

Technical manual

LioN-P EtherNet/IP with QuickConnect
0980 ESL 311-xxx ... 0980 ESL 313-xxx
0980 ESL 391-xxx ... 0980 ESL 393-xxx

LioN-R EtherNet/IP with QuickConnect
0980 ESL 811-EIP 16DI-M12-R
0980 ESL 812-EIP 16DO-M12-R
0980 ESL 813-EIP 8DI/8DO-M12-R





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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 and LioN-R/ -P modules with EtherNet/IP interface. Keep the manual where it is accessible to all users.

The texts, figures, diagrams and examples used in this manual are used exclusively to explain how to operate and apply the LioN-P and LioN-R/ -P modules with EtherNet/IP interface.

Please contact us if you have any 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 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:



NOTE

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	March 2013	May 2013	Aug 2014
Name/department	Knipp/PM	Knipp/PM	Knipp/PM
Version number	Version 1.3	Version 1.4	
Date	December 2015	February 2016	
Name/department	Knipp/PM	Lieb/R&D	

Table 1: Overview of manual revisions

2 Safety instructions

2.1 Intended use

The devices described in this manual are decentralized input/output assemblies on a EtherNet/IP 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 modules fulfill the requirements of the EMC guidelines (89/336/EEC, 93/68/EEC and 93/44/EEC) and the low voltage guideline (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.

i NOTE

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 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 permitted for the installation can be obtained from Lumberg Automation™ 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 this manual are authorized to install and maintain the devices described. These are persons who

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

Only Belden Deutschland GmbH – Lumberg Automation™ – is permitted to make changes to the hardware or software of 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 manual, can result in serious personal injury or damage to equipment.

3 System description

3.1 About the LioN-P/-R module series

LioN modules (Lumberg input/output Network) function as the interface in an industrial fieldbus system: They enable a central controller on the management level to communicate with the decentralized sensors and actuators on the field level. The line or ring topologies that they can be used to create not only ensure reliable data communication but also significantly reduce the cables required and thus also the costs for installation and maintenance. They additionally enable easy, quick extension.

The modules of the LioN-P/-R series have a very sturdy metal housing made of die-cast zinc. The completely cast device housing protects the module electronics from environmental effects and allows the device to be used in a wide temperature range. Despite the sturdy construction, the modules have compact dimensions and a low weight. They are especially suitable for use in machines and installations with a moderate I/O concentration over separate assemblies.

3.2 Special product features

► Robust design:

The connection option provided by the module series is the widely-used M12 connector with A coding for the I/O signals and D coding for the network. The connectors are also color-coded to prevent the ports from being mixed up. The output power circuits are electrically isolated from the rest of the network and the sensor electronics. This reliably protects the control devices from interference signals.

► Integrated switch:

The integrated 2-port Ethernet switch of the modules allows a bus or ring topology to be set up for the EtherNet/IP network. The additionally implemented DLR protocol enables you to design a high-availability network infrastructure.

▶ Redundancy function:

In ring topologies, the firmware of the LioN-P/-R modules supports the redundancy function DLR (Device Level Ring). With this function, if the connection is interrupted, the modules immediately switch to an alternative ring segment and thus ensure interruption-free operation. The DLR class supported is “beacon-based” according to the EtherNet/IP specification.

▶ Failsafe function:

The modules with output functions (variants 16DO and 8DI/8DO) provide a failsafe function. This allows you to define the behavior of every single output channel in the case of an interruption or a loss of communication.

▶ Integrated web server:

The network parameters such as IP address, subnet mask and gateway can be adjusted using the rotary switch (last octet of the IP address) or the integrated web server. For automated assignment of the network parameters by the relevant server, the modules support the BOOTP and DHCP protocols.

▶ QuickConnect:

QuickConnect provides an accelerated start-up process that enables LioN-P/-R modules to begin the communication in an EtherNet/IP network particularly quickly. This makes a faster tool change possible, for example.

3.3 Product overview

The LioN-P/-R module series consists of 3 variants of modules with different I/O functions. Detailed information is provided in the following table.

Item number	Description	I/O ports	Design
LioN-P/-R module with 16 digital inputs			
0980 ESL 811-EIP 16DI-M12-R SAP number: 934 691-001	16DI	8 x M12	Sturdy/metal
0980 ESL 311-111 (single protocol) SAP number: 934 880-001			
0980 ESL 311-121 (single protocol) SAP number: 934 839-001			
0980 ESL 391-111 (multiprotocol) SAP number: 934 882-001			
0980 ESL 391-121 (multiprotocol) SAP number: 934 879-001			
LioN-P/-R module with 16 digital outputs			
0980 ESL 812-EIP 16DO-M12-R SAP number: 934 691-002	16DO	8 x M12	Sturdy/metal
0980 ESL 312-111 (single protocol) SAP number: 934 880-002			
0980 ESL 312-121 (single protocol) SAP number: 934 839-002			
0980 ESL 392-111 (multiprotocol) SAP number: 934 882-002			
0980 ESL 392-121 (multiprotocol) SAP number: 934 879-002			
LioN-P/-R module with 8 digital inputs and 8 digital outputs			
0980 ESL 813-EIP 8DI/8DO-M12-R SAP number: 934 691-003	8DI/8DO	8 x M12	Sturdy/metal
0980 ESL 313-111 (single protocol) SAP number: 934 880-003			
0980 ESL 313-121 (single protocol) SAP number: 934 839-003			
0980 ESL 393-111 (multiprotocol) SAP number: 934 882-003			
0980 ESL 393-121 (multiprotocol) SAP number: 934 879-003			

Table 2: Overview of module variants of the LioN-P/-R series

4 Assembly and wiring

4.1 General information

Mount the module with 2 screws (M6x25 / 30) for LioN-R and 2 screws (M4x25/30) for LioN-P on a level surface. The torque required here is 1 Nm. Use washers for all fastening methods as per DIN 125. For the mounting holes, use a distance of 237.3 to 239.7 mm for the LioN-R modules, a distance of 190.3 to 191.8 mm for LioN-P modules with 7/8" connector/socket, and a distance of 196.8 to 198.3 mm for LioN-P modules with M12 power L-coded.

i Note

The modules have a ground connection with an M4 thread for the conduction of interference currents and the EMC immunity. This is labeled with the symbol for the ground and the designation "XE"

i Note

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

i Note

If the mounting surface not grounded, use a ground strap or a suitable PE line. Use an M4 screw to connect the ground strap or the PE line to the ground point and if possible put a washer and a toothed washer below the fixing screw.

i Note

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.

i Note

For UL application:

Only approved for interior use. Please note the maximum elevation of 2000 meters. Approved up to a maximum soiling level of 2.

**WARNING**

Terminals, housings field-wired terminal boxes or components can exceed temperatures of 60 °C.

**WARNING**

For UL application:

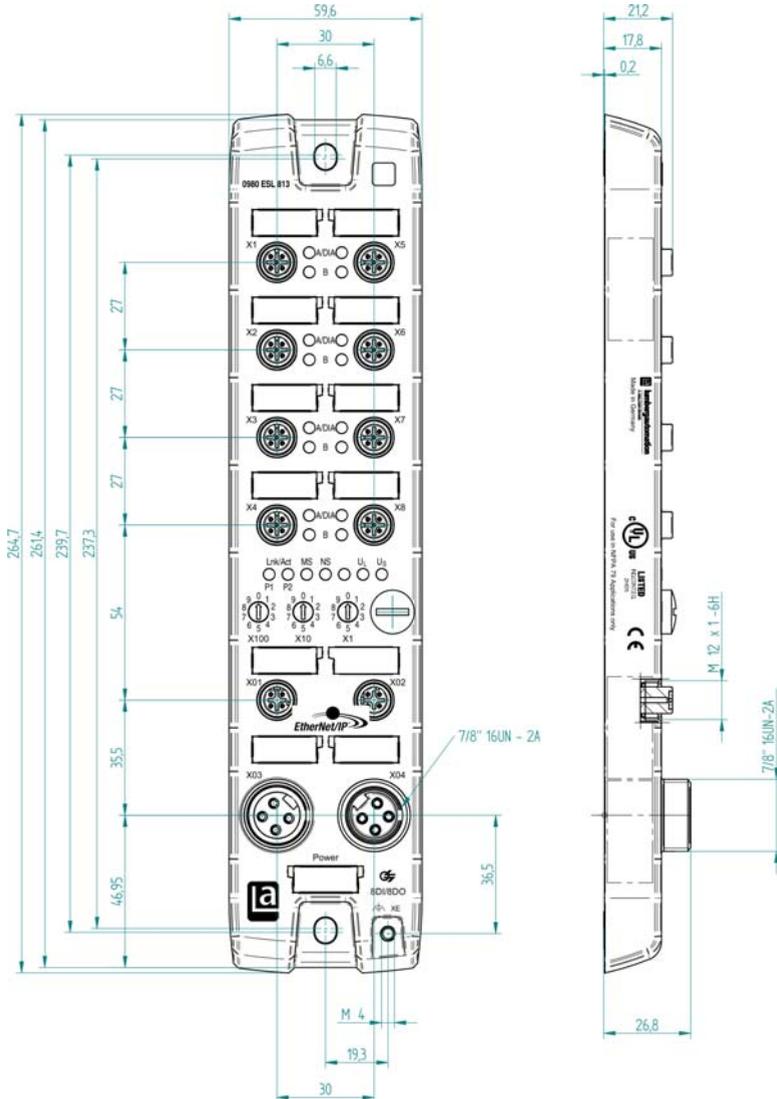
Use temperature-resistant cables with the following properties:

For the modules 0980 ESL3x1-121 and 0980 ESL109-121 heat-resistant up to at least 85 °C.

