FACTORY AUTOMATION

Instruction Manual

Optical data Coupler LS610-DA

CE

PEPPERL+FUCHS
VISOLUX

Date of issue 100 8d200 4

General information

Attention

This symbol warns the user of the possibility of device failure. Failure to observe this warning can lead to the complete failure of the device or any device connected to it.

Note

This symbol advises the user of important tips.

This symbol denotes sections of these operating instructions which are relevant only to PROFIBUS devices.

This symbol denotes sections of these operating instructions which are relevant only to INTERBUS devices.

Date of issue 100 8/2004

Declaration of conformity

We, Pepperl+Fuchs GmbH, declare herewith at our sole responsibility that the

LS610-DA optical data coupler

and all models of this product to which this declaration pertains, are compliant with the following standards and other regulating documents

DIN EN 61000-6-2, Edition:2002-08

Electromagnetic compatibility (EMC) - Part 6-2: Basic standard; Interference rejection for the industrial sector (IEC 61000-6-2:1999, modified); German edition EN 61000-6-2:2001

DIN EN 60947-5-2, Edition:2000-08

Low-voltage switching equipment - Part 5-2: Control equipment and switching elements; Proximity switches (IEC 60947-5-2:1997, modified + A1:1999); German edition EN 60947-5-2:1998 + A1:1999

and the guidelines of the following directive(s):

89/336 CEE AND SUBSEQUENT CHANGES MADE,
92/31 CEE; 93/68 CEE

Note

A corresponding declaration of conformity may be requested from the manufacturer.

Pepperl+Fuchs GmbH, in D-68301 Mannheim, has a certified quality assurance program in accordance with ISO 9001.

CE

ISO9001

Date of issue 10.08.2004

1 Quick instructions

1.1 Tools needed

- SW7 wrench for M4 nuts adjustment system
- INBUS size 5 for M6 screws (central fastening, position adjustment)

1.2 Installation

Attach wall bracket and set adjustment system in desired direction. Tighten M4 nuts.

Set LS610 on with mounting levers held together, then release levers. This may also be done with wires already installed.

1.3 Adjustment

Switch on power to both devices. Bus operation not required!

At a moderate distance (< 20 m), using adjustment

- Find contact –> fast blinking on the opposite side goes out and turns into a slow blinking
- Find maximum –> set bar graph display on opposite side to maximum

Check setting at maximal distance and correct if necessary.

The adjustment setting is fastened by tightening the M6 central screw.

1.4 Bus connections

1.4.1 INTERBUS-S

If prefabricated cables are not used, care must be taken that the built-in connector with the plug (remote bus input) is connected to the master side, and that the built-in connector with the built-in socket (remote bus output) is connected to the segment side. Only one of the two connectors may be used on the LS610.

The exchange of the twisted pairs is not permissible.

1.4.2 PROFIBUS

The PROFIBUS cable segments must have standardised termination on the ends. The LS610 contains no switchable terminator. If an LS610-DA-P is the first or last bus node, then a termination connector (M12) can be screwed onto the outgoing bus connection; the necessary power supply for this is provided. Since the bus connections are switched in parallel internally, inputs and outputs for the bus cable are equivalent and exchangeable.

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1.5 Device and shield grounding

Grounding devices at the bus plug connector is recommended (functional grounding), to increase resistance to electromagnetic interference. For this purpose, the included grounding strap should be screwed onto the built-in connector used for the bus connection.

1.6 Setting parameters

PROFIBUS devices must be set to the correct system baud rate. This setting is performed using the setup keys (for much more information, see Chapter 6.7.1). Operation with telegram verification (TVT) should preferably be selected. In this mode, data is transmitted only at the correct configured baud rate.

Without TVT, a baud rate should be selected which is equal to or larger than the system baud rate.

Date of issue 10.5.2004

2 Scope of these operating instructions

VISOLUX offers two different types of optical data coupler: the LS610-DA-P for data transfer in PROFIBUS systems, and the LS610-DA-IBS for data transfer in INTERBUS systems. The difference between these types can be seen in Chapter 3 "Scope of delivery".

The handbook applies to both types. Paragraphs which are relevant to only one type are marked with the corresponding symbol. These include the following Pepperl+Fuchs GmbH products:

Symbol	Bus system	Description	F*	Range [m]
	PROFIBUS higher level designation: LS610-DA-P	LS610-DA-P/F1	1	120
		LS610-DA-P/F2	2	120
		LS610-DA-P/F1/35	1	240
		LS610-DA-P/F2/35	2	240
	INTERBUS higher level designation: LS610-DA-IBS	LS610-DA-IBS/F1	1	120
		LS610-DA-IBS/F2	2	120
		LS610-DA-IBS/F1/35	1	240
		LS610-DA-IBS/F2/35	2	240

Table 2.1 Device types

* F = middle frequency. For installation of a transmission path, a device pair (LS.../F1 and LS.../F2) is used.

3 Scope of delivery

After opening packaging, check that all parts are included.

