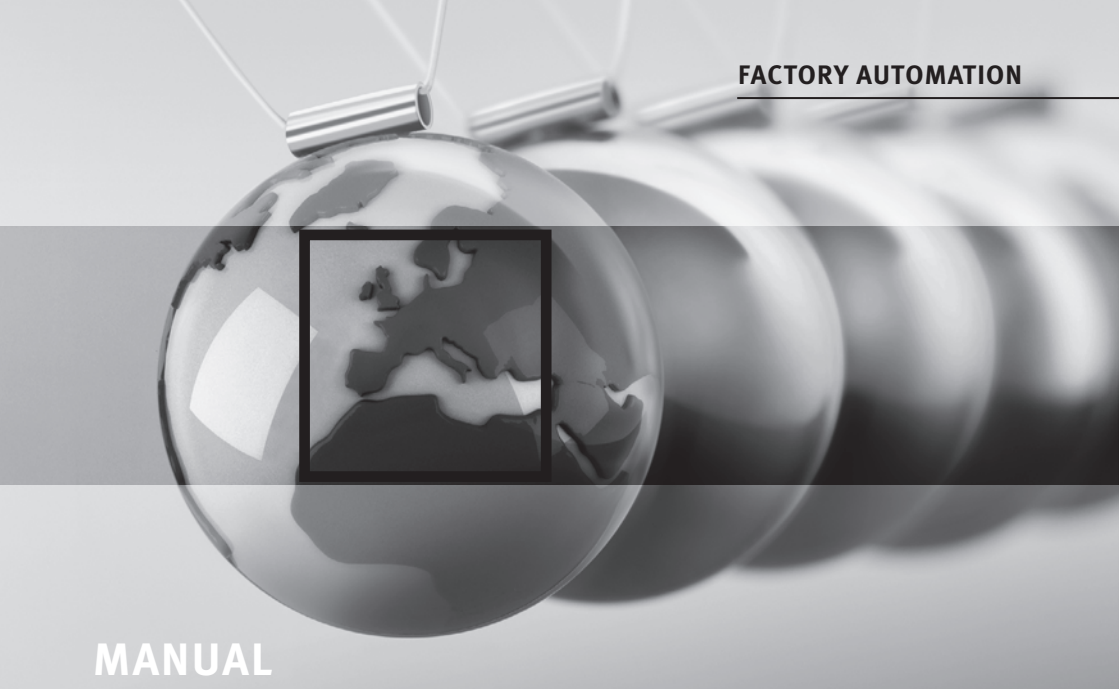

MANUAL

Optical data coupler LS600-DA-P

PROFIBUS

CE

PEPPERL+FUCHS
SENSING YOUR NEEDS

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"

Part No. 220470
Date of issue 07/22/2009

PEPPERL+FUCHS

Issue date 07/22/2009 Part No. 220470

1 Introduction

Congratulations!

You have chosen a device from Pepperl+Fuchs. Pepperl+Fuchs develops, produces, and markets electronic sensors and interface components for the automation technology market worldwide.

Contact

If you have questions about the device, accessories, or other functions, please contact:

Pepperl+Fuchs GmbH
Lilienthalstraße 200
68307 Mannheim
Phone: +49 621 776-4411
Fax: +49 621 776-274411
E-mail: fa-info@pepperl-fuchs.com

1.1. Warranty

Pepperl+Fuchs manufactures its hardware products according to recognized industrial standards. Pepperl+Fuchs guarantees its products to be free of defects in material and workmanship provided the products are used under the normal operating conditions specified by the manufacturer. The warranty applies only to the original owner and is not transferable. All accompanying exclusions of liability, restrictions, and other conditions of this section apply to this warranty.

Exclusions of liability

No warranty obtained or granted hereby shall apply to products that:

- have been repaired, modified, or tampered with unless explicitly performed or approved by Pepperl+Fuchs
- have not been serviced in accordance with the Operating and Handling Instructions provided by Pepperl+Fuchs
- have been exposed to unusual physical or electrical loads, immersed in liquids, or exposed to any one of the following circumstances:
    - breakdown
    - crushing
    - improper use
    - misuse
    - low current
    - unsuitable power supply
    - reverse polarity
    - negligence or accident
- has been used for any purpose other than what is described in the Operating and Handling Instructions

Preventive maintenance is the customer's responsibility and is not covered by this warranty.

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General

With the exception of the warranties noted above, Pepperl+Fuchs offers no warranties for products delivered below in any form whatsoever, whether explicit or implicit, including, but not limited to implicit defect warranty services and guarantee of suitability for a specific purpose, and absence of injury. The explicit warranties noted above shall satisfy all obligations and liabilities of Pepperl+Fuchs for damages, including but not limited to concrete damages, indirect damages or consequential damages in connection with the use or design of the product. The seller's liability to the buyer and other persons (regardless of the origin of liability, whether it be based on contract, warranty, impermissible handling, misuse, and/or other origin) in connection with the use of a product shall in no case exceed the original purchase price of the product. Pepperl+Fuchs shall in no event be liable for consequential damages, concrete and indirect damages, secondary damages or penalties, or lost profits, sales, or loss of data, even if Pepperl+Fuchs had been made aware of this possibility.

2 Declaration of Conformity

We, Pepperl+Fuchs GmbH, hereby declare on our sole responsibility that the

LS600 Optical data coupler

and all models of this product to which this declaration refers are in conformity with the following standards and other regulatory documents

EN 60947-5-2

Product family standard: Electromagnetic Compatibility (EMC for light industry and industry)

	A corresponding Declaration of Conformity may be requested from the manufacturer.

Pepperl+Fuchs GmbH in D-68301 Mannheim has a certified quality assurance system in conformity with ISO 9001.

CE

ISO**9001**

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3 Safety

3.1. Symbols used

Safety-related symbols

	**Danger!** This symbol identifies an immediate and present danger. Failure to observe this warning may result in personal injury or even death.
	**Warning!** This symbol warns of a possible malfunction or hazard. Failure to observe this warning may result in personal injury or extensive damage to property.
	**Caution!** This symbol warns of a possible malfunction. If the instruction given in this warning is not heeded, the device and any plant or systems connected to it could develop a fault or even fail completely.

Informative symbols

Note!
This symbol draws your attention to important information.

3.2. General safety instructions

The following basic instructions must be observed in all cases:

- The device must not be placed in service until the manual has been read and understood
- The power device for generating the power supply voltage must be reliably insulated electrically by means of double insulation and a safety transformer according to DIN VDE 0551 (corresponds to IEC 742).
- The device must not be used outside the specification without suitable protective measures
- No unauthorized tampering with the device is permitted
- Do not point the device directly at the sun or measure into the sun
- Do not remove the warning instructions or rating plates

The radiation emitted by a Class 1 laser is harmless. This type of laser instrument can be operated by anyone.

The system operator is responsible for planning, assembly, commissioning, operation, and maintenance of the system.

Installation and commissioning of all devices must only be performed by personnel specially trained for that purpose.

The protection of the system and operating personnel is not ensured if the module is not

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used according to its intended purpose.

Observe the applicable laws and regulations for use and for the intended purpose. The devices are only approved for proper use in accordance with intended purpose. Any other use voids all warrantee claims and manufacturer's responsibility.

Use only recommended original accessories.

If you are unable to eliminate malfunctions, take the device out of operation. Secure the device against accidental operation. Return the device to Pepperl+Fuchs for repair. Own interventions and modifications are potentially hazardous, and any guarantee and manufacturer's liability shall become void.

Dispose of the useless device in keeping with the applicable national legal regulations.

For example, you can take the sensor to the designated collection point for electronic scrap.

The LS600 corresponds to the laser protection class 1 and is eye-safe according to DIN EN 60825-1.

	*In applications with shelf distances and moving carriages, care must always be taken to observe the applicable safety regulations. Failure to do so will result in grave danger to life and limb!*

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4 Identification

- Optical data transfer for the bus system PROFIBUS in accordance with EN50170/2 and systems similar to profibus.
- galvanically isolated bus interface
- Operating range 0.5 ... 100 m; /35: 0.5 ... 150 m
- Transfer rates for:
  Profibus: 1.5 MBd / 500 k / 187.5 k / 93.75 k
  Suconet: 375 k / 187 k
- Bus termination in accordance with EN50170; can be turned off
- Operation and function reserve displays, multicoloured
- Setting accessory, large in area, flashing red
- Integrated aiming telescope
- Input for emitter deactivation.
- Supply voltage 24V DC ± 25%
- Stability control outputs, P-switching

4.1 Data transfer

Data transfer is performed independently in both directions by modulated infrared light. The data are transferred on the light distance by means of frequency shifting (FSK).

Various medium frequencies are selected for the light distances for trouble-free transfer. For this reason, an operating line consists of a device with the frequency F1 and a device with the frequency F2.

The red function indicator LED is lit when the level of the received signal reaches the switching point (simple safety). The transfer of the data is only released from this level. On achieving the 1.5-fold switching point, the green operation indicator LED is lit and thus indicates a sufficient stability control.

An additional red LED with optical system is integrated as setting accessory. It flashes after starting up the device and is well visible on a large distance. If the reception level exceeds the minimum value required for transfer by 50 %, the flashing setting accessory is switched off.

Data activity is indicated by a yellow LED for the receiving data and a green LED for the transmitting data.

4.2 Interface

The LS 600 DA P contains an interface adapter that checks the Profibus messages on the light reception side and suppresses messages that are not compatible with Profibus. The signals are regenerated in a bit and character conform manner. The messages are transmitted to the bus in a crystal stabilized manner.

The repeater function involves priority control to prevent illegal interception of running bus traffic by unintended received signals coming from scattered light.

When the repeater function is activated, the baud rate must be correctly set by means of the selector switch Sd. Otherwise, in case of incorrect setting, no transfer is performed at all.

This repeater function can be deactivated (Sd) for application in systems that have other message structures or for which this function is undesirable. In this state, the interface

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realises the idle time only.

The signal idle times then correspond to the Profibus standard. For systems requiring different idle times (e.g. SUCONET 375/187.5) the user has to chose the corresponding settings (see p.16/17), otherwise the use of the rest time table (see Technical Data) is recommended.

In case of interrupted light beams, most likely data messages suffer interference during transition to complete interruption and vice versa. Due to the activated repeater function, this interference is limited to the message that is suffering interference at the moment.

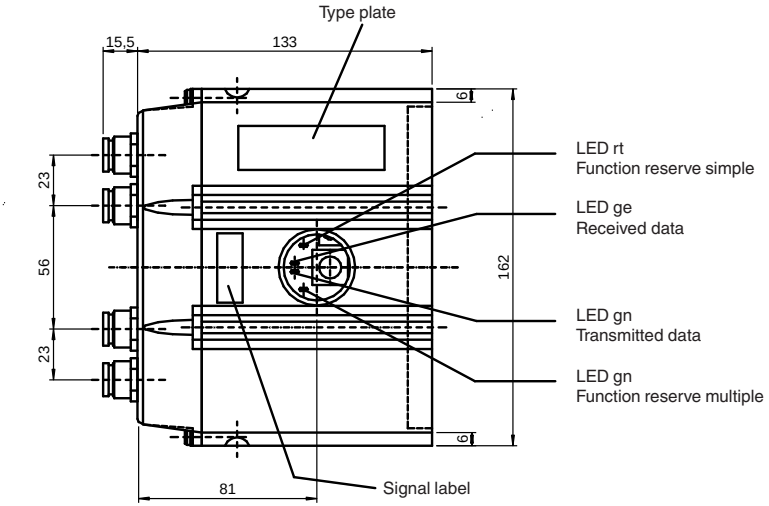
This also applies to interruptions of voltage supply in case of optical and bus disturbances. A bus short circuit of e.g. a segment is not transferred to the other side.

In case a light beam is interrupted, data transfer is blocked for both transfer directions.

The bus termination can be switched on and off by means of the switches Sb and Sc on the interface print. Note that the termination is not supplied with voltage when the device is powered off, so that the bus idle voltage is reduced.

In case of a baud rate of 1.5MBd or below, incorrectly set terminations may lead to an instable party connection. An oscillographic control of the bus cables RXTX-P or RXTX-N against GND must not reveal any transient effects at the bit changes.

4.3 Function indicators:



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5 Installation

The devices F1 and F2 are mounted in the provided position by means of the enclosed mounting bracket. On top of the housing, there is a view finder for an aiming telescope, which is used for rough alignment. The counter device is to be focused in such a way that its receiver is positioned at the peak of the division mark. The housings can be aligned both horizontally and vertically relative to the mounting bracket.

The horizontal adjustment angle is ± 4°

The vertical adjustment angle is ± 90°

Adjustment is obtained from a rough alignment, preferably in maximum distance, but at least in a distance of 7 ... 10 m. The device is aligned in such a way that the red flashing indicator on the opposite side goes out. After performing the homogeneous adjustment on the opposite side, the whole adjustment is completed. The positions in the blind range must not be modified!

The receiver is highly overmodulated in the blind range, so that correct adjustment is no longer possible. If adjustment in the blind range cannot be avoided, the reception intensity of light should be reduced during adjustment by partially covering the emitter lenses or the receiver lens.

If the optical barrier is to be approached up to approx. 1 m or less, the lens coverage must be secured by means of mechanical measures:

1. a parallel offset of the axes by 40 mm horizontally enlarges the visual range to an approach of up to 500 mm.
2. the upside-down installation of a page covers the range up to below 500 mm.

Although the optical contact in the blind range up to 1 m is secured even when mounted uptight, upside-down installation in accordance with 2) is recommended because of the significantly easier adjustment from an approach of 2 m onwards. For this, according to requirement, the flange plate fixed with four Allen screws is moved to one of the other sides of the housing.

If interruptions occur in the blind range, the optical contact must be secured by means of the above-mentioned measures 1) or 2). Afterwards, adjustment must be repeated in the distant range.

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5.1 Electrical connection

Pin	Name	Description
1	RXTX-P	Data+ (B cable)
2	RXTX-N	Data- (A cable)
3	GNDI	Data Ground insulated
4	RXTX-P	Data+ (B cable)
5	RXTX-N	Data- (A cable)
6	GNDI	Data Ground insulated
14	/TX-DIS	Emitter deactivation for 0 ... 1 V, open: transmitter switched on (internal pull up)
15	FRES1	Stability control output, simple, PNP 0.2 A/ 30 V DC
16	FRES2	Stability control output, double, PNP 0.2 A/30 V DC
21	UB+	Supply voltage U+
22	UB+	Supply voltage U+
23	UB-	Supply voltage 0 V
24	UB-	Supply voltage 0 V

Table 5.1: Electrical connection

Non-designated terminals are not assigned.

The connections RXTX-P, -N as well as GNDI are galvanically isolated from all the others.

The double connections GNDI (3, 6), UB+ (21, 22) and UB- (23, 24) are connected on the terminal print. The data lines RXTX-P and RXTX-N of the incoming and outgoing cable can be linked on the terminal print by the switches S2 and S3. This is assured by the signal looping-through during installation as long as the optical barriers are not yet fitted. Prior to placing the optical data coupler, this link does not have to be re-opened. Irrespective of the position of these switches, the placed optical barrier links inputs and outputs properly.

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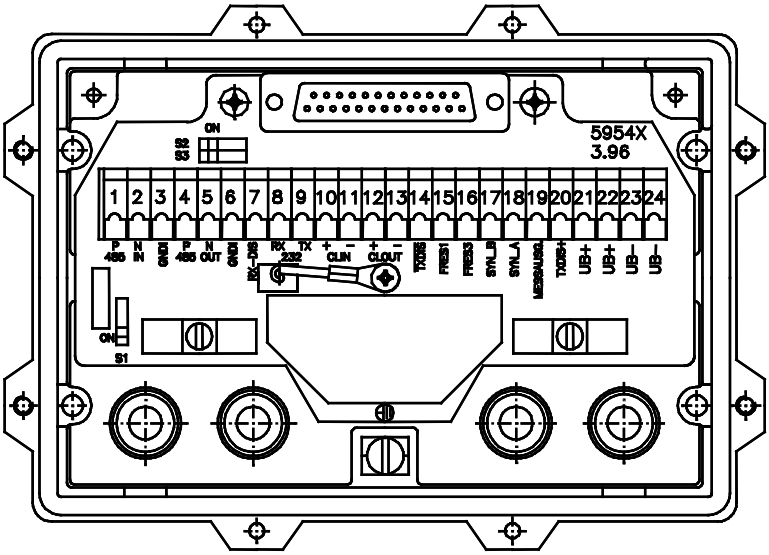
5.2 Terminal box



Switch positions:

S1	ON	Cable shield directly at the housing
	OFF	Cable shield capacitively at the housing
S2 and S3	ON	Inputs and outputs of type 485 connected
	OFF	Normal operation

Table 5.2: Switch positions

6 Notes to application

The optical data coupler may be damaged by incorrect connections or incorrect supplies at the data lines!

The optical data coupler causes a signal delay of one character length plus **4 ... 6 µs** per distance with activated repeater. This parameter must be taken into consideration if required for system planning, since the reaction of a party connected via light distance is delayed by twice the signal transfer time. In time-critical cases (e.g. older software solutions) it may therefore be necessary to do without the repeater function.

By means of the switch S1 on the terminal print, the housing connection of the data screen can be switched from galvanic (on) to capacitive (off) (10 nF/630 V). This may be necessary for non-avoidable low-pass potential differences.

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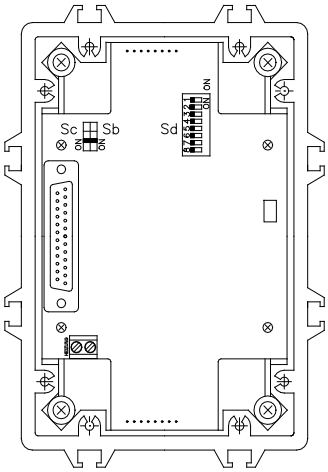
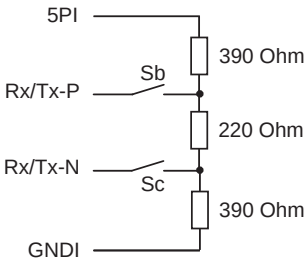
7 Profibus Interface

7.1 Profibus Interface Version A

Switch assignment of the interface print:
(visible after removing the cover)



Switch Sb, Sc: Profibus termination
on = active,
off = without terminal resistance
The switches Sb and Sc may be used together only!



Switch Sd: baud rate setting

Baud rate	Bd0	Bd1	Bd2	Notes
1.5 MB	x	x	x	
500 k	x	-	x	
375 k	-	-	x	
187.5 k	x	x	-	Suconet 375 [1)]
93.75 k	-	x	-	Suconet 187.5

(x=on, see overprint)
[1)] Observe the description of the baud rate setting

Sd.4	off:	FRES controls receiving in Profibus mode
	on:	Receiving possible below acceptance threshold (only Profibus mode)
Sd.5	off:	Idle mode; allows any protocol based on idle time (e.g. SUCONET)
	on:	Profibus mode: only Profibus protocol (EN50170) transmittable; baud setting must fit

Sd.6 to Sd.8 are unused.

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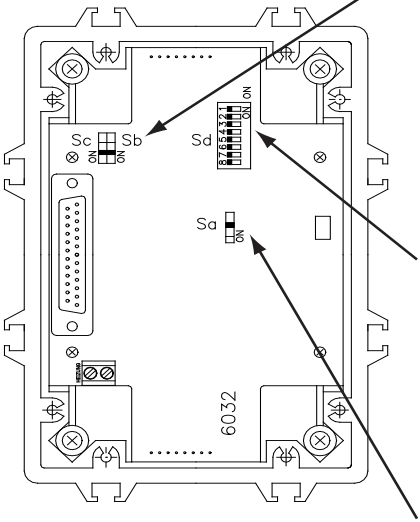
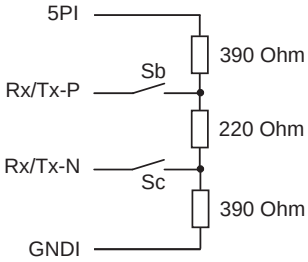
7.2 Profibus Interface Version B

Switch assignment of the interface print:
(visible after removing the cover)



Switch Sb, Sc: Profibus termination
on = aktive,
off = without terminal resistance
The switches Sb and Sc may be used together only!



Switch Sb: baud rate setting

Sd. 1	n.c.
Sd. 2	500 k
Sd. 3	375 k / Suronet 375 k [1)]
Sd. 4	187.5 k / Suronet 187 k
Sd. 5	93.75 k
Sd. 6	19.2 k
Sd. 7	9.6 k
Sd. 8 0 "off"	repeater active (only Profibus)
Sd. 8 0 "on"	Non Profibus System

Switch Sa:
Behaviour in case of beam interruption:
on = special state
off = highly resistive

[1)] Observe the description of the baud rate setting

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8 Appendix

8.1 Technical data

General specifications		
Effective detection range		0,5 ... 100 m
Option /35		0,5 ... 150 m (layout for operating range < 2 m see installation note)
Light source Option /RT		IRED LED
Approvals		CE
Alignment aid		Telescopic sight, frontal red LED flashing, off with Signal > sufficient stability control
Transmission mode		FSK
Light type Option /RT		infrared, alternating light red, alternating light
Diameter of the light spot		2500 mm at a distance of 100 m
Angle of diverence		1,4 °
Ambient light limit		1000 Lux
Indicators/operating means		
Data flow display		LED green: emitter LED yellow: receiver
Function display		LED red: 1-fold stability control LED green: Sufficient stability control
Operating elements		8-fold DIP-switch
Electrical specifications		
Operating voltage	U_B	24 V DC ± 25 %
Data sampling blanking		emitter deactivation at 0 V
Data rate		9,6 ... 1500 kBit/s , adjustable (96 k / 19,2 k only Version B)
Operation frequency		
LS600 / 1,5		F1 = 8,25 MHz ± 750 kHz
		F2 = 13,5 MHz ± 250 kHz
LS600		F1 = 8,5 MHz ± 250 kHz
		F2 = 13,5 MHz ± 250 kHz
No-load supply current Option /GUF	I_0	450 mA max. 1.5 A
Interface		
Interface type		PROFIBUS, electrically isolated
Output		
Output of the pre-fault indication		2 pnp-outputs, short-circuit proof, 30 V DC 0.1 A activated for single or sufficient stability control

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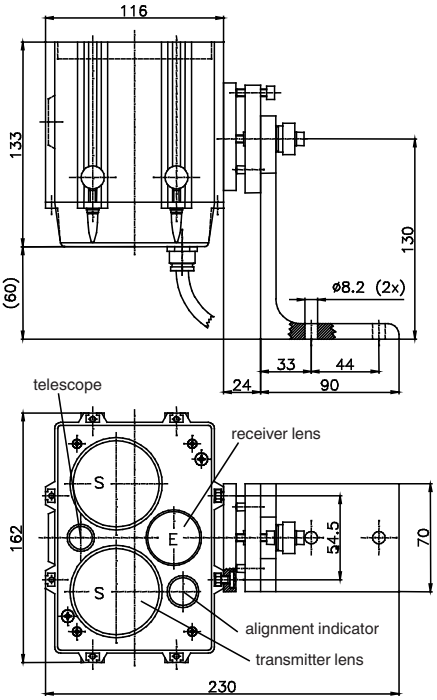
Standard conformity	
Standards	EN 60947-5-2
Ambient conditions	
Ambient temperature	-20 ... 50 °C (253 ... 323 K)
Option /GUF	-35 ... 50 °C (238 ... 323 K) with heated housing
Storage temperature	-20 ... 75 °C (253 ... 348 K)
Mechanical specifications	
Protection degree	IP65
Connection	4 PG9 screwed connections , spring-loaded terminals in the terminal compartment
Material	
Housing	Aluminium, black, lacquered
Optical face	Glass screen
Weight:	2000 g

Table 8.1: Technical data

8.2 Dimensions with mounting bracket



Picture 8.2: Dimensions with mounting bracket

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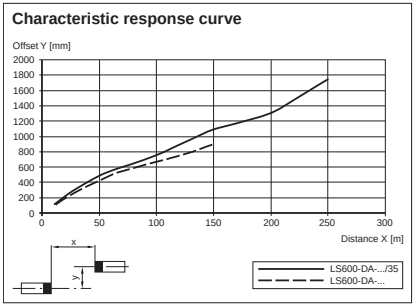
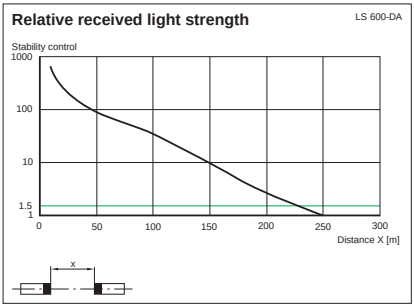