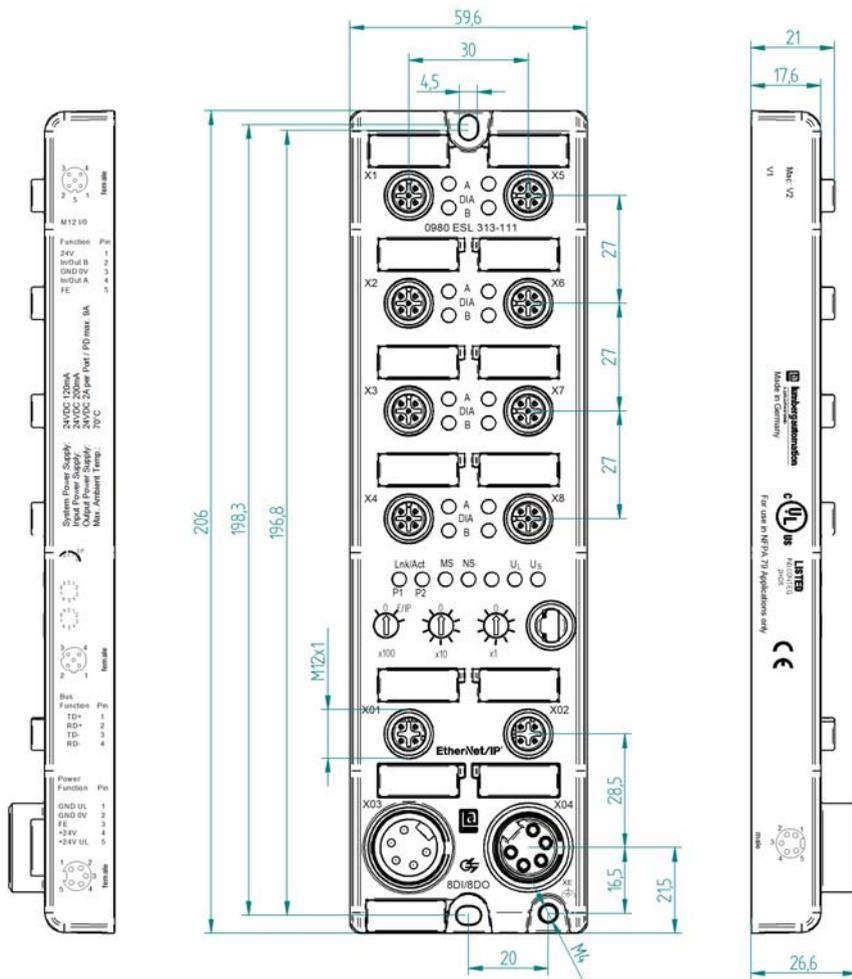
For the modules 0980 ESL3x2-121 and 0980 ESL3x3-121 heat-resistant up to at least 96 °C.

4.2 Outer dimensions

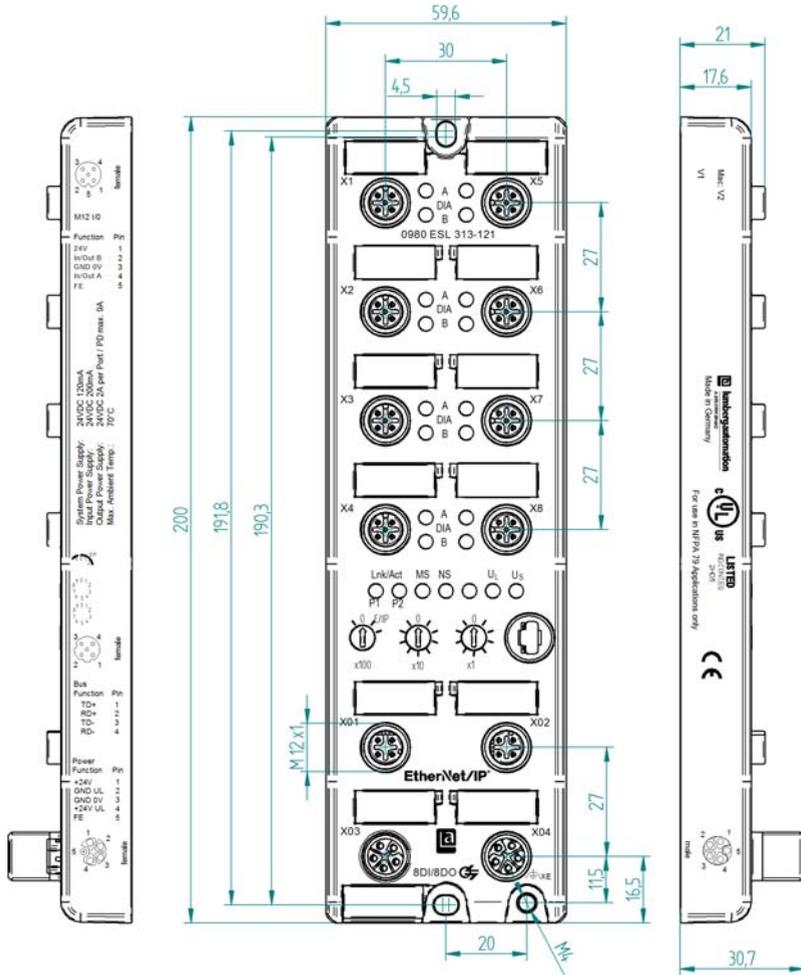
4.2.1 Module 0980 ESL 813-EIP 8DI/8DO-M12-R



4.2.2 Module 0980 ESL 313-111



4.2.3 Module 0980 ESL 313-121



4.3 Port assignments

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

4.3.1 Ethernet/IP ports

- ▶ Design: M12 socket, 4-pin, D-coded
- ▶ Color coding: green

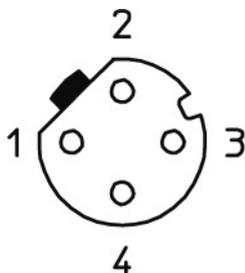


Figure 1: Schematic drawing, ports X01, X02

Port	Pin	Signal	Function
EtherNet/IP	1	TD+	Transmit Data +
Ports X01, X02	2	RD+	Receive Data +
	3	TD-	Transmit Data -
	4	RD-	Receive Data -

Table 3: Assignment of ports X01, X02

Caution

Risk of destruction! Never connect the power supply to the data cables.

4.3.2 Ports for the power supply

- ▶ Design: MINI, 7/8" connector/socket, 4-pin
- ▶ Color coding: gray

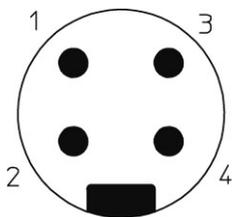


Figure 2: Schematic drawing, port X03 (IN)

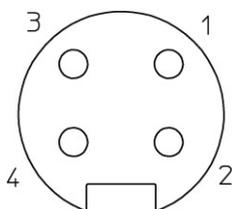


Figure 3: Schematic drawing, port X04 (OUT)

Port	Pin	Signal	Function
Power supply X03, X04	1	+24 V DC	Actuator U_L
	2	+24 V DC	System/sensors U_S
	3	0 V DC	System/sensors U_S
	4	0 V DC	Actuator U_L

Table 4: Assignment of ports X03, X04

i NOTE

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.

i NOTE

For modules with a 7/8" housing, use the power supply voltage "SELV and Limited Energy".

4.3.3 Connections for power supply, 7/8", 5-pin (only applies to multiprotocol)

► Color coding: gray

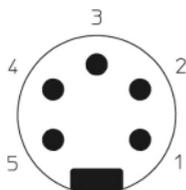


Figure 4: Schematic drawing, port X03 (IN)

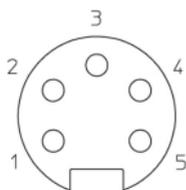


Figure 5: Schematic drawing, port X04 (OUT)

Port	Pin	Signal	Function
		0980 ESL 801	0980 ESL 802 0980 ESL 803
Power supply X03, X04	1	*see note	Actuator
	2	GND (0V)	System/sensors
	3	FE	Ground
	4	+24 V	System/sensors
	5	*see note	Actuator
			GND (0V)
			GND (0V)
			Functional ground
			U _S +24 V
			V _L (+24 V)

Table 5: Assignment of ports X03, X04

i NOTE

For the input module 0980 ESL 801, the two contacts 1 and 5 are not required for the power supply to the actuators. However, these two contacts are connected to each other on the connector and socket side to enable 5-pin transmission of the power supply to a downstream module.

i NOTE

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.

4.3.4 Power supply with M12 power L-coded

► Color coding: gray

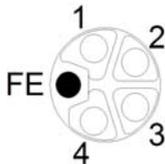


Figure 6: Schematic diagram of the M12 L-coding (connector), port X03 (IN)

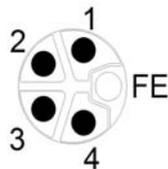


Figure 7: Schematic diagram of the M12 L-coding (socket), port X04 (OUT)

Power supply	Pin	Signal	Function
	1	V_s (+24V)	Sensor/system power supply
	2	GND_{-U_L}	Ground/reference potential V_{aux}
	3	GND_{-V_s}	Ground/reference potential V_s
	4	U_L (+24V)	Auxiliary supply (electrically isolated)
	PE (5)	PE	Functional ground

Table 6: Assignment of X03, X04

i NOTE

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.

