Manual

UNITRONIC® ACCESS IO-Link Hub

IOL08DIO08DIO (16DIO low current Hub)

Contents

1 About this manual

1.1 General information

Read the assembly and operating instructions on the following pages carefully before starting up the modules. Keep this information where it is accessible to all users.

The texts, figures, diagrams, and examples used in this document are exclusively used to explain how to operate and apply the modules.

Please contact us if you have any detailed questions on installing and starting up the devices.

U.I. Lapp GmbH

Schulze-Delitzsch-Straße 25
D-70565 Stuttgart
Germany

mailto:info@lapp.com
https://www.lapp.com

1.2 Explanation of symbols

1.2.1 Use of 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

Version	Created	Changes
1.0	10/2024	

Table 1: Overview of manual revisions

Attention: In the interest of product improvement and further development, LAPP 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 products described in this manual are decentralized Input/Output assemblies on a fieldbus I/O network.

We adhere to all 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 devices fulfill the requirements of the EMC guidelines (2014/30/EU) and the low voltage guideline (2014/35/EU).

The devices 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, storage, assembly, and installation, and careful operation.

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

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 permitted for the installation can be obtained from U.I. Lapp GmbH or is contained in this manual.

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 all provided device documentation 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 U.I. Lapp GmbH is permitted to make changes to the hardware or software of the 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 document, can result in serious personal injury or damage to equipment.

Attention: U.I. Lapp GmbH accepts no liability for any damage caused by unqualified personnel or improper use. This automatically voids the warranty.

3 Designations and synonyms

AOI	Add-On Instruction
API	Application Programming Interface
BF	Bus Fault LED
Big Endian	Data format with High-B on first place (PROFINET and IO-Link)
BUI	Back-Up Inconsistency (EIP diagnostics)
CC	CC-Link IE Field
C/Q	I/O port pin 4 mode, IO-Link communication/switching signal
Ch. A	Channel A (Pin 4) of I/O port
Ch. B	Channel B (Pin 2) of I/O port
CIP	Common Industrial Protocol (media independent protocol)
CIP Safety™	Common Industrial Protocol for Safety applications, CIP Safety™ is a registered trademark of ODVA
Class A	IO-Link port specification (Class A)
Class B	IO-Link port specification (Class B)
CoAP	Constrained Application Protocol
CSP+	Control & Communication System Profile Plus
DAT	Device Acknowledgement Time
DCP	Discovery and Configuration Protocol
DevCom	Device Comunicating (EIP diagnostics)
DevErr	Device Error (EIP diagnostics)
DI	Digital Input
DIA	Diagnostic LED
DO	Digital Output
DIO	Digital Input/Output
DTO	Device Temperature Overrun (EIP diagnostics)
DTU	Device Temperature Underrun (EIP diagnostics)
DUT	Device under test

EIP	EtherNet/IP™ is a registered trademark of ODVA
ERP	Enterprise Resource Planning system
ETH	ETHERNET
FE	Functional Earth
FME	Force Mode Enabled (EIP diagnostics)
FS	Functional Safety
FSU	Fast Start-Up
GSDML	General Station Description Markup Language
High-B	High-Byte
HTTPS	Hyper Text Transfer Protocol Secure
ICE	IO-Link port COM Error (EIP diagnostics)
ICT	Invalid Cycle Time (EIP diagnostics)
IDE	IO-Link port Device Error (EIP diagnostics)
IDN	IO-Link port Device Notification (EIP diagnostics)
IDW	IO-Link port Device Warning (EIP diagnostics)
IIoT	Industrial Internet of Things
ILE	Input process data Length Error (EIP diagnostics)
IME	Internal Module Error (EIP diagnostics)
I/O	Input / Output
I/O port	X1 .. X8
I/O port pin 2	Channel B of I/O ports
I/O port pin 4 (C/Q)	Channel A of I/O ports
IODD	I/O Device Description
IOL or IO-L	IO-Link
I/Q	I/O port pin 2 mode, Digital Input/switching signal
ISDU	Indexed Service Data Unit
IVE	IO-Link port Validation Error (EIP diagnostics)
I&M	Identification & Maintenance
JSON	JavaScript Object Notation (platform independent data format)
L+	I/O port pin 1, sensor power supply

