



LioN-Link Profibus

Technical Manual

0940 PSL 601

0942 UEM 6xx | 0970 UEM 7xx



lumberg
automation

A Belden Company



LioN-Link – Modular system for Profibus-DP

0940 PSL 601

BusHead, Profibus-Slave, M12 bus connection,
with rotary address switches

0942 UEM 6xx | 0942 UEM 7xx

I/O modules



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1. About this Manual

Please read the assembly and operating instructions in this Manual carefully before putting the LioN-Link system into operation. The Manual should be stored in a place that is accessible for all users.

The texts, illustrations, diagrams and examples used in this Manual are solely for the purpose of explaining the operation and use of input/output modules of the series type LioN-Link.

Please contact us if you have any further questions concerning installation and commissioning of the devices. We will be happy to be of assistance to you at any time.

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Lumberg Automation reserves the right to alter these technical modifications or to modify this Manual at any time without notice.

1.1 Explanations of symbols used

1.1.1 Use of notes

Notes concerning important information are specially marked. They are displayed in grey.

1.1.2 Use of hazard notes

Notes concerning hazards are marked as follows:

**DANGER:**

Non-compliance with respective precautionary measures will expose the user to life-threatening dangers and health hazards.

**NOTE:**

Non-compliance with precautionary measures can result in possible damage to equipment and other property.

1.2 Safety Guidelines

1.2.1 Certified usage

The devices described in this Manual are used as decentralised input/output assemblies in a Profibus DP network.

Our products have been developed, produced, tested and documented in compliance with safety standards. No hazards to personnel or property are to be anticipated under normal conditions in connection with these products when the handling regulations and safety instructions described here for project planning, assembly and specified operations are complied with.

The modules fulfill the requirements of the

- EMC guideline (89/336/EWG, 93/68/EWG and 93/44/EWG)
- Low-voltage Guideline (73/23/EWG)
- are designed for utilization in the industrial area. The industrial environment is characterised by the fact that users are not directly connected with the public low-voltage mains. Additional measures are to be implemented for utilization in residential quarters and in business and trade areas.

Warning!

This installation can cause radio interference in resident areas; the user may be asked to implement appropriate measures.

The error-free, secure operation of the product requires proper transport, storage, set-up and assembly, as well as careful operation. The intended operation of the device can only be guaranteed when the housing is mounted in its entirety. All of the other devices connected with this device must fulfill the requirements contained in EN 61558-2-4 and EN 61558-2-6.

Project planning, installation, commissioning, maintenance and testing of the devices may not be performed by anyone other than an electrician who has successfully completed recognised training courses and who is familiar with the safety standards of automation technology.

The user has to comply with the safety and accident prevention regulations that apply to the specific activity being performed during project planning, installation, commissioning, maintenance and testing of the devices.

No cables or accessories may be installed except for those which fulfill the requirements and regulations governing safety, electromagnetic compatibility and, where appropriate, terminal device equipment for telecommunications and which correspond to the statement of specifications. Information concerning those cables and accessories which are authorized for installation can either be obtained from Lumberg Automation or are already described in this Manual.

1.3 Qualified personnel

The personnel requirements are oriented towards the requirements profile outlined by ZVEI and VDMA. Only skilled electricians who are familiar with the contents of this Manual are permitted to install or service the products described.

These are individuals who

- to assess the tasks to be performed on the basis of their professional training, knowledge and experience and on the basis of their knowledge of the pertinent standards, and who can recognise possible dangers.
- have the same knowledge levels as those who have completed a specialised training course, thanks to many years of professional involvement in a comparable area.

No modifications may be carried out on our product hardware or software, insofar as they are not described in the Manual, except by Lumberg Automation personnel.

Warning!

Unqualified modifications of hardware or software or non-compliance with the warning notices listed in this Manual could lead to severe injury to persons or damage to property.

2. System description

LioN (Lumberg I/O Network) Link is a modular system for decentralized utilization in rough industrial environments, for simple management of I/O data within a higher-level bus system. It is especially well suited to situations with high I/O concentration across dispersed assemblies.

Its ultracompact dimensions and minimal weight mean that it can be utilized even where space is restricted, and can be attached to handling devices. LioN-Link provides IP 67 protection.

The LioN-Link system consists of the BusHead – the connection to the higher-level fieldbus – and the various different fieldbus-independent I/O modules. The maximum extension of the Link system is 100 m per Link connection (two connections per BusHead => total extension 200 m). Each branch can be expanded with up to 15 I/O modules. Two Link devices can be any distance apart. However, the maximum total length allowed for each branch cannot be exceeded.

When the maximum extension is utilized, additional system/sensor power supply can be fed in via T-connectors and/or on the last Link device.

To keep within the permissible limits for safe power supply to the modules, every system needs to be planned according to the actual conditions on site (number of modules and sensors, and the length of lines between the modules). A planning table is available for this purpose at <http://www.lumberg-automation.com/downloads>. This manual includes an example in Section 6.3.

We recommend using a standard CAN/DeviceNet line as the Link line. Unshielded 5-core lines with standard M12 male/female connectors are also suitable. Alternatively, Fixcon male/female connectors may be used.

When using an unshielded line, do not exceed an extension of 25 m per Link connection. In systems subject to EMC stress (close to regulated motors, converters, or in welding applications), shielded lines must be used (standard CAN/DeviceNet).

3. Product overview

3.1 Module variants

Part no.	Description	I/O connection	Form
BusHead			
0940 PSL 601	BusHead Profibus DP		S
LioN-Link Module 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
0942 UEM 780 *	16 In/Out universal	Multipole interface	M
0942 UEM 782 *	16 Out	Multipole interface	M
LioN-Link Module 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 Module Input I analog			
0942 UEM 630	I/O module 4AI (0)4–20mA	4xM12	S
0942 UEM 631	I/O module 4AI 0–10V	4xM12	S

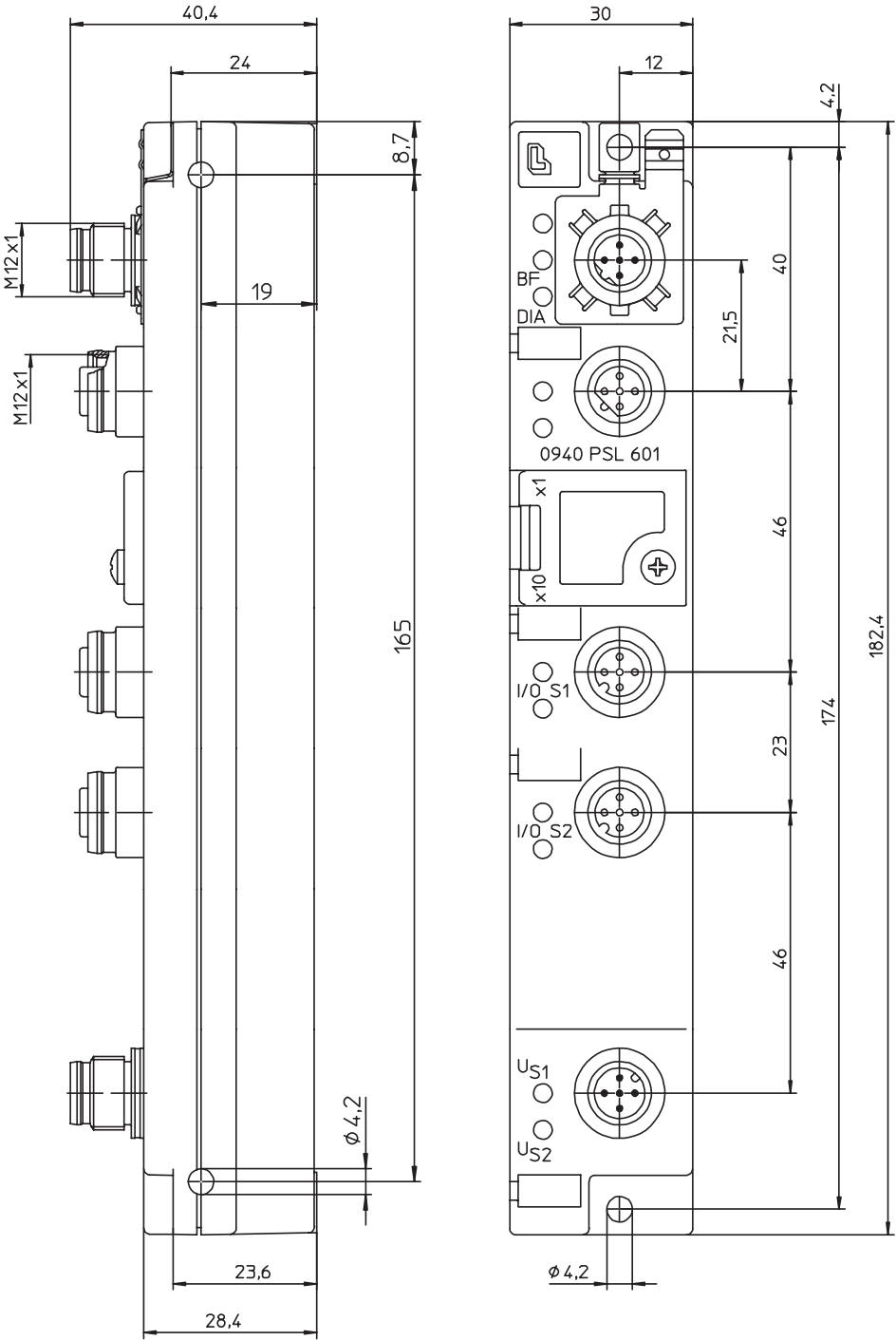
* in preparation - available probably from April 2008

3.2 Place Holder Modules

NOTE: these are purely virtual modules!

