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A **BELDEN** BRAND

EtherNet/IP™

Technical Manual
LioN-M EtherNet/IP
0980 ESL 710
0980 ESL 711

Table of contents

1.   About this manual

Please read the assembly and operating instructions of this manual carefully, before you put the LioN-M I/O-modules with EtherNet/IP interface into operation. The manual should be kept at a place that is accessible for all users.

The texts, illustrations, diagrams and examples being used in this manual are solely intended to explain the operation and handling of the LioN-M I/O-modules with EtherNet/IP interface.

To obtain further information on the installation and putting into operation of the devices, please do not hesitate to contact us. We will be glad to be at your disposal at any time.

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1.1.   Explanation of the symbolism

1.1.1.   Use of notes

The following sign is used to mark important information.

1.1.2.   Use of hazard warnings

Hazard warnings are marked as follows:

DANGER:
Violation of appropriate protection measures may cause danger to the life and health of the user.

ATTENTION:
Violation of appropriate protection measures may cause damage to other devices or material assets.

1.2. Safety guidelines

1.2.1. Normal conditions of use

The devices that are explained in this manual are intended to be used as decentralized Input / Output assemblies in an EtherNet/IP network.

Our products are designed, manufactured, tested and documented with respect to common safety standards. With attention to the handling specifications for planning, development and mounting and the safety instructions our products do not cause any danger to persons and property under normal conditions.

The modules comply to the rules of the
- EMC-directive (89/336/EWG, 93/68/EWG und 93/44/EWG)
- Low voltage directive (73/23/EWG)

They are designed to be used in the industrial area. The industrial environment is characterized by the fact that electrical consumers are not connected directly to the public low voltage network. For the application in residential areas, business areas and commercial areas additional measures are to be taken.

i	**Caution!** This equipment can cause interferences in the residential area. In this case the operator can be required to accomplish appropriate measures.

The proper and safe function of the product requires an appropriate transport, storage, installation and mounting as well as a careful operation.

The intended operation of the device is only guaranteed with a completely installed housing. All devices connected to this equipment must fulfil the requirements of the EN 61558-2-4 and EN 61558-2-6.

Projecting, installation, commissioning, maintenance and test of the devices may be carried out only by an approved qualified electrical specialist who is familiar with the security standards of the automation technology.

During projecting, installation, commissioning, maintenance and test of the devices the regulations for safety and prevention of accidents in the specific application case have to be considered.

Only cables and accessories shall be installed that correspond to the requirements and regulations for safety, electromagnetic compatibility and if necessary telecommunication terminals as well as the specification data.
More information about the admitted cables and accessories for installation may be obtained from Belden Deutschland – Lumberg Automation™- or are described in this technical manual.

1.3. Qualified personnel

The requirements for the personnel depend on the requirement profile described by the ZVEI and VDMA or comparable organizations.

Only electrical specialists, who know the content of this manual, may install and maintain the described products.
These are persons who
- can assess the works to be performed and recognize possible dangers based on their technical education, knowledge and experience as well as their knowledge of the relevant standards.
- have the same level of knowledge as after a technical education due to an activity in a comparable area for several years.

Modifications to the hard- and software of our products, as far as they are not described in this technical manual, may be carried out only by Belden Deutschland GmbH -Lumberg Automation™.

ATTENTION!
Unqualified modifications to the hardware or software or the non-observance of the warning instructions given in this technical manual can entail heavy personal damages or damages to property.

1.4. Version information of the manual

Index	Created	Changed	Changed	Changed	Changed	Changed
Version number	V1.0	V1.1	V1.2			
Date	March 2012	November 2012	August 2013			
Name / department	Knipp/PM	Knipp/PM	Knipp/PM			

2. System description

LioN (Lumberg I/O network)-M is a stand-alone fieldbus device for the decentralized operation in rough industrial environment for the simple handling of the I/O data in a superordinate bus system. It is particularly suitable for application places with moderate I/O concentration on distributed assemblies.

By the very compact dimensions and the low weight the system can be used under limited space conditions and on handling devices. As a protection class LioN-M offers IP 67.

The LioN-M I/O-module 0980 ESL 710 works as a slave device in an EtherNet/IP network. It offers 16 digital I/O-channels with universal I/O-functionality. Each of the 16 channels can be used as a digital input or output indepently from another channel. The input or output functionality is determined during the PLC programming. There is no additional configuration necessary.

In applications where only digital inputs are required the I/O-module 0980 ESL 711 can be used. This module also has an EtherNet/IP interface and offers 16 digital input channels.

3. Product overview

3.1. I/O-module variants

Part number	Description	I/O-connection	Design
LioN-M module universal I/O digital			
0980 ESL 710	16 In/Out universal	8xM12	M
LioN-M modules input I digital			
0980 ESL 711	16 In	8xM12	M

3.2. Accessories

| Part number	Description
EtherNet/IP	
0985 706 100/... M	EtherNet/IP, high-flex, double-ended cord set, M12 male to male straight, 4-pin, D-coding, 24AWG TPE cable, stranded/unshielded, 2 twisted pairs with teal jacket.
0985 706 101/... M	EtherNet/IP, high-flex, double-ended cord set, M12 male to male straight, 4-pin, D-coding, 24AWG TPE cable, stranded/unshielded cross-over cable with two twisted pairs with teal jacket.
0985 706 103/... M	EtherNet/IP, high-flex, double-ended cord set, M12 male to RJ45 male straight, 4-pin, D-coding, 24AWG TPE cable, stranded/unshielded, 2 twisted pairs with teal jacket.
0985 707 100/... M	EtherNet/IP, moderate-flex, double-ended cord set, M12 male to male straight, 4-pin, D-coding, 24AWG PVC cable, solid/shielded, 2 twisted pairs with teal jacket.
0985 707 101/... M	EtherNet/IP, moderate-flex, double-ended cord set, M12 male to male straight, 4-pin, D-coding, 24AWG PVC cable, solid/shielded, cross-over cable, 2 twisted pairs with teal jacket.
0985 S4549 100/... M	EtherNet/IP, double-ended cord set, M12 male to male straight, 4-pin, D-coding, 26AWG PUR halogen-free cable, stranded/shielded, 2 twisted pairs with water blue jacket.
0985 S4549 103/... M	EtherNet/IP, double-ended cord set, M12 male 4-pin D-coded to RJ45 male, 26AWG PUR halogen-free cable, stranded/shielded, 2 twisted pairs with water blue jacket.

| Part number	Description
Power supply cables	
RK 40-637/... F RS 40-637/... F	Mini, 7/8" single-ended cord set, female (RK) or male (RS) straight, 4-pole, 18AWG TPE cable, IEC colour code
RK 40-602/... M RS 40-602/... M	Mini, 7/8" single-ended cord set, female (RK) or male (RS) straight, 4-pole, 18AWG PUR cable, IEC colour code
RK 40-739/... F	Mini, 7/8" single-ended cord set, female straight, 4-pole, 16AWG TPE cable, US colour code
RKW 40-637/... F RSW 40-637/... F	Mini, 7/8" single-ended cord set, female (RKW) or male (RSW) angled, 4-pole, 18AWG TPE cable, IEC colour code
RKW 40-602/... M RSW 40-602/... M	Mini, 7/8" single-ended cord set, female (RKW) or male (RSW) angled, 4-pole, 18AWG PUR cable, IEC colour code
RKW 40-739/... F	Mini, 7/8" single-ended cord set, female angled, 4-pole, 16AWG TPE cable, US colour code
RSRK 40-637/... F	Mini, 7/8" double-ended cord set, female to male straight, 4-pole, 18AWG TPE cable, IEC colour code
RSRK 40-602/... M	Mini, 7/8" double-ended cord set, female to male straight, 4-pole, 18AWG PUR cable, IEC colour code
RSRKW 40-637/... F	Mini, 7/8" double-ended cord set, male straight to female angled, 4-pole, 18AWG TPE cable, IEC colour code
RSRKW 40-602/... M	Mini, 7/8" double-ended cord set, male straight to female angled, 4-pole, 18AWG PUR cable, IEC colour code
Field attachables	
0986 EMC 102	Field attachable M12-plug for EtherNet/IP cable, straight, 4-pole, D-coded, with spring-type terminals
RSC 40/9 RSC 40/11 RSC 40/16	Field attachable connector, Mini, 7/8", male, 4-pole, /9 for cable diameter 6.0 to 8.0 mm, /11 for cable diameter 8.0 to 10.0 mm, /16 for cable diameter 12.0 to 14.0 mm
RKC 40/9 RKC 40/11 RKC 40/16	Field attachable connector, Mini, 7/8", female, 4-pole, /9 for cable diameter 6.0 to 8.0 mm, /11 for cable diameter 8.0 to 10.0 mm, /16 for cable diameter 12.0 to 14.0 mm
Other accessories	
RKV	Dust cover for unused MINI, 7/8" female socket connectors
RSV	Dust cover for unused MINI, 7/8" male plug connectors

