lumbergautomation
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Manual

LioN-P EtherNet/IP

0980 ESL 310-xxx ... 0980 ESL 313-xxx
0980 ESL 390-xxx ... 0980 ESL 393-xxx
0980 ESL 390-121-DCU1 und 0980 ESL 393-121-DCU1

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Contents

1 About this manual

1.1 General information

Please read the assembly and operating instructions in this manual carefully before starting up the LioN-P modules with the 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 modules with EtherNet/IP interface.

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

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

1.2 Explanation of symbols

1.2.1 Using danger information

Danger information is denoted as follows:

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

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

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

1.2.2 Use of general information

General information is denoted as follows:

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

1.3 Version information

Index	Created	Changed	Changed
Version number	Version 1.0	Version 1.1	Version 1.2
Date	May 2013	May 2013	August 2014
Name/department	Knipp/PM	Knipp/PM	Knipp/PM

Index	Changed	Changed	Changed
Version number	Version 1.3	Version 1.4	Version 2.0
Date	Dec. 2014	Feb. 2016	Nov. 2017
Name/department	Lieb/R&D	Lieb/R&D	Lieb/R&D

Table 1: Overview of revisions to manual

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 guideline (2014/30/EU) and the low voltage guideline (2014/35/EU).

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

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

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

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

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

Only install cables and accessories that fulfill the requirements and regulations for safety, electromagnetic compatibility, and, where applicable, telecommunication end devices, as well as the specification information.

Information on which cables and accessories are 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 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 module series

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

The LioN-P I/O module series has a very rugged metal housing made of die-cast zinc. The module electronics are fully protected from environmental influences by the fully sealed housing. The modules have protection classes IP65, IP67 (IP69 for modules with M12-L). The permissible temperature range for the modules is -25° C to +70°C. The module series is therefore ideally suited for direct field service in a tough industrial environment.

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

The integrated 2-port Ethernet switch of the modules allows for a bus or star topology for the EtherNet/IP network to be set up. The implemented device level ring protocol (DLR) enables the design of a highly accessible network infrastructure.

According to the EtherNet/IP specification, the modules receive their network parameters / addresses from rotary encoder switches. It possible to determine the last octet of the IP address through this. Alternatively, the protocols BOOTP and DHCP can be used to automatically assign the network parameters through a corresponding server.

The LioN-P module series consists of four types of modules with different I/O functionality. Modules with 16 digital inputs (16 DI), 16 digital outputs (16 DO), 8 digital inputs / 8 digital outputs (8DI/8DO) or 16 universal inputs/ outputs (16DIO) are available. The output current is 2 A per channel. The output power circuits are electrically isolated (with the exception of 16DIO) from the rest of the network and the sensor electronics.

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

Two DCU1 (Distributed Control Unit) variants are also available with integrated programmable logic. Details on DCU programming are available in the µDCU Manual.

For connecting the network, power supplies, and E/A devices, the module series features the widely used M12 connector with A-coding for the E/A signals, D-coding for the network, and L-coding for the power supply. The connectors are also color-coded to prevent the connections from being mixed up.

3.2 Special product features

- Robust design:

  For connection capability, the module series offers the widely used M12 connector for the E/A signals, the network, and the power supply. 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 two-port Ethernet switch of the modules allows a bus, star, or ring topology for the EtherNet/IP network.

- Redundancy function:

  The LioN-P modules support the redundancy function DLR (device level ring) for ring topologies. 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 16DIO, 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 code switch (last octet of the IP address) or the integrated web server. In addition, the status data of the LioN-P module and all channels are displayed.

- QuickConnect:

  QuickConnect enables LioN-P modules to start communicating quickly in a EtherNet/IP network through an accelerated startup process. This is a useful function for robot applications, for example, enabling robot arms to perform quick tool changes.

- Force Mode:

  Force mode enables the simulation of process data of the inputs and outputs without the connection of sensors and actuators. It is thus possible to pre-test an application without full physical application. This feature facilitates and accelerates machine starting operations and can be used for checking new production facilities. For an application, input switching states can be simulated or even switched without control outputs.

- Flex-bit technology for 16DIO modules (IO mapping):

  With Flex-bit technology, it is possible to change the IO mapping of the process data. As a rule, each channel is statically assigned to one bit in the process data. This function can be used to determine the data direction of a channel as well as its bit assignment in the process data. Thus, LioN-P modules can be used by configuring the IO mapping in applications with bit mappings from other manufacturers.

- Distributed control unit for DCU modules:

  LioN-P modules with the DCU function can independently control applications with an integrated programmable logic, run timers and counters as well as other functions, and optionally exchange data with a higher-level control system. Remanent storage of the program is ideal for plug-and-play operation. This enables fast and intuitive installation and maintenance of the LioN-P modules. Details on DCU programming are available in the µDCU Manual.

3.3 Product overview

Item number LioN-P 16DIO	Description	E/A ports	Design
0980 ESL 310-111 (Single protocol) SAP number: 934 881-007	Decentralized E/A module with 16 digital inputs or 16 digital outputs, 2.0 A, peripheral equipment connection through 8 M12 slots.	8 x M12	Sturdy/metal With power 7/8"
0980 ESL 310-121 (Single protocol) SAP number: 934 878-007			Sturdy/metal With power M12-L
0980 ESL 390-111 (Multi Protocol) SAP number: 934 882-007			Sturdy/metal With power 7/8"
0980 ESL 390-121 (Multi Protocol) SAP number: 934 879-007			Sturdy/metal With power M12-L

Item number LioN-P 16DI	Description	E/A ports	Design
0980 ESL 311-111 (Single protocol) SAP number: 934 881-001	Decentralized E/A module with 16 digital inputs, peripheral equipment connection through 8 M12 slots.	8 x M12	Sturdy/metal With power 7/8"
0980 ESL 311-121 (Single protocol) SAP number: 934 878-001			Sturdy/metal With power M12-L
0980 ESL 391-111 (Multi Protocol) SAP number: 934 882-001			Sturdy/metal With power 7/8"
0980 ESL 391-121 (Multi Protocol) SAP number: 934 879-001			Sturdy/metal With power M12-L

Item number LioN-P 16DO	Description	E/A ports	Design
0980 ESL 312-111 (Single protocol) SAP number: 934 881-002	Decentralized E/A module with 16 digital outputs, 2.0 A, peripheral equipment connection through 8 M12 slots.	8 x M12	Sturdy/metal With power 7/8"
0980 ESL 312-121 (Single protocol) SAP number: 934 878-002			Sturdy/metal With power M12-L
0980 ESL 392-111 (Multi Protocol) SAP number: 934 882-002			Sturdy/metal With power 7/8"
0980 ESL 392-121 (Multi Protocol) SAP number: 934 879-002			Sturdy/metal With power M12-L

Item number LioN-P 8DI/8DO	Description	E/A ports	Design
0980 ESL 313-111 (Single protocol) SAP number: 934 881-003	Decentralized E/A module with 8 digital inputs and 8 digital outputs, 2.0 A, peripheral equipment connection through 8 M12 slots.	8 x M12	Sturdy/metal With power 7/8"
0980 ESL 313-121 (Single protocol) SAP number: 934 878-003			Sturdy/metal With power M12-L
0980 ESL 393-111 (Multi Protocol) SAP number: 934 882-003			Sturdy/metal With power 7/8"
0980 ESL 393-121 (Multi Protocol) SAP number: 934 879-003			Sturdy/metal With power M12-L

Item number LioN-P 8DI/8DO-DCU	Description	E/A ports	Design
0980 ESL 393-121-DCU (MP) SAP number: 934 879-005	Decentralized E/A module with 8 digital inputs and 8 digital outputs, 2.0 A, peripheral equipment connection through 8 M12 slots.	8 x M12	Sturdy/metal With power M12-L

Item number LioN-P 16DIO-DCU	Description	E/A ports	Design
0980 ESL 310-121-DCU (MP) SAP number: 934 879-009	Decentralized E/A module with 16 digital inputs or 16 digital outputs, 2.0 A, peripheral equipment connection through 8 M12 slots.	8 x M12	Sturdy/metal With power M12-L

4 Assembly and wiring

4.1 General information

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

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

Attention: 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.

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

Attention: For UL application:

Be sure to use a UL-certified cable with a suitable rating to connect the devices (CYJV or PVVA).

Attention: To program the control, please refer to the OEM information, and only use suitable accessories.

Attention: For UL application:

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

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

Warning: For UL application:

Use temperature-resistant cables with following properties: For modules 0980 ESL3x1-121 heat resistance up to at least 85° C.

For modules 0980 ESL3x0-121, 0980 ESL3x2-121 and 0980 ESL3x3-121 heat resistance up to at least 96° C.

4.2 External dimensions

4.2.1 Module 0980 ESL 3xx-111

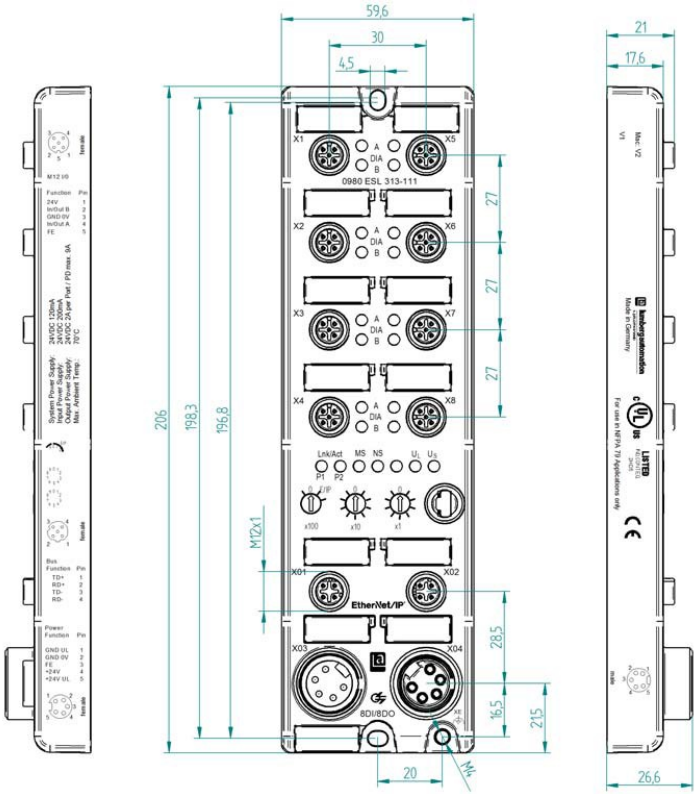


Figure 1: Example figure for 0980 ESL 313-111

4.2.2 Module 0980 ESL 3xx-121

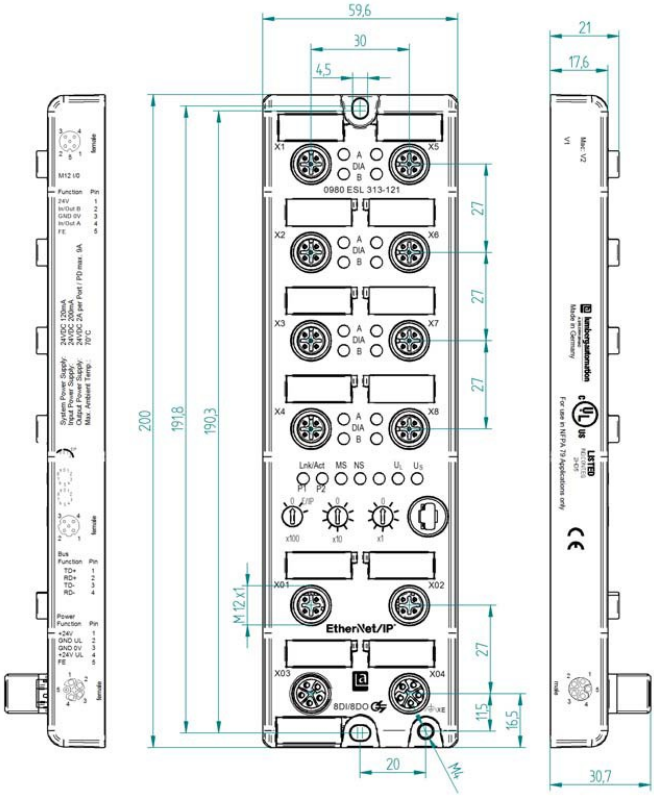


Figure 2: Example figure for 0980 ESL 313-121

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, M12 socket, 4-pin, D-coded

