

## LioN-Link BusHead ProfiNet-IO-Device-Slave



Technical Manual  
0940 ESL 601

## Table of contents

|        |  |    |
|--------|--|----|
| 1.     | About this manual.....   | 4  |
| 1.1.   | Explanation of the symbolism .....   | 4  |
| 1.1.1. | Use of notes .....   | 4  |
| 1.1.2. | Use of hazard warnings.....  | 4  |
| 1.2.   | Safety guidelines .....  | 5  |
| 1.2.1. | Normal conditions of use .....   | 5  |
| 1.3.   | Qualified personnel.....   | 6  |
| 1.4.   | Version information of the manual.....   | 6  |
| 2.     | System description.....  | 7  |
| 3.     | Product overview.....  | 8  |
| 3.1.   | Module variants.....   | 8  |
| 3.2.   | Accessories .....  | 8  |
| 4.     | Mounting .....   | 10 |
| 4.1.   | Outer dimensions .....   | 10 |
| 4.2.   | Notes for the field installation .....   | 11 |
| 5.     | Wiring .....   | 12 |
| 5.1.   | Pin assignments .....  | 12 |
| 5.1.1. | PROFINET ports, M12-socket, 4-pole, D-coded .....  | 12 |
| 5.1.2. | Power supply connector for the BusHead, M12-plug, 5-pole.....  | 12 |
| 5.1.3. | Link system connector, M12-socket, 5-pole.....   | 13 |
| 5.2.   | Intermediate power supply feed on LioN-Link I/O-modules.....   | 14 |
| 5.2.1. | T-connector for intermediate power supply .....  | 14 |
| 5.2.2. | Auxiliary tool for the determination of the voltage drop and the place of the intermediate power supply feed. .... | 15 |
| 6.     | Configuring and commissioning .....  | 16 |
| 6.1.   | GSDML-file.....  | 16 |
| 6.2.   | MAC addresses .....  | 16 |
| 6.3.   | SNMP .....   | 16 |
| 6.4.   | Configuration of the LioN-Link PROFINET system in <i>STEP7</i> .....   | 17 |
| 6.4.1. | Assignment of a unique device name .....   | 18 |
| 6.4.2. | Assignment of the device name to the BusHead .....   | 18 |
| 6.4.3. | Device exchange without removeable media/PG .....  | 19 |
| 6.4.4. | The parameter <i>Interchanged Modules</i> .....  | 21 |
| 6.4.5. | Prioritized startup .....  | 22 |
| 6.4.6. | Resetting the BusHead to factory settings.....   | 22 |

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|       |   |    |
|-------|---|----|
| 7.    | The integrated web server .....                                     | 23 |
| 7.1.  | The homepage (Overview).....  | 23 |
| 7.2.  | The configuration page (Configuration) .....                        | 24 |
| 7.3.  | The monitoring page (Monitoring) .....                              | 25 |
| 8.    | Firmware update.....  | 26 |
| 9.    | Alarm and error messages of the BusHead.....                        | 27 |
| 9.1.  | Evaluation of alarms in <i>STEP7</i> .....                          | 27 |
| 9.1.  | Reaction of the BusHead to a module breakdown („pull “ alarm) ..... | 27 |
| 9.2.  | Channel diagnostics .....   | 28 |
| 10.   | Technical data .....  | 29 |
| 10.1. | General data.....   | 29 |
| 10.2. | Technical data of the bus system.....                               | 29 |
| 10.3. | Technical data of the power supply for the BusHead electronics..... | 29 |
| 10.4. | LED indicators .....  | 30 |

## 1. About this manual

Please read the assembly and operating instructions of this manual carefully, before you put the LioN-Link system 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 PROFINET BusHead of the LioN-Link system.

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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Belden Deutschland GmbH -Lumberg Automation- reserves any technical changes or changes to this manual without prior notice.

### 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 a PROFINET 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.



**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              | 01.06.2010 | 09.07.2014 | 29.08.2014 |         |         |         |
| Name / department | Knipp/PM   | Knipp/PM   | Knipp/PM   |         |         |         |

## 2. System description

LioN (Lumberg i/o network)-Link is a modular system 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 high 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-Link offers IP 67.

The LioN-Link system consists of the BusHead - the connection to the superordinate field bus - and the different field-bus-independent I/O modules. The maximum expansion of the link system amounts to 100 m for each link connection (two connections for each BusHead => total extension 200 m).

Each line can be extended with up to 15 I/O modules. The distance between two link participants is arbitrary. The permissible overall length for each line may not be exceeded however. Using the maximum expansion of the system an additional feed of the power supply for the system and sensors is possible through T-connectors and/or at the last link participant.

In order to keep the permissible values for a safe power supply of the modules it is necessary to calculate each system under the actual conditions (number of the modules and sensors as well as the cable length between the modules). For this a calculation table is available at the link

[http://www.beldensolutions.com/en/Service/Downloadcenter/Software\\_Lumberg/index.phtml](http://www.beldensolutions.com/en/Service/Downloadcenter/Software_Lumberg/index.phtml)

An example can be found in this manual in chapter 5.2.2.

As a link cable we recommend a standard CAN/DeviceNet cable. Also unshielded 5-pole cables with standard M12 plugs and jacks are suitable. As an alternative also Fixcon plugs and jacks can be used.

With the use of an unshielded cable an extension of 25 m for each line connection should not be exceeded. In plants with EMC load (in the near of controlled motors, frequency converter drives or in welding applications) the use of shielded cables (standard CAN/DeviceNet) is necessary.

### 3. Product overview

#### 3.1.

#### 3.2. Module variants

| Part number                                    | Description                             | I/O-connection      | Design |
|--|---|---------------------|--------|
| <b>LioN-Link BusHead</b>                       |   |                     |        |
| 0940 ESL 601                                   | BusHead                                 | PROFINET IO         | M      |
| <b>LioN-Link modules universal I/O digital</b> |   |                     |        |
| 0942 UEM 600                                   | 8 In/Out universal                      | 4xM12               | S      |
| 0942 UEM 650                                   | 8 In/Out universal                      | 8xM8                | S      |
| 0942 UEM 700                                   | 16 In/Out universal                     | 8xM12               | M      |
| 0942 UEM 780                                   | 16 In/Out universal                     | Multipole interface | M      |
| <b>LioN-Link modules input I digital</b>       |   |                     |        |
| 0942 UEM 601                                   | 8 In                                    | 4xM12               | S      |
| 0942 UEM 651                                   | 8 In                                    | 8xM8                | S      |
| 0942 UEM 701                                   | 16 In                                   | 8xM12               | M      |
| <b>LioN-Link modules input I analogue</b>      |   |                     |        |
| 0942 UEM 630                                   | I/O-module 4A I (0)4–20mA               | 4xM12               | S      |
| 0942 UEM 631                                   | I/O-module 4A I 0–10V                   | 4xM12               | S      |
| <b>LioN-Link modules output O digital</b>      |   |                     |        |
| 0942 UEM 602                                   | 4 Out                                   | 4xM12               | S      |
| 0942 UEM 612                                   | 4 Out (for safety related applications) | 4xM12               | S      |
| 0942 UEM 782                                   | 16 Out                                  | Multipole interface | M      |
| <b>LioN-Link special modules</b>               |   |                     |        |
| 0942 UEM 620                                   | IO-Link master                          | 4xM12               | S      |
| 0942 UEM 783                                   | Motion drive control                    | 8xM12               | M      |