4.3.5 Ports for the sensors/actuators

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

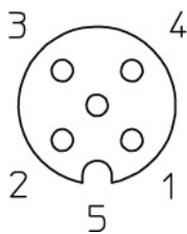


Figure 8: Schematic drawing, ports X1 to X8

Port	Pin	Function		
		0980 ESL 811 16DI	0980 ESL 812 16DO	0980 ESL 813 8DI/8DO
Sensor/actuator 1		+24 V DC	n.c.	+24 V DC (ports X1..X4) n.c. (ports X5..X8)
	2	IN B	OUT B	IN B (ports X1..X4) OUT B (ports X5..X8)
	3	0 V DC	0 V DC	0 V DC
	4	IN A	OUT A	IN A (ports X1..X4) OUT A (ports X5..X8)
	5	Shielding/PE	Shielding/PE	Shielding/PE

Table 7: Assignment of ports X1 to X8

5 Starting operation

5.1 Downloading and installing the EDS file

An EDS file is required for the configuration of a module in the controller. Each of the 3 module variants requires its own EDS file. You have the option of downloading the EDS file from our website or asking our support team to send it to you. The address of the website is:

http://www.beldensolutions.com/de/Service/Downloadcenter/Software_Lumberg

The EDS files are grouped together in an archive file with the name **LioN-P ETHERNET-IP EDS V3.9**. Download this file and unpack it.

The archive contains the following EDS files:

- ▶ EDS-V3.9-LumbergAutomation-0980ESL811-yyyymmdd.eds
- ▶ EDS-V3.9-LumbergAutomation-0980ESL812-yyyymmdd.eds
- ▶ EDS-V3.9-LumbergAutomation-0980ESL813-yyyymmdd.eds

- ▶ EDS-V3.9-LumbergAutomation-0980ESL311-xxx-yyyymmdd.eds
- ▶ EDS-V3.9-LumbergAutomation-0980ESL312-xxx-yyyymmdd.eds
- ▶ EDS-V3.9-LumbergAutomation-0980ESL313-xxx-yyyymmdd.eds
- ▶ EDS-V3.9-LumbergAutomation-0980ESL391-xxx-yyyymmdd.eds
- ▶ EDS-V3.9-LumbergAutomation-0980ESL392-xxx-yyyymmdd.eds
- ▶ EDS-V3.9-LumbergAutomation-0980ESL393-xxx-yyyymmdd.eds

yyyymmdd stands for the date on which the file was issued.

Install the EDS file for the module variant used with the aid of the hardware or network configuration tool of your controller manufacturer. After the installation, the modules are available in the hardware catalogs as a "General Purpose Discrete I/O" device.

5.2 Reading the MAC addresses

Every module has a unique MAC address assigned by the manufacturer that cannot be changed by the user. The assigned MAC address is printed on the right side of the module.

5.3 Setting the network parameters

You can use the 3 rotary switches on the front of the modules to set the operation mode for receiving the network parameters such as IP address, subnet mask, and gateway address.

Please note that a fixed IP address is required for using QuickConnect.

After the power supply is restored, the modules read the switch settings. The selected operation mode overwrites the stored settings.

The devices support the DHCP and BOOTP protocols for receiving the required network parameters such as IP address and subnet mask.

The factory settings of the static network parameters are:

- ▶ IP address: 192,168,001,001
- ▶ Subnet mask: 255,255,255,000
- ▶ Gateway address: 000,000,000,000

Using the rotary encoding switches, the following settings are possible for LioN-R modules:

Rotary switch setting	Function
000 (state on delivery)	In the state on delivery, the DHCP and BOOTP functions are activated. The network parameters are initially requested via DHCP requests. If this is not successful, BOOTP requests are used. The network parameters are not saved, but the integrated web server can be used to save them.
000 (network parameters already saved)	The network parameters last saved are used (IP address, subnet mask, gateway address, DHCP on/off, BOOTP on/off).

Table 8: Setting options of the rotary encoding switches for LioN-R modules

Rotary switch setting	Function
001 to 254	The last 3 digits of the saved or preset IP address are overwritten by the setting of the rotary switch.
255 to 998 (exception: 888)	The network parameters are requested via DHCP and BOOTP but are not saved.
888	The device performs a reset to the factory settings. The network parameters are also reset to the default values. Communication is not possible in this operation mode.
999	The factory setting of the IP address (192.168.001.001) is used.

Table 8: Setting options of the rotary encoding switches for LioN-R modules

Using the rotary encoding switches, the following settings are possible for LioN-P modules:

Rotary switch setting	Function
000 (state on delivery)	In the state on delivery, the DHCP and BOOTP functions are activated. The network parameters are initially requested via DHCP requests. If this is not successful, BOOTP requests are used. The network parameters are not saved, but the integrated web server can be used to save them.
000 (network parameters already saved)	The network parameters last saved are used (IP address, subnet mask, gateway address, DHCP on/off, BOOTP on/off).
001 to 254	The last 3 digits of the saved or preset IP address are overwritten by the setting of the rotary switch.
255 to 999 (exceptions: 299 and 979)	The network parameters are requested via DHCP and BOOTP but are not saved.
299	The factory setting of the IP address (192.168.001.001) is used.
979	The device performs a reset to the factory settings. The network parameters are also reset to the default values. Communication is not possible in this operation mode.

Table 9: Setting options of the rotary encoding switches for LioN-P modules

5.4 Configuring the controlling

5.4.1 Connections and assembly object

The modules support the **Exclusive Owner**, **Input Only**, and **Listen Only** connection types. The **Exclusive Owner** connection type is only available for modules with an output function (variants 16DO and 8DI/8DO).

By selecting the relevant instance ID of the assembly object, you decide whether the module adds diagnostic data to the standard process data.

The modules provide the following connections and assembly instance IDs:

- **16DI modules:**
 - **0980 ESL 811-EIP 16DI-M12-R**
 - **0980 ESL 311-xxx**
 - **0980 ESL 391-xxx**

Connection type	Diagnostics	Instance ID	Length
Input Only	Yes	Output: 193	0 byte
		Input: 101	4 byte
Input Only	No	Output: 193	0 byte
		Input: 102	3 byte
Listen Only	Yes	Output: 192	0 byte
		Input: 101	4 byte
Listen Only	No	Output: 192	0 byte
		Input: 102	3 byte

Table 10: Connections and assembly instance IDs in module 811

- **16DO modules:**
 - **0980 ESL 812-EIP 16DO-M12-R**
 - **0980 ESL 312-xxx**
 - **0980 ESL 392-xxx**

Connection type	Diagnostics	Instance ID	Length
Exclusive Owner	Yes	Output: 100	2 byte
		Input: 101	7 byte
		Configuration: 105	64 byte
Exclusive Owner	No	Output: 100	2 byte
		Input: 102	3 byte
		Configuration: 105	64 byte
Input Only	Yes	Output: 193	0 byte
		Input: 101	7 byte
Input Only	No	Output: 193	0 byte
		Input: 102	3 byte

Table 11: Connections and assembly instance IDs in module 812

Connection type	Diagnostics	Instance ID	Length
Listen Only	Yes	Output: 192	0 byte
		Input: 101	7 byte
Listen Only	No	Output: 192	0 byte
		Input: 102	3 byte

Table 11: Connections and assembly instance IDs in module 812

- **8DI/8DO modules:**
 - **0980 ESL 813-EIP 8DI/8DO-M12-R**
 - **0980 ESL 313-xxx**
 - **0980 ESL 393-xxx**

Connection type	Diagnostics	Instance ID	Length
Exclusive Owner	Yes	Output: 100	1 byte
		Input: 101	6 byte
		Configuration: 105	32 byte
Exclusive Owner	No	Output: 100	1 byte
		Input: 102	3 byte
		Configuration: 105	32 byte
Input Only	Yes	Output: 193	0 byte
		Input: 101	6 byte
Input Only	No	Output: 193	0 byte
		Input: 102	3 byte
Listen Only	Yes	Output: 192	0 byte
		Input: 101	6 byte
Listen Only	No	Output: 192	0 byte
		Input: 102	3 byte

Table 12: Connections and assembly instance IDs in module 813

5.4.2 Configuration assembly instance

The configuration assembly instance is only available for modules with an output function (variants 16DO and 8DI/8DO).

With this instance, the surveillance timeout and the starting status for the fail-safe can be defined for every individual output channel.

The instance ID for the configuration assembly instance is 105. The length of the configuration assembly instance is

- ▶ 32 words (= 64 byte) for the 16DO module and
- ▶ 16 words (= 32 byte) for the 8DI/8DO module.

■ Surveillance timeout

The firmware of the modules allows you to define a delay time before the monitoring of the output currents begins, known as the surveillance timeout. You can define this for every individual output channel.

The delay time begins after the status of the output channel changes, i.e. when this is activated (after a rising edge) or deactivated (after a falling edge). After this time has elapsed, the monitoring of the output begins and the diagnosis reports error statuses.

The value of the surveillance timeout is 0 to 255 ms. The standard value is 80 ms. When the output channel is in the static state, i.e. the channel is permanently switched on or off, the value is 100 ms.

	MSB															LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	Surveillance timeout port X1, channel A (pin 4), possible values 0...255															
Word 1	Surveillance timeout port X1, channel B (pin 2), possible values 0...255															
...																
Word 14	Surveillance timeout port X8, channel A (pin 4), possible values 0...255															
Word 15	Surveillance timeout port X8, channel B (pin 2), possible values 0...255															

Table 13: Possible surveillance timeout values for module 16DO

	MSB															LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	Surveillance timeout port X5, channel A (pin 4), possible values 0...255															
Word 1	Surveillance timeout port X5, channel B (pin 2), possible values 0...255															
...																
Word 6	Surveillance timeout port X8, channel A (pin 4), possible values 0...255															
Word 7	Surveillance timeout port X8, channel B (pin 2), possible values 0...255															

Table 14: Possible surveillance timeout values for module 8DI/8DO

■ Failsafe function

The firmware of the modules provides a fail-safe function for the outputs. During the configuration of the modules, you have the option to define the status of the outputs after an interruption or a loss of communication.