- Color coding: green

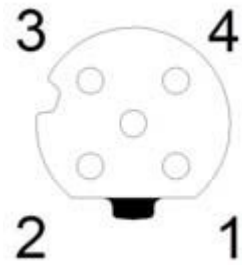


Figure 3: Schematic drawing, ports X01, X02

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

Table 2: Assignment of ports X01, X02

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

4.3.2 Power supply with 7/8", 5-pin

- Color coding: gray

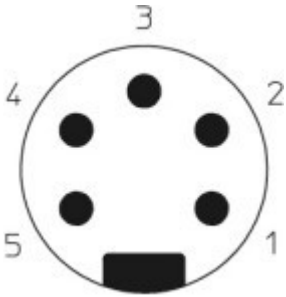


Figure 4: Schematic drawing, port X03 (IN)

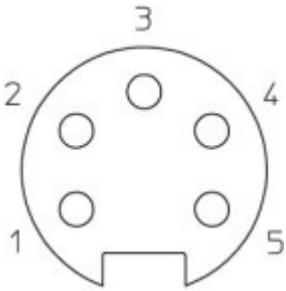


Figure 5: Schematic drawing, port X04 (OUT)

Port	Pin	Signal	Function
Power supply X03/X04	1	GND_U_L	Actuator
	2	GND_V_S	System/sensors
	3	FE	Function earth
	4	U_S (+24 V)	System/sensors
	5	U_L (+24 V)	Actuator

Table 3: Assignment of ports X03, X04

Attention: For the input module 0980 ESL 311-xxx, 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.

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

Attention: For UL applications: For modules with a 7/8" housing, use the "SELV and Limited Energy" power source.

4.3.3 Power supply with M12 Power L-coded

- Color coding: gray

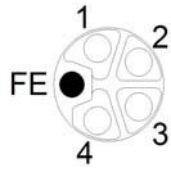


Figure 6: Schematic diagram of the M12 L-coded (socket), port X03 (IN)

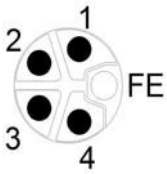


Figure 7: Schematic diagram of the M12 L-coded (connector), port X04 (OUT)

Power supply	Pin	Signal	Function
Power supply X03/X04	1	U_S (+24 V)	System/sensors
	2	GND_U_L	Actuator
	3	GND_U_S	System/sensors
	4	U_L (+24 V)	Actuator
	5	FE	Function earth

Table 4: Assignment of X03, X04

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

4.3.4 Ports for sensors/actuators

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

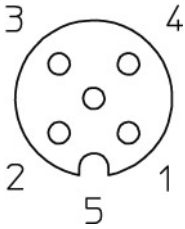


Figure 8: Schematic diagram ports X1 to X8

Port	Pin	16DI	16DO	8DI/8DO	16DI/DO
Sensor/ actuator	1	+24 V DC	n.c.	+24 V DC (ports X1..X4) n.c. (Ports X5..X8)	+24 V DC
	2	IN B	OUT B	IN B (Ports X1..X4) OUT B (Ports X5..X8)	IN/OUT B
	3	0 V DC	0 V DC	0 V DC	0 V DC
	4	IN A	OUT A	IN A (Ports X1..X4) OUT A (Ports X5..X8)	IN/OUT A
	5	Shielding/FE	Shielding/FE	Shielding/FE	Shielding/FE

Table 5: Assignment of ports X1 to X8

5 Configuration and startup

The configuration and commissioning of the LioN-P EtherNet/IP modules described on the following pages was performed using an Allen-Bradley controller and the Rockwell software RSLogix 5000. If you are using a control system from another control system provider, please consult the associated documentation.

5.1 EDS files

An EDS file is required for configuration of a module in the controller. Each module variant 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/index.phtml

The EDS files are consolidated in an archive file for all LioN-P modules. Download this archive file and unpack it.

The archive contains the following EDS files:

- EDS-V3.21.1-LumbergAutomation-0980ESL310-xxx-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL311-xxx-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL312-xxx-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL313-xxx-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL390-xxx-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL391-xxx-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL392-xxx-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL393-xxx-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL390-xxx-DCU1-yyyymmdd.eds
- EDS-V3.21.1-LumbergAutomation-0980ESL393-xxx-DCU1-yyyymmdd.eds

yyyymmdd stands for the date on which the corresponding 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

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

5.3 Setting the network parameters

The 3 rotary encoding switches on the front of the LioN-P modules allow you to set the operating mode for using or maintaining network parameters such as IP address, subnet mask, and gateway address. The LioN-P module can be assigned a static IP address by setting the last octet through the rotary code switches.

Alternatively, by resetting the rotary code switches, it is possible to obtain the required network parameters through DHCP or BOOTP. In this case it should be noted that the selected operating mode is read in only after restoration of the power supply. If changes to the network parameters are made during operation – using the web server, for example – it is necessary to restart the module to apply them.

Factory setting of the static network parameters:

- IP address: 192.168.001.001
- Subnet mask: 255.255.255.000
- Gateway address: 000.000.000.000

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

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

Rotary switch setting	Function
000 (Default setting)	On delivery, the DHCP function is enabled. The network parameters are requested by DHCP requests to a server. If you want to request the network parameters with BOOTP requests, you must activate the BOOTP function through the web server or the TCP/IP interface object (CIP Class ID 0xF5, attribute 3 (0x03)). 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 code switch. DHCP or BOOTP is disabled if necessary and the module will start with a static IP address.
255 to 999 (Exceptions: 299 and 979)	The network parameters are requested through DHCP or 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 6: Setting options of the rotary code switches for LioN-P modules

5.4 Configuration of the LioN-P EtherNet/IP modules

The LioN-P modules support **Implicit Messaging** and **Explicit Messaging** for EthetNet/IP communication. IO process data is transferred cyclically via assembly objects and an existing connection using **Implicit Messaging**.

Data with low priority, data that is not time critical, and configuration and diagnostic data can be exchanged with acyclic messages using **Explicit Messaging**.

5.4.1 Connections and assembly objects

The LioN-P modules use the connection types Exclusive Owner, Input Only and Listen Only for exchanging IO process data and communication via Implicit Messaging.

The Exclusive Owner connection type is only available for modules with an output function (variants 16DIO, 16DO and 8DI/8DO).

By selecting the corresponding instance ID of the assembly object, you decide how many items of IO process data the LioN-P module makes available to the user and whether diagnostic data is to be added.

LioN-P 16DIO modules can be used everywhere and offer you different profiles as the basic system configuration. With these you can preconfigure a 16DIO module as a 16DI, 16DO or 8DI/8DO module and replace it, for example.

With LioN-P 16DIO modules with DCU function, the process data is expanded to include an additional 18 bytes in both data directions. Further details on the data structure are described in section Bit assignment of the process data on page 61.

The LioN-P modules provide the following connections and assembly IDs:

5.4.1.1 16DIO modules: 0980 ESL 310-xxx / 0980 ESL 390-xxx

Link	Connection type	Diagnostics	Assembly ID	Length
16 DI/DO + DIA	Exclusive Owner	Yes	Output: 100	2 byte
			Input: 101	7 byte
			Configuration: 110	130 byte
16 DI/DO	Exclusive Owner	No	Output: 100	2 byte
			Input: 102	3 byte
			Configuration: 110	130 byte
16 DI/DO + DIA	Input Only	Yes	Output: 193	0 byte
			Input: 101	7 byte
			Configuration: 110	130 byte
16 DI/DO	Input Only	No	Output: 193	0 byte
			Input: 102	3 byte
			Configuration: 110	130 byte

Table 7: 16 DI/DO profiles

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI/DO + DIA	Exclusive Owner	Yes	Output: 103	1 byte
			Input: 104	6 byte
			Configuration: 111	130 byte
8 DI/DO	Exclusive Owner	No	Output: 103	1 byte
			Input: 105	2 byte
			Configuration: 111	130 byte

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI/DO + DIA	Input Only	Yes	Output: 193	0 byte
			Input: 104	6 byte
			Configuration: 111	130 byte
8 DI/DO	Input Only	No	Output: 193	0 byte
			Input: 105	2 byte
			Configuration: 111	130 byte

Table 8: 8 DI/DO profiles

Link	Connection type	Diagnostics	Assembly ID	Length
16 DI + DIA	Input Only	Yes	Output: 193	0 byte
			Input: 101	7 byte
			Configuration: 112	66 byte
16 DI	Input Only	No	Output: 193	0 byte
			Input: 102	3 byte
			Configuration: 112	66 byte

Table 9: 16 DI profiles

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI + DIA	Input Only	Yes	Output: 193	0 byte
			Input: 104	6 byte
			Configuration: 113	66 byte
8 DI	Input Only	No	Output: 193	0 byte
			Input: 105	2 byte
			Configuration: 113	66 byte

Table 10: 8 DI profiles

Link	Connection type	Diagnostics	Assembly ID	Length
16 DO + DIA	Exclusive Owner	Yes	Output: 100	2 byte
			Input: 106	5 byte
			Configuration: 114	130 byte
16 DO	Exclusive Owner	No	Output: 100	2 byte
			Input: 107	1 byte
			Configuration: 114	130 byte

Table 11: 16 DO profiles

Link	Connection type	Diagnostics	Assembly ID	Length
8 DO + DIA	Exclusive Owner	Yes	Output: 103	1 byte
			Input: 106	5 byte
			Configuration: 115	130 byte
8 DO	Exclusive Owner	No	Output: 103	1 byte
			Input: 107	1 byte
			Configuration: 115	130 byte