4. Mounting

4.1. Outer dimensions

4.1.1. 0980 ESL 710
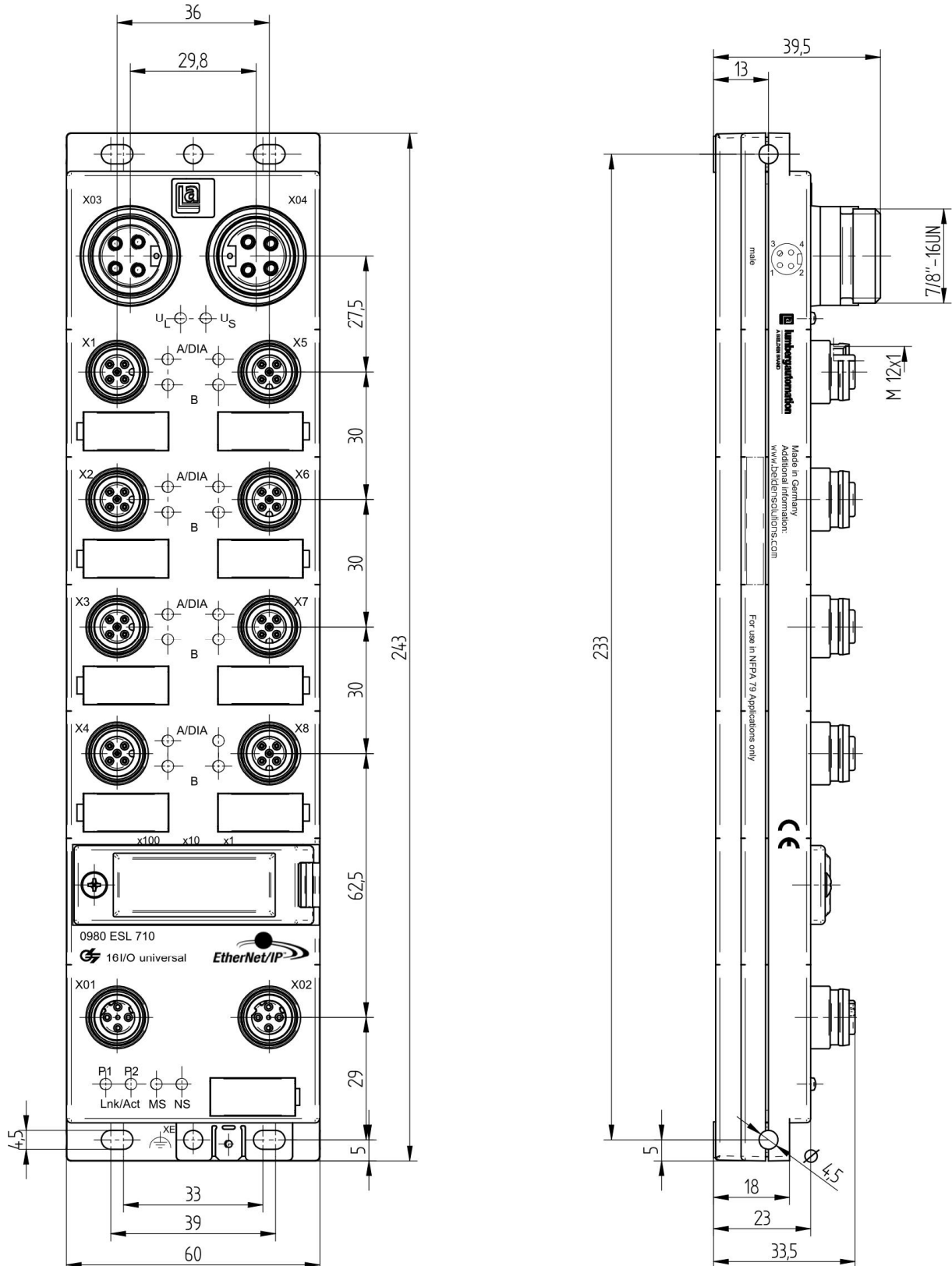
4.1.2. 0980 ESL 711
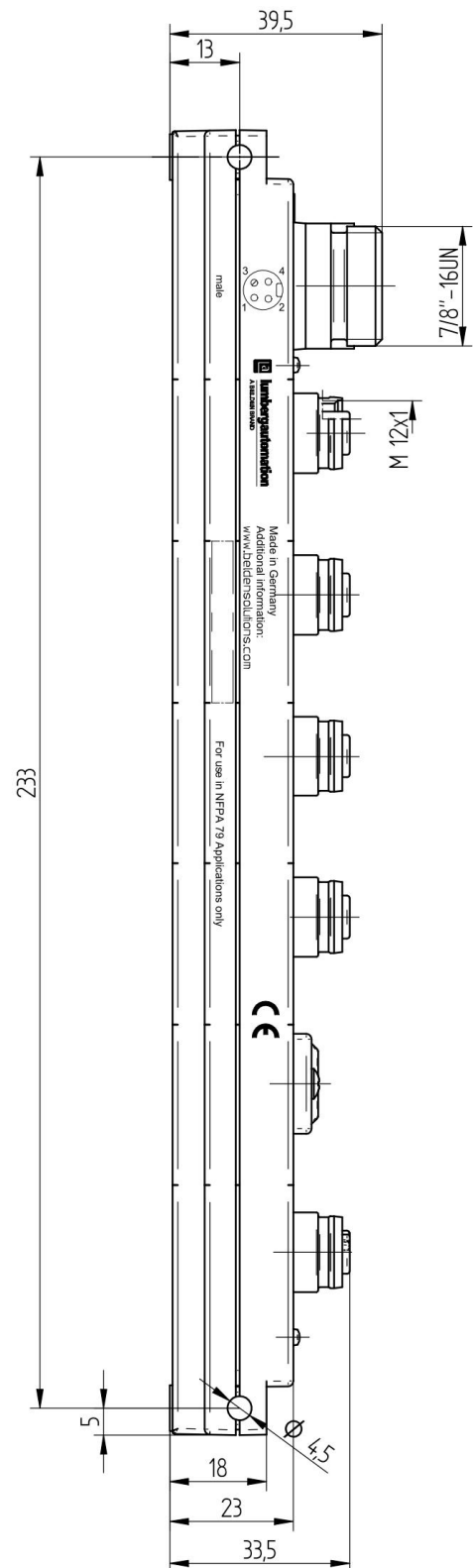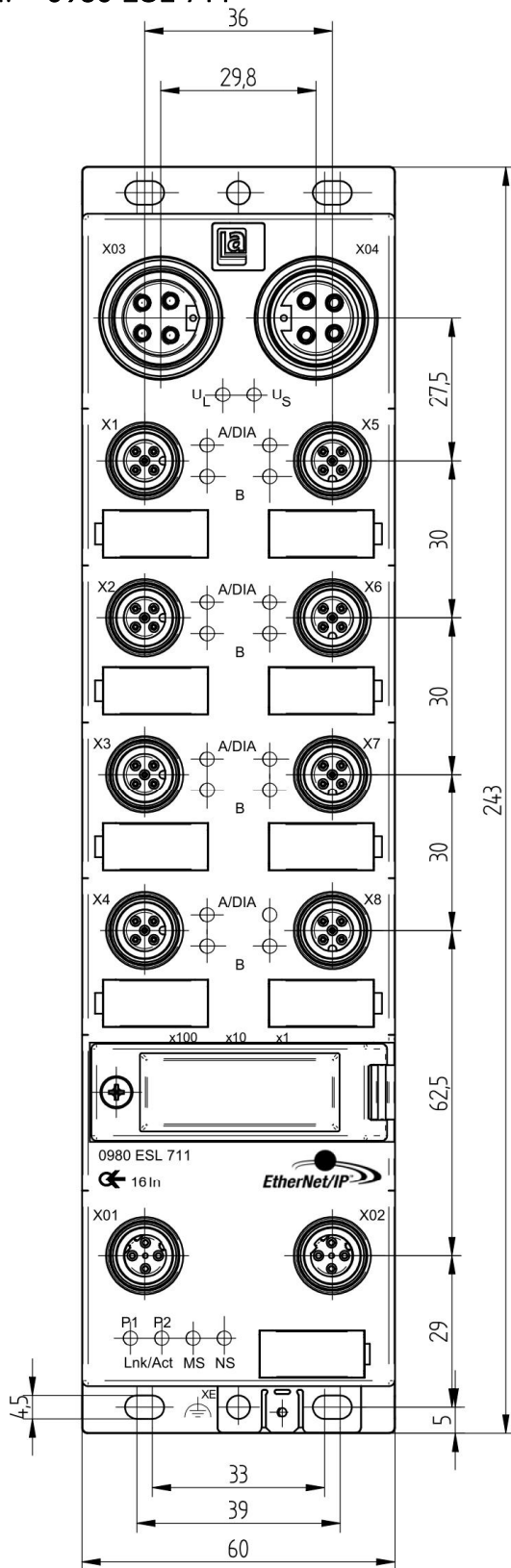
4.2.   Notes for the field installation