### 3.3. Accessories

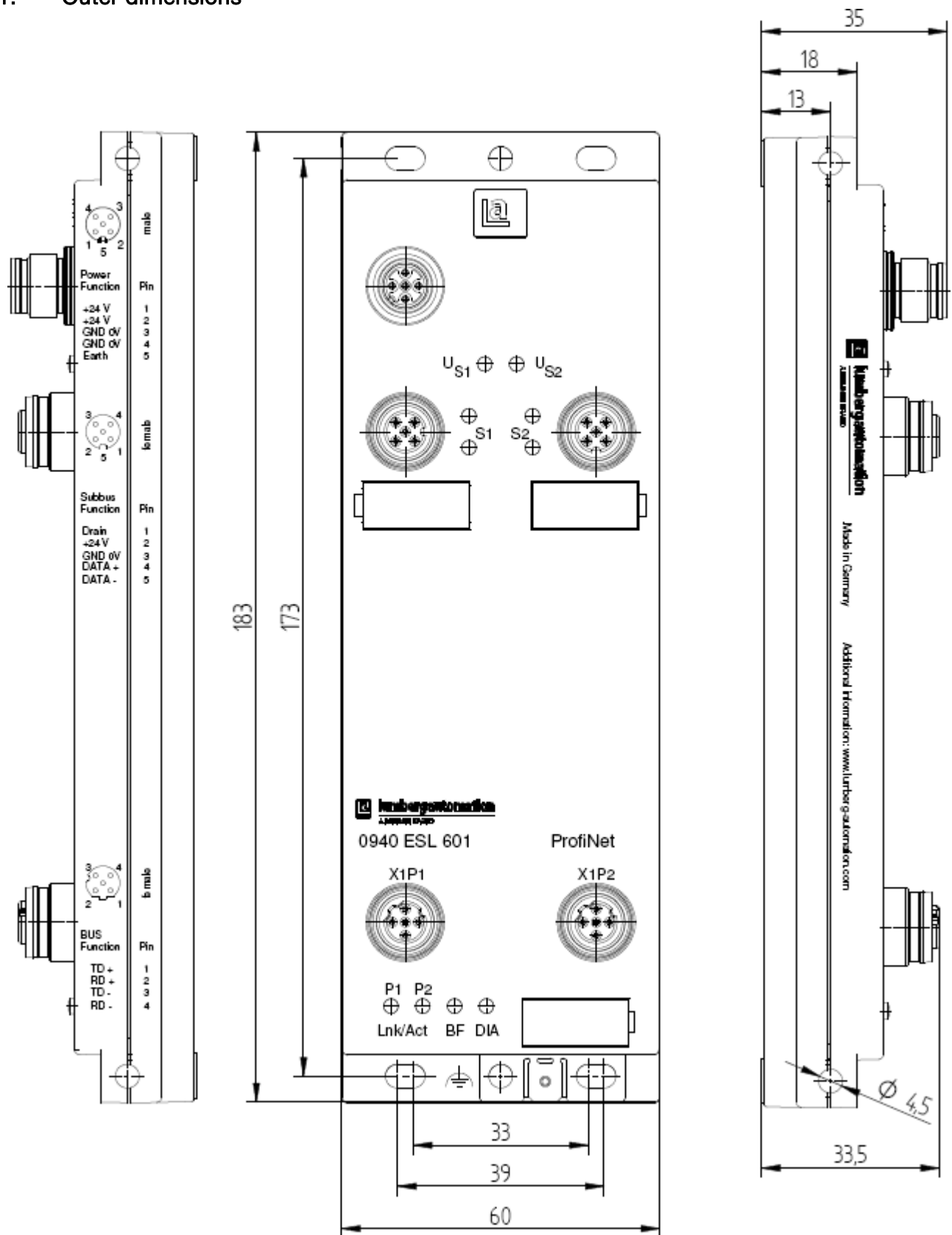
| Part number            | Description   |
|------------------------|---|
| <b>PROFINET</b>        |   |
| 0985 342 100/... M     | Connecting cable for PROFINET, double ended with M12-plug, straight, 4-pole, D-coded  |
| 0985 342 102/... M     | Connecting cable for PROFINET, single ended with M12-plug, straight, 4-pole, D-coded  |
| 0985 342 104/... M     | Connecting cable for PROFINET, double ended with M12-plug, straight, 4-pole, D-coded and RJ45-plug, straight                          |
| <b>LioN-Link lines</b> |   |
| 0935 253 103/... M     | Connecting cable for LioN-Link line, double ended, with M12-plug, straight, 5-pole, A-coded and M12-socket, straight, 5-pole, A-coded |
| 0935 253 104/... M     | Connecting cable for LioN-Link line, single ended, with M12-plug, straight, 5-pole, A-coded   |
| 0935 253 105/... M     | Connecting cable for LioN-Link line, single ended, with M12-socket, straight, 5-pole, A-coded   |
| 0935 253 106/... M     | Connecting cable for LioN-Link line, single ended, with M12-socket, angled, 5-pole, A-coded   |
| 0935 253 107/... M     | Connecting cable for LioN-Link line, single ended, with M12-plug, angled, 5-pole, A-coded   |



| Part number              | Description   |
|--------------------------|---|
| 0935 253 108/... M       | Connecting cable for LioN-Link line, double ended, with M12-plug, angled, 5-pole, A-coded and M12-socket, angled, 5-pole, A-coded |
| <b>Power supply</b>      |   |
| RKT 5-228/... M          | Connecting cable for power supply, single ended, with M12-socket, straight, 5-pole, A-coded                                       |
| RKWT 5-228/... M         | Connecting cable for power supply, single ended, with M12-socket, angled, 5-pole, A-coded   |
| RKT 5-226/... P89        | Connecting cable for additional power feed, single ended, with M12-socket, straight, 5-pole, contacts 1&3 connected, A-coded      |
| <b>Field attachables</b> |   |
| 0986 EMC 102             | Field attachable M12-plug for PROFINET cable, straight, 4-pole, D-coded, with spring-type terminals                               |
| RSC 5/9                  | Field attachable M12-plug for LioN-Link line and power supply, straight, 5-pole, A-coded  |
| RSCW 5/9                 | Field attachable M12-plug for LioN-Link line and power supply, angled, 5-pole, A-coded  |
| RKC 5/9                  | Field attachable M12-socket for LioN-Link line and power supply, straight, 5-pole, A-coded  |
| RKCW 5/9                 | Field attachable M12-socket for LioN-Link line and power supply, angled, 5-pole, A-coded  |
| <b>T-connectors</b>      |   |
| 0906 UTP 101             | T-connector for daisy-chaining the power supply.<br>Pay attention to the current load!  |
| 0906 UTP 104             | T-connector for additional power feed in the LioN-Link line.  |
| <b>Other accessories</b> |   |
|                          |   |

## 4. Mounting

### 4.1. Outer dimensions



## 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  | M4x30/35 | 1,0 Nm |
| laterally   | M4x40/70 | 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

#### 5.1.1. PROFINET ports, M12-socket, 4-pole, D-coded

Colour code of the connectors: green



| Connector                | Pin | Signal | Function        |
|--------------------------|-----|--------|-----------------|
| PROFINET<br>ports P1, P2 | 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 connector for the BusHead, M12-plug, 5-pole

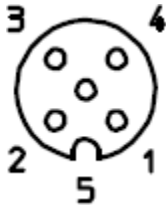
Colour code of the connector: grey



| Connector                          | Pin | Signal | Function                          |
|------------------------------------|-----|--------|-----------------------------------|
| Power supply<br>BusHead/<br>System | 1   | +24VDC | system/sensors line 1/2 + BusHead |
|                                    | 2   | +24VDC | system/sensors line 1/2 + BusHead |
|                                    | 3   | 0V     | system/sensors line 1/2 + BusHead |
|                                    | 4   | 0V     | system/sensors line 1/2 + BusHead |
|                                    | 5   | Earth  | Earth                             |

### 5.1.3. Link system connector, M12-socket, 5-pole

Colour code of the connector: **orange**



| Connector      | Pin | Signal | Function              |
|----------------|-----|--------|-----------------------|
| System bus out | 1   | Drain  | Shield                |
|                | 2   | +24 V  | 24 V system / sensors |
|                | 3   | 0 V    | 0 V system / sensors  |
|                | 4   | Data + | Data +                |
|                | 5   | Data - | Data -                |

The 24 V power supply in the bus connectors is used to energize the module electronics and the sensors of the system bus participants.



#### **ATTENTION! Risk of destruction!**

Do not connect the power supply lines (+24 V DC) to the data lines (Data + -> Pin 4, Data - -> Pin 5). Also the reverse connection of the power supply lines can lead to the destruction of the module.



#### **Important note!**

With long cable lengths an additional power supply feed is recommended, see following chapter.

