

## LioN-Link BusHead DeviceNet-Slave



**Technical Manual**  
**0940 DSL 601**

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## 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 DeviceNet 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 DeviceNet 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					
Date	01.08.2010					
Name / department	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 maximum number of I/O-modules that can be connected to this BusHead is 16. 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 sockets are suitable. As an alternative also Fixcon plugs and socket 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. Module variants

Part number	Description	I/O-connection	Design
LioN-Link BusHead			
0940 DSL 601	DeviceNet BusHead		S
LioN-Link modules universal I/O digital			
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
LioN-Link modules input I digital			
0942 UEM 601	8 In	4xM12	S
0942 UEM 651	8 In	8xM8	S
0942 UEM 701	16 In	8xM12	M
LioN-Link modules input I analogue			
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

#### 3.2. Accessories

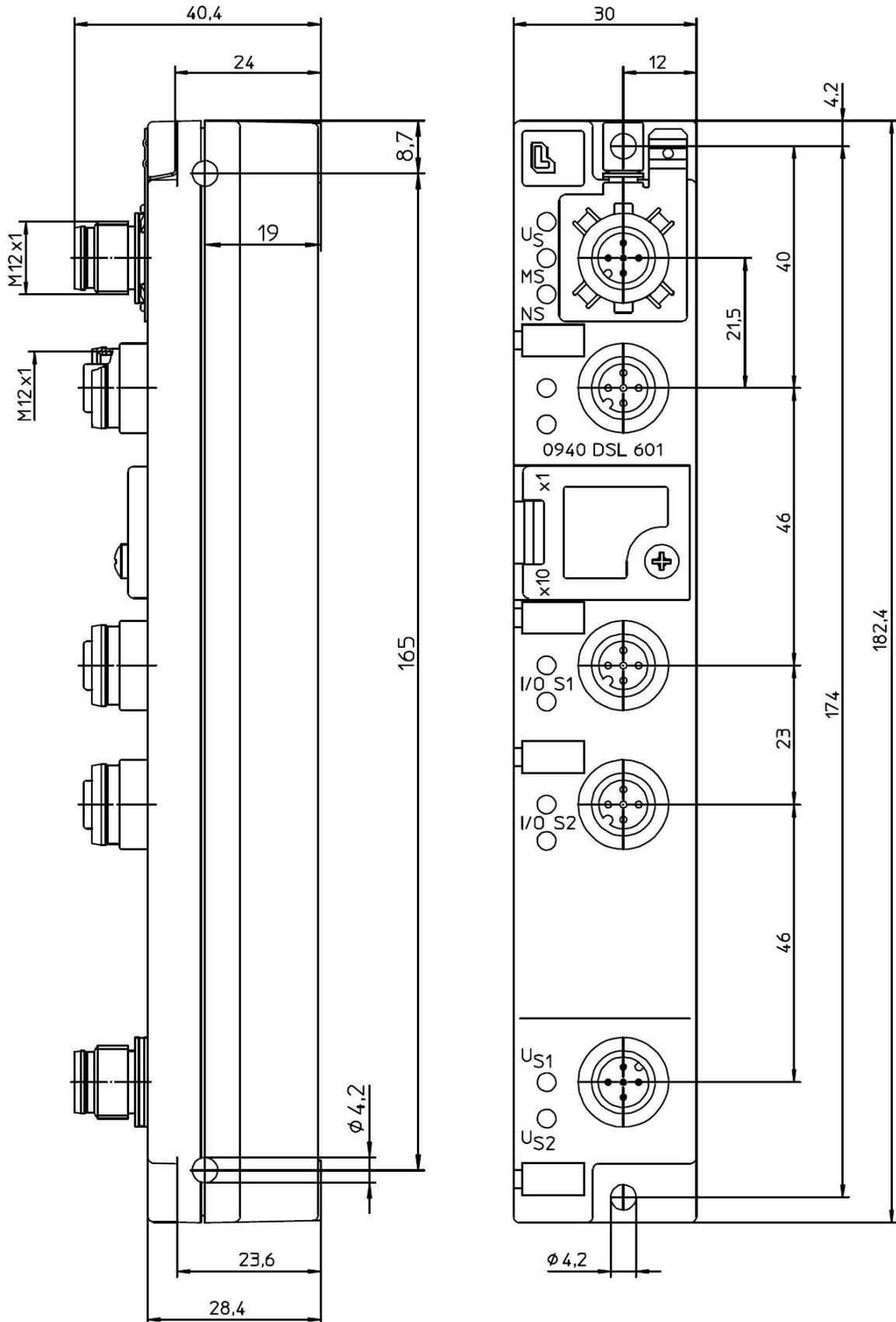
Part number	Description
DeviceNet and LioN-Link lines	
0935 253 103/... M	Connecting cable for DeviceNet and LioN-Link line, double ended, with M12-plug, straight, 5-pole, A-coded and M12-socket, straight, 5-pole, A-coded
0935 253 104/... M	Connecting cable for DeviceNet and LioN-Link line, single ended, with M12-plug, straight, 5-pole, A-coded
0935 253 105/... M	Connecting cable for DeviceNet and LioN-Link line, single ended, with M12-socket, straight, 5-pole, A-coded
0935 253 106/... M	Connecting cable for DeviceNet and LioN-Link line, single ended, with M12-socket, angled, 5-pole, A-coded
0935 253 107/... M	Connecting cable for DeviceNet and LioN-Link line, single ended, with M12-plug, angled, 5-pole, A-coded
0935 253 108/... M	Connecting cable for DeviceNet and LioN-Link line, double ended, with M12-plug, angled, 5-pole, A-coded and M12-socket, angled, 5-pole, A-coded
Power supply	
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
Field attachables	
RSC 5/9 RKC 5/9	Field attachable M12-connectors for DeviceNet cable, straight, 5-pole, A-coded
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

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T-connectors	
0906 UTP 101	T-connector for daisy-chaining the power supply. Pay attention to the current load!
0906 UTP 104	T-connector for additional power feed in the LioN-Link line.
Other accessories	

## 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).

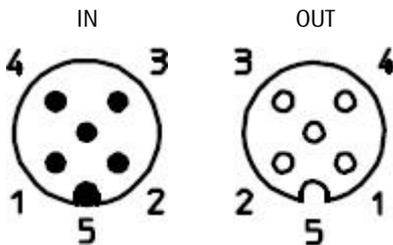
With a not grounded mounting surface or lateral mounting a ground strap or a suitable PE-cable has to be used.