The modules are to be mounted on a flat surface, each with or at least with two screws.

Type of mounting	Screws	Torque
flat	M4x25/30	1,0 Nm
laterally	M4x70/80	1,0 Nm
With all types of mounting a flat washer according to DIN 125 has to be used.		

Important note:
For the derivation of interference currents and/or for the EMC stability the module provides a metal grounding sheet.

It is necessary to connect this metal grounding sheet by a low impedance connection to the reference earth. In case of a grounded mounting surface the connection can be set up directly through the mounting screws (not with laterally mounting).

With a not grounded mounting surface or lateral mounting a ground strap or a suitable PE-cable has to be used.
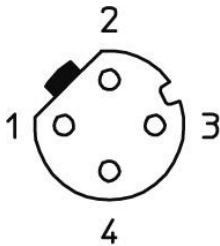
5. Wiring

5.1. Pin assignments

All connector pin arrangements that are shown in this chapter show the view from the front to the mating area of the plug connectors.

5.1.1. EtherNet/IP ports, M12 female connectors, 4-pole, D-coded

Colour code of the connectors: green

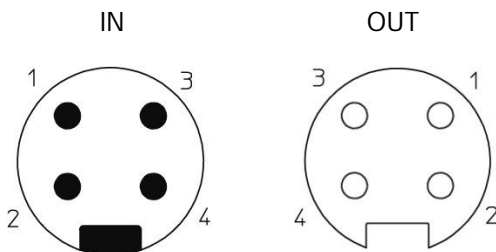| Connector	Pin	Signal	Function
EtherNet/IP ports X01, X02	1	TD+	Transmit Data +
	2	RD+	Receive Data -
	3	TD-	Transmit Data +
	4	RD-	Receive Data -

ATTENTION, risk of destruction!
Do not connect power supply lines (24 V DC) to the data lines.

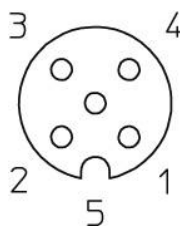### 5.1.2. Power supply connectors, MINI, 7/8″, 4-pole, male/female connectors

Colour code of the connectors: grey

IN   OUT

Connector	Pin	Signal	Function
Power supply X03, X04	1	+24 V DC	Actuator power UL
	2	+24 V DC	System/sensor power US
	3	0 V DC	System/sensor power US
	4	0 V DC	Actuator power UL

5.1.3. Sensor/actuator connector, M12-socket, 5-pole

Colour code of the connector: black

Connector	Pin	Function	
		0980 ESL 710	0980 ESL 711
Sensor/ actuator X1…X8	1	+24 V DC	+24 V DC
	2	IN/OUT B	IN B
	3	0 V DC	0 V DC
	4	IN/OUT A	IN A
	5	Earth/GND	Earth/GND

6. Configuring and commissioning

The configuration and commissioning of the I/O-modules described on the following pages was accomplished with the help of the RSNetWorx-software from Rockwell Automation Inc. In case of using a control system from another controller supplier please attend to the associated documentation.

6.1. EDS-file

For the configuration of the I/O-modules in the control system an EDS-file is required. Both modules need a unique EDS-file. The files can be downloaded from our homepage under

http://www.beldensolutions.com/en/Service/Downloadcenter/Software_Lumberg/index.phtml.

On request the EDS-file would be mailed also by the support team.

The name of the files is as follows:

LioN-M_EDS_0980ESL710_Rev_Vx_y.eds,
LioN-M_EDS_0980ESL711_Rev_Vx_y.eds

in which "x" expresses the major revision and "y" the minor revision of the files.

After installing the EDS-files with the help of the hardware or network configuration tools of the specific PLC manufacturers the modules should be available in the hardware catalogues as "General Purpose Discrete I/O" devices.

6.2. MAC addresses

Each of the two I/O-modules gets one unique MAC address that is assigned on delivery. This address cannot be changed by the user. The MAC address assigned to a module is printed on a label on the back side of the module.

6.3. Setting the EtherNet/IP network parameters (IP-settings)

The network parameters such as IP-address, subnet mask and gateway address are set by three rotary switches that can be found on the front side of the modules behind the transparent cover.

The three rotary switches are used to adjust the operation mode for receiving the network parameters (IP-settings). During a power-on reset the switch settings are read in. The selected operation mode overwrites the stored settings.

The device supports the DHCP (Dynamic Host Configuration Protocol) and BOOTP (Bootstrap Protocol) protocols for receiving the necessary network parameters like IP-address and subnet mask.

6.3.1. Default manufacturer settings of the network parameters

IP-address: 192.168.001.001 (see information below)
Subnet-mask: 255.255.255.000
Gateway address: 000.000.000.000

As of firmware version 1.1.3.0 and higher, the default IP-address has been changed from 192.168.100.001 to 192.168.001.001.

6.3.2. Rotary switch setting 000 (delivery state)

In the delivery state the DHCP and BOOTP functionality is activated. The network parameters are requested by DHCP requests first and, if this is not successful, by BOOTP requests. The network parameters are not stored but storing is possible by using the integrated web server.

6.3.3. Rotary switch setting 000 (network parameters have been stored before)

The last stored network parameters are used (IP-address, subnet mask, gateway address, DHCP on/off, BOOTP on/off)

6.3.4. Rotary switch setting 001 to 254

The last octet of the stored or pre-adjusted IP-address is overwritten by the setting of the rotary switches.

6.3.5. Rotary switch setting 255 to 998 (exception: 888)

The network parameters are requested by DHCP and BOOTP without storing.

6.3.6. Rotary switch setting 888

The device performs a factory reset. The network parameters are restored to the factory settings. In this mode, no network communication is possible.

6.3.7. Rotary switch setting 999

The default manufacturer IP-address 192.168.001.001 is used, see information on this page.

6.4.   PLC configuration

The configuration and commissioning of the EtherNet/IP I/O-modules as described on the following pages was accomplished with the help of the *RSLogix 5000*-software of *Rockwell Automation*. In case of using a control system from another controller supplier please attend to the associated documentation.