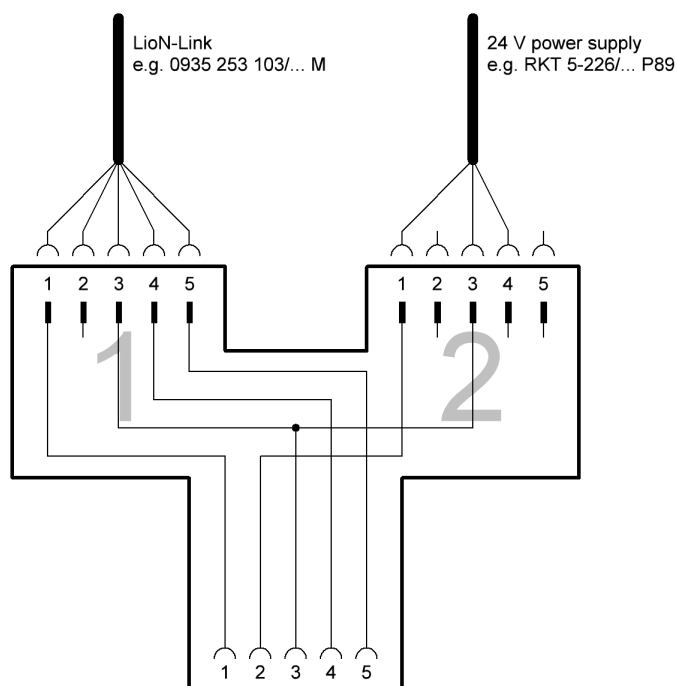
## 5.2. Intermediate power supply feed on LioN-Link I/O-modules

During the planning of a machine or a plant it has to be considered that starting from certain cable lengths an intermediate power supply feed for the electronics and sensors of the I/O-modules can be necessary.

If the power supply for the I/O-modules is not sufficient they deliver a diagnostics message.  
The warning threshold for the diagnostics is approximately 19 V.

### 5.2.1. T-connector for intermediate power supply

An easy possibility of realizing the intermediate power supply on an I/O-module is the use of the T-connector 0906 UTP 104. Its internal wiring is shown in the following drawing. The T-connector is screwed onto the link input (M12-plug) of a LioN-Link I/O-module.



## 5.2.2. Auxiliary tool for the determination of the voltage drop and the place of the intermediate power supply feed.

For the calculation of the voltage drop on the LioN-Link line a calculation table as a Microsoft Excel sheet is available under [http://www.beldensolutions.com/en/Service/Downloadcenter/Software\\_Lumberg/index.phtml](http://www.beldensolutions.com/en/Service/Downloadcenter/Software_Lumberg/index.phtml).

The table determines the voltage drop on the LioN-Link lines based on the current consumption of the I/O-modules and the sensors as well as the cable lengths and conductor cross sections of the LioN-Link lines. Furthermore the I/O-module is indicated at which the intermediate power supply feed seems to be reasonable.

Microsoft Excel - Konfigurator Zw-Einspeisung\_LioN-Link\_2.15.xls

Startwerte: Testversion: 2.15

Abfrage Zwischeneinspeisung abhängig von STL-Typ und StromModul:

empf. Absicherung: 20

Leitungslänge in Link-Zweig in Meter

| Systemaufbau   | Zwischen-einspeisung                          | Eingangsspannung U in [V] | Modultyp<br>STL-Typ       | Leitungslänge in [m] | Kanal-Stromaufnahme |             |             |             |             |             |             |             | Modulstromaufnahme in [A] | Summenstrom (max. 3.0 A) in [A] | Spannungsfall in [V] | Spannungsfall in [%] bezogen auf vorhergehende Moduleinspeisung |
|----------------|---|---------------------------|---------------------------|----------------------|---------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|---------------------------|---------------------------------|----------------------|---|
|                |   |                           |                           |                      | D17<br>D115         | D16<br>D114 | D15<br>D113 | D14<br>D112 | D13<br>D111 | D12<br>D110 | D11<br>D109 | D10<br>D108 |                           |                                 |                      |   |
| Buskopf        |   | 24,00                     | 0940 PSL 500 Profibus     |                      |                     |             |             |             |             |             |             |             |                           |                                 |                      |   |
| Link-Leitung 1 | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | 0942 UEM 600-4-AM2 / 8-UM | 20                   | 0,05                | 0,05        | 0,05        | 0,05        | 0,05        | 0,05        | 0,05        | 0,05        | 0,47                      | 0,99                            | 4,11                 | 4,11  |
| Modul 1        | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             |                           |                                 |                      |   |
| Link-Leitung 2 | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             | 0,00                      | 0,00                            | 0,00                 | 0,00  |
| Modul 2        | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             |                           |                                 |                      |   |
| Link-Leitung 3 | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             | 0,00                      | 0,00                            | 0,00                 | 0,00  |
| Modul 3        | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             |                           |                                 |                      |   |
| Link-Leitung 4 | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             | 0,00                      | 0,00                            | 0,00                 | 0,00  |
| Modul 4        | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             |                           |                                 |                      |   |
| Link-Leitung 5 | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             | 0,00                      | 0,00                            | 0,00                 | 0,00  |
| Modul 5        | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             |                           |                                 |                      |   |
| Link-Leitung 6 | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             | 0,00                      | 0,00                            | 0,00                 | 0,00  |
| Modul 6        | <input type="checkbox"/> Zwischen-einspeisung | 23,01                     | kein                      |                      |                     |             |             |             |             |             |             |             |                           |                                 |                      |   |

Formular Spannungsfall / Vorgaben / Stückliste

## 6. Configuring and commissioning

The configuration and commissioning of the LioN-Link BusHead described on the following pages was accomplished with the help of the *STEP7*-software of the *Siemens AG*. In case of using a control system from another controller supplier please attend to the associated documentation.

### 6.1. GSDML-file

For the configuration of the BusHead in the control system a GSD-file in XML-format is required. This GSDML-file can be downloaded from our homepage under

[http://www.beldensolutions.com/en/Service/Downloadcenter/Software\\_Lumberg/index.phtml](http://www.beldensolutions.com/en/Service/Downloadcenter/Software_Lumberg/index.phtml).

On request the GSDML-file is also mailed by the support team.

The name of the file is as follows:

GSDML-v2.2-Lumberg Automation-LioN Link-yyyymmdd.xml,

in which „yyyymmdd“ expresses the release date of the file.

In *STEP7* you create a new project and open the hardware manager *HW-Config*. By the menu item *Options – Install GSD File...* and the subsequent dialogue the GSDML file is installed. The LioN-Link system with the PROFINET BusHead is displayed afterwards in the hardware catalogue.

### 6.2. MAC addresses

The BusHead gets three MAC addresses assigned on delivery. These are unique and cannot be changed by the user.

### 6.3. SNMP

The BusHead supports the Ethernet network protocol SNMP (Simple Network Management Protocol). The information of the network management is presented according to the MIB-II (Management Information Base) which is defined in the RFC 1213.



## 6.4. Configuration of the LioN-Link PROFINET system in STEP7

After the installation of the GSDML file for the BusHead the LioN-Link system is available in the hardware catalogue under *PROFINET IO – Additional Field Devices – I/O – Lumberg LioN-Link*.

First configure the control system in the usual way. Assign an IP-address and a subnet mask for the PROFINET port of the control unit.

Afterwards click on the part description of the BusHead *0940ESL601* in the hardware catalogue. Move the system to the PROFINET line of the control unit.

Insert now the I/O modules of the LioN link system connected to the BusHead into the configuration. Locate the I/O-modules connected to line 1 to the slots 1 to 15. The slots 16 to 30 are to be filled with the I/O-modules of the second line. It is allowed to leave slots free, placeholder modules are not necessary. However, the correct order of the I/O-modules has to be observed.

Both lines of the BusHead can be filled with a maximum of 15 I/O-modules each.

