

MANUAL

Optical data coupler

LS611-DA-P

LS611-DA-P/35





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, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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General information



This symbol warns the user against a potential device failure. The non-observation of these warning notes may lead to the complete failure of the device or any other device connected.



This symbol draws the user's attention to the important instructions.

Declaration of conformity

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

Optical Data Coupler LS611

and all models of this product, which are included in this declaration, are in conformity with the following standards and other controlling documents

DIN EN 61326-6-2, issue:1998-01, 1998-05

Product family standard: Electromagnetic compatibility (EMC for control systems, industry)



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

Pepperl+Fuchs GmbH of D-68301 Mannheim operates a certified quality assurance system in accordance with ISO 9001.





1 Quick Reference

1.1 Tools required

- 7 mm key to fit the M4 nuts of the adjustment device.
- Allen key, size 5 for M6 screws (central attachment, X and Y adjustment)

1.2 Mounting

Attach the wall angle and place the adjustment device in the requested direction. Tighten the M4 nuts. Do not tighten the M6 screw.



*With the locking lever pressed together, place the LS611 and release the lever.
This action can also be carried out when the cables have already been attached.*

1.3 Adjustment

Make both devices alive. Bus operation is not required!

Using X and Y adjustment for a moderate distance (< 20 m):

- Find contact
--> Fast flashing of the opposite sides stops and switches to slow flashing
- Find maximum
--> Sets the bar graph display of the opposite side to maximum

Check the adjustment at maximum distance, and correct, if and when required.

The adjusted position is secured by tightening the central M6 screw.

For detailed instructions on adjustment, please refer to chapter 6.2.

1.4 Bus connections

We recommend the attachment of the screen to the screw connection of the M12 connector. If this is ensured, Pin5 need not be connected. The pin assignment is printed on the device. The M12 socket "Bus OUT/Termination" can be used to terminate the bus cable by means of a PROFIBUS terminator (cf. chapter 13 Accessories).

1.5 Setting the baud rate

Press the button for longer than a second in order to enter the baud rate adjustment mode. If the LED of the selected baud rate is flashing, it can be changed by pressing shortly.

(for detailed instructions, please refer to chapter 7.1 Adjusting the bus parameters).

2 Validity of this instruction manual

Pepperl+Fuchs VISOLUX supplies the LS611 for two different detection ranges.

Designation	Operating range [m]
LS611-DA-P	150
LS611-DA-P/35	300

Table 2.1 Device types

Two identical LS611 devices are required for a data transmission path.

3 Scope of delivery

Check the delivery for completeness after opening the packaging.

- Optical Data Coupler LS611
- Instruction manual
- Grounding set (grounding clip and nut)



4 Principles of operation

The LS611 is a device used for serial data transmission of the PROFIBUS. The data transmission speed varies between 93.75 kbit/s and 1.5 MBit/s.

The data are transmitted in both directions by means of modulated infrared light.

4.1 PROFIBUS data transmission

All types of PROFIBUS protocols are supported:

- PROFIBUS DP: DP-V0, DP-V1 and DP-V2 (Decentral periphery)
- PROFIBUS FMS (Fieldbus Message Specification)
- Mixed operation FMS-DP
- MPI (Multi Point Interface)
- Profisafe

In order to prevent a disturbance of the connected bus operation in case of a potential interruption of the light beam, the "Telegram Verification Technology" (TVT) has been implemented. TVT prevents the transmission of invalid telegrams. The signals are regenerated according to bits and characters and are sent to the bus by a crystal-controlled process. This method ensures perfect signal conditioning. The signal quality is electrical and temporally identical with the original PROFIBUS station.

A switch-on "C1CP" function is used to prevent a collision with the master of the control system in case of "multi-master operation".

For more information, please refer to chapter 8 "Special instructions when using several masters".

5 Safety Instructions

The LS611 is LED operates and corresponds to the laser protection class 1 in accordance with EN 60825.



Do not look into the beam from a short distance! The operating voltage has to be provided by power supply units with safe electric isolation in accordance with EN 60742 (IEC60742). Interventions in the device are not intended and not permissible. Damaged devices shall have to be removed immediately. The connection of the devices as well as any servicing work on them, in particular in live condition, may be carried out by qualified experts only.

If the LS611 is used as intended, the device is not cause any hazards for apparatuses and operating staff.

6 Initial operation

6.1 Mounting

If existing adjustment and mounting facilities are to be used, M4 inserts can be pressed into the housing foot fixtures; to be ordered as an accessory (page 27) Pos. 7.

The accessory OMH/LS610-01, a mounting aid for attachment to walls, permits a fast installation and adjustment.