The following options are available to you:

- ▶ **Set low** – deactivate the output channel (value = 0)
- ▶ **Set high** – activate the output channel (value = 1)
- ▶ **Hold last** – hold the last output status (value = 2)

	MSB					LSB										
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 16	Failsafe port X1, channel A (pin 4), possible values: 0...2															
Word 17	Failsafe port X1, channel B (pin 2), possible values: 0...2															
...																
Word 30	Failsafe port X8, channel A (pin 4), possible values: 0...2															
Word 31	Failsafe port X8, channel B (pin 2), possible values: 0...2															

Table 15: Possible failsafe values with module 16DO

	MSB					LSB										
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 8	Failsafe port X5, channel A (pin 4), possible values: 0...2															
Word 9	Failsafe port X5, channel B (pin 2), possible values: 0...2															
...																
Word 14	Failsafe port X8, channel A (pin 4), possible values: 0...2															
Word 15	Failsafe port X8, channel B (pin 2), possible values: 0...2															

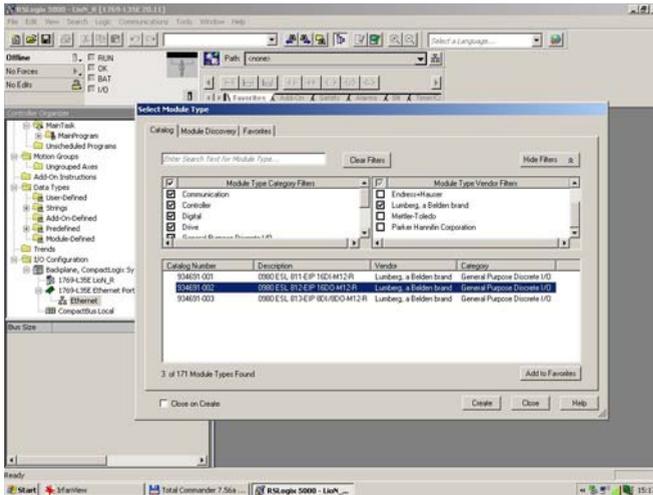
Table 16: Possible failsafe values with module 8DI/8DO

5.4.3 Configuration example

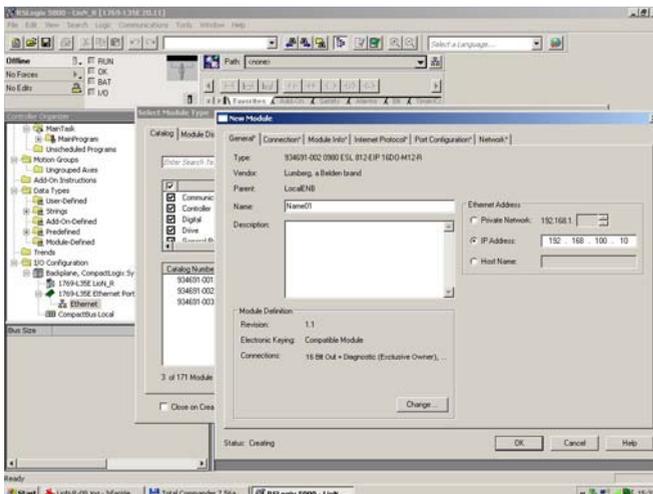
The configuration and start-up of the modules described on the following pages refers to the RSLogix5000 software from Rockwell Automation. If you are using a control system from another provider, please consider the related documentation.

- Install the EDS files of the modules in "RSLogix5000" with the EDS hardware installation tool under the "Tools" menu.
- Select the correct controller.

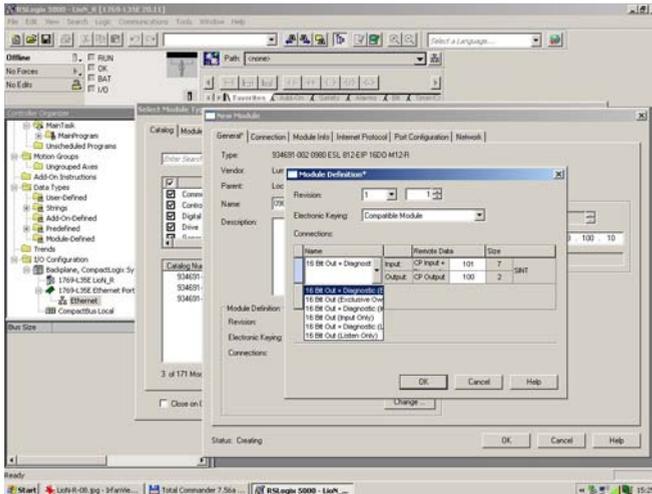
- Go to the "/O-Configuration" section in the "Controller Organizer" and right-click on "Ethernet".
- Select the "New Module" menu item. The following selection window opens:



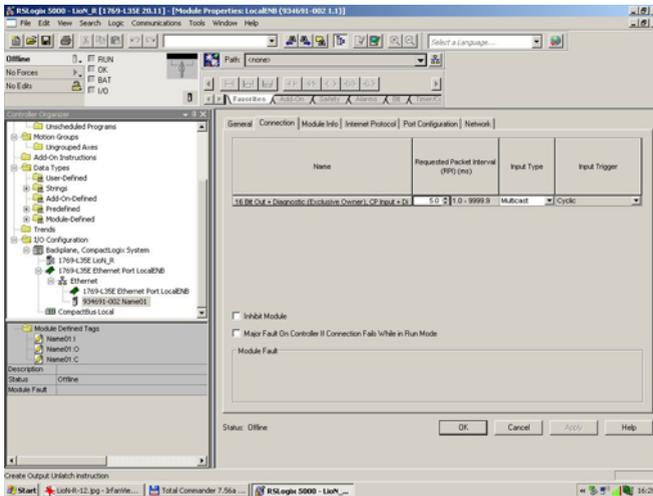
- Select the module to be added and click the "Create" button.



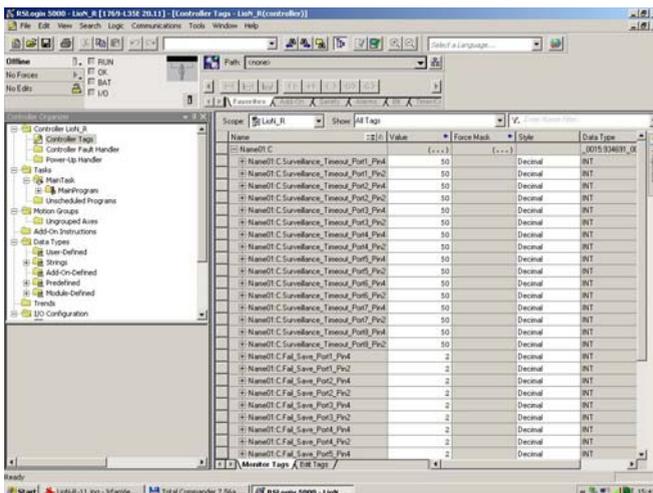
- ❑ Enter a name for the module and the correct IP address. In this example, the name is Name01 and the IP address 192.168.100.10.
- ❑ Click the "Change" button and change the setting for the module revision, electronic keying, and connection type.



- ❑ Select the connection type. This specifies which process and diagnostic data the module provides.
- ❑ In the "Connections" folder of the "Module Properties", you will see the selected connection type. This folder also lets you set the "Requested-Packet-Interval (RPI)" and the input type ("Input Type"). A value of 5 ms is the minimum for parameter RPI.



- Change to the "Controller-Tags" section in "Controller Organizer". The controller tags for the configuration parameters contain the name of the module, followed by a :C. The surveillance timeout and fail-safe parameters can be defined for each individual output channel - see the following example:



5.4.4 Initial settings of the connection parameters

Configuration tools of other controller manufacturers may ask you to enter additional parameters for setting up a communication link between your EtherNet/IP I/O scanner and the modules. For this scenario, the following table provides a list of useful parameters:

■ 16DI slot with diagnostics

Transport type	Input only
Trigger mode	Cyclic
Requested packet interval (RPI)	Minimum 5 ms (LioN-R) Minimum 2 ms (LioN-P)

Sender to target device (O->T), connection parameters

Real-time transfer format	Heartbeat
Connection type	POINT2POINT
Assembly instance ID	193
Data type	USINT
Data size	1 byte
Data length	0 byte

Target device to sender (T->O), connection parameters

Real-time transfer format	Connection is pure data and is modeless
Connection type	MULTICAST
Assembly instance ID	101
Data type	USINT
Data size	1 byte
Data length	4 byte

Table 17: Parameters for the 16DI module

■ 16DO slot with diagnostics

Transport type	Exclusive Owner
Trigger mode	Cyclic
Requested packet interval (RPI)	Minimum 5 ms (LioN-R) Minimum 2 ms (LioN-P)

Sender to target device (O->T), connection parameters

Real-time transfer format	32-bit run/idle header
Connection type	POINT2POINT
Assembly instance ID	100

Table 18: Parameters for the 16DO module

Data type	USINT
Data size	1 byte
Data length	2 byte

Target device to sender (T->O), connection parameters

Real-time transfer format	Connection is pure data and is modeless
Connection type	MULTICAST
Assembly instance ID	101
Data type	USINT
Data size	1 byte
Data length	7 byte

Table 18: Parameters for the 16DO module

■ 8DI/8DO module with diagnostics

Transport type	Exclusive Owner
Trigger mode	Cyclic
Requested packet interval (RPI)	Minimum 5 ms (LioN-R) Minimum 2 ms (LioN-P)

Sender to target device (O->T), connection parameters

Real-time transfer format	32-bit run/idle header
Connection type	POINT2POINT
Assembly instance ID	100
Data type	USINT
Data size	1 byte
Data length	1 byte

Target device to sender (T->O), connection parameters

Real-time transfer format	Connection is pure data and is modeless
Connection type	MULTICAST
Assembly instance ID	101
Data type	USINT
Data size	1 byte
Data length	6 byte

Table 19: Parameters for the 8DI/8DO module

6 The integrated web server

The modules provide an integrated web server for configuration, monitoring, and diagnosis. You have the option to call up the websites saved on it by entering the address in a web browser. To do this, replace the placeholder [IP-Adresse] with the IP address of the relevant module.