**HW Config - [SIMATIC 300(1) (Configuration) -- LioN-Link PN]**

Station Edit Insert PLC View Options Window Help

Find: Standard

Profile: Standard

Hardware Catalogue:

- PROFIBUS DP
- PROFIBUS PA
- PROFINET IO
- Additional Field Devices
- Gateway
- I/O
- Lumberg LioN-Link
- 0940ESL601
- AI
- DO
- 0942UEM600 8DI/DO
- 0942UEM600 as 8 DI
- 0942UEM650 as 8 DO
- 0942UEM650 8DI/DO
- 0942UEM650 as 8 DI
- 0942UEM650 as 8 DO
- 0942UEM700 16DI/DO
- 0942UEM700 as 16 DI
- 0942UEM700 as 16 DO
- 0942UEM700 as 8DI/DO
- 0942UEM780 16DI/DO
- 0942UEM780 as 16 DI
- 0942UEM780 as 16 DO
- DO
- IO-Link
- Special Modules
- Gateway
- I/O
- Network Components
- Sensors
- SIMATIC 300
- SIMATIC 400
- SIMATIC PC Based Control 300/400
- SIMATIC PC Station

| Slot | Module             | Order number | I Address | Q address | Diagnostic address | Comment |
|------|--------------------|--------------|-----------|-----------|--------------------|---------|
| 0    | name01             | 0940ESL601   |           |           | 0186*              |         |
| X1   | Interface          |              |           |           | 0186*              |         |
| X2   | NT12 10/100 Mbit/s |              |           |           | 0184*              |         |
| X3   | NT12 10/100 Mbit/s |              |           |           | 0183*              |         |
| 1    | 0942UEM650 8DI/DO  | 0942UEM650   | 1         | 1         |                    |         |
| 2    |                    |              |           |           |                    |         |
| 3    | 0942UEM650 8DI/DO  | 0942UEM650   | 2         | 2         |                    |         |
| 4    | 0942UEM650 8DI/DO  | 0942UEM650   | 3         | 3         |                    |         |
| 5    |                    |              |           |           |                    |         |
| 6    |                    |              |           |           |                    |         |
| 7    |                    |              |           |           |                    |         |
| 8    |                    |              |           |           |                    |         |
| 9    |                    |              |           |           |                    |         |
| 10   |                    |              |           |           |                    |         |
| 11   |                    |              |           |           |                    |         |
| 12   |                    |              |           |           |                    |         |
| 13   |                    |              |           |           |                    |         |
| 14   |                    |              |           |           |                    |         |
| 15   |                    |              |           |           |                    |         |
| 16   | 0942UEM650 8DI/DO  | 0942UEM650   | 4         | 4         |                    |         |
| 17   | 0942UEM650 8DI/DO  | 0942UEM650   | 5         | 5         |                    |         |
| 18   |                    |              |           |           |                    |         |
| 19   |                    |              |           |           |                    |         |
| 20   | 0942UEM650 8DI/DO  | 0942UEM650   | 6         | 6         |                    |         |
| 21   |                    |              |           |           |                    |         |
| 22   |                    |              |           |           |                    |         |
| 23   |                    |              |           |           |                    |         |
| 24   |                    |              |           |           |                    |         |
| 25   |                    |              |           |           |                    |         |
| 26   |                    |              |           |           |                    |         |
| 27   |                    |              |           |           |                    |         |
| 28   |                    |              |           |           |                    |         |
| 29   |                    |              |           |           |                    |         |
| 30   |                    |              |           |           |                    |         |
| 31   | Virtual Module     | -            | 0         | 0         |                    |         |

Press F1 to get Help.

I/O-modules at the line 1 are inserted into the slots 1-15.

I/O-modules at the line 2 are inserted into the slots 16-30.

Virtual module necessary for the operation of LioN-Link motion module 0942 UEM 783.

0942UEM650 digital input/output module 8 DI/DO (8xM8) GSDML V2.2 Lumberg Automation-LioN Link-20100406.xml

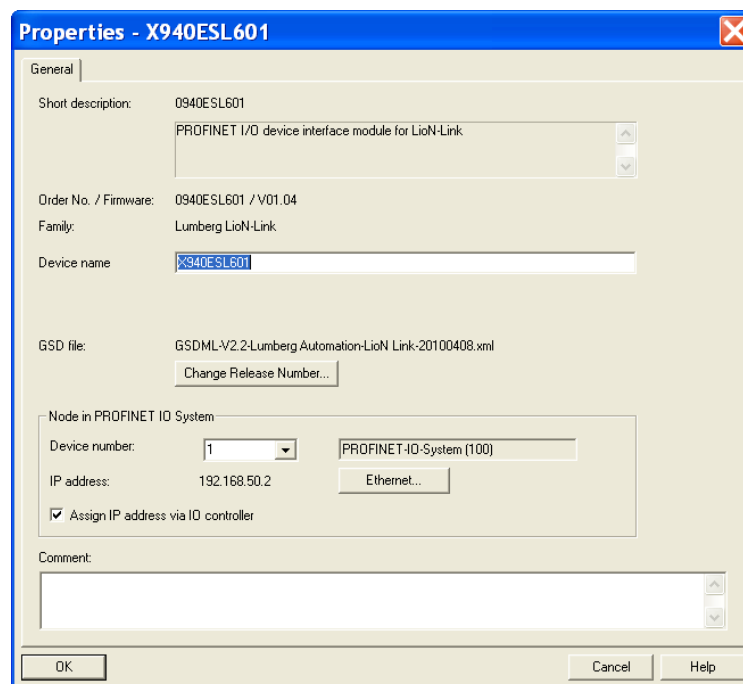
### 6.4.1. Assignment of a unique device name

PROFINET IO devices are addressed in PROFINET by a unique device name. The name can be assigned freely by the user but may only occur once in the network.

Select the LioN-Link System in *HW-Config* and choose the menu item *Edit – Object Properties*. In the opening dialogue window you can change the device name.

Check whether the displayed IP-address is correct and control unit and BusHead are located in the same Ethernet subsystem.

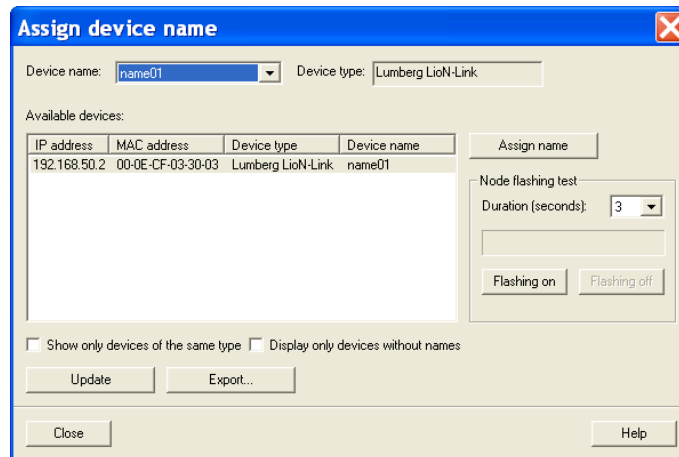
Confirm the settings with *OK*.



### 6.4.2. Assignment of the device name to the BusHead

An online PROFINET connection between the programming device and the BusHead is required for the assignment of the device name to the BusHead.

Select the LioN-Link system and choose the dialogue *PLC – Ethernet –Assign Device Name*.



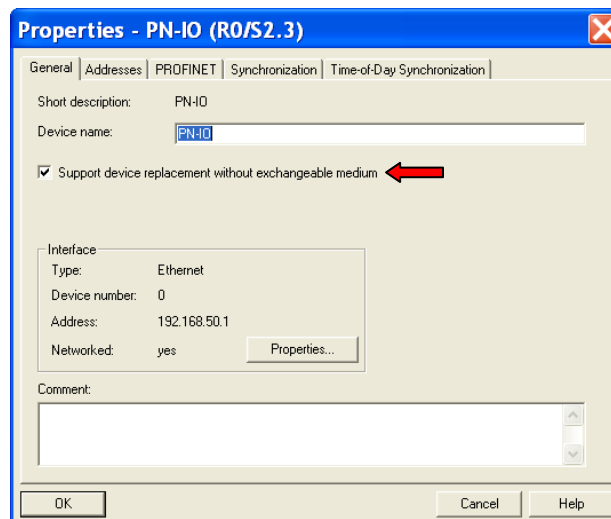
### 6.4.3. Device exchange without removable media/PG

PROFINET IO devices that support the function device exchange without removable media or PG can be exchanged in an existing PROFINET network without the need to use a removable media or programming device. In this case the IO-Controller takes over the task to assign the device name. For the assignment of the device name the IO-controller uses the configured topology and the adjacent relationships determined by the IO-Devices.

The LioN-Link PROFINET BusHead supports the function of device exchange without removable media/PG.

The topology of the network has to be configured for the use of the function.

During the configuration of the IO-Controller in *HW-Config* the function has to be selected. A double click on the PROFINET IO port of the controller opens the properties dialogue. Activate the function "*Support device replacement without exchangeable medium*".