UNITRONIC® ACCESS 60	UNITRONIC® ACCESS variants with a width of 60mm
Little Endian	Data format with Low-B on first place (EtherNet/IP)
LLDP	Link Layer Discovery Protocol
Low-B	Low-Byte
LSB	Least Significant Bit
LVA	Low Voltage Actuator Supply (EIP diagnostics)
LVS	Low Voltage System/Sensor Supply (EIP diagnostics)
MIB	Management Information Base
MP	Multi-protocol: PROFINET + EtherNet/IP + EtherCAT® + Modbus TCP (+ CC-Link IE Field Basic)
MQTT	Message Queuing Telemetry Transport (open networking protocol)
MSB	Most Significant Bit
M12	Metric thread according to DIN 13-1 with 12 mm diameter
NTP	Network Time Protocol
OFDT	One Fault Delay Time
OLE	Output process data Length Error (EIP diagnostics)
OPC UA	Open Platform Communications Unified Architecture (platform independent, service-oriented architecture)
PFH	Probability of dangerous Failure per Hour [h -1]
PD	Process Data
PDCT	Port and Device Configuration Tool
PLC	Programmable Logic Controller
PN	PROFINET
PWR	Power
Qualifier	Validity on a process value. Valid = "1"
REST	REpresentational State Transfer
RFC	Request for Comments
RPI	Requested Packet Interval
RWr	Word data input as seen from the master station (CC-Link)
RWw	Word data output as seen from the master station (CC-Link)
RX	Bit data input as seen from the master station (CC-Link)

RY	Bit data output as seen from the master station (CC-Link)
SCA	Short Circuit Actuator/U_L/U_{AUX} (EIP diagnostics)
SCS	Short Circuit Sensor (EIP diagnostics)
SFRT	Safety Function Response Time
SIO mode	Standard Input Output mode
SLMP	Seamless Message Protocol
SNMP	Simple Network Management Protocol
SP	Single Protocol (PROFINET, EtherNet/IP, EtherCAT®, Modbus TCP or CC-Link IE Field Basic)
SPE	Startup Parameterization Error (EIP diagnostics)
T-B	Test Channel B
T-A	Test Channel A
U_{AUX}	$U_{Auxiliary}$, supply voltage for the load circuit (Actuator supply on Class B ports of Class A/B IO-Link Master)
UDP	User Datagram Protocol
UDT	User-Defined Data Types
UINT8	Byte in PLC (IB, QB)
UINT16	Unsigned integer with 16 bits or word in PLC (IW, QW)
U_L	U_{Load}, supply voltage for the load circuit (Actuator supply on Class A IO-Link-Master)
UL	Underwriters Laboratories Inc. (certification company)
UTC	Coordinated Universal Time (Temps Universel Coordonné)
WCDT	Worst Case Delay Time

Table 2: Designations and synonyms

4 System description

The Lapp U.I. UNITRONIC® ACCESS modules function as the interface in an industrial Ethernet system: A central controller on the management level is able to communicate with the decentralized sensors and actuators on the field level. The line or ring topologies for which UNITRONIC® modules can be used ensure not only reliable data communication but also significantly reduce the number of cables required and thus also the costs for installation and maintenance. They additionally enable easy and quick extension.

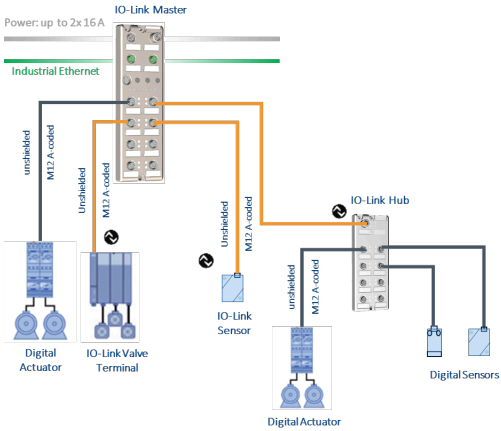
4.1 About UNITRONIC® ACCESS

The UNITRONIC® ACCESS device variants convert standard input, standard output or IO-Link signals from sensors & actuators into an industrial Ethernet protocol (PROFINET, EtherNet/IP, EtherCAT®, Modbus TCP, CC-Link IE Field Basic) and/or into a cloud protocol (REST API, CoAP, OPC UA, MQTT). For the first time, there is now Syslog on board. The robust 8 port housing design allows the use even in harsh environments where e.g. weld field immunity, high temperature ranges or protection class IP67 & IP69K are needed.

