.5 16DI module: 0960 IOL 381-001-EEC

Index	Sub-Index	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	0x381003
0x0000	11	Device ID2	R	1	UINT8	
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 28: Direct Parameter 1

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	1	Parameters (write) Access (opt.)	R/W	1 bit	Boolean	0
0x00C	2	Data storage lock	R/W	1 bit	Boolean	Lock parameter upload 0: unlocked, 1: locked Default:0
0x00C	3	Local parameterization (opt.)	R/W	1 bit	Boolean	0

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	4	Local user interface (opt.)	R/W	1 bit	Boolean	0

Table 29: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700
0x000E	2	PD input descriptor	R	3	UINT8	0x010507
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010
0x000F	1	PD output descriptor	R	3	UINT8	0x010107

Table 30: Common Profile parameter

Index	Sub-Index	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-EEC
0x0013	0	Product ID	R	64	String	934992050
0x0014	0	Product description	R	64	String	LioN-P IO-Link I/O hub, 16DI, EEC
0x0015	0	Serial number	R	16	String	(Production/user serial number)
0x0016	0	Hardware revision	R	64	String	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)



Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0018	0	Application Specific tag	R/W	32	String	***
0x0019	0	Electrical node ID	R/W	32	String	***
0x001A	0	Location tag	R/W	32	String	***

*Table 31: Identification*

Index	Sub-Index	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	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0060	1	Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

Table 32: Device parameters (individual)

## 8.6 16DI module: 0960 IOL 381-001-PX0

Index	Sub-Index	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	0x381004
0x0000	11	Device ID2	R	1	UINT8	
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 33: Direct Parameter 1

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

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	4	Local user interface (opt.)	R/W	1 bit	Boolean	0

Table 34: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700
0x000E	2	PD input descriptor	R	3	UINT8	0x010408
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010

Table 35: Common Profile parameter

Index	Sub-Index	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-PX0
0x0013	0	Product ID	R	64	String	934992052
0x0014	0	Product description	R	64	String	LioN-P IO-Link I/O hub, 16DI, basic parameter set
0x0015	0	Serial number	R	16	String	(Production/user serial number)
0x0016	0	Hardware revision	R	64	String	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)
0x0018	0	Application Specific tag	R/W	32	String	***

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0019	0	Electrical node ID	R/W	32	String	***
0x001A	0	Location tag	R/W	32	String	***

Table 36: Identification

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0060	1	Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

Table 37: Device parameters (individual)

## 8.7 10DI/6DO module: 0960 IOL 385-001

Index	Sub-Index	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	0x385002
0x0000	11	Device ID2	R	1	UINT8	
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 38: Direct Parameter 1

Index	Sub-Index	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 lock	R/W	1 bit	Boolean	Lock parameter upload 0: unlocked, 1: locked Default:0

Index	Sub-Index	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 39: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700
0x000E	2	PD input descriptor	R	3	UINT8	0x010507
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010
0x000F	1	PD output descriptor	R	3	UINT8	0x010107
0x000F	2	PD output descriptor	R	3	UINT8	0x010612 (standard mapping) 0x010315 (legacy mapping)
0x000F	3	PD output descriptor	R	3	UINT8	0x01031D (legacy mapping)

Table 40: Common Profile parameter

Index	Sub-Index	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

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
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	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)
0x0018	0	Application Specific tag	R/W	32	String	***
0x0019	0	Electrical node ID	R/W	32	String	***
0x001A	0	Location tag	R/W	32	String	***

*Table 41: Identification*

Index	Sub-Index	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	3 ms
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
0x0047	1-16	Surveillance timeout	R/W	16	UINT8	80 ms
0x0048		User serial number	R/W	16	String	0
0x0060		Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

*Table 42: Device parameters (individual)*

## 8.8 10DI/6DO module: 0960 IOL 385-001-EEC

Index	Sub-Index	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	0x385003
0x0000	11	Device ID2	R	1	UINT8	
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 43: Direct Parameter 1

Index	Sub-Index	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 lock	R/W	1 bit	Boolean	Lock parameter upload 0: unlocked, 1: locked Default:0
0x000C	3	Local parameterization (opt.)	R/W	1 bit	Boolean	0
0x000C	4	Local user interface (opt.)	R/W	1 bit	Boolean	0