The interconnections of the PROFINET ports of the individual devices have to be configured also. A double click on a port of a device in *HW-Config* opens its properties dialogue. In the register *Topology* the interconnections with the partner ports of other devices in the network are defined.

Properties - Interface - M12 10/100 MBit/s (X1 Port1)

GeneralAddressesTopologyOptions

Port Interconnection

Local port:

SIMATIC 300(1)\name01\M12 10/100 MBit/s (X1 Port1)

Medium:

Local port:

Copper

Partner port:

Copper

Cable name:

Copper

Partners

Partner port:

SIMATIC 300(1)\PN-HQ (CPU 319-3 PN/DP)\Port 1 (X3 P1)

Alternating partner ports:

Add ...DeleteDetails ...

Cable Data

Cable length:

< 100 m

(Signal delay time: 0.30 µs)

Signal delay time [µs]:

0.60

OKCancelHelp

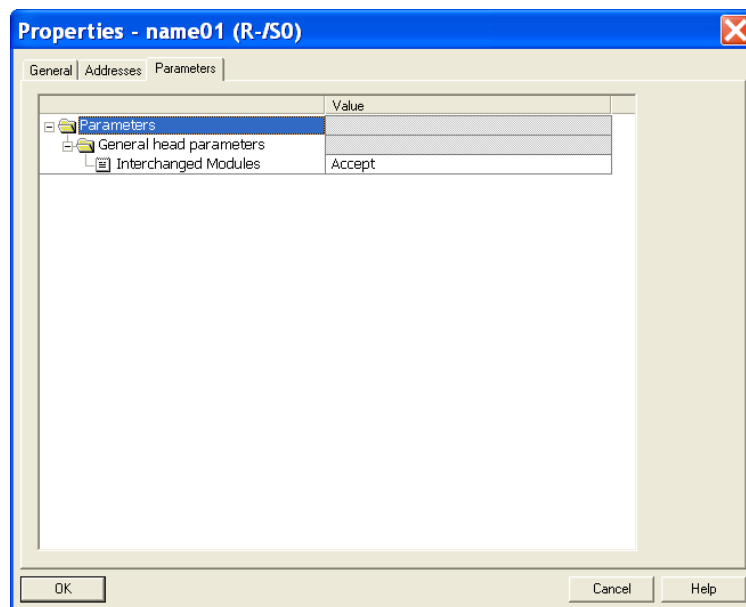


**Notice!**

The replacement device must be in the delivery state (factory settings) for the exchange without removable media/PG. If necessary the factory settings have to be restored.

#### 6.4.4. The parameter *Interchanged Modules*

The parameter settings can be reached via the menu item *Object properties – Parameter*. First select the LioN-Link system in *HW Config*. Click with the right mouse button on the row *Slot 0* and the PROFINET device name of the BusHead.



During commissioning it is recommended to leave the parameter *Interchanged Modules* on the setting *ACCEPT* (default setting). In this mode it is possible to find the optimal installation and the most favourable wiring solution for the LioN-Link system.

After the determination of the final configuration this setting should be changed to *DO NOT ACCEPT* to immediately discover permutations of modules or wiring and check the proper installation.

But also in the mode *ACCEPT* an error-free operation of the system and the exchange of defective modules are possible of course.

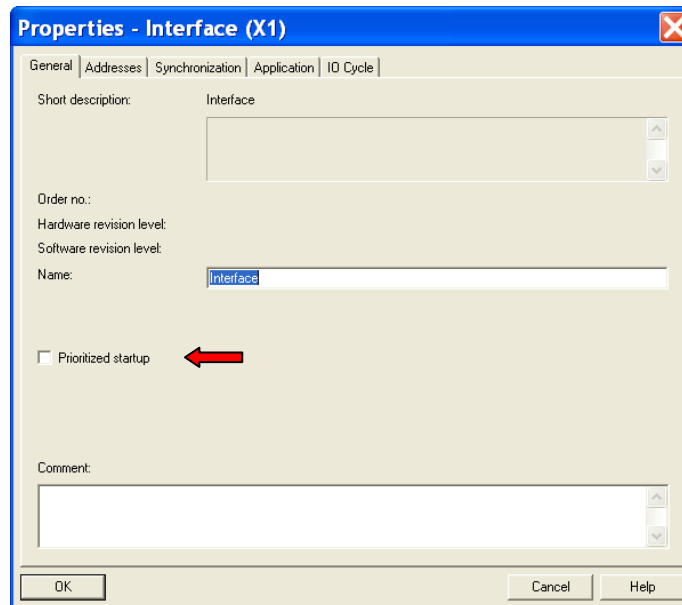


**Notice!**

With the setting *ACCEPT* the changed actual configuration is adopted as the new target configuration during restart of the system. With the selection *DO NOT ACCEPT* the existing configuration is fixed!

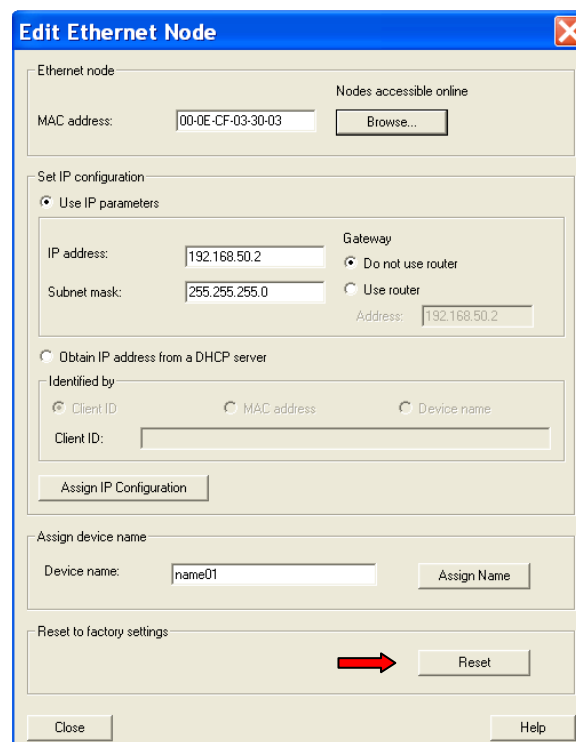
### 6.4.5. Prioritized start-up

The prioritized start-up is not supported by the BusHead. Therefore, the selection box *Prioritized Start-up* in the window *Properties – Interface (X1)* should not be selected.



### 6.4.6. Resetting the BusHead to factory settings

In *STEP7*, resetting the BusHead to factory settings is carried out through the menu item *PLC – Ethernet – Edit Ethernet Node*. After browsing the online available participants and selecting the BusHead for resetting a click on the button *Reset* restores the factory settings of the BusHead.



## 7. The integrated web server

The BusHead provides an integrated web server which offers functions for configuration, monitoring and diagnostics of the BusHead itself and the connected I/O-modules.