1. Optical data coupler LS610-DA
2. Instruction manual
3. Grounding set (grounding strap and nut)
4. M12 protective cap set (only with LS610-DA-IBS/F1)

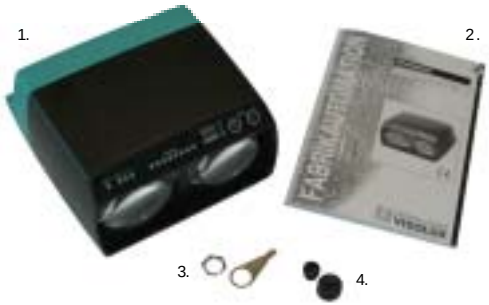

Figure 3.1 Scope of delivery

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4 Principle of operation

The LS610-DA is a device for the serial transmission of data for the field bus systems PROFIBUS (P) and INTERBUS (IBS).

Data is transmitted in both directions using modulated infrared light. The information carried on the incoming interface is modulated on the carrier signal in real time using frequency shift keying (FSK). In the receiver, the corresponding demodulation is performed and the data is output on the outgoing interface. For reliable signal separation in the two directions of transmission, the middle frequencies F1 and F2 of the carrier signals are different. Thus optical data couplers can only be operated in pairs (LS.../F1 and LS.../F2). The product designations for middle frequencies refer to the optical transmitter; the optical receiver of an optical data coupler has the corresponding complementary middle frequency (see Table 2.1, on page 6).

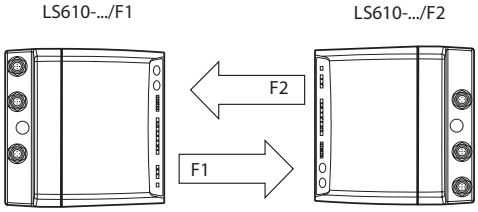

Figure 4.1 Center frequencies F1 and F2 of carrier signals

4.1 PROFIBUS data transfer

In order not to disturb the operation of a connected bus in case the light beam is interrupted, Telegram Verification Technology (TVT) is used. TVT prevents the transmission of invalid telegrams. Signals are regenerated by bit and character, and transmitted with crystal stability on the bus. This results in optimal signal conditioning; the signal quality is electrically and temporally identical with the original PROFIBUS node.

TVT can be disabled; this makes transmission largely protocol-free, and the unit is suitable for RS485 protocols with time requirements which vary from PROFIBUS (see Chapter "Operation").

4.2 INTERBUS data transfer

The LS610-DA-IBS is a device for serial data transmission in INTERBUS systems with transfer rates of up to 2 MBit/s. The transmission is protocol-free.

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5 Safety Instructions

Connection of devices as well as their maintenance, particularly when switched on, must only be performed by qualified professionals.

When used properly, the LS610 poses no hazard to equipment or operating personnel. The LS610 uses LEDs and is compliant with laser protection class 1 of EN 60825. Do not look into the beam from a short distance!

Operating power must be provided by a power supply with safe electrical isolation compliant with EN 60742 (IEC60742). Grounding of cable shields and bus systems must be performed in accordance with the appropriate guidelines (PROFIBUS, INTERBUS).

The device is not intended to be serviced, and opening it is not permissible. Damaged units should be taken out of service immediately.

6 Commissioning

6.1 Installation

The optical data couplers are installed on each beam in pairs with regards to carrier frequencies F1 and F2.

Installation is done with the corresponding accessories, for instance OMH-LS610-01 for wall mounting.

The position adjustments are premounted at the factory. It is fastened to the mounting bracket in the desired transmission direction (±90° rotation possible) with the two M4 screws and a central M6 screw. The middle screw is for fastening after adjustment and should only be tightened afterwards.

The data photo sensor is inserted into the notches of the adjustment device while holding both of the front bolts together with holding tabs. After insertion, the bolts are released and hold the unit securely by springing back.

Using the two adjustment screws (Inbus 5mm), the transmission axis can now be directed in the vertical and horizontal directions, and the adjustment fixed in place by tightening the middle screw.

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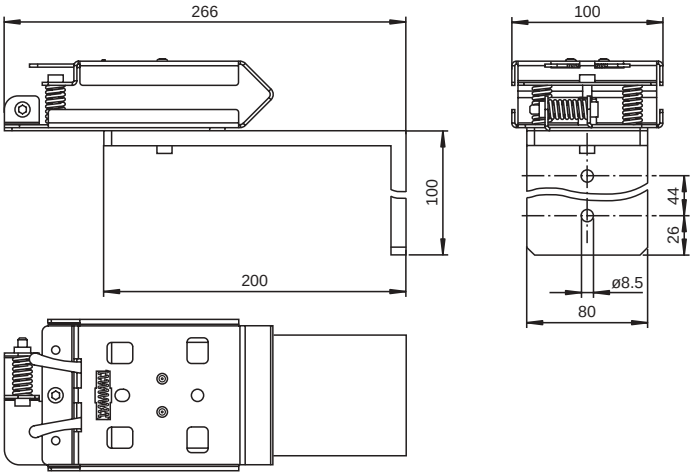

Figure 6.1 Mounting accessory OMH-LS610-01 for panel mounting

6.2 Orientation with adjustment system

Bus operation is not required for position adjustment.