Table 12: 8 DO profiles

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI/8 DO + DIA	Exclusive Owner	Yes	Output: 103	1 byte
			Input: 104	6 byte
			Configuration: 116	130 byte
8 DI/8 DO	Exclusive Owner	No	Output: 103	1 byte
			Input: 105	2 byte
			Configuration: 116	130 byte
8 DI/8 DO + DIA	Input Only	Yes	Output: 193	0 byte
			Input: 104	6 byte
			Configuration: 116	130 byte

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI/8 DO	Input Only	No	Output: 193	0 byte
			Input: 105	2 byte
			Configuration: 116	130 byte

Table 13: 8DI/8DO profiles

Link	Connection type	Diagnostics	Assembly ID	Length
Generic 16 DI + DIA	Listen Only	Yes	Output: 192	0 byte
			Input: 101	7 byte
			Configuration: n/a	0 byte
Generic 16 DI	Listen Only	No	Output: 192	0 byte
			Input: 102	3 byte
			Configuration: n/a	0 byte
Generic 8 DI + DIA	Listen Only	Yes	Output: 192	0 byte
			Input: 104	6 byte
			Configuration: n/a	0 byte
Generic 8 DI	Listen Only	No	Output: 192	0 byte
			Input: 105	2 byte
			Configuration: n/a	0 byte

Table 14: Generic profiles

Link	Connection type	Diagnostics	Assembly ID	Length
16 DI/DO + DIA (Even DI/DO-bytes)	Exclusive Owner	Yes	Output: 100	2 byte
			Input: 108	8 byte
			Configuration: 110	130 byte
16 DI/DO + DIA (Even DI/DO-bytes)	Input Only	Yes	Output: 193	0 byte
			Input: 108	8 byte
			Configuration: 110	130 byte

Link	Connection type	Diagnostics	Assembly ID	Length
Generic 16 DI + DIA (Even DI/DO-bytes)	Listen Only	Yes	Output: 192	0 byte
			Input: 108	8 byte
			Configuration: n/a	0 byte

Table 15: Even number of DI/DO-bytes profiles

5.4.1.2 16DIO DCU modules: 0980 ESL 390-121-DCU1

Link	Connection type	Diagnostics	Assembly ID	Length
16 DI/DO + DIA + DCU	Exclusive Owner	Yes	Output: 100	20 byte
			Input: 101	25 byte
			Configuration: 110	130 byte
16 DI/DO + DCU	Exclusive Owner	No	Output: 100	20 byte
			Input: 102	21 byte
			Configuration: 110	130 byte
16 DI/DO + DIA + DCU	Input Only	Yes	Output: 193	0 byte
			Input: 101	25 byte
			Configuration: 110	130 byte
16 DI/DO + DCU	Input Only	No	Output: 193	0 byte
			Input: 102	21 byte
			Configuration: 110	130 byte

Table 16: 16 DI/DO DCU profiles

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI/DO + DIA + DCU	Exclusive Owner	Yes	Output: 103	19 byte
			Input: 104	24 byte
			Configuration: 111	130 byte
8 DI/DO + DCU	Exclusive Owner	No	Output: 103	19 byte
			Input: 105	20 byte
			Configuration: 111	130 byte

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI/DO + DIA + DCU	Input Only	Yes	Output: 193	0 byte
			Input: 104	24 byte
			Configuration: 111	130 byte
8 DI/DO + DCU	Input Only	No	Output: 193	0 byte
			Input: 105	20 byte
			Configuration: 111	130 byte

Table 17: 8 DI/DO DCU profiles

Link	Connection type	Diagnostics	Assembly ID	Length
16 DI + DIA + DCU	Input Only	Yes	Output: 193	0 byte
			Input: 101	25 byte
			Configuration: 112	66 byte
16 DI + DCU	Input Only	No	Output: 193	0 byte
			Input: 102	21 byte
			Configuration: 112	66 byte

Table 18: 16 DI DCU profiles

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI + DIA + DCU	Input Only	Yes	Output: 193	0 byte
			Input: 104	24 byte
			Configuration: 113	66 byte
8 DI + DCU	Input Only	No	Output: 193	0 byte
			Input: 105	20 byte
			Configuration: 113	66 byte

Table 19: 8 DI DCU profiles

Link	Connection type	Diagnostics	Assembly ID	Length
16 DO + DIA + DCU	Exclusive Owner	Yes	Output: 100	20 byte
			Input: 106	23 byte
			Configuration: 114	130 byte
16 DO + DCU	Exclusive Owner	No	Output: 100	20 byte
			Input: 107	19 byte
			Configuration: 114	130 byte

Table 20: 16 DO DCU profile

Link	Connection type	Diagnostics	Assembly ID	Length
8 DO + DIA + DCU	Exclusive Owner	Yes	Output: 103	19 byte
			Input: 106	23 byte
			Configuration: 115	130 byte
8 DO + DCU	Exclusive Owner	No	Output: 103	19 byte
			Input: 107	19 byte
			Configuration: 115	130 byte

Table 21: 8 DO DCU profile

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI/8 DO + DIA + DCU	Exclusive Owner	Yes	Output: 103	19 byte
			Input: 104	24 byte
			Configuration: 116	130 byte
8 DI/8 DO + DCU	Exclusive Owner	No	Output: 103	19 byte
			Input: 105	20 byte
			Configuration: 116	130 byte
8 DI/8 DO + DIA + DCU	Input Only	Yes	Output: 193	0 byte
			Input: 104	24 byte
			Configuration: 116	130 byte

Link	Connection type	Diagnostics	Assembly ID	Length
8 DI/8 DO + DCU	Input Only	No	Output: 193	0 byte
			Input: 105	20 byte
			Configuration: 116	130 byte

Table 22: 8 DI/8 DO DCU profiles

Link	Connection type	Diagnostics	Assembly ID	Length
Generic 16 DI + DIA + DCU	Listen Only	Yes	Output: 192	0 byte
			Input: 101	25 byte
			Configuration: n/a	0 byte
Generic 16 DI + DCU	Listen Only	No	Output: 192	0 byte
			Input: 102	21 byte
			Configuration: n/a	0 byte
Generic 8 DI + DIA + DCU	Listen Only	Yes	Output: 192	0 byte
			Input: 104	24 byte
			Configuration: n/a	0 byte
Generic 8 DI + DCU	Listen Only	No	Output: 192	0 byte
			Input: 105	20 byte
			Configuration: n/a	0 byte

Table 23: Generic DCU profiles

Link	Connection type	Diagnostics	Assembly ID	Length
16 DI/DO + DIA + DCU (Even DI/DO-bytes)	Exclusive Owner	Yes	Output: 100	20 byte
			Input: 108	26 byte
			Configuration: 110	130 byte
16 DI/DO + DIA + DCU (Even DI/DO-bytes)	Input Only	Yes	Output: 193	0 byte
			Input: 108	26 byte
			Configuration: 110	130 byte

Link	Connection type	Diagnostics	Assembly ID	Length
Generic 16 DI + DIA + DCU (Even DI/DO-bytes)	Listen Only	Yes	Output: 192	0 byte
			Input: 108	26 byte
			Configuration: n/a	0 byte

Table 24: Even number of DI / DO bytes DCU profiles

5.4.1.3 16DI modules: 0980 ESL 311-xxx / 0980 ESL 391-xxx

Link	Connection type	Diagnostics	Assembly ID	Length
16-bit in + diagnostic	Input Only	Yes	Output: 193	0 byte
			Input: 101	4 byte
			Configuration: 105	2 byte
16 bit in	Input Only	No	Output: 193	0 byte
			Input: 102	3 byte
			Configuration: 105	2 byte
16-bit in + diagnostic	Listen Only	Yes	Output: 193	0 byte
			Input: 101	4 byte
			Configuration: n/a	0 byte
16 bit in	Listen Only	No	Output: 193	0 byte
			Input: 102	3 byte
			Configuration: n/a	0 byte

5.4.1.4 16DO modules: 0980 ESL 312-xxx / 0980 ESL 392-xxx

Link	Connection type	Diagnostics	Assembly ID	Length
16-bit out + diagnostic	Exclusive Owner	Yes	Output: 100	2 byte
			Input: 101	7 byte
			Configuration: 105	66 byte
16-bit out	Exclusive Owner	No	Output: 100	2 byte
			Input: 102	3 byte
			Configuration: 105	66 byte

Link	Connection type	Diagnostics	Assembly ID	Length
16-bit out + diagnostic	Input Only	Yes	Output: 193	0 byte
			Input: 101	7 byte
			Configuration: 105	66 byte
16-bit out	Input Only	No	Output: 193	0 byte
			Input: 102	3 byte
			Configuration: 105	66 byte
16-bit out + diagnostic	Listen Only	Yes	Output: 192	0 byte
			Input: 101	7 byte
			Configuration: n/a	0 byte
16-bit out	Listen Only	No	Output: 192	0 byte
			Input: 102	3 byte
			Configuration: n/a	0 byte

5.4.1.5 8DI/8DO modules: 0980 ESL 313-xxx / 0980 ESL 393-xxx / 0980 ESL 393-121-DCU1

Link	Connection type	Diagnostics	Assembly ID	Length
8-bit in/out + diagnostic	Exclusive Owner	Yes	Output: 100	1 byte
			Input: 101	6 byte
			Configuration: 105	34 byte
8-bit in/out	Exclusive Owner	No	Output: 100	1 byte
			Input: 102	3 byte
			Configuration: 105	34 byte
8-bit in/out + diagnostic	Input Only	Yes	Output: 193	0 byte
			Input: 101	6 byte
			Configuration: 105	34 byte
8-bit in/out	Input Only	No	Output: 193	0 byte
			Input: 102	3 byte
			Configuration: 105	34 byte

Link	Connection type	Diagnostics	Assembly ID	Length
8-bit in/out + diagnostic	Listen Only	Yes	Output: 192	0 byte
			Input: 101	6 byte
			Configuration: n/a	0 byte
8-bit in/out	Listen Only	No	Output: 192	0 byte
			Input: 102	3 byte
			Configuration: n/a	0 byte

5.4.2 Configuration parameters

To transfer the configuration parameters, LioN-P uses different assembly objects depending on the module type. These can be seen in section Connections and assembly objects on page 28.

Each LioN-P module has a fixed number of configuration parameters. This variable is determined by the respective configuration assembly instance.

Length of the configuration parameters:

- 16DIO: 65/33 words (130/66 bytes) depending on the selected profile
- 16DI: 1 word (2 bytes)
- 16DO: 33 words (66 bytes)
- 8DI/8DO: 17 words (34 bytes)

The configuration parameters Surveillance Timeout (delay of the output monitoring time of a channel) and Fail Safe (initial state of a channel in the event of an error) are only available for LioN-P modules and 16DIO profiles with output functionality (16DIO, 16DO, 8DI/8DO).