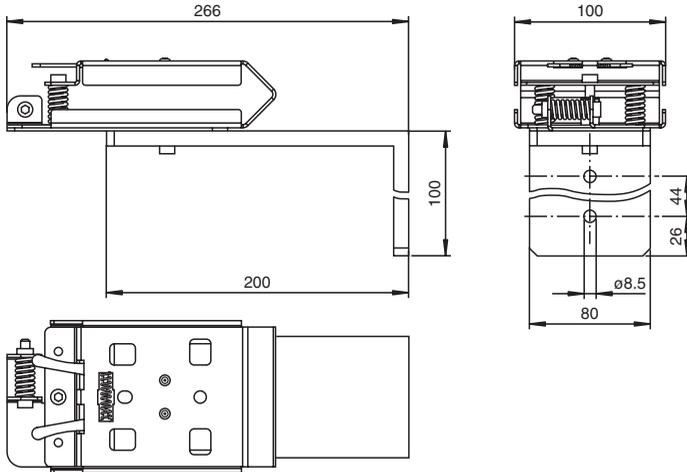


Illustration 6.1 Mounting aid OMH-LS610-01 for wall attachment

The mounting aid (OMH-LS610-01) consists of a holding angle and a pre-mounted adjustment device (X and Y direction). The mounting aid can be used to set the requested direction of beam ($\pm 90^\circ$ rotation); the two M4 screws and the central M6 screws can be used for the attachment to the holding angle. The central screw is used for attachment after the adjustment, which should be tightened only after the adjustment has been completed.

The optical data coupler's feed are placed into the recesses of the adjustment device by pressing the two bars on the front together. The feet have to lock into place in such a way that the bars can be pressed to the outside up to the stop; if necessary the optical data coupler has to be pressed down applying some force from the top to the center. (cf. illustration 6.2)



Illustration 6.2 Mounting the optical data coupler LS611 with the adjusting device

6.2 Adjustment

6.2.1 Alignment aid / stability control

A clearly visible alignment LED (alignment aid) has been fitted to the adjustment device. As soon as a receiver recognizes the emitter's light of the opposite device, the flashing frequency of the alignment aid is reduced. By going off in the end, the alignment LED indicates that the devices are optimally aligned, and that sufficient stability has been ensured. For fine adjustment, the optical data coupler has been provided with an additional bar graph display which permits optimal alignment.

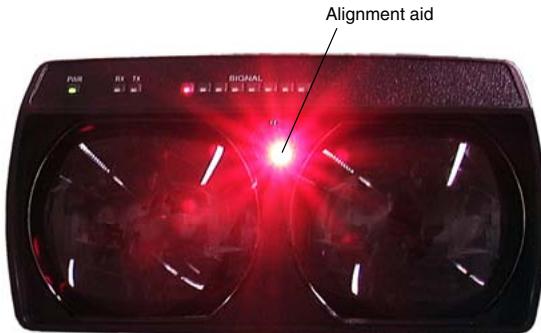


Illustration 6.3 Alignment aid

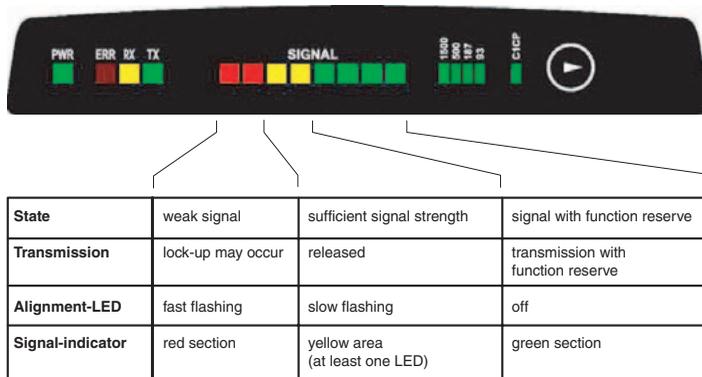


Illustration 6.4 Relationship between display and operating condition

If "Stability" (green section) is displayed, the optical data coupler is operating at a receiving strength sufficient to ensure operation. Within the effective operating distance, the LS611 has to operate in the green section (at least one green LED). If the receiving strength falls below this threshold value, the alarm output is switched off. If the received strength falls below the limiting value required for operation (no yellow LED), messages are no longer safely transferred. An unsafe transfer in the red range is also possible.

A very fast evaluation of the signal level is carried out internally for each individual message and does not run precisely in synchronization with the bar graph display.

6.2.2 Using the adjustment device for alignment

By means of the alignment aid of the opposite optical data coupler and the two adjustment screws (5 mm Allen key) of the adjustment device, the beam axle is aligned in X and Y direction.



The transmitting angle is smaller than the receiving angle, which means that the bar graph as well as the alignment LED is decisive only for the alignment of the opposite side. It is only if the two optical data couplers have been set to the same baud rate, that the bar graph renders the correct signal strength.