- Fasten wall bracket in installation location.
- Set adjustment system on the bracket in the desired direction and tighten the two M4 nuts. Screw in the M6 central screw, but do not tighten.
- Snap optical data coupler into the adjustment system and screw on the cable plug.
- Orient at a moderate distance (<20 m), until both signal displays are at least in the yellow range.
- Perform fine adjustment using the adjustment screws until the maximum in the green signal displays is found.
- Increase distance up to maximum distance, adjusting if necessary.
- Tighten the central M6 screw to fix the orientation in the horizontal direction.

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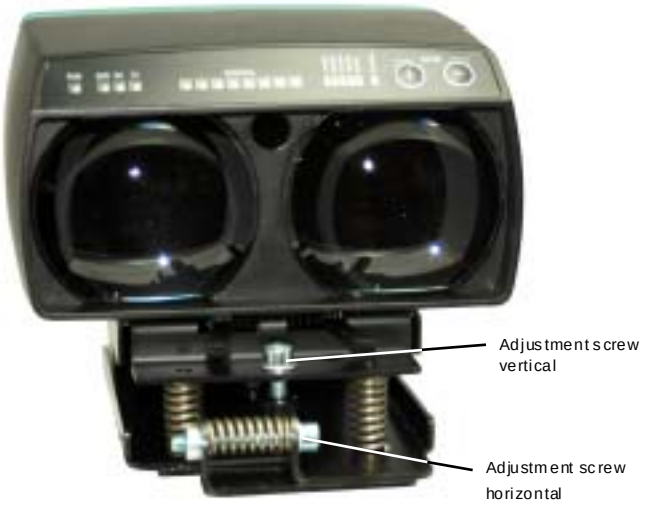

Figure 6.2 mounted LS610 with adjustment elements

6.3 Parallel beams

If multiple beams are installed next to one another without optical isolation, the distance between their optical axes must be maintained to reduce crosstalk.

In general, an arrangement as in Illustration 6.3 (anti parallel) is preferred, then the minimum distance is 1 m.

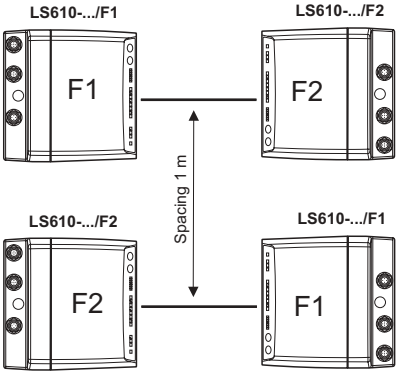

Figure 6.3 anti parallel arrangement

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The arrangement in Illustration 6.4, on the other hand, must have an axis separation of half the maximum size of the light spot, which is dependent on distance for this reason.

For an arrangement as in Illustration 6.4, the minimum separation a should be calculated as follows:

$a = 1m + d \cdot 0.018$ all units in meters [m]

for instance, d = 100m --> a = 2.8m

This calculation is valid for the optimal orientation of the units to one another, that is, the bar graph displays of the optical data couplers are directed as far away as possible (at maximum separation).

In this sort of arrangement, switching off only one end of a data coupler is not allowed. The beam may also not be interrupted.

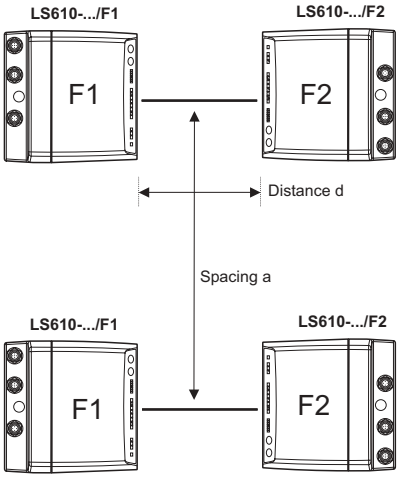

Figure 6.4 parallel arrangement

6.4 Parallel arrangement of EDM distance measuring device

For the combination of optical data couplers and type-EDM distance measuring devices, the frequency arrangement as in Illustration 6.5 is recommended. This has the lowest interference sensitivity for the data optical coupler beam.

In general it should be ensured that the laser beam of the EDM does not illuminate the lens of the optical data coupler during operation. Possible interference is caused by reflection from the reflector in medium distances (10 m ... 50 m).

When using R140 lens reflectors for distance measurement, the frequency recommendation do not apply; the frequencies may then be selected arbitrarily.

The EDM will not be disturbed by the optical radiation of the optical data coupler.

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Note

The orientation of the optical data coupler on the EDM side can be disturbed by the reflector; it must therefore be covered while adjusting the data coupler.

The separation of the optical axes should not be less than 1m.

When switching off the optical data coupler on the reflector side, under some circumstances there may be bus disturbances in the data coupler remaining switched on.