The configuration parameters Process Data Direction and IO-Mapping (bit assignment of the channels) are only available for LioN-P 16DIO modules.

5.4.2.1 Surveillance Timeout Configuration (ms)

These parameters are provided to all module types with digital outputs. The configuration can be used to set a delay time (Surveillance Timeout) that

defines the monitoring procedure for the individual digital output currents for each 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. The default value is 80 ms. When the output channel is in the static state, (channel permanently switched on or off) the value is 100 ms.

	MSB								**LSB**							
Bit	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), value range 0...255, default value 80															
Word 1	Surveillance timeout port X1, channel B (pin 2), value range 0...255, default value 80															
:	:															
Word 14	Surveillance timeout port X8, channel A (pin 4), value range 0...255, default value 80															
Word 15	Surveillance timeout port X8, channel B (pin 2), value range 0...255, default value 80															

Table 25: Surveillance timeout values for the 16DO module or 16DIO module with DIO, DO and 8DI/8DO profiles

	MSB								**LSB**							
Bit	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), value range 0...255, default value 80															
Word 1	Surveillance timeout port X5, channel B (pin 2), value range 0...255, default value 80															
:	:															
Word 6	Surveillance timeout port X8, channel A (pin 4), value range 0...255, default value 80															
Word 7	Surveillance timeout port X8, channel B (pin 2), value range 0...255, default value 80															

Table 26: Surveillance timeout values for the 8DI/8DO module

5.4.2.2 Fail safe configuration

These parameters are provided to all module types with digital outputs. If a breakdown/loss of EtherNet/IP communication occurs or another major fault, the outputs can be switched using parameterization into a reliable state.

The following options are available:

Set low (0)	Disabling the output channel (digital value = 0)
Set high (1)	Activate the output channel (digital value = 1)
Hold last (2)	Hold last output state (digital value corresponds to the last status)

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 16	Failsafe port X5, channel A (pin 4), value range 0...2, default value 0															
Word 17	Failsafe port X5, channel B (pin 2), value range 0...2, default value 0															
:	:															
Word 30	Failsafe port X8, channel A (pin 4), value range 0...2, default value 0															
Word 31	Failsafe port X8, channel B (pin 2), value range 0...2, default value 0															

Table 27: Failsafe values for the 16DO module or 16DIO module with DIO, DO and 8DI/8DO profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 8	Failsafe port X1, channel A (pin 4), value range 0...2, default value 0															
Word 9	Failsafe port X1, channel B (pin 2), value range 0...2, default value 0															
:	:															
Word 14	Failsafe port X8, channel A (pin 4), value range 0...2, default value 0															
Word 15	Failsafe port X8, channel B (pin 2), value range 0...2, default value 0															

Table 28: Failsafe values for the 8DI/8DO module

5.4.2.3 QuickConnect Configuration

This parameter is provided by all LioN-P modules. QuickConnect (QC) enables the module to perform the start-up process faster. Through the activation of this parameter, particularly quick start-up of EtherNet/IP communication is possible.

If you enable QuickConnect, the LioN-P module accepts a TCP connection within 350 ms after being switched on. Then the control system establishes a connection. The LioN-P module achieves a start-up time of 400 to 500 ms.

To use QuickConnect, the network must be in a star or line topology and the LioN-P 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.

If QuickConnect is activated, the following parameters for the Ethernet interface of the LioN-P module are fixed:

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

Attention: The prerequisite for the use of QuickConnect is the adherence to a strictly prescribed procedure. The LioN-P modules must be notified before switch-off (inhibit instruction) and switch-on (uninhibit instruction).

A hard disconnect during operation is not permitted. Details of this procedure can be found in Rockwell Automation's ENET-AT001C-EN-P document.

The following options are available for using QuickConnect:

Disabled (0)	QuickConnect disabled (default value)
Enabled (1)	QuickConnect enabled

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0									QuickConnect, value range 0…1							

Table 29: QuickConnect on the 16DI module or 16DIO module with DI profiles

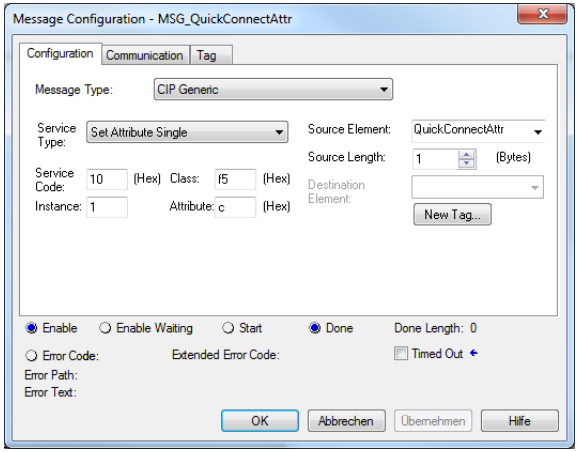
	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 32									QuickConnect, value range 0…1							

Table 30: QuickConnect on the 16DO module or 16DIO module with DIO, DO and 8DI/8DO profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 16									QuickConnect, value range 0…1							

Table 31: QuickConnect on the 8DI/8DO module

An activation of QuickConnect does not necessarily have to be done through the configuration assembly instance. Alternatively, this can also be done at runtime with the TCP/IP interface object (CIP Class ID 0xF5, attribute 12(0x0C), value 1). In RSLogix 5000, you use a message command to do this. Please note that changing this configuration requires a restart of the LioN-P module.



5.4.2.4 General settings configuration

The display of these general parameters depends on the LioN-P module used. Different parameters can be configured. Each bit in this bit field represents the state of a parameter.

The following options are available to use for each parameter:

Disabled (0)	Parameter disabled
Enabled (1)	Parameter enabled

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 0	RES	DOR	DCR	DCL	RDO	RUL	WIL	FML								

Table 32: General settings on the 16DI module or 16DIO module with DI profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 32	RES	DOR	DCR	DCL	RDO	RUL	WIL	FML								

Table 33: General settings on the 16DO module or 16DIO module with DIO, DO and 8DI/8DO profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 16	RES	DOR	DCR	DCL	RDO	RUL	WIL	FML								

Table 34: General settings on the 8DI/8DO module

Key:

FML: Force mode lock

Allow use of the force mode through the web server (0) / block (1), default value: allow (0)

WIL: Web interface lock

Allow use of the web server (0) / block (1), default value: allow (0)

RUL:Report U_L supply voltage fault

Diagnostic alarm message in the absence of actuator power supply (U_L) disable (0) / enable (1), default value: enable (1)

RDO: Report DO fault without U_L

Diagnostic alarm message in the absence of actuator power supply (U_L) and actuation of an actuator disable (0) / enable (1), default value: enable (1)

DCL: DCU lock (for DCU modules only)

Allow DCU function (0) / disable (1), default value: allow (0), for further details please refer to the manual for µDCU

DCR: DCU run (for DCU modules only)

Disable DCU program (0) / start (1), default value: (0), for further details please refer to the manual for µDCU.

DOR: Digital out restart mode

Resetting the channel diagnostics when resetting the digital output (0) or automatic restart after a short-circuit in the digital output or after return of the actuator supply (1), default value: automatic restart (1)

RES: Reserved

Reserved parameter, default value: 0

5.4.2.5 Process data direction configuration (for 16DIO modules only)

These parameters are only supported by LioN-P modules for which IO mapping can be configured. Depending on the selected profile and the IO mapping, the data direction can be determined for each channel with the process data direction.

With a 16 DI/DO profile, for example, each channel can be configured as input and output, as pure input or as pure output. This has the advantage of each channel being universally usable.

The following options are available:

Input/output (0)	Input and output channel
Input (1)	Input channel
Output (2)	Output channel

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 33	Process data direction port X1, channel A (pin 4), value range 0...2, default value 0															
Word 34	Process data direction port X1, channel B (pin 2), value range 0...2, default value 0															
:	:															
Word 47	Process data direction port X8, channel A (pin 4), value range 0...2, default value 0															
Word 48	Process data direction port X8, channel B (pin 2), value range 0...2, default value 0															

Table 35: Process data direction for the 16DIO module with DIO profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 1	Process data direction port X1, channel A (pin 4), static value 1															
Word 2	Process data direction port X1, channel B (pin 2), static value 1															
:	:															
Word 15	Process data direction port X8, channel A (pin 4), static value 1															
Word 16	Process data direction port X8, channel B (pin 2), static value 1															

Table 36: Process data direction for the 16DIO module with DI profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 33	Process data direction port X1, channel A (pin 4), static value 2															
Word 34	Process data direction port X1, channel B (pin 2), static value 2															
:	:															
Word 47	Process data direction port X8, channel A (pin 4), static value 2															
Word 48	Process data direction port X8, channel B (pin 2), static value 2															

Table 37: Process data direction for the 16DIO module with DO profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 33	Process data direction port X1, channel A (pin 4), value range 1...2, default value 1															
Word 34	Process data direction port X1, channel B (pin 2), value range 1...2, default value 1															
:	:															
Word 47	Process data direction port X8, channel A (pin 4), value range 1...2, default value 2															
Word 48	Process data direction port X8, channel B (pin 2), value range 1...2, default value 2															

Table 38: Process data direction for the 16DIO module with 8DI/8DO profiles

5.4.2.6 IO mapping configuration (for 16DIO modules only)

Configuration of the IO mapping makes it possible to change the data structure of the E/A data. By default each E/A channel is mapped in sequence in the process data. Existing PLC programs however, may under certain circumstances, use another channel assignment.

These parameters enable all E/A channels to be freely assigned a bit in the E/A data. It should be noted that duplicate assignments are not possible here. If faulty parameterization of the IO mapping when transferring the configuration is detected,the LioN-P module registers a fault. A misconfiguration can be viewed with the status page of the web interface.

The permitted value range and the default value of the parameters depend on the selected profile. A channel can also be set to inactive with the value 255.

For example, if a channel has been configured with the value 3, its status value will be transferred to the third bit of the process data. This applies to both data directions if this has been configured through the process data direction of the channel. For more information on the process data, see Bit assignment of the process data on page 61.