## 5. Wiring

### 5.1. Pin assignments

#### 5.1.1. DeviceNet ports, M12-plug/socket, 5-pole, A-coded

Colour code of the connectors: **black**



Connector	Pin	Signal	Function
DeviceNet IN / OUT	1	Drain	Shield
	2	24 V	Power supply
	3	GND (0 V)	Power supply
	4	CAN_H	Data signal
	5	CAN_L	Data signal

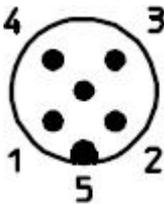


#### ATTENTION, risk of destruction!

Do not connect the power supply lines (24 V DC) to the data lines (CAN\_H -> Pin 4, CAN\_L -> Pin 5).

#### 5.1.2. Power supply connector for the BusHead, M12-plug, 5-pole

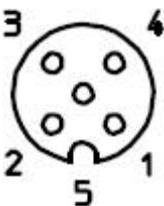
Colour code of the connector: **grey**



Connector	Pin	Signal	Function
Power supply BusHead/ System	1	+24VDC	system/sensors line 1/2 + BusHead
	2	+24VDC	
	3	0V	system/sensors line 1/2 + BusHead
	4	0V	
	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.

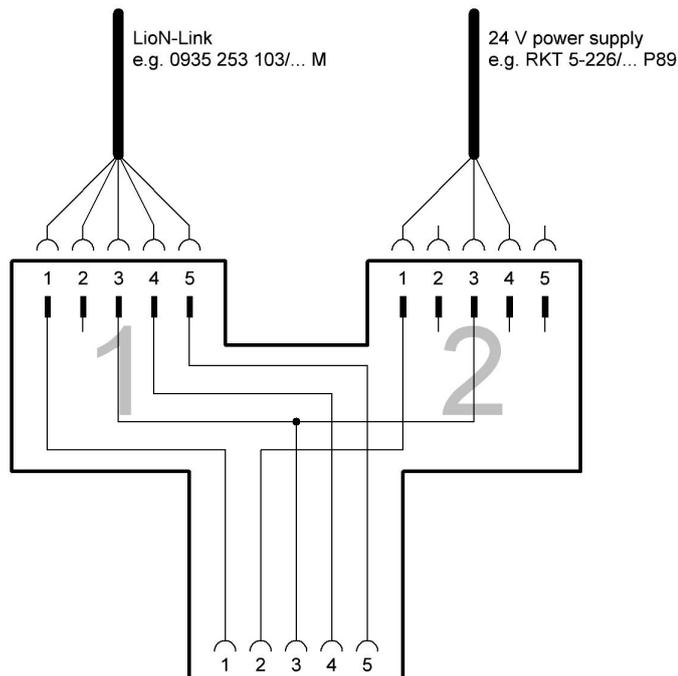
## 5.2. Intermediate power supply feed on LioN-Link I/O-modules

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

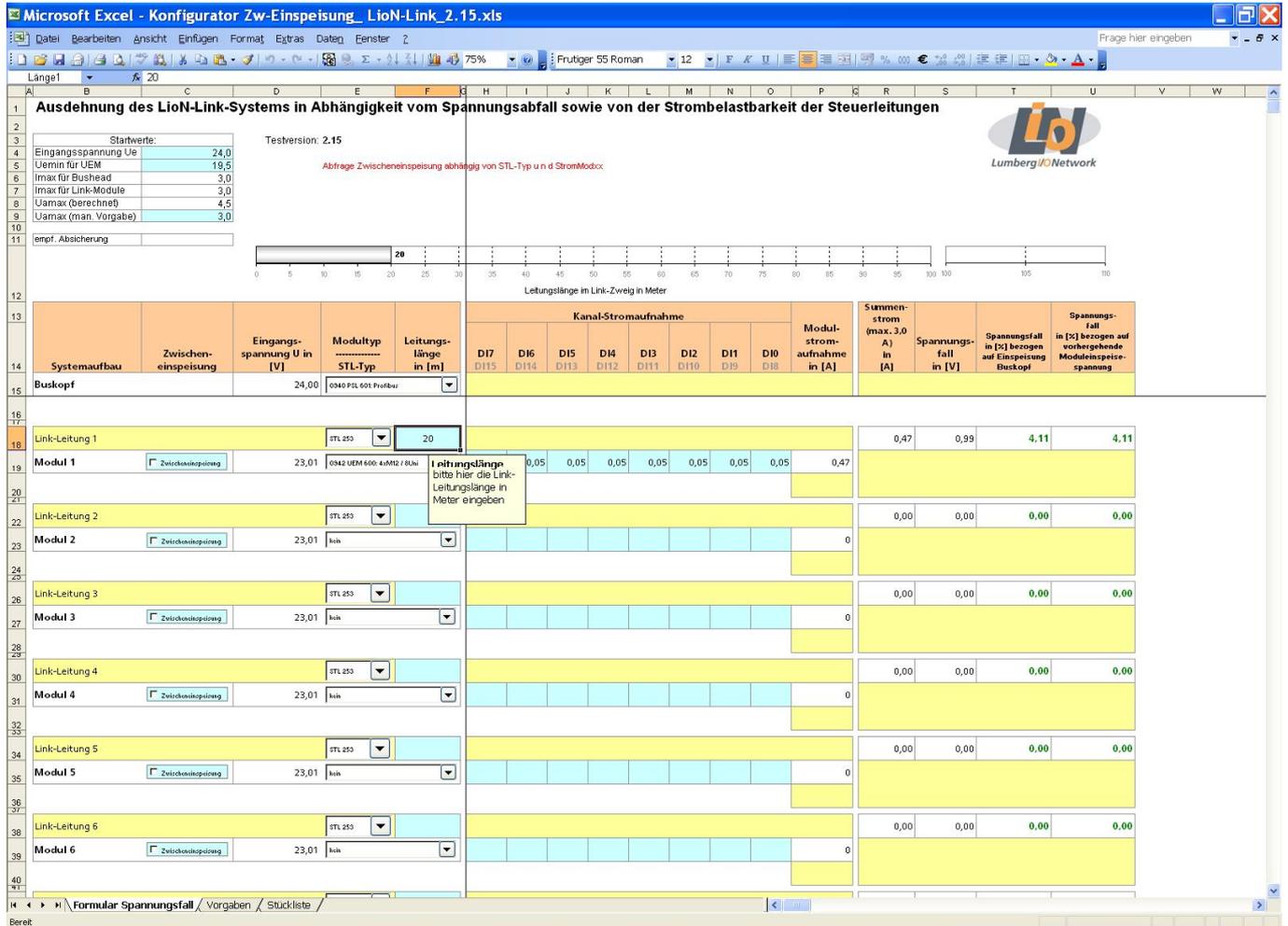
An easy possibility of realizing the intermediate power supply on an I/O-module is the use of the T-connector 0906 UTP 104. Its internal wiring is shown in the following drawing. The T-connector is screwed onto the link input (M12-plug) of a LioN-Link I/O-module.



