

Technical Manual



LioN-R PROFIBUS

0970 PSL 811-PB-DP 16DI-M12-R

0970 PSL 812-PB-DP 16DO-M12-R

0970 PSL 813-PB-DP 8DI/8DO-M12-R

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1. About this manual

Please read the installation and operating instructions in this manual carefully before you put the LioN-R I/O module with PROFIBUS DP interface into operation. The manual should be kept in a location which is accessible to all users.

The texts, diagrams, illustrations and examples used in this manual serve exclusively for the explanation of the operation and application of the LioN-R I/O module with PROFIBUS DP interface.

If there should be any further questions regarding the installation and operational startup of the devices, please do not hesitate to contact us.

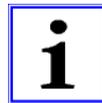
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Belden Deutschland GmbH - Lumberg Automation™ - reserves the right to make technical changes or revisions to this manual at any time without special notification.

1.1. Explanations about the symbolism

1.1.1. Utilization of notes

Notes about important information are specially marked. They are represented as follows:



1.1.2. Utilization of danger warnings

Danger warnings are identified as follows:



DANGER:
In case of non-compliance with corresponding precautions, danger exists to the life and health of the user.



CAUTION:
Non-observance of precautions can result in possible damage to devices and other property.

1.2. Notes on safety

1.2.1. Use according to specification

The devices described in this manual serve as decentralized input/output module assemblies in a PROFIBUS DP network.

Our products were developed, produced, tested and documented subject to observation of the safety standards. With observation of the handling specifications and safety-technical instructions described for the project planning, installation and operation according to specification, the products normally present no danger to persons or property.

The modules meet the requirements

- EMC Directive (2004/108/EG, 93/68/EWG and 93/44/EWG)
- Low-Voltage Directive (2006/95/EG)

They are designed for employment in the industrial sector. The industrial environment is identified by consumers as not being connected directly to the public low-voltage network. For employment in the residential sector, in business and trade sectors, additional measures are to be applied.



Warning!

This equipment can cause radio interference in the residential area; in this case the operator may be required to implement adequate measures.

The trouble-free and safe function of the product requires proper transport, storage, assembly and installation, as well as careful operation.

The operation of the devices according to specification is only guaranteed in the case of completely assembled housing. All devices connected to these modules must fulfill the requirements of EN 61558-2-4 and EN 61558-2-6.

The project planning, installation, operational startup, maintenance and testing of the devices may only be implemented by an electrical specialist who is trained and certified and who is familiar with the safety standards of automatic control.

For the project planning, installation, operational startup, maintenance and testing of the devices, the safety and accident prevention specifications valid for the specific application must be considered.

Only lines and accessories may be installed which correspond to the requirements and specifications regarding safety, electromagnetic compatibility and, as appropriate, telecommunications terminal unit equipment, as well as to the specification information. You are provided with information by Belden Deutschland GmbH - Lumberg Automation™ about which lines and accessories are authorized for installation or these are described in this manual.

1.3. Qualified personnel

The requirements of the personnel depend on the requirement profiles which were described by ZVEI, 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:

- Are able to assess the work to be implemented based on their specialist training, knowledge and experience, as well as knowledge of the relevant standards, and who can identify possible dangers.
- Based on many years of activity in a comparable area, have the same know-how as with specialist training.

Interventions in the hardware and software of our products, insofar as they are not described in this manual, may only be carried out by Belden Deutschland GmbH - Lumberg Automation™.



Warning!

Unqualified interventions in the hardware or software or non-observance of the warnings given in this manual can result in serious personal injuries or damage to property.

1.4. Version information relating to the manual

Index	Created	Changed	Changed	Changed	Changed	Changed
Version number	Version 1.0					
Date	November 2013					
Name/Department	Knipp/PM					

2. System description

The LioN (Lumberg I/O Network)-R module series includes a standalone field bus device for decentralized employment in a raw industrial environment. The devices offer a simple handling of the I/O data in a higher-level bus system. They are particularly suited for application locations in machines and systems with a moderate I/O concentration on distributed module assemblies.

The LioN-R I/O module series is provided with a very rugged metal housing from zinc die-casting. The module electronics are fully protected against environmental impacts by the completely encapsulating housing. As a protection type, the modules offer IP67. The permissible temperature range of the modules is -10°C to +60°C. The module series is therefore very well suited for direct field employment in raw industrial environments.

In spite of the rugged design, the module series offers compact dimensions and low weight.

The modules provide connections as signal input and output with integrated T-piece, both for the field bus as well as for the voltage supply. This connection option enables the forwarding of the PROFIBUS and the supply voltage to one of the following subscribers without the utilization of additional T-pieces.

The LioN-R module series consists of three types of modules with different I/O functionality. Modules with 16 digital inputs (16 DI), 16 digital outputs (16 DO) and 8 digital inputs/8 digital outputs (8DI/8DO) are available. The output current is 1.6 A per channel. The output current circuits are isolated galvanically from the remaining network and the sensor electronics.

The modules with output functionality offer a fail-safe function. During the configuration of these modules, the characteristics of every individual outlet channel can be adjusted in the case of an interruption or loss of communication.

For the connection of the network and the I/O devices, the module series offers the widespread M12 plug connector with A-coding for the I/O signal and B-coding for the PROFIBUS. In addition, the plug connectors are color-coded in order to prevent any mix-up of the connections.

The PROFIBUS address of the modules is set using the three rotary coding switches integrated into the housing.

3. Product overview

3.1. Module variants

Article number	Description	I/O connection	Construction design
LioN-R 16 DI			
0970 PSL 811-PB-DP 16DI-M12-R SAP number: 934 770-001	Decentralized I/O module with 16 digital inputs. Connection of the periphery over 8 M12 insertion slots.	8 M12 sockets	Rugged/metal
LioN-R 16 DO			
0970 PSL 812-PB-DP 16DO-M12-R SAP number: 934 770-002	Decentralized I/O module with 16 digital outputs, 1.6 A. connection of the periphery over 8 M12 insertion slots.	8 M12 sockets	Rugged/metal
8DI/8DO LioN-R			
0970 PSL 813-PB-DP 8DI/8DO-M12-R SAP number: 934 770-003	Decentralized I/O module with 8 digital inputs and 8 digital outputs, 1.6 A. connection of the periphery over 8 M12 insertion slots.	8 M12 sockets	Rugged/metal

3.2. Accessories

Article number	Description
PROFIBUS DP	
0975 254 101/... M	Connecting lead for PROFIBUS, fabricated on both sides with M12 plug connector/socket, straight, 5-pole, B-coded
0975 254 102/... M	Connecting lead for PROFIBUS, fabricated on one side with M12 plug connector, straight, 5-pole, B-coded
0975 254 103/... M	Connecting lead for PROFIBUS, fabricated on one side with M12 socket, straight, 5-pole, B-coded
0975 254 104/... M	Connecting lead for PROFIBUS, fabricated on both sides with M12 plug connector, straight, 5-pole, B-coded and D-Sub PROFIBUS plug connector, 9-pole
0975 254 105/... M	Connecting lead for PROFIBUS, fabricated on both sides with M12 socket, straight, 5-pole, B-coded and D-Sub PROFIBUS plug connector, 9-pole
0975 254 130/... M	Connection line for PROFIBUS, fabricated on both sides with M12-plug connector/socket, angled, 5-pole, B-coded
0975 254 131/... M	Connection line for PROFIBUS, fabricated on one side with M12-socket, angled, 5-pole, B-coded
0975 254 132/... M	Connection line for PROFIBUS, fabricated on one side with M12 plug connector, angled, 5-pole, B-coded
0975 254 133/... M	Connecting lead for PROFIBUS, fabricated on both sides with M12 plug connector, straight/socket, angled, 5-pole, B-coded