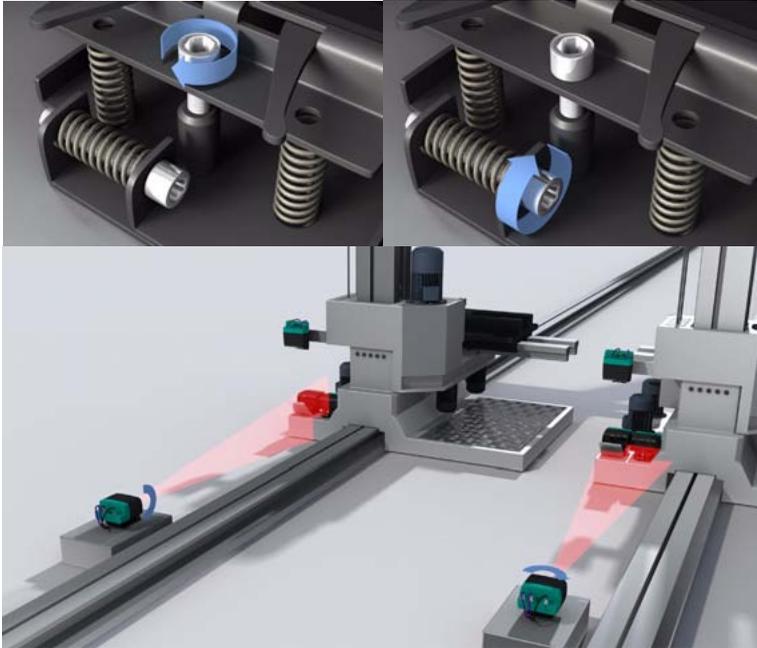


Illustration 6.5 Adjustment of the optical data coupler

Bus operation is not required for alignment.

- Screw the central M6 screw into the lower side of the adjustment device, but do not tighten yet. (Tightening prevents horizontal movement).
- Roughly align the optical data coupler at a distance of approx. 3 m to 5 m until both signal displays are in green section. In the process, please make sure that the optical data couplers are equally high and not displaced.
- At approx. 20 m, turn the adjustment screw for the Y direction until the alignment LED (cf. illustration 6.3) on the opposite side starts flashing slowly. Subsequently turn into the opposite direction, and count the revolutions in the process (during which the alignment LED remains off) until the alignment LED starts flashing again. Then turn the adjustment screw back by half a turn (the center). Carry out the same procedure for the X direction.
- Increase the distance to the maximum distance; readjust, if and when necessary.
- Tighten the central M6 screw in order to secure the adjustment in horizontal direction.

6.3 Parallel optical paths

If several optical paths are fitted next to each other without optical separation, the spacing between the optical axes has to be observed to reduce crosstalk.

The arrangement in keeping with illustration 6.6 has to have an axis spacing of half the maximum size of the emitter spot, which for this reason depends on the distance.

For the arrangement rendered in illustration 6.6 the minimum distance a has to be determined as follows:

$$a = 1 \text{ m} + d \cdot 0.018$$

All units in meter [m]

e.g. $d = 100 \text{ m} \rightarrow a = 2.8 \text{ m}$

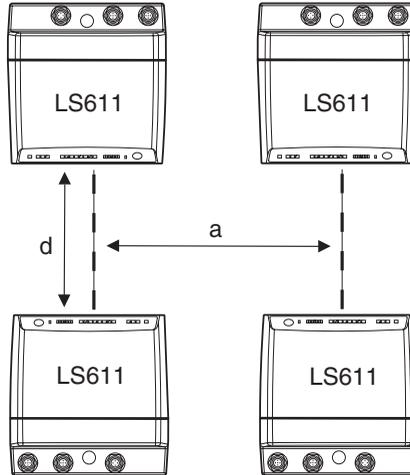


Illustration 6.6 Parallel arrangement

This calculation applies in case of ideal alignment of the device, i.e. the bar graph display of the optical data couplers are extended as far as possible (in case of maximum travel). In such an arrangement, a one-sided shutdown of an optical data coupler is not permissible. Moreover, the light beam must not be interrupted either.

6.4 Parallel arrangement of distance measurement devices EDM/VDM100

For the frequently found combination of optical data coupler and range finder of EDM / VDM100 type, it has to be made sure that the laser beam of the EDM / VDM100 does not illuminate the optical data coupler lens during operation. Potential failures are caused by the reflection of the reflector in case of medium distance (10 m to 50 m).

The EDM / VDM100 is not disturbed by the optical beam of the optical data coupler.

The alignment of the optical data coupler on the EDM / VDM100 side may be significantly disturbed by the reflector. For this reason, the optical data coupler has to be covered during the adjustment process.

The spacing between the optical axes should not be any smaller than 1 m.

When the optical data coupler on the reflector side is switched off, bus failure may be caused by the live optical data coupler.