4.2 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.

In the following graphic, IO-Link connections are shown in orange, digital connections (standard I/O) in black and ethernet connections in green.



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.

4.3 Device variants

The following UNITRONIC® ACCESS Hub variant is available:

Article number	Product designation	Description	I/O port functionality
381166719	IOL08DIO08DIO	UNITRONIC® ACCESS M12 60 mm, 16DIO low current IO-Link Hub	8 x IO-Link Class A

Table 3: Overview of UNITRONIC® ACCESS Hub variants

IO-Link Hub – 16DIO

The IO-Link Hub IOL08DIO08DIO 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 IO-Link Master supply voltage on Pin1/L+.

5 Assembly and wiring

5.1 General information

Mount the device on a flat surface using 2 screws (M4x25/30). The torque required is 1 Nm. Use washers compliant with DIN 125 for all types of mounting, maintaining a distance of **149.3 mm (5.878 in) to 150.8 mm (5.937 in)** between the mounting holes.

Using a standardized M12 connecting lead, connect the IO-Link interface of the I/O Hub to the IO-Link Master. In the case of devices 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 Hub, the connection to an IO-Link Master is absolutely necessary.

Attention: The devices have a ground connection with an M4 thread for the conduction of interference currents and the EMC immunity. This is labeled with the symbol functional earth and the designation "FE".

Attention: Use a low-impedance connection to connect the device to the reference ground. When using a grounded mounting surface, you can make the connection directly via the fixing screws.

Attention: If the mounting surface is ground-free, use a ground strap or a suitable FE line (FE = Functional Earth). Use an M4 screw to connect the ground strap or the FE line to the ground point and if possible put a washer and a toothed washer below 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 devices is only permitted for interior use. Please observe the maximum installation and operating height of 2000 m (6561 ft) 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 (+140° F).

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 with max. ambient temperature +70° C (+158° F):

Use temperature-resistant cables with following properties:

For devices of type IOL08DIO08DIO -> heat resistance up to at least +103° C.

Warning: The power supply may only be provided via the IO-Link port X01 of the module. An external power supply via an I/O port (ports X1-X8 --> Pin 1/Pin 3) is not permitted.