Table 44: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700



Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000E	2	PD input descriptor	R	3	UINT8	0x010507
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010
0x000F	1	PD output descriptor	R	3	UINT8	0x010107
0x000F	2	PD output descriptor	R	3	UINT8	0x010612 (standard mapping) 0x010315 (legacy mapping)
0x000F	3	PD output descriptor	R	3	UINT8	0x01031D (legacy mapping)

Table 45: Common Profile parameter

Index	Sub-Index	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-EEC
0x0013	0	Product ID	R	64	String	935001050
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	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)
0x0018	0	Application Specific tag	R/W	32	String	***
0x0019	0	Electrical node ID	R/W	32	String	***

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x001A	0	Location tag	R/W	32	String	***

Table 46: Identification

Index	Sub-Index	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	3 ms
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
0x0047	1-16	Surveillance timeout	R/W	16	UINT8	80 ms
0x0048		User serial number	R/W	16	String	0
0x0060		Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

Table 47: Device parameters (individual)

## 8.9 10DI/6DO module: 0960 IOL 385-001-PX0

Index	Sub-Index	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	0x385004
0x0000	11	Device ID2	R	1	UINT8	

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 48: Direct Parameter 1

Index	Sub-Index	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 lock	R/W	1 bit	Boolean	Lock parameter upload 0: unlocked, 1: locked Default:0
0x000C	3	Local parameterization (opt.)	R/W	1 bit	Boolean	0
0x000C	4	Local user interface (opt.)	R/W	1 bit	Boolean	0

Table 49: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700
0x000E	2	PD input descriptor	R	3	UINT8	0x010408
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000F	1	PD output descriptor	R	3	UINT8	0x010612

Table 50: Common Profile parameter

Index	Sub-Index	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-PX0
0x0013	0	Product ID	R	64	String	935001052
0x0014	0	Product description	R	64	String	LioN-P IO-Link I/O hub, 10DI/6DO, basic parameter set
0x0015	0	Serial number	R	16	String	(Production/user serial number)
0x0016	0	Hardware revision	R	64	String	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)
0x0018	0	Application Specific tag	R/W	32	String	***
0x0019	0	Electrical node ID	R/W	32	String	***

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x001A	0	Location tag	R/W	32	String	***

Table 51: Identification

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0060	1	Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

Table 52: Device parameters (individual)

## 8.10 16DIO module: 0960 IOL 380-021

Index	Sub-Index	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	0x380002
0x0000	11	Device ID2	R	1	UINT8	
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 53: Direct Parameter 1

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	1	Parameters (write) Access (opt.)	R/W	1 bit	Boolean	0
0x00C	2	Data storage lock	R/W	1 bit	Boolean	Lock parameter upload 0: unlocked, 1: locked Default:0

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	3	Local parameterization (opt.)	R/W	1 bit	Boolean	0
0x00C	4	Local user interface (opt.)	R/W	1 bit	Boolean	0

Table 54: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700
0x000E	2	PD input descriptor	R	3	UINT8	0x010507
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010
0x000F	1	PD output descriptor	R	3	UINT8	0x010107
0x000F	2	PD output descriptor	R	3	UINT8	0x011010

Table 55: Common Profile parameter

Index	Sub-Index	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

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0015	0	Serial number	R	16	String	(Production/user serial number)
0x0016	0	Hardware revision	R	64	String	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)
0x0018	0	Application Specific tag	R/W	32	String	***
0x0019	0	Electrical node ID	R/W	32	String	***
0x001A	0	Location tag	R/W	32	String	***

Table 56: Identification

Index	Sub-Index	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
0x0047	1-16	Surveillance timeout	R/W	16	UINT8	80 ms
0x0048	1-16	User serial number	R/W	16	String	0

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0060	1	Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

Table 57: Device parameters (individual)

## 8.11 16DIO module: 0960 IOL 380-021-EEC

Index	Sub-Index	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	0x380003
0x0000	11	Device ID2	R	1	UINT8	
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 58: Direct Parameter 1

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



Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	4	Local user interface (opt.)	R/W	1 bit	Boolean	0

Table 59: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700
0x000E	2	PD input descriptor	R	3	UINT8	0x010507
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010
0x000F	1	PD output descriptor	R	3	UINT8	0x010107
0x000F	2	PD output descriptor	R	3	UINT8	0x011010

Table 60: Common Profile parameter

Index	Sub-Index	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-EEC
0x0013	0	Product ID	R	64	String	934994050
0x0014	0	Product description	R	64	String	LioN-P IO-Link I/O hub, 16DIO, EEC
0x0015	0	Serial number	R	16	String	(Production/user serial number)

