

MANUAL

LS684* Optical Data Coupler



EtherCAT

ETHERNET
POWERLINK

EtherNet/IP

PROFINET

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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1 Introduction

1.1 Content of this Document

This document contains information required to use the product in the relevant phases of the product life cycle. This may include information on the following:

- Product identification
- Delivery, transport, and storage
- Mounting and installation
- Commissioning and operation
- Maintenance and repair
- Troubleshooting
- Dismounting
- Disposal



Note!

For full information on the product, refer to the further documentation on the Internet at www.pepperl-fuchs.com.

The documentation comprises the following parts:

- This document
- Datasheet

In addition, the documentation may comprise the following parts, if applicable:

- EU-type examination certificate
- EU declaration of conformity
- Attestation of conformity
- Certificates
- Control drawings
- Instruction manual
- Other documents

1.2 Manufacturer

Pepperl+Fuchs GmbH Lilienthalstraße 200, 68307 Mannheim, Germany
Internet: www.pepperl-fuchs.com

1.3 Target Group, Personnel

Responsibility for planning, assembly, commissioning, operation, maintenance, and dismounting lies with the plant operator.

Only appropriately trained and qualified personnel may carry out mounting, installation, commissioning, operation, maintenance, and dismounting of the product. The personnel must have read and understood the instruction manual and the further documentation.

Prior to using the product make yourself familiar with it. Read the document carefully.

1.4 Symbols Used

This document contains symbols for the identification of warning messages and of informative messages.

Warning Messages

You will find warning messages, whenever dangers may arise from your actions. It is mandatory that you observe these warning messages for your personal safety and in order to avoid property damage.

Depending on the risk level, the warning messages are displayed in descending order as follows:



Danger!

This symbol indicates an imminent danger.

Non-observance will result in personal injury or death.



Warning!

This symbol indicates a possible fault or danger.

Non-observance may cause personal injury or serious property damage.



Caution!

This symbol indicates a possible fault.

Non-observance could interrupt the device and any connected systems and plants, or result in their complete failure.

Informative Symbols



Note!

This symbol brings important information to your attention.



Action

This symbol indicates a paragraph with instructions. You are prompted to perform an action or a sequence of actions.

2 Safety

2.1 Intended Use

The optical data coupler serves as an optical link between two Ethernet devices; ideally, one of these devices is mobile.

Always operate the device as described in these instructions to ensure that the device and connected systems function correctly. The protection of operating personnel and plant is only guaranteed if the device is operated in accordance with its intended use.

Only use recommended original accessories.

The operating company bears responsibility for observing locally applicable safety regulations.

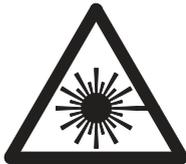
Installation and commissioning of all devices may only be performed by trained and qualified personnel.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.

2.2 General Safety Information

Class 1M laser product

This device is a class 1M laser product:



Standards

IEC 60825-1:2007 certified. Complies with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007.

Certifié cei 60825-1:2007. Conforme aux normes 21 CFR 1040.10 ET 1040.11 à l'exception des écarts conformément à la notice du laser N° 50, Datée du 24 JUIN 2007.

LS68*-DA-F2



Warning!

Danger due to visible class 1M laser light

If the laser light is pointed at people, especially in the dark, this can lead to irritation and result in the risk of an accident due to glare.

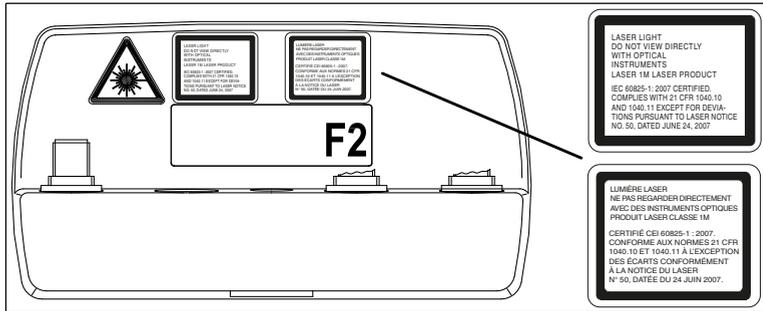
If the laser light is viewed through optical instruments (magnifying glasses, microscopes, telescopes, or binoculars, etc.), it may damage the observer's eyes due to a burning lens effect.

Install the device so that the warnings are clearly visible and legible.

Do not point the laser light at people.

Do not look at the laser light using optical instruments.

The maintenance and repair of a class 1M laser must be performed by authorized service personnel only.



LS68*-DA-F1



Warning!

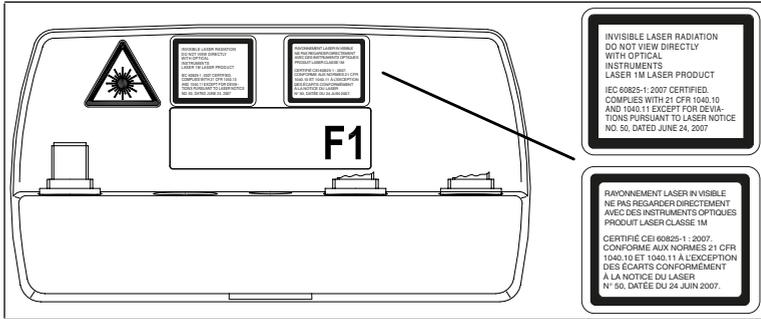
Danger due to invisible class 1M laser beam

If the laser light is viewed through optical instruments (magnifying glasses, microscopes, telescopes, or binoculars, etc.), it may damage the observer's eyes due to a burning lens effect.