### 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.



**Ausdehnung des LioN-Link-Systems in Abhängigkeit vom Spannungsabfall sowie von der Strombelastbarkeit der Steuerleitungen**

Startwerte: Eingangsspannung  $U_e$  24,0; Uemin für UEM 19,5; lmax für Bushead 3,0; lmax für Link-Module 3,0; Usmax (berechnet) 4,5; Usmax (man. Vorgabe) 3,0.

Testversion: 2.15

Abfrage Zwischeneinspeisung abhängig von STL-Typ u n d StromModx:

Litungslänge in Link-Zweig in Meter

Systemaufbau	Zwischen-einspeisung	Eingangsspannung U in [V]	Modultyp STL-Typ	Leitungslänge in [m]	Kanal-Stromaufnahme								Modul-stromaufnahme in [A]	Summenstrom (max. 3.0 A) in [A]	Spannungsfall in [V]	Spannungsfall in [%] bezogen auf Einspeisung Buskopf	Spannungsfall in [%] bezogen auf vorhergehende Moduleinspeisung
					D17 D115	D16 D114	D15 D113	D14 D112	D13 D111	D12 D110	D11 D109	D10 D108					
Buskopf		24,00	0340 PSL 601 Profibus														
Link-Leitung 1			STL 253	20									0,47	0,99	4,11	4,11	
Modul 1	<input type="checkbox"/> Zwischen-einspeisung	23,01	0342 UEM 500: 4xMM2 / 8Ux		0,05	0,05	0,05	0,05	0,05	0,05	0,05	0,47					
Link-Leitung 2			STL 253										0,00	0,00	0,00	0,00	
Modul 2	<input type="checkbox"/> Zwischen-einspeisung	23,01	kein									0					
Link-Leitung 3			STL 253										0,00	0,00	0,00	0,00	
Modul 3	<input type="checkbox"/> Zwischen-einspeisung	23,01	kein									0					
Link-Leitung 4			STL 253										0,00	0,00	0,00	0,00	
Modul 4	<input type="checkbox"/> Zwischen-einspeisung	23,01	kein									0					
Link-Leitung 5			STL 253										0,00	0,00	0,00	0,00	
Modul 5	<input type="checkbox"/> Zwischen-einspeisung	23,01	kein									0					
Link-Leitung 6			STL 253										0,00	0,00	0,00	0,00	
Modul 6	<input type="checkbox"/> Zwischen-einspeisung	23,01	kein									0					

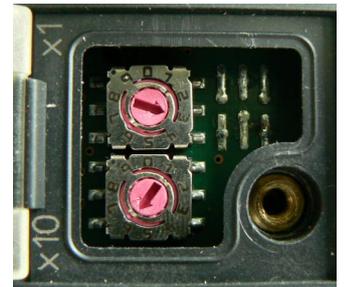
Formular Spannungsfall / Vorgaben / Stückliste

## 6. Configuring

The configuration of the LioN-Link BusHead 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. Node address

For the direct setting of the DeviceNet node address two rotary switches are used, which are located above the two M12 LioN-Link connectors behind a transparent cover. The switches for the ten's and unit position of the address are marked. The adjusted address is accepted when the power supply is switched on. Therefore the power supply must be interrupted shortly after a change of the address, so that the BusHead accepts the new address.



The node address is adjusted with the rotary switches at the front. The valid range of values is from 1 to 63. If a node address is set that is not within the limits, the address 63 is used automatically.

### 6.2. Data rate

The DeviceNet BusHead 0940 DSL 601 supports all data rates that are released by the ODVA. These are 125 kBit/s, 250 kBit/s and 500 kBit/s. The Bushead automatically detects the used data rate, a manual or fixed setting of the data rate is not possible.

### 6.3. EDS configuration file

For the configuration and parameterization of the BusHead in the control system an EDS-file is required. This EDS-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 EDS-file is also mailed by the support team.



The EDS-file that is being received has a modular structure. For optimal performance the configuration software should support the use of modular EDS-files. If the configuration software cannot use modular EDS-files try to use the file "00\_0940 DSL 601.eds" from the list of supplied EDS-files for configuration. In this case the number of producer and consumer bytes for the Bushead has to be self-calculated.