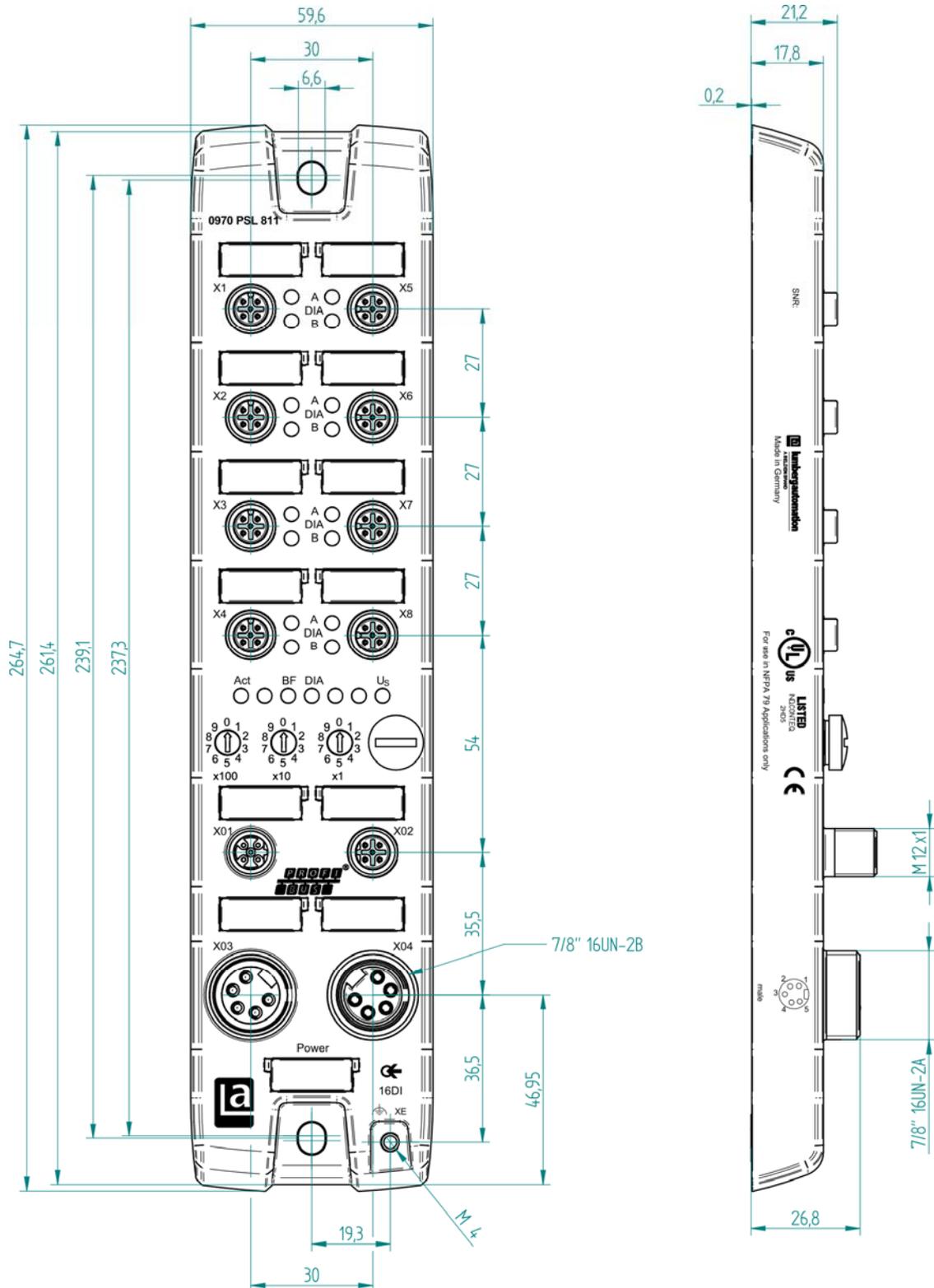
0975 254 134/... M	Connecting lead for PROFIBUS, fabricated on both sides with M12 plug connector, angled/socket, straight 5-pole, B-coded
0975 254 135/... M	Connecting lead for PROFIBUS, fabricated on both sides, 9-pole with M12 socket, angled, 5-pole, B-coded and D-Sub plug connector PROFIBUS
0975 254 136/... M	Connecting lead for PROFIBUS, fabricated on both sides with M12 plug connector, 9-pole, angled, 5-pole, B-coded and D-Sub plug connector PROFIBUS

Article number	Description
Voltage supply	
0905 204 301/... M	Connecting lead for voltage supply, fabricated on one side with 7/8" socket, straight, 5-pole
0905 204 302/... M	Connecting lead for voltage supply, fabricated on both sides with 7/8" plug connector/socket, straight, 5-pole.
0905 204 303/... M	Connecting lead for voltage supply, fabricated on one side with 7/8" plug connector, straight, 5-pole
0905 204 308/... M	Connecting lead for voltage supply, fabricated on one side with 7/8" socket, angled, 5-pole
0905 204 309/... M	Connecting lead for voltage supply, fabricated on both sides with 7/8" plug connector/socket, angled, 5-pole.
0905 204 310/... M	Connecting lead for voltage supply, fabricated on one side with 7/8" plug connector, angled, 5-pole
Fabrication-capable plug connectors	
0976 PMC 101	Fabrication-capable M12 plug connector for PROFIBUS line, straight, 5-pole, B-coded with screwed terminal
0976 PMC 102	Fabrication-capable M12 plug connector for PROFIBUS line, straight, 4-pole, B-coded with spring tension terminal
0976 PFC 101	Fabrication-capable M12 socket for PROFIBUS line, straight, 5-pole, B-coded with screwed terminal
0976 PFC 102	Fabrication-capable M12 socket for PROFIBUS line, straight, 4-pole, B-coded with spring tension terminal
RSC 50/11	Fabrication-capable 7/8" plug connector for voltage supply, straight, 5-pole, for line diameter 8.0 - 10.0 mm
RKC 50/11	Fabrication-capable 7/8" socket for voltage supply, straight, 5-pole, for line diameter 8.0 - 10.0 mm
Other accessories	
Terminating resistor for the network	0979 PTX 101
M12 protective cap	ZVK
Designation plates	ZBR 9/40