Install the device so that the warnings are clearly visible and legible.

Do not look at the laser light using optical instruments.

The maintenance and repair of a class 1M laser must be performed by authorized service personnel only.



Caution!

Danger due to inadequate operating or adjustment equipment

Use of operating or adjusting equipment other than that specified here or operating and adjusting procedures other than those described in this document may result in harmful laser beam exposure.

Only use operating and adjustment equipment that is recommended for the device described here. Follow the procedures described for this device concerning operation and adjustment.

Only use recommended original accessories.

The operating company bears responsibility for observing locally applicable safety regulations.

User modification and or repair are dangerous and will void the warranty and exclude the manufacturer from any liability. If serious faults occur, stop using the device. Secure the device against inadvertent operation. In the event of repairs, return the device to your local Pepperl+Fuchs representative or sales office.

3 Product Description

3.1 Intended Use

The optical data coupler serves as an optical link between two Ethernet devices; ideally, one of these devices is mobile. The opening angle is optimized for operations in high-rack storage.

Devices in industrial Ethernet networks (e.g., with PROFINET, EtherNet/IP, and other Ethernet protocol designs) can be connected to the optical data coupler.

The physical transfer takes place with 100 MBit/s full duplex. The connection to multiple devices requires network switches that have been certified for use with the bus system in question. All layer 2 telegrams (IEEE 802.3 Clause 25) are physically transported. Since no telegrams are saved, the transfer takes place without any delay.

Devices with a transfer rate of 10 MBit/s can be connected via a network switch.

The optical data coupler uses a semiconductor laser as an optical emitter. The dilation of the light beam and the use of return map blocks guarantee that the devices are harmless in accordance with laser class 1M. The emitted beam must not be viewed with telescopes or binoculars from distances of less than 20 m. At greater distances, the limit values for laser class 1M are not exceeded, even when viewed through a telescope with a 50 mm aperture.

Optical data transfer in real time

The optical data coupler offers robust optical data transfer in real time for industrial Ethernet systems such as PROFINET IRT and EtherCAT.

The automatic runtime compensation allows a consistent throughput time for synchronous, jitter-free switching operations and control processes at both ends of the transmission path. This takes place over any distance and with any driving dynamics.

The connection status is quickly recognized and transmitted across all segments of the data transfer. The optical data coupler therefore helps the network's redundancy mechanisms to immediately bridge faulty paths with unique localization and enables a high level of availability and clear diagnosis.

Compatibility with LS680, LS682

Due to technical changes for the runtime compensation and the signaling of the link status, mixed operation of LS684 with LS680 receivers or LS682 receivers is not possible.

If mixed operation is attempted, the bar graph display shows a reception level. However, Ethernet data cannot be exchanged.



Runtime compensation

Real-time Ethernet systems allow cycle times in the microsecond range. Process data is synchronized throughout the system on the basis of a distributed time signal. The transmission paths between the network devices are measured for this purpose.

The mechanisms used are intended for wired transfer. Variations in drift and temperature affect the throughput time of the networks. These changes lead to minor runtime differences over minutes or hours and are identified and compensated for.

For optical transmission paths with mobile devices, the throughput time varies depending on the distance between the stations. Typical driving dynamics of several meters per second and high acceleration result in short-term runtime changes. Industrial Ethernet systems provide no compensation mechanisms for these situations. There is a runtime difference of 0.5 μ s for each transmission direction if the receiver is at the beginning or end of a 150 m transmission path.

The optical data coupler compensates for distance changes in real time. The transfer time between the two sides of the optical connection remains constant, even at high acceleration. Packages with process data and time synchronization always reach the opposite side at the scheduled time. Fixed throughput times apply for a transmission path of the optical data coupler; see table.

These runtimes must be taken into account when planning the Ethernet system.

Throughput times of the LS684 optical data coupler

LS684 models	Effective operating distance (meters)	Throughput time (per direction, in μ s)	Jitter (in ns)
LS684-DA-EN/F1 LS684-DA-EN/F2	150 m	2.9 μ s	+/- 40 ns
LS684-DA-EN/F1/35 LS684-DA-EN/F2/35	300 m	3.4 μ s	+/- 40 ns

Table 3.1 Throughput time depending on the model type of the LS684 optical data coupler. The runtimes are calculated based on a 20 m connection cable. The length specifications relate to the sum of the connection cable length at both ends of a transmission path of the optical data coupler. If the length of the cable connections between the optical data coupler and the next device is more than 20 m, the additional cable length is to be added to the above-mentioned value in increments of 5 ns/m (0.005 μ s/m).