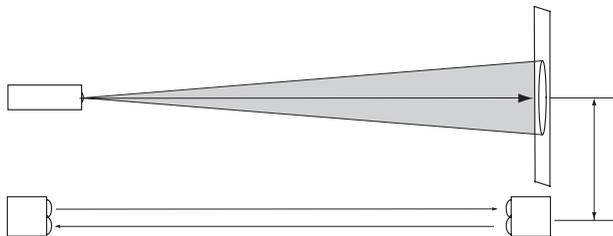


Illustration 6.7 Parallel operation of EDM / VDM100 range finders and optical data coupler LS611

6.5 Electrical installation

In order to ensure IP65 type of protection, the unused M12 connectors have to be provided with protective caps. The protective caps can be ordered as accessories. (cf. chapter 13)

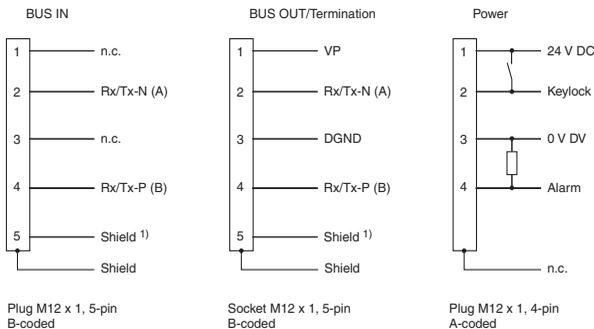
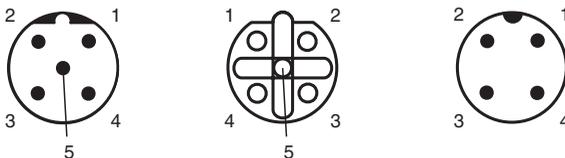


Illustration 6.8 Electrical connection

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6.5.1 Power supply

The device is in conformity with protection class III. Please observe that the power supply has to be ensured by power packs, which supply protective low voltage (PELV). The grounding of the cable screens on the metal plug-in connectors is not protective grounding in the sense of personal protection, but rather a protection of function. The power supply of the LS611 is 18 V DC to 30 V DC.

6.5.2 Installation guidelines

We recommend to observe the guidelines rendered in the "Handbook PROFIBUS Installation Guideline". It can be downloaded at www.PROFIBUS.com.

6.5.3 Customization of the bus plug connector

In case of non-customised plug-in connections, the screen plug-in connectors, such as the V15B-G (chapter 13) accessory parts, should be used.

In the process, please observe the following working steps:

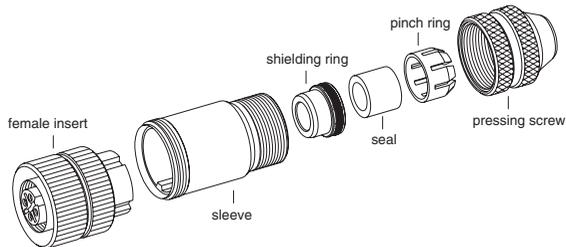


Illustration 6.9 Bus connector assembly

1. First, push all housing parts with the exception of the insert and the coupling socket on to the bus cable. Please observe the sequence: pressure screw; clamping block; seal; shield ring.
2. Stripping the cable and peeling off the cores: (illustration 6.10)

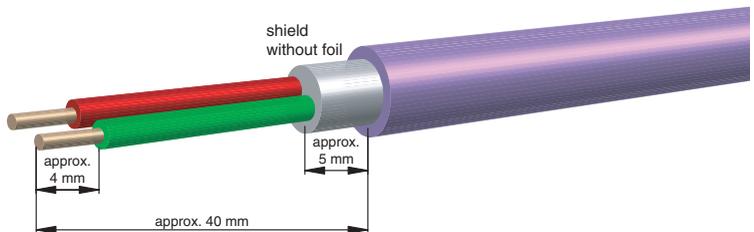


Illustration 6.10 Cut the cable to length

- After fitting the coupling socket, use a screwdriver to close the two screw terminals. Please observe the torque when tightening.

Pin	Connection	Old standard designation
2	A, green	RxD / TxD-N
4	B, red	RxD / TxD-N
5	Connection not recommended.	
Screen/housing	Screen	

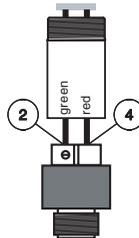


Illustration 6.11 Assembly of connector and cable

Do not contact the middle Pin5 (if present).

- Screw the socket to the respective insert (socket/connector).