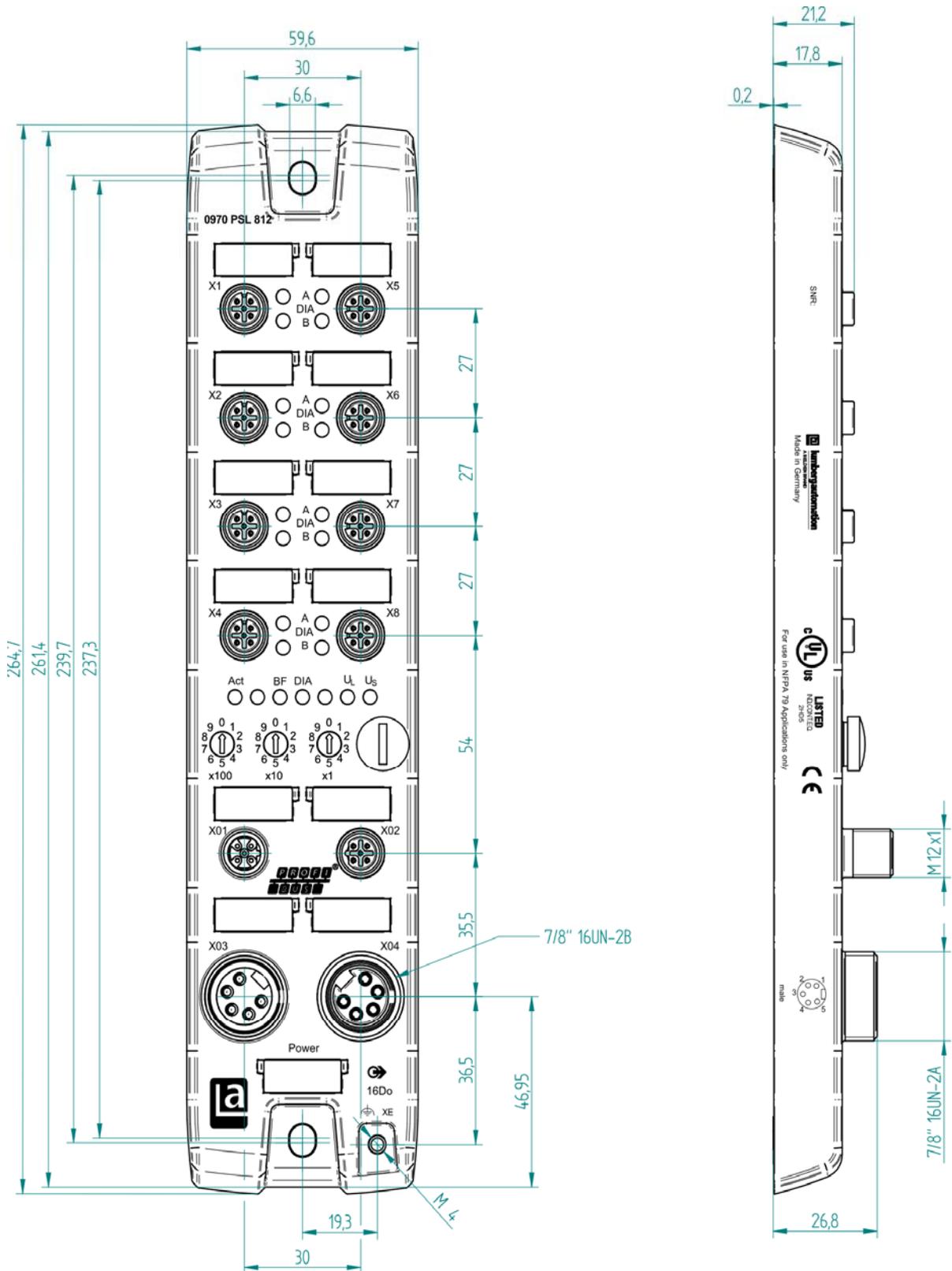
4. Assembling

4.1. External dimensions

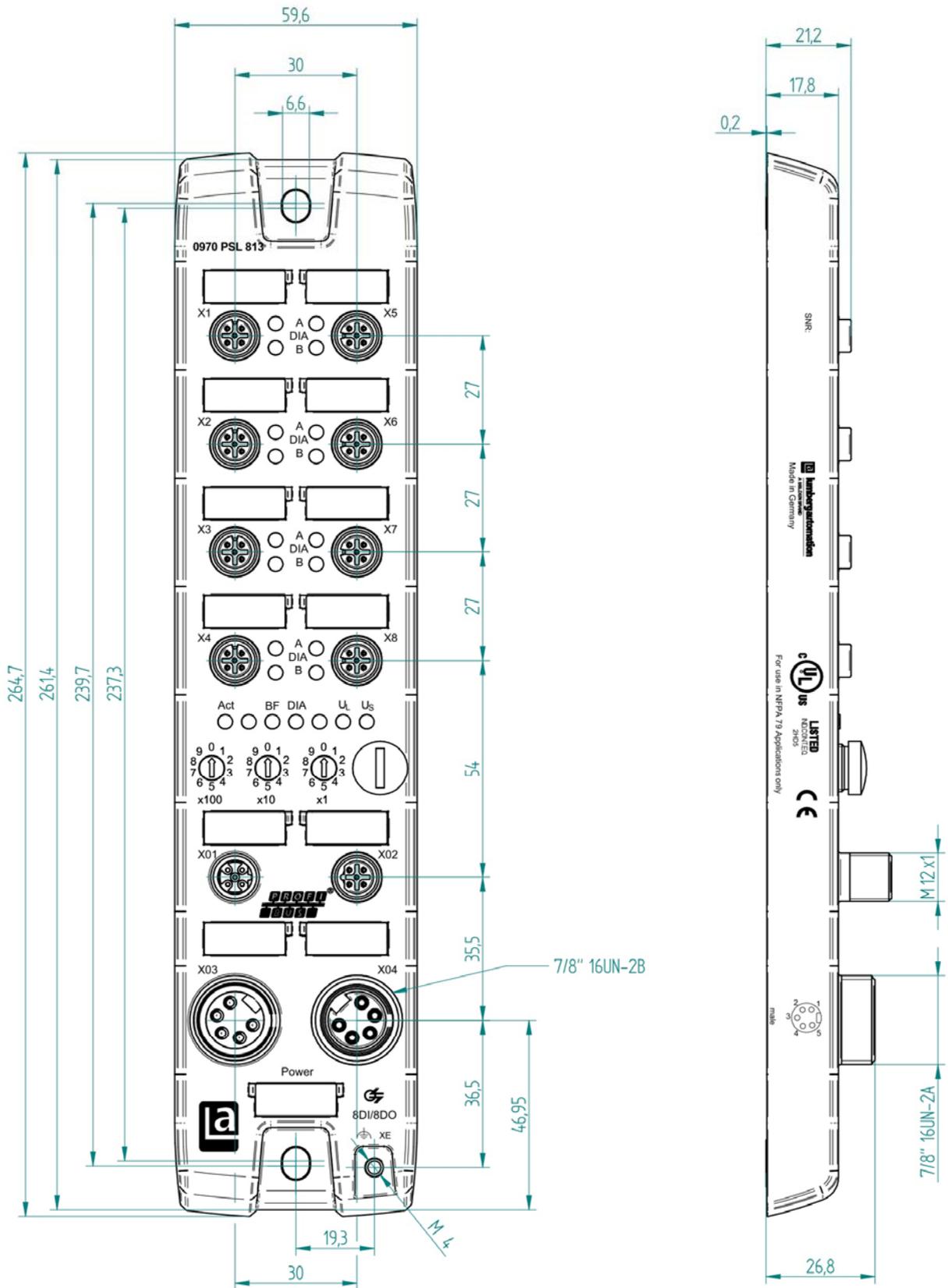
4.1.1. 0970 PSL 811



4.1.2. 0970 PSL 812



4.1.3. 0970 PSL 813



4.2. Notes for field installation

The modules are to be mounted on a flat surface with two bolts in each case.