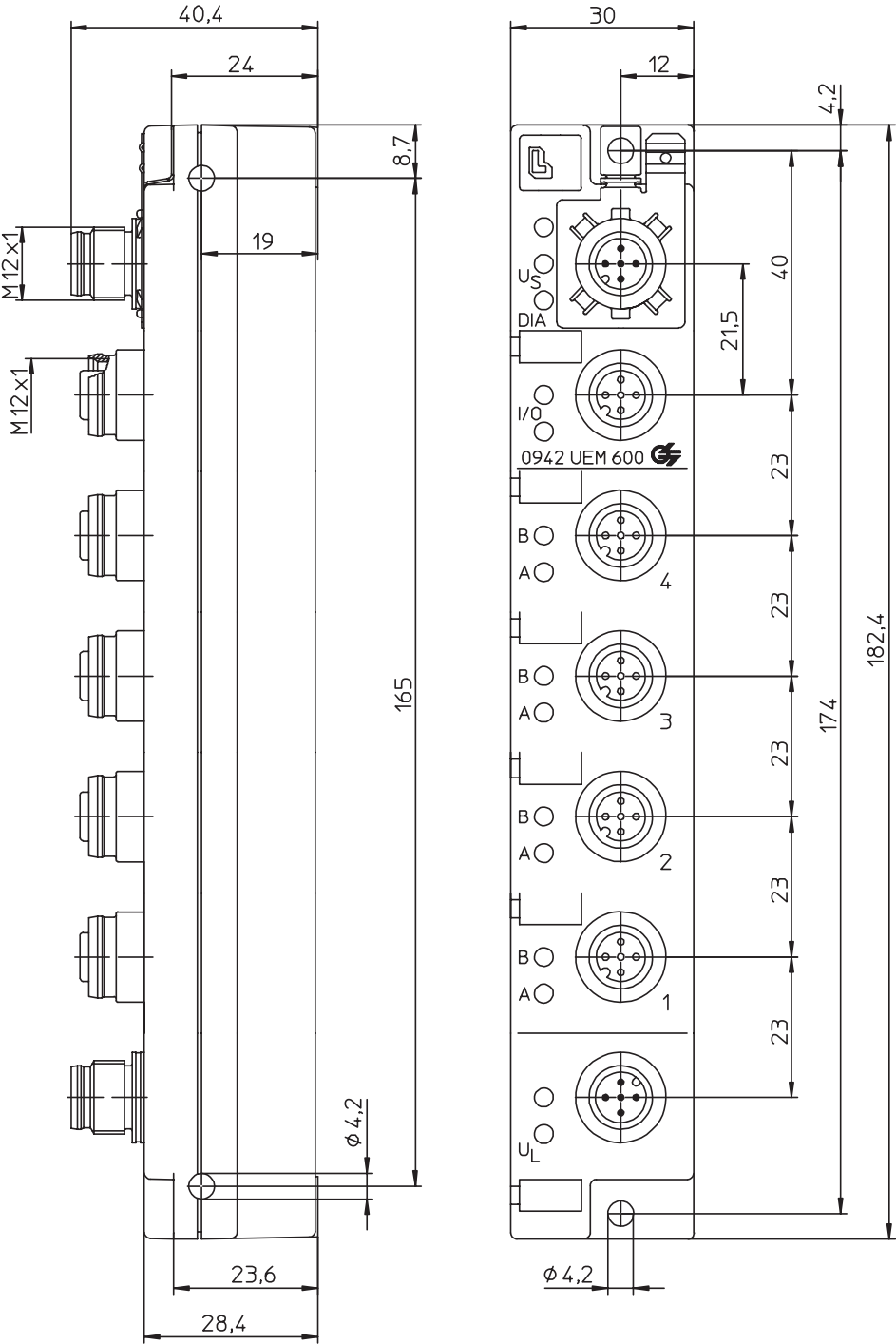
4. Dimensions

4.1 BusHead

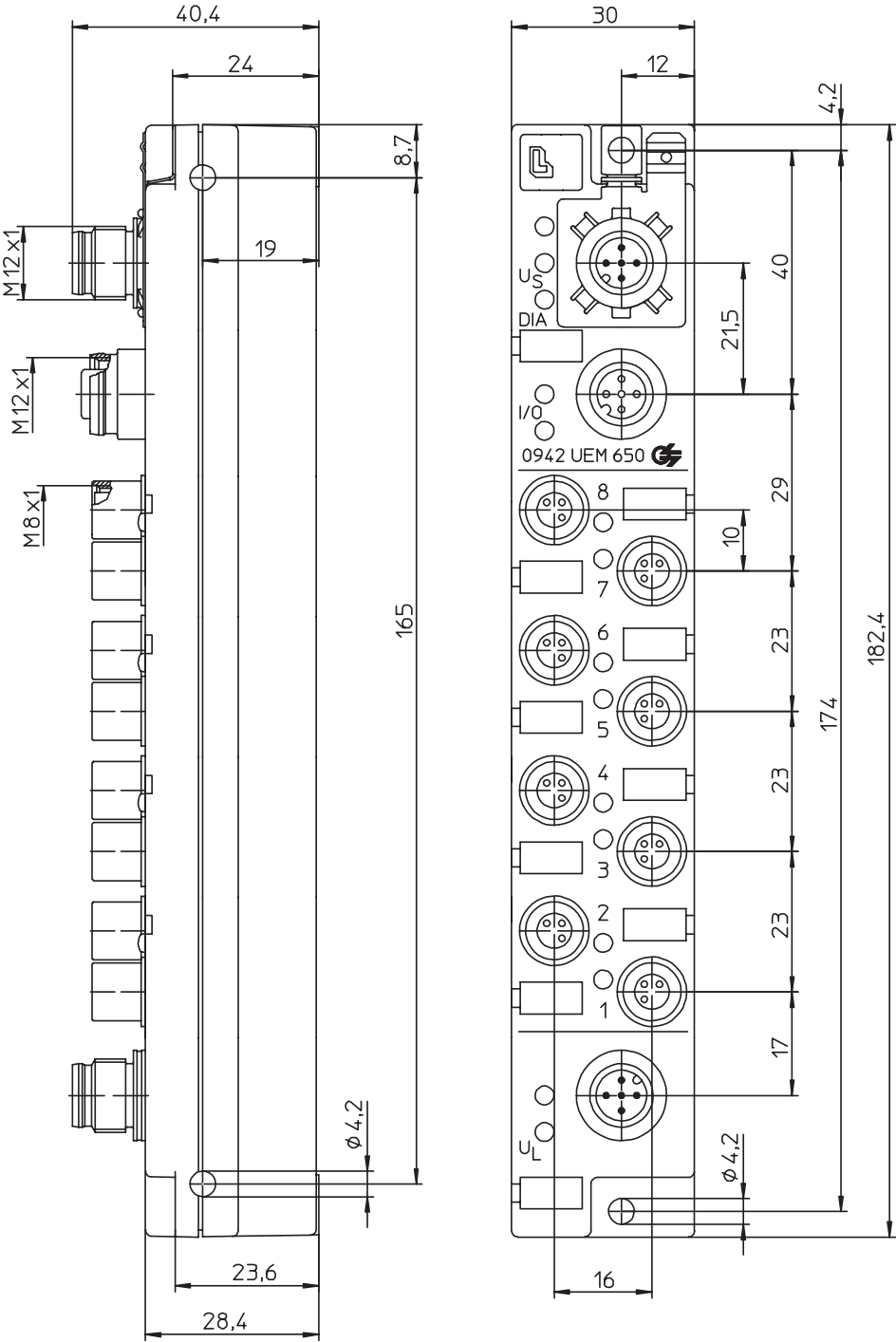


4.2 Digital Universal modules

4.2.1 0942 UEM 600

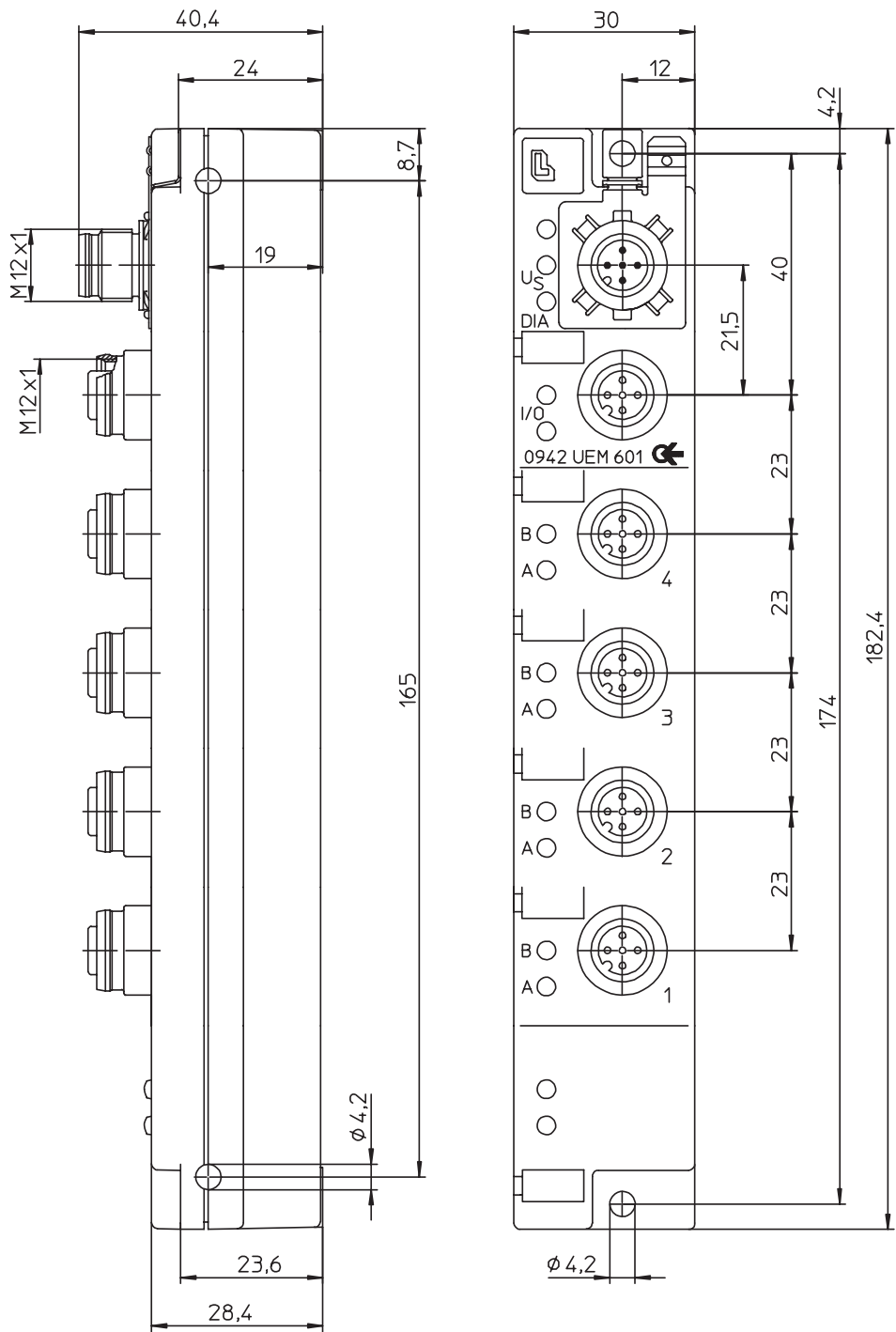


4.2.2 0942 UEM 650



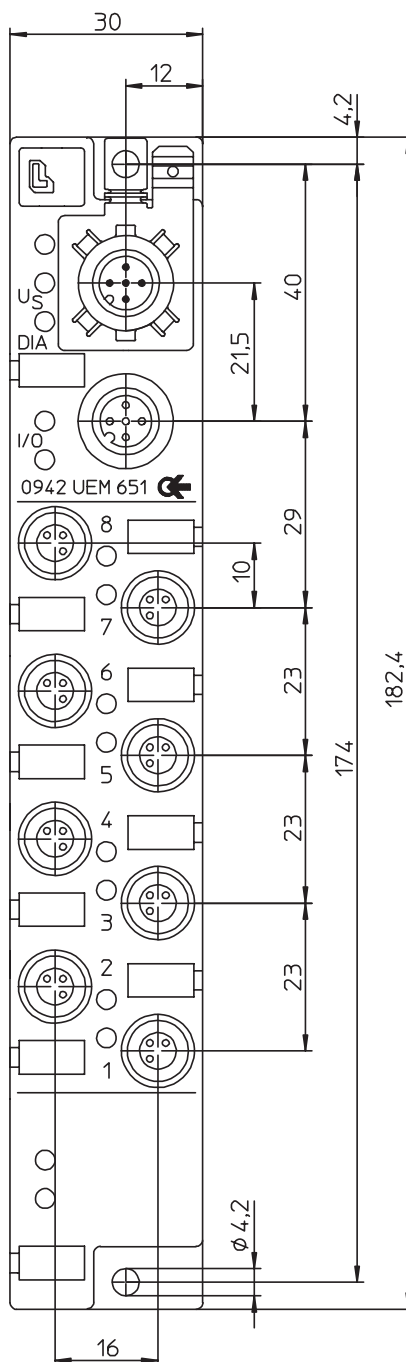
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4.3 Digital Input modules
4.3.1 0942 UEM 601



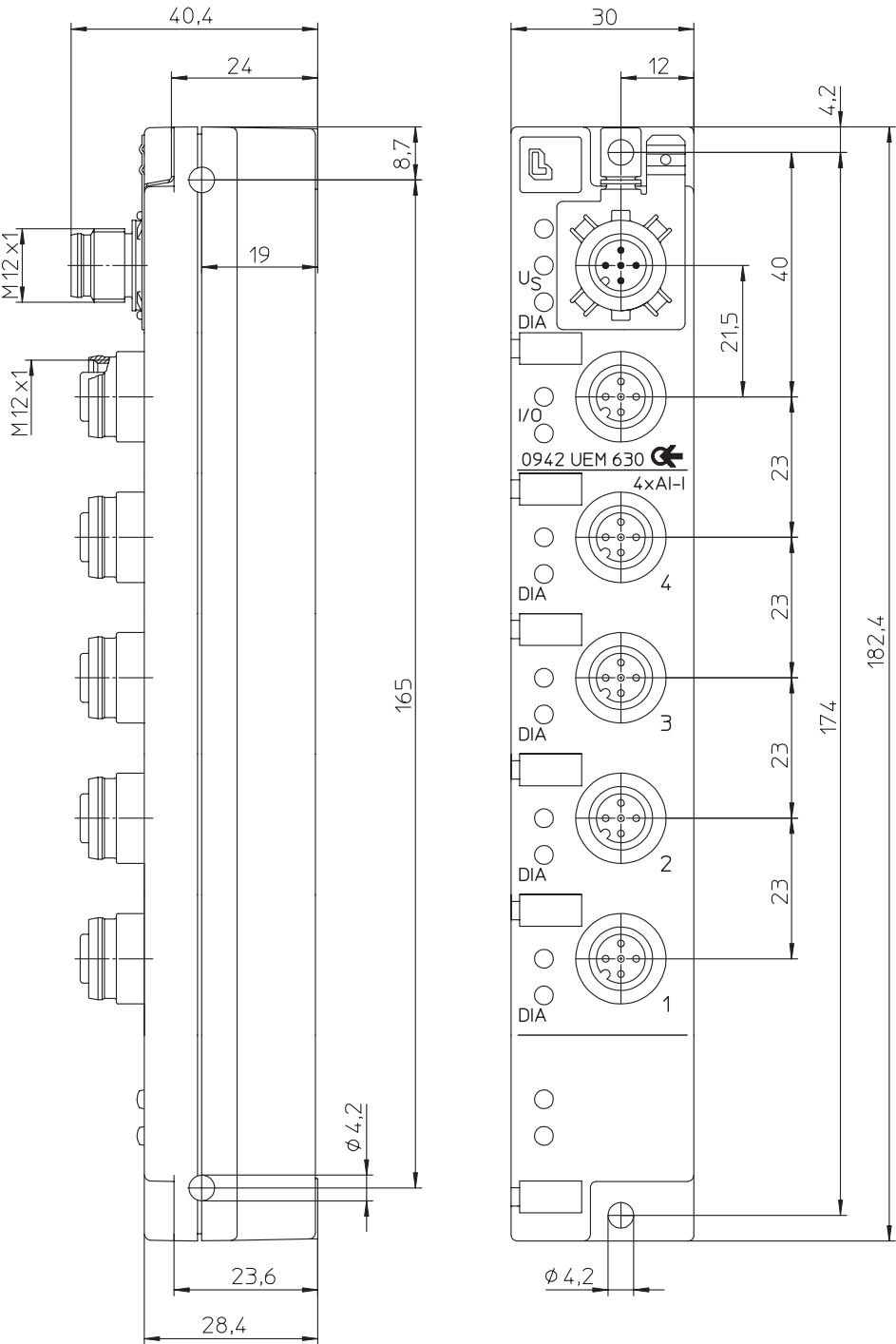
Technical drawing of a 165x40.4mm extruded aluminum profile. The drawing shows the profile with various mounting options and dimensions:

- Overall width: 40,4
- Overall height: 165
- Mounting hole diameter: $\varnothing 4,2$
- Mounting hole spacing: 24
- Mounting hole offset from top edge: 8,7
- Mounting hole offset from bottom edge: 23,6
- Mounting hole offset from side edge: 19
- Mounting hole diameter: M12 x1
- Mounting hole diameter: M8 x1



[illegible]

4.4 Analog Input modules
4.2.3 0942 UEM 630/631



4.5 Directions for field installation

The module is to be mounted on a level surface with at least 2 screws.

Type of mounting	Screw	Tightening torque
flat	M4 x 30/35	1.0 Nm
lateral	M4 x 40/70	1.0 Nm

A washer in accordance with DIN 125 is to be provided with all types of mounting fixtures.

Important note:

The module is equipped with a grounding sheet for the purpose of discharging parasitic currents and/or for EMC stability.

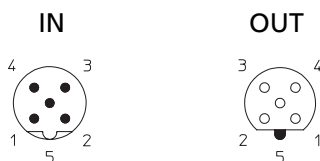
It is necessary that this grounding sheet is linked with the reference earth by means of a low-impedance connection. If the mounting surface is already grounded, the connection can be made directly via the fastening screw (not with lateral mounting).

If the mounting surface is not already grounded, or if the lateral mounting holes are used, a grounding strip or a suitable PE wire is to be used!

5. Pin assignment

5.1 Profibus DP M12 male/female connector, 5 poles, B-coded

Color coding of the connections: **violet**



Connection	Pin	Function
Profibus DP In/Out	1	+5 V*
	2	Line A
	3	GND*
	4	Line B
	5	earth

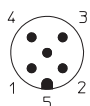
The signals marked with * are internal signals which the module provides for supplying a terminator. These are not permitted to be configured or redirected to other devices. Article 0979 PTX 101 is to be used as an authorized terminator.

⚠ CAUTION, danger of destruction

Never place the voltage supply (24 V DC) on the data circuits (Pin 2, Pin 4) or on the internal signals (Pin 1, Pin 3).

5.2 Power connection of the BusHead, M12 male connector, 5 poles

Color coding of the connection: **grey**



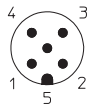
Connection	Pin	Signal	Function
Power Supply BusHead/ System	1	+24 V DC	System/Sensors Subbus 1/2 + Bus coupler
	2	+24 V DC	
	3	0 V	System/Sensors Subbus 1/2 + Bus coupler
	4	0 V	
	5	earth	earth

5.3 Link System connection, M12 male/female connector, 5 poles

Color coding of the connections: **orange**

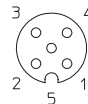
IN

M12 male, 5 poles,
not at BusHead



OUT

M12 female, 5 poles,
twice at BusHead
(Line 1, Line 2)



Connection	Pin	Function
Systembus In/Out	1	Drain
	2	24 V System/Sensors
	3	0 V System/Sensors
	4	Data +
	5	Data -

The 24 V power supply in the bus connections supplies the module electronics and the sensors of the system bus devices.

CAUTION, danger of destruction!

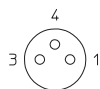
Never place the voltage supply (+24 V DC) on the data circuits (Data + -> Pin 4, Data - -> Pin 5). Polarity reversal of the power supply (+24 V DC/0 V) can also permanently damage the module.

When lines are very long, intermediate supply of power is recommended.