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 49	IO mapping port X1, channel A (pin 4), value range 0...15, 255, default value 0															
Word 50	IO mapping port X1, channel B (pin 2), value range 0...15, 255, default value 1															
:	:															
Word 63	IO mapping port X8, channel A (pin 4), value range 0...15, 255, default value 14															
Word 64	IO mapping port X8, channel B (pin 2), value range 0...15, 255, default value 15															

Table 39: IO mapping on the 16DIO module with 16DI/DO and 16DO profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 49	IO mapping port X1, channel A (pin 4), value range 0...7, 255, default value 0															
Word 50	IO mapping port X1, channel B (pin 2), value range 0...7, 255, default value 255															
:	:															
Word 63	IO mapping port X8, channel A (pin 4), value range 0...7, 255, default value 7															
Word 64	IO mapping port X8, channel B (pin 2), value range 0...7, 255, default value 255															

Table 40: IO mapping on the 16DIO module with 8DI/DO and 8DO profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 17	IO mapping port X1, channel A (pin 4), value range 0...15, 255, default value 0															
Word 18	IO mapping port X1, channel B (pin 2), value range 0...15, 255, default value 1															
:	:															
Word 31	IO mapping port X8, channel A (pin 4), value range 0...15, 255, default value 14															
Word 32	IO mapping port X8, channel B (pin 2), value range 0...15, 255, default value 15															

Table 41: IO mapping on the 16DIO module with 16DI profiles

	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 17	IO mapping port X1, channel A (pin 4), value range 0...7, 255, default value 0															
Word 18	IO mapping port X1, channel B (pin 2), value range 0...7, 255, default value 255															
:	:															
Word 31	IO mapping port X8, channel A (pin 4), value range 0...7, 255, default value 7															
Word 32	IO mapping port X8, channel B (pin 2), value range 0...7, 255, default value 255															

Table 42: IO mapping on the 16DIO module with 8DI profiles

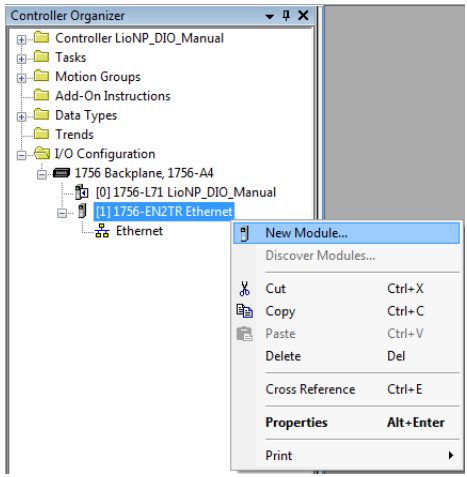
	MSB								LSB							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Word 49	IO mapping port X1, channel A (pin 4), value range 0...7, 255, default value 0															
Word 50	IO mapping port X1, channel B (pin 2), value range 0...7, 255, default value 1															
:	:															
Word 63	IO mapping port X8, channel A (pin 4), value range 0...7, 255, default value 6															
Word 64	IO mapping port X8, channel B (pin 2), value range 0...7, 255, default value 7															

Table 43: IO mapping on the 16DIO module with 8DI/8DO profiles

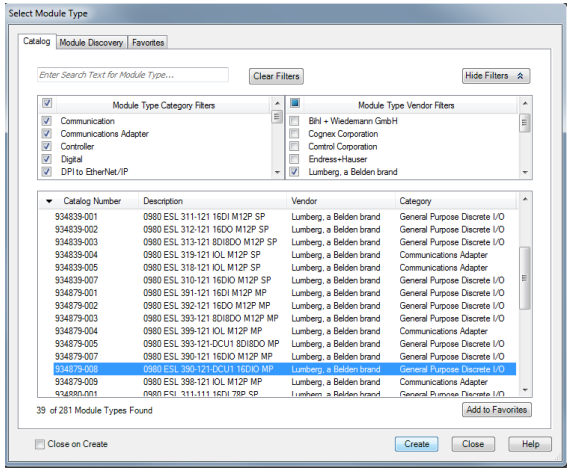
5.4.3 Configuration in RSLogix 5000

The configuration and start-up of the LioN-P modules described on the following pages refers to the RSLogix 5000 software from Rockwell Automation. If you are using a control system from another provider, please consider the related documentation.

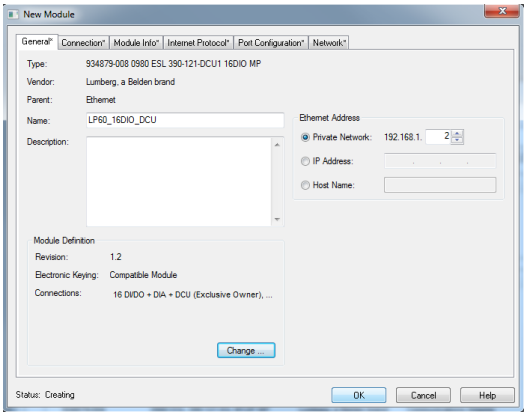
1. Create a new project in RSLogix 5000.
2. Select the correct controller.
3. Add the correct EtherNet/IP communication interface to your backplane in the Controller Organizer under I/O Configuration.
4. Select a communication path with the control system with Select Recent Communications Path.
5. Install the EDS files of the LioN-P modules in RSLogix 5000 through the tools main menu using the EDS Hardware Installation Tool.
6. Add a LioN-P module to your EtherNet/IP communication interface with a right click and menu item New Module....



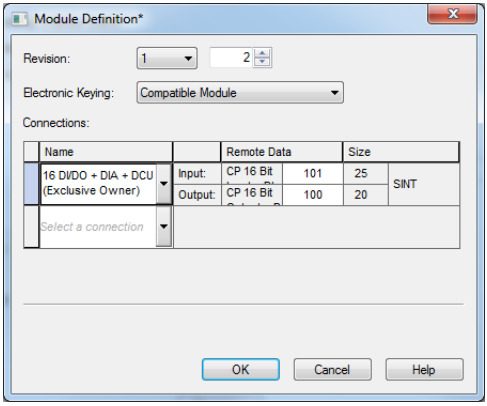
7. In the open window in the upper right corner, place the Module Type Vendor Filter on Lumberg, a Belden brand. All installed LioN-P modules will be displayed. Select the desired LioN-P module and confirm with Create.



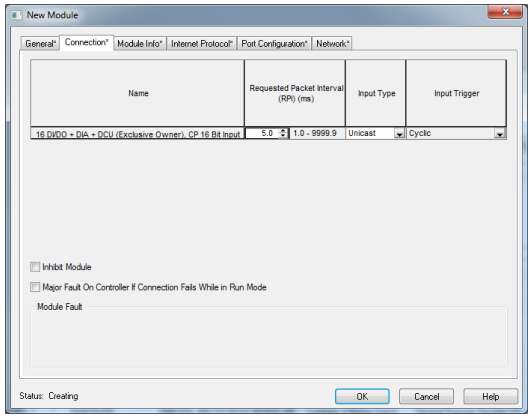
8. Give the LioN-P module a name and a valid IP address.



9. Select a suitable connection through Change... and confirm the entries. Further details are provided in section Connections and assembly objects on page 28.

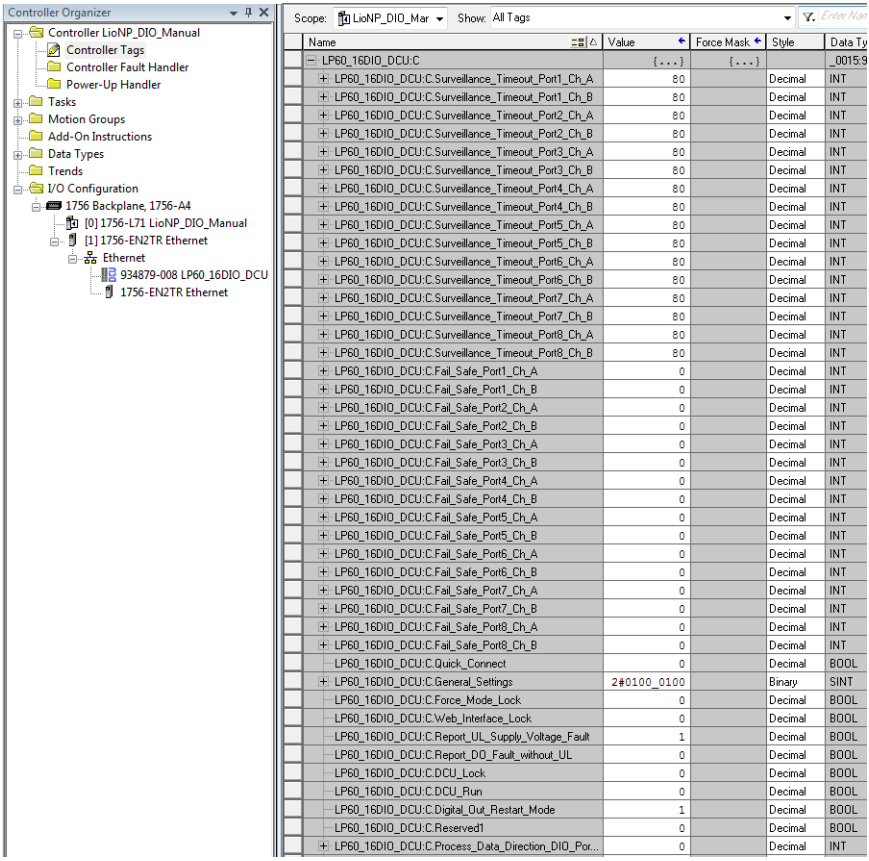


10. The Connection tab allows you to set the cycle time, the so-called Requested Packet Interval (RPI) time. With Input Type the input communication type can be determined (Unicast or Multitask).



11. Confirm the entries with OK.

12. In the Controller Organizer, you can view the connection data of the configuration (extension: C), the input data (extension: I), and the output data (extension: O) under the item Controller Tags through the assigned LioN-P module name and make changes accordingly. A description of the configuration can be found in the section Configuration parameters on page 40. The process data for input and output are described in section Bit assignment of the process data on page 61.



13. Configure the LioN-P module and download the parameters to the control system.

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 scanner and the LioN-P modules. For this scenario, the following tables provide a list of useful parameters:

5.4.4.1 16DIO module with 16DI/DO profile and diagnostic

Transport type	Exclusive Owner
Trigger mode	Cyclic
Requested packet interval (RPI)	Minimum 1 ms

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	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

5.4.4.2 16DI module with diagnostics

Transport type	Input only
Trigger mode	Cyclic
Requested packet interval (RPI)	Minimum 1 ms

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 data type USINT data size 1 byte data length 4 bytes	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

5.4.4.3 16DO slot with diagnostics

Transport type	Exclusive Owner
Trigger mode	Cyclic
Requested packet interval (RPI)	Minimum 1 ms

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	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

5.4.4.4 8DI/8DO module with diagnostics

Transport type	Exclusive Owner
Trigger mode	Cyclic
Requested packet interval (RPI)	Minimum 1 ms

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

6 Bit assignment of the process data

For the LioN-P modules, the input data are given as actual values and the output data as target values.

Please note that the amount of input data is variable. The amount depends on whether the transfer of diagnostic data is to be selected. The modules provide one byte for the slot or channel diagnostic, known as the module information byte. The diagnostic data is appended to the standard process input data.

LioN-P 16DIO modules with DCU function have an extended process data range with an additional 18 bytes in both directions. These are appended to the output data or module information byte or diagnostics of the input data. Further details on using the extended process data area are available in the µDCU Manual.