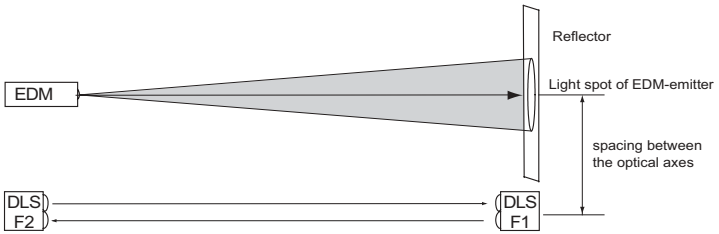

Figure 6.5 Parallel operation of EDM distance measuring devices and LS610 optical data couplers

6.5 Electrical connection:

To achieve protection class IP 65, the unused M12 plug connectors must be equipped with protective caps.

6.5.1 Connection instructions for PROFIBUS

Optical data couplers are repeaters from an electrical standpoint, that is, one PROFIBUS segment (= line) is connected to each data coupler. The lines should be installed according to PROFIBUS guidelines, and thus terminated on both ends. The signal lines of both bus connections are switched in parallel; besides their mechanical form (plug / socket) they differ only in the power supply for a terminating resistor, which is provided only on the socket's "Bus OUT/Termination". If the optical data coupler is not located at the end of a line, then the sequence of bus connections (IN>OUT, OUT>IN) has no significance.

Bus termination

If a data photo sensor is at the end of a bus line, bus termination is required by connecting an external standardised termination resistor (see accessories) to the M12 connector labelled "Bus OUT/Termination". In any case, both bus lines must be terminated.

Termination with the M12 terminating resistor must take place directly at the Bus_OUT plug; an extension using cable is not allowed.

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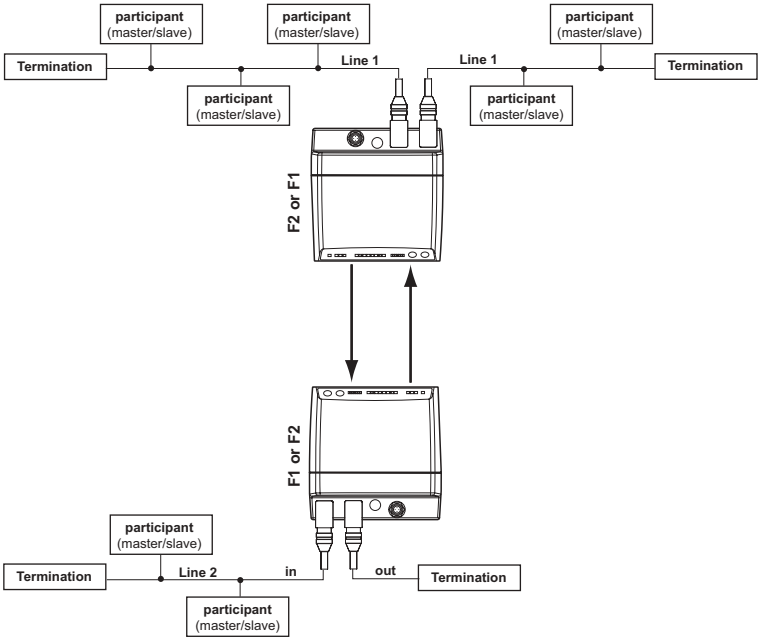

Figure 6.6 Topology of the PROFIBUS with bus connections

Connection layout of PROFIBUS devices

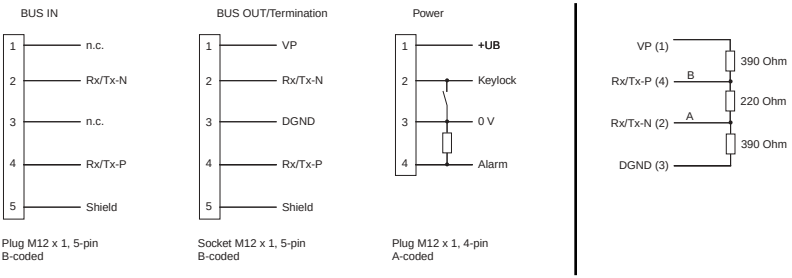

Figure 6.7 Connection layout of PROFIBUS unit and internal switching of the bus connector plug

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6.5.2 Connection instructions for INTERBUS

The LS610-DA-IBS is intended for the direct connection of INTERBUS units ("extension of bus cables"). It contains no bus connection logic, and is thus not suited for spur line installations. For this reason, only one of the M12 connectors should be used at one time. The unused connectors should be closed with the included protective caps to preserve the IP protection class.