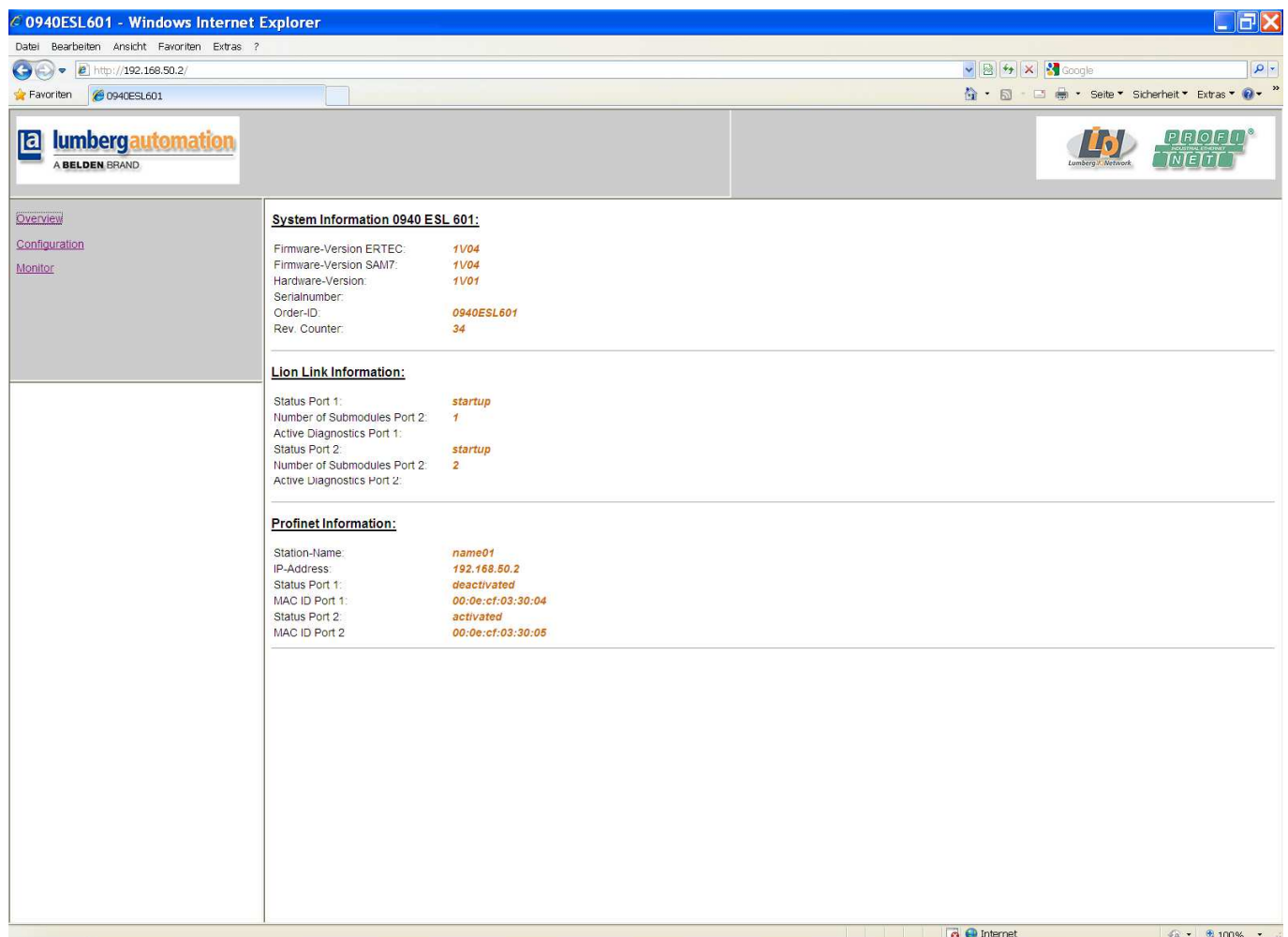
With the help of a standard web browser it is possible to get access to the provided functions via an existing TCP/IP connection.

For the use of the web server the BusHead needs an own IP address. According to the PROFINET standard all PROFINET IO devices are delivered with IP address 0.0.0.0. This means, a free IP address deviating from the factory settings has to be assigned to the BusHead before using the web server. The assignment of the IP address can be carried out with STEP7, for example, as described in chapter 6 of this manual.

As far as the IO-controller self-assigns the IP-address, this IP-address can be used to call the web server.

### 7.1. The homepage (Overview)

Enter <http://> in the address bar of your web browser followed by the IP-address, for example:  
<http://192.168.50.2>. If the homepage of the BusHead does not open, please check your browser and firewall settings.



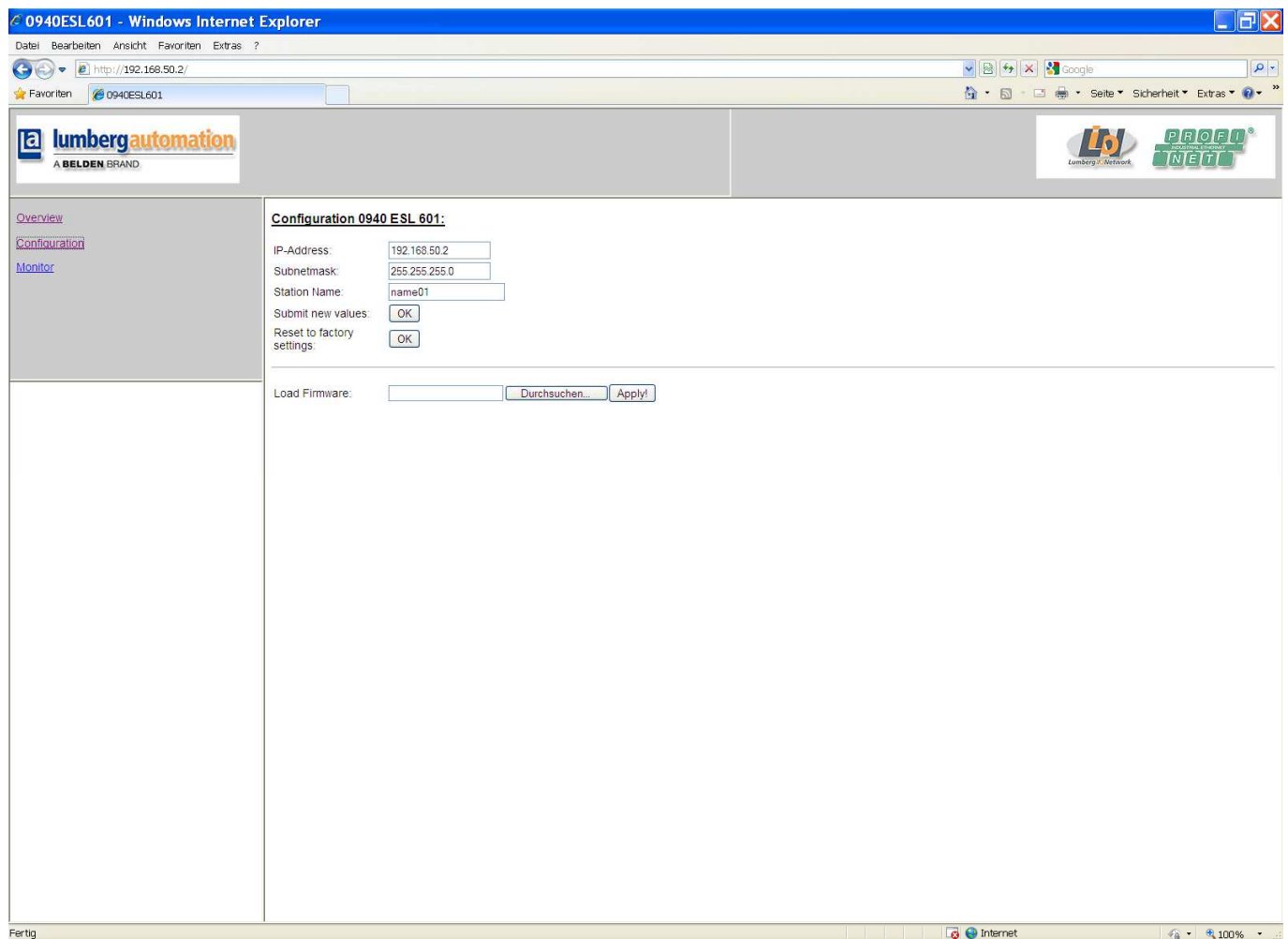
The homepage gives an overview over the characteristics of the BusHead regarding system, LioN-Link and PROFINET. The system characteristics comprise information concerning the firmware versions, serial number and a counter (Rev. Counter), which is increased by one with each change of a parameter (IP-address, device name) on the BusHead.

In the section „LioN Link Information “you find the number of connected I/O modules per line, the actual conditions of the two LioN Link lines and information concerning the presence of a diagnostics at a line.

## 7.2. The configuration page (Configuration)

With the selection of the menu item *Configuration* on the left side of the homepage you are requested to enter a user name and a password.

Enter “Admin” as the user name and “Belden601” as the password. Pay attention to the upper case and lower case. After the input the following window appears:



The screenshot shows a web browser window titled "0940ESL601 - Windows Internet Explorer". The address bar shows "http://192.168.50.2/". The page has a header with the "lumbergautomation A BELDEN BRAND" logo on the left and "LioN-Link" and "PROFINET" logos on the right. A left sidebar contains links for "Overview", "Configuration" (highlighted), and "Monitor". The main content area is titled "Configuration 0940 ESL 601:" and contains the following fields and buttons:

- IP-Address:
- Subnetmask:
- Station Name:
- Submit new values:
- Reset to factory settings:
- Load Firmware:

On this page you can change the IP-address of the BusHead, the subnet mask and the PROFINET device name. The changed values are accepted by a click on the button "OK" behind the lettering "Submit new values". Please pay attention to possibly adapt your network settings and PLC configuration after transmitting the values.