6.1 16DIO module

6.1.1 Assembly ID 100 (16-bit input data, default IO mapping)

Output	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 44: Assembly ID 100 bit assignment

6.1.2 Assembly ID 101 (16-bit input data with diagnostics, default IO mapping)

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	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
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 45: Assembly ID 101 bit assignment

6.1.3 Assembly ID 102 (16-bit input data without diagnostics, default IO mapping)

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

Table 46: Assembly ID 102 bit assignment

6.1.4 Assembly ID 103 (8-bit output data, default IO mapping, not for 8DI/8DO)

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

Table 47: Assembly ID 103 bit assignment, not for 8DI/8DO

6.1.5 Assembly ID 103 (8-bit output data, default IO mapping, for 8DI/8DO only)

Output	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 48: Assembly ID 103 bit assignment, for 8DI/8DO only

6.1.6 Assembly ID 104 (8-bit input data with diagnostics, default IO mapping), not for 8DI/8DO

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

Table 49: Assembly ID 104 bit assignment, not for 8DI/8DO

6.1.7 Assembly ID 104 (8-bit input data with diagnostics, default IO mapping), for 8DI/8DO only

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

Table 50: Assembly ID 104 bit assignment, for 8DI/8DO only

6.1.8 Assembly ID 105 (8-bit input data without diagnostics, default IO mapping), not for 8DI/8DO

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

Table 51: Assembly ID 105 bit assignment, not for 8DI/8DO

6.1.9 Assembly ID 105 (8-bit input data without diagnostics, default IO mapping), for 8DI/8DO only

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	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS

Table 52: Assembly ID 105 bit assignment, for 8DI/8DO only

6.1.10 Assembly ID 106 (0-bit input data with diagnostics, default IO mapping)

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

Table 53: Assembly ID 106 bit assignment

6.1.11 Assembly ID 107 (0-bit input data without diagnostics, default IO mapping)

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	MI-IME	0	0	0	MI-SCA	MI-SCS	MI-LVA	MI-LVS

Table 54: Assembly ID 107 bit assignment

6.1.12 Assembly ID 108 (16-bit input data with diagnostics and padding byte, default IO mapping)

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	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1
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
Byte 7	0	0	0	0	0	0	0	0

Table 55: Assembly ID 108 bit assignment

6.1.13 Key

- X1-A…X8-A: Status, channel A (pin 4) of slots X1 to X8
- X1-B…X8-B: Status, channel B (pin 2) of slots X1 to X8
- MI-LVS: Module Info Byte – undervoltage system / sensor supply
- MI-LVA: Module Info Byte – actuator undervoltage
- MI-SCS: Module Info Byte – a sensor short-circuit
- MI-SCA: Module Info Byte – actuator short circuit
- MI-IME: Module Info Byte – internal module error (error)
- SCS-X1…SCS-X8: Sensor short-circuit on slot X1 to X8
- CE-X1A…CE-X8A: Channel error, channel A (pin 4) on slots X1 to X8
- CE-X1B…CE-X8B: Channel error, channel B (pin 2) on slots X1 to X8

6.1.14 Output data DCU extension (DCU modules only)

Output	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	16 bit I/O DCU extension							
Byte n + 1								
Byte n + 2	INT I/O DCU extension							
Byte n + 3								
:	:							
Byte n + 16	INT I/O DCU extension							
Byte n + 17								

Table 56: Output data DCU extension

Key:

- 16 bit I/O DCU extension: Bit states as DCU input data
- INT I/O DCU extension: 8 word data types as DCU input data (e.g. for transferring program parameters)

6.1.15 Input data DCU extension (DCU modules only)

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	16 bit I/O DCU extension							
Byte n + 1								
Byte n + 2	INT I/O DCU extension							
Byte n + 3								
:	:							
Byte m + 16	INT I/O DCU extension							
Byte m + 17								

Table 57: Input data DCU extension

Key:

- 16 bit I/O DCU extension: Bit states as DCU output data
- INT I/O DCU extension: 8 word data types as DCU output data (e.g. for transferring counter states)

6.2 16DI module

6.2.1 Assembly ID 101 (input data with diagnostic)

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
Byte 3	SCS-X8	SCS-X7	SCS-X6	SCS-X5	SCS-X4	SCS-X3	SCS-X2	SCS-X1

Table 58: Assembly ID 101 bit assignment

6.2.2 Assembly ID 102 (input data without diagnostic)

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 59: Assembly ID 102 bit assignment

6.2.3 Key

- X1-A…X8-A: Status, channel A (pin 4) of slots X1 to X8
- X1-B…X8-B: Status, channel B (pin 2) of slots X1 to X8
- MI-LVS: Module Info Byte – undervoltage system / sensor supply
- MI-SCS: Module Info Byte – a sensor short-circuit
- MI-IME: Module Info Byte – internal module error (error)
- SCS-X1…SCS-X8: Sensor short-circuit on slot X1 to X8

6.3 16DO module

6.3.1 Assembly ID 100 (output data)

Output	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 60: Assembly ID 100 bit assignment

6.3.2 Assembly ID 101 (input data with diagnostic)

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 61: Assembly ID 101 bit assignment

6.3.3 Assembly ID 102 (input data without diagnostic)

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

Table 62: Assembly ID 102 bit assignment

6.3.4 Key

- X1-A…X8-A: Status, channel A (pin 4) of slots X1 to X8
- X1-B…X8-B: Status, channel B (pin 2) of slots X1 to X8
- MI-LVS: Module Info Byte – undervoltage system / sensor supply
- MI-LVA: Module Info Byte – actuator undervoltage
- MI-SCA: Module Info Byte – actuator short circuit
- MI-IME: Module Info Byte – internal module error (error)
- CE-X1A…CE-X8A: Channel error, channel A (pin 4) on slots X1 to X8
- CE-X1B…CE-X8B: Channel error, channel B (pin 2) on slots X1 to X8

6.4 8DI/8DO module

6.4.1 Assembly ID 100 (output data)

Output	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 63: Assembly ID 100 bit assignment

6.4.2 Assembly ID 101 (input data with diagnostic)

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 64: Assembly ID 101 bit assignment

6.4.3 Assembly ID 102 (input data without diagnostic)

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

Table 65: Assembly ID 102 bit assignment

6.4.4 Key

- X1-A…X8-A: Status, channel A (pin 4) of slots X1 to X8
- X1-B…X8-B: Status, channel B (pin 2) of slots X1 to X8
- MI-LVS: Module Info Byte – undervoltage system / sensor supply
- MI-LVA: Module Info Byte – actuator undervoltage
- MI-SCS: Module Info Byte – a sensor short-circuit
- MI-SCA: Module Info Byte – actuator short circuit
- MI-IME: Module Info Byte – internal module error (error)
- SCS-X1…SCS-X8: Sensor short-circuit on slot X1 to X8
- CE-X1A…CE-X8A: Channel error, channel A (pin 4) on slots X1 to X8
- CE-X1B…CE-X8B: Channel error, channel B (pin 2) on slots X1 to X8

7 Diagnostics processing

The modules provide advanced diagnostic 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.

7.1 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 diagnostic
Off	Off	OK, no diagnostic
Active	Off	Short-circuit Channel indicator is red. Channel error bit in the diagnostic is set. Channel is locked after error is removed.
Off	Active	Voltage is fed back in Red and yellow/white channel indicators are activated. Channel error bit in the diagnostic is set. Channel is not locked after error is removed.

Table 66: Interpretation of channel errors

Attention: 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.

7.2 Voltage errors at 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 diagnostic bytes.

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

7.3 Overload of output drivers

The output drivers of the modules with output functions (variants 16DIO, 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 diagnostic bytes.

Attention: 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.

7.4 Error in actuator power supply

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

Attention: 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 has 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 diagnostic when the voltage value has normalized again.

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

7.5 Error in 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 always be ensured that the supply voltage measured at the most remote participant does not drop below 18 V DC from the perspective of the system power supply.

8 Integrated web server

The LioN-P modules are equipped with an integrated web server which makes functions available for the configuration of modules and display of status and diagnostic information.

Using a standard web browser, the provided functions can be accessed via an existing TCP/IP connection.

Attention: To use the web server, the modules need their own IP address. In accordance with the EtherNet/IP standard, all EtherNet/IP devices are shipped with the IP address 192.168.1.1. Consequently, the modules must be assigned a free IP address that differs from the factory setting prior to use of the web server. The assignment of the IP address is described in this manual in section Setting the network parameters on page 27.

8.1 Start page/status page (Status)

In the address line of your web browser enter http://, followed by the IP address, e.g. http://192.168.1.1. If the module start page doe snot open, check your browser and firewall settings.

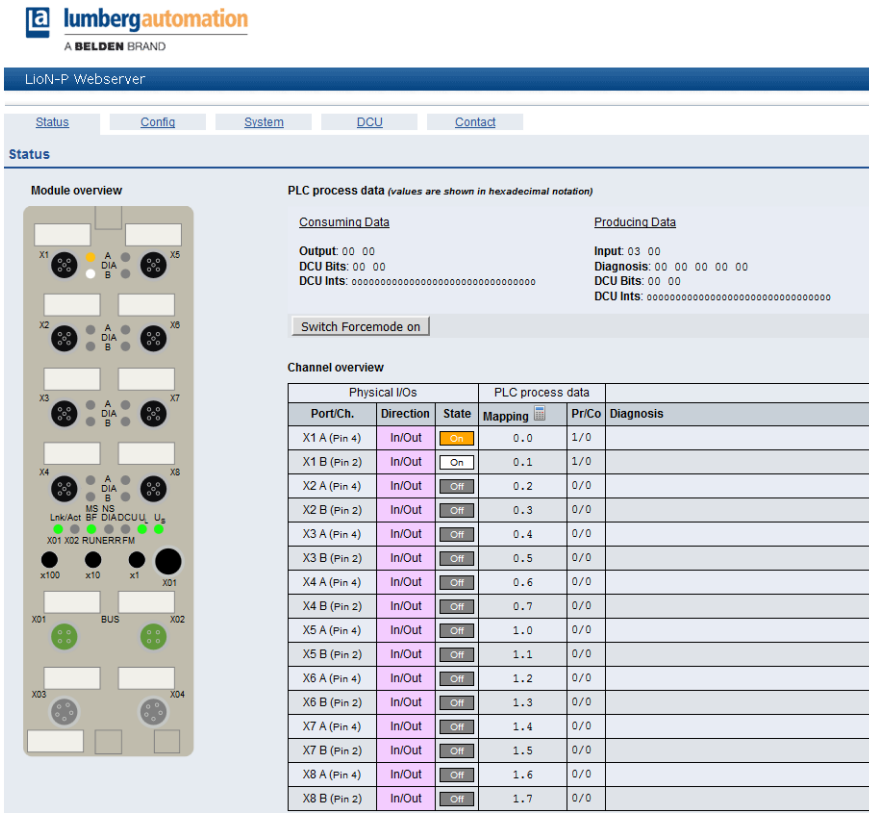
This website shows the current status of the overall module and the respective status of the individual channels. Pending diagnoses are notified as for the controller.