5.2 Outer dimensions

5.2.1 16DIO variant

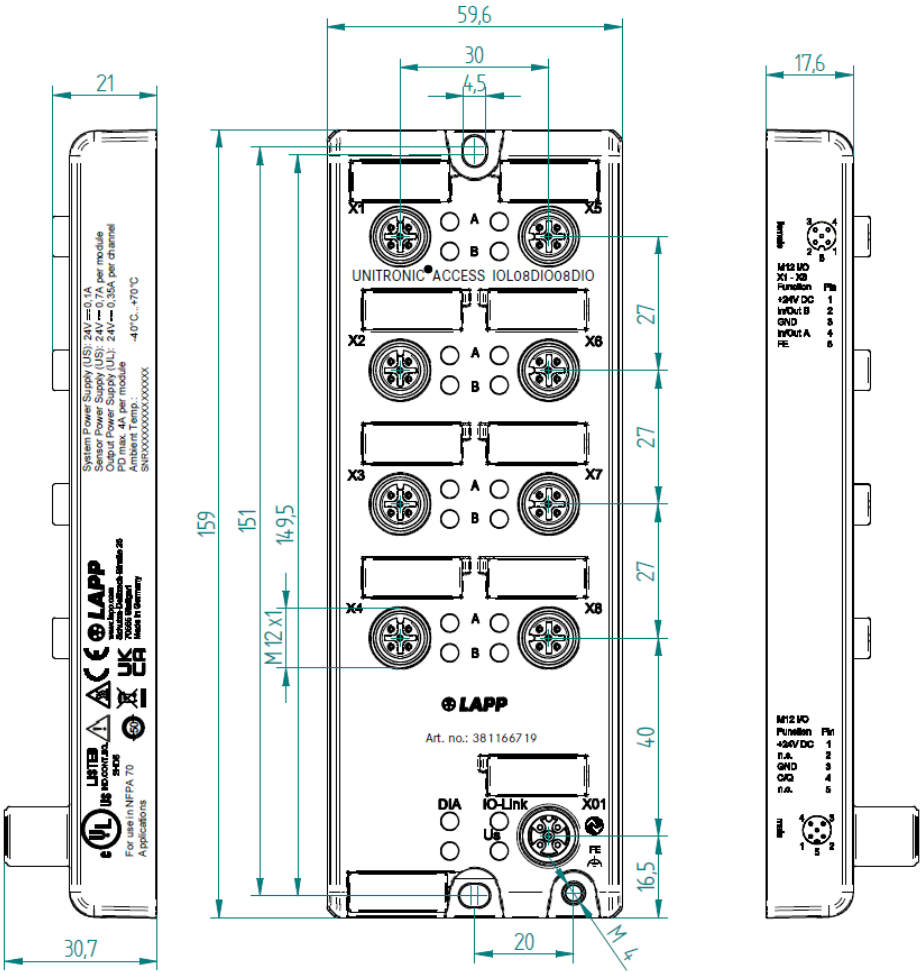


Figure 1: IOL08DIO08DIO

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

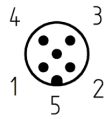


Figure 2: Schematic diagram port X01

Pin	16DIO (Class A) IOL08DIO08DIO	Function
1	+24 V DC (L+)	Supply voltage From the IO-Link Master
2	nc	Additional Supply voltage From the IO-Link Master
3	GND (L-)	Reference potential to L+
4	C/Q (IO-Link)	IO-Link data channel
5	nc	Reference potential to 2L+

Table 4: IO-Link interface

5.3.2 Ports for sensors/actuators

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

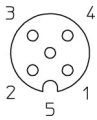


Figure 3: Schematic diagram ports X1 to X8

Pin	16DIO IOL08DIO08DIO	Function
	Ports X1-X8	
1	+24 V DC	Sensor supply
2	IN / OUT B	Dig. I/O
3	GND	Reference potential
4	IN / OUT A	Dig. I/O
5	FE	Functional earth

Table 5: I/O port

6 Configuration and startup

The LAPP IO-Link Hub variants are operated with an IO-Link Master from version 1.1 (the LAPP IO-Link-Masters support 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.

7 Process data assignment

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 LAPP IO-Link Hubs. The following tables show the structure of the data. It is not possible to configure the process data length.

Explanations of the abbreviations used:

1A ... 8A:	Current status of input/output channel A (pin 4) of the M12 connectors 1 to 8.
1B ... 8B:	Current status of input/output channel B (pin 2) of M12 connectors 1 to 8.
MD-LVS	Module diagnosis – system/sensor power supply voltage too low
PD-SE	Port diagnosis – sensor error (short-circuit or overload)
PD-AE	Port diagnosis – actuator error (short-circuit or overload)
DIAG-PORT	Port release notes (1–8) of the PD-AE diagnosis
ID	ID byte for identification of a tool change, 0 = default, ID = 0–127
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”.

7.1 16DIO: IOL08DIO08DIO

7.1.1 Input Data

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

Standard LAPP Mapping, (UNITRONIC® ACCESS 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-LVS
Byte 3	PRM-MODE	ID						

Table 6: Input process data

Mapping UNITRONIC® -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-LVS
Byte 3	PRM-MODE	ID						

Table 7: Input process data

7.1.2 Output Data

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

Standard LAPP Mapping, (UNITRONIC® ACCESS 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 8: Output process data

Mapping UNITRONIC® -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 9: Output process data

8 Parameterization of the IO-Link Hub

The parameters set during system commissioning are transferred to the IO-Link Hub. The IO-Link Hub and the IO-Link Master store these parameters. The behavior of the IO-Link Master and the connected IO-Link Hub is defined on the IO-Link Master port.

8.1 IO-Link data storage

The LAPP IO-Link Hub and the LAPP IO-Link Masters support the data storage functionality. All user-configurable parameters are stored on the hub and on the master (Exceptions: user serial number, index 0x48 and tool identification, index 0x60). In case of a device exchange, the stored parameters can then be automatically transferred to the new device.

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 LAPP IO-Link Hub supports the block configuration described.