1. Create a "Generic Ethernet Module" under the Ethernet section in the *I/O Configuration* tree.
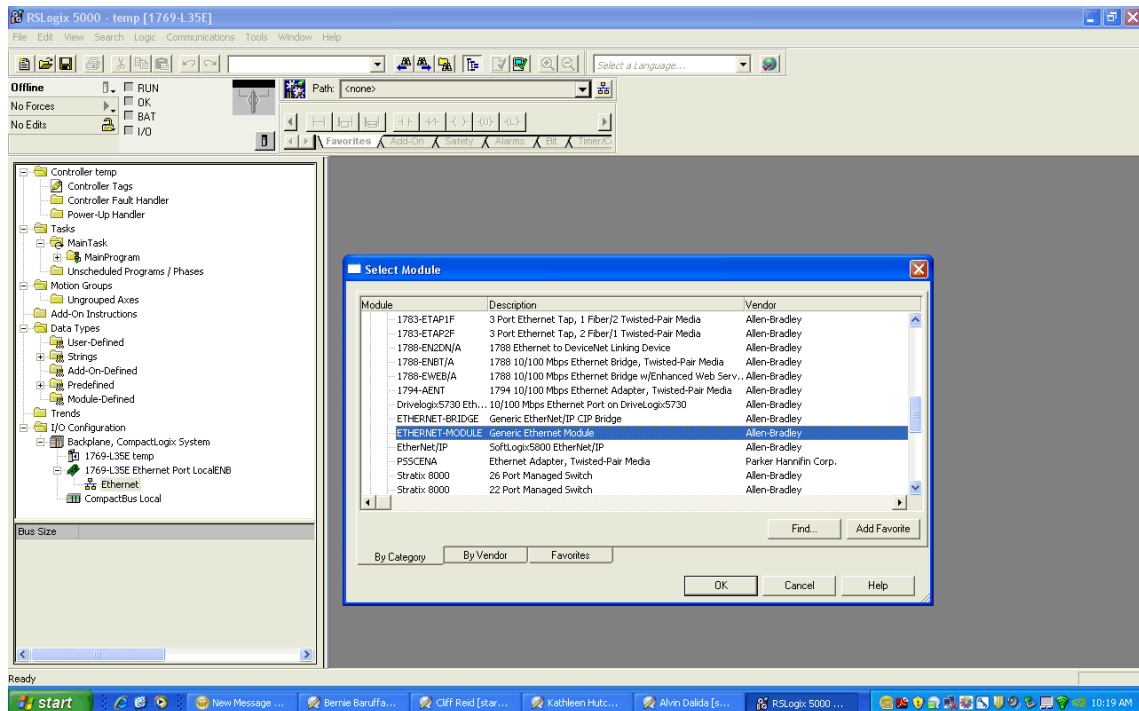
2. Edit the settings of the new *Generic Ethernet Module*. As shown in the screen shot below, the module was named "lumberg_automation_eip" and the IP-address 192.168.100.10 was used for it.
    Comm Format
    The I/O-module 0980 ESL 710 requires the data type *Data – SINT* for the *Comm Format*.
   The data type *Input Data – SINT* is necessary for the I/O-module 0980 ESL 711 to built up an Input Only connection with the module.

    Assembly instance IDs
    The I/O-module 0980 ESL 710 uses minimum two bytes and maximum seven bytes for input Assembly Instance 101 and two bytes for output Assembly Instance 100.

    The second I/O-module 0980 ESL 711 uses minimum two bytes and maximum seven bytes for input Assembly Instance 101. Although the I/O-module 0980 ESL 711 does not have physical outputs a value of 193 shall be selected for the output Assembly instance. The value 193 is necessary to build up an Input Only communication path. As the *Comm Format* was set to *Input Data-SINT* it is not possible to enter a length for the output Assembly instance.

    RSLogix 5000 requires a configuration assembly instance. Both modules do not provide a configuration assembly instance. Therefore it is allowed to select an Assembly Instance of 102 and to set the size to zero.
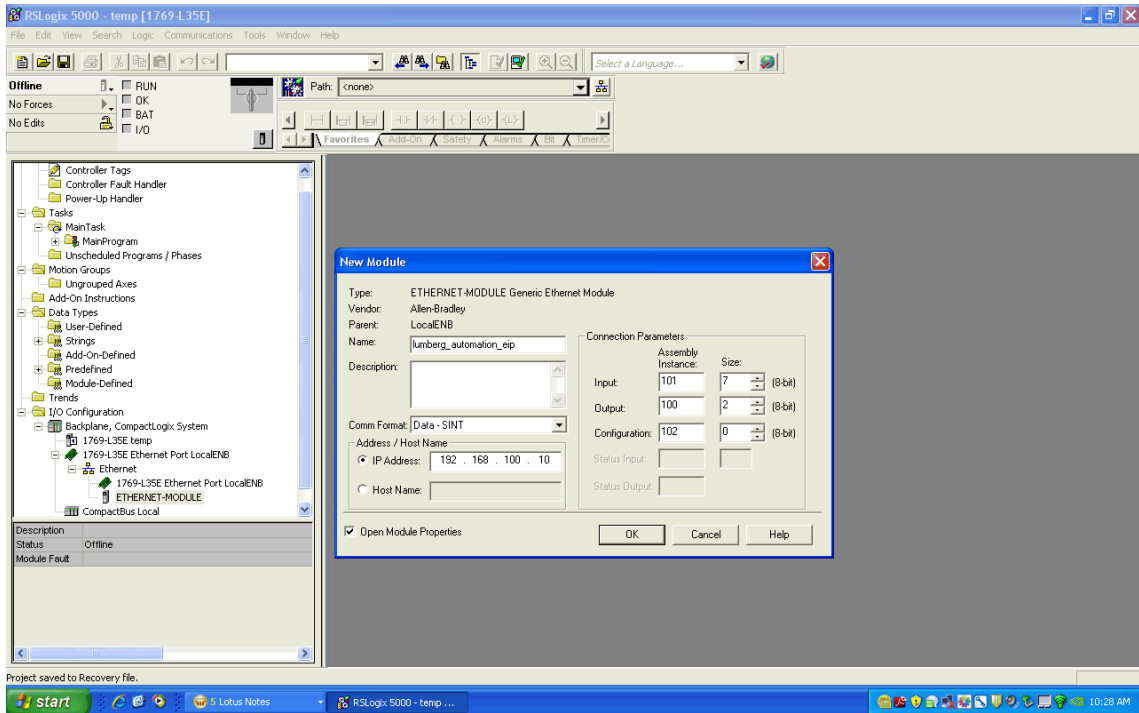
3. The setting of 10msec for the *Requested Packet Interval (RPI)* is adequate but it is possible to change this value as required. A lower value as 5ms shall not be selected.
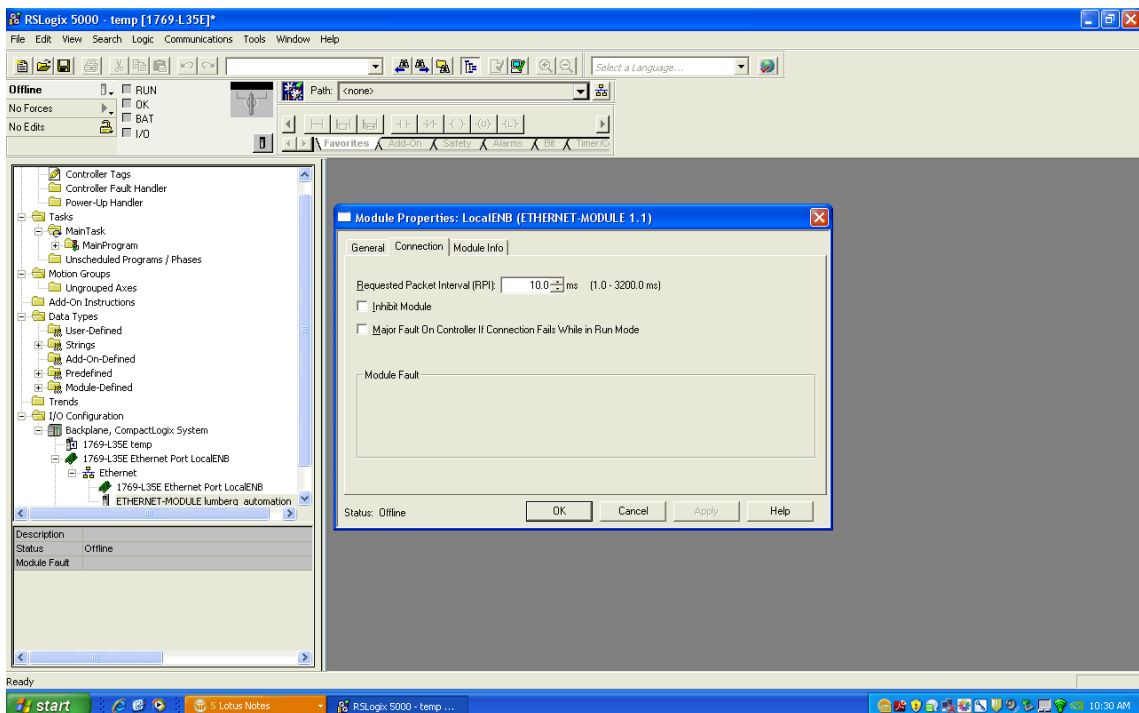
4. After the configuration is completed the controller tags are created. The first two bytes of the input controller tags are the process data (channel status) of the 16 inputs, and the remaining maximum five input bytes contain diagnostic information. This number of bytes is the same for both I/O-modules 0980 ESL 710 and 0980 ESL 711. Additionally, the module 0980 ESL 710 provides 2 bytes of output controller tags that include the process data of the 16 outputs. Reference the bit assignment information listed in this document in the next chapter.