The process data Consuming/Producing Data, including the diagnostic Diagnostic, is shown as hexadecimal in the PLC process data as well as graphically in the Module overview and Channel overview areas. The coding of the diagnostic can be found in section Bit assignment of the process data on page 61.

The table Channel overview is broken down into three different areas. The status of the physical input and output data for the channels as well as the process data sent to and received from the controller is displayed. Channel errors are registered in the last column.

The LioN-P modules display the channel direction, the current channel status, the IO mapping configured through the control system, and the currently displayed process data (Pr/Co) of a channel.

Pressing the Calculator symbol enables the mapping values to be assigned as an overview to the input and output addresses from the controller. In 16DI/DO modules, changes to the IO mapping can be made only through the controller.



Physical I/Os			PLC process data		
Port/Ch.	Direction	State	Mapping	Pr/Co	Diagnosis
X1 A (Pin 4)	In/Out	On	0.0	1/0	
X1 B (Pin 2)	In/Out	On	0.1	1/0	
X2 A (Pin 4)	In/Out	Off	0.2	0/0	
X2 B (Pin 2)	In/Out	Off	0.3	0/0	
X3 A (Pin 4)	In/Out	Off	0.4	0/0	
X3 B (Pin 2)	In/Out	Off	0.5	0/0	
X4 A (Pin 4)	In/Out	Off	0.6	0/0	
X4 B (Pin 2)	In/Out	Off	0.7	0/0	
X5 A (Pin 4)	In/Out	Off	1.0	0/0	
X5 B (Pin 2)	In/Out	Off	1.1	0/0	
X6 A (Pin 4)	In/Out	Off	1.2	0/0	
X6 B (Pin 2)	In/Out	Off	1.3	0/0	
X7 A (Pin 4)	In/Out	Off	1.4	0/0	
X7 B (Pin 2)	In/Out	Off	1.5	0/0	
X8 A (Pin 4)	In/Out	Off	1.6	0/0	
X8 B (Pin 2)	In/Out	Off	1.7	0/0	

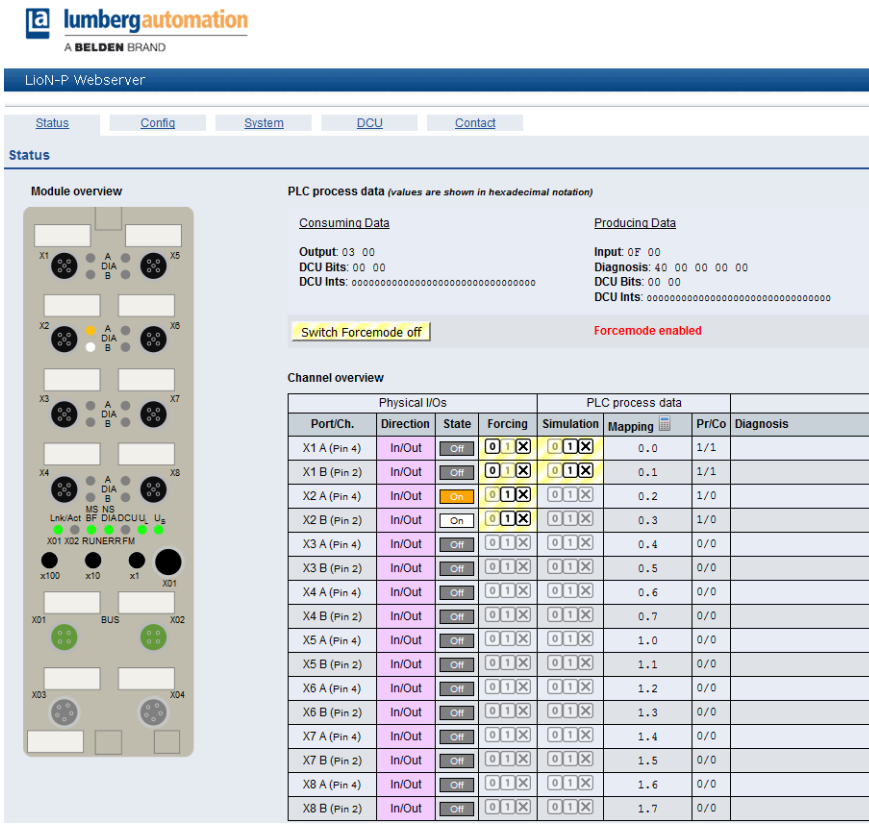
The force mode is activated by the button Switch Forcemode on. This can generally be used in offline mode (without any connection to the controller) as well as in the online mode (with connection to controller). If the status page or the web server is exited, Force Mode is automatically switched off.

If Force Mode is activated in the offline mode through the web server, then a connection cannot be made to the controller.

To use Force Mode in the online mode the web interface and Force Mode have to be activated through the controller parameterization.

If Force Mode is activated in online mode through the web server, Force Mode is automatically switched off if the failsafe is actuated (connection interruption, controller to STOP, internal module error).

User authentication must be entered to use Force Mode. Users can be created and edited using the System page. The admin user uses private as the default password.

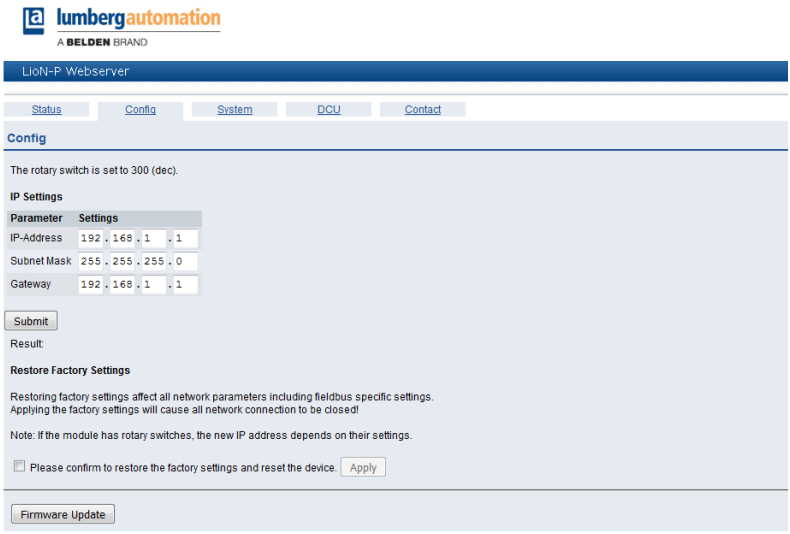


The 0 and 1 buttons in the Forcing column can be used to set physical output data for the individual channels. The X button cancels forcing for the corresponding channel.

In a similar manner, the Simulation column can be used to simulate the input data of the individual channels before mapping into the process data.

8.2 Configuration page (Config)

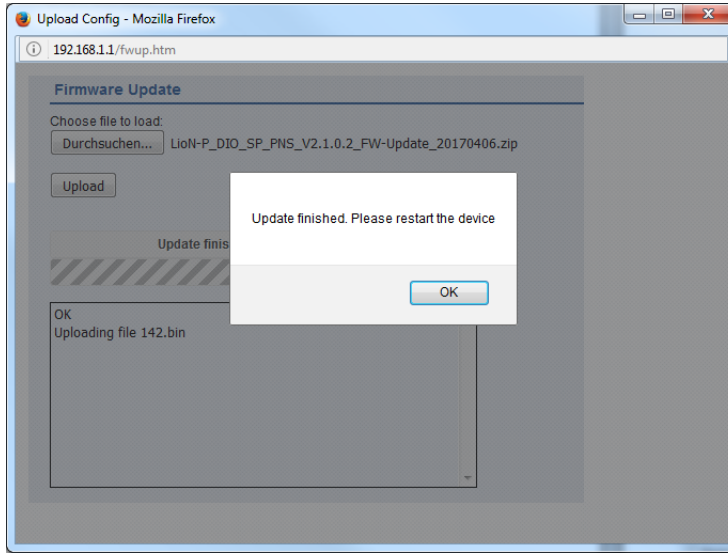
When the Config menu item in the Web server menu bar is selected, the Configuration page opens. Network parameters such as the IP address can be configured here and the LioN-P module reset to factory settings. Executed actions must be confirmed using the Submit or Apply button.



Attention: Please note that if you reset the modules to the factory settings, the EtherNet/IP name and IP address are also reset to the default values. It may not be possible to access the web server of the modules and exchange data in the EtherNet/IP network after the reset.

If the firmware of the LioN-P module is updated, this can be done using the Firmware Update button. Select the corresponding ZIP file and conform the procedure with the Upload button.

Do not interrupt the update procedure. Once the firmware update is completed you are prompted to restart the LioN-P module.



8.3 System page

When the System menu item in the Web server menu bar is selected, the System page opens. On this page in the Connection Status area, the current status of both Ethernet ports is displayed with regard to the connection, transfer rate and transfer mode as well as the network parameters and the PROFINET status of the LioN-P module.

The General Information area contains the system-related information on the runtime, the Firmware version used and the LioN-P module's manufacturing details.

In User Management passwords of created users can be changed using the Edit button. The Create User area can be used to add users with Write or Admin permissions. Only access with Admin permission enables new users to be created or passwords to be changed.

The status information on this page is updated in a web browser only after reopening or refreshing of the page.

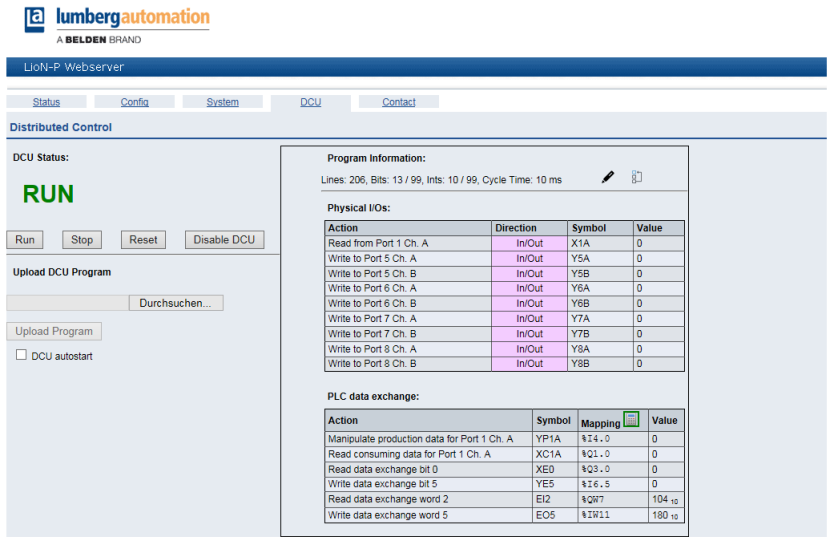

lumbergautomation
A BELDEN BRAND
LioN-P Webserver
Status
Config
System
DCU
Contact
System
Connection Status
Network
Port 0 100 MBit/s FULL
Port 1 No Link
Phy MAC Address 3C:B9:A6:F3:F5:FF
IP Address 192.168.1.2
Subnetmask 255.255.255.0
Gateway 0.0.0.0
Ethernet/IP
State Connected
Quick Connect Disabled
General Information
System
Time Since Startup 716 s
System Message OK
Restarts of IO-System 0
Firmware
Name Belden - EtherNet/IP
Version V2.1.0.9-2.2 (W10015)
Date 2.11.2017
Device
Name 0980 ESL 390-121-DCU1 16DIO MP
Ordering Number 934879008
Hardware V1.0
Serial Number 12345
Production Date 32 / 2015
User Management
Show User Informations

8.4 Distributed control page (DCU)

The Distributed Control function is an optional extension and it is only supported by LioN-P modules 0980 ESL 390-121-DCU1 and 0980 ESL 393-121-DCU1.