8.3 IO-Link factory reset

The device 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 16DIO: IOL08DIO08DIO

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0010	0	Vendor name	R	64	String	U.I. Lapp GmbH
0x0011	0	Vendor text	R	64	String	https://www.lapp.com
0x0012	0	Product name	R	64	String	IOL08DIO08DIO
0x0013	0	Product ID	R	64	String	381166719
0x0014	0	Product description	R	64	String	UNITRONIC® ACCESS IO-Link Hub, 16DIO
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	Function tag	R/W	32	String	***
0x001A	0	Location tag	R/W	32	String	***

Table 10: Identification

Index	Sub-Index	Parameter	Access	Data length [byte]	Data type	Default value
0x0040	1-16	General device 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

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

Table 11: Device parameters (individual)

8.5 Description of parameter data

8.5.1 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 = UNITRONIC® ACCESS (A/B, A/B, …, channel order), 1 = UNITRONIC® -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 **(only devices 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

8.5.2 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	I/O channel / port	Parameter value
0x43	1	0-3	0 / X1A	0 = Off, 1-255 = Input filter in ms
0x43	2	0-3	1 / X1B	0 = Off, 1-255 = Input filter in ms
0x43	3	0-3	2 / X2A	0 = Off, 1-255 = Input filter in ms
0x43	4	0-3	3 / X2B	0 = Off, 1-255 = Input filter in ms
0x43	5	0-3	4 / X3A	0 = Off, 1-255 = Input filter in ms
0x43	6	0-3	5 / X3B	0 = Off, 1-255 = Input filter in ms
0x43	7	0-3	6 / X4A	0 = Off, 1-255 = Input filter in ms
0x43	8	0-3	7 / X4B	0 = Off, 1-255 = Input filter in ms
0x43	9	0-3	8 / X5A	0 = Off, 1-255 = Input filter in ms

Index	Subindex, Data length 16 bytes	Bit number	I/O channel / port	Parameter value
0x43	10	0-3	9 / X5B	0 = Off, 1-255 = Input filter in ms
0x43	11	0-3	10 / X6A	0 = Off, 1-255 = Input filter in ms
0x43	12	0-3	11 / X6B	0 = Off, 1-255 = Input filter in ms
0x43	13	0-3	12 / X7A	0 = Off, 1-255 = Input filter in ms
0x43	14	0-3	13 / X7B	0 = Off, 1-255 = Input filter in ms
0x43	15	0-3	14 / X8A	0 = Off, 1-255 = Input filter in ms
0x43	16	0-3	15 / X8B	0 = Off, 1-255 = Input filter in ms

8.5.3 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	I/O channel / port	Parameter
0x44	1	0-3	0 / X1A	0 = Off, 1-255 = Input signal extension in ms
0x44	2	0-3	1 / X1B	0 = Off, 1-255 = Input signal extension in ms
0x44	3	0-3	2 / X2A	0 = Off, 1-255 = Input signal extension in ms
0x44	4	0-3	3 / X2B	0 = Off, 1-255 = Input signal extension in ms
0x44	5	0-3	4 / X3A	0 = Off, 1-255 = Input signal extension in ms
0x44	6	0-3	5 / X3B	0 = Off, 1-255 = Input signal extension in ms
0x44	7	0-3	6 / X4A	0 = Off, 1-255 = Input signal extension in ms
0x44	8	0-3	7 / X4B	0 = Off, 1-255 = Input signal extension in ms
0x44	9	0-3	8 / X5A	0 = Off, 1-255 = Input signal extension in ms
0x44	10	0-3	9 / X5B	0 = Off, 1-255 = Input signal extension in ms
0x44	11	0-3	10 / X6A	0 = Off, 1-255 = Input signal extension in ms

Index	Subindex / Data length 16 bytes	Bit number	I/O channel / port	Parameter
0x44	12	0-3	11 / X6B	0 = Off, 1-255 = Input signal extension in ms
0x44	13	0-3	12 / X7A	0 = Off, 1-255 = Input signal extension in ms
0x44	14	0-3	13 / X7B	0 = Off, 1-255 = Input signal extension in ms
0x44	15	0-3	14 / X8A	0 = Off, 1-255 = Input signal extension in ms
0x44	16	0-3	15 / X8B	0 = Off, 1-255 = Input signal extension in ms