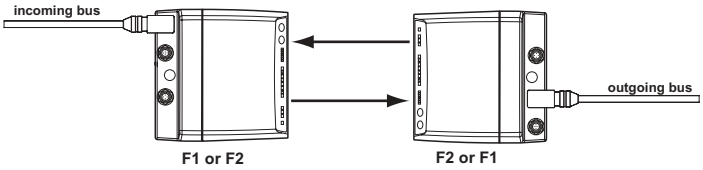

Figure 6.8 Topology of INTERBUS

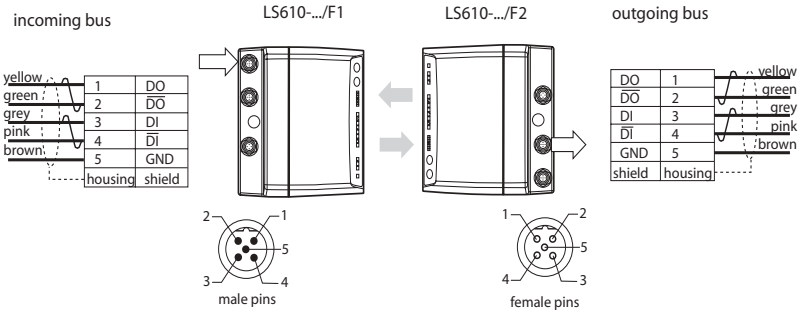

Figure 6.9 Operation of optical data coupler on INTERBUS

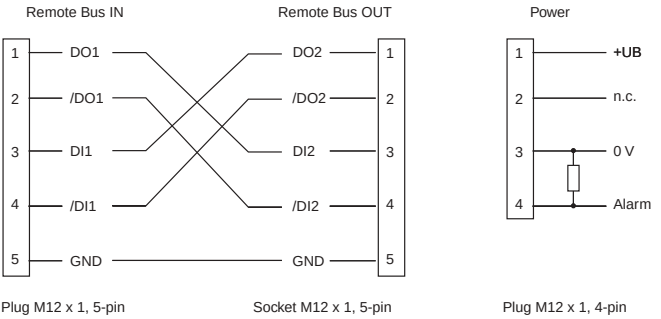

Figure 6.10 Connection layout of INTERBUS device. The connections show the internal wiring of the bus connectors.

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6.5.3 Functional ground/shielding

Functional grounding of the cable shielding is recommended, since the housing does not permit grounding. If the shields must be grounded for EMC reasons, Section 12.2.2.3 of EN 60079-14 and Section 3.3.3 of the PROFIBUS PNO working group should be followed strictly.

For grounding of shielding, the plug tongue (included in delivery) must be screwed onto one of the bus connectors used, using the nut also provided in the scope of delivery.

Attention

Under no circumstances should the primary fastening nut of the built-in plug connector be unfastened; otherwise the connection assembly may be damaged and the housing could leak.

Figure 6.11 Optical data coupler with mounted grounding set

6.5.4 Power supply

The unit corresponds to protection category III. Care must be taken that power is supplied by power supplies providing protective low voltage (PELV). The grounding of cable shielding to metallic built-in plug connectors is not protective grounding in the sense of personal safety, but a functional grounding.

Power supply of the LS610 is direct current between 18V and 30V.

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6.6 Alignment

6.6.1 Alignment aid/functional reserve

For alignment, there is an alignment LED on the unit's face which is visible from a distance (alignment aid). As soon as a receiver detects the transmission light of the opposite unit, the blink frequency of the alignment aid is lowered. When it is extinguished, this signals that the units are optimally aligned with one another, and enough functional reserve is available. For fine adjustment, the data system is equipped with a bar graph display which enables optimal alignment.

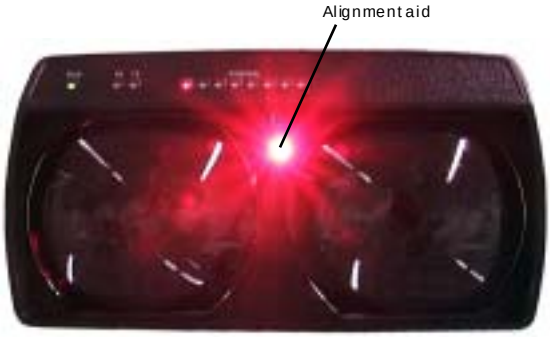
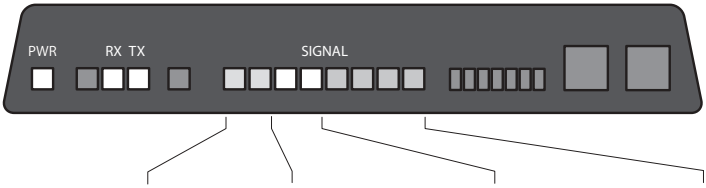


Figure 6.12 Alignment aid



Zustand	zu wenig Signal	ausreichend Signal	Signal mit Funktionsreserve
Übertragung	blockiert	freigegeben	Übertragung mit Funktionsreserve
Ausricht-LED	schnelles Blinken	langsames Blinken	aus
Signal-Anzeige	roter Bereich	gelber Bereich (mindestens eine LED)	grüner Bereich

Figure 6.13 Connection between display and operational status

In the "Functional reserve" state (green range), the optical data coupler is working with a sufficient receiving strength necessary for operation. Within operational range, the LS610 should work in the green range (at least one green LED); if the receiving strength falls below this limit, the alarm output is triggered. Only when receiving strength falls below the limit necessary for operation (no yellow LEDs) are the bus drivers switched off (high ohmage); at this point, no more data is transmitted on the beam, since this error implies a beam interruption. This prevents possible interference with neighbouring beams.