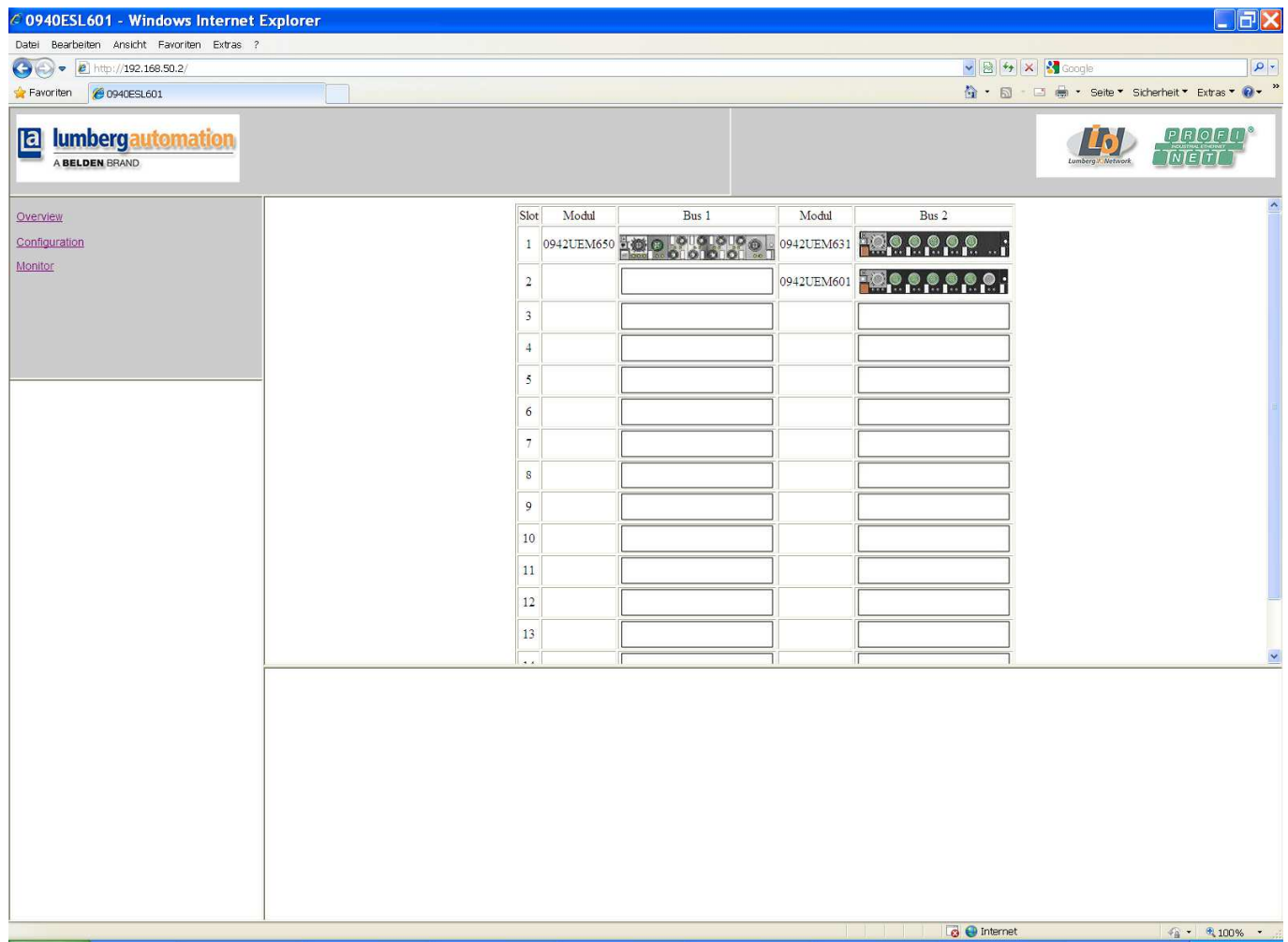
Click on the button "OK" behind the lettering "Reset to factory settings", to restore the factory settings of the BusHead. Please note that the PROFINET name is hereby deleted and the IP-address is reset to the value 0.0.0.0.






A firmware update of the two microcontrollers, which are used in this BusHead, is also possible on this side. The procedure is described in one of the following chapters of this manual and should be absolutely observed.

### 7.3. The monitoring page (Monitoring)

The page Monitoring gives you an overview of the connected I/O modules in graphical form.  
For each of the two LioN-Link lines the connected I/O-modules to the BusHead are displayed with part number and picture.



| Slot | Modul      | Bus 1   | Modul      | Bus 2   |
|------|------------|---|------------|---|
| 1    | 0942UEM650 |  | 0942UEM631 |  |
| 2    |            |   | 0942UEM601 |  |
| 3    |            |   |            |   |
| 4    |            |   |            |   |
| 5    |            |   |            |   |
| 6    |            |   |            |   |
| 7    |            |   |            |   |
| 8    |            |   |            |   |
| 9    |            |   |            |   |
| 10   |            |   |            |   |
| 11   |            |   |            |   |
| 12   |            |   |            |   |
| 13   |            |   |            |   |
| ...  |            |   |            |   |

## 8. Firmware update

Over the configuration page of the integrated web server a firmware update of the two microcontrollers is possible, which are used in this BusHead.



### Important note!

Please observe the following description of the firmware updates exactly since otherwise the BusHead cannot function properly any longer.

1. Disconnect the BusHead from all connections to LioN-Link I/O-modules by unscrewing the M12 connecting plugs of the two lines.
2. Disconnect also the connection to your control unit and other PROFINET IO devices.  
Only the computer which is intended to accomplish the update should be connected to the BusHead.
3. Perform a power reset at the BusHead 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 two green LEDs  $U_{S1}$  and  $U_{S2}$  must light permanently.
4. Make sure that the BusHead has a static IP address, or assign an IP address using a tool that supports the DCP protocol of PROFINET, such as *STEP7*.
5. In your browser, change to the configuration page of the integrated web server and select the file for the firmware update by clicking on the button *Search*. The file for the microcontroller SAM7 is called "0940ESL601\_SAM7.bin", the file name for the ERTEC controller is "0940ESL601\_ERTEC.bin". The file names may not be changed.
6. By clicking on the button *"Apply!"* the firmware file is transferred to the BusHead. Due to the size of the firmware for the ERTEC chip this process can take several seconds. The transmission time of the SAM7 firmware is much shorter. An indication of the transfer by an LED indicator does not take place.
7. After completing the transfer of the firmware file, the BusHead stores internally the file in the non-volatile memory. This process is indicated by a special LED display. During an ERTEC update only the DIA LED flashes. When updating the SAM7, the LED indicators  $U_{S1}$  and  $U_{S2}$  flash additionally.
8. Upon completion of the update, the red DIA LED stops flashing and the two LED indicators  $U_{S1}$  and  $U_{S2}$  switch back to solid green again. The browser displays the message *"LioN-Link Firmware Update successfully completed"*.
9. Upon completion of the update, a power reset of BusHead is necessary. For this purpose, the power supply has to be interrupted shortly.  
**Caution: Before a power reset, the status of the LED indicators DIA,  $U_{S1}$  and  $U_{S2}$  has to be observed. It is necessary to wait until the DIA-LED is off and the LED indicators  $U_{S1}$  and  $U_{S2}$  are solid green again.**
10. If an update should also be available for the second microcontroller, then the steps 5 to 9 with the appropriate file are to be repeated.
11. After completion of all updates the connection with the LioN-Link I/O-modules, the control unit and further PROFINET IO devices can be restored. Note that the BusHead first detects the actual configuration of LioN-Link I/O-modules after a power reset.

## 9. Alarm and error messages of the BusHead

If the BusHead detects an error condition, then it triggers an alarm message. The BusHead supports diagnostics alarms. Diagnostics alarms are released in case of periphery faults, like overload, short circuit and broken wire.