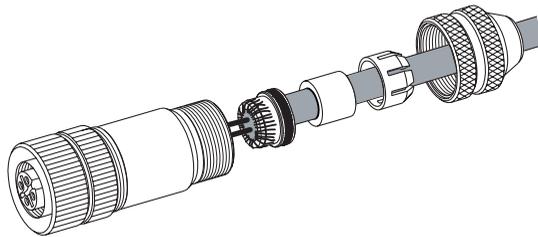


Illustration 6.12 Mounting socket/connector and cable

- Flush mount the shield ring to the sheath end, and lay the braiding over the narrow part of the shield ring. Now push the shield ring together with the cable and seal into the socket until the sealing ring of the shield ring touches the socket. If wires of the shield prevent the unit being pushed in, they have to be shortened correspondingly.
- Close up the plug-in connector by screwing the pressure screw to the socket.

6.5.4 Grounding / shielding

In order to retain the interference immunity, functional grounding of the cable shields is required.



This type of grounding is no protective grounding. It is used only to discharge cable faults, and does not have to meet any safety guidelines (e.g. personal protection) whatsoever.

For shield grounding, the plug-in stud (contained in the scope of supply) has to be screwed to one of the bus connectors used. Use the nut also enclosed for attachment. By no means open the primary attachment nut of the plug-in connector. The connecting assembly may be damaged and the housing may become leaky. The plug-in stud should be contacted to a low-impedance connection of the surrounding metal parts (such as mounting socket, frame).



Illustration 6.13 Optical data coupler with grounding set mounted

6.5.5 Bus terminal

If the optical data coupler is located at the end of a bus line, the bus termination is provided by the connection to an external standardized terminal (cf. chapter 13) of the M12 socket "Bus OUT /Termination".

As the case may be, **all** bus lines have to be terminated. (cf. illustration 6.16).

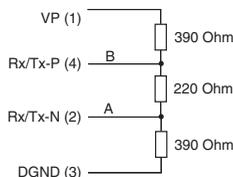


Illustration 6.14 Internal switch circuit of the terminal

As the internal bus connections are switched parallel, the inputs and outputs for the bus cable are identical for the bus cable.

6.6 Topology

A pair of optical data couplers acts as a repeater; the maximum bus cable lengths refer to the respective segments only. In case of illustration 6.16 the maximum length can be laid between the terminating resistors, and the maximum number of stations can be connected to all lines.

Baud rate [kBit/s]	Maximum segment length [m]
93.75	1200
187.5	1200
500	400
1500	200

Table 6.15 Topology

Like in repeaters, star or tree topologies may be set up through light paths.

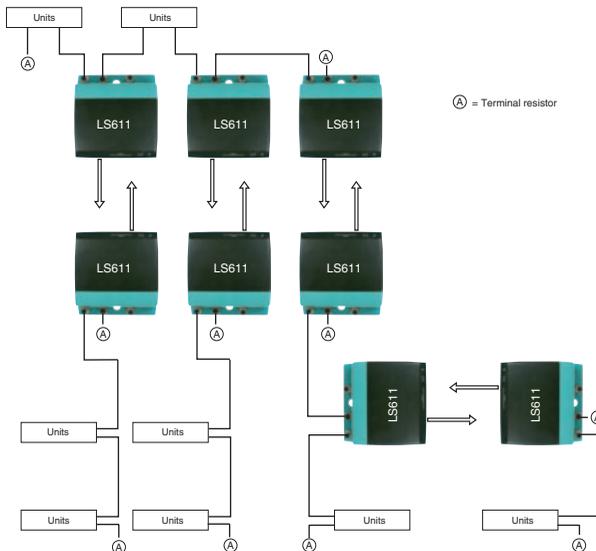


Illustration 6.16 Topology

7 Function displays

When the bus is active, a yellow LED "RX" lights up to indicate data reception from the light path, and a green LED "TX" is lit to indicate data transmission to the light path.



Illustration 7.1 Function displays

7.1 Adjustment of the bus parameters



Illustration 7.2 Control panel

In order to prevent any manipulation or inadvertent changes of the parameters, the key can be blocked by means of an electric signal. An attempt to change the parameters in this condition will be acknowledged by simultaneous flashing of all mode LEDs. The lock is activated by applying a high voltage level to the "KEY LOCK" pin.

The push-button key  can be used to set the baud rate or to switch on or off the C1CP function (cf. chapter 7.1.2).

7.1.1 Setting the baud rate

Press the button for longer than a second in order to enter the baud rate adjustment mode. The LED of the position to be changed flashes. By pressing the key shortly, the position can be moved forward. When the requested baud rate starts flashing, a short wait will cause the return to the normal operating mode. The requested baud rate is displayed permanently, and is thus set. The setting process is thus completed.

If a PROFIBUS master (active station) is located on the opposite side, the wrong baud rate setting will be indicated as an error by the error LED. If the baud rate of the opposite side is wrong, and a master is located exclusively on the side of the indicator viewed, no error will be displayed as all telegrams are already suppressed by the bus of the opposite side.