6.1 The Home page

The address of the Home page is:

`http://[IP-Adresse]/home.htm`



This page is the starting point for accessing the integrated web server.

6.2 The Configuration page (Config)

The address of the configuration page is:

`http://[IP-Adresse]/config.htm`

On this page you have the option to access the following values and parameters:

- ▶ Network parameters (IP settings):
 - ▶ IP address, readable and writable
 - ▶ Subnet mask, readable and writable
 - ▶ Gateway address, readable and writable
- ▶ Start configuration:
 - ▶ Fix: The module uses the IP settings defined by the above parameters.
 - ▶ BOOTP: The module receives the IP settings via a BOOTP server.
 - ▶ DHCP: The module receives the IP settings via a DHCP server.
- ▶ Restore Factory Settings:
 - ▶ The module restores the factory settings.

When you click the "Submit" button, the new parameters are transferred to the module. The module only takes over the new settings after the power supply is restored.

The screenshot shows the 'Config' page of the LiON-P Webserver. At the top, there is a navigation bar with 'Home', 'Config', 'Status', and 'Contact' tabs. Below this, the 'Config' section is active. Under 'IP Settings', there is a note that the rotary switch is set to 0 (dec). A table lists the IP-Address, Subnet Mask, and Gateway with their respective settings. The 'Startup configuration' section has radio buttons for 'Fix', 'BOOTP', and 'DHCP', with 'Fix' selected. Below this are 'Clear' and 'Submit' buttons. A 'Result: OK' message is displayed. The 'Restore Factory Settings' section includes a warning and an 'Apply' button. At the bottom, there is a 'Firmware Update' button.

LiON-P Webserver

Home Config Status Contact

Config

IP Settings

The rotary switch is set to 0 (dec).

Each field may contain a value from 0 to 255 or remains empty, if the current value shall not be changed.
If the IP-Address is set to 0.0.0.0 and DHCP/BOOTP failed, no IP-Address is assumed.

Parameter	Settings			
IP-Address	192	168	1	8
Subnet Mask	255	255	255	0
Gateway	0	0	0	0

Startup configuration: Fix BOOTP DHCP

Clear Submit

Result: OK

Restore Factory Settings

Restoring factory settings affect all network parameter, including EtherNet/IP settings.
Applying the factory settings will cause all network connection to be closed!
Note: The new address depends on the rotary switch settings.

Please confirm to restore the factory settings and reset the device. Apply

Firmware Update

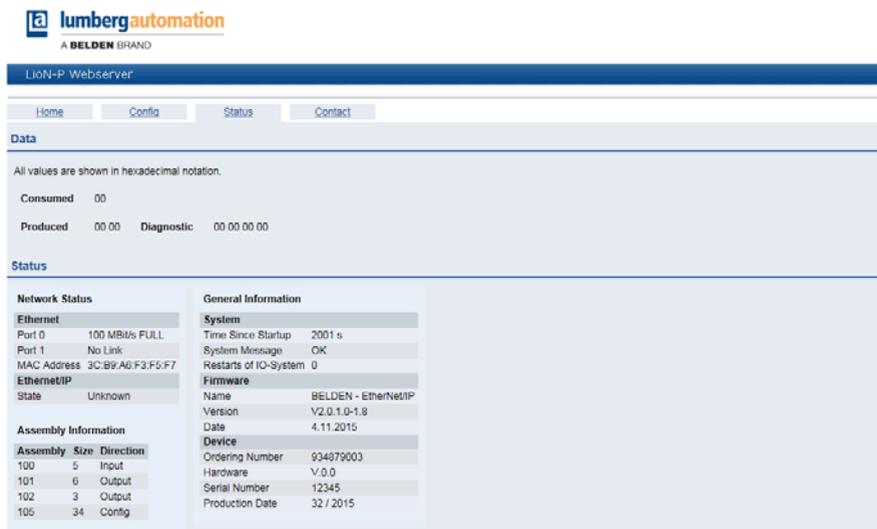
6.3 The Status page

The address of the Status page is:

`http://[IP-Adresse]/status.htm`

On this page you have the option to read the following values and parameters:

- ▶ Process data:
 - ▶ Output data ("Consumed")
 - ▶ Input data ("Produced") with diagnosis
- ▶ Status of the LAN ports:
 - ▶ Duplex mode (full duplex, half duplex)
 - ▶ Transmission rate (10 MBit, 100 MBit)
- ▶ Network address:
 - ▶ MAC address
- ▶ Size and data direction of the assembly instances
- ▶ Status of the EtherNet/IP connection:
 - ▶ Stand-by
 - ▶ Wait-for-Connection
 - ▶ Operational
- ▶ Device status:
 - ▶ System runtime
 - ▶ System information
 - ▶ Number of restarts of the I/O system
- ▶ Firmware version and date
- ▶ Device information
- ▶ Revision:
 - ▶ Item number
 - ▶ Serial number
 - ▶ Production year and week



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LiON-P Webserver

Home Config Status **Contact**

Data

All values are shown in hexadecimal notation.

Consumed 00

Produced 00 00 Diagnostic 00 00 00 00

Status

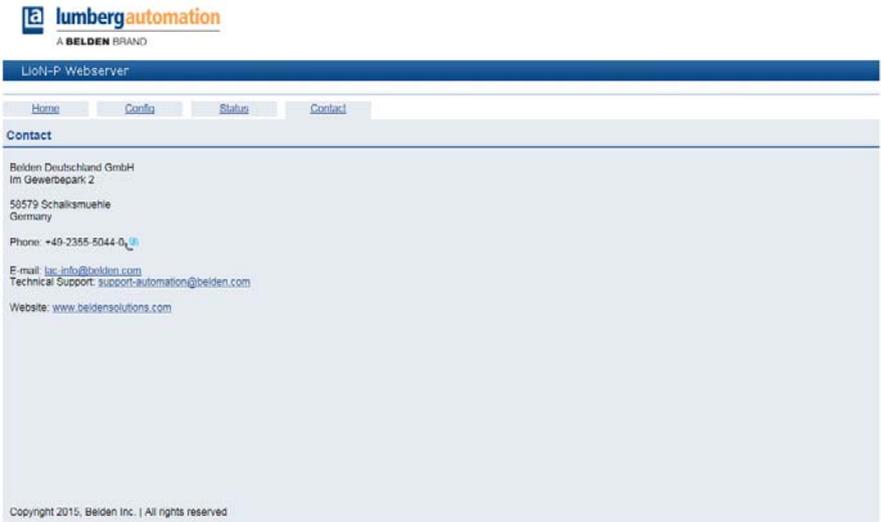
Network Status			General Information	
Ethernet			System	
Port 0	100	MBits FULL	Time Since Startup	2001 s
Port 1	No	Link	System Message	OK
MAC Address 3C:B9:A6:F3:F5:F7			Restarts of IO-System 0	
Ethernet/IP			Firmware	
State	Unknown		Name	BELDEN - EtherNet/IP
Assembly Information			Version	V2.0.1.0-1.8
Assembly	Size	Direction	Date	4.11.2015
100	5	Input	Device	
101	6	Output	Ordering Number	934079003
102	3	Output	Hardware	V.0.0
105	34	Config	Serial Number	12345
			Production Date	32 / 2015

6.4 The Contact page

The address of the contact page is:

[http://\[IP-Adresse\]/contact.htm](http://[IP-Adresse]/contact.htm)

This page provides information on the contact data for Belden Deutschland GmbH.



6.5 Reading the process and diagnostic data

You have the option to read the process and diagnostic data for the LioN-R modules using the integrated web server. The web server provides the data in standardized JSON format. The data is accessed via the website. The relevant address is:

```
http://[IP-Adresse]/data.json
```

In higher programming languages, the process and diagnostic data is read via HTTP requests. The following example uses the GET command in an HTTP request to obtain the data:

HTTP request:

```
GET /data.json HTTP/1.1
```

HTTP response:

```
HTTP/1.1 200 OK
Server: servX
Content-Length: 73
Content-Type: application/json
{"consumed": [0,0], "produced": [0,0,0,0,0,0]}
```

The response has the following object structure:

- ▶ Consumed: Array[a,b] – contains the output data of the module
- ▶ Produced: Array[a,b] – contains the input data of the module with a diagnosis

7 QuickConnect

QuickConnect (QC) enables the module to perform the start-up process faster. This makes it possible to begin the network communication particularly quickly.

7.1 How it works

When you activate QuickConnect, the module accepts a TCP connection within 350 ms of being switched on. Then the controller sets up the connection. In this way the module achieves a start-up time of approx. 400 to 500 ms.

To be able to use QC, the network must be in a star or line topology and the module must have a static IP address. Ring topologies and DHCP/BOOTP are not supported. Please note that no automatic check is performed for IP addresses that are assigned more than once in the same network.

When QuickConnect is activated, the following parameters are fixed for the Ethernet interface of the module:

- ▶ 100 Mbit/s transmission speed
- ▶ Full duplex connection
- ▶ Auto-negotiation and Auto-MDIX deactivated

Make sure that your controller software is configured according to these parameters.