5.4 Sensor/Actuator connection System bus modules,

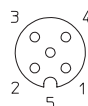
Color coding of the connections: **black**

5.4.1 Module 0942 UEM 650/651, M8 female connector, 3 poles



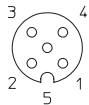
Connection	Pin	Function	
		UEM 650	UEM 651
I/O channels	1	+24 V	+24 V
	3	0 V	0 V
	4	In/Out	In

5.4.2 Module 0942 UEM 600/601 Module 0942 UEM 700/701 M12 female connector, 5 poles



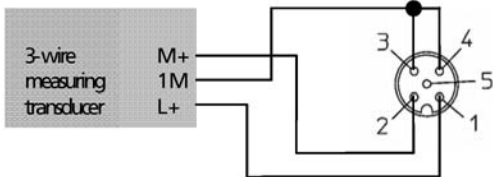
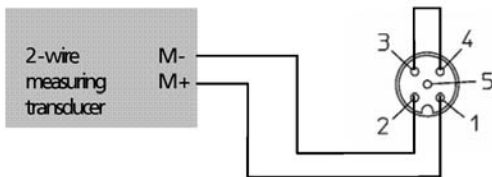
Connection	Pin	Function	
		UEM 600 UEM 700	UEM 601 UEM 701
I/O channels	1	+24 V	+24 V
	2	In/Out B	In B
	3	0 V	0 V
	4	In/Out A	In A
	5	earth	earth

5.4.3 Module 0942 UEM 630/631,
M12 female connector, 5 poles



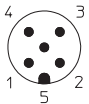
Connection	Pin	Function
		UEM 630 / UEM 631
I channels	1	+24 V
	2	+ measuring signal
	3	0 V
	4	- measuring signal
	5	shield

5.4.4 Connection of analog transducers



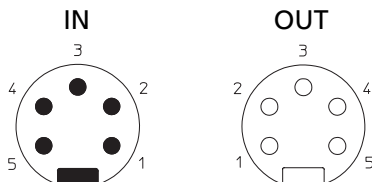
5.5 Actuator Power connection System bus modules,
Color coding of the connection: **grey**

5.5.1 System bus module Form S,
M12 male connector, 5 poles



Connection	Pin	Function
		UEM 600 / UEM 650
Power supply Actuators	1	+24 V
	2	n.c.
	3	GND (0 V)
	4	n.c.
	5	earth

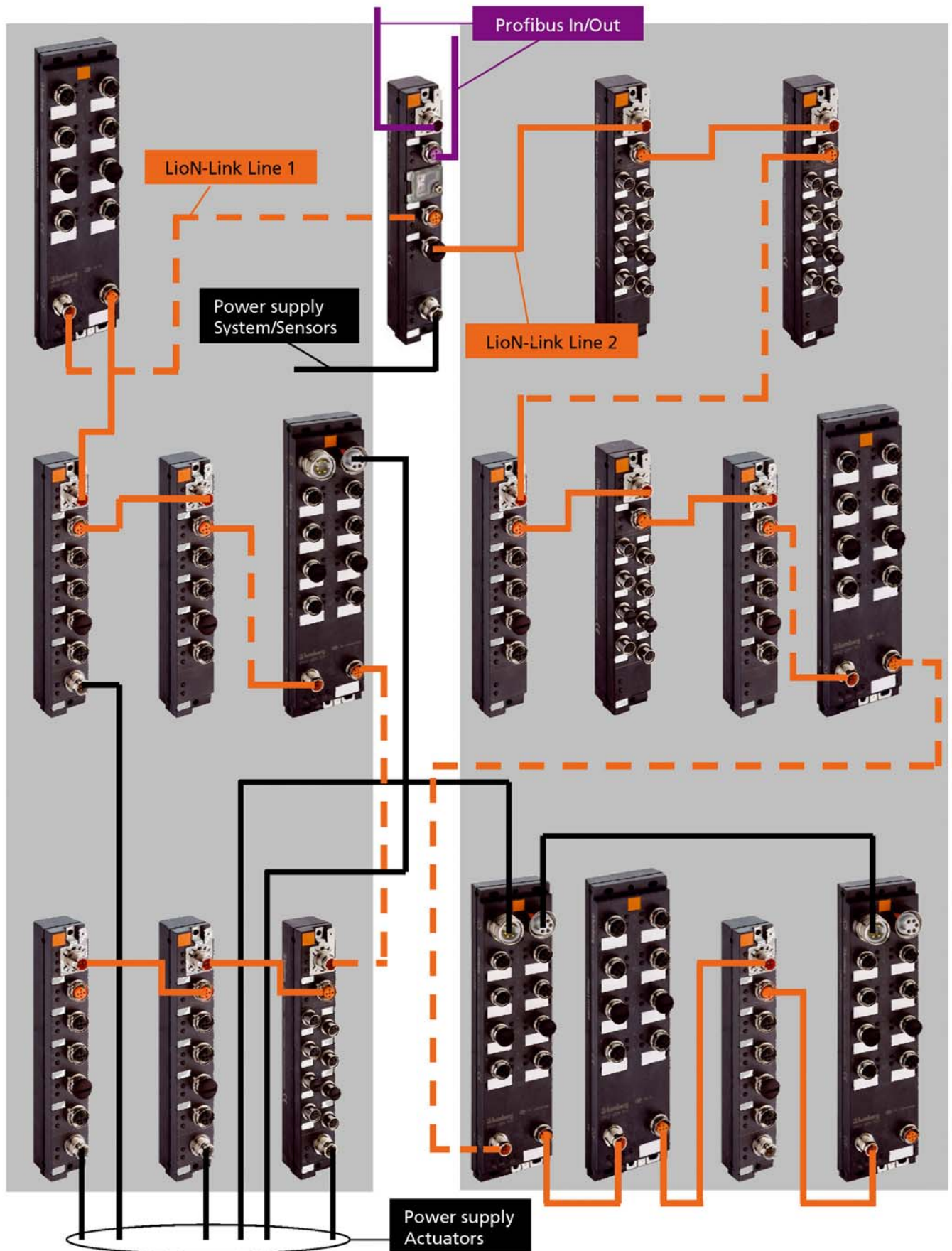
5.5.2 System bus modules Form M,
7/8" male/female connector, 5 poles



Connection	Pin	Function
		UEM 700
Power supply Actuators	1	GND (0 V)
	2	GND (0 V)
	3	earth
	4	24 V
	5	24 V

Pin 4 supply socket 1–4;
Pin 5 supply socket 5–8

6. Wiring concept



When planning a system, remember that intermediate supply of system/sensor power may be necessary beyond certain line lengths.

If the power supply is not sufficient, the I/O modules report a diagnostic signal. The warning threshold is about 19 V DC.

To calculate the line voltage drop, a calculation table is available at <http://www.lumberg-automation.com/downloads/> (see also illustration on next page).

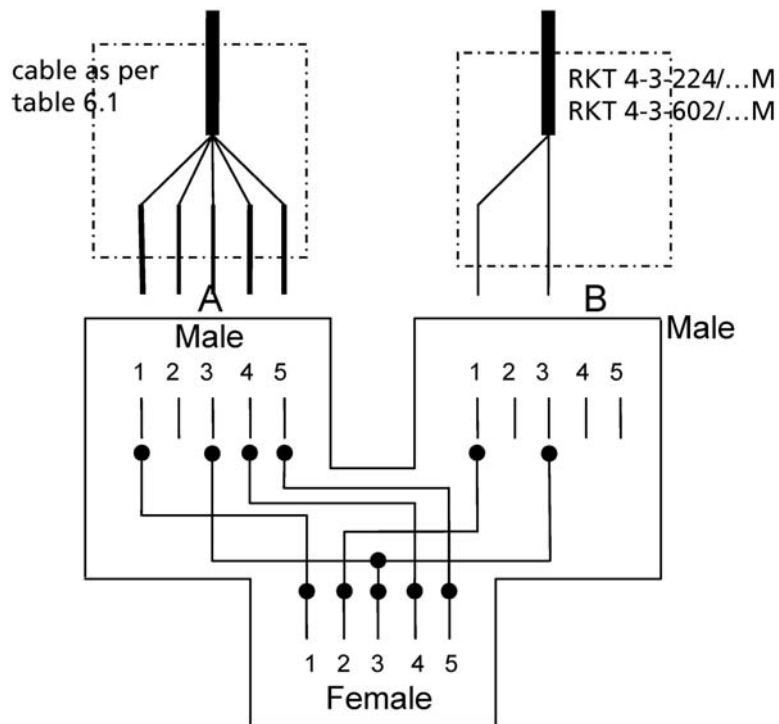
6.1 Possible cable variants

Designation	Version M12	Lead	Lengths*
Standard CAN-/DeviceNet Thin Cable			
0935 253 103/..M	Male/Female	2x0.25/2x0.34 mm ²	0.3/0.6/1/2/3/5/10/15/20/25 m
0935 253 104/..M	Male	2x0.25/2x0.34 mm ²	0.3/0.6/1/2/3/5/10/15/20/25 m
0935 253 105/..M	Female	2x0.25/2x0.34 mm ²	1/2/3/5/10/15 m
0935 253 108/..M	Male/Female right angle	2x0.25/2x0.34 mm ²	
0935 253 111/..M	Male right angle/ Female right angle	2x0.25/2x0.34 mm ²	
0935 253 112/..M	Male right angle/Female	2x0.25/2x0.34 mm ²	
CAN-/DeviceNet Mid Cable			
RST 5-RKT 5-616/..M	Male/Female	2xAWG16/ 2xAWG20 (1.3 / 0.5 mm ²)	1/3/5/10 m
RST 5-RKT 5-709/..M	Male/Female	2xAWG16/ 2xAWG20 (1.3 / 0.5 mm ²)	1/3/5/10 m
unshielded cable			
RST 5-RKT 5-xxx/..M	M12 Male/Female		

Designation	Version Fixcon	Lead	Lengths*
Standard CAN-/DeviceNet Thin Cable			
0935 253 174/..M	Male	2x0.25/2x0.34 mm ²	1/3/5/10/15 m
0935 253 175/..M	Female	2x0.25/2x0.34 mm ²	1/3/5/10/15 m
0935 253 173/..M	Male/Female	2x0.25/2x0.34 mm ²	0.3/0.6/1/2/3/5/10/15/20/25 m

* The specified lengths refer to standard types available from stock.
(Other variants on request)

6.2 Intermediate supply of sensor/system power to the Link modules using the T-distributor 0906 UTP 104 and standard connecting cables e.g. RKT 5-226/..M P89; RKT 4-3-224/..M; RKT 4-3-602/..M...



6.3 Illustration of the table for calculating line voltage drop and the positions for intermediate power supply, using examples

Rated voltage: 24 V
Cable cross-section: 0.34 mm²
Voltage threshold: 19 V

Module No.	Cable length in m	Output current in A	Voltage at module in V
1	0.3	0.1	23.96
2	3	0.1	23.56
3	5	0.1	22.95
4	7	0.1	22.18
5	3	0.1	21.88
6	3	0.1	21.61
7	8	0.1	20.97
8	8	0.1	20.42
9	11	0.2	19.77
10	5	0.06	19.58
11	7	0.06	19.36
12	8	0.06	19.16
13	8	0.06	19.01
14	8	0.06	18.91
15	16	0.06	18.81

Rated voltage: 24 V
Cable cross-section: 1.31 mm²
Voltage threshold: 19 V

Module No.	Cable length in m	Output current in A	Voltage at module in V
1	5	0.5	23.31
2	5	0.5	22.68
3	5	0.5	22.12
4	5	0.5	21.64
5	5	0.5	21.21
6	5	0.5	20.86
7	5	0.5	20.58
8	5	0.5	20.36
9	5	0.5	20.21
10	5	0.5	20.13
11	5	0.1	20.11
12	5	0	0.00
13	5	0	0.00
14	5	0	0.00
15	5	0	0.00

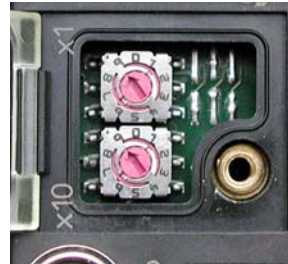
7. Communication with the module

Communication with the higher-level bus system (here: Profibus DP) is via the BusHead 0940 PSL 601.

7.1 Addressing

a) Rotary address switches

Two rotary switches, located above the M12 bus connections behind a clear cover, are used for direct adjustment of the Profibus address. The switches for setting the tens and the ones of the address are indicated. After selecting the address via the rotary switches the address will be set internally after power is applied to the module. Therefore the power supply must be interrupted briefly if the address is changed during power-on in order to allow the module to adopt the new address.



The adjustable address range lies between 1 and 99. The factory setting for the address is 99.

7.1.2 Profibus network

It is also possible to adjust the settings of the module address via the Profibus network. Precise directions regarding procedural method can be found in the manual for your respective Profibus Master.

The rotary switches must be set to the value "00" to allow software addressing. The addressing range in such cases lies between 1 and 125.

7.2 Data transmission rate

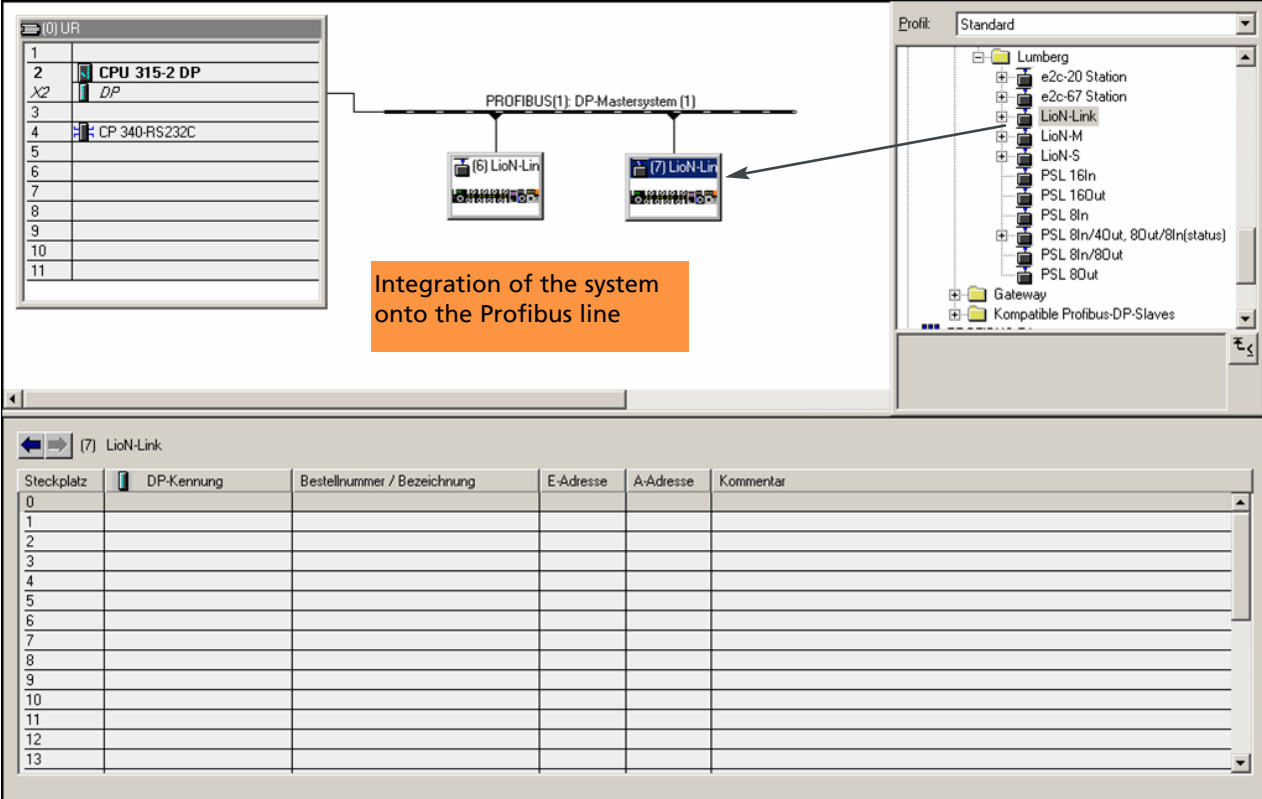
The data transmission rate used is established at the start of communication between the module with the master, and is automatically detected (AutoBaud Detection).

7.3 Examples for integration into the control system configuration

The configuration file (gsd file) of the modules must be integrated into the control system software. The precise procedural method can be obtained from the manual for the respective control system. The following examples show the procedure for the S7 software of the Siemens Company and the CoDeSys software of the 3S Software Solutions Company.

The determination of the Profibus address and the range of the input and output bytes is automatically set by the respective configuration software, but can also be altered by the user.