7.1.2 Switching C1CP on or off

Press the button for longer than a second in order to enter the baud rate adjustment mode. The C1CP function can be switched on or off here. The LED of the position to be changed flashes. By brief actuation of the key, the position can be moved forward until the "C1CP" LED starts flashing. After a short wait without key actuation, the normal operating mode will be activated again. The "C1CP" function has now been activated or deactivated, and will be displayed permanently. The setting process is thus completed.



During the setting mode, no changes are carried out. The device continues to operate with the previous baud rate without interruption. As the C1CP function has an effect only when the light beam is interrupted, switching on or off has not influence on the normal operation.

7.2 Notes on the adjustment of the PROFIBUS operating parameters

Optical data couplers are to be considered a cable extensions.

For this reason, no changes have to be made to the PROFIBUS parameters, if all stations connected to the bus correspond to the PROFIBUS DP standard.

PROFIBUS FMS devices are not subject to the performance characteristics (such as response time) of the PROFIBUS DP standard.

The time parameters here may be observed as follows:

An optical data coupler LS611 delays the signal by 15 bit times and 1 μ s (table 7.3, "Time parameter of the optical data coupler LS611," on page 20).

In case of PROFIBUS stations which are known to be slow (such as software based test computers), the slot time "TSLOT" should be increase by the value of the delta slot.

Baud rate	Absolute delay		DeltaSlot
[kBit/s]	[bit]	[μ s]	[bit]
1,500	17	11.1	34
500	16	31	32
187.5	15	80.8	31
93.75	15	161	31

Table 7.3 Time parameter of the optical data coupler LS611

8 Special notes on the use of several masters

When using the PROFIBUS protocol, the time sequence of the bus traffic is determined by the "active" bus station or by a master. In general, the PROFIBUS DP has been designed as a mono master system, which means that there is only one master in the bus segment, which as a rule is used as an interface to the control system (or PLC). This master is referred to as Class1-Master. All other stations are passive, and are referred to as slaves.

In some applications, however, several active stations are used, which frequently may be the case in operating elements ("touch panels"), for example. However, due to their communication relationship to the PLC these devices also have to have the properties of an active station. As no fast (cyclical) connections are operated with slaves, and the Class1-Master only is used for communication as a rule, it is not always realized that such a station also has the functional range of a master. In this case, a so-called "Class2-Master" (acyclical connection) is used.

The existence of the Class2-Master within a certain topology is significant for the analysis of sequence errors after the interruption of the light beam.

If two optical data couplers wired after each other (for the additional transmission in Y direction, for example), (cf. illustration 8.1), and if the Class2-Master is located behind the

second optical data coupler, the slot time parameter of the Class2-Master should be increased by 100 bit.

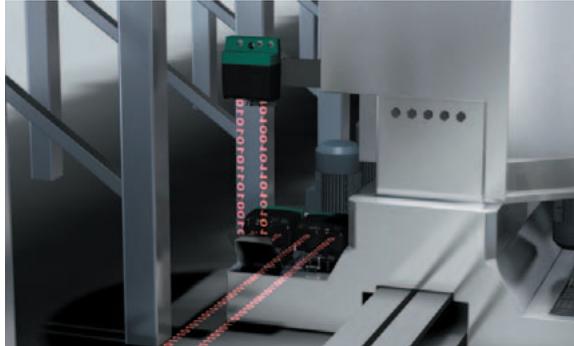


Illustration 8.1 Two optical data couplers

8.1 Problem after light beam interruption in multi-master systems

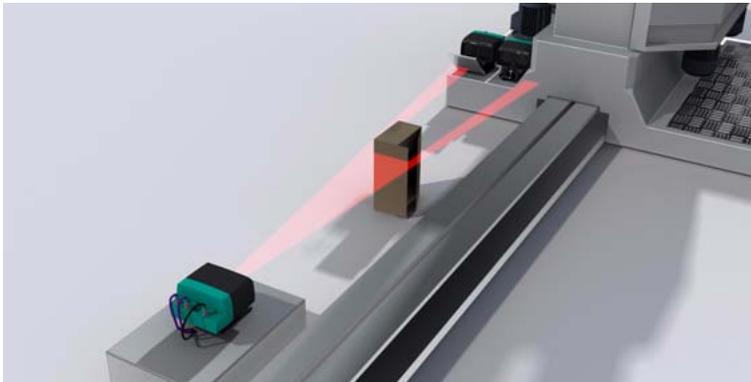


Illustration 8.2 Light beam interruption in multi-master systems

After the light beam has been interrupted, a data collision may occur in multi-master systems, during the master of the control system retires for a short period of time. Depending on the length of this condition, the entire bus does not operate correctly, which also affects aisles (bus segments which operate downstream from an optical data coupler) where the light beams have not been interrupted. This behavior is caused exclusively by the Class2-Master of the opposite side. Light paths with exclusively passive stations on the opposite side do not demonstrate such a behavior.