Type of securing	Bolts	Tightening torque
Flat	M6x25/30	1.0 Nm
With all types of securing, a spacing washer is to be provided in accordance with DIN 125.		



Important note:

For the conduction of interference currents and for the EMC resistance, the modules are provided with a grounding connection with an M4 screw thread, which is marked with the ground symbol and XES.

It is necessary to connect a module with the common ground reference potential by a low-impedance connection. For a grounded installation surface, the connection can be manufactured directly over the fastening screws.

For a non-grounded installation surface, a grounding strip or a suitable PE line is to be employed! The grounding strip or the PE line is to be connected to the grounding location using an M4-bolt. Screening the fastening screw with an underlay and toothed washer is recommended.

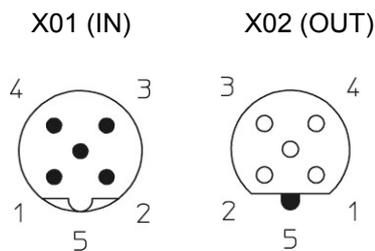
5. Wiring

5.1. Connector pin assignments

All contact arrangements which are represented in this chapter indicate the view from in front to the contact area of the plug connectors.

5.1.1. Connections for PROFIBUS DP, M12 plug connector/socket, 5-pole, B-coded

Color coding of the connections: **violet**



Connection	Pin	Signal	Function
PROFIBUS Ports X01, X02	1	VP*	+ 5 V (e.g. for bus terminator)
	2	RxD/TxD-N	Line A
	3	GND(0 V)*	Data Ground (reference potential to VP)
	4	RxD/TxD-P	Line B
	5	n.c.	
	Housing	Shield	

The signals identified with * are internal signals which make the module available for the supply of a terminating resistor. They may be neither connected nor transmitted to other subscribers. As a permissible terminating resistor, the article 0979 PTX 101 is to be employed.

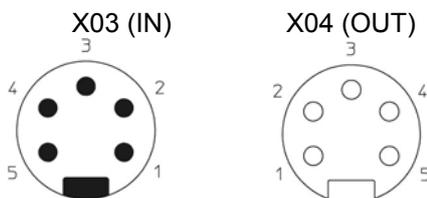


CAUTION, danger of destruction!

Never place voltage supply (24 V DC) on the data lines (P2, pin 4) or the internal signals (P1, pin 3).

5.1.2. Connections for voltage supply, 7/8" plug connector/socket, 5-pole

Color coding of the connection: **gray**



Connection	Pin	Function	Signal	
Voltage supply X03/X04			0970 PSL 811	
			0970 PSL 812	
			0970 PSL 813	
	1	Actuators	see Note	GND (0V)
	2	System/sensors	GND (0V)	GND (0V)
	3		Earth/FE	Earth/FE
4	System/sensors	+24 V	+24 V	
5	Actuators	see Note	+24 V	



Important Note!

For the input module 0970

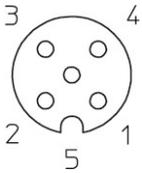
PSL 811, the two contacts 1 and 5 for the voltage supply of the actuator circuit are not required. Nevertheless, these two contacts are jumpered with each other on plug connector and socket side in order to enable a 5-pole forwarding of the voltage supply to the following module.



The power supply units, which are employed for the system/sensor and actuator supply, must correspond to PELV (Protective Extra Low Voltage) or SELV (Safety Extra Low Voltage). Power supplies according to EN 61558-2-6 (transformer) or EN 60950-1 (switched-mode power supplies) meet these requirements.

5.1.3. Connections for sensor technology/actuator technology, M12-socket, 5-pole

Color coding of the connections: **black**



Connection	Pin	Function		
		0970 PSL 811	0970 PSL 812	0970 PSL 813
Sensor / Actuator	1	DC +24 V	n.c.	+24 V DC (Ports X1..X4) n.c. (Ports X5..X8)
	2	IN B	OUT B	IN B (Ports X1..X4) OUT B (Ports X5..X8)
	3	GND (0V) DC	GND (0V) DC	GND (0V) DC
	4	IN A	OUT A	IN A (Ports X1..X4) OUT A (Ports X5..X8)
	5	Earth/FE	Earth/FE	Earth/FE

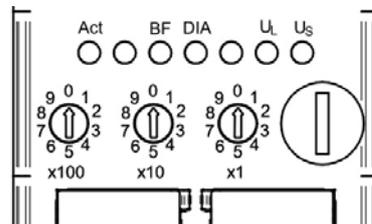
6. Project planning and operational startup

The configuration and operational startup of the LioN-R I PROFIBUS module described on the following pages was implemented with the aid of the *STEP7* Software from *Siemens AG*. When utilizing a control system from another control provider, please consider the corresponding documentation.

6.1. Adjustment of the PROFIBUS address

a) Rotary switch

Three rotary switches, which are located below the LED displays, are employed for the direct adjustment of the Profibus address. The switches for the hundred, ten and one units of the address are identified. The adjusted address is taken over with switching on the voltage supply. Therefore the supply must be interrupted briefly in case of a change of the address so that the module takes over the new address.



The adjustable address range lies between 1 and 125. With adjustment of an address greater than 125, the address 126 is employed automatically. The address 126 is adjusted by the manufacturer.

b) PROFIBUS network

Adjusting the module address is also possible over the Profibus network. You can find precise instructions about the procedure in the manual of your respective PROFIBUS master.



The rotary switches are to be adjusted to the value "000" for this addressing mode, and not changed. The address range lies between 1 and 125. In case of disabled address change option after address programming by Profibus network, a further address programming is possible by using the rotary switch address "999". Turn the rotary switches back to "000" after using this option.

6.2. GSD file

A GSD file is required for the configuration of the module LioN-R in the control system. These can be downloaded from our home page

[http:// www.beldensolutions.com/de/Service/Downloadcenter/Software_Lumberg/index.phtml](http://www.beldensolutions.com/de/Service/Downloadcenter/Software_Lumberg/index.phtml)

On request, the GSD file will also be sent by the support team.

The file bears the name:

LUM_0E94.GSD

Create a new project in *STEP7* and open the hardware manager *HW config*. Using the menu command *Extras - install GSD files ...* and the following dialog, the GSD file is installed. The LioN-R I/O module with PROFIBUS interface is then available in the hardware catalog.

6.3. Data transfer rate

The data transfer rate employed is determined with the start of the communication of the module with the master, and adjusted automatically (AutoBaud Detection).