It is possible to use any combination of the input or output bytes for a total of 16bits (2bytes). The mixing of inputs and outputs on the same I/O-port of the I/O-module 0980 ESL 710 is permitted (8 I/O-ports, 2 signals per port).
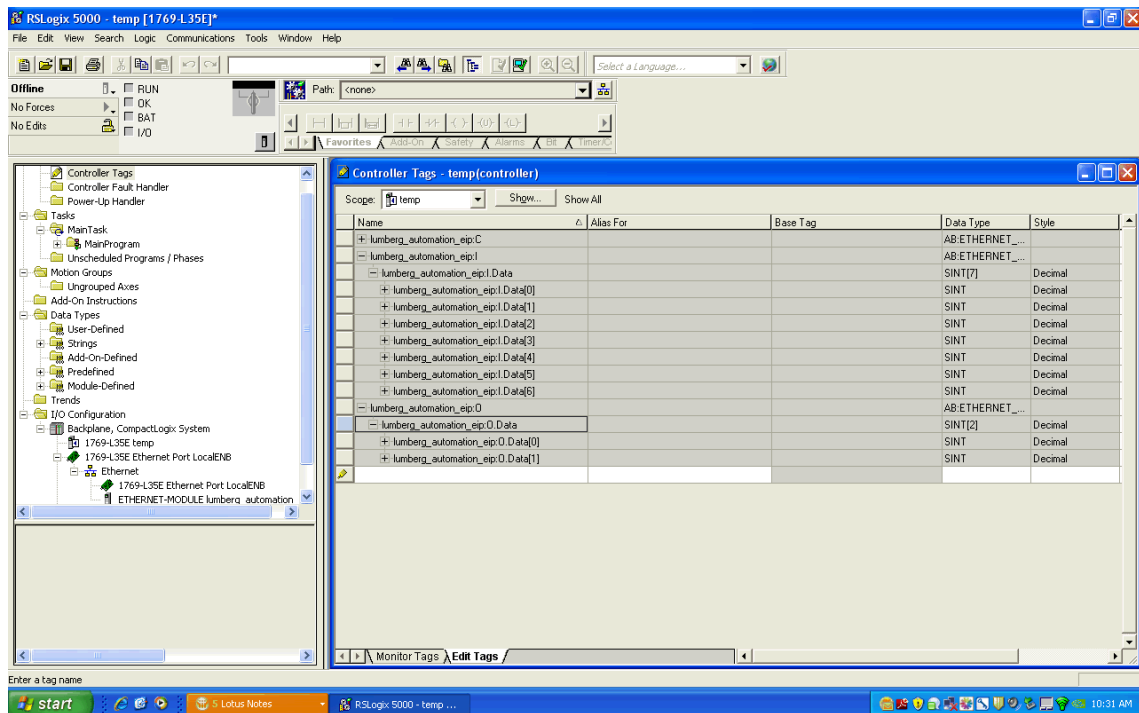
6.4.1. Initial connection parameter settings

In case of using the PLC configuration tools of other manufacturers you might be requested to enter further parameters to establish the communication connection between the EtherNet/IP I/O-scanner of your manufacturer and the LioN-M I/O-modules. The following tables provide a list of useful parameters.

a) 0980 ESL 710

Application Type	Exclusive-Owner
Trigger Mode	Cyclic
Requested Packet Interval (RPI)	minimum 5 ms
Originator To Target (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 bytes
Target To Originator (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	minimum 2 to maximum 7 bytes

b) 0980 ESL 711

Application Type	Input-Only
Trigger Mode	Cyclic
Requested Packet Interval (RPI)	minimum 5 ms
Originator To Target (O->T) connection parameters	
Real Time Transfer Format	Heartbeat
Connection Type	POINT2POINT
Assembly Instance ID	193
Data Type	USINT or *Input data - SINT*
Data Size	n/a
Data Length	n/a
Target To Originator (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	minimum 2 to maximum 7 bytes

6.5.   Device Level Ring

The firmware of both LioN-M I/O-modules supports the redundancy function DLR (Device Level Ring, ring topology). The supported DLR class is "beacon based" according to the EtherNet/IP specification.

7. Bit assignment

Please note that the amount of provider data (input data bytes) may vary depending on the selection whether diagnostic data should be transmitted or not. The diagnostic data is added as additional bytes to the standard process input data.

7.1. Provider (input) data

7.1.1. Channel status

The status of the 16 input channels is always transmitted. If only the channel status is needed the minimum length of two bytes shall be selected for the Assembly Instance 101.

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	4B	4A	3B	3A	2B	2A	1B	1A
Byte 1	8B	8A	7B	7A	6B	6A	5B	5A

7.1.2. Module related diagnostic

The LioN-M I/O-modules provide one byte of module related diagnostic. The bit assignment can be found in the following table. To receive the module related diagnostic select a minimum length of three bytes for the Assembly Instance 101.

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 2	0	0	BW	0	SCA	SCS	LVA	LVS

7.1.3. Channel related diagnostic

Both I/O-modules also offer a channel related diagnostic. The next table shows the bit assignment of this diagnostic. To receive this diagnostic a minimum length of 7 byte shall be selected for the Assembly Instance 101 on the I/O-module 0980 ESL 710. A length of 7 bytes for Assembly Instance 101 is also possible for the I/O-module 0980 ESL 711. Because of the fact that 0980 ESL 711 has no physical outputs the last two bytes of the channel related diagnostic can be omitted, so that a length of 5 bytes is sufficient for Assembly Instance 101.

INPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 3	LVS-4B	LVS-4A	LVS-3B	LVS-3A	LVS-2B	LVS-2A	LVS-1B	LVS-1A
Byte 4	LVS-8B	LVS-8A	LVS-7B	LVS-7A	LVS-6B	LVS-6A	LVS-5B	LVS-5A
Byte 5	LVA-4B	LVA-4A	LVA-3B	LVA-3A	LVA-2B	LVA-2A	LVA-1B	LVA-1A
Byte 6	LVA-8B	LVA-8A	LVA-7B	LVA-7A	LVA-6B	LVA-6A	LVA-5B	LVA-5A

Legend:
1A...8A: Input status of channel A (contact pin 4) on ports 1 to 8
1B...8B: Input status of channel B (contact pin 2) on ports 1 to 8
LVS: Low voltage on sensor channel
LVA: Low voltage on actuator channel
SCS: Short circuit on sensor channel
SCA: Short circuit on actuator channel
BW: Broken wire detection

7.2. Consumer (output) data

Only the LioN-M I/O-module with universal functionality 0980 ESL 710 consumes output data.

OUTPUT	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	4B	4A	3B	3A	2B	2A	1B	1A
Byte 1	8B	8A	7B	7A	6B	6A	5B	5A

Legend:
1A...8A: Output status of channel A (contact pin 4) on ports 1 to 8
1B...8B: Output status of channel B (contact pin 2) on ports 1 to 8

8. The embedded web server

Both I/O-modules provide an embedded web server for configuration, monitoring and diagnostics.

8.1. The Home page

The Home page can be reached through a web browser by selecting the address:

http://[IP-address]/home.htm.