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0016	0	Hardware revision	R	64	String	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)
0x0018	0	Application Specific tag	R/W	32	String	***
0x0019	0	Electrical node ID	R/W	32	String	***
0x001A	0	Location tag	R/W	32	String	***

Table 61: Identification

Index	Sub-Index	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
0x0047	1-16	Surveillance timeout	R/W	16	UINT8	80 ms
0x0048	1-16	User serial number	R/W	16	String	0

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0060	1	Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

Table 62: Device parameters (individual)

## 8.12 16DIO module: 0960 IOL 380-021-PX0

Index	Sub-Index	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	0x380004
0x0000	11	Device ID2	R	1	UINT8	
0x0000	12	Device ID3 (LSB)	R	1	UINT8	

Table 63: Direct Parameter 1

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	1	Parameters (write) Access (opt.)	R/W	1 bit	Boolean	0
0x00C	2	Data storage lock	R/W	1 bit	Boolean	Lock parameter upload 0: unlocked, 1: locked Default:0
0x00C	3	Local parameterization (opt.)	R/W	1 bit	Boolean	0

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x00C	4	Local user interface (opt.)	R/W	1 bit	Boolean	0

Table 64: Device access locks

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x000D	1	Profile characteristic	R	2	UINT8	0x0031 (Firmware update profile)
0x000D	2	Profile characteristic	R	2	UINT8	0x4000 (Common profile)
0x000E	1	PD input descriptor	R	3	UINT8	0x020700
0x000E	2	PD input descriptor	R	3	UINT8	0x010408
0x000E	3	PD input descriptor	R	3	UINT8	0x02040C
0x000E	4	PD input descriptor	R	3	UINT8	0x011010
0x000F	1	PD output descriptor	R	3	UINT8	0x011010

Table 65: Common Profile parameter

Index	Sub-Index	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-PX0
0x0013	0	Product ID	R	64	String	934994052
0x0014	0	Product description	R	64	String	LioN-P IO-Link I/O hub, 16DIO, basic parameter set
0x0015	0	Serial number	R	16	String	(Production/user serial number)
0x0016	0	Hardware revision	R	64	String	(Current HW version)
0x0017	0	Firmware revision	R	64	String	(Current FW version)

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0018	0	Application Specific tag	R/W	32	String	***
0x0019	0	Electrical node ID	R/W	32	String	***
0x001A	0	Location tag	R/W	32	String	***

Table 66: Identification

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0060	1	Tool identification	R/W	1		0 (b7: res. + b6 ... b0)

Table 67: Device parameters (individual)

## 8.13 Description of parameter data

### 8.13.1 Parameter – General device settings



**Attention:** 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), 1 = LioN-Classic (A, A, A ... channel / B, B, B, ... channel order)
0x40	2	1	DIS-AE-AR: Disable actuator error auto restart, 0 = false, 1 = true <b>(only modules with DO function, otherwise do not use)</b>
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

### 8.13.2 Parameter – General diagnosis settings



**Note:** Cannot access individual subindexes.

Index	Subindex/ Data length 1 bytes	Bit number	Parameters for peripheral IO-Link diagnosis
0x41	1	0	Switch off transmission of the peripheral diagnosis using the IO-Link protocol, <b>0 = false</b> , 1 = true (peripheral diagnoses in the input data are always available.)
0x41	2	1	DIS-AE-WO-VA: Disable actuator error without $V_A$ : <b>0 = false</b> , 1 = true <b>(only modules with DO function, otherwise do not use)</b>
0x41	3	2	DIS-LVA: Disable low voltage actuator power ( $V_A = V_{Auxiliary}$ ) diagnosis: <b>0 = false</b> , 1 = true <b>(only modules with DO function, otherwise do not use)</b>
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	
***** < 5 V ***** > 18 V	<b>DIS-AE-WO-VA</b> 1 = true OK	<b>DIS-LVA</b> 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 <sub>A</sub>	Dependencies of actuator error parameter settings		AE diagnosis / LVA diagnosis
OK	1	1	No (overload or short-circuit) / No

Table 68: Description re index 0x41, subindex 1 + 2

### 8.13.3 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



### 8.13.4 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

### 8.13.5 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

### 8.13.6 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

### 8.13.7 Parameter – Surveillance Timeout



**Attention:** Only for modules with DO function, otherwise not to be used.

A Surveillance Timeout can be set with this parameter configuration, which determines the monitoring procedure of the possible output overload for each digital channel. The delay time starts after a change to the output channel status. If an output is activated (rising edge) or deactivated (falling edge) the output monitoring does not start until the delay time expires. Any fault conditions that arise after this delay are reported as diagnostics. The adjustable value range for the delay time is 0 to 255 ms.