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6.6.2 Functional displays

If the bus is active, a yellow LED "RX" lights for received data, and a green LED "TX" for transmitted data on the beam.

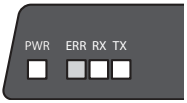

Figure 6.14 Functional displays

6.7 Setting the bus parameters

6.7.1 PROFIBUS

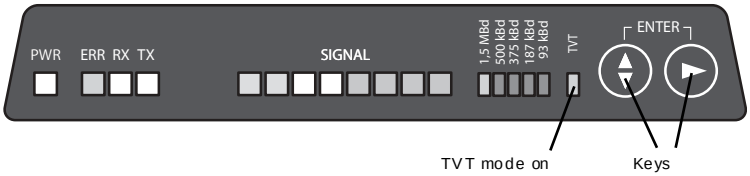

Figure 6.15 Control panel

Using the ▲▼ ► key, the baud rate can be set. TVT mode can also be switched off (not recommended). If both keys are pressed simultaneously, you enter parameterisation mode, and the LED blinks at the position which can be changed.

The ► key is used to jump to the next position. For baud rates, the corresponding position is activated with the ▲▼ key. In the "TVT" position, TVT mode (see Chapter 4.1) is switched on or off by pressing the ▲▼ key. If the LED blinks brightly, TVT mode is activated; if it blinks dully, it is deactivated. When changing a position by pressing the ▲▼ key, the configuration is changed immediately. A few seconds after the last key is pressed, parameterisation mode is exited, the LEDs light statically, and the configuration is stored to permanent memory. The device "remembers" the setting even after a power failure.

Note

*Due to the Profibus-standards, baud rate of 375 kbaud **and** TVT mode are mutually exclusive.*

If a PROFIBUS master (active node) is on the opposite side, an incorrectly set baud rate will show as an error on the error LED. If the baud rate of the opposite side is incorrect and there is a master only on the side being observed, there will be no error displayed, since all telegrams on the bus are already being suppressed on the opposite side.

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To prevent tampering or accidental parameter changes, the buttons can be locked using an electrical signal. Any attempt to change parameters in this state will be confirmed by simultaneous blinking of all mode LEDs. The lock is activated by a low level on KEY LOCK.

Error LED on TVT "ERR"

If telegram errors are detected by TVT (see Chapter 4.1) the error LED will light. These errors are only related to light receiving. Telegram errors in the transmit direction will only be displayed on the data coupler on the opposite side.

Operation without TVT

In this mode, a data telegram received is ended when the data high level lasts about 10.5 bit periods. The duration of 11 bits is the minimum pause between two telegrams. After 10.5 bit periods, the optical data coupler is again ready to transmit the response of the bus node in the opposite direction. This setting is compatible with the PROFIBUS. However, serial protocols may be transmitted which deviate from this, as long as they have a defined minimum idle time between telegrams. If necessary, the baud rate must be set so that the resulting idle time corresponds to this requirement; the possible transmitted data rate remains independent from this setting.

Depending on the baud rate set, the following idle times are in effect:

Baud rate	Idle time
1.5MB	6.7 µs
500 k	20.1 µs
375 k	26.9 µs
187.5 k	53.6µs (Suconet 375)
93.75 k	107µs (Suconet 187,5)

6.7.2 INTERBUS

The LS610-DA-IBS has no manual settings.

7 Maintenance

The LS610 is maintenance-free. In case of dustiness/dirt (alarm, functional reserve), the plastic lenses can be cleaned with a damp cloth, if necessary with a neutral cleaning agent. No cleaners containing alcohol or solvents may be used.

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8 Correction of problems

8.1 General problems

Error no.	Error picture	Displays			Cause of error	Measures
		Signal	RX TX	PWR		
1	No display	off	off	off	No power	
2	No communications	off or red	off	on	Receiving level too low, transmission blocked	• Alignment of optical data coupler see. 5.6 • Wrong pairing; F1 + F2 required
3	Bar graph not fully on despite exact alignment	x		on	**No error;** individual scaling deviations in high-level range	none
4	Weak display RX and/or TX	normal		on	**No error;** brightness dependent on bus load and baud rate	none
5	Signal display with opposite side switched off	yellow		on	LS610 pointed directly at reflector or LS610 opposite side	**None**, if bus operation not disturbed. **otherwise:** increase axis separation from reflector, if necessary turn reflector away from LS610

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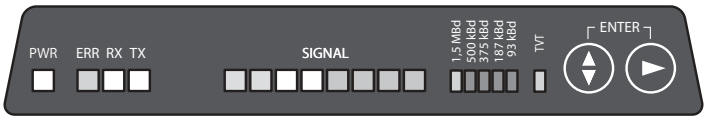
8.2 PROFIBUS



Prerequisite for the following cases is that no general error as described in Chapter 8.1 applies. Incorrect wiring of the bus connections cannot be detected or corrected by the LS610-DA-P. Please note the connection instructions in Chapter 6.5.1.