The bus segment which is directly connected up to the Class1-Master, is referred to as being "stationary" here; bus segments which are located on the opposite side, "behind" the optical data coupler, are referred to as "mobile" segments. At the same time the stationary side is to be the segment, from which several segments branch off to optical data couplers (cf. illustration 8.3).

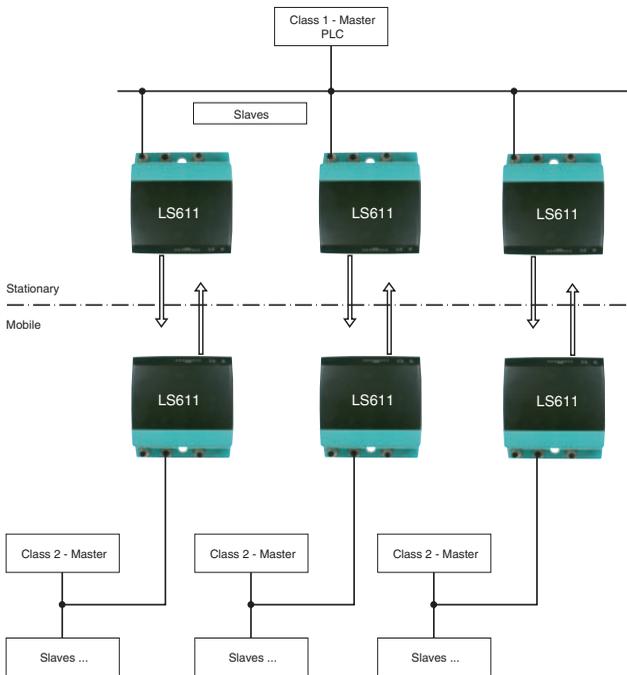


Illustration 8.3 Light beam interruption in multi-master systems

8.2 Collision prevention

If it is not possible to arrange the topology of the field bus structure in such a way that all masters are located in one segment (no optical data coupler in-between), LS611 provides the possibility to switch one function on on the stationary side of the optical data coupler pair, which prevents the collision caused by the Class2-Master in the star segment.

This function is referred to as "C1CP", meaning Class1-Master Collision Protection.



Some hand-held terminals or touch panels provide the option to have this PROFIBUS station communicate with the Class1-Master as a passive station or slave. But, this does not solve the problem by any means. This communication relationship is used exclusively to ensure a faster cyclical access. The stations behave like masters in this configuration as well.

8.3 Using C1CP

The function "C1CP" = Class1-Master Collision Protection can be added by keeping the key pressed like in the baud rate selection (cf. chapter 7.1). If the LED is lit for C1CP, the function is active.

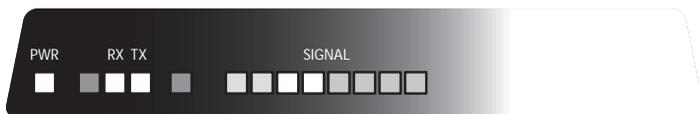
In order to employ this protection effectively, it is recommended to set the addresses of the Class2-Masters as high as possible, i.e. approx. > 80. At the same time, the highest address "HSA" = Highest Station Address to be parameterized is set higher from the out-set or at least equally high as the highest real address used. In case of longer aisles, the perfect alignment is especially important. In case of longer distances, at least one green LED of the bar graph indicator should be lit.

9 Maintenance

LS611 does not require any servicing. When dust/dirty (alarm, stability control), use a moist cloth to wipe the plastic lenses and use a neutral detergent, if and when required. Do not use any detergents containing alcohol or solvents.

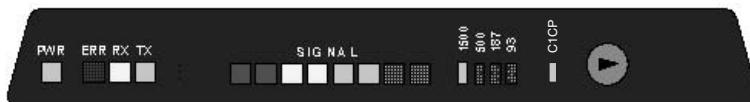
10 Trouble shooting

10.1 General problems



Error No.	Error type	Indicators			Error reasons	Measures
		Signal	RX TX	PWR		
1	No display	off	off	off	No operating voltage	
2	No communication	Off or red	off	on	Low reception level, transfer blocked	Alignment of the opposite optical data coupler (cf. chapter 6.2.2)
3	Bar graph is not extended completely despite correct alignment	x		on	No error; Individual scale deviation in the high-level range	No
4	Weak RX and/or TX display	Normal		on	No error; Intensity depends on bus load and baud rate	No
5	Signal display with the opposite side switched off	Yellow		on	LS611 is directed precisely on the reflector or on the opposite station of LS611	No, if bus operation is not disturbed Otherwise: Increase axle spacing to reflector; lower reflector of LS611, if and when required