Index	Subindex. Data length 16 bytes	Bit number	IO channel / port	Parameter
0x47	1	0-15	0/X1A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	2	0-15	1/X1B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	3	0-15	2/X2A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	4	0-15	3/X2B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	5	0-15	4/X3A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	6	0-15	5/X3B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	7	0-15	6/X4A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	8	0-15	7/X4B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	9	0-15	8/X5A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	10	0-15	9/X5B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	11	0-15	10/X6A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	12	0-15	11/X6B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	13	0-15	12/X7A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	14	0-15	13/X7B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	15	0-15	14/X8A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms
0x47	16	0-15	15/X8B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, ... 255 = 255 ms

### 8.13.8 Parameter – User serial number

This parameter allows the user to set a user-specific serial number. The user-specific serial number is output when the identification parameter, index 0x15, is read.

If the contents of index 0x48 are equal to zero, the production serial number is output 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)

### 8.13.9 Parameter – Electrical Node ID Tag (16DI V2.x only)

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

*Table 69: User-specific description*

### 8.13.10 Parameter – Identification

This parameter can be used to display different tool configurations. The content of this parameter is transmitted to the cyclic input data.

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

*Table 70: 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

Index	Sub Index / Data length 1 Byte	Length	Parameter														
0x24	0	Octet	<table border="1"> <thead> <tr> <th>Value</th> <th>Definition</th> </tr> </thead> <tbody> <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> </tbody> </table> <p><i>Table 71: R only: Contains the current status of the device.</i></p>	Value	Definition	0	Device is operating properly.	1	Maintenance-Required	2	Out-of-Specification	3	Functional-Check	4	Failure	5-255	Reserved
Value	Definition																
0	Device is operating properly.																
1	Maintenance-Required																
2	Out-of-Specification																
3	Functional-Check																
4	Failure																
5-255	Reserved																

## 9.2 Device status in detail

Index	Subindex / data length N x ArrayT	Length	Parameter																									
0x25	1-24	ArrayT	<table border="1"> <thead> <tr> <th>Subindex</th> <th>Object name</th> <th>Data type</th> <th>Comment</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Error_Warning_1</td> <td>3 octets</td> <td rowspan="4">All octets 0x00: no error/warning Octet 1: Event qualifier 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> </tbody> </table> <p><i>Table 72: R only: Contains the extended status of the device.</i></p>	Subindex	Object name	Data type	Comment	1	Error_Warning_1	3 octets	All octets 0x00: no error/warning Octet 1: Event qualifier Octet 2, 3: Event code	2	Error_Warning_2	3 octets	3	Error_Warning_3	3 octets	4	Error_Warning_4	3 octets	:	:	:	:	n	Error_Warning_n	3 octets	
Subindex	Object name	Data type	Comment																									
1	Error_Warning_1	3 octets	All octets 0x00: no error/warning Octet 1: Event qualifier Octet 2, 3: Event code																									
2	Error_Warning_2	3 octets																										
3	Error_Warning_3	3 octets																										
4	Error_Warning_4	3 octets																										
:	:	:	:																									
n	Error_Warning_n	3 octets																										

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

Table 73: 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 74: Event codes for peripheral errors*

\* Only modules with DO functions; otherwise, do not use.

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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 75: 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/en/Service/download\\_center](http://www.beldensolutions.com/en/Service/download_center)

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 an IO-Link Master, which supports the IO-Link BLOB transmission mechanism.

# 12 Technical data

## 12.1 General

Ambient temperature during operation	-20° C ... +70° C
Ambient temperature during operation – EEC variant	-40° C ... +70° C
Ambient storage temperature	-40° C ... +85° C
Ambient humidity	98% RH (for UL applications 80% PRH)
Weight	Approx. 280 g
Housing material	Die-cast zinc
Protection class: Plugged in and properly screwed together (according to DIN EN 60529)	IP65, IP67 and IP69K (not subject to UL inspection)
Pollution Degree	2
Flammability class	UL 94
Vibration, sinusoidal	EN 60068-2-6 5-500 Hz / 15 g
Shock, semi-sinusoidal EN 60068-2-27	EN 60068-2-27 50 g / 11 ms
EMC immunity, EMC interference emission	EN 61000-6-2 EN 61000-6-4
Torques Fixing screws M4/M6 M12 connector	1.0 Nm 0.5 Nm
Installation position	Any
Approvals	CE, UL, IO-Link

*Table 76: General information*

## 12.2 IO-Link interface

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

Table 77: 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 (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 for the 16DIO version.