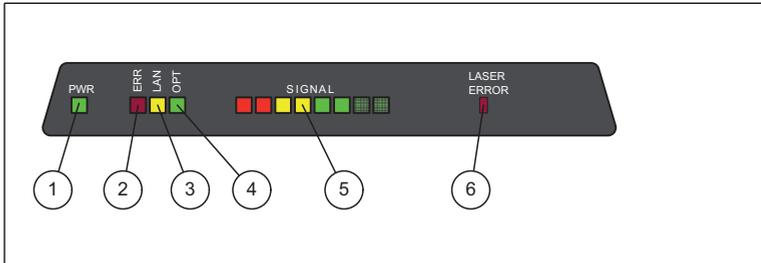
3.2

Model Varieties

The optical data coupler is available in different versions:

Item number	Model number	Description
309502	LS684-DA-EN/F1	Standard version, 150 m detection range, frequency 1
309505	LS684-DA-EN/F2	Standard version, 150 m detection range, frequency 2
309506	LS684-DA-EN/F1/35	Version with increased detection range of 300 m, frequency 1
309507	LS684-DA-EN/F2/35	Version with increased detection range of 300 m, frequency 2
309508	LS684-DA-EN/F1/146	Version for deep-freeze applications, 150 m detection range, frequency 1
309510	LS684-DA-EN/F2/146	Version for deep-freeze applications, 150 m detection range, frequency 2
309511	LS684-DA-EN/F1/35/146	Version with increased detection range of 300 m, for deep-freeze applications, frequency 1
309512	LS684-DA-EN/F2/35/146	Version with increased detection range of 300 m, for deep-freeze applications, frequency 2

3.3 Displays and Operating Elements



- 1 **PWR**
Lights up as soon as the optical data coupler receives operating voltage in the correct manner.
- 2 **ERR**
Status of the overall connection. Lights up in the event of errors (insufficient signal strength to establish the connection, e.g., misalignment, light beam obstructions, extraneous light in the optical channel). The LED does not light up during normal operation.
- 3 **LAN**
Status of the cable connection. The LAN LED (yellow) indicates a physical connection to the next device on the cable. If this LED is not on, this indicates a connection problem. The LAN LED lights up steadily when no data is being transported. Flashing of the LAN LED indicates the presence of data packets on the LAN.
- 4 **OPT**
Status of the optical connection. The OPT LED flashes when the optical connection is stabilized through correct alignment.
- 5 **SIGNAL**
The optical signal strength is displayed as an alignment aid during adjustment of the optical data couplers. Additional information see chapter 5.1.
- 6 **LASER ERROR**
If the permissible internal temperature is exceeded, this LED flashes. The transmission power is not reduced. If an internal activation error such as overcurrent is detected, the laser is switched off, and an attempt is then made every second to resume normal operation. Meanwhile, the laser-ERROR LED lights for 30 s to 60 s, even if the process was a one-off, e.g., as the result of an EMC event.

3.4 Signaling of the Connection Status

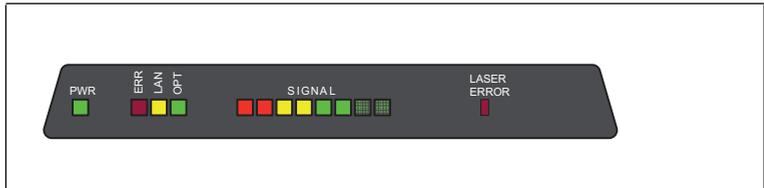
Real-time Ethernet systems monitor the distribution of process data and respond quickly to changes in the connection status. The faster and more clearly an interruption in the data traffic is detected, the faster and more targeted the diagnosis and remedial measures: unreachable segments can be bridged or supplied via redundant paths. The location of the fault can be detected immediately.

The optical data coupler continuously monitors the cable connection to the connected devices and the optical connection. The monitoring includes a unidirectional interruption of the optical transmission and the termination of the cable connection on the opposite side.

If the optical data coupler detects an interruption on one of the sections, this information is displayed immediately with the status "Link Down" on both sides of the LS684 path via the Ethernet cable. As soon as the interruption is resolved, the cable connection on both sides will be restored.

In addition to the usual display function, the optical data coupler signals the status of the network connections, see table.

LS684 LED status indicators for the status of the network connections



LINK status		ERR LED (red)	LAN LED (yellow)	OPT LED (green)
Connection established on both sides		Off	On	On
Activity	Cable reception		Flashing	
	Optical reception			Flashing
	Transmission error	On		
Connection interrupted		
... locally	Optical	On	Off	Off
... locally	Cable	On	Off	On
... opposite side	Optical or cable	Flashing	Off	On
Connection is established		On	Flashing	On

3.5 Interfaces and Connections

The following device connections are located on the device:

Power supply

A 4-pin M12 A-coded plug is located on the rear of the housing to connect the power supply and the alarm output.

Pinout for M12 plug, 4-pin, A-coded



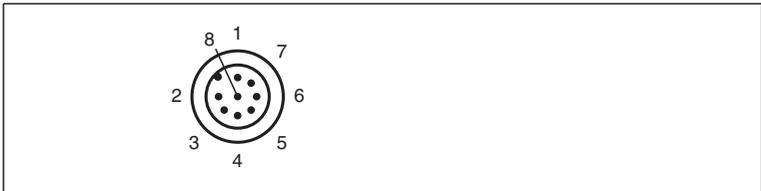
Figure 3.1 Connection layout for power supply and alarm output

- 1 24 V power supply
- 2 n.c.
- 3 Ground (GND)
- 4 Alarm

Service

There is an 8-pin M12 plug on the rear of the housing for servicing. This plug is for internal use at Pepperl+Fuchs.

Pinout for M12 plug, 8-pin



Network

A 4-pin M12 D-coded socket is located on the rear of the housing for connecting to the Ethernet network.