6.4. Configuration of the LioN-R PROFIBUS module in STEP 7

After the installation of the GSD file for the LioN-R PROFIBUS module, this is available in the hardware catalog under *PROFIBUS-DP - Further FIELD UNITS - I/O - Lumberg LioN-R*.

First configure the control system in the usual manner.

Click on the LioN-R lettering in the hardware catalog and move the entire module assembly to the PROFIBUS DP section. A window is opened in which you can indicate and change the PROFIBUS address of the module.

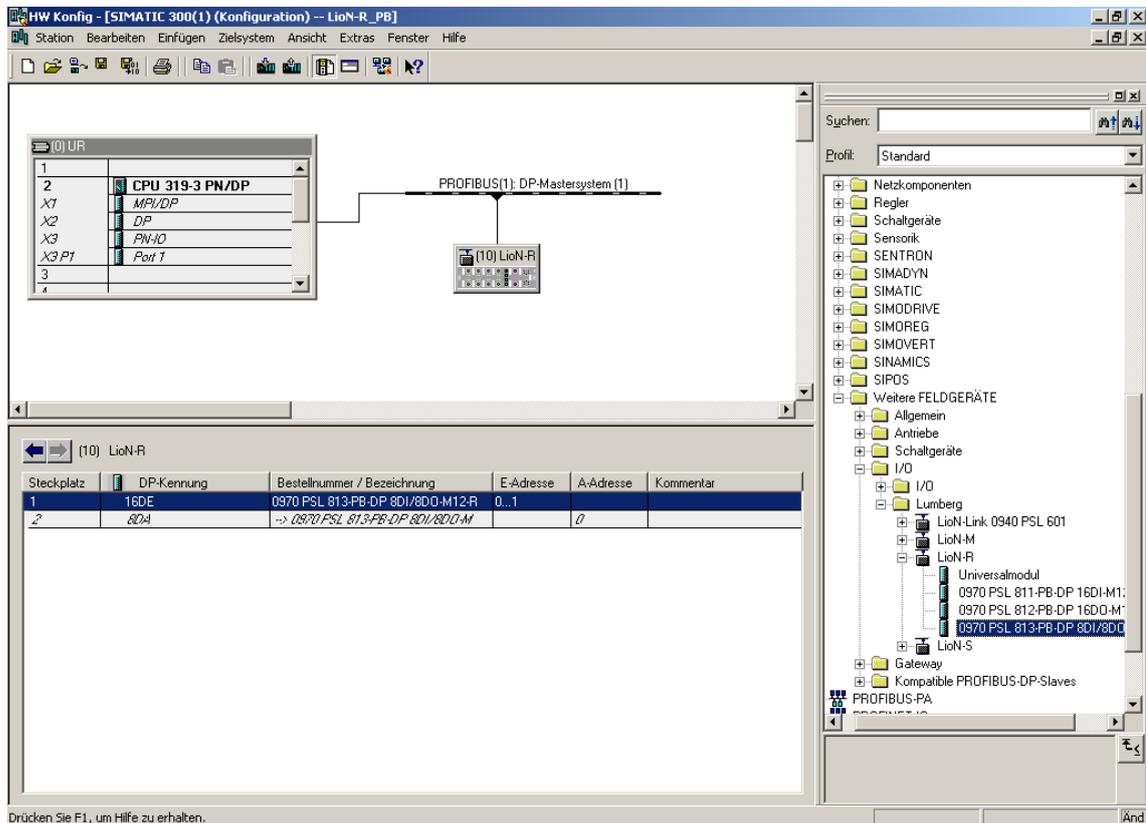


IMPORTANT:

The selected address in the configurator window must agree with the programmed address on the module adjusted over the rotary switches and over the bus. Otherwise no communication occurs.

Then click on the article description of the modules *0970 PSL 811-PB-DP 16DI-M12-R*, *0970 PSL 812-PB-DP 16DO-M12-R* or *0970 PSL 813-PB-DP 8DI/8DO-M12-R*, and insert the required module into insertion slot 1 of the module support rack. The listed universal module is added automatically by the STEP 7 software and has no importance for the configuration. Therefore it should not be selected.

The input and output addresses specified by the hardware manager can be changed.

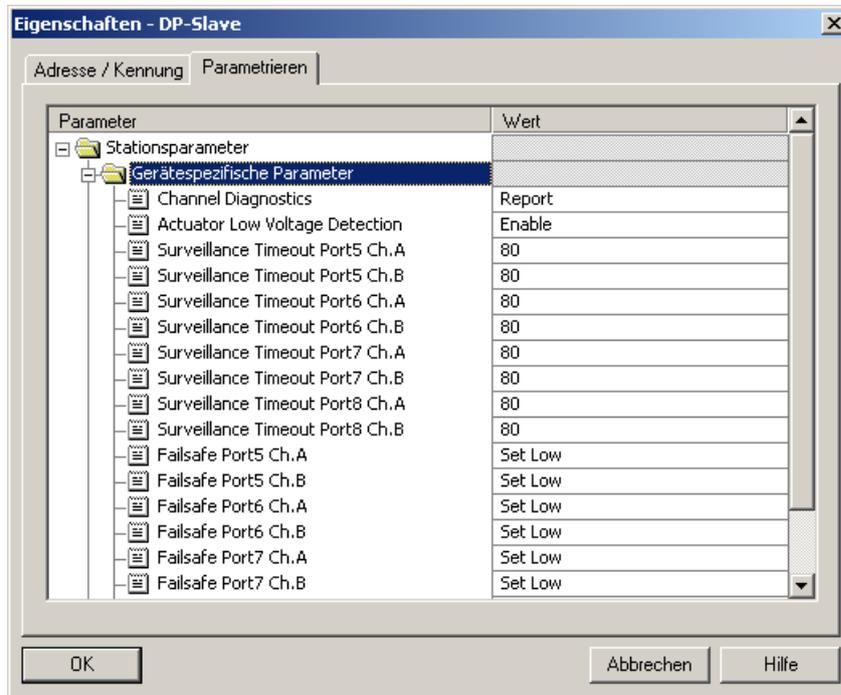


Steckplatz	DP-Kennung	Bestellnummer / Bezeichnung	E-Adresse	A-Adresse	Kommentar
1	16DE	0970 PSL 813-PB-DP 8DI/8DO-M12-R	0...1		
2	824	→ 0970 PSL 813-PB-DP 8DI/8DO-M		0	

6.4.1. The parameter settings of the module LioN-R

You can access the parameter setting via the menu item *Object characteristics - parameters*. For this, double-click on insertion slot 1 of the module support rack in *HW Config*.

The following display indicates the parameter settings of the module 0970 PSL 813-PB-DP 8DI/8DO-M12-R.



6.4.1.1. The parameter *Channel Diagnostics*

With this parameter setting, activate (*Report*) or deactivate (*Do not report*) the channel-related diagnostic message of the module. In PROFIBUS diagnostics telegram, only the device-related and the identification-related diagnostics are transmitted in the case of *Do not report*, and no channel-related diagnostics.