If an I/O-module at a LioN-Link line is removed or if it is no longer accessible (module breakdown, connection disturbed, "pulling" the module), an alarm is triggered also. This alarm is called a pull alarm.

An alarm is triggered with a coming event (e.g. sensor short circuit), as well as a going event.

The evaluation of the alarms is carried out in dependence of the used PROFINET IO controller.

### 9.1. Evaluation of alarms in *STEP7*

In *STEP7* the processing of the user program is interrupted by triggering a diagnostics alarm and a diagnostics organization block is called. The following organization blocks are called.

| Cause of the alarm  | OB-call |
|---|---------|
| Periphery fault (short circuit, overload, broken wire, low voltage at I/O-module) | OB 82   |
| Pulling an I/O-module, I/O-module no longer accessible                            | OB 83   |
| Complete breakdown of the system  | OB 86   |

Based on the called OBs and their start information, first information about the cause of the fault and kind of the fault are delivered already. Detailed information about the fault can be obtained in the fault OB by calling the SFB 54 RALRM (Receive additional alarm information). The SFB 54 therefore has to be called in every fault OB.

If the called fault OB is not available in the PLC, the PLC changes to the operation mode STOP.

### 9.1. Reaction of the BusHead to a module breakdown („pull “ alarm)

If an I/O-module on the LioN-Link line fails due to an interruption of the communication (removing the I/O-module, disconnection of the link connections, broken wire, I/O-module fault), the BusHead generates a "Pull-alarm". At the BusHead itself this condition is indicated by the red "DIA"-indicator flashing up.

The "pull"-alarm immediately starts the execution of the OB 83 in the *STEP 7* PLC. Within the OB 83 more information can be evaluated by calling the SFB 54 RALRM.

After the BusHead properly triggered the „pull"-alarm, the BusHead periodically tries to restart the incomplete LioN-Link line again. The attempt to restart the affected line is indicated by an alternating red and green lighting-up of the indicators S1 and/or S2 at the two link lines on the BusHead. This condition is maintained as long as both Link lines are completed by the correct I/O-modules at the configured positions.



#### Important note!

During a configuration error (missing or incorrect I/O-modules) in a LioN-Link line the BusHead does not disconnect from the network, but returns again to the cyclic data exchange after the error is resolved. This behaviour applies during operation but also after restarting the LioN-Link system.

## 9.2. Channel diagnostics

For the representation of the diagnostics data records the block version 0x0100 and the format identification (USI, user Structure Identifier) 0x8000 is used.

The error type in the 16-bit value "ChannelErrorType" is manufacturer specific and defined as follows:

| Bit number       | 15             | 14 | 13 | 12 | 11               | 10 | 9 | 8 | 7          | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|------------------|----------------|----|----|----|------------------|----|---|---|------------|---|---|---|---|---|---|---|
| ChannelErrorType | Number of line |    |    |    | Number of module |    |   |   | Error code |   |   |   |   |   |   |   |

|                  |   |                                    |
|------------------|---|------------------------------------|
| Number of line   | 0x1   | Diagnostics at line 1              |
|                  | 0x2   | Diagnostics at line 2              |
| Number of module | 0x1 to 0xF  | Number of module with diagnostics  |
| Error code       | 0x00  | Reserved                           |
|                  | 0x01  | Short circuit                      |
|                  | 0x02  | Low voltage                        |
|                  | 0x03  | Overvoltage                        |
|                  | 0x04*   | Overload                           |
|                  | 0x05  | Over temperature                   |
|                  | 0x06  | Broken wire                        |
|                  | 0x07  | Upper limit value exceeded         |
|                  | 0x08  | Lower limit value exceeded         |
|                  | 0x09  | IO-Link fault                      |
|                  | 0x0A  | Simulation active                  |
|                  | 0x0B  | Reserved                           |
|                  | 0x0C  | Reserved                           |
|                  | 0x0D  | Check number of configured modules |
|                  | 0x0E  | Reserved                           |
|                  | 0x0F  | Missing parameter                  |
|                  | 0x10  | Wrong parameter, parameter fault   |
|                  | 0x11  | Power supply fault                 |
|                  | 0x12  | I/O module failure                 |
|                  | 0x13  | I/O module diagnostics             |
|                  | 0x14  | Configuration fault                |
|                  | 0x15  | Common I/O fault                   |
|                  | 0x16  | Over current motor                 |
|                  | 0x17  | Common motor fault                 |
|                  | 0x18  | Internal module fault              |
|                  | 0x19  | Fuse defective                     |
|                  | *: The error code 0x04 is defined in the GSDML file as "Actuator Error". This code is generated after an overload, a short circuit or a missing actuator voltage. |                                    |

## 10. Technical data

### 10.1. General data

|                      |                                      |
|----------------------|--------------------------------------|
| Degree of protection | IP 67 (only with screwed connectors) |
| Ambient temperature  | -10°C / +60°C                        |
| Weight               | 800 g                                |
| Housing material     | PBT                                  |
| Vibration resistance | 15 g / 5–500 Hz                      |
| Shock resistance     | 50 g / 11 ms                         |
| Torques:             |                                      |
| • Fastening screw M4 | 1,0 Nm                               |
| • M8 connectors      | 0,3 Nm                               |
| • M12 connectors     | 0,5 Nm                               |

### 10.2. Technical data of the bus system

|  |  |
|--|--|
| Protocol                               | PROFINET IO<br>RT is supported   |
| GSDML-file                             | GSDML-v2.2-Lumberg Automation-LioN Link-yyyymmdd.xml   |
| Transmission rate                      | 100 Mbit/s, Full Duplex  |
| Transmission method<br>Autonegotiation | 100BASE-TX<br>supported  |
| Manufacturer code (Vendor ID)          | 0016A <sub>H</sub>   |
| Device code (Device ID)                | 0302 <sub>H</sub>  |
| Supported Ethernet protocols           | <ul style="list-style-type: none"> <li>• Ping</li> <li>• ARP</li> <li>• LLDP</li> <li>• SNMP (Network diagnostics)</li> <li>• DCP</li> <li>• HTTP</li> <li>• TCP/IP</li> </ul> |
| Switch-functionality                   | integrated<br>IRT is supported   |
| PROFINET-interface<br>Connections      | 2 M12-sockets, 4-pole, D-coded (see pin assignments)   |
| Autocrossing                           | supported  |

### 10.3. Technical data of the power supply for the BusHead electronics

|   |   |
|---|---|
| Rated voltage $U_{S1}$ , $U_{S2}$   | 24 V DC                                 |
| Voltage range   | 19–30 V DC                              |
| Current consumption electronics   | typ. 100 mA                             |
| Supply current per line   | 3 A                                     |
| Reverse polarity protection   | yes                                     |
| Operation indicator ( $U_{S1}$ , $U_{S2}$ )   | LED green                               |
| Connection  | M12-plug, 5-pole<br>see pin assignments |
| The power supply of the LioN-Link modules from the BusHead is limited to 3 A per Link line. It is absolutely necessary to connect both power supplies of the BusHead.<br>See chapter 5.1 (pin assignments). |   |

## 10.4. LED indicators

|                                   |                                  |   |
|-----------------------------------|----------------------------------|---|
| U <sub>S1</sub> , U <sub>S2</sub> | green                            | System-/ sensors power supply line 1 and/or. Line 2 available     |
|                                   | off                              | System-/ sensors power supply line 1 and/or. Line 2 missing       |
|                                   | green flashing                   | Firmware update   |
| S1, S2                            | green                            | Line 1 and/or line 2 active, data exchange with I/O-modules       |
|                                   | red                              | Incorrect configuration / modules permuted.                       |
|                                   | red / green alternating flashing | Restart of line 1 and/or line 2.                                  |
|                                   | off                              | Line 1 and/or line 2 not used (no I/O-module connected).          |
| P1 Lnk / Act<br>P2 Lnk / Act      | green                            | Ethernet connection to another participant exists.                |
|                                   | yellow flashing                  | Data exchange with another participant.                           |
|                                   | off                              | No connection with another participant.                           |
| BF                                | red                              | Bus fault, no data exchange via PROFINET with the I/O-controller. |
|                                   | off                              | No bus fault.   |
| DIA                               | red                              | Group indication for periphery faults.                            |
|                                   | off                              | No diagnostics existing.  |
|                                   | red flashing                     | Firmware update   |