8.5.4 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	I/O 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

8.5.5 Parameter – fail-safe settings

Attention: Only devices 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	I/O 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

8.5.6 Parameter – Surveillance Timeout

Attention: Only for devices 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	I/O channel / port	Parameter
0x47	1	0-7	0/X1A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	2	0-7	1/X1B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	3	0-7	2/X2A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	4	0-7	3/X2B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	5	0-7	4/X3A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	6	0-7	5/X3B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	7	0-7	6/X4A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	8	0-7	7/X4B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	9	0-7	8/X5A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	10	0-7	9/X5B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	11	0-7	10/X6A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	12	0-7	11/X6B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	13	0-7	12/X7A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	14	0-7	13/X7B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	15	0-7	14/X8A	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms
0x47	16	0-7	15/X8B	0 = 0 ms, 1 = 1 ms, 2 = 2 ms, … 255 = 255 ms

8.5.7 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)

8.5.8 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 12: ID for detecting correct tool change

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

9 Diagnostic Properties

The devices 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 13: Read 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></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
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>
</table>
Table 14: Read only: Contains the extended status of the device.
</td></tr>
</table>

<table>
<tr><th>Bits</th><th>Description</th><th></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 15: Event qualifier

Event code	Type	Device Status	Description
0x5111	Warning	2	Low voltage sensor (U_S)
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 16: Event codes for peripheral errors

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 17: Error codes for access management

10 IO-Link IODD

There is an IODD device description file available for every LAPP 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 LAPP download area at:

https://www.lapp.com/en/dn/service/download-centre/e/000801

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 Technical data

The following sections give an overview of the most important functional data needed to operate the device. For further information and detailed technical data, see the respective **Data Sheet** of your required product in the product specific download area on https://lapp.com.

11.1 General

Ambient temperature during operation	-20° C … +70° C (-4° F … +158° F)
Ambient temperature during operation – EEC variant	-40° C … +70° C (-40° F … +158° F)
Ambient storage temperature	-40° C … +85° C (-40° F … +185° F)
Ambient humidity	98% RH (for UL applications 80% PRH)
Weight	Approx. 280 g (9.87 oz)
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 18: General information

11.2 IO-Link interface

Specification	IO-Link spec. v1.1.3
Physical transmission	IO-Link, 24 V Half duplex
Transfer rate Com3	COM 3 (230.4 kBaud)
Limitation IO-Link expansion	max. 20 m (65.6 ft)
IO-Link standard	IEC 61131-9
Process data	4 bytes input data 4 bytes output data
Frame type	Type_2_V
Cycle time	Max. 2 ms

Table 19: Information on the bus system

11.3 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 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 LED red, U_S < 18 V

Table 20: 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.

11.4 Digital inputs

11.4.1 Variant IOL08DIO08DIO

Standard digital input (8/16DIO)	Type 1 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 overload protection	Yes
Status indicator	Yellow LED for channel A White LED for channel B

Table 21: Release notes on the inputs

11.5 Digital outputs

11.5.1 Variant IOL08DIO08DIO

Output current per channel	Max. 350 mA
Signal level of the outputs: Signal status “1” Signal status “0”	 Min. (V_L – 1 V) Max. 2 V
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	Respective channel LED flashing

Table 22: Release notes on the outputs

11.6 LEDs

LED	LED color	Description
COM	Off	Module de-energized
	Green	No communication
	Flashing green	Communication OK
	Red	Overload of the communication line
U_S	Off	Module de-energized
	Green	Power supply of system/sensor OK
	Red	Power supply of system/sensor < 18 V +/- 1 V
X1-X8 (A/DIA)	Off	Channel A – signal = ‘0’ / OFF
	Yellow	Channel A – signal = ‘1’ / ON
	Flashing yellow	Periphery error (actuator overload/short circuit)
X1-X8 (B/DIA)	Off	Channel B – signal = ‘0’ / OFF
	White	Channel B – signal = ‘1’ / ON
	Flashing white	Periphery error (actuator overload/short circuit)
DIA	Off	No error message exists
	Red	Module diagnosis available

Table 23: Information on LED colors

12 Accessories

In order to get access to various types of accessories, please visit our Web page:

https://www.lapp.com