7.2 Activation

You activate QuickConnect via any EtherNet/IP master, e.g. via your machine controller. The following instructions are valid for using the RSLogix5000 software from Rockwell Automation.

You have the option to activate QC via configuration assembly instance 105 and via an EtherNet/IP object (TCP/IP object). Note that the modules only take over the changes in a new power cycle.

7.2.1 Configuration assembly instance 105

In the "Controller Organizer", select the "Controller-Tags" section and set the "QuickConnectEn" bit to the value 1.

The screenshot shows the SIMATIC Manager interface with the 'Controller Organizer' window open. The left pane shows a tree view of the controller configuration, including 'Controller L17_QuickConnect' and its various components. The right pane displays a table of controller tags. The tag 'L17_QuickConnect.C.QuickConnectEn' is highlighted in red, indicating it is selected. The table columns are Name, Value, Force Mask, Style, and Data Type.

Name	Value	Force Mask	Style	Data Type
L17_QuickConnect.C.Fal_Save_Port1_Ch_A	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port1_Ch_B	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port2_Ch_A	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port2_Ch_B	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port3_Ch_A	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port3_Ch_B	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port4_Ch_A	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port4_Ch_B	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port5_Ch_A	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port5_Ch_B	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port6_Ch_A	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port6_Ch_B	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port7_Ch_A	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port7_Ch_B	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port8_Ch_A	0		Decompl	INT
L17_QuickConnect.C.Fal_Save_Port8_Ch_B	0		Decompl	INT
L17_QuickConnect.C.QuickConnectEn	1		Decompl	BOOL
L17_QuickConnect.C.Surveillance_Timeout_0	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_1	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_2	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_3	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_4	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_5	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_6	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_7	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_8	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_9	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_10	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_11	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_12	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_13	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_14	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_15	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_16	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_17	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_18	80		Decompl	INT
L17_QuickConnect.C.Surveillance_Timeout_19	80		Decompl	INT

7.2.2 EtherNet/IP object (TCP/IP object)

Enter a message command from the command list and open the related configuration window. There you enter the values F5 for "Class" and 12 for "Attribute"; then under "Source Element", set the relevant variable to the value 1.

Message Configuration - CIP_generic_type

Configuration | Communication | Tag

Message Type: CIP Generic

Service Type: Set Attribute Single Source Element:

Service Code: 10 (Hex) Class: F5 (Hex) Source Length: 1 (Bytes)
Instance: 1 Attribute: 12 (Hex) Destination Element:

New Tag...

Enable Enable Waiting Start Done Done Length: 0

Error Code: Extended Error Code: Timed Out

Error Path:
Error Text:

OK Cancel Apply Help

8 Bit assignment

With the input data, actual values are specified, and with the output data target values.

Please note that the amount of provider data (input data) is variable. The amount depends on whether the transfer of diagnostic data has been selected. The modules provide one byte for the slot or channel diagnosis, known as the **module information byte**. The diagnostic data is added to the standard process input data as additional bytes.

8.1 16DI module

8.1.1 Assembly instance ID 101 (input data with diagnosis)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	X7-B	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	0	0	0	0	0	MI-SCS	0	MI-LVS
Byte 3	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1

Table 20: Bit assignment for assembly instance ID 101

8.1.2 Assembly instance ID 102 (input data without diagnosis)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	X7-B	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	MI-IME	0	0	0	0	MI-SCS	0	MI-LVS

Table 21: Bit assignment for assembly instance ID 102

8.1.3 Key:

- ▶ X1-A...X8-A: Input status, channel A (contact pin 4) of slots X1 to X8
- ▶ X1-B...X8-B: Input status, channel B (contact pin 2) of slots X1 to X8
- ▶ MI-LVS: Module information byte – undervoltage for system/sensor power supply
- ▶ MI-SCS: Module information byte – sensor short-circuit at an M12 slot

- ▶ MI-IME Module information byte – internal module error
- ▶ SCS-X1...SCS-X8: Sensor short-circuit at slot X1 to X8

8.2 16DO module

8.2.1 Assembly instance ID 101 (input data with diagnosis)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	X7-B	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	MI-IME	0	0	0	MI-SCA	0	MI-LVA	MI-LVS
Byte 3	0	0	0	0	0	0	0	0
Byte 4	0	0	0	0	0	0	0	0
Byte 5	CE-X4B	CE-X4A	CE-X3B	CE-X3A	CE-X2B	CE-X2A	CE-X1B	CE-X1A
Byte 6	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

Table 22: Bit assignment for assembly instance ID 101

8.2.2 Assembly instance ID 102 (input data without diagnosis)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	X7-B	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	0	0	0	0	MI-SCA	0	MI-LVA	MI-LVS

Table 23: Bit assignment for assembly instance ID 102

8.2.3 Assembly instance ID 100 (output data)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	X7-B	X7-A	X6-B	X6-A	X5-B	X5-A

Table 24: Bit assignment for assembly instance ID 100

8.2.4 Key

- ▶ X1-A...X8-A: Input status, channel A (contact pin 4) of slots X1 to X8
- ▶ X1-B...X8-B: Input status, channel B (contact pin 2) of slots X1 to X8
- ▶ MI-LVS: Module information byte – undervoltage for system/sensor power supply

- ▶ MI-LVA: Module information byte – actuator undervoltage
- ▶ MI-SCA: Module information byte – actuator short-circuit
- ▶ MI-IME: Module information byte – internal module error
- ▶ CE-X1A...CE-X8A: Channel error, channel A (contact pin 4) of slots X1 to X8
- ▶ CE-X1B...CE-X8B: Channel error, channel B (contact pin 2) of slots X1 to X8

8.3 8DI/8DO module

8.3.1 Assembly instance ID 101 (input data with diagnosis)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	X7-B	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS
Byte 3	0	0	0	0	SCS-X4	SCS-X3	SCS-X2	SCS-X1
Byte 4	0	0	0	0	0	0	0	0
Byte 5	CE-X8B	CE-X8A	CE-X7B	CE-X7A	CE-X6B	CE-X6A	CE-X5B	CE-X5A

Table 25: Bit assignment for assembly instance ID 101

8.3.2 Assembly instance ID 102 (input data without diagnosis)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X4-B	X4-A	X3-B	X3-A	X2-B	X2-A	X1-B	X1-A
Byte 1	X8-B	X8-A	X7-B	X7-A	X6-B	X6-A	X5-B	X5-A
Byte 2	0	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS

Table 26: Bit assignment for assembly instance ID 102

8.3.3 Assembly instance ID 100 (output data)

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	X8-B	X8-A	X7-B	X7-A	X6-B	X6-A	X5-B	X5-A

Table 27: Bit assignment for assembly instance ID 100

8.3.4 Key

- ▶ X1-A...X4-A: Input status, channel A (contact pin 4) of slots X1 to X4
- ▶ X1-B...X4-B: Input status, channel B (contact pin 2) of slots X1 to X4
- ▶ X5-A...X8-A: Output status, channel A (contact pin 4) of slots X5 to X8
- ▶ X5-B...X8-B: Output status, channel B (contact pin 2) of slots X5 to X8
- ▶ MI-LVS: Module information byte – undervoltage for system/sensor power supply
- ▶ MI-LVA: Module information byte – actuator undervoltage
- ▶ MI-SCS: Module information byte – sensor short-circuit
- ▶ MI-SCA: Module information byte – actuator short-circuit
- ▶ MI-IME: Module information byte – internal module error
- ▶ SCS-X1...SCS-X4: Sensor short-circuit at slot X1 to X4
- ▶ CE-X5A...CE-X8A: Channel error, channel A (contact pin 4) of slots X1 to X8
- ▶ CE-X5B...CE-X8B: Channel error, channel B (contact pin 2) of slots X1 to X8

9 Diagnostics processing

The modules provide advanced diagnosis behavior, in particular for the output channels to determine errors in the transmission. The firmware of the modules distinguishes between 5 different types of error.

9.1 Channel error

A channel error is determined by comparing the target value set by a controller and the actual value of an output channel.

Target value	Actual value	Comment
Active	Active	OK, no diagnosis
Off	Off	OK, no diagnosis
Active	Off	Short-circuit Channel indicator is red. Channel error bit in the diagnosis is set. Channel is locked after the error is rectified.
Off	Active	Voltage is fed back in Red and yellow/white channel indicators are activated. Channel error bit in the diagnosis is set. Channel is not locked after the error is rectified.

Table 28: Interpretation of channel errors

i Note

If both output channels of an M12 slot are activated when a channel error occurs, the controller locks both channels, even if only one channel is affected by the error. If only one channel is activated, the controller only locks this one. Locked channels are deactivated and remain in the `Off` state if you do not reset them using the controller.

When an output channel is activated (rising edge of the channel state) or deactivated (falling edge), the channel errors are filtered for the period that you set using the "Surveillance-Timeout" parameter during the configuration of the module. The value of this parameter can range from 0 to 255 ms; the factory setting is 80 ms.

The filter is used to avoid premature error messages when a capacitive load is activated or an inductive load is deactivated, and during other voltage peaks when a status changes.

When a channel is in the static state – that is, when it is permanently activated or deactivated – the controller uses a fixed specified duration of 100 ms for filtering the error message.

9.2 Voltage error at the M12 slots (sensor short-circuit)

At every M12 input socket of the modules, pin 1 supplies a monitored sensor voltage V_S .

In the case of a sensor short-circuit, a voltage error is reported. Both channel indicators of the M12 input socket light up red, and the relevant error bit for the sensor short-circuit is set in the diagnosis bytes.

The error message is filtered by the "Surveillance-Timeout" parameter.