The adjustment is available for all three different module types (16DI, 16DO, 8DI/8DO). The default setting is *Report*.

6.4.1.2. The parameter *Actuator Low Voltage Detection*

This parameter is made available by the module types with digital outputs (16DO, 8DI/DO). The default setting is *Enable*.

The diagnostic message of a low voltage of the supply voltage for the actuator technology can be suppressed with this parameter. Provided that the modules are initially operated without supply voltage for the actuator technology, and this is first added later, an instant diagnostic message of the modules can be prevented in case of missing actuator supply.

6.4.1.3. The parameter *Fail Safe*

This parameter is made available by the module types with digital outputs (16DO, 8DI/DO).

The firmware of the modules provides a fail-safe function for the outputs. During the configuration of the modules, the status of the outputs can be defined in the PROFINET I/O network after an interruption or a loss of communication.

The following options can be selected:

- Set low - the output channel is deactivated
- Set high - the output channel is activated
- Hold last - the last initial state is held

The default setting is *Set low*.

6.4.1.4. The parameter *Surveillance Timeout*

This parameter is made available by the module types with digital outputs (16DO, 8DI/DO).

The firmware of the modules enables the configuration of a delay period before the monitoring of the output currents is activated. This delay period is designated as Surveillance Timeout, and can be adjusted for every individual output channel. The delay period is started after a state change of the output channel, i.e. when this is activated (after an increasing flank) or deactivated (after a trailing flank). After this time, the output is monitored and fault states are reported through diagnostics. The parameter Surveillance Timeout can be adjusted from 0 to 255 ms. The default value for this parameter is 80 ms. In the static status of an output channel, when the channel is permanently switched on or off, the value is 100 ms.

7. Allocation of the process data

This chapter describes the allocation of the process data of the control to the I/O channel of the modules.

7.1. Module 0970 PSL 811-PB-DP 16DI-M12-R

7.1.1. Input data

The module supplies two bytes of status information to the digital inputs. The bit allocation is as follows:

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4A	3B	3A	2B	2A	1B	1A
Byte n+1	8B	8A	7B	7A	6B	6A	5B	5A

In this case:

1A ... 8A: Actual status of the input channel A (contact pin 4) of the M12 socket connections 1 to 8.

1B ... 8B: Actual status of the input channel B (Contact pin 2) of the M12 socket connections 1 to 8.

7.2. Module 0970 PSL 812-PB-DP 16DO-M12 R

7.2.1. Input data

This module supplies two bytes input data which display the current status of the output channels.

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4A	3B	3A	2B	2A	1B	1A
Byte n+1	8B	8A	7B	7A	6B	6A	5B	5A

In this case:

1A ... 8A: Actual status of the output channel A (contact pin 4) of the M12 socket connections 1 to 8.

1B ... 8B: Actual status of the output channel B (contact pin 2) of the M12 socket connections 1 to 8.

7.2.2. Output data

This module requires two bytes status information for the control of the digital outputs.

Output	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4A	3B	3A	2B	2A	1B	1A
Byte n+1	8B	8A	7B	7A	6B	6A	5B	5A

In this case:

1A ... 8A: Setpoint status of the output channel A (contact pin 4) of the M12 socket connections 1 to 8.

1B ... 8B: Setpoint status of the output channel B (Contact pin 2) of the M12 socket connections 1 to 8.

7.3. Module 0970 PSL 813-PB-DP 8DI/8DO- M12-R

7.3.1. Input data

This module supplies two bytes input data which display the current status of the input and output channels.

Input	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte n	4B	4A	3B	3A	2B	2A	1B	1A
Byte n+1	8B	8A	7B	7A	6B	6A	5B	5A

In this case:

- 1A ... 4A: Actual status of the input channel A (contact pin 4) of the M12 socket connections 1 to 4.
- 1B ... 4B: Actual status of the input channel B (contact pin 2) of the M12 socket connections 1 to 4.
- 5A ... 5A: Actual status of the output channel A (contact pin 4) of the M12 socket connections 5 to 8.
- 5B ... 5B: Actual status of the output channel B (contact pin 2) of the M12 socket connections 5 to 8.

7.3.2. Output data

This module requires byte status information for the control of the digital outputs.

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

In this case:

- 5A ... 8A: Setpoint status of the output channel A (contact pin 4) of the M12 socket connections 5 to 8.
- 5B ... 8B: Setpoint status of the output channel B (contact pin 2) of the M12 socket connections 5 to 8.

8. Diagnostic properties of the modules

The modules offer an extended diagnostics characteristic, particularly for the output channels, which is explained in this chapter.

There are five different types of faults which must be differentiated.

8.1. Channel fault

Channel faults result from a comparison between the setpoint value of an output channel, which is set by a control, and its actual value.

Setpoint value	Actual value	Remark
Active	Active	OK, no diagnostics
Off	From	OK, no diagnostics
Active	From	Short circuit Channel display is red. The actuator fault diagnostic message is sent. Channel is blocked after fault correction.
Off	Active	Return feed of a voltage Channel display is red and yellow/white are switched on. The actuator fault diagnostic message is sent. Channel is not blocked after fault correction.



IMPORTANT!

Provided that both output channels of an M12 insertion slot are activated in case of occurrence of a channel fault, both channels are blocked, even if only one channel is affected. If only one channel is activated, only this is blocked with a channel fault.

Blocked channels are deactivated and remain in the Off status, provided that they are not reset through the control and renewed.

With activation of an output channel (increasing flank of the channel status) or deactivation (trailing flank), the channel fault is filtered for a period which is stipulated by the parameter Surveillance Timeout with the configuration of the module in the control. The parameter Surveillance Timeout can be adjusted from 0 to 255 ms. The default setting is 80 ms.

The filter is used to avoid premature fault reports in case of switch-on of a capacitive load or switch-off of an inductive load, as well as other voltage peaks during a status change.

In the static status of a channel, while this is permanently switched on or off, a fixed adjusted time of 100 ms is employed for the filtering of the fault report.

8.2. Voltage fault on the M12 insertion slot/sensor short circuit

On every M12 input socket of the modules, contact 1 delivers a 24 V potential to the voltage supply. This potential is taken from the system/sensor voltage U_S and monitored.

For a sensor short circuit, a sensor fault is reported. Both channel displays of the M12 input socket light up red and a diagnostic message for both channels is sent.

The fault report of the sensor fault is filtered with a fixed time of typically 100 ms.

8.3. Overload of the output drivers

The output drivers of the modules 0970 PSL 812 - 16DO and 0970 PSL 813 - 8DI/8DO signal a fault if they determine an overload.



IMPORTANT!

If both output channels of an M12 insertion slot are activated in case of occurrence of an overload, both channels are blocked. If only one channel is active with overload, only this channel is blocked. Blocked channels must be reset by the control before they can be employed again.

With an overload, the status indicator of the active output channel lights up red. If both output channels of an M12 insertion slot are active during an overload, both status indicators light up red.

An actuator fault is sent as a diagnostic message to the PROFIBUS master.

The overload fault is filtered by the parameter Surveillance Timeout. The same adjustment of the parameter Surveillance Timeout applies for the channel, voltage and overload faults which were explained in Chapters 8.1 and 8.2.