This function enables control and monitoring tasks to be executed directly on the device using a DCU program. The LioN-P module can supply status information to a higher-level PLC (online mode) or be operated independently without bus communication (offline mode).

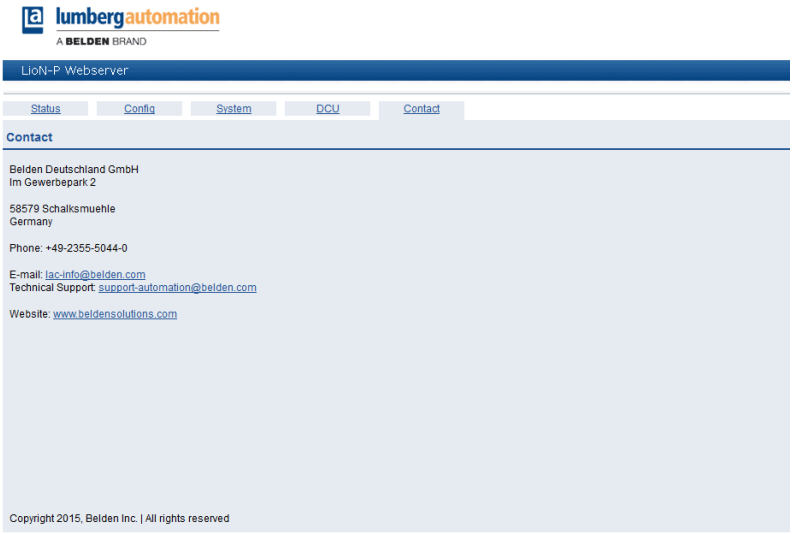
Further details are available in the µDCU Manual.



LioN-P modules without a DCU function on this website do not display any useful information.

8.5 Contact page

When the Contact menu item in the Web server menu bar is selected, the Contacts page opens. This provides information on the contact data for Belden Deutschland GmbH.



8.6 Reading the process and diagnostic data

Request	Method http GET
Request URI	/info.json
Response format	JSON

Example JSON response


```
{“name”: “0980 ESL 390-121-DCU1”,“fw-version”: “V2.1.0.2-2.0”,
“hw-version”:“V1.0”, “mac”: “3C:B9:A6:00:17:00”,“bus”: 0,“failsafe”: 0,
“inputs”:[3,0],“outputs”: [0,0],“consuming”: [0,0],“producing”:
[0,0],“Diag”:[0,0,0,0],“dcu”: {“state”: 1,“autostart”: 0,“public”:
[0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0],
“consuming_bits”:[0,0],“consuming_ints”: [0,0,0,0,0,0,0,0],
“producing_bits”:[0,0],“producing_ints”:[0,0,0,0,0,0,0,0]}}
```


Fieldname	Data type	Description
sysName	String	Name of the module
fw-version	String	Firmware version
hw-version	String	Hardware version
mac	String	MAC address of the module
bus	Number	0 = Not connected to fieldbus 1 = Connected to fieldbus
failsafe	Number	0 = Normal output operation 1 = Outputs in failsafe state
inputs	Number[2]	LSB = Physical input state port X1-X4 MSB= Physical input state port X5-X8
Outputs	Number[2]	LSB = Physical output state port X1-X4 MSB= Physical output state port X5-X8
Consuming	Number[2]	Consuming data from PLC
Producing	Number[2]	Producing data to PLC
Diag	Number[4]	Contains diagnostic information of the module Byte 0: ▶ Bit 0 = System/sensor voltage supply fault (U_S) ▶ Bit 1 = Actuator voltage supply fault (U_L) ▶ Bit 2 = Sensor short circuit detected ▶ Bit 3 = Actuator overload ▶ Bit 6 = Forcemode active ▶ Bit 7 = Internal module fault (IO data invalid) Byte 1 = Sensor short circuit port 1-8 Byte 2 = Actuator short circuit port 1-4 (channel A, B) Byte 3 = Actuator short circuit port 5-8 (channel A, B)
DCU	Object	(only available on DCU modules)
DCU/state	Number	Current state of the DCU: ▶ 0 = LOCKED ▶ 1 = NO PROGRAM ▶ 2 = DISABLED ▶ 3 = STOP ▶ 4 = RUN ▶ 5 = ERROR
DCU/autostart	Number	Is 1 if the local autostart is enabled

Fieldname	Data type	Description
DCU/public	Number[32]	Contains all values of the DCU public variables _P0 - _P31
DCU/ consuming_bits	Number[2]	16 DCU exchange bits set by PLC
DCU/ producing_bit	Number[2]	16 DCU exchange bits set by DCU program
DCU/ consuming_ints	Number[8]	16 DCU exchange words (16-bit signed integer) set by PLC
DCU/ producing_ints	Number[8]	16 DCU exchange words set by DCU program

Table 67: JSON response description

9 Technical data

9.1 General

Protection class	IP 65, IP 67, IP 69, ... (only when the connectors are screwed in or when protective caps are used)
Ambient temperature	-25° C to +70° C (-13° F to +158° F)
Ambient humidity	98% RF (for UL applications 80% PRF)
Weight	480 g (M12-L) or 520 g (7/8")
Housing material	Die-cast zinc
Vibration resistance (oscillation)	15 g / 5-500 Hz
Shock resistance	50 g / 11 ms
Torques: Fixing screws M6/M4 M12 connector Function ground connection M4	1.0 Nm 0.5 Nm 1.0 Nm

Table 68: General information

9.2 Bus system

Protocol	EtherNet/IP
EDS files	EDS-V3.21.1-LumbergAutomation-0980ESL310-xxx-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL311-xxx-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL312-xxx-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL313-xxx-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL390-xxx-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL391-xxx-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL392-xxx-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL393-xxx-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL390-xxx-DCU1-yyyymmdd.eds EDS-V3.21.1-LumbergAutomation-0980ESL393-xxx-DCU1-yyyymmdd.eds
Transfer rate	100 Mbit/s, full duplex
Transmission procedure Autonegotiation	100BASE-TX is supported
Manufacturer ID (Vendor ID)	21
Product type	General Purpose Discrete I/O

Product code	31000 (0980 ESL 310-111 16DIO 7/8P SP) 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) 31002 (0980 ESL 310-121 16DIO M12P 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) 39000 (0980 ESL 390-111 16DIO 7/8P MP) 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) 39002 (0980 ESL 390-121 16DIO M12P 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) 39012 (0980 ESL 390-121-DCU1 16DIO MP) 39312 (0980 ESL 393-121-DCU1 8DI8DO MP)
Supported Ethernet Protocols	Ping ARP HTTP TCP/IP DHCP BOOTP DLR (beacon-based)
Switch functionality	Integrated
PROFINET interface Port Autocrossing	2 M12 sockets 4-pin, D-coded (see pin assignments) is supported

Table 69: Information on the bus system

9.3 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 120 mA
Voltage level of the sensor power supply	Min. (U_S – 1.5 V)
Power consumption of sensors	Max. 200 mA (at T_U = 30° C) per port
Reverse polarity protection	Yes
Operational indicator (U_S)	Green LED, 18 V <= U_S +/- 1 V <= 30 V Red LED, U_S < 18 V +/- 1 V or U_S > 30 V +/- 1 V

Table 70: Information on the power supply for the module electronics/ sensors

9.4 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. 18 V
Delay time for undervoltage detection	< 20 ms
Reverse polarity protection	Yes
Operational indicator (U_L)	Green LED, 18 V <= U_L +/- 1 V <= 30 V Red LED, U_L < 18 V +/- 1 V or U_L > 30 V +/- 1 V

Table 71: Release notes on the power supply for the actuators

9.5 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 16 with 16DIO
Status indicator	Yellow LED for channel A White LED for channel B
Diagnostic indicator	LED red for each slot
Port	M12 socket, 5-pin See pin assignment

Table 72: Release notes on the inputs

9.6 Outputs

Each channel can independently switch 2.0 A, the port groups X1/X2, X3/X4, X5/X6, X7/X8 can each support a total load of 6.5 A at their 4 channels. The complete port group X1…X8 can support a max. load of 9 A.

Output connection Nominal output current per channel:	Type 2.0 A as per IEC 61131-2 See information 1
Signal status “1” Signal status “0”	Max. 2.0 A Max. 1.0 mA (standard specifications)
Signal level of the outputs: Signal status “1” Signal status “0”	 Min. (U_L – 1 V) Max. 2 V
Short-circuit protection	Yes
Max. output current per module	0980 ESL 3xx-111…: As per U_L approval: 9 A (12 A see info 2) 0980 ESL 3xx-121… As per U_L approval: 9 A (16 A per supply point)
Overload proof	Yes
Number of digital channels	0 with 16 DI 16 with 16DO 8 with 8DI/8DO 16 with DIO
Channel type	Normally open, p-switching
Status indicator	Yellow LED per channel A White LED per channel B
Diagnostic indicator	LED red per channel
Port	M12 socket, 5-pin See pin assignment

Table 73: Release notes on the outputs

Attention: With inductive loads of consumption category DC13 (EN60947-5-1), the outputs can connect currents of 2.0 A at a frequency of 1 Hz.

9.7 LEDs

U_S	Green	System/sensor power supply, voltage level 18 V <= U_S +/- 1 V <=30 V
	Red	System/sensor power supply, voltage level U_S < 18 V +/- 1 V or U_S > 30 V +/- 1 V
	Off	No system/sensor power supply
U_L	Green	Actuator power supply, voltage level 18 V <= U_L +/- 1 V <=30 V
	Red	Actuator power supply, voltage level U_L < 18 V +/- 1 V or U_L > 30 V +/- 1 V
	Off	No actuator power supply
X1…X8 A	Yellow	Channel status A "On"
DIA	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	Green	Ethernet connection exists to another subscriber. Link connection created.
P2 Lnk/Act	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: 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 determined that the assigned IP address already exists.
	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.
DCU/FM	Blue	DCU program stop
	Blue flashing at 1 Hz	DCU program run
	Off	DCU/FM off
	Red	DCU error
	Blue/red flashing	ForceMode active

Table 74: Information on LED colors

10 Accessories

Information on general accessories is available on the Internet at:

http://www.beldensolutions.com