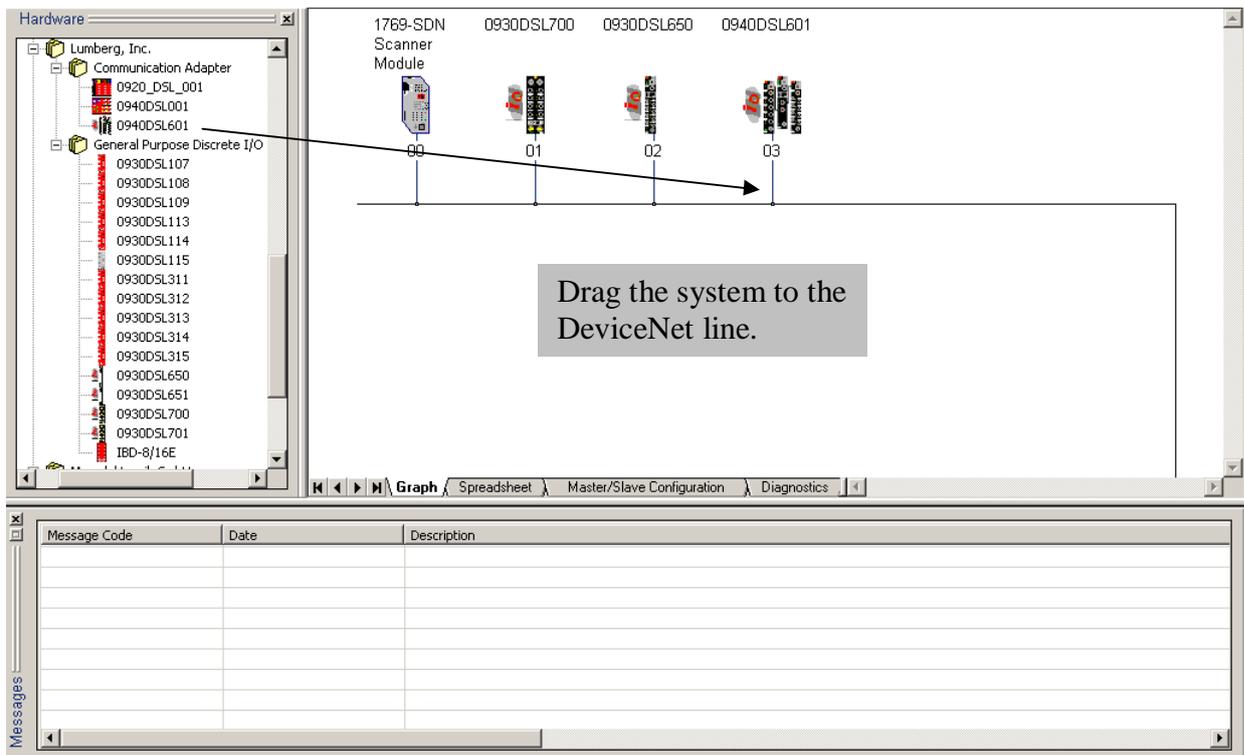
In *RSNetWorx* select *Tools – EDS Registry Wizard* to register and install the EDS-file. The LioN-Link system with the DeviceNet BusHead is displayed afterwards in the hardware list.

## 6.4. Configuration of the LioN-Link DeviceNet system in *RSNetWorx*

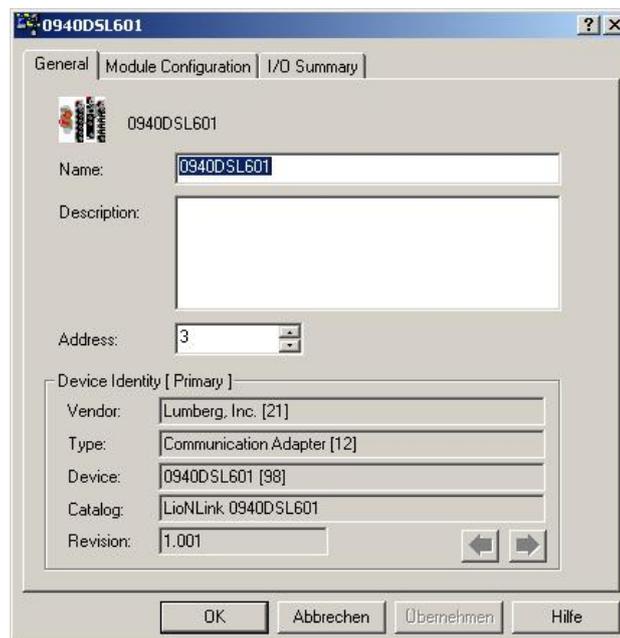
After the installation of the EDS file for the BusHead the LioN-Link system is available in the hardware list under *Communication Adapter*.

### 6.4.1. Configuration of the LioN-Link system

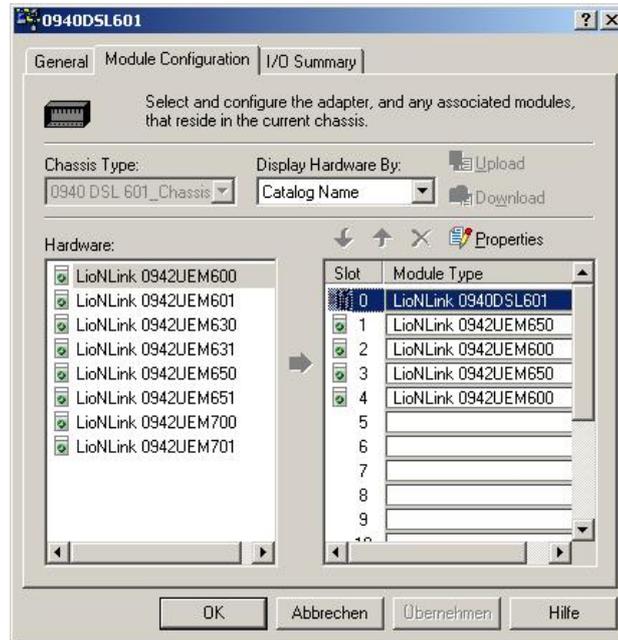
Click on the part description of the BusHead *0940DSL601* in the hardware list. Move the system to the DeviceNet line.



The DeviceNet node address and the range of the input and output bytes are assigned automatically by the configuration software. However, they can be changed by the user. Doubleclick on the system and the following dialogue box appears. In the folder *General* the node address can be changed.



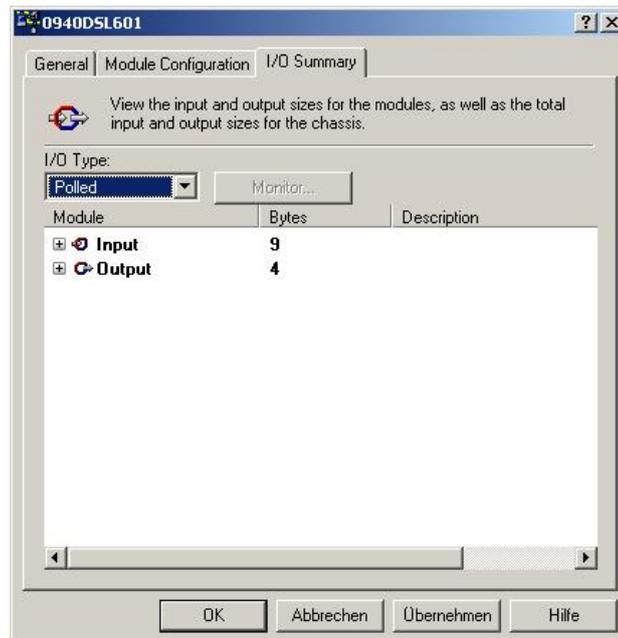
Switch to the folder *Module Configuration* to insert the BusHead and the connected I/O-modules into the configuration.