8.4. Fault of the actuator supply U_L

At the connections for the voltage supply of the actuator-technology, the voltage level is monitored globally and module-related.

If the actuator-technology supply U_L undershoots or overshoots the voltage value range 18 V or 30 V resp., a fault is reported.

The display U_L lights up red.

A fault in the actuator-technology supply is sent as a diagnostic message to the PROFIBUS master.



IMPORTANT!

Every output channel is blocked provided that this is activated with simultaneous presence of the fault of the supply voltage U_L . This means that the output channel must be reset for correct operation through the control if the status of the supply voltage U_L is normalized again.

We recommend deactivating all output channels through the control as soon as the low voltage is identified. Otherwise, every active output channel will generate an alarm because of its interlocking if the voltage level is normalized again.

This fault is filtered by a fixed filter time of 300 ms.

8.5. Fault the system / sensor supply U_S

The voltage level of the system/sensor supply is also monitored globally. With undershooting or overshooting the voltage value range 18 V or 30 V resp., a fault is reported.

The display U_S lights up red and a fault in the sensor supply is reported.

This fault does not have any effects on the outputs and is not filtered, but reported immediately.

8.6. Diagnostic message of the LioN-R module over PROFIBUS-DP

If the LioN-R modules identify a fault state, they activate a diagnostic message. For example, periphery faults, such as overload, short circuit and low voltage lead to diagnostic messages.

A diagnostic message is activated both in case of an incoming event (e.g. sensor short circuit), as well as in case of an outgoing event.

8.6.1. Alarm recognition circuit in STEP7

In *STEP7* the processing of the application program is interrupted through the activation of a diagnostic message and a diagnostics module is called up. The following modules are employed:

Cause of the alarm	OB call
Periphery fault (short circuit, overload, wire break, low voltage of an I/O module)	OB 82
Complete failure of the system	OB 86

By means of the called-up OB and its start information, initial information is supplied about the fault cause and type of fault. You are provided with more detailed information about the fault event in the fault OB 82 through the call-up of the system function SFC 13 "DPNRM_DG" (read diagnostic data of a DP slave) or the system function module SFB 54 "RALRM" (read alarm additional information).

If the called-up fault OB is not present in the CPU, this goes into the operating state STOP.

8.6.2. Structure of the diagnostics telegram

a) Standard diagnostics information of a PROFIBUS-DP slave

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 0	Station status 1							
Byte 1	Station status 2							
Byte 2	Station status 3							
Byte 3	PROFIBUS address (station number) of the master							
Byte 4	High-byte of the ident. number (in this case: 0E)							
Byte 5	Low-byte of the ident. number (in this case: 94)							

b) Device-specific diagnostics (byte 6 and byte 7)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 6	0	0	0	0	0	0	1	0
Byte 7	Module fault				Actuator fault	Sensor fault	Fault U _S	Fault U _L

The corresponding fault bit is set in byte 7 for the respective fault.

c). Identification-related diagnostics (Byte 8 and byte 9)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 8	0	1	0	0	0	0	1	0
Byte 9	Socket 8	Socket 7	Socket 6	Socket 5	Socket 4	Socket 3	Socket 2	Socket 1

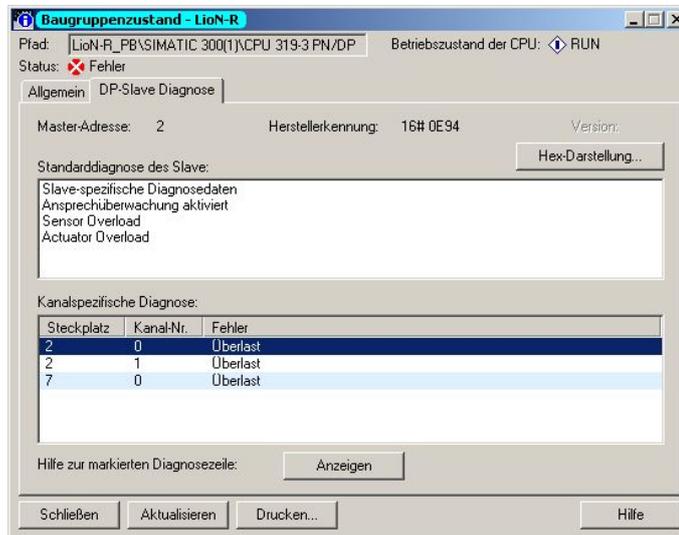
The corresponding fault bit is set for a fault on an M12 socket

d) Channel-related diagnostics

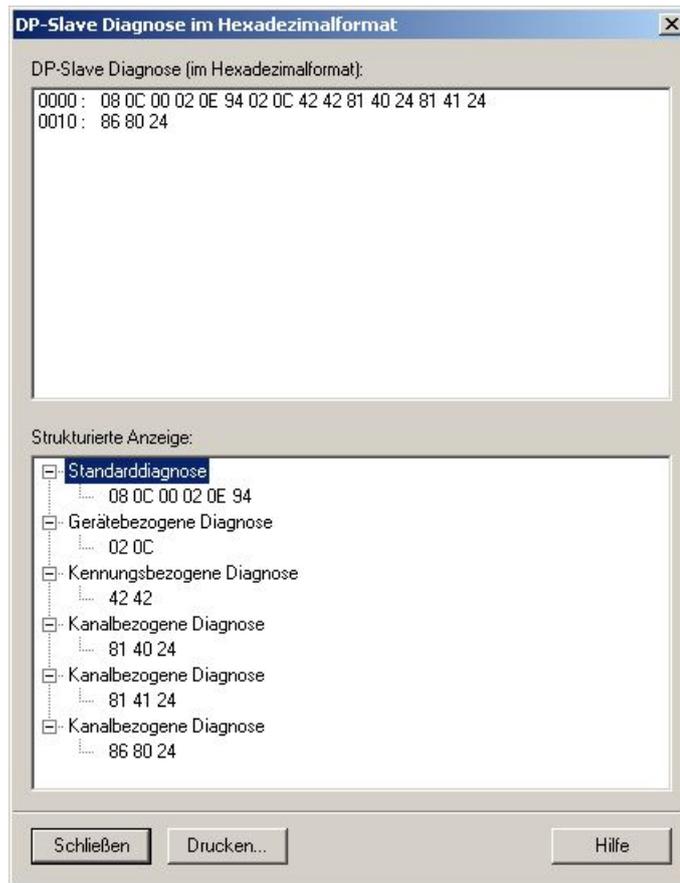
For **every** incorrect channel, the following 3 bytes are sent (from byte 10)

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Byte 10	1	0	0	0	0	0	0	0
Byte 11	Input: 01 Output: 10		Channel number: 0 to 15 (Channel no. 0 = socket 1, Channel A; Channel no. 1 = socket 1, Channel B; and so forth to channel no. 15 = socket 8, Channel B)					
Byte 12	Channel type: Bit: 001			Fault type: Only fault type 1 is employed, i.e. with sensor short circuit, actuator short circuit, actuator overload.				