Error no.	Error picture	Displays			Cause of error	Measures
		ERR	RX	TX		
6	No communications	off	on	off	No response from connected bus nodes	Check interruption in connected PROFIBUS
7	No communications	off	off	on	No response from opposite side	Check interruption in PROFIBUS on opposite side, if error 6 on opposite side
8	Receipt of erroneous telegram a)	on	on	x	Wrong baud rate set on one LS610	Correct baud rate
9	Receipt of erroneous telegram b)	on	on	x	Incorrect termination on opposite side	Check and set termination
10	Receipt of erroneous telegram c)	on	on	x	Bus disturbance on other side	Correct source of disturbance
11	Key press ignored	all baud LEDs blinking			Key lock is active	Deactivate key lock (M12 plug power, pin 2)

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8.3 INTERBUS

Prerequisite for the following cases is that no general error as described in Chapter 8.1 applies. Incorrect wiring of the bus connections cannot be detected or corrected by the LS610-DA-IBS. Please note the connection instructions in Chapter 6.5.2.

Error no.	LEDs		Error picture	Cause of error	Measures
	RX	TX			
12	off	off	no communication with segment side	Interruption on master-side INTERBUS	Master side: check BUS_IN for switching of DI and DO
13	Master side		no communication with segment side	Interruption on segment-side INTERBUS	Segment side: Check BUS_OUT for switching of DI and /DI, DO and /DO, and DI and DO
	off	on			
14	Segment side		no communication with master side	Interruption on master-side INTERBUS	
	on	off			
15	on	on	no communication with segment side	Faulty wiring on master-side INTERBUS	Master side Check BUS_IN for switching of DO and /DO
16	on	on	long restart wait after beam interruption	DI and /DI or DO and /DO wire pairs switched on both sides	Correct problem on both sides

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9 Technical data

9.1 PROFIBUS devices LS610-DA-P

General data		
Operating range	0 ... 120 m	Option /35: 0 ... 240 m
Threshold detection range	140 m	Option /35: 280 m
Light type	infrared, blinking light	
Light spot diameter	2 m at a distance of 100 m	
Beam angle	1,1 ° (full angle)	
Extraneous light limit	>10.000 Lux	
Displays/control elements		
Alignment aid	blinking red LED on front	
Data flow display	Transmit: "TX"; Receive: "RX"; Telegram error: "ERR"	
Function indicator	Bar graph for signal strength (8 LED: red, yellow, green), power on	
Control elements	2 keys	
Electrical data		
Operating voltage	18 ... 30 V DC	
No load current	200 mA	
Data rate	93.75/187.5/375*/500/1500 kBit/s configurable (* not in TVT mode)	
Middle frequency	F1 = 8.25 MHz / F2 = 13.5 MHz (included in item code)	
Signal duration	TVT mode: 14 bit periods + 1.5µs; Idle time mode: 1.5 µs	
Interface		
Interface type	PROFIBUS, galvanically isolated	
Input		
Key lock	active low	
Output		
Pre-failure output	1 PNP (switches on with sufficient functional reserve) short-circuit protected, max. 200 mA	
Standards		
Standards compliance	EN 61000-6-2, EN 60947-5-2, CE	
Ambient conditions		
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	
Storage temperature	-20 ... 70 °C (253 ... 348 K)	
Mechanical data		
Protection class	IP65	
Connection	M12 x 1 connector 4-pin. A-coded (power), M12 x 1 connector 5-pin. B-coded (Bus IN) M12 x 1 socket 5-pin. B-coded (Bus OUT/Termination)	
Material		
Housing	ABS/PC	
Light exit	Plastic lenses	
Mass	700 g	

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9.2 INTERBUS devices LS610-DA-IBS

General data		
Operating range	0 ... 120 m	Option /35: 0 ... 240 m
Threshold detection range	140 m	Option /35: 280 m
Light type	infrared, blinking light	
Light spot diameter	2 m at a distance of 100 m	
Beam angle	1,1 ° (full angle)	
Extraneous light limit	>10.000 Lux	
Displays		
Alignment aid	blinking red LED on front	
Data flow display	Green LED: Transmitter LED yellow: Receiver	
Function indicator	Bar graph for signal strength (8 LED: red, yellow, green), power on	
Electrical data		
Operating voltage	18 ... 30 V DC	
No load current	200 mA	
Data rate	0 ... 2 MBit/s	
Middle frequency	F1 = 8.25 MHz / F2 = 13.5 MHz (included in item code)	
Signal duration	1.5 µs	
Interface		
Interface type	RS 422, IBS termination integrated, galvanically isolated	
Output		
Pre-failure output	1 PNP (switches on with sufficient functional reserve) short-circuit protected, max. 200 mA	
Standards		
Standards compliance	EN 61000-6-2, EN 60947-5-2, CE	
Ambient conditions		
Ambient temperature	-10 ... 50 °C (263 ... 323 K)	
Storage temperature	-20 ... 70 °C (253 ... 348 K)	
Mechanical data		
Protection class	IP65	
Connection	M12 x 1 connector 4-pin A-coded (power supply), M12 x 1 connector 5-pin B-coded (Remote Bus IN) M12 x 1 socket 5-pin B-coded (Remote Bus OUT)	
Material		
Housing	ABS/PC	
Light exit	Plastic lenses	
Mass	700 g	