First insert the BusHead 0940DSL601 into the slot 0. Add the connected I/O-modules to the following slots according to their physical installation. Start with the first module at line 1 next to the BusHead. Then insert the subsequent I/O-Modules of line 1 followed by those of line 2. Observe the correct order of the I/O-modules.

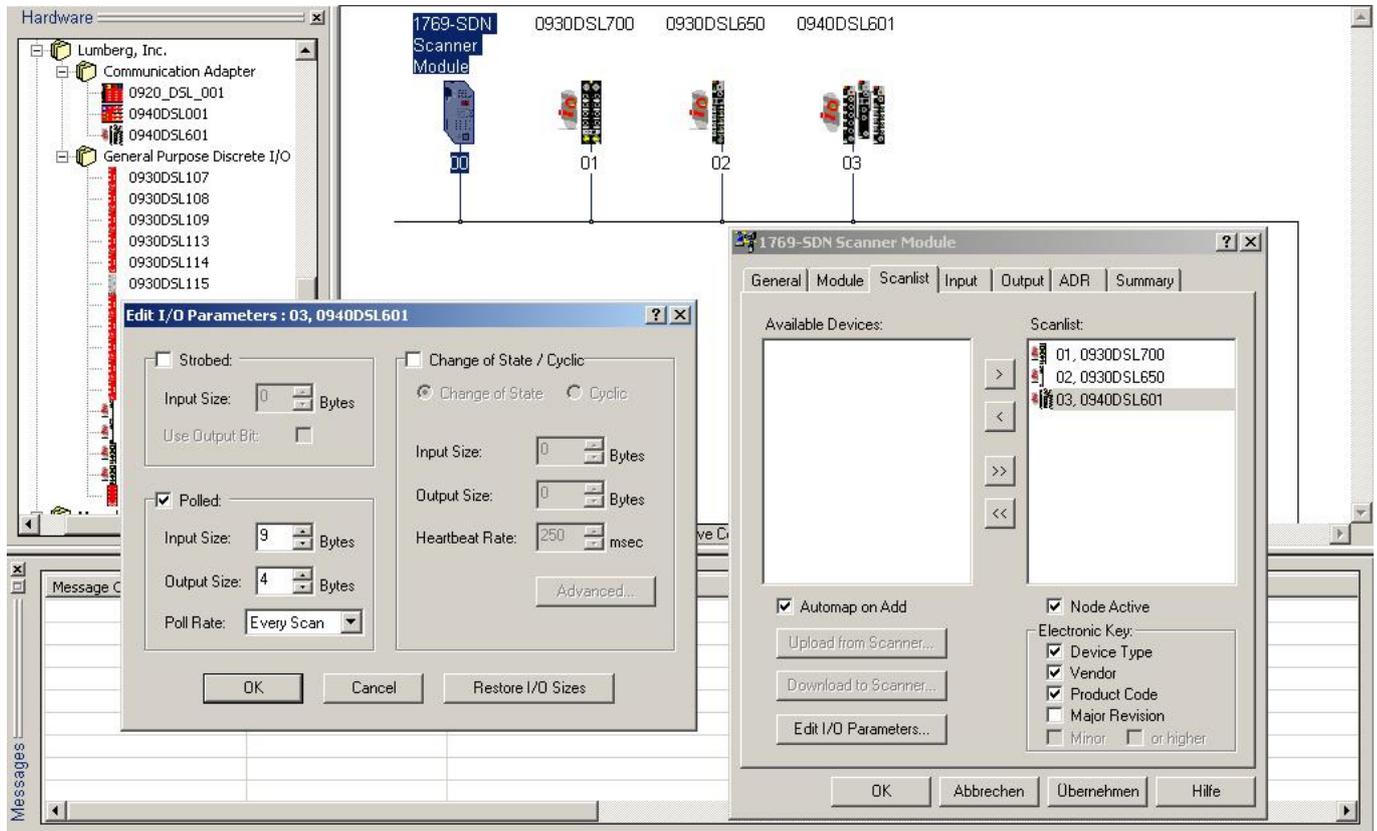
In summation a maximum number of 16 I/O-modules can be connected to the BusHead. Both lines of the BusHead can be filled with a maximum of 15 I/O-modules each.

The folder *I/O Summary* shows the number of input and output bytes that are required for the specific configuration in dependence of the communication mode.



## 6.4.2. Configuration of the scanner

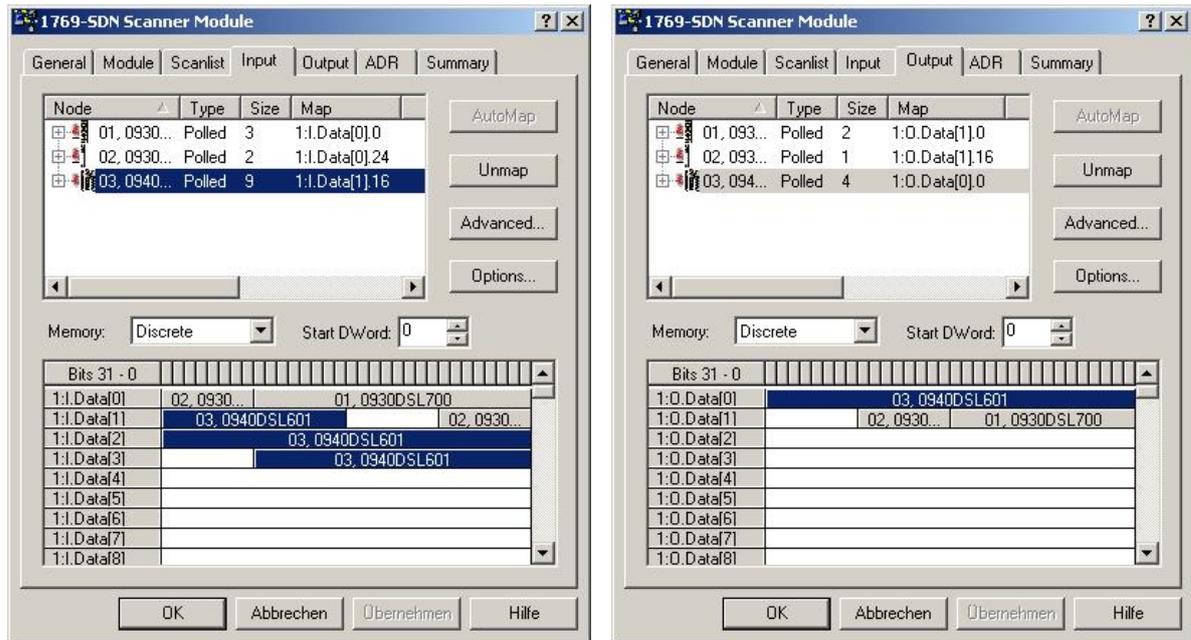
Doubleclick on the used scanner module to open the dialogue box for configuring the scanner. Select the folder *Scanlist* and move the LioN-Link system from the list *Available Devices* to the list *Scanlist*.