10.2 PROFIBUS



Error No.	Error type	Indicators			Error reasons	Measures
		Err	RX	TX		
6	No communication	off	on	off	No response from connected bus stations	Analyze interruption of the PROFIBUS connected
7	No communication	off	off	on	No response from the opposite side	Analyze the interruption on the PROFIBUS of the opposite side, if error 6 is indicated for the opposite side
8	Reception of faulty telegrams (a)	on	on	x	Wrong baud rate set on LS611 station	Correct baud rate
9	Reception of faulty telegrams (b)	on	on	x	Faulty terminal of the opposite side	Check and set terminal
10	Reception of faulty telegrams (c)	on	on	x	Bus interference on the opposite side	Remedy source of interference
11	Key actuation refused	All baud LEDs are flashing			Keylock is active	Remove the keylock (M12 connector power, pin 2)

11 Technical data

General data		
Effective operating distance	0 ... 150 m	Option /35: 0 ... 300 m
Detection range limit	200 m	Option /35: 350 m
Type of light	Infrared, wave length = 870 nm, alternating light	
Diameter of the light spot	2 m at a distance of 100 m	
Angle of divergence	1,1 ° (full angle)	
Extraneous light limit	10,000 Lux	
Display/operating components		
Alignment aid	Frontal red LED flashing	
Data flow display	Transmit: "TX"; Reception: "RX"; Telegram error: "ERR"	
Function display	Bar graph for signal intensity (8 LED: red, yellow, green), operating voltage	
Operating components	1 key	
Electrical data		
Operating voltage	18 ... 30 VDC	
No load current	300 mA	
Data rate	93,75/187,5/500/1,500 kBit/s adjustable	
Signal time	15 bit times + 1 µs	
Interface		
Type of interface	PROFIBUS, galvanically isolated	
Input		
Keylock	Locked with ON	
Output		
Pre-fault output	1 pnp (is switched on in case of sufficient stability control) short-circuit-proof, max. 200 mA	
Standards		
Standard conformity	EN 61321 (EMC for controls and instrumentation, industry)	
Ambient conditions		
Ambient temperature	-10 ... 50 °Celsius (263 ... 323 K)	
Storage temperature	-20 ... 70 °Celsius (253 ... 348 K)	
Mechanical data		
Protection type	IP65	
Connection	M12 x 1 4-pole connector A coded (supply), M12 x 1 5-pole connector. B coded (bus IN) M12 x 1 5-pole socket. B coded (bus OUT/termination)	
Material		
Housing	ABS/PC	
Light exit	Plastic lenses	
Weight	690 g	

12 Dimensions

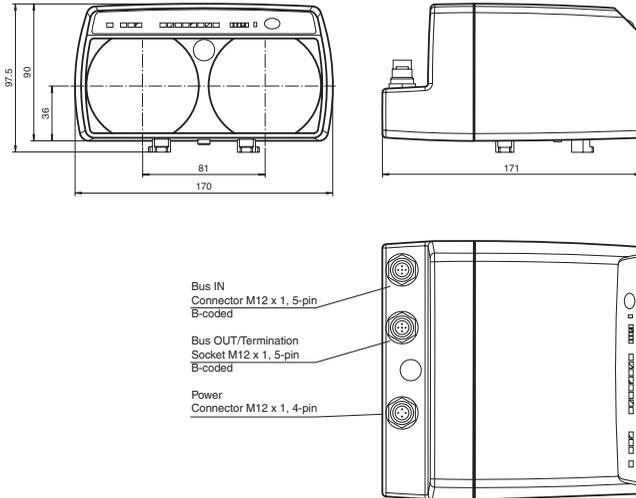


Illustration 12.1 Device dimensions

13 Accessories

Pos.	Designation	Article number	Notes
1	OMH-LS610-01	133698	Adjustment unit
2	OMH-LS610-03	185993	Quick clamp and adjustment system with deviation mirror
3	ICZ-TR-V15B	127860	PROFIBUS terminal
4	V15SB-G	128586	Cable connector, M12, B coded, 5-pole for bus cable
5	V15B-G	128585	Cable socket, M12, B coded, 5-pole for bus cable
6	Funktionserdung LS610 Zubehoer	181313	Grounding set
7	Schutzkappe LS610 Zubehoer (connector + socket)	181312	M12 closure
8	V15-G		Cable socket
9	OMH-LS610-02	182940	Direct installation set (4 Dodge inserts M4)

Abbreviations of the accessories overleaf (not to scale)



Pos. 1
OMH-LS610-01



Pos. 1
OMH-LS610-03



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Pos. 2
ICZ-TR-V15B



Pos. 3
V15SB-G



Pos. 4
V15B-G



Pos. 5
Erdungsset



Pos. 6
M12-Schutzkappen-Set



Pos. 7
V15-G



Pos. 8
OMH-LS610-02





14 Notes



Part No. 194341

07/02/2007

Date of issue

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, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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