The placeholder [IP-Address] should be replaced by the actual IP-address of the I/O-module.
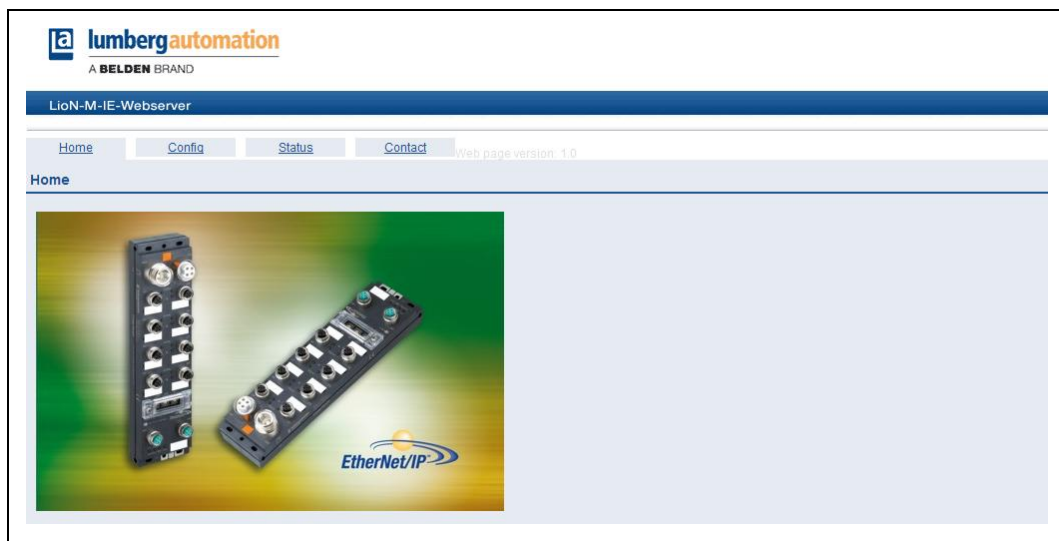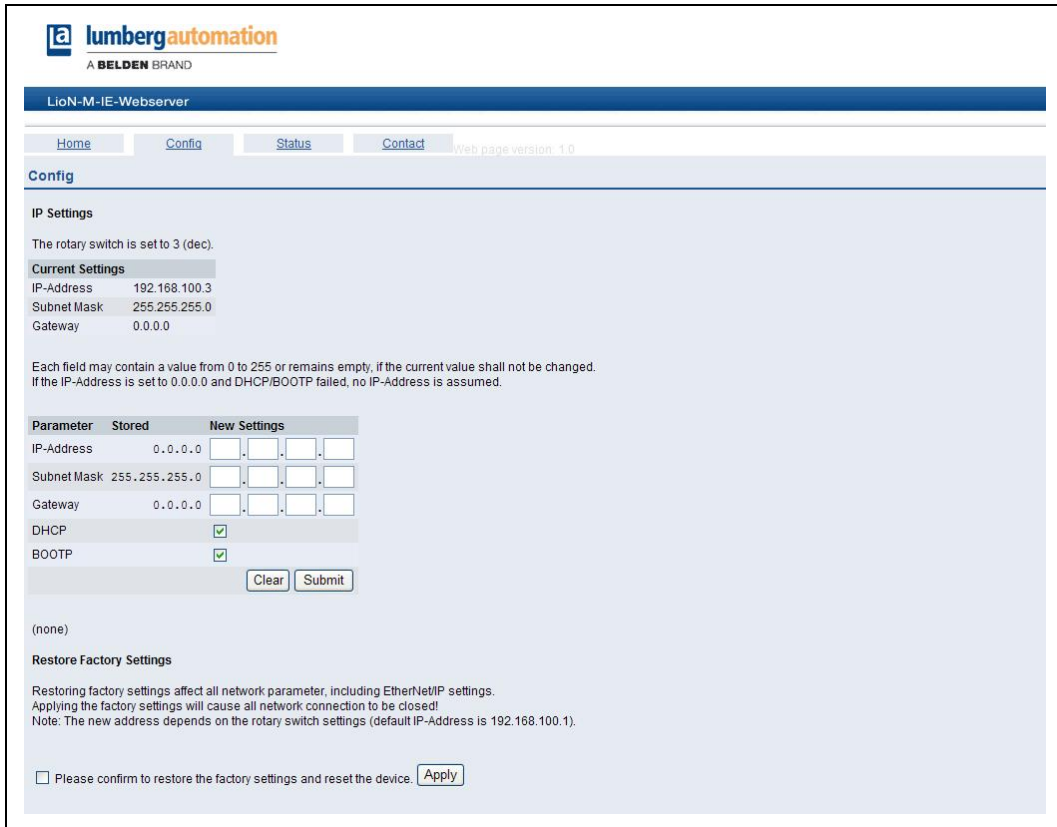

8.2. The *Config* page

The Config page can be reached through a web browser by selecting the address:

http://[IP-address]/config.htm.

The following values and parameters can be read and changed through this page:

o Network parameters (IP settings)
  ▪ IP-address, read- and writeable
  ▪ Subnet mask, read- and writeable
  ▪ Gateway address, read- and writeable

o Additional network parameters
  ▪ BOOTP, read- and writeable
  ▪ DHCP, read- and writeable

o Device status
  ▪ Restore Factory Settings, only writeable

By pressing the button Submit the new parameter settings are transmitted to the I/O-module.
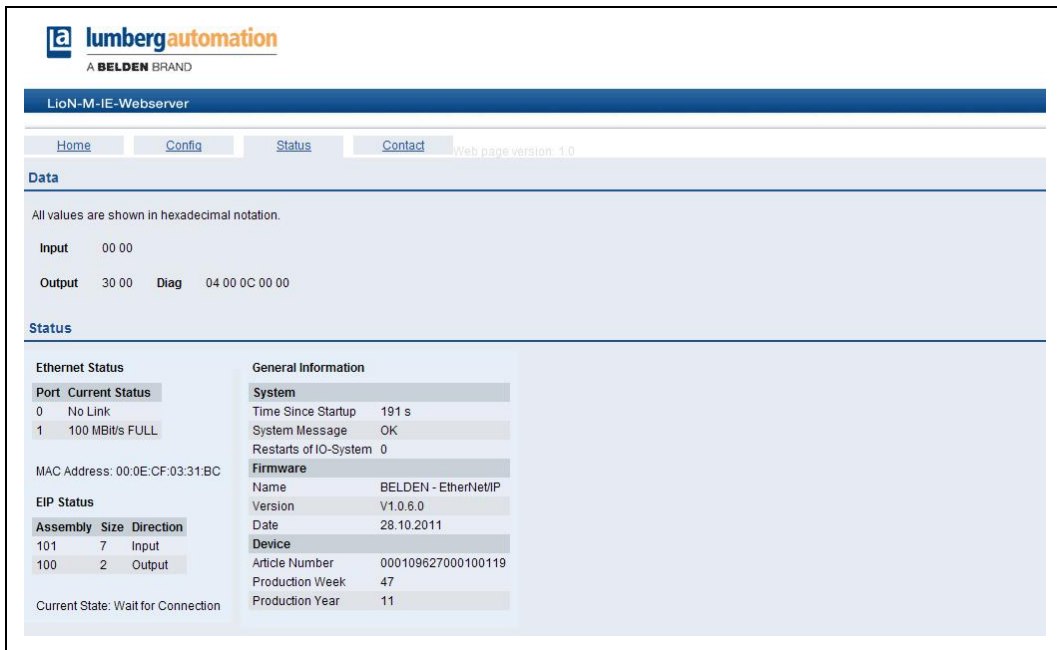The new settings are adopted by the I/O-module only after a power-on reset.

8.3.   The *Status* page

The Status page can be reached through a web browser by selecting the address:

http://[IP-address]/status.htm.

The following values and parameters can be read through this page. All values and parameters are read-only.

o Content of the Assembly Instances (Input, Output, Diagnostics)
o LAN-port status
   ▪ Duplex Mode (full duplex, half duplex)
   ▪ Speed (10 MBit, 100 MBit)
o Network parameter
   ▪ MAC Adresse
o Size and direction of the Assembly Instances

- o EtherNet/IP status
  - ▪ Standby, Operational
- o Device status
  - ▪ Operating time
  - ▪ System informations
  - ▪ Number of I/O-system restarts
- o Firmware version and date
- o Device information
- o Revision
  - ▪ Part number
  - ▪ Serial number
  - ▪ Year and week of production

8.4.   The *Contact* page

The Contact page can be reached through a web browser by selecting the address:

http://[IP-address]/contact.htm.