If the LioN-Link system is not part of the scanlist the scanner will not establish communication with it.

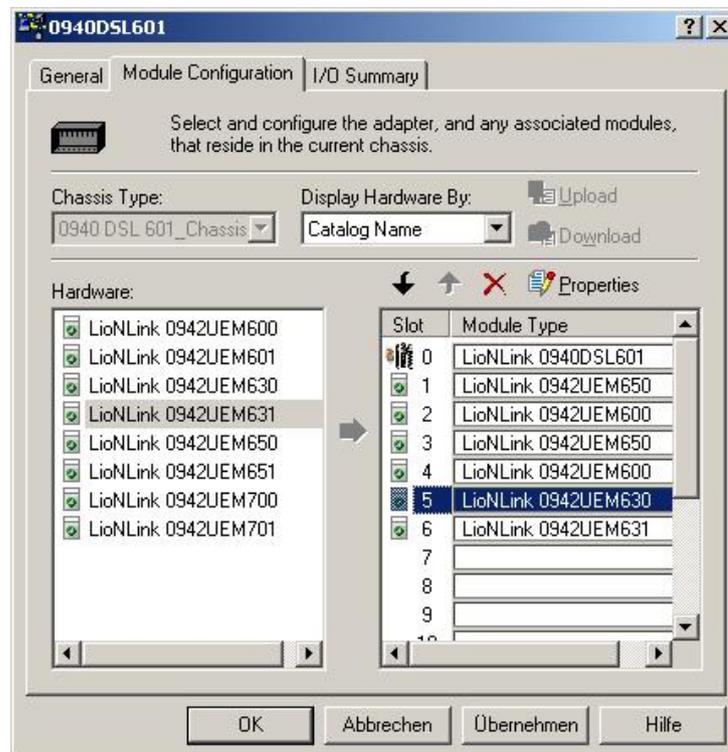
Select the button *Edit I/O Parameters...* or doubleclick on the device name of the LioN-Link system in the scanlist to edit the I/O-parameters. Select desired communication mode and the number of input and output bytes. The number of input and output bytes is automatically determined if the configuration tool supports modular EDS-files. Otherwise the number of input and output bytes has to be calculated and entered manually.

The folders *Input* and *Output* of the scanner's dialogue box show the allocation of the input and output bytes of the LioN-Link system in the PLC's memory. The input and output bytes can be mapped automatically or allocated manually.



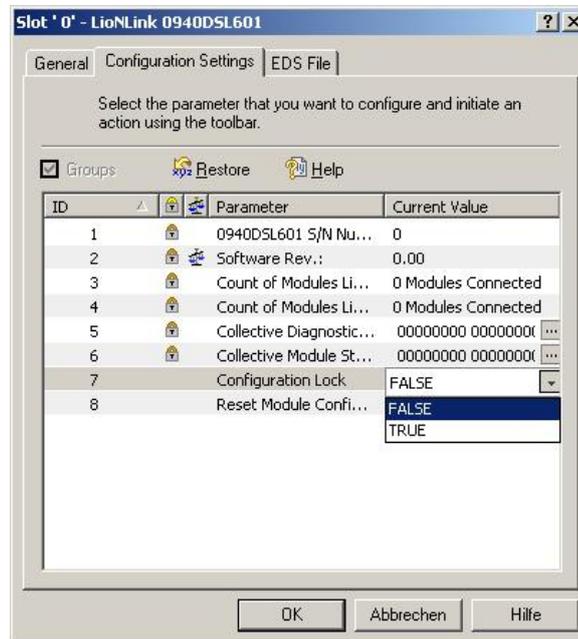
## 6.5. Parameter settings

Access to the parameter settings of the BusHead and the I/O-modules of the LioN-Link system can be obtained by a doubleclick on the BusHead or the I/O-modules in the folder *Module Configuration* of the configuration dialogue box.



### 6.5.1. Parameter settings of the BusHead

The parameter settings of the BusHead are shown in the folder *Configuration Settings* of the following dialogue box.



#### 1. Serial number

Each DeviceNet BusHead possesses a unique serial number. The serial number is 32 bits long and shown in the configuration tool. The serial number can also be read by sending an Explicit Message to the BusHead. The message can be send through the configuration tool in online mode or the PLC program.

Access is obtained using the class 01, instance 01 and the attribute 06.

#### 2. Software revision

The firmware version of the BusHead can be read out with the configuration tool.

Access is obtained using the class 102, instance 01 and the attribute 03.

#### 3. Count of modules line 1

This parameter shows the number of detected I/O-modules in the Lion-Link line 1.

Access is obtained using the class 102, instance 01 and the attribute 04.

#### 4. Count of modules line 2

This parameter shows the number of detected modules in the LioN-Link line 2.

Access is obtained using the class 102, instance 01 and the attribute 05.

#### 5. Collective Diagnostic Info

This parameter shows the detected I/O-modules with active diagnostics set. The collective diagnostics information is 16 bits long, the single diagnostics bit corresponds to the module position starting with the first module in LioN-Link line 1.

Access is obtained using the class 102, instance 01 and the attribute 06.

## 6. Collective Module Status

This parameter shows the I/O-modules that are configured in the wrong way or have been removed. The status information is 16 bits long, the status bit corresponds to the module position starting with the first module in LioN-Link line 1.

Access is obtained using the class 102, instance 01 and the attribute 07.

## 7. Configuration Lock

This parameter is editable, it accepts the values TRUE (1) and FALSE (0). If the parameter is set to FALSE during power on, each configuration at the LioN-Link lines is accepted. Setting the parameter to TRUE fixes the actual configuration of I/O-modules as the valid configuration and stores it in the BusHeads nonvolatile memory. After power on, the BusHead compares the actual configuration of I/O-modules with the stored configuration. The BusHead starts operation only if the actual and stored configuration are identical.

Access is obtained using the class 102, instance 01 and the attribute 07.