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10 Dimensions

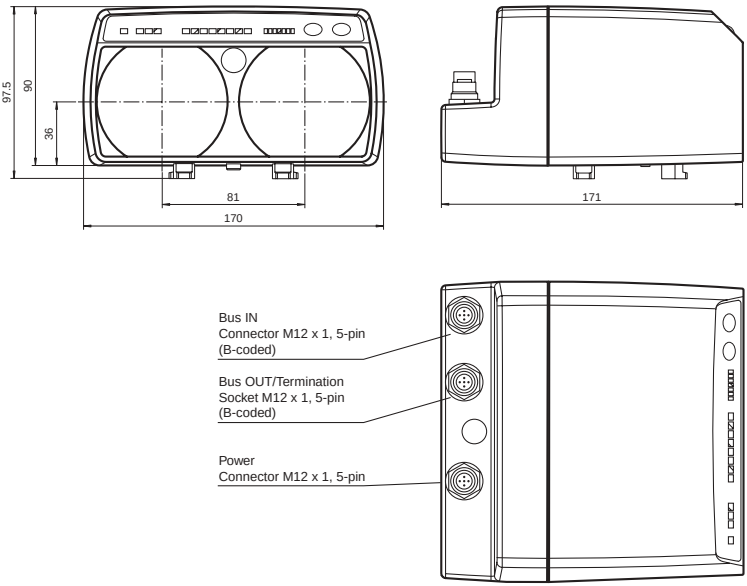

Figure 10.1 Device dimensions

11 Accessories

Item	Description	Item number	Remarks
1	OMH-LS610-01	133698	Adjustment unit
2	ICZ-TR-V15B	127860	PROFIBUS terminator
3	V15-SB-G	128586	Cable connector, M12, B-coding, 5-pin for bus cable
4	V15B-G	128585	Cable socket, M12, B-coding, 5-pin for bus cable
5	Grounding set	181313	Functional grounding
6	M12 protective cap set (plug + socket)	181312	M12 connection
7	OMH-LS610-02	182940	Direct mounting set (4 Dodge inserts M4)
8	V15-G	099774	Cable socket for power supply

Illustrations of accessories on the following page

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Illustrations of accessories (not to scale)

Item 1
OMH-LS610-01

Item 2
ICZ-TR-V15B

Item 3
V15-SB-G

Item 4
V15B-G

Item 5
Grounding set

Item 6
M12 protective cap set

Item 7
OMH-LS610-02

Item 8
V15-G

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12 Notes

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13 Drilling jigs

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Optical data coupler LS610-DA
Drilling jigs

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With regard to the supply of products, the current issue of the following document is applicable:
The General Terms of Delivery for Products and Services of the Electrical Industry, as published by the Central Association of the 'Elektrotechnik und Elektroindustrie (ZVEI) e.V.',
including the supplementary clause "Extended reservation of title"

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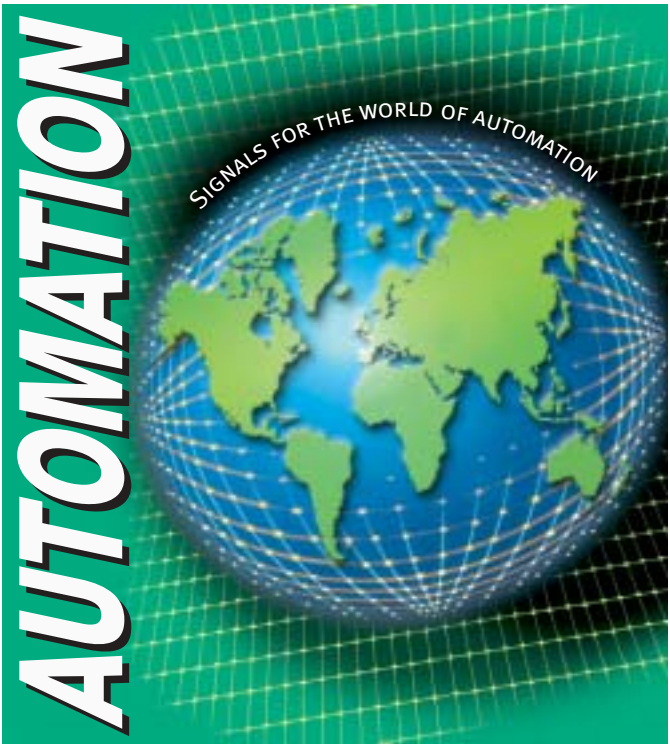

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