9.3 Overload of output drivers

The output drivers of the modules with output functions (variants 16DO and 8DI/8DO) report an error when they detect an overload. This error is reported by setting the relevant channel error bits in the diagnosis bytes.

i Note

If both output channels of an M12 slot are activated when a channel error occurs, the controller locks both channels, even if only one channel is affected by the error. If only one channel is activated, the controller only locks this one. Locked channels are deactivated and remain in the `Off` state if you do not reset them using the controller.

If there is an overload, the status indicator of the active output channel lights up red. If both output channels of an M12 slot are active during an overload, both status indicators light up red.

The error message is filtered by the "Surveillance-Timeout" parameter.

9.4 Error in the actuator power supply

The voltage value at the connections for the power supply of the actuators is monitored globally and on the module level.

If the actuator power supply U_L goes outside the voltage range of 18 to 30 V, an error is reported. The U_L indicator lights up red, and the actuator undervoltage bit is set in the module information byte.

When output channels are activated, the voltage error is also displayed by setting the relevant error bits of the M12 slots.

Note

Every output channel that is active at the same time as the error occurs in supply voltage U_L is locked. This means that for correct operation, the output channel must be reset by the controller when the status of the supply voltage U_L is normalized again.

We recommend deactivating all output channels with the controller as soon as the undervoltage is detected. Otherwise, because it is locked, every active output channel will report a diagnosis when the voltage value is normalized again.

The error message is filtered by means of a fixed filter period of 300 ms.

9.5 Error in the system/sensor power supply

The voltage value for the system/sensor power supply is also monitored globally. If the value goes outside the voltage range of 18 to 30 V, an error message is created.

The U_S indicator lights up red and the sensor undervoltage bit is set in the module information byte.

The error message has no effect on the outputs and is not filtered, but is reported immediately.

 **Caution**

It must definitely be ensured that the supply voltage, measured at the most remote participant is not below 18 V DC from the perspective of the system power supply.

10 Technical data

10.1 General

Protection class	IP 67 (only when the connectors are screwed in or when protective caps are used)
Ambient temperature	LioN-R: -10 °C to +60 °C (+14 °F to +140 °F) LioN-P: -40 °C to +70 °C (-40 °F to +158 °F)
Weight	615 g (LioN-R); 480 g (LioN-P)
Housing material	Die-cast zinc
Vibration resistance (oscillation)	15 g / 5–500 Hz
Shock resistance	50 g / 11 ms
Torques:	
M6 fixing screws	1.0 Nm
M4 ground connection	1.0 Nm
M12 connector	0.5 Nm

Table 29: General information

10.2 Bus system

Protocol	EtherNet/IP
EDS files	EDS-V3.9-LumbergAutomation-0980ESL811-yyyyymmdd.eds EDS-V3.9-LumbergAutomation-0980ESL812-yyyyymmdd.eds EDS-V3.9-LumbergAutomation-0980ESL813-yyyyymmdd.eds EDS-V3.9-LumbergAutomation-0980ESL31x-xxx-yyyyymmdd.eds EDS-V3.9-LumbergAutomation-0980ESL39x-xxx-yyyyymmdd.eds
Data transmission rate	10/100 Mbit/s, full duplex
Transmission procedure	100BASE-TX
Autonegotiation	is supported
Manufacturer ID	21
Product code (number)	7
Product code (character string)	“General Purpose Discrete I/O”

Table 30: Information on the bus system

Product code	8110 (0980 ESL 811-EIP 16DI-M12-RQC) 8120 (0980 ESL 812-EIP 16DO-M12-RQC) 8130 (0980 ESL 813-EIP 8DI/8DO-M12-RQC) 31100 (0980 ESL 311-111 16DI 7/8P SP) 31200 (0980 ESL 312-111 16DO 7/8P SP) 31300 (0980 ESL 313-111 8DI8DO 7/8P SP) 31102 (0980 ESL 311-121 16DI M12P SP) 31202 (0980 ESL 312-121 16DO M12P SP) 31302 (0980 ESL 313-121 8DI8DO M12P SP) 39100 (0980 ESL 391-111 16DI 7/8P MP) 39200 (0980 ESL 392-111 16DO 7/8P MP) 39300 (0980 ESL 393-111 8DI8DO 7/8P MP) 39102 (0980 ESL 391-121 16DI M12P MP) 39202 (0980 ESL 392-121 16DO M12P MP) 39302 (0980 ESL 393-121 8DI8DO M12P MP)
Supported Ethernet protocols	Ping ARP HTTP TCP/IP DHCP BOOTP DLR (beacon-based)
Switch functions	Integrated
EtherNet/IP interface	2 M12 sockets
Port	4-pin, D-coded (see pin assignment)
Autocrossing	is supported

Table 30: Information on the bus system

10.3 Power supply for the module electronics/sensors

Nominal voltage U_S	24 V DC (SELV/PELV)
Voltage range	18-30 V DC
Power consumption of module electronics	Typically 95 mA
Voltage level of the sensor power supply	Min. ($U_S - 1.5$ V)
Current consumption of sensors	Max. 200 mA (at $T_U = 30$ °C) per Port

Table 31: Information on the power supply for the module electronics/sensors

Reverse polarity protection	Yes
Operational indicator (U_S)	LED green, $18\text{ V} \leq U_S \leq 30\text{ V}$ LED red, $U_S < 18\text{ V}$ or $U_S > 30\text{ V}$

Table 31: Information on the power supply for the module electronics/sensors

10.4 Power supply for the actuators

Nominal voltage U_L	24 V DC (SELV/PELV)
Voltage range	18-30 V DC
Electric isolation	Yes
Threshold value of the undervoltage detection	Typ. 17 V
Delay time of the undervoltage detection	< 20 ms
Reverse polarity protection	Yes
Operational indicator (U_L)	LED green, $18\text{ V} \leq U_L \leq 30\text{ V}$ LED red, $U_L < 18\text{ V}$ or $U_L > 30\text{ V}$

Table 32: Information on the power supply for the actuators

10.5 Inputs

Input connection	Type 3 as per IEC 61131-2
Nominal input voltage	24 V DC
Input current at 24 V DC	Typically 5 mA
Short-circuit protection	Yes
Channel type	Normally open, p-switching
Number of digital channels	16 with 16DI 0 with 16DO 8 with 8DI/8DO
Status indicator	LED yellow for channel A, LED white for channel B
Diagnosis indicator	LED red for each slot
Port	M12 socket, 5-pin See pin assignment

Table 33: Information on the inputs

10.6 Outputs

Output connection	Typically 1.6 A (2 A for LioN-P) as per IEC 61131-2
Nominal output current per channel:	1.6 A (2 A for LioN-P), see Info 1
Signal status "1"	max. 1.6 A (2 A for LioN-P)
Signal status "0"	Max. 1 mA (according to specification)
Signal level of the outputs:	Min. ($V_L - 1$ V)
Signal status "1"	max. 2 V
Signal status "0"	
Short-circuit protection	Yes
Max. output current per module	As per U_L approval: 9 A (12 A see Info 2) (LioN-P: 16 A)
Overload protection	Yes
Number of digital channels	0 with 16 DI 16 with 16DO 8 with 8DI/8DO
Channel type	Normally open, p-switching
Status indicator	LED yellow per channel A, LED white per channel B
Diagnosis indicator	LED red per channel
Port	M12 socket, 5-pin See pin assignment

Info 1: With inductive loads of consumption category DC13 (EN60947-5-1), the outputs can connect currents of 1.6 A at a frequency of 1 Hz.

Info 2: Technically possible and approved under the following conditions:

- ▶ Looped sensor/system power supply max. 2.5 A
- ▶ Power supply cable STL 204 (5 x 1.0 mm²)
- ▶ Ambient temperature max. 40 °C

Table 34: Information on the outputs

10.7 LEDs

U_S	Green	System/sensor power supply, voltage level $18\text{ V} \leq U_S \leq 30\text{ V}$
	Red	System/sensor power supply, voltage level $18\text{ V} \leq U_S \leq 30\text{ V}$
	Off	No system/sensor power supply

Table 35: Information on the LED colors

U _L	Green	Actuator power supply, voltage level 18 V ≤ U _L ≤ 30 V
	Red	Actuator power supply, voltage level U _L < 18 V or U _L > 30 V
	Off	No actuator power supply
X1...X8 A/DIA	Yellow	Channel status A "On"
	Red	Periphery error (sensor or actuator overload/short-circuit)
	Off	Not connected, status "Off", no error
X1...X8 B	White	Channel status B "On"
	Red	Periphery error (actuator overload/short-circuit)
	Off	Not connected, status "Off", no error
P1 Lnk/Act P2 Lnk/Act	Green	Ethernet connection exists to another subscriber. Link connection created.
	Flashing yellow	Data exchange with another subscriber.
	Off	No connection to another subscriber. No link, no data exchange.
MS	Green	Device ready for operation.
	Flashing green	Device ready but not configured.
	Red	Serious error that cannot be resolved
	Flashing red	Minor error that can be resolved Example: An incorrect or contradictory configuration is classified as a minor error.
	Alternately flashing red/green	The device is performing a self-test.
	Off	Device is switched off.
NS	Green	Connected: The device has at least one connection.
	Flashing green	No connection: The device has no connections. IP address exists.
	Red	Duplicate IP address. The device has detected that the assigned IP address is already being used by another device.
	Flashing red	Connection has exceeded time limit or connection interrupted.
	Alternately flashing red/green	The device is performing a self-test.
	Off	The device is switched off or does not have an IP address.