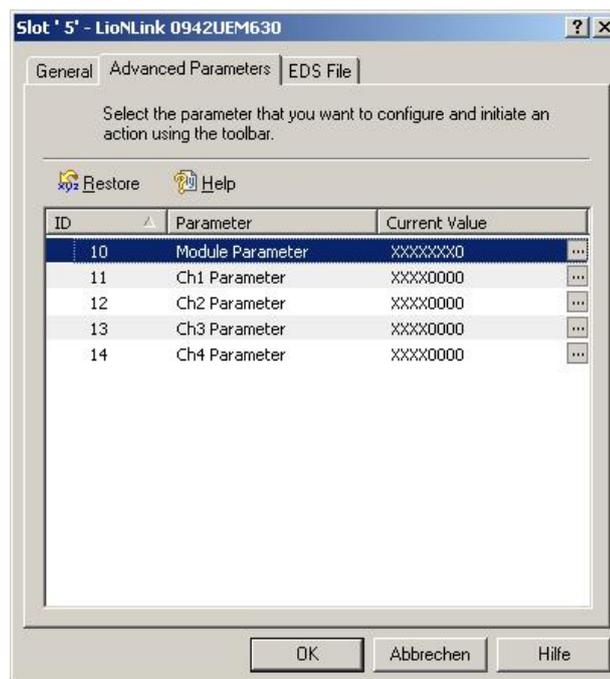
## 8. Reset Module Configuration

This parameter is editable, it accepts the values TRUE (1) and FALSE (0). Selecting TRUE for this parameter will set all I/O-modules to the default configuration. For an update of the process image a new configuration upload is necessary after the parameter change. If this parameter is set, the Configuration Lock (parameter 7) is cancelled automatically. The parameter resets to FALSE automatically.

Acyclic access is obtained using the class 102, instance 01 and the attribute 09. After the I/O-modules have been resetted, a system reset is accomplished.

### 6.5.2. Parameter settings of I/O-modules

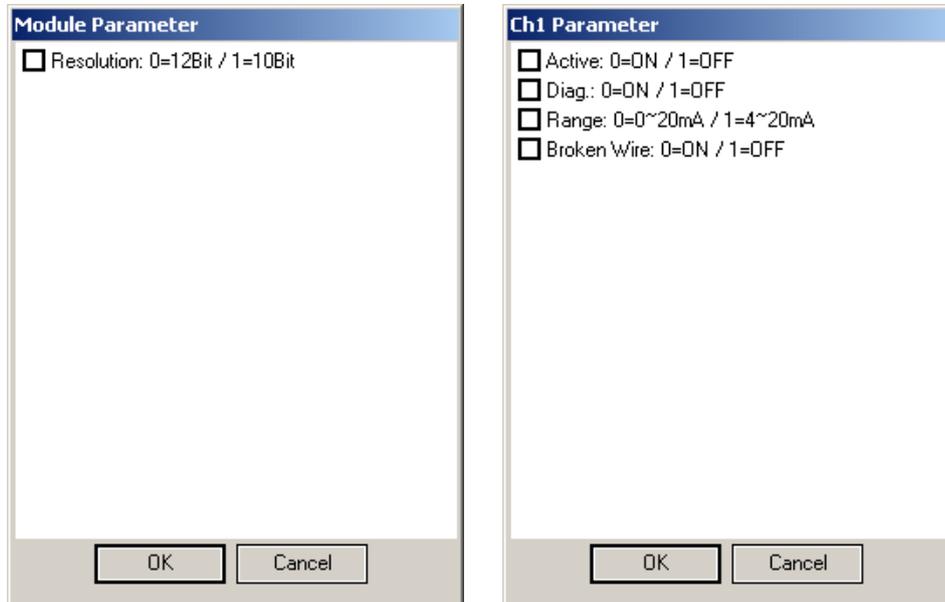
Doubleclick on the selected I/O-module in the configuration dialogue box to open the folder *Advanced Parameters* in the opening dialogue box for its parameter setting. The parameters are available only if the appropriate I/O-module provides parameter bytes. The following picture shows the parameter set of the analogue I/O-module 0942 UEM 630 as an example.





The respective I/O-module parameters are adjusted by the configuration tool. After the parameter setting a configuration download is necessary.

Doubleclick on a parameter for setting.



Acyclic access is obtained by using the class 101. The instance complies with the respective module position of the I/O-module beginning with the first module in LioN-Link line 1. The attribute 11 shows the number of available parameters. The attributes 12 and following correspond to the module parameter byte with its respective meaning.

## 6.6. Bit assignment / Process data

The process data are divided into consumer (output) data and producer (input) data. The process data are transferred as a block according to the DeviceNet specification.

### 6.6.1. Process data of the BusHead

The BusHead provides 5 byte producer (input) data that always build up the beginning of the producer (input) data block.

BYTE 0:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
0	0	0	0	US1	US2	KS1	KS2

US1: 1 = Voltage monitoring of LioN-Link line 1 reports diagnostics.

0 = Voltage level on LioN-Link line is ok.

US2: 1 = Voltage monitoring of LioN-Link line 2 reports diagnostics.

0 = Voltage level on LioN-Link line is ok.

KS1: 1 = Short-circuit monitoring of LioN-Link line 1 reports diagnostics.

0 = No short circuit on LioN-Link line 1.

KS2: 1 = Short-circuit monitoring of LioN-Link line 2 reports diagnostics.

0 = No short circuit on LioN-Link line 2.

BYTE 1:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DIAG S_8	DIAG S_7	DIAG S_6	DIAG S_5	DIAG S_4	DIAG S_3	DIAG S_2	DIAG S_1

BYTE 2:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
DIAG S_16	DIAG S_15	DIAG S_14	DIAG S_13	DIAG S_12	DIAG S_11	DIAG S_10	DIAG S_9

DIAG S\_[1..16]: 1 = I/O-module with number [1..16] reports diagnostics.  
0 = No diagnostics detected at I/O-module [1..16].

BYTE 3:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
STATUS S_8	STATUS S_7	STATUS S_6	STATUS S_5	STATUS S_4	STATUS S_3	STATUS S_2	STATUS S_1

BYTE 4:

Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
STATUS S_16	STATUS S_15	STATUS S_14	STATUS S_13	STATUS S_12	STATUS S_11	STATUS S_10	STATUS S_9

STATUS\_[1..16]: 1 = I/O-module with number [1..16] reports an incorrect status.  
0 = I/O-module with number [1..16] is configured correctly.