This page gives information about our contact data.
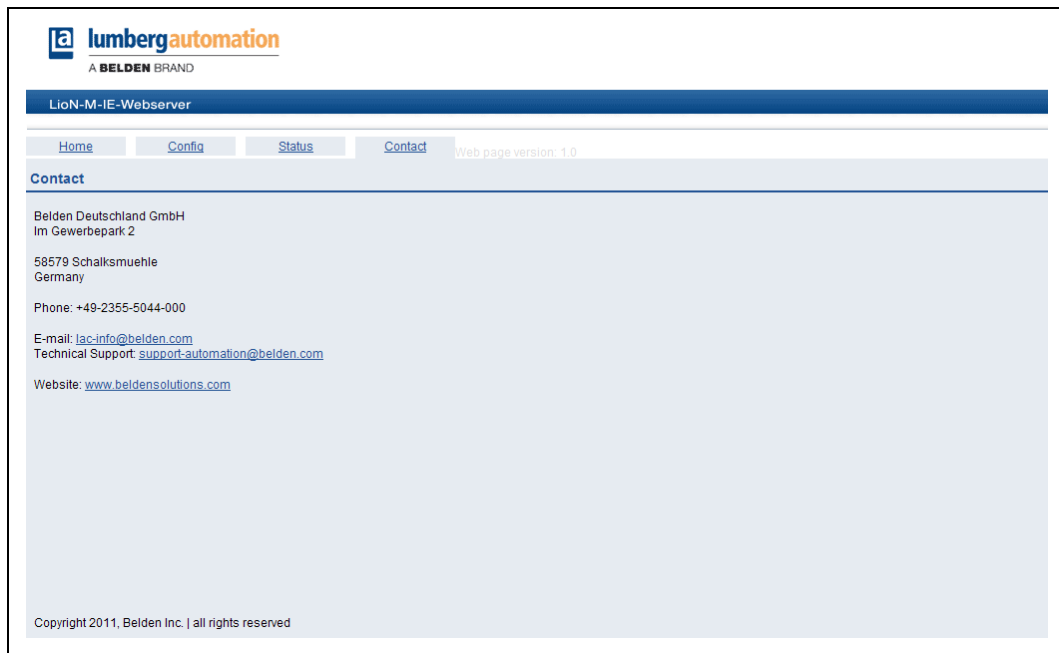
8.5.   Upload of process and diagnostic data using the web interface

The process and diagnostic data of the two I/O-modules can be uploaded by means of the integrated web server. The web server provides this data in the standardized JSON format. Access to the data is granted by the following web page:

http://[IP-address]/data.jsn

In higher level programming languages a HTTP request uploads the process and diagnostic data.
The following example uses the GET command in a HTTP request to obtain the data:

HTTP request:
```
GET /data.jsn HTTP/1.1
```

HTTP response:
```
HTTP/1.1 200 OK
Server: servX
Content-Length: 73
Content-Type: application/json

{"ProcessData": {"In": [0,0],"Out": [0,12]}
,"Diagnostic": [4,48,0,0,0]}
```

The response has the following object structure:
- ProcessData
  - In: Array[a,b]
  - Out: Array[a,b]
- Diagnostic: Array[a,b,c,d,e]

9.   Firmware update of the LioN-M I/O-modules

The firmware of both LioN-M I/O-modules allow the update of the firmware file with the help of web-based services. Before updating the firmware it is recommended to follow the following instructions.

> **Important note!**
> Please observe the following description of the firmware update exactly since otherwise the I/O-modules cannot function properly any longer.
> We recommend to perform the firmware update only if really needed. Please, use firmware files released exclusively by Belden Deutschland GmbH – Lumberg Automation™.
> We do not guarantee for non-compliance with these instructions.

1. Disconnect the I/O-module from all connections to sensors and actuators by unscrewing the M12 connecting plugs.

2. Disconnect also the connection to your control unit and other EtherNet/IP devices.
   Only the computer which is intended to accomplish the update should be connected to the I/O-module.

3. Perform a power reset at the I/O-module by interrupting the power supply for a short time.
   However, after starting the update it has to be ensured that the power supply cannot be interrupted any more.
   The green LED U$_S$ must light permanently.

4. Make sure that a correct IP-address is assigned to the I/O-module. See chapter 6.3 for setting IP-parameters.

5. Start the web browser on your computer and open the homepage of the I/O-module to check the access to it.

6. Open the firmware transfer page of the I/O-module by entering *http://[IP-address]/fwupdate* in the address bar of your web browser. It is not possible to access the firmware transfer page by other means. The following web page should open. This page identifies the version and date of the actual firmware and allows the selection and transfer of the new firmware file.
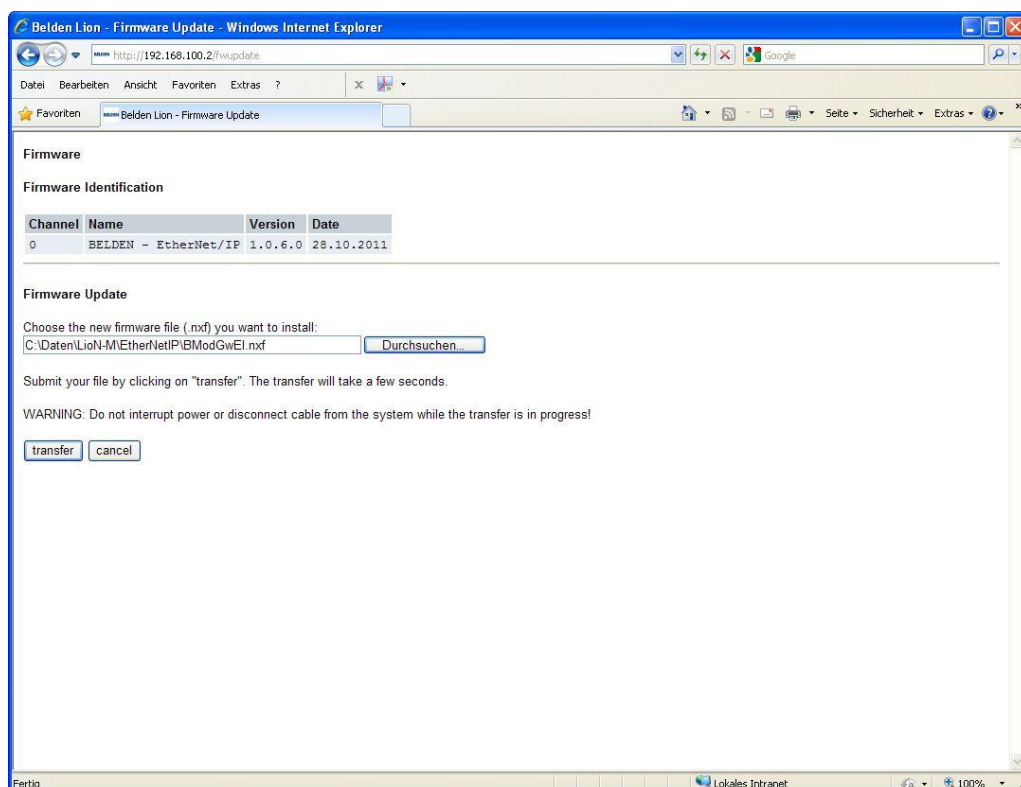
7. Select the new firmware file by pressing the *Search* button and open the folder on your computer with the correct file. The file shall be available with 8.3 notation and the file extension shall be *".nxf".*