Table 35: Information on the LED colors

11 Declaration of conformity



Lumberg Automation™ and Hirschmann™ Products

Declaration of Conformity

We Belden Deutschland GmbH
Wir

Address Im Gewerbepark 2, 58579
Adresse

declare under our sole responsibility, that the products
erklären in alleiniger Verantwortung, dass die Produkte

Name 0980 ESL 811-EIP 16DI-M12-R
Bezeichnung 0980 ESL 812-EIP 16DO-M12-R
0980 ESL 813-EIP 8DI/8DO-M12-R

Type I/O-Module für Ethernet
Typ

angelehnt an die Direktive
corresponding to directive

EMC-Directive 2004/108/EC

fulfils the requirements of the following standards
den Anforderungen der folgenden Normen entspricht

Standards DIN EN 61000-6-4: 2007 and DIN EN 61000-6-2: 2006

Schalksmühle, den 18.03.2013

Dr. Hubert Ermer

Belden Deutschland GmbH
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Heinz Denkman
Dr. Hubert Ermer

VAT No.:
DE 253 565 700
Tax No.: 330/57072404
Register court: Berlin
Trade register No.: HRB 6316

Declaration of conformity



Lunberg Automation™ and Hirschmann™ Products

Declaration of Conformity

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Wir
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declare under our sole responsibility, that the products
erklären in alleiniger Verantwortung, dass die Produkte

Name 0980 ESL 311-xxx, 0980 ESL 312-xxx, 0980 ESL 313-xxx,
Bezeichnung 0980 ESL 391-xxx, 0980 ESL 392-xxx, 0980 ESL 393-xxx

Type I/O Module für EtherNet/IP Digital IO
Typ I/O Module für Multiprotokoll Digital IO

corresponding to directive
angelehnt an die Direktive

EMC-Directive 2004/108/EC

fulfills the requirements of the following standards
den Anforderungen der folgenden Normen entspricht

Standards DIN EN 61000-6-4: 2007 and DIN EN 61000-6-2: 2006

Schalksmühle, den 14.10.2015


Axel Vornhagen


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Managing Director:
Mark Decker
Director, Sales/Marketing

VAT No.:
DE 251 544 707
Tax No.: 3330/032426
Registered office:
Trade register No.: HRB 6316

12 Accessories

Item number	Description
0985 706 100/... M	Connection cable for EtherNet/IP, with M12 connector at both ends, straight, 4-pin, D-coded, 24AWG TPE with blue-green casing, highly flexible, multi-wire/unshielded, 2 twisted wire pairs.
0985 706 101/... M	Connection cable for EtherNet/IP, crossover, with M12 connector at both ends, straight, 4-pin, D-coded, 24AWG TPE with blue-green casing, highly flexible, multi-wire/unshielded, 2 twisted wire pairs.
0985 706 103/... M	Connection cable for EtherNet/IP, with M12 connector at both ends, straight, 4-pin, D-coded and RJ45 connector, 24AWG TPE with blue-green casing, highly flexible, multi-wire/unshielded, 2 twisted wire pairs.
0985 707 100/... M	Connection cable for EtherNet/IP, with M12 connector at both ends, straight, 4-pin, D-coded, 24AWG PVC with blue-green casing, flexible, solid conductor/unshielded, 2 twisted wire pairs.
0985 707 101/... M	Connection cable for EtherNet/IP, crossover, with M12 connector at both ends, straight, 4-pin, D-coded, 24AWG PVC with blue-green casing, flexible, solid conductor/unshielded, 2 twisted wire pairs.
0985 S4549 100/... M	Connection cable for EtherNet/IP, with M12 connector at both ends, straight, 4-pin, D-coded, 26AWG PUR, halogen-free, with water-blue casing, multi-wire/shielded, 2 twisted wire pairs.
0985 S4549 103/... M	Connection cable for EtherNet/IP, with M12 connector at both ends, straight, 4-pin, D-coded and RJ45 connector, 26AWG PUR, halogen-free, with water-blue casing, multi-wire/shielded, 2 twisted wire pairs.
0985 706 100/... M	Connection cable for PROFINET, with M12 connector at both ends, straight, 4-pin, D-coded, 24AWG TPE with blue-green casing, highly flexible, multi-wire/unshielded, 2 twisted wire pairs.
0985 706 101/... M	Connection cable for PROFINET, crossover, with M12 connector at both ends, straight, 4-pin, D-coded, 24AWG TPE with blue-green casing, highly flexible, multi-wire/unshielded, 2 twisted wire pairs.
0985 706 103/... M	Connection cable for PROFINET, with M12 connector at both ends, straight, 4-pin, D-coded and RJ-45 plug, 24AWG TPE with blue-green casing, highly flexible, multi-wire/unshielded, 2 twisted wire pairs.
0985 707 100/... M	Connection cable for PROFINET, with M12 connector at both ends, straight, 4-pin, D-coded, 24AWG PVC with blue-green casing, flexible, solid conductor/unshielded, 2 twisted wire pairs.
0985 707 101/... M	Connection cable for PROFINET, crossover, with M12 connector at both ends, straight, 4-pin, D-coded, 24AWG PVC with blue-green casing, flexible, solid conductor/unshielded, 2 twisted wire pairs.
0985 S4549 100/... M	Connection cable for PROFINET, with M12 connector at both ends, straight, 4-pin, D-coded, 26AWG PUR, halogen-free, with water-blue casing, multi-wire/shielded, 2 twisted wire pairs.
0985 S4549 103/... M	Connection cable for PROFINET, with M12 connector at both ends, straight, 4-pin, D-coded and RJ-45 plug, 26AWG PUR, halogen-free, with water-blue casing, multi-wire/shielded, 2 twisted wire pairs.

Table 36: Connection cables for data transfer

Item number	Description
0986 EMC 102	M12 cable connector for EtherNet/IP cable, straight, 4-pin, D-coded, connection for spring terminal

Table 37: Customizable connectors for data transfer

Item number	Description
RK 40-637/... F	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), straight, 4-pin, 18AWG TPE, conductor IEC color-coded
RS 40-637/... F	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), straight, 4-pin, 18AWG PUR, conductor IEC color-coded
RK 40-602/... M	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), straight, 4-pin, 18AWG PUR, conductor IEC color-coded
RS 40-602/... M	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), straight, 4-pin, 18AWG PUR, conductor IEC color-coded
RK 40-739/... F	MINI, 7/8" connection cable, one end with cable socket, straight, 4-pin, 18AWG TPE, conductor US color-coded
RKW 40-637/... F	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), angled, 4-pin, 18AWG TPE, conductor IEC color-coded
RSW 40-637/... F	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), angled, 4-pin, 18AWG TPE, conductor IEC color-coded
RKW 40-602/... M	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), angled, 4-pin, 18AWG PUR, conductor IEC color-coded
RSW 40-602/... M	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), angled, 4-pin, 18AWG PUR, conductor IEC color-coded
RKW 40-739/... F	MINI, 7/8" connection cable, one end with cable socket, angled, 4-pin, 18AWG TPE, conductor US color-coded
RSRK 40-637/... F	MINI, 7/8" connection cable, both ends with cable plug (RS) and socket (RK), straight, 4-pin, 18AWG TPE, conductor IEC color-coded
RSRK 40-602/... M	MINI, 7/8" connection cable, both ends with cable plug (RS) and socket (RK), straight, 4-pin, 18AWG PUR, conductor IEC color-coded
RSRKW 40-637/... F	MINI, 7/8" connection cable, both ends with cable plug (RS), straight, and socket (RK), angled, 4-pin, 18AWG TPE, conductor IEC color-coded
RSRKW 40-602/... M	MINI, 7/8" connection cable, both ends with cable plug (RS), straight, and socket (RK), angled, 4-pin, 18AWG TPE, conductor IEC color-coded

Table 38: Connection cables for the power supply

Item number	Description
RSC 40/9	MINI, 7/8" cable plug, 4-pin, connection via screw terminal, /9 for cable diameter 6 to 8 mm, /11 for 8 to 10 mm, /16 for 12 to 14 mm
RSC 40/11	MINI, 7/8" cable plug, 4-pin, connection via screw terminal, /9 for cable diameter 6 to 8 mm, /11 for 8 to 10 mm, /16 for 12 to 14 mm
RSC 40/16	MINI, 7/8" cable plug, 4-pin, connection via screw terminal, /9 for cable diameter 6 to 8 mm, /11 for 8 to 10 mm, /16 for 12 to 14 mm
RKC 40/9	MINI, 7/8" cable socket, 4-pin, connection via screw terminal, /9 for cable diameter 6 to 8 mm, /11 for 8 to 10 mm, /16 for 12 to 14 mm
RKC 40/11	MINI, 7/8" cable socket, 4-pin, connection via screw terminal, /9 for cable diameter 6 to 8 mm, /11 for 8 to 10 mm, /16 for 12 to 14 mm
RKC 40/16	MINI, 7/8" cable socket, 4-pin, connection via screw terminal, /9 for cable diameter 6 to 8 mm, /11 for 8 to 10 mm, /16 for 12 to 14 mm
RK 50-637/... F	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), straight, 5-pin, 18AWG TPE, conductor IEC color-coded
RS 50-637/... F	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), straight, 5-pin, 18AWG PUR, conductor IEC color-coded
RK 50-602/... M	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), straight, 5-pin, 18AWG PUR, conductor IEC color-coded
RS 50-602/... M	MINI, 7/8" connection cable, one end with cable plug (RS) or socket (RK), straight, 5-pin, 18AWG PUR, conductor IEC color-coded
RK 50-739/... F	MINI, 7/8" connection cable, one end with cable socket, straight, 5-pin, 18AWG TPE, conductor US color-coded

Table 39: Customizable connectors for the power supply

Accessories

Item number	Description
RKV	Cover for unused MINI, 7/8" device sockets
RSV	Cover for unused MINI, 7/8" device plugs

Table 40: Other accessories