Please consider that only the first detected configuration error can be reported.

## 6.6.2. Process data of the I/O-modules

The producer (input) process data of the I/O-modules is added after the process data of the BusHead to the producer data block. The consumer (output) data block is filled with the consumer (output) data of the I/O-modules. The producer and consumer data is arranged following the position of the I/O-modules. It depends on the configuration of the entire system.

## 6.7. Communication modes of the BusHead

The BusHead supports Polling and Change Of State according to the DeviceNet specification.

### 6.7.1. Polling

The DeviceNet scanner addresses each slave through a POLL command. A „Point2Point“- connection is established. The slave adopts the consumer data and transmits its producer data on the bus.

### 6.7.2. Change of State

With this mode of communication the process data are transmitted only after a state change in the producer or consumer data.

## 7. Operation of the BusHead

### 7.1. Commissioning

During commissioning it is recommended to leave the parameter *Configuration Lock* on FALSE (default setting). In this mode it is possible to find the optimal topology for the LioN-Link system and the most favorable wiring solution. After the final configuration has been determined this parameter should be set to TRUE to immediately detect permutations of I/O-modules or a wrong wiring and to check the desired topology.

### 7.2. Exchange of I/O-modules

A defective module can be replaced by an equivalent one without interruption of the power supply. After exchange the I/O-module is detected automatically and the bus communication is started again.

In order to minimise the stock-keeping with replacement modules it is possible also to replace the I/O-modules with only digital inputs by a universal module without changes to the configuration. This means, the following I/O-modules in first row replace the ones in the second row.

0942 UEM 650	->	0942 UEM 651
0942 UEM 600	->	0942 UEM 601
0942 UEM 700	->	0942 UEM 701



The power supply for the actuators on a universal module is not needed as far as the module is used as an input module only.  
In this case no diagnostics of the actuator power is indicated or evaluated!

### 7.3. Bus interruptions and restart

During an interruption of the bus line of one or both LioN-Link lines the MS and NS indicators start flashing. A diagnostic message is sent to the master. This behaviour explains itself from the fact that in this case the current configuration of the DeviceNet system does no longer comply with the target configuration. Therefore the communication over the DeviceNet bus line is interrupted.

The BusHead restarts cyclically and tries to find the lost modules again. During the restart process the MS and NS indicators as well as the green and red LioN-Link indicators of the interrupted line (IO S1/S2) flash in cyclic change. For the LioN-Link line being not concerned only the green indicator IO (IO S1/S2) flashes cyclically.

The red and green IO indicators LED of all I/O-modules that are connected with the BusHead flash in cyclic change (restart process). The red IO indicator is active permanently on those I/O-modules that lost the connection. If both, the bus connection and voltage supply are interrupted no indicators are illuminated.

As soon as the interruption in the LioN-Link is repaired, the system restarts independently. Also, the diagnostic message that was caused by the incorrect configuration, is reset in the DeviceNet system.



The position of the interruption in the LioN-Link line can be recognised by the status of the indicators.

## 7.4. Diagnostics

For easier troubleshooting a software diagnostics is implemented in the BusHead that can be evaluated by the DeviceNet scanner. Also, LED indicators for the visual diagnostics are available.

The diagnostics data of the I/O-modules can be accessed through acyclic services (Explicit Messages). The information which module has detected an active diagnostics is presented in the bytes 1 and 2 of the BusHead's process data.

Access to the diagnostics bytes of an I/O-module can be obtained by the class 101. The instance is built up according to the respective position of the I/O-module on the LioN-Link line starting with the first I/O-module in LioN-Link line 1. The attributes 1 to 10 correspond to the module's diagnostics bytes. The description of the diagnostics bytes is found in the documentation of the respective module.

The LioN-Link BusHead provides several LED indicators to report internal conditions.

## 7.5. System expansion

In order to be able to insert a further module, all I/O-modules of the appropriate LioN-Link line must be shifted beginning from the rear up to the position, at which the additional module is to be inserted.

Please consider that the position of the I/O-module diagnostics also shifts.

## 8. Technical data

### 8.1. General data

Degree of protection	IP 67 (only with screwed connectors)
Ambient temperature	-10°C / +60°C
Weight	200 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

### 8.2. Technical data of the bus system

Protocol	DeviceNet
EDS-file	00_0940 DSL 601.eds
Transmission rates	125 / 250 / 500 KBit/s
Setting of the transmission rate	Automatically during communication start.
Node address	
Setting through rotary switches	1 to 63 dec.
Default address	63 dec, see chapter address setting
Vendor code	21 dec.
Product type	12 dec, Communication Adapter
Product code	98 dec.
Connections	M12-plug and M12-socket, 5-pole, A-coded (see pin assignments)

### 8.3. Technical data of the power supply for the fieldbus interface

Rated voltage $U_s$	24 V DC
Voltage range	11-30 V DC
Current consumption	typ. 10 mA
Reverse polarity protection	yes
Operation indicator ( $U_s$ )	LED green
Connection	via DeviceNet bus cable

### 8.4. Technical data of the power supply for the system / sensors

Rated voltage $U_{s1}, U_{s2}$	24 V DC
Voltage range	19-30 V DC
Current consumption	typ. 50 mA
Supply current per line	3 A
Reverse polarity protection	yes
Operation indicator ( $U_{s1}, U_{s2}$ )	LED green
Connection	M12-plug, 5-pole 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. See chapter 5.1 (pin assignments).	



The reverse polarity protection functions only, if the power supplies of the system in each case are protected by an overcurrent fuse (6 A, semi time-lag) and switched off in the case of a short-circuit after 10 to 100 ms at the latest.



#### Attention!

A power supply unit with current control or a wrong protection leads to the destruction of the module in case of reverse polarity.

## 8.5. LED indicators

U <sub>5</sub>	green	Power supply DeviceNet fieldbus interface available, necessary for operation
	off	Missing power supply DeviceNet fieldbus interface
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
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 P2 Lnk / Act	green	Ethernet connection to another participant exists.
	yellow flashing	Data exchange with another participant.
	off	No connection with another participant.
MS	green	Device is ready for operation
	green flashing	Incorrect configuration
	red	Unrecoverable error
	red flashing	Recoverable error
NS	red / green flashing	Self-test is running
	green	Online, communication with PLC
	green flashing	Online, no communication with PLC
	red flashing	Timeout status of at least one I/O-connection
	red	Faulty communication, Bus-off status, redundant MAC-ID