8. Submit the file by pressing the *Transfer* button. After a successful transfer the following page should open.
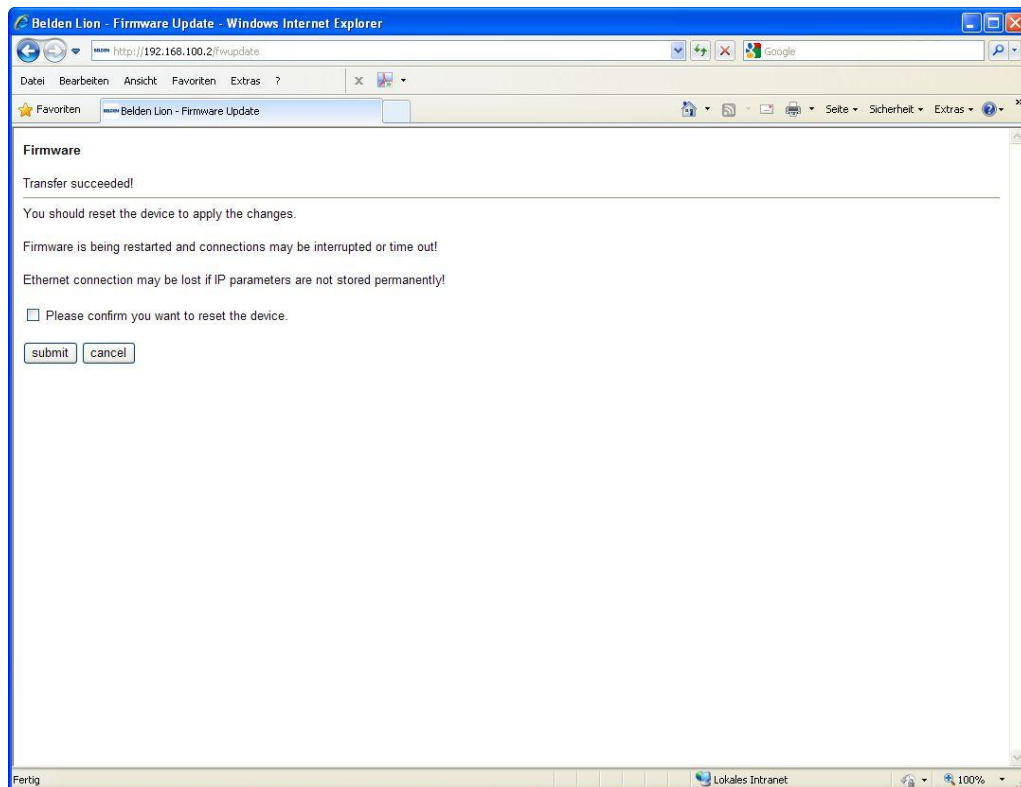
9. Confirm the reset of the I/O-module by activating the checkbox and pressing the *Submit* button. The module starts with the new firmware. Please note that the IP-parameters may be lost after the reset and need to be re-assigned.

If the transfer of the new firmware file is not completed successfully a web page opens with one of the following failure messages:

- Invalid File Name
  This error is reported, if the file name/file extension does not correspond to the 8.3-notation.
- Invalid Checksum
  This error is reported if the checksum that is stored in the file header does not comply with the calculated checksum of the transferred firmware file.
- Invalid Manufacturer
  This error is reported if the manufacturer identifier in the firmware file does not comply with that one stored in the Security-EEPROM of the I/O-module.
- Invalid Device Class
  This error is reported, if the device class in the firmware file does not comply with the class stored in the Security-EEPROM of the I/O-module.
- Incompatible Hardware
  This error is reported if the hardware identifier in the firmware file does not comply with the indentifier stored in the Security-EEPROM of the I/O-module.
- Incompatible Hardware Options
  This error is reported if the hardware option code in the firmware file does not comply with the hardware option code stored in the Security-EEPROM of the I/O-module.

If the transfer of the firmware file is rejected due to one of the above mentioned reasons the file shall be discarded.

10. Technical data

10.1. General data

Degree of protection	IP 67 (only with screwed connectors)
Ambient temperature	-10°C (+14°F) / +60°C (+140°F)
Weight	390 g
Housing material	PBT
Vibration resistance	15 g / 5–500 Hz
Shock resistance	50 g / 11 ms
Torques: • Fastening screw M4 • M12 connectors	 1,0 Nm 0,5 Nm

10.2. Technical data of the bus system

Protocol	EtherNet/IP
EDS-file	LioN-M_EDS_0980ESL710_Rev_Vx_y.eds LioN-M_EDS_0980ESL711_Rev_Vx_y.eds
Transmission rate	10/100 Mbit/s, Full Duplex
Transmission method Autonegotiation	100BASE-TX supported
Vendor code	21_D
Product type	7
Product type string	"General Purpose Discrete I/O"
Product code	710 (0980 ESL 710) 711 (0980 ESL 711)
Supported Ethernet protocols	• Ping • ARP • LLDP • SNMP (Network diagnostics) • HTTP • TCP/IP • DHCP • BOOTP
Switch-functionality	integrated
EtherNet/IP-interface Connections Autocrossing	 2 M12-sockets, 4-pole, D-coded (see pin assignments) supported

10.3. Technical data of the power supply for the electronics and sensors

Rated voltage U_S	24 V DC
Voltage range	19–30 V DC
Current consumption electronics	typ. 95 mA
Voltage level power supply sensors	min. (U_S - 1.5 V)
Power consumption sensors	max. 200 mA (at T_u 30°C)
Reverse polarity protection	yes
Operation indicator (U_S)	LED green
Connection	Mini, 7/8" connectors male / female, 4-pole see pin assignments

10.4. Technical power supply actuators

Rated voltage U_L	24 V DC
Voltage range	19–30 V DC
Galvanic separation	yes
Low voltage threshold	typ. 17 V
Delay time low voltage detection	< 20 ms
Inverse polarity protection	yes
Operation indicator (U_L)	LED green
Connection	Mini, 7/8" connectors male/female, 4-pole see pin assignments

CAUTION!
The inverse polarity protection only works, if the actuator power supply is protected by an over-current fuse (10 A, mT) and switched off after a short circuit within 10 to 100 ms at the latest.

ATTENTION!
A power supply unit with current control or a wrong fuse lead to damage of the module in case of inverse polarity connection.

10.5. Technical data inputs

Input circuit	Type 3 according to IEC 61131-2
Rated input voltage	24 V DC
Input current at 24 V DC	typ. 5 mA
Short-circuit proof	yes
Channel type	N.O., p-switching
Number of digital channels	16
Status indication	LED yellow per channel
Diagnostic indication	LED red per socket
Connection	M12 female connector, 5 poles see pin assignments

10.6. Technical data outputs

Output circuit	Type 1.6 A according to IEC 61131-2
Rated output current per channel:	1.6 A, please see Info 1
Signal state "1" Signal state "0"	max. 1.9 A max. 1 mA (according to specification)
Signal level of the outputs Signal state "1" Signal state "0"	 min. (U_L - 1 V) max. 2 V
Short-circuit proof	yes
Max. output current per module	9.0 A, (12.0 A please see Info 2)
Overload-proof	yes
Number of digital channels	16
Channel type	N.O., p-switching
Status indication	LED yellow per channel
Diagnostics indication	LED red per channel/socket
Connection	M12 female connector, 5 poles see pin assignments

Info 1: The outputs are able to switch currents of 1.6 A with a frequency of 1 Hz with inductive loads of the utilization category DC13 (EN60947-5-1).

Info 2: Technically feasible and approved under the following conditions:
Looped through sensor/system power, maximum 2.5 A
Minimum cross section of power supply cable: 4x 1.0 mm²
Ambient temperature maximum 40 °C/ 104 °F

10.7. LED indicators

U_S	green	System-/ sensors power supply applied
	off	System-/ sensors power supply missing
U_L	green	Actuator power supply applied
	off	Actuator power supply missing
X1...X8 A/DIA	yellow	Channel status A
	red	Periphery fault (sensor or actuator overload/short circuit)
	off	Not connected, no status, no fault
X1...X8 B	yellow	Channel status B
	red	Periphery fault (actuator overload/short circuit)
	off	Not connected, no status, no fault
P1 Lnk / Act P2 Lnk / Act	green	Ethernet connection to another participant exists. Link detected.
	yellow flashing	Data exchange with another participant.
	off	No connection with another participant. No link, no data exchange.
MS	green	Device ready for operation
	green flashing	Stand-by, device not configured
	red	Fatal, non-recoverable fault
	red flashing	Light, recoverable fault. For example, a wrong or inconsistent configuration is classified as a light fault.
	red/green alternating flashing	Device performs a self-test.
	off	Device switched off.
NS	green	Connected: The device has at least one existing connection.
	green flashing	No connection: The device has no existing connections. IP-address is available.
	red	Redundant IP-address. The device detected that its IP-address is already used by another device.
	red flashing	Connection time-out
	red/green alternating flashing	Device performs a self-test.
	off	Device switched off or no IP-address available