For the display of the diagnostics in *STEP 7*, click to select the faulty I/O module in the hardware manager and open the online diagnostics with the menu item *Target system - Module status - DP slave diagnostics*.



The actuation of the *Hex Representation* button in the above window supplies the representation of the DP slave diagnostics in hexadecimal format and its structure.



9. Technical data

9.1. General data

Protection type	IP 67 (only in the screwed-together status)
Ambient temperature	-10°C/+60°C
Weight	approx. 605 g
Housing material	Zinc die-casting
Vibration resistance oscillating cranks	15 g / 5-500 Hz
Impact test vibration resistance	50 g / 11 ms
Torques:	
• Fastening screw M6	1.0 Nm
• Plug connector M12	0.5 Nm

9.2. Technical data relating to the bus system

Protocol	PROFIBUS DP-V0
Ident. number	0E94 hex
GSD file	LUM_0E94.GSD
Transmission rate	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 transfer rate	Automatically with start of the communication
Address setting	Address range:
Adjustment over Profibus (addressing switch: "000")	1-125 dez
Adjustment over addressing switch	1-125 dez
Preset address	126 dez
PROFIBUS interface Connections	M12 plug connector and socket, 5-pole, B-coded (see connector pin assignments)

9.3. Technical data of the power supply for the module electronics/sensor technology

Rated voltage U_S	24 V DC (SELV/PELV)
Voltage range	18-30 V DC
Electronics current consumption	Typically 60 mA
Sensor technology voltage	Min. ($U_S - 1.5V$)
Sensor technology current consumption	Max. 200 mA with $T_U = 30^\circ\text{C}$
Reverse polarity protection	Yes
Operation indication	LED green, $18\text{ V} \leq U_S \leq 30\text{ V}$ LED red, $U_S < 18\text{ V}$ or $U_S > 30\text{ V}$
Connection	MINI, 7/8" plug connector and socket, 5-pole; see connector pin assignments

9.4. Technical data of the actuator-technology power supply

Rated voltage U_L	24 DC (SELV/PELV)
Voltage range	18-30 DC
Disconnection of the potential	Yes
Undervoltage threshold	typ. 17 V
Delay period	typ. 300 ms
Low-voltage identification	
Reverse polarity protection	Yes
Actuator supply display U_L	LED green, $18\text{ V} \leq U_L \leq 30$ LED red, $U_L < 18\text{ V}$ or $U_L > 30\text{ V}$
Connection	MINI, 7/8" plug connector/socket, 5-pole see connector pin assignments

9.5. Technical data of the input stages

Input wiring	Type 3 in accordance with IEC 61131-2
Rated input voltage	24 V DC
Input current at 24 V DC	typ. 5 mA
Short-circuit resistant	Yes
Channel type	Make contact, P-switching,
Number of digital channels	16 (0970 PSL 811-PB-DP 16DI-M12-R) 8 (0970 PSL 813-PB-DP 8DI/8DO-M12-R)
Status indicator	LED yellow for channel A, LED white for channel B
Diagnostic indicator	LED red per M12 socket
Connection	M12-socket, 5-pole see connector pin assignments

9.6. Technical data of the output stages

Output wiring	Type 1.6 A in accordance with IEC 61131-2
Rated output current per channel: Signal status "1" Signal status "0"	1.6 A (see Info 1) max. 1.6 A max. 1 mA (standard specification)
Signal level of the outputs: Signal status "1" Signal status "0"	min. ($U_L - 1$ V) max. 2
Short-circuit resistant	Yes
Max. current-carrying capacity per module	In accordance with UL-certificate: 9.0 A (12 A see Info 2)
Overload resistant	Yes
Number of digital channels	16 (0970 PSL 812-PB-DP 8DO-M12-R) 8 (0970 PSL 813-PB-DP 8DI/8DO-M12-R)
Channel type	Make contact p-switching
Status indicator	LED yellow for channel A, LED white for channel B
Diagnostic indicator	LED red per channel
Connection	M12 socket, 5-pole see connector pin assignments
<p>Info 1: With inductive loads of the utilization-category DC13 (EN60947-5-1), the outputs are capable of switching currents of 1.6 A with a frequency of 1 Hz.</p> <p>Info 2: Technically possible and released under the following prerequisites: Looped sensor/system supply max. 2.5 A Minimum conductor cross section of the supply line: 5x 1.0 mm² Max. ambient temperature 40°C/104°F</p>	

9.7. LED displays

U_S	Green	System /Sensor supply, voltage level $18\text{ V} \leq U_S \leq 30\text{ V}$
	Red	System /Sensor supply, voltage level $U_S < 18\text{ V}$ or $U_S > 30\text{ V}$
	Off	System /Sensor supply missing.
U_L	Green	Actuator supply, voltage level $18\text{ V} \leq U_L \leq 30\text{ V}$
	Red	Actuator supply, voltage level $U_L < 18\text{ V}$ or $U_L > 30\text{ V}$
	Off	Actuator supply is missing.
X1...X8 A/DIA	Yellow	Channel A status "On"
	red	Periphery fault (sensor or actuator overload/short circuit)
	Off	Not connected, status "Off", no fault
X1...X8 B	White	Channel B status "On"
	Red	Periphery fault (actuator overload/short circuit)
	Off	Not connected, status "Off", no fault
Act	Yellow	Data exchange with PROFIBUS master
BF	Red	Bus fault, no communication
	Off	No fault
DIA	Red	Collective indicator for periphery faults (sensor /actuator overload and short circuit, undervoltage/overvoltage of the supply)
	green	No fault report exists

10. CE Declaration of Conformity

	Lumberg Automation™ and Hirschmann™ Products		
<u>Declaration of Conformity</u>			
We Wir	Belden Deutschland GmbH		
Adress Adresse	Im Gewerbepark 2, 58579		
declare under our sole responsibility, that the products erklären in alleiniger Verantwortung, dass die Produkte			
Name Bezeichnung	0970 PSL 811-PB-DP 16DI-M12-R 0970 PSL 812-PB-DP 16DO-M12-R 0970 PSL 813-PB-DP 8DI/8DO-M12-R		
Type Typ	I/O-Module für Profibus		
angelehnt an die Direktive corresponding to directive			
<u>EMC-Directive 2004/108/EC</u>			
fulfils the requirements of the following standards den Anforderungen der folgenden Normen entspricht			
<u>Standards DIN EN 61000-6-4: 2007 and DIN EN 61000-6-2: 2006</u>			
Schalksmühle, den 06.11.2013			
 per. Axel Vornhagen	 i.V. Uwe Widmann		
Belden Deutschland GmbH Standort Neckartenzlingen Stuttgarter Str. 45-51 - 72054 Neckartenzlingen Postfach 16 49 - 72606 Nürtingen Deutschland			
<small>Registered office: Belden Deutschland GmbH Im Gewerbepark 2 58579 Schalksmühle Deutschland</small>	<small>www.beldensolutions.com</small>	<small>Managing Directors: Henk Derksen Christoph Gusenleitner Alex van Denderen</small>	<small>VAT No.: DE 253 565 700 Tax No.: 332/5707/2404 Register court: Iserlohn Trade register No.: HRB 6316</small>