7.3.1 Configuration example in the Siemens Company's S7 Software



Integration of the system onto the Profibus line

Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse	Kommentar
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					

Eigenschaften - DP-Slave

Allgemein | Parametrieren

Baugruppe

Bestellnummer: GSD-Datei (Typdatei): LUM_QA36.GSD

Familie: I/O

DP-Slave-Typ: LioN-Link

Bezeichnung: LioN-Link

Adressen

Diagnoseadresse: 1022

Teilnehmer/Mastersystem

PROFIBUS... 8

DP-Mastersystem (1)

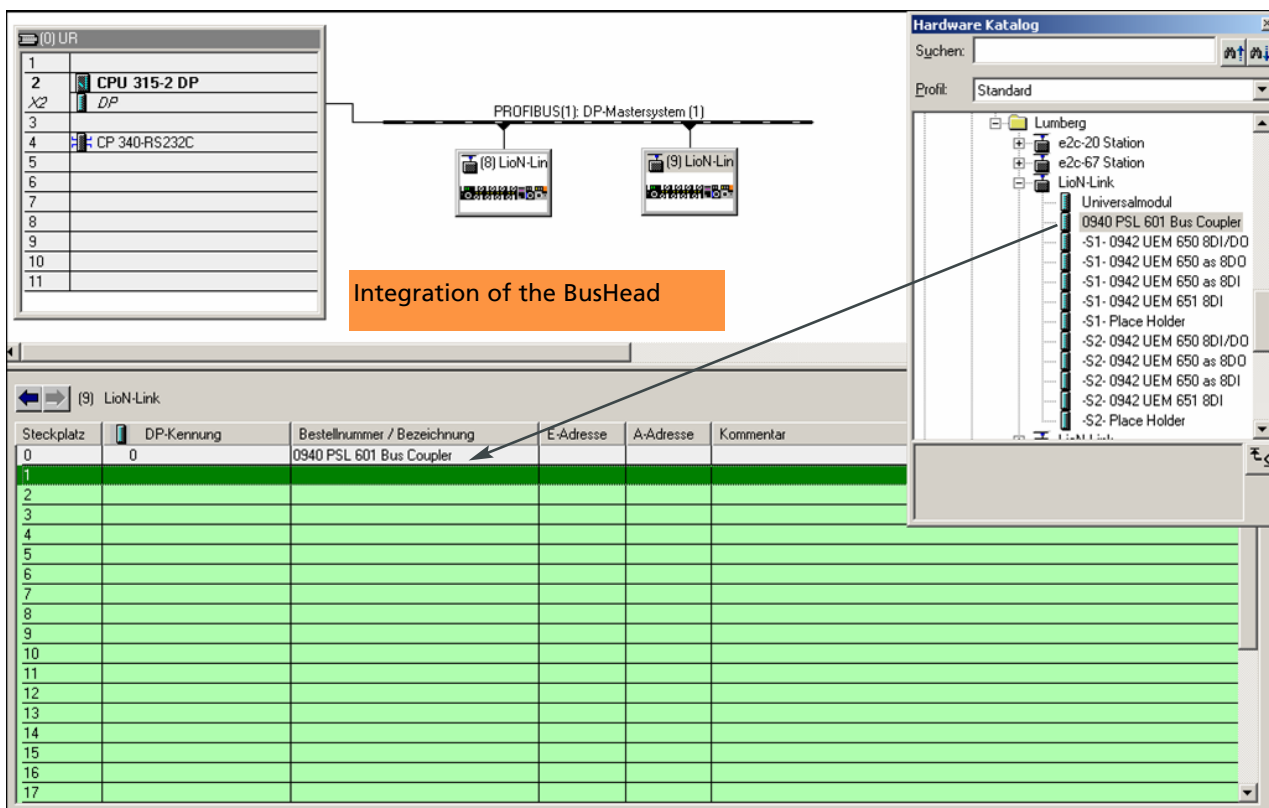
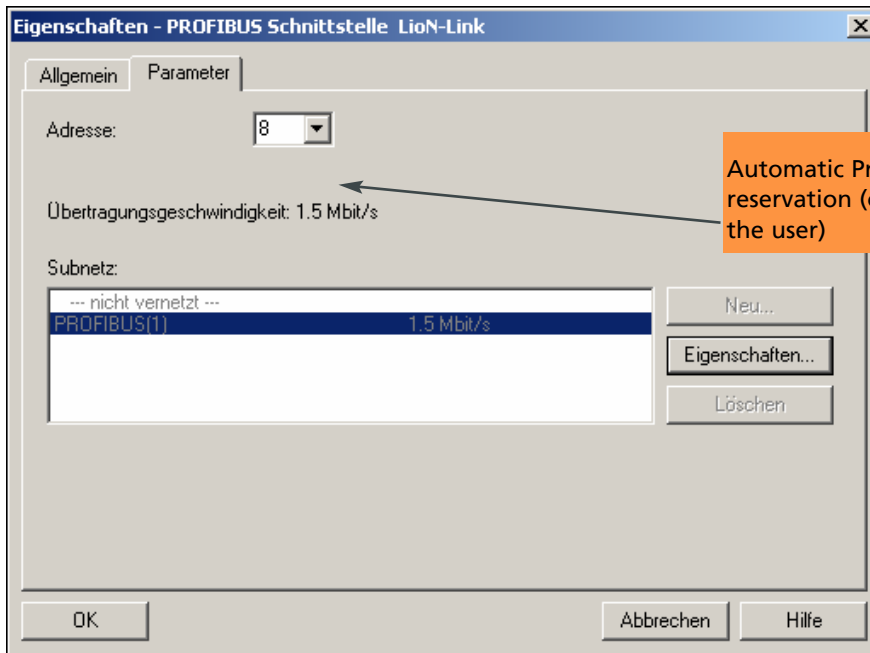
SYNC/FREEZE-Fähigkeiten

☒ SYNC-fähig ☒ FREEZE-fähig

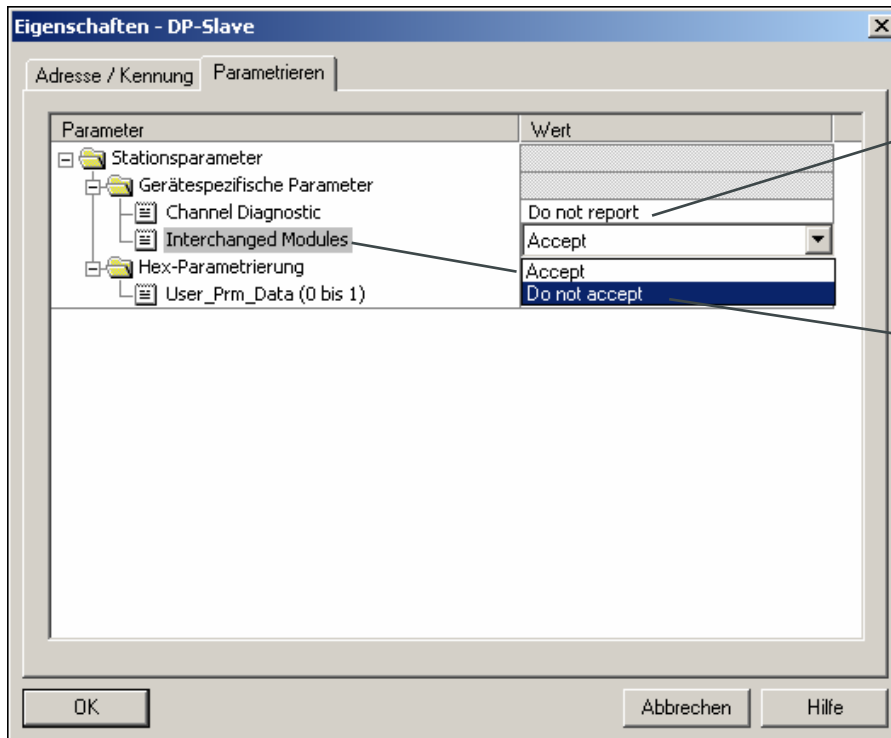
☒ Ansprechüberwachung

Kommentar:

OK Abbrechen Hilfe



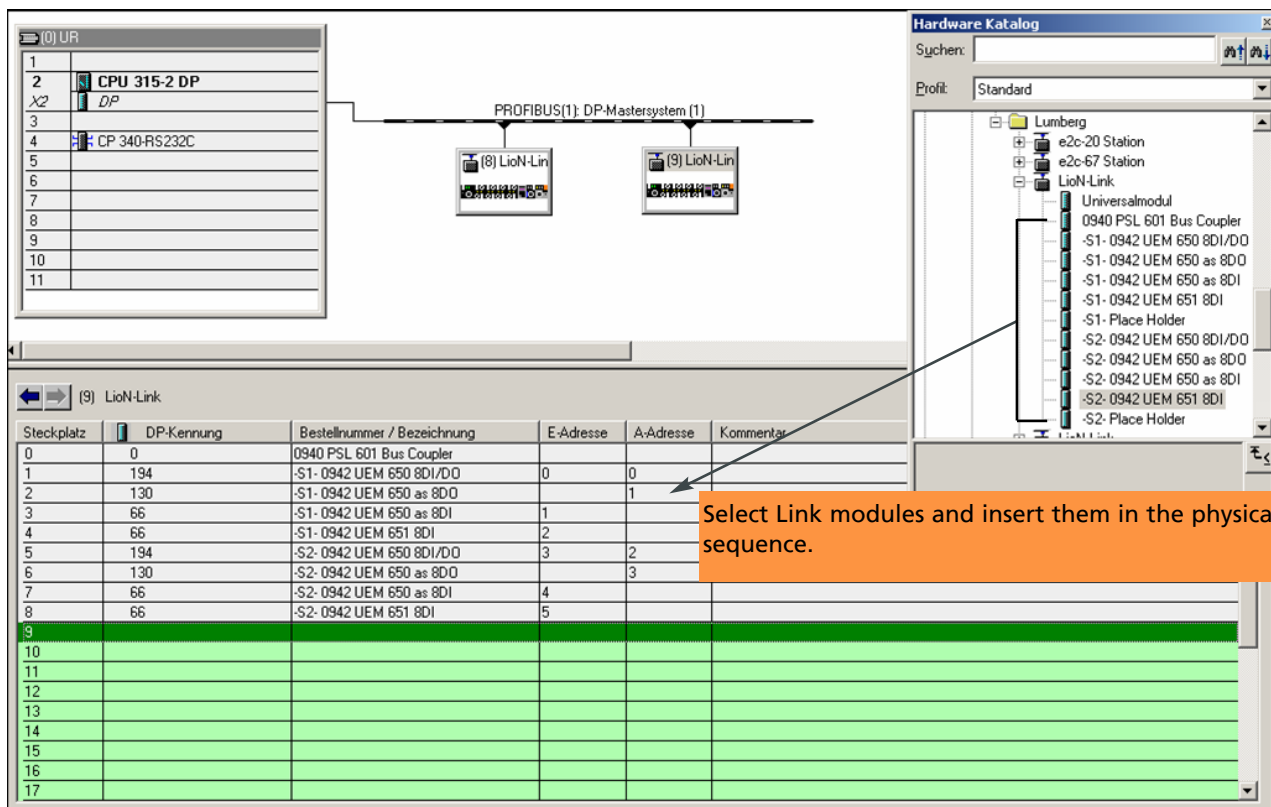
The default settings for the software diagnosis can be changed on the BusHead. To change the parameter settings, double click on the module and select Parameterize. Then open the folder Device-Specific Parameters. The set values are displayed.



Currently not supported

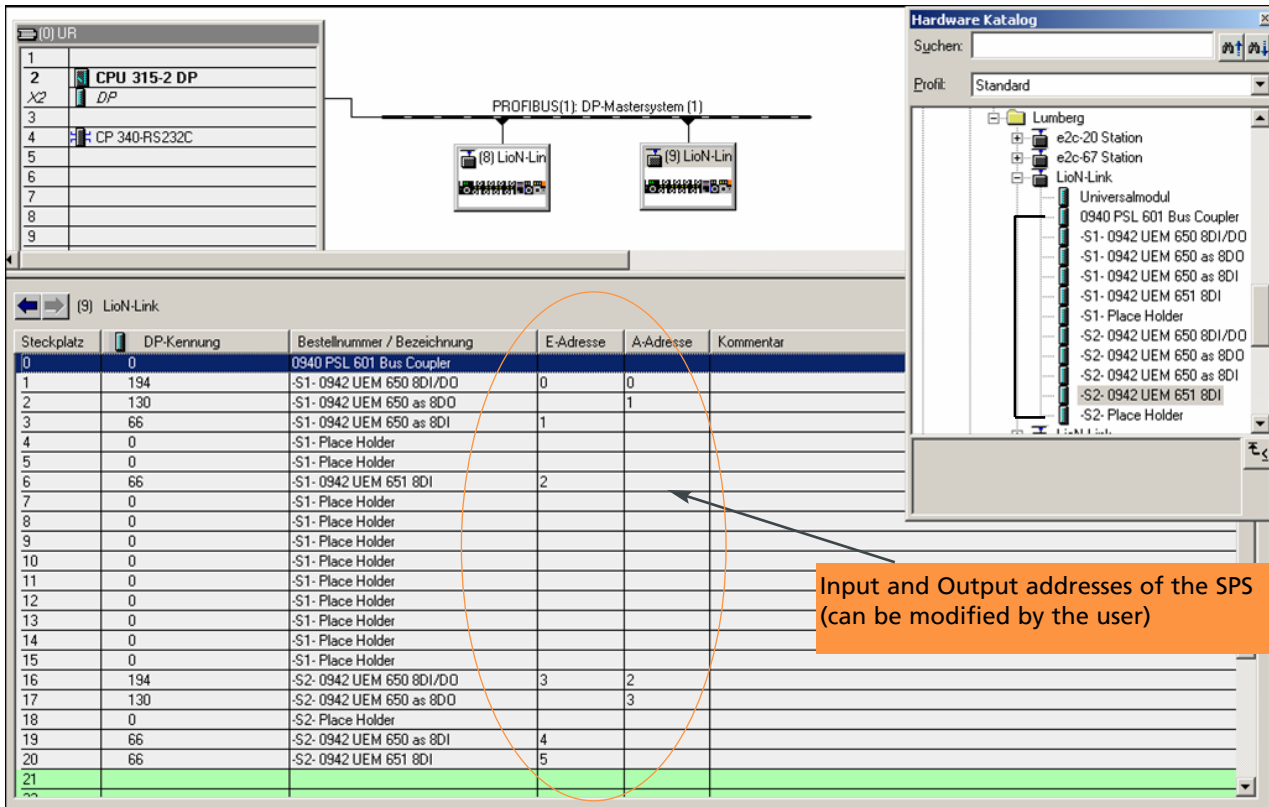
Interchanging modules within the bus structure can be permitted or excluded.
Default setting --> ACCEPT

If ACCEPT is set, the modified actual configuration will be accepted as the new target configuration when the system is restarted. With DO NOT ACCEPT, the existing configuration will be coded permanently.



Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse	Kommentar
0	0	0940 PSL 601 Bus Coupler			
1	194	-S1- 0942 UEM 650 8DI/D0	0	0	
2	130	-S1- 0942 UEM 650 as 8DO	1	1	
3	66	-S1- 0942 UEM 650 as 8DI	2	2	
4	66	-S2- 0942 UEM 650 as 8DO	3	3	
5	194	-S2- 0942 UEM 650 as 8DI	4	4	
6	130	-S2- 0942 UEM 650 as 8DO	5	5	
7	66	-S2- 0942 UEM 650 as 8DI			
8	66	-S2- 0942 UEM 651 8DI			
9					
10					
11					
12					
13					
14					
15					
16					
17					

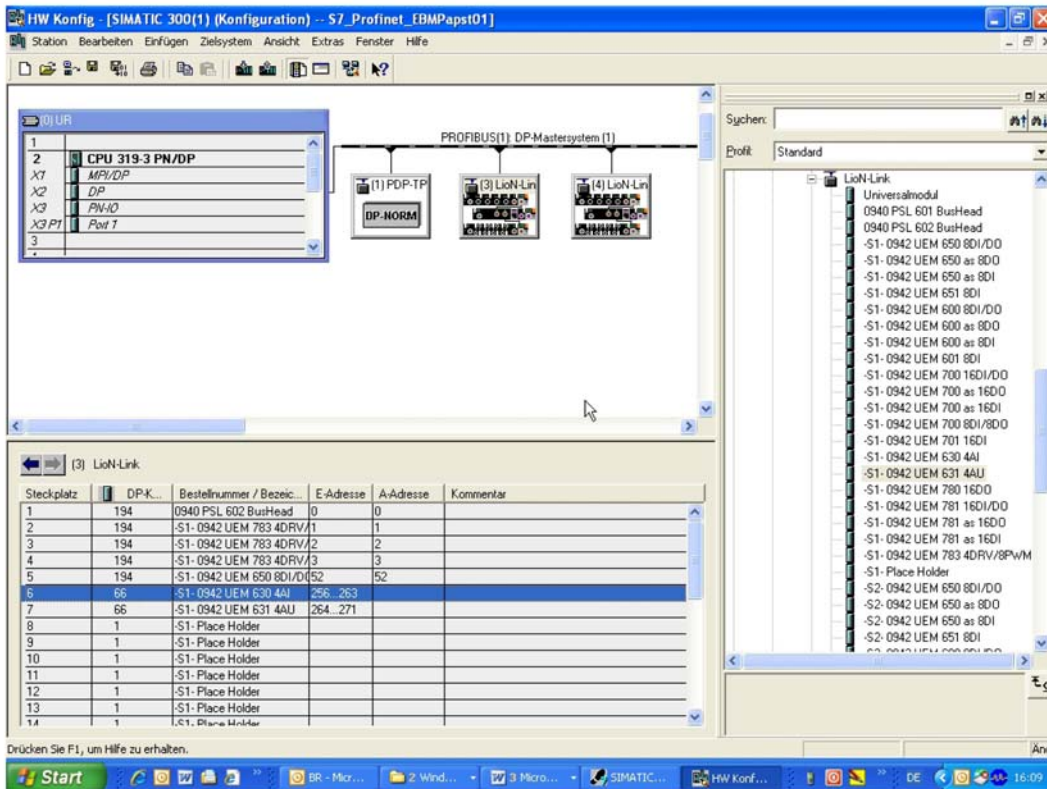
First, the BusHead is integrated into the system. Next, the I/O modules from Link branch 1 and then the modules from branch 2 are appended in the sequence in which they are physically installed. All usable modules – except for the BusHead – are present for both branches and are equipped with the sign "S1" for Link branch 1 and "S2" for Link branch 2. **The correct assignment must be adhered to in all cases.**



Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse	Kommentar
0	0	0940 PSL 601 Bus Coupler			
1	194	-S1- 0942 UEM 650 8DI/D0	0	0	
2	130	-S1- 0942 UEM 650 as 8DO		1	
3	66	-S1- 0942 UEM 650 as 8DI	1		
4	0	-S1- Place Holder			
5	0	-S1- Place Holder			
6	66	-S1- 0942 UEM 651 8DI	2		
7	0	-S1- Place Holder			
8	0	-S1- Place Holder			
9	0	-S1- Place Holder			
10	0	-S1- Place Holder			
11	0	-S1- Place Holder			
12	0	-S1- Place Holder			
13	0	-S1- Place Holder			
14	0	-S1- Place Holder			
15	0	-S1- Place Holder			
16	194	-S2- 0942 UEM 650 8DI/D0	3	2	
17	130	-S2- 0942 UEM 650 as 8DO		3	
18	0	-S2- Place Holder			
19	66	-S2- 0942 UEM 650 as 8DI	4		
20	66	-S2- 0942 UEM 651 8DI	5		
21					

Both branches can be filled with placeholders up to the maximum number of 15 modules per branch. In this case, the configurator reserves the corresponding diagnostic address range in the PLC. If the system is expanded, there are no shifts or jumps in the diagnostic addressing.

7.3.1.1 Configuration possibilities analog modules



E/A Typ:

Eingang

Adresse: Länge: Einheit: Konsistent über:

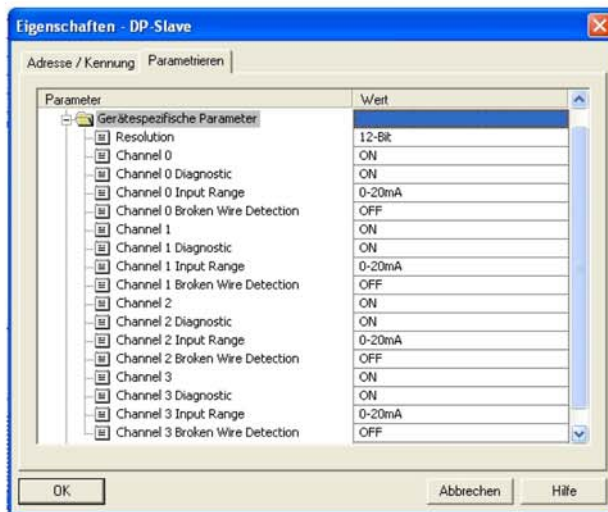
Anfang: Ende:

Prozabbild:

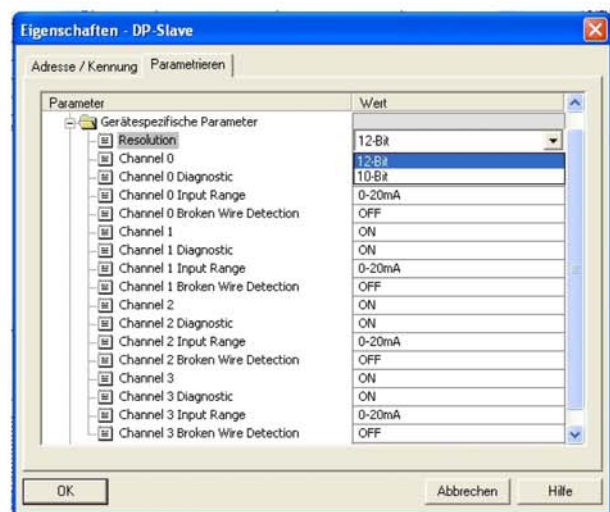
Herstellerspezifische Daten:
(maximal 14 Byte hexadezimal, durch Komma oder Leerzeichen getrennt)

The start address may be changed by the user. The end address is specified by the number of channels used.

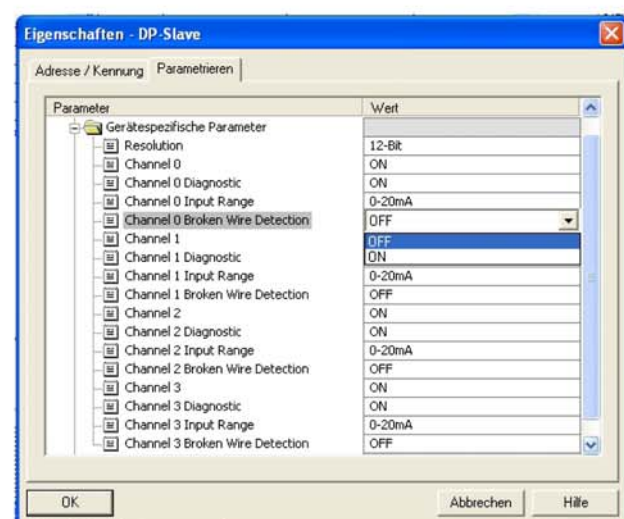
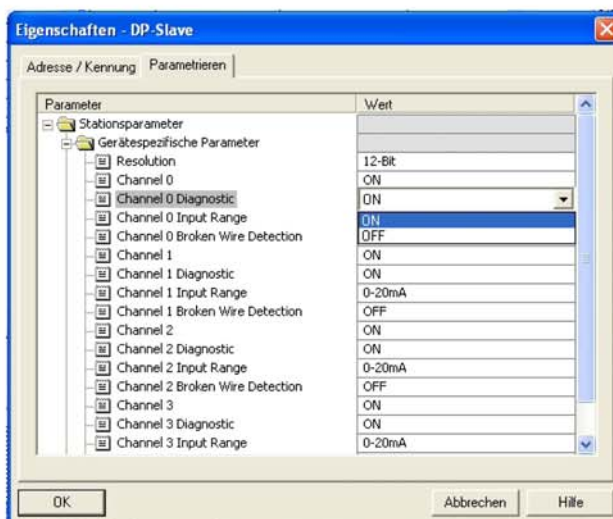
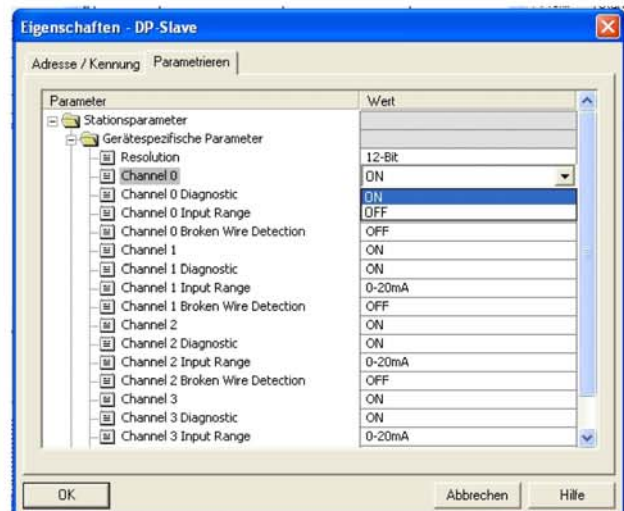
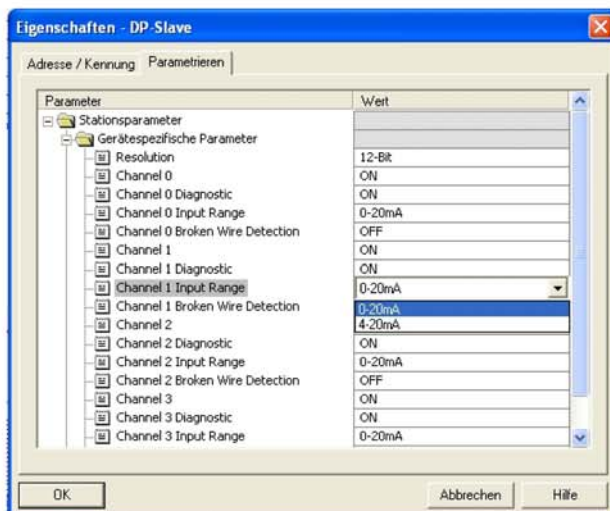
7.3.1.2 Analog module 0942 UEM 630; 0(4)–20 mA



Design of default settings

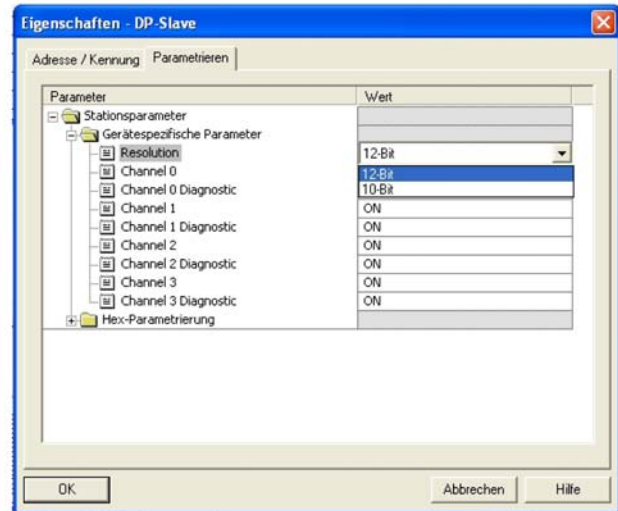
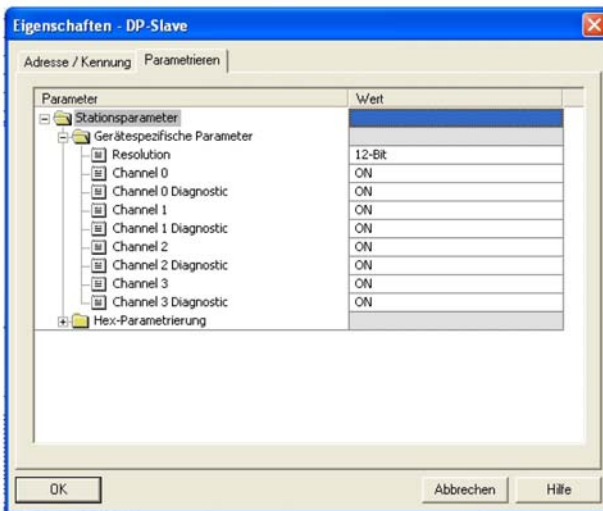


The preset resolution is valid for all channels.



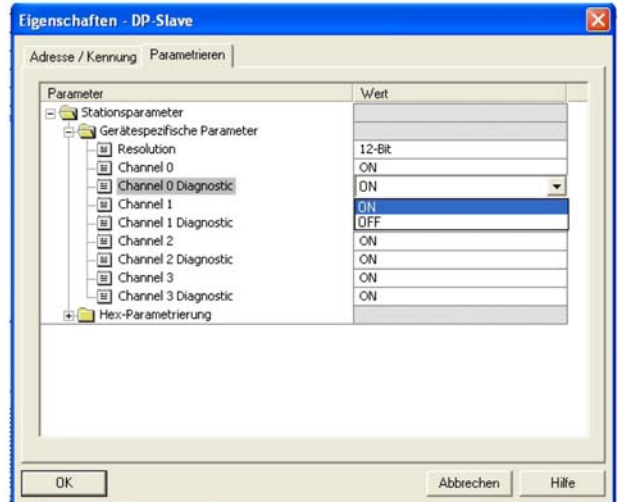
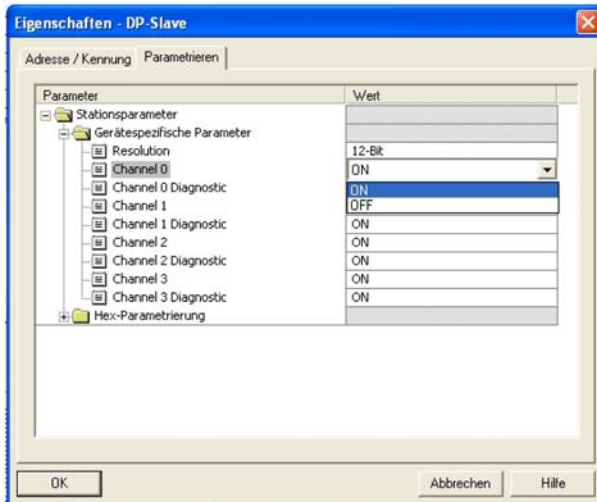
Each channel may be assigned parameters individually. A channel may be switched off if it is not used. The measuring range can be selected. The diagnosis and monitoring of the broken wire can be switched on/off through the channels.

7.3.1.3 Analog module 0942 UEM 631; 0–10 V



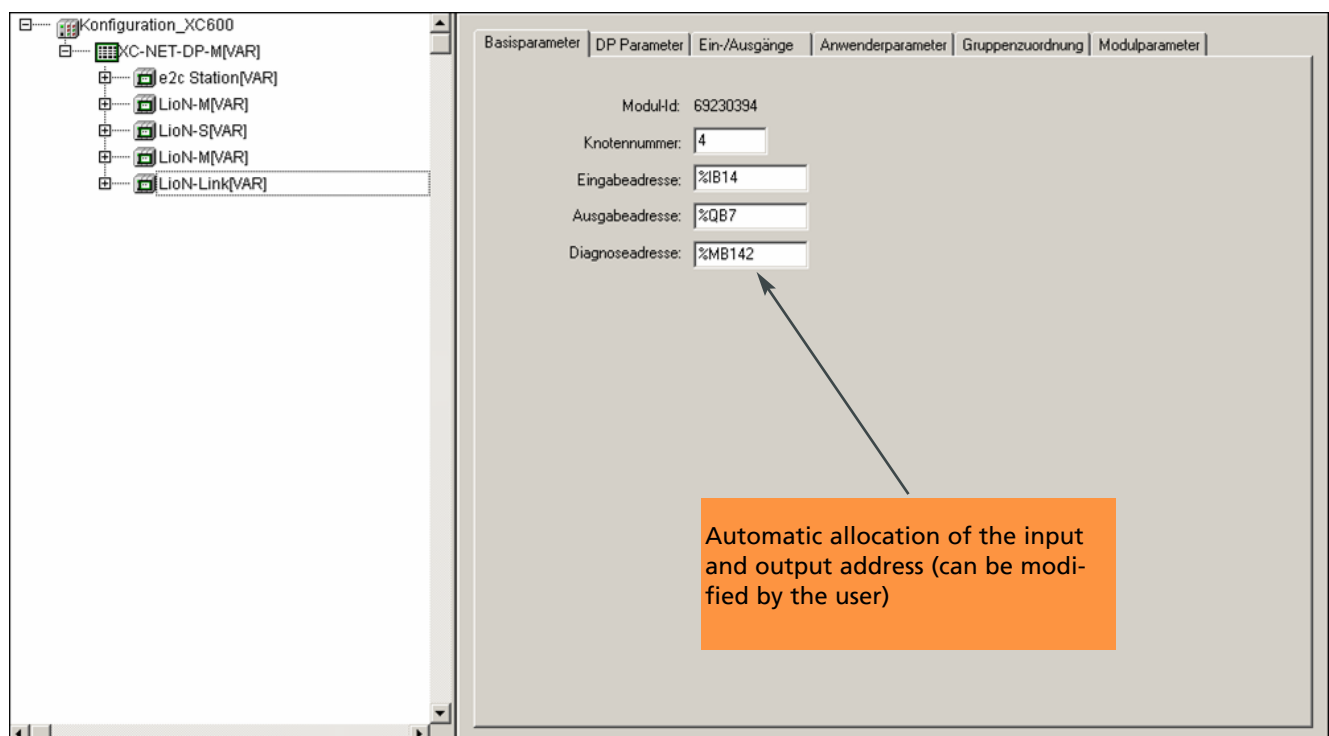
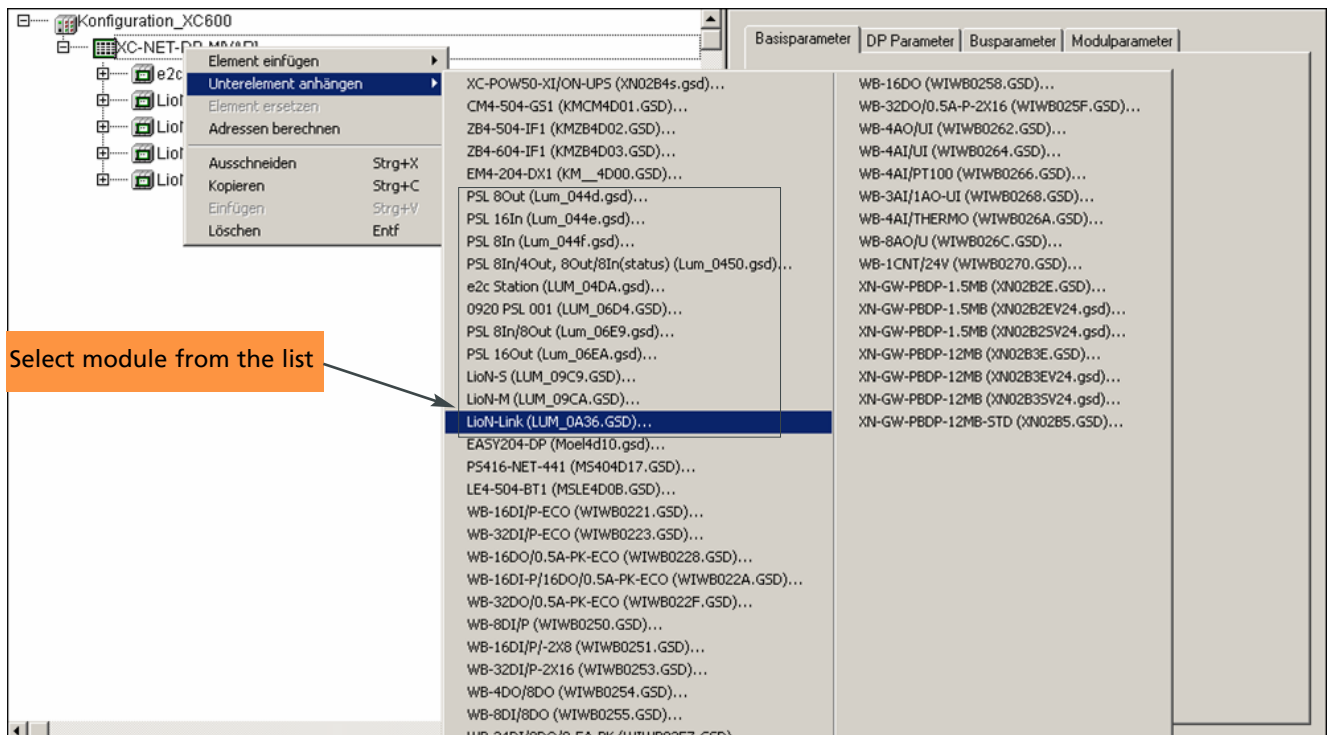
Design of default settings

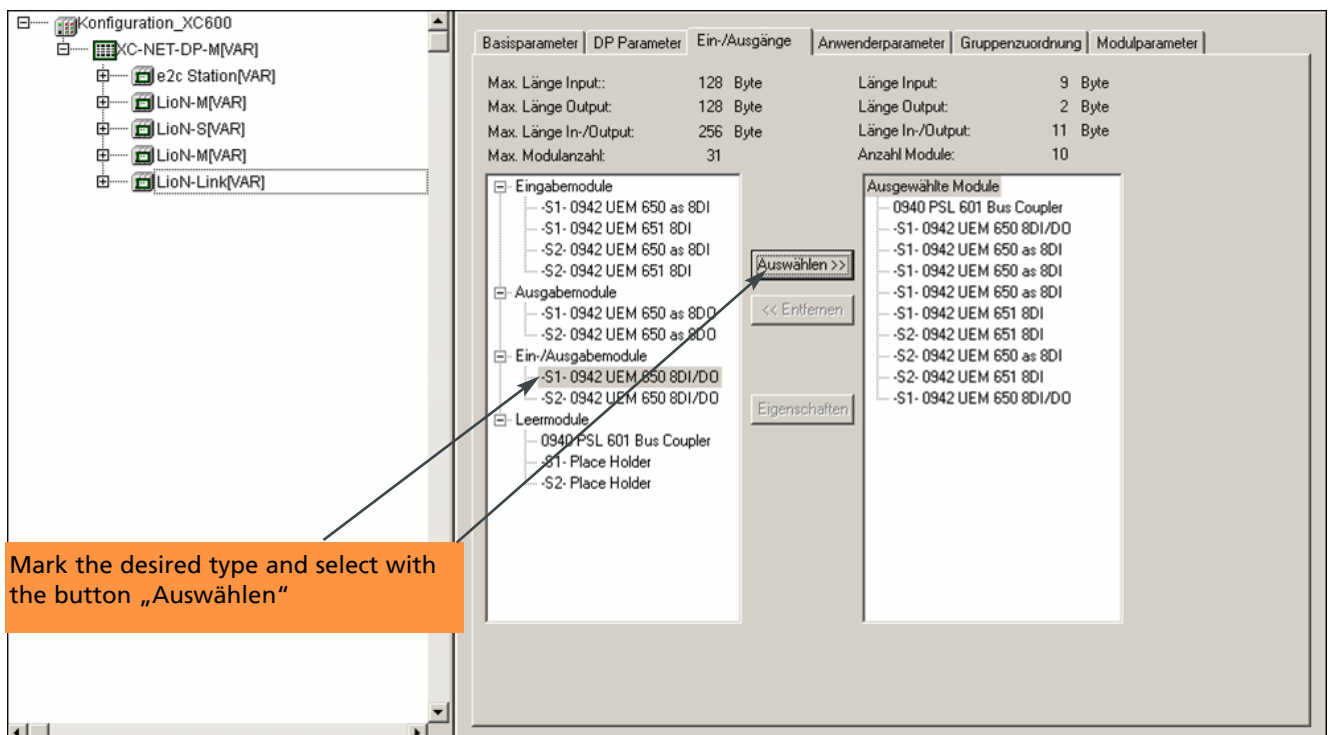
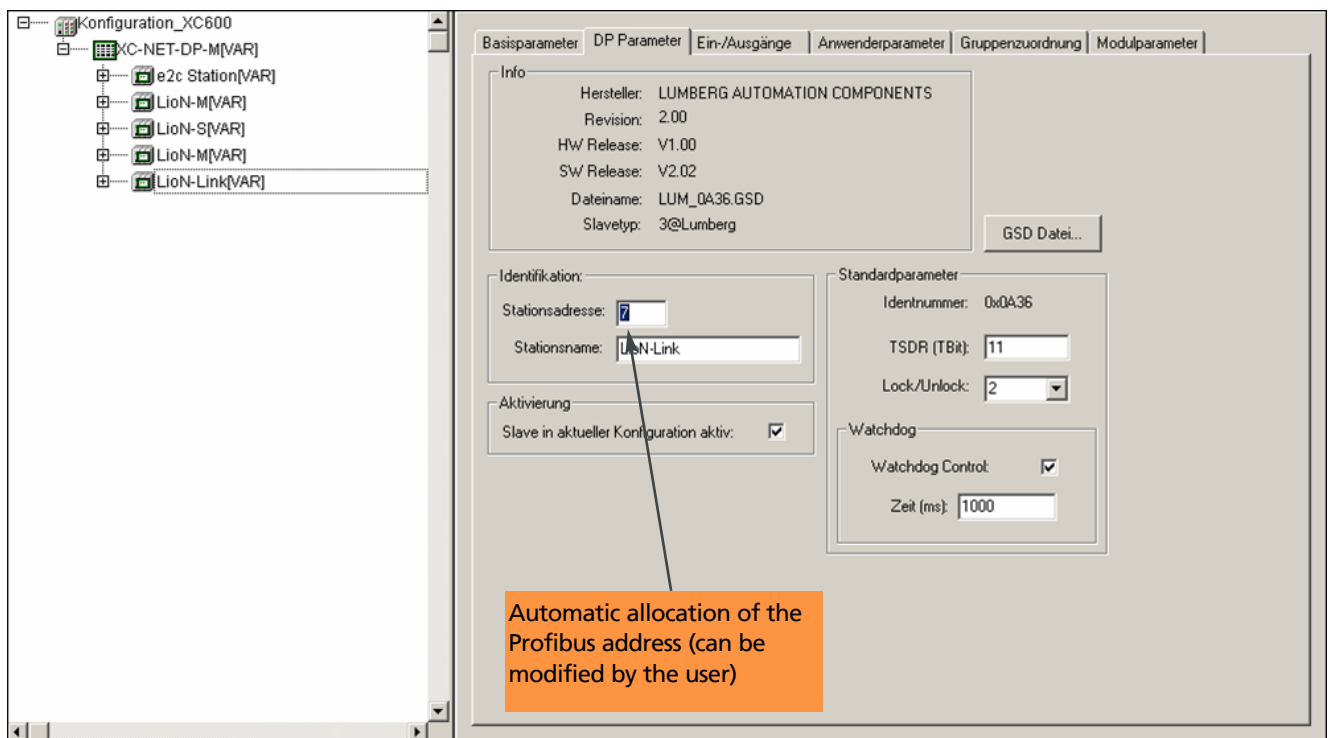
The preset resolution is valid for all channels.



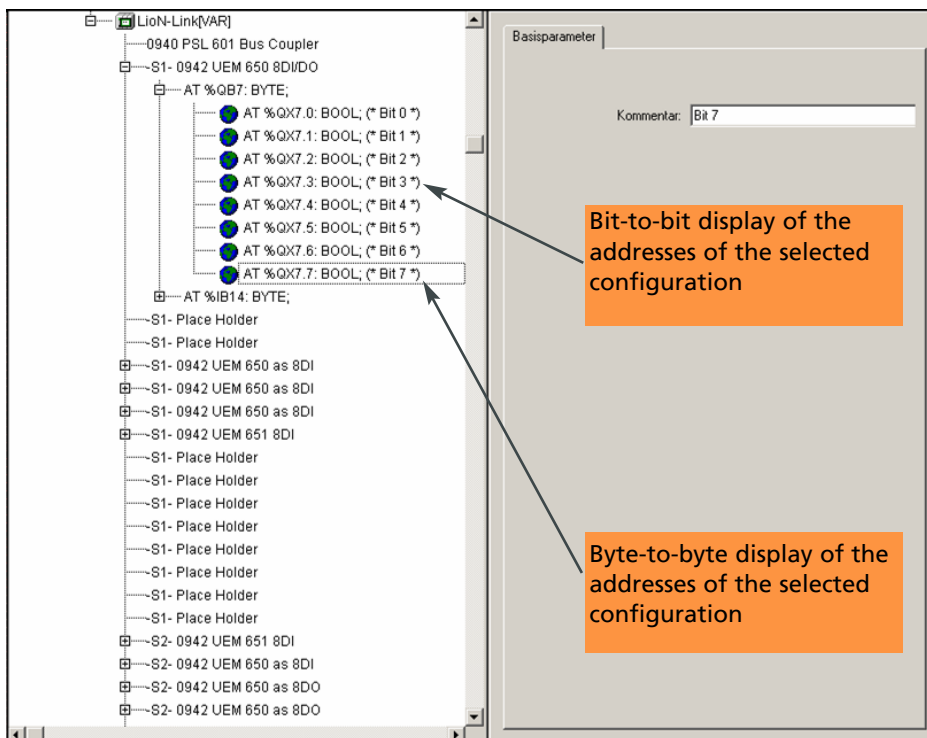
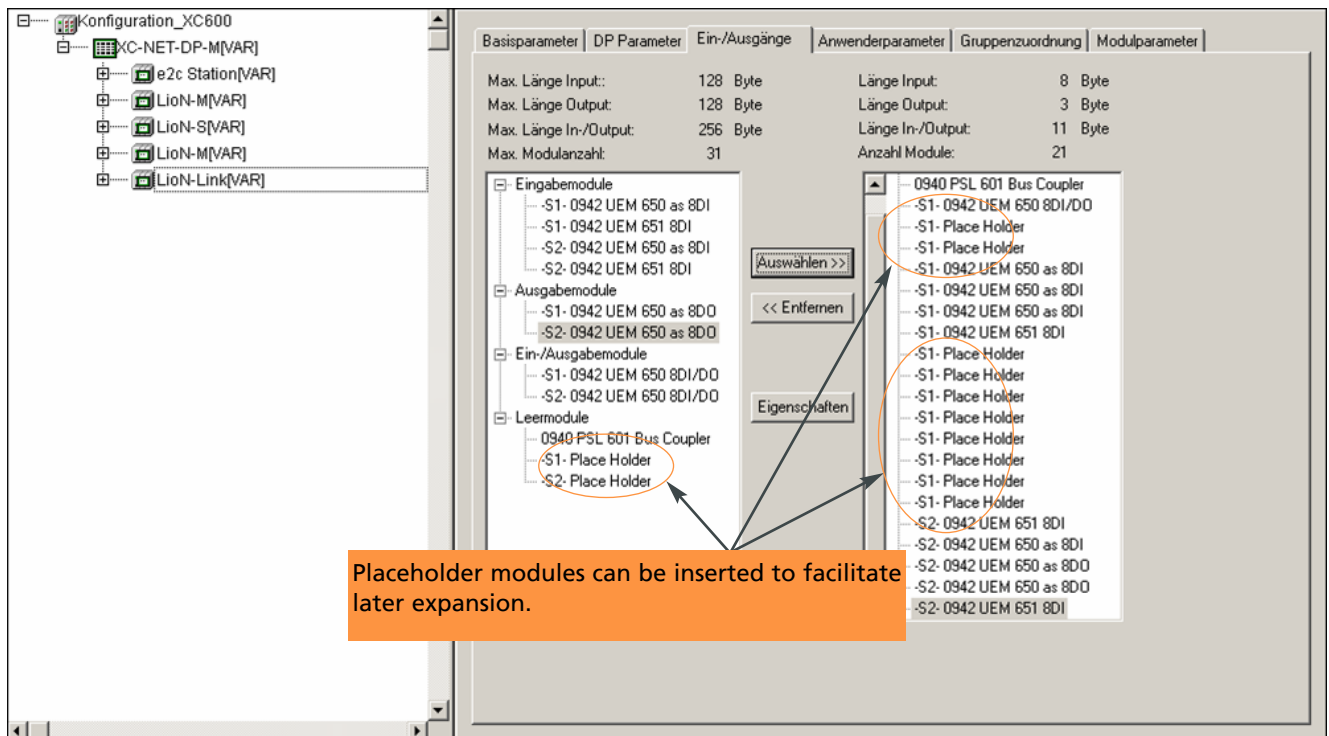
Each channel may be assigned parameters individually. A channel may be switched off if it is not used. The diagnosis can be switched on/off through the channels.

7.3.2 Configuration example CoDeSys of the 3S Software Solutions Co. (Moeller)





First, the BusHead is integrated into the system. Next, the I/O modules from Link branch 1 and then the modules from branch 2 are appended in the sequence in which they are physically installed. All usable modules – except for the BusHead – are present for both branches and are equipped with the sign "S1" for Link branch 1 and "S2" for Link branch 2. **The correct assignment must be adhered to in all cases.**



7.4 Bit assignment

The Profibus telegram permits transmission of a maximum of 244 bytes of information data.

7.4.1 Digital modules

In this system, the reference data for each configured module consists of either one or two bytes of input and output data, depending on its type, application, and configuration.

Bitbelegung Bit assignment								
Bit	7	6	5	4	3	2	1	0
Input								
Byte 0								
0942 UEM 60x	4B	4A	3B	3A	2B	2A	1B	1A
0942 UEM 65x	8	7	6	5	4	3	2	1
0942 UEM 70x	4B	4A	3B	3A	2B	2A	1B	1A
Byte 1								
0942 UEM 700 konfiguriert als 16 DI 16 DO	8B	8A	7B	7A	6B	6A	5B	5A
Output								
Byte 0								
0942 UEM 60x	4B	4A	3B	3A	2B	2A	1B	1A
0942 UEM 65x	8	7	6	5	4	3	2	1
0942 UEM 700 konfiguriert als 16 DI/16 DO 16 DO	4B	4A	3B	3A	2B	2A	1B	1A
0942 UEM 700 konfiguriert als 8 DI/8 DO	8B	8A	7B	7A	6B	6A	5B	5A
Byte 1								
16 DI/16 DO 16 DO	8B	8A	7B	7A	6B	6A	5B	5A

The **0942 UEM 600/650** universal modules with 8 DI/8 DO configuration have one input and output byte each; if configured as 8 DI, only one input byte and if configured as 8 DO, only one output byte.

The **0942 UEM 700** modules with the maximum 16 DI/16 DO configuration have two input bytes and two output bytes each; if configured as 8 DI/8 DO, one input and output byte each; if configured as 16 DI, two input bytes, and as 16 DO, two output bytes.

7.4.2 Analog modules

When using analog modules, the user data for each configured module is comprised of up to eight byte input data depending on the use and parameter setting.

The resolution of measured values of the analog inputs are in Siemens S7 format.

Resolution	Analog value															
Bit no.	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Valency	0	2 ¹⁴	2 ¹³	2 ¹²	2 ¹¹	2 ¹⁰	2 ⁹	2 ⁸	2 ⁷	2 ⁶	2 ⁵	2 ⁴	2 ³	2 ²	2 ¹	2 ⁰
10 Bit resolution	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Bit resolution	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

7.5 Diagnostic messages

In order to make the detection of a fault easier, software diagnostics have been integrated for evaluation by the Master and LED's for visual diagnostics. The functionality and the various statuses are explained in greater detail in the following Table.

7.5.1 Visual by LED

If a communication fault occurs on one or both of the two Link branches, the BusHead makes cyclical attempts to put the entire system back into operation by rebooting. The green LED lights up during this process. If the process was unsuccessful, the red LED also lights up on the branch where the fault was detected. After about two seconds the LEDs go out again and the process starts again. This is repeated until the fault is rectified. The system is then operational again. This is indicated by the green I/O LED.

Diagnoseanzeige – BusHead
Diagnostic indication – BusHead

LED	Anzeige Indication	Bedingung Condition
I/O Line 1/ I/O Line 2	rot red grün green aus off	fehlerhafte Konfiguration/Modul vertauscht wrong configuration/module exchanged online, Kommunikation mit Steuerung online, communication with PLC Strang wird nicht benutzt (kein Modul angeschlossen) branch not in use (module not connected)
US1	grün green	Sensor-/Systemversorgung Line 1 sensor/system power supply Line 1
US2	grün green	Sensor-/Systemversorgung Line 2 sensor/system power supply Line 2
BF	rot red	Busfehler bus error
DIA	rot red	Sammelanzeige für Peripheriefehler common indication for periphery faults

Diagnoseanzeige – I/O-Module
Diagnostic indication – I/O modules

LED	Anzeige Indication	Bedingung Condition
1...8	gelb yellow	Kanalstatus channel status
1...8	rot red	Peripheriefehler (Aktorkurzschluss/Überlast) periphery fault (actuator short-circuit/ actuator overload)
I/O	rot red rot blinkend red blinking grün green	fehlerhafte Konfiguration/Modul vertauscht wrong configuration/module exchanged wird vom BusHead nicht erkannt not recognized by the BusHead online, Kommunikation mit BusHead online, communication with BusHead
US	grün green	Sensor-/Systemversorgung sensor/system power supply
UL	grün green	Aktorversorgung actuator power supply
DIA	rot red	Sammelanzeige für Peripheriefehler common indication for periphery faults

7.5.2 Profibus network

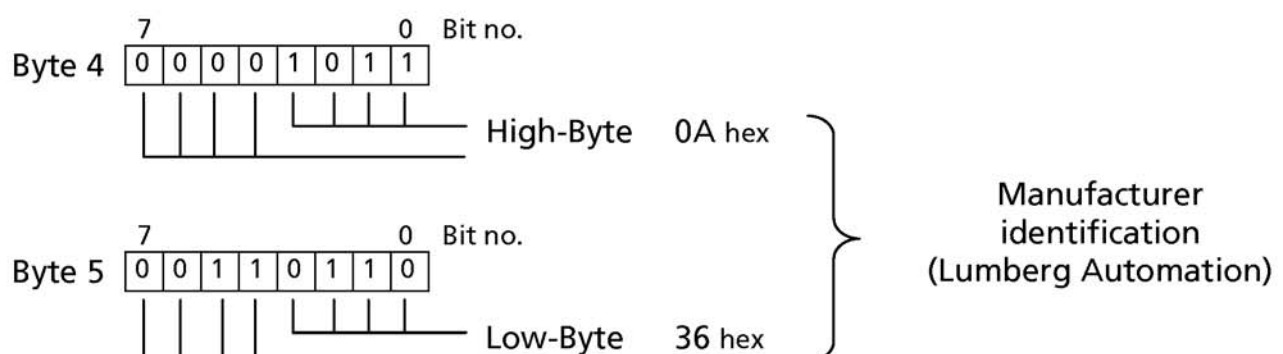
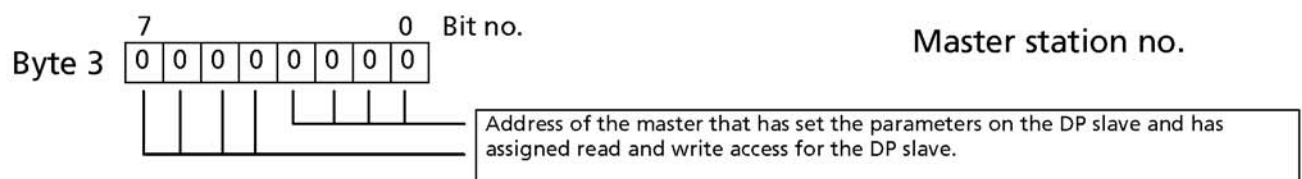
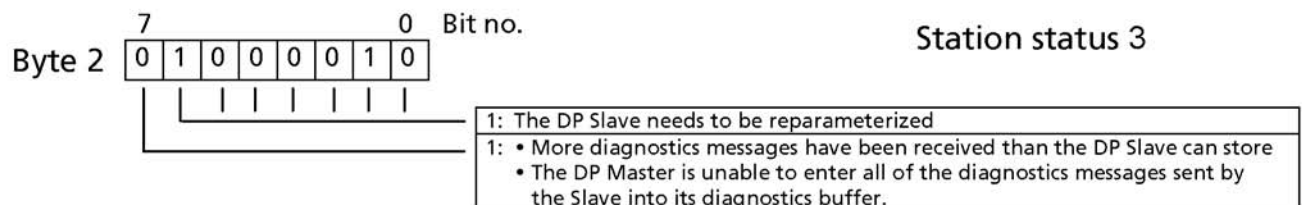
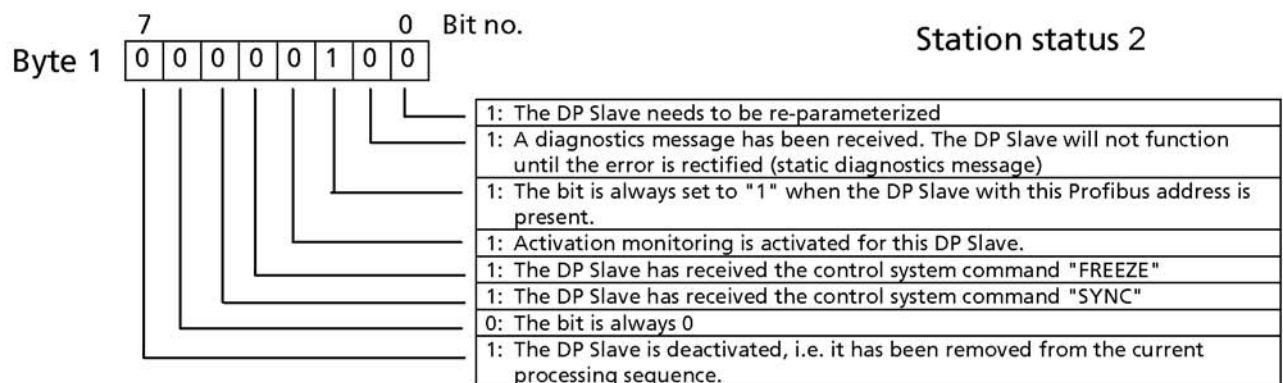
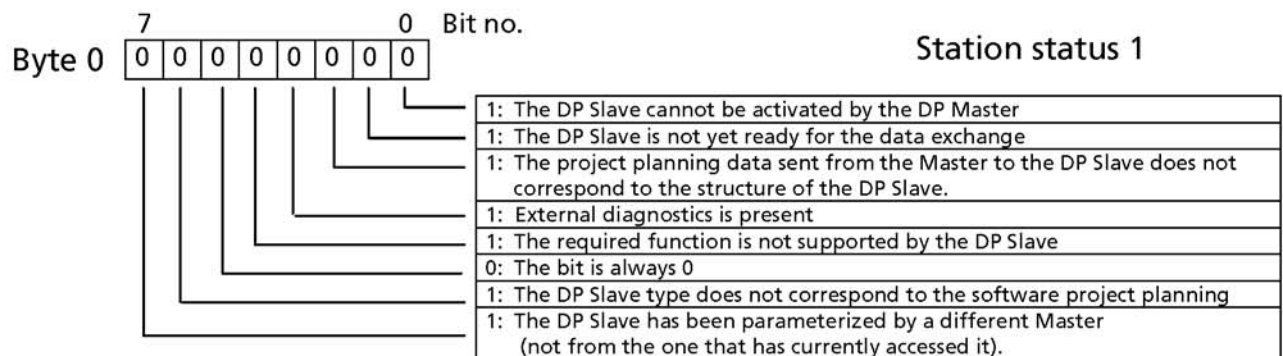
In case of an error Profibus devices send a diagnostic message to the Master (sensor/actuator short circuit, undervoltages). The Master then requests the diagnostics telegram of the device, which can consist of a maximum of 244 bytes, the same as the information data. The first six bytes (byte 0 to byte 5) of this diagnostics telegram are standardized and the

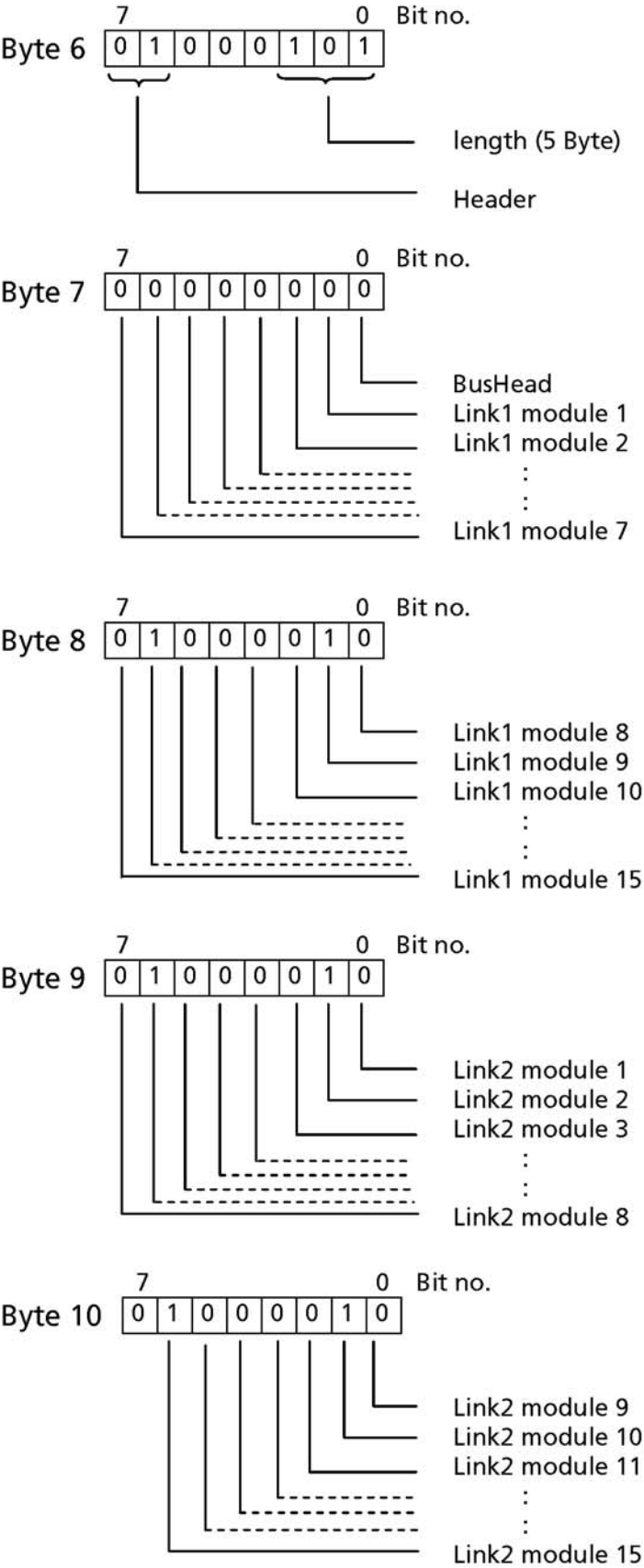
content cannot be altered. The user-specific diagnostics begins with byte 6.

The length of the user-specific diagnosis depends in this system on the number of configured Link devices. The overall construction of the diagnostics telegram can be obtained from the following Table.

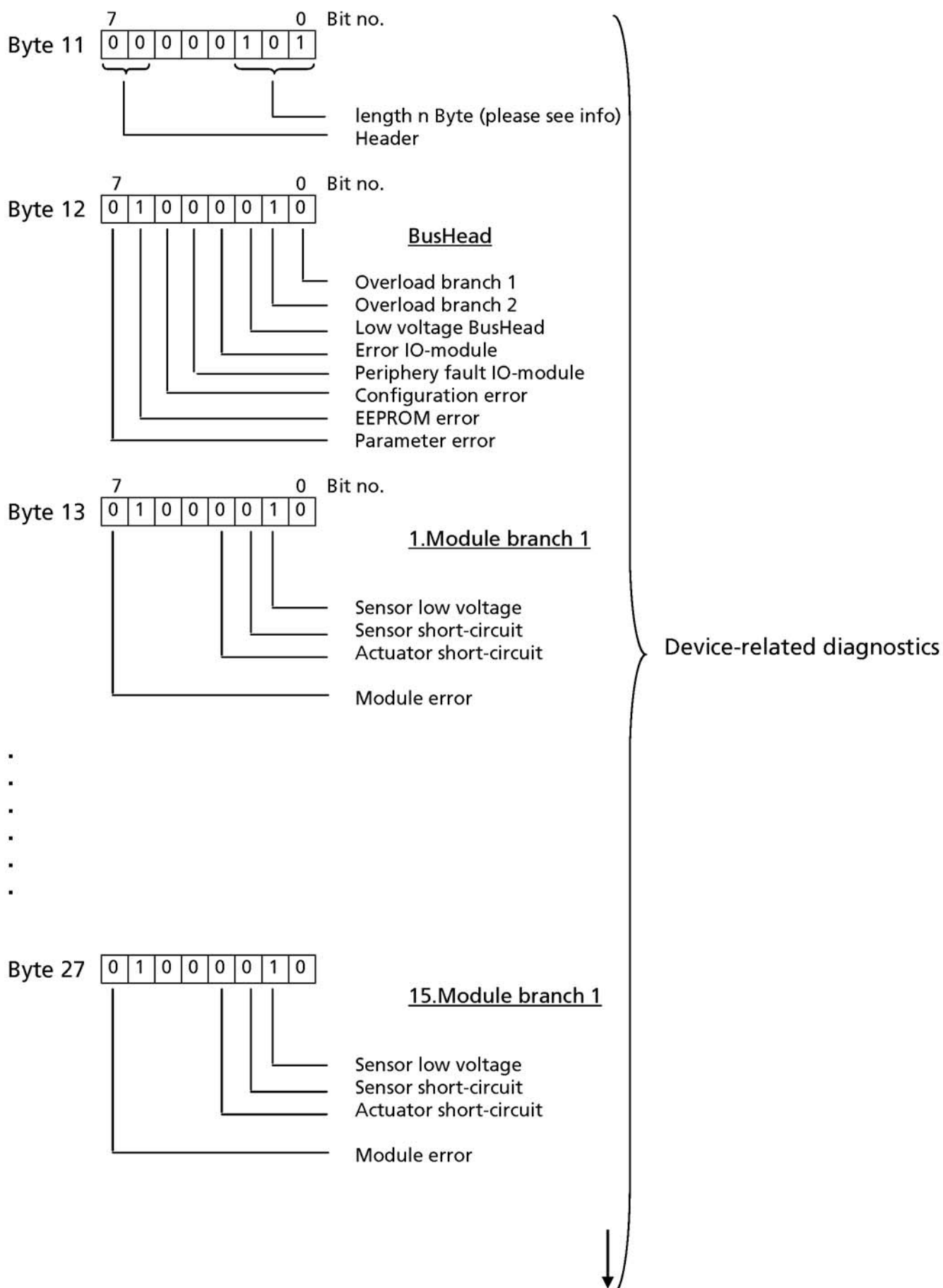
Diagnostic texts generated automatically from the GSD file are displayed in plain text in the corresponding components of the relevant control software.

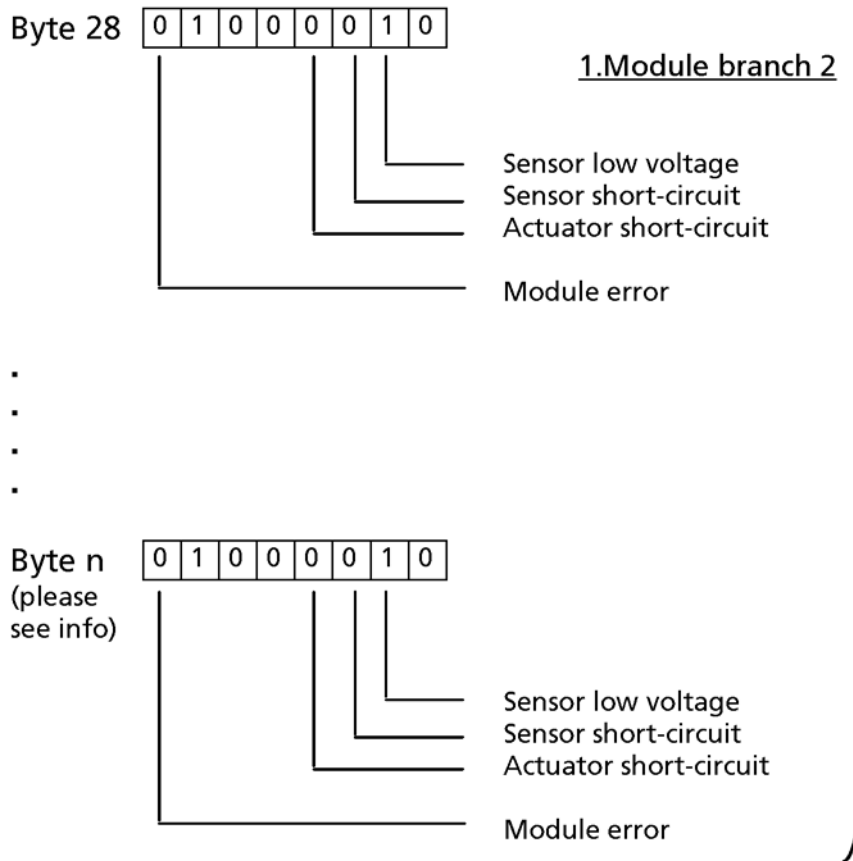
7.5.2.1 Diagnostic structure of the Profibus DP





ID-related diagnostics





The length of the device-specific diagnosis depends in this system on the number of configured Link devices.

A) Modules are configured in branch 1 and branch 2 or only in branch 2

Number of diagnostic bytes = 1 (BusHead) + 15 (Link modules for branch 1 regardless of the actual number) + (Σ Link modules on branch 2 as configured)

B) Modules are configured in branch 1

Number of diagnostic bytes = 1 (BusHead) + (Σ Link modules for branch 1 as configured) + 0 (no Link modules on branch 2)

8. Operation of the system

8.1 Startup

During startup, we recommend leaving the Interchanged Modules parameter on the ACCEPT setting (default setting). In this mode, it is possible to find the optimum setup and the best wiring solution. Once the final configuration has been made by the bus master, this setting should then be changed to DO NOT ACCEPT, so that interchange of modules or wiring can be detected immediately and the correct setup can be maintained. In the ACCEPT mode, error-free operation is naturally also possible and faulty modules can be replaced.

8.2 Replacing components

A faulty module can be replaced by an equivalent one without interrupting the power supply. It is detected automatically and the bus is restarted. To keep stocks of replacement modules at a minimum, the digital input modules can also be replaced by a universal module without any modifications to the configuration:

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

When using a universal module as an input module only, the power supply for the actuators is not required. Note that in this case, diagnostics will not be displayed or analyzed.

8.3 Bus interruptions and return to operation

If the bus line of one or both Link branches is interrupted, the DIA and BF LEDs light up. A diagnostic signal is sent to the master. This response is explained by the fact that in this case the current configuration of the Profibus system no longer matches the target configuration and therefore communication via the Profibus is interrupted. The Link BusHead makes cyclical attempt to reboot and to find the lost modules. During the boot process, both the BF and DIA LEDs remain permanently switched on and the green and red IO LEDs on the interrupted branch (IO S1/S2) flash alternately in cycle. For the unaffected branch, only the green IO LED (IO S1/S2) flashes in cycle.

The red and green IO LEDs of all Link devices connected to the BusHead flash alternately in cycle (boot process). For the Link devices to which the Link connection is interrupted, the red LED is permanently lit.

If both the bus connection and the power supply are interrupted, no LEDs light up.

Once an interruption in the Link has been rectified, the system starts operating again automatically. The bus fault triggered in the Profibus system by the (temporarily) faulty configuration is reset as well.

The position of the interruption in the branch can be seen from the LED.

8.4 System expansion

8.4.1 Placeholder module present in the configuration

The placeholder module is replaced by the desired Link module and the next free address is then assigned to the new module (e.g. Siemens S7 software). With other configurators, shifts may occur in the IO addresses.

The position of the diagnostic bytes is not affected by this.

8.4.2 No placeholder module present in the configuration

In this case, to be able to add another module, all modules in the relevant branch from the rear up to the position where the additional module is to be inserted must be shifted.

Note that the position of the module diagnosis will shift.

9. Technical data

9.1 General data

Degree of protection	IP 67 (only in locked position)
Operating temperature range	-10°C / +60°C
Weight	
BusHead (0940 PSL 601)	175 g
Universal module (0942 UEM 600)	200 g
(0942 UEM 650)	175 g
(0942 UEM 700)	375 g
Input module (0942 UEM 701)	275 g
(0942 UEM 601/651)	175 g
(0942 UEM 630/631)	175 g
Housing	PBT
Vibration resistance oscillations	15 g / 5–500 Hz
Vibration resistance shocks	50 g / 11 ms
Torques:	
Fastening screw M4	1.0 Nm
Connector M8	0.3 Nm
Connector M12	0.5 Nm

9.2 Technical data – Bus system

Protocol	Profibus DP
GSD file	Lum_0A36.gsd
Data transmission rates	9.6 / 19.2 / 45.45 / 93.75 / 187.5 / 500 KBit/s 1.5 / 3.0 / 6.0 / 12.0 MBit/s
Adjustment of the data transmission rate	automatic at the start of communications
Address range:	
Adjustment via Profibus	1–125 dec ((address switch: "00")
Adjustment via address switch	1–99 dec
Default address	99 dec Please see chapter Addressing
Connection	M12 male/female connector, 5 poles; please see pin assignment

9.3 Technical data power supply BusHead Electronics

Rated voltage U_s	24 V DC
Voltage range	19–30 V DC
Power consumption Electronics	
BusHead PB (0940 PSL 601)	typ. 100 mA
Reverse polarity protection	yes
Indication (U_s)	LED green
Connection	M12 male connector, 5 poles; please see pin assignment

The power supply to the Link modules from the BusHead is restricted to 3 A per branch. Both supply points on the BusHead must always be connected.
please see chapter 5.2 (Pin assignment)

9.4 Technical data power supply Link-Modules Electronics/Sensors

Rated voltage U_L	24 V DC
Voltage range	19–30 V DC
Power consumption Electronics	
Link module (0942 UEM 600/601)	typ. 60 mA
Link module (0942 UEM 650/651)	typ. 60 mA
Link module (0942 UEM 700/701)	typ. 100 mA
Link module (0942 UEM 630/631)	typ. 45 mA
Voltage Sensors	min. ($U_{system} - 1,5V$)
Power consumption Sensors	max. 700 mA (at T_u 30°C)/ module
Indication U_s	LED green
Connection	male connector, 5 poles; please see pin assignment

9.5 Technical data power supply Actuators

Rated voltage U_L	24 V DC
Voltage range	19–30 V DC
Reverse polarity protection	yes (please see info)
Indication Actuator supply U_L	LED green
Connection (0942 UEM 6xx)	male connector, 5 poles; please see pin assignment
(0942 UEM 7xx)	7/8" male/female connector, 5 poles; please see pin assignment

Info: The reverse polarity protection only works if the actuator system power supply is protected by a current overload fuse (6 A resp. 10 A, mT) and switches off no later than 10–100 ms after a short circuit has occurred.



NOTE!

A power pack with current regulation or an incorrect fuse will result in the destruction of the module in the event of reverse polarity.

9.6.1 Technical data – Inputs Digital modules

Input circuit	Type 3 according to IEC 61131-2
Rated input voltage	24 V DC
Input current at 24 V DC	typ. 5 mA
Short-circuit proof	yes
Channel type N.O.	p-switching
Number of digital channels	max. 8 / 16
Status indication	LED yellow per channel
Diagnostic indication	LED red per module
Connection (0942 UEM 60x)	M12 female connector, 5 poles; please see pin assignment
(0942 UEM 65x)	M8 female connector, 3 poles; please see pin assignment
(0942 UEM 70x)	M12 female connector, 5 poles; please see pin assignment

9.6.2 Technical data – Inputs Analog modules

Type	"Single End"
Max. input voltage	30 V
Input resistance	
(0942 UEM 630)	dynamic < 500 Ω
(0942 UEM 631)	20 kΩ
Measuring range of each channel	
(0942 UEM 630)	0(4)–20 mA
(0942 UEM 631)	0–10 V
Resolution	10/12 Bit
Cycle time per channel	1/16 ms
Number format	S7: 0–20 mA resp. 0–27648 S7: 4–20 mA resp. 0–27648 S7: 0–10 V resp. 0–27648
Measuring fault of measurement range end value	± 1,2 %
Status indication (channel on)	LED yellow per channel
Diagnostic indication	LED red per module
Connection	M12 female connector, 5 poles; please see pin assignment

9.7 Technical data – Outputs

Output circuit	Type 0.5 A acc. to IEC 61131-2
Rated output current per channel:	
(0942 UEM 600)	1.6 A (please see Info 1)
Signal state "1"	max. 2.0 A
Signal state "0"	max. 1 mA (acc. to specification)
(0942 UEM 650)	0.5 A (please see Info 1)
Signal state "1"	max. 0.6 A
Signal state "0"	max. 1 mA (acc. to specification)
(0942 UEM 700)	1.6 A (please see Info 1)
Signal state "1"	max. 2.0 A
Signal state "0"	max. 1 mA (acc. to specification)
Signal level of the outputs:	
Signal state "1"	min. (U _L - 1 V)
Signal state "0"	max. 2 V
Short-circuit proof	yes
Max. output current per module	
(0942 UEM 600)	4 A
(0942 UEM 650)	4 A
(0942 UEM 700)	2 x 9 A
Overload-proof	yes
Number of digital channels	
(0942 UEM 6x0)	max. 8
(0942 UEM 700)	max. 16
Channel type N.O.	p-switching
Status indication	LED yellow per channel
Diagnostic indication	LED red per channel
Connection	
(0942 UEM 600)	M12 female connector, 5 poles; please see pin assignment
(0942 UEM 650)	M8 female connector, 3 poles; please see pin assignment
(0942 UEM 700)	M12 female connector, 5 poles; please see pin assignment

Info 1: The outputs are able to switch currents of 1.6 A (0942 UEM 600/700) or 0.5 A (0942 UEM 650) with a frequency of 1 Hz with inductive loads of the utilization category DC13 (EN60947-5-1).

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