Pinout for M12 socket, 4-pin, D-coded



Figure 3.2 Connection layout for network socket

- 1 Transmit data (+)
- 2 Receive data (+)
- 3 Transmit data (-)
- 4 Receive data (-)

3.6 Scope of Delivery

- LS684
- Package insert

3.7 Accessories

3.7.1 Mounting Accessories

The following mounting accessories are available:

Designation	Description
OMH-LS610-01	Adjustment unit
OMH-LS610-02	Direct mounting set (4 M4 threaded inserts)
Protective cap LS610 accessories	Additional fastening for transport and storage. A protective cap has already been placed onto the service connector.
OMH-LS610-03	Deviation mirror

3.7.2 Connecting Cables

The following female single-ended cordsets are available for selection:

Designation	Description
V1-G-2M-PVC	Female single-ended cordset, straight, M12, 4-pin, PVC cable, length: 2 m
V1-G-2M-PUR	Female single-ended cordset, straight, M12, 4-pin, PUR cable, length: 2 m
V1-M-5M-PVC	Female single-ended cordset, straight, M12, 4-pin, PVC cable, length: 5 m
V1-M-5M-PUR	Female single-ended cordset, straight, M12, 4-pin, PUR cable, length: 5 m

Designation	Description
V1-G-PG9	Female single-ended cordset, straight, M12, 4-pin, field attachable
V1-W-PG9	Female single-ended cordset, angled, M12, 4-pin, field attachable
V1-W-2M-PVC	Female single-ended cordset, angled, M12, 4-pin, PVC cable, length: 2 m
V1-W-2M-PUR	Female single-ended cordset, angled, M12, 4-pin, PUR cable, length: 2 m
V1-W-5M-PVC	Female single-ended cordset, angled, M12, 4-pin, PVC cable, length: 5 m
V1-W-5M-PUR	Female single-ended cordset, angled, M12, 4-pin, PUR cable, length: 5 m

3.7.3 Network Connection Cable

The sensor is connected to the network using an M12 plug.

Designation	Description
V1SD-G-2M-PUR-ABG-V45-G	Patch cable M12 to RJ45, length: 2 m
V1SD-G-5M-PUR-ABG-V45-G	Patch cable M12 to RJ45, length: 5 m
V1SD-G-ABG-PG9	Single-ended male cordset M12, D-coded, 4-pin for bus cable, self-assembly

4 Installation

4.1 Preparation



Unpacking the device

1. Check the packaging and contents for damage.
 - ↳ In the event of damage, inform the shipping company and notify the supplier.
2. Check the package contents against your order and the shipping documents for completeness and accuracy.
 - ↳ Should you have any questions, direct them to Pepperl+Fuchs.
3. Retain the original packaging in case the device is to be stored or shipped again at a later date.

4.2 Mounting



Warning!

Danger due to visible class 1M laser light

If the laser light is pointed at people, especially in the dark, this can lead to irritation and result in the risk of an accident due to glare.

If the laser light is viewed through optical instruments (magnifying glasses, microscopes, telescopes, or binoculars, etc.), it may damage the observer's eyes due to a burning lens effect.

Install the device so that the warnings are clearly visible and legible.

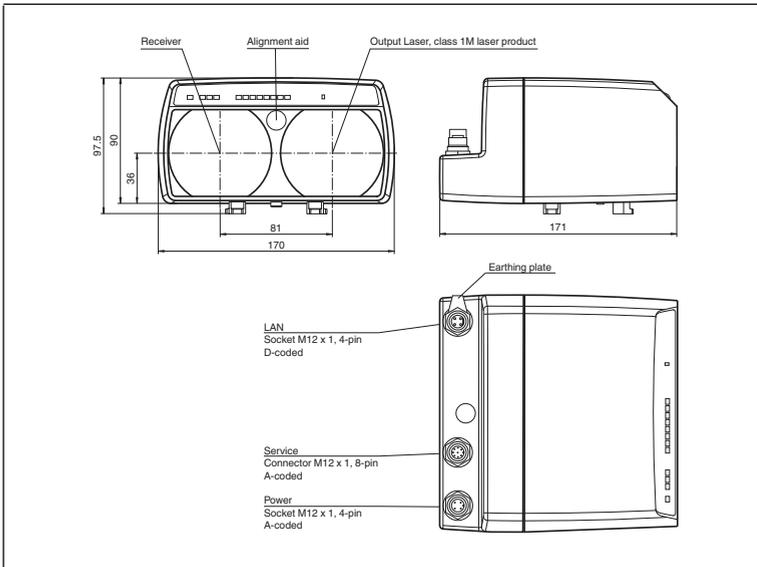
Do not point the laser light at people.

Do not look at the laser light using optical instruments.

The maintenance and repair of a class 1M laser must be performed by authorized service personnel only.

The device has two mounting holes and four retaining feet for easy mounting of the optical data coupler in your plant. If required, M4 inserts can be pressed into these four retaining feet. This allows existing adjustment and mounting options to be used. Further mounting aids for quick adjustment are available in the range of device accessories. See chapter 3.7.1

LS68 housing dimensions*



Mounting using OMH-LS610-01



Caution!

Danger due to inadequate operating or adjustment equipment

Use of operating or adjusting equipment other than that specified here or operating and adjusting procedures other than those described in this document may result in harmful laser beam exposure.

Only use operating and adjustment equipment that is recommended for the device described here. Follow the procedures described for this device concerning operation and adjustment.

The mounting aid (OMH-LS610-01) comprises a mounting bracket and a preassembled adjustment device for the x and y direction. The adjustment device is attached to the mounting bracket using two M4 nuts and a central M6 fixing screw.

The adjustment device of the mounting aid enables the desired beam direction of the optical data coupler to be set using $\pm 90^\circ$ rotation. For details about adjustment, see chapter 5.1.



Assembling the mounting aid and attaching the device

To assemble the mounting aid and attach the optical data coupler to the adjustment device, proceed as follows:

1. Place the adjustment device on the mounting bracket in the required direction and tighten the two M4 nuts.
2. Screw in the central M6 fixing screw, but do not tighten it yet.
3. Hold the device above the adjustment device with the retaining feet positioned over the openings.
4. With your free hand, squeeze the two front latches on the adjustment devices together.



5. Click the device into the openings. Make sure that the retaining feet of the device are engaged far enough that you can push the two latches outward fully. To do this, push in the center of the device, applying some force from above if necessary.



↳ The latches will spring all the way outward again.



6. Now perform the required adjustment. See chapter 5.1.
7. Once you have made the adjustments, tighten the central M6 fixing screw to fix the position in the horizontal direction.

4.3

Connection

Connecting the supply voltage

The device conforms to protection class III. Note that the power must be supplied as a protective extra-low voltage (PELV) and must be limited according to UL Class 2 (100 W). The optical data coupler is supplied with a direct voltage of 18 VDC to 30 VDC. The insulation test voltage of shields against power/GND is 50 V maximum.

To supply voltage to the device, proceed as follows:

1. Plug the prepared connection cable with the 4-pin M12 socket into the plug provided on the rear of the housing.
2. Screw the lock nut onto the connector as far as it will go.

↳ This ensures that the power cable cannot be pulled out inadvertently.

3. Connect the supply voltage to the cable provided.

↳ The device is ready for operation.

Grounding/shielding

This grounding is protective grounding and is not for personal protection.

The grounding is intended exclusively for the derivation of cable-related faults. Functional grounding of the cable shields is required to provide immunity to interference.

To ground the device, proceed as follows:

1. Use a ground cable with a 6 mm flat connector and an adequate cross section ($\geq 1.5 \text{ mm}^2$).
2. Plug the flat connector onto the pre-mounted insertion prong on the device.

3. Connect the other end of the grounding cable to adjacent metal components (e.g., mounting base, frame, etc.).

↳ The device is grounded.



Establishing the network

The M12 D-coded plug on both devices features the standard assignment for Ethernet. The optical data coupler automatically locates transmitting and receiving lines (Auto-MDIX), meaning there is no need for a crossover cable. To connect the device to a network, proceed as follows:

1. Plug the prepared network cable with the 4-pin M12 plug into the socket provided on the rear of the housing.
2. Screw the lock nut onto the connector as far as it will go.
 - ↳ This ensures that the power cable cannot be pulled out inadvertently.
3. Connect the network cable to the network connection provided for this purpose.

↳ The device is ready for operation.



Note!

Unshielded cables (UTP) are not suitable for maintaining noise immunity. Make sure that the Ethernet cables are at least of CAT5 quality.

4.4

Storage and Transportation

Keep the original packaging. Always store and transport the device in the original packaging.

Store the device in a clean and dry environment. The permitted ambient conditions must be considered, see datasheet.

5 Commissioning

5.1 Alignment and Adjustment



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If the laser light is viewed through optical instruments (magnifying glasses, microscopes, telescopes, or binoculars, etc.), it may damage the observer's eyes due to a burning lens effect.

Install the device so that the warnings are clearly visible and legible.

Do not point the laser light at people.

Do not look at the laser light using optical instruments.

The maintenance and repair of a class 1M laser must be performed by authorized service personnel only.



Caution!

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Only use operating and adjustment equipment that is recommended for the device described here. Follow the procedures described for this device concerning operation and adjustment.

Optimal alignment of the devices and the highest possible reception level are crucial for faultless data transfer. However, it is almost impossible to align two optical data couplers over long distances if working alone. The "bidirectional" display mode of the optical data coupler helps with this process.

The following display modes help with adjustment:

- Unidirectional: suitable for short distances up to approx. 150 m
- Bidirectional: suitable for long distances from 150 m to 300 m



Tip

The optical data coupler is designed to ensure that an adequate reception level is obtained over the entire emitter spot. For technical reasons, the maximum reception level is often not in the center of the spot. To ensure that the range is as symmetrical as possible, we recommend using the adjustment aid to "trace" the edges of the spot horizontally and vertically, and then setting the center position. The drop-off in intensity at the edge of the spot is very pronounced, which makes the edges easy to locate.

Alignment aids in "unidirectional" display mode

To make alignment easier, an alignment LED that is visible from far away is located on the front of the device. As soon as a receiver detects the emitted light of the device opposite it, the flashing frequency of the alignment LED decreases. When the alignment LED goes out, the devices are optimally aligned. Sufficient operating reserve is available.

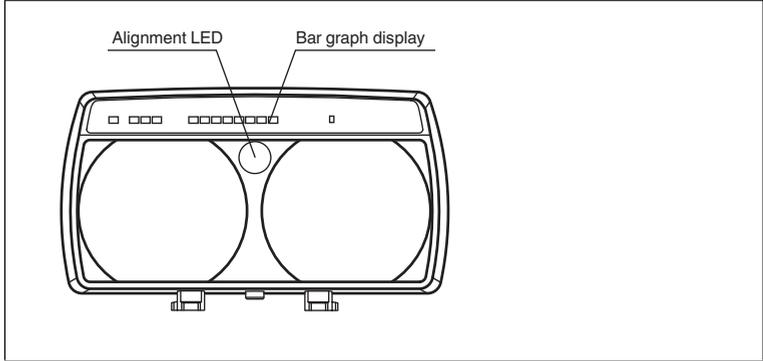


Figure 5.1 Position of the alignment LED and the bar graph display on the device

The bar graph indicator shows the reception level of the device on which it is located.

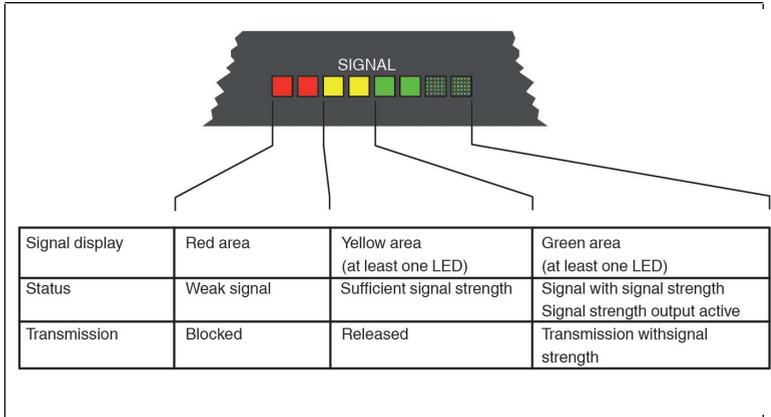


Figure 5.2 Explanation of relationship between bar graph display and operating state

Operating reserve

In the "Operating reserve" status (green zone), the received signal strength of the optical data coupler is sufficient for operational purposes. The optical data coupler should operate in the green zone within the nominal range (at least one green LED); if the signal strength drops below this limit level, the operating reserve indication (alarm output) is switched off. Telegrams continue to be sent until the signal strength drops below the level required for operational purposes (red LED only).

Alignment aid in "bidirectional" display mode

The reception level of both sides is shown at the same time on one device.

This means that the effect on the reception of both devices when aligning can be read directly on the device. It is no longer necessary to have someone helping on the opposite side.

The "bidirectional" display mode starts automatically when the optical data coupler has not received any signal for more than three seconds. This may happen due to interruption of the light beam with opaque material or deliberate covering of the receiving lens.

In the "bidirectional" display mode, the highest reception level value is displayed:

- Steady LED: reception level of the local device
- Flashing LED: reception level of the opposite device

The "bidirectional" display mode is ended if the signal level on both sides is stable and greater than the minimum reception strength for more than eight seconds.

Example 1

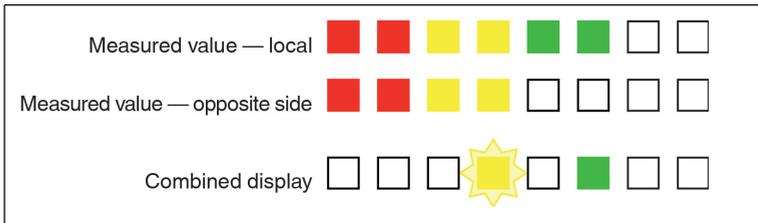


Figure 5.3 The reception level of the local device is greater than the reception level of the opposite side: green LED lights up (local device), yellow LED flashes (opposite side)

Example 2

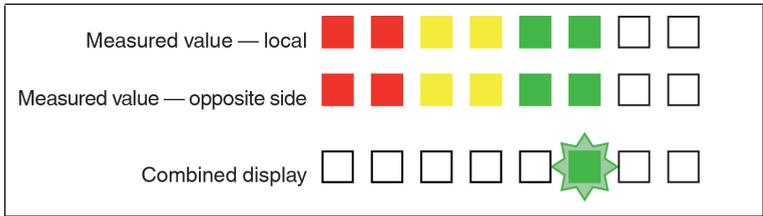


Figure 5.4 The reception level of both devices is equally good: green LED flashes (local measured value/opposite side measured value identical)

Example 3

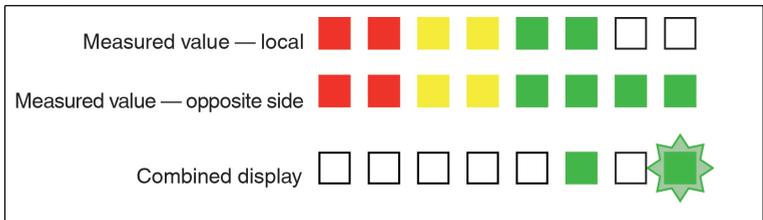


Figure 5.5 The reception level of the opposite side is greater than the reception level of the local device: green LED lights up (local device), green LED flashes (opposite side)

Example 4

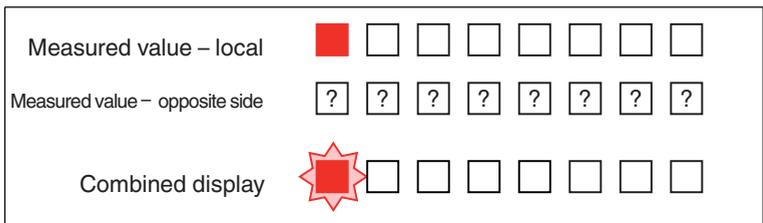
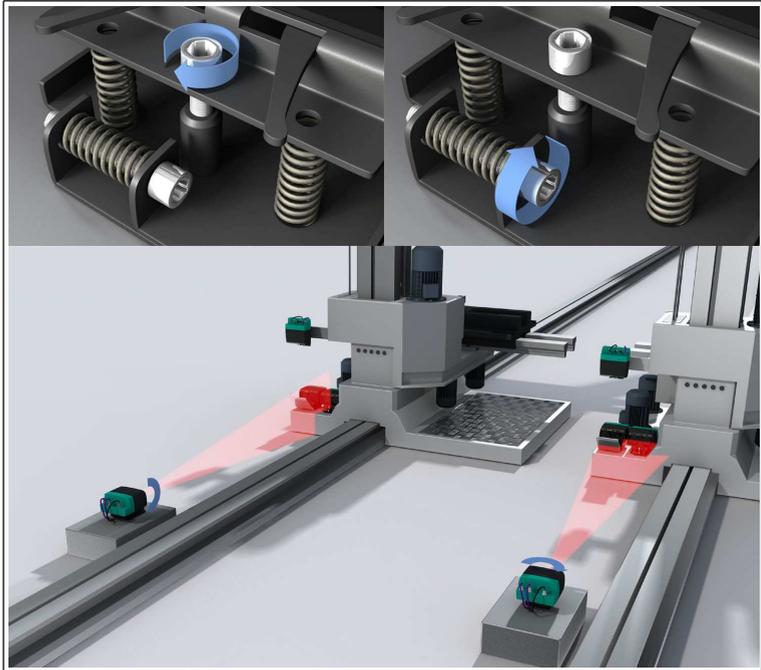


Figure 5.6 The reception level of the opposite side is unknown. For example, interruption of the light beam, misaligned, etc. The reception level of the local device is low: red LED flashes

Aligning using the adjustment aid

The beam axis is aligned in the x and y direction using the two adjustment screws (hollow, 5 mm). This position is then fixed by tightening the central M6 fixing screw. Ethernet data communication is not needed for the alignment.



Adjusting the optical data coupler

The mounting aid is assembled and the optical data coupler is inserted into the adjustment device. See chapter 4.2.

We recommend performing the height adjustment first and then the lateral adjustment. The reason for this is that the height adjustment can change the lateral position mechanically, but not vice versa.

1. Roughly align the optical data coupler at a distance of approx. 3 m to 5 m until both signal indicators lie in the green zone. Ensure that the two optical data couplers are at the same height and are not offset.
2. Move the two optical data couplers so that they are approx. 20 m apart.
3. To align the vertical y-adjustment screw, proceed as follows:
 - Turn the screw clockwise until the alignment LED flashes slowly.
 - Change the direction of rotation (counterclockwise). Turn and count the revolutions for as long as the alignment LED remains deactivated.

- If the alignment LED flashes again, stop turning. Now turn the adjustment screw half the number of turns in a clockwise direction to get it back to the middle.
4. To align the horizontal x-adjustment screw, proceed in the same way as described above.
 - Turn the screw clockwise until the alignment LED flashes slowly.
 - Change the direction of rotation (counterclockwise). Turn and count the revolutions for as long as the alignment LED remains deactivated.
 - If the alignment LED flashes again, stop turning. Now turn the adjustment screw half the number of turns in a clockwise direction to get it back to the middle.
 5. Increase the distance between the two devices to the maximum distance. Readjust the device if necessary.
 6. Once you have made the adjustments, tighten the central M6 fixing screw to fix the position in the horizontal direction.

Parallel light paths

If two light paths are installed next to each other without any optical separation, the optical data couplers must be installed opposite each other in pairs. This is to avoid cross-talk. A minimum distance "a" between the beam axes is not required, provided that the adjacent pairs have the identical overall distance "d."

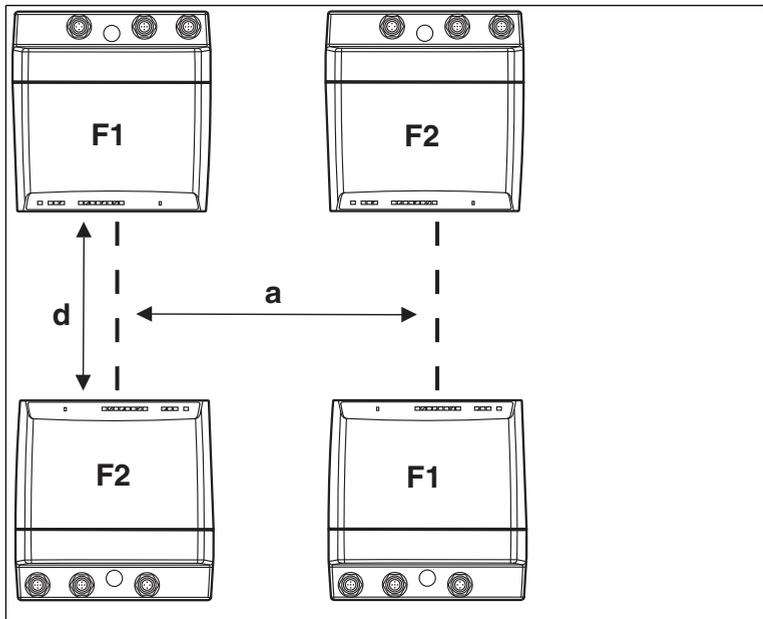


Figure 5.7 Parallel light paths

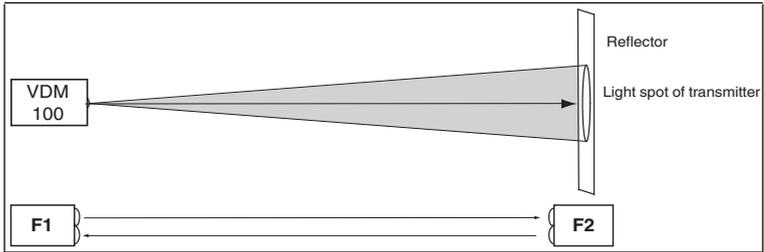


Note!

In parallel light path arrangements, disconnecting one side of an optical data coupler is not permitted. Similarly, the light beam must not be obstructed.

Parallel arrangement with distance sensors of type VDM100

The optical data coupler and distance sensors of type VDM100 can be arranged in parallel. A minimum distance between the devices is not required.



5.2 Topology

The optical data coupler does not contain any address routing logic. As a result, the distribution of the information must always be controlled by an external network switch. The internal Ethernet adapter is permanently set to 100 MBit full duplex, as this is the only format that is converted for the optical transmission. Any adjustments required to connection modes must be made using the external network switch.

The pair of optical data couplers effectively replaces a cable. The maximum cable lengths always relate to the distance from the optical data coupler to the relevant network switch. The signal propagation delay depends on the physical distance between the two optical data couplers. The runtime is 3.3 ns for each meter of light path.

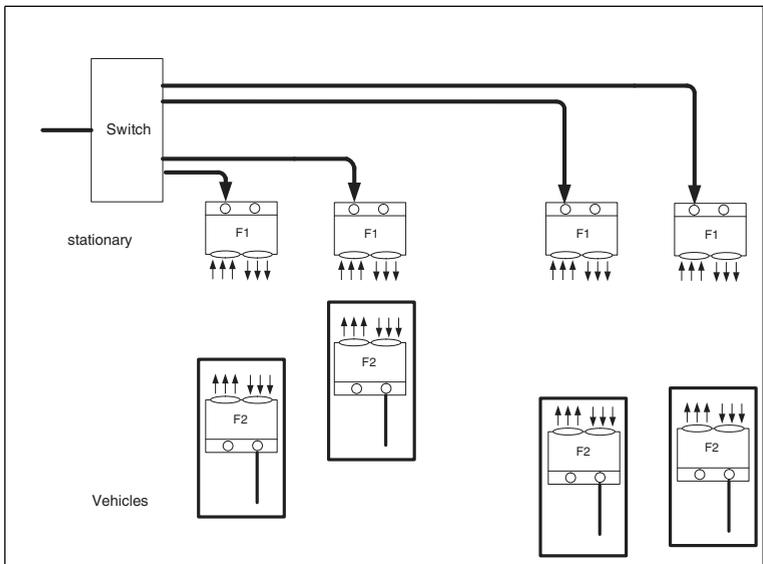


Figure 5.8 Topology

6 Maintenance and Repair

6.1 Maintenance

To get the best possible performance out of your device, clean the optical unit on the device when necessary and always keep it clean.

When cleaning the optical unit you should note the following:

- Do not touch the optical unit with your fingers.
- Do not immerse the device in water. Do not spray the device with water or other liquids.
- Do not use a scouring agent to clean the surface of the device.
- Use a cotton or paper cloth moistened with water or isopropyl alcohol. The cloth must not be soaked!
- Remove any residual alcohol using a cotton or paper cloth moistened with distilled water. The cloth must not be soaked!
- Wipe the device surfaces dry using a lint-free cloth.

6.2 Repair

The device must not be repaired, changed, or manipulated. In case of failure, always replace the device with an original device.

7 Troubleshooting

7.1 What to Do in the Event of a Fault

Check that the following actions have been taken:

- Plant test according to the following checklist
- Telephone assistance obtained from the Support team to isolate the problem

Checklist for fault repair

Error	Displays				Cause	Remedy
	PWR	EPR	LAN	OPT		
No display	Off	Off	Off	Off	The power supply is switched off or there is a wiring fault in the distribution panel or switch cabinet.	Check whether there is a reason why the power supply is switched off (installation or maintenance work, etc.). Switch on the power supply if appropriate. Check the wiring carefully and repair any faults with the wiring.
No network connection	On		Off		Network cable not connected or incorrectly connected Port on the network switch is deactivated	Check the connection to the next device: LAN LED Activate the port on the network switch
No optical communication	On	On		Off	Receiving level too low, transfer blocked	Improve alignment or incorrect pairing; F1+F2 required
Bar graph display does not reflect full value despite precise alignment	On	Off	On	On	Not an error; individual scaling deviation in the highest signal strength range	None

If you were unable to rectify the fault with any of the suggested measures, contact the Support team. Have the exact model number of the sensor ready if appropriate.

FACTORY AUTOMATION – SENSING YOUR NEEDS



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