Voltage level of the sensor power supply	Min. ( $U_S - 1.5\text{ V}$ )
Power consumption of sensors	Max. 700 mA (at $T_U = 30^\circ\text{ C}$ ) per module
Operational indicator ( $U_S$ )	LED green, $18\text{ V} \leq U_S \leq 30\text{ V}$ LED red, $U_S < 18\text{ V}$

*Table 78: Information on the power supply for the module electronics/sensors*

\*)The modules should be supplied with a Limited Energy power supply in accordance with UL 61010-1, 3rd edition, section 9.4, or with LPS (Limited Power Source) in accordance with UL 60950-1 or class 2 in accordance with UL 1310 or UL 1585.

## 12.4 Power supply for the actuators

Nominal voltage $V_L$	24 V DC
Nominal voltage range	19.2 – 28.8 V DC (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 for the 16DIO version.
Electric isolation	Yes
Operational indicator ( $U_L$ )	Green LED, $18\text{ V} \leq U_L \leq 30\text{ V}$ LED red, $U_L < 18\text{ V}$

Table 79: Release notes on the power supply for the actuators

## 12.5 Digital inputs

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

Standard digital input (16DI)	Type 1 In accordance with IEC 61131-2
Standard digital input (10DI/6DO)	Type 3 In accordance with IEC 61131-2
Input current at 24 V DC	Typically 4.6 mA (type 1)
Input channels	10 (10DI/6DO) 16 (16DI)
Input type	Normally open p-switching
Input filter	Configurable via software Off, 0.5 ms, 1 ms, 2 ms, 3 ms (default)



Input pulse extension	Configurable via software Off (default), 0.5 ms, 1 ms, 2 ms, 3 ms
Sensor power supply off L+	Depending on the IO-Link master Max. 700 mA per module
Sensor power supply overload protection	Yes
Status indicator	Yellow LED for channel A White LED for channel B
Diagnostic indicator	V <sub>S</sub> red/flashing

*Table 80: Release notes on the inputs*

### 12.5.2 Variants 0960 IOL 380-021-xxx

Standard digital input (8/16DIO)	Type 3 In accordance with IEC 61131-2
Input current at 24 V DC	Typically 5.3 mA
Input channels	16 x
Input type	Normally open p-switching
Input filter	Configurable via software Off, 0.5 ms, 1 ms, 2 ms, 3 ms (default)
Input pulse extension	Configurable via software 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 White LED for channel B

Diagnostic indicator	V <sub>S</sub> red/flashing
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Table 81: Release notes on the inputs

## 12.6 Digital outputs

### 12.6.1 Variants 0960 IOL 385-001-xxx (Class B modules)

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

Table 82: Release notes on the outputs

### 12.6.2 Variants 0960 IOL 380-021-xxx

Output current per channel	Max. 2 A
Signal level of the outputs: Signal status "1" Signal status "0"	Min. ( $V_L - 1\text{ V}$ ) Max. 2 V

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

*Table 83: Release notes on the outputs*

# 13 Displays

## 13.1 LEDs

LED	LED color	Description
COM	Off	Module de-energized
	Green	No communication
	Flashing green	Communication OK
	Red	Overload of the communication line
U <sub>S</sub>	Off	Module de-energized
	Green	Power supply of system/sensor OK
	Red	Power supply of system/sensor < 18 V +/- 1 V
V <sub>L</sub> (V <sub>Aux</sub> )	Off	Actuator power supply without voltage
	Green	Actuator power supply OK
	Red	Actuator power supply < 18 V +/- 1 V
X1-X8 (A/DIA)	Off	Channel A – signal = '0' / OFF
	Yellow	Channel A – signal = '1' / ON
	Red	Periphery error (sensor or actuator overload/short circuit)
X1-X8 (B/DIA)	Off	Channel B – signal = '0' / OFF
	White	Channel B – signal = '1' / ON
	Red	Periphery error (sensor or actuator overload/short circuit)
DIA	Off	No error message exists
	Red	Module diagnosis available

Table 84: 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:

[www.lumberg-automation.com](http://www.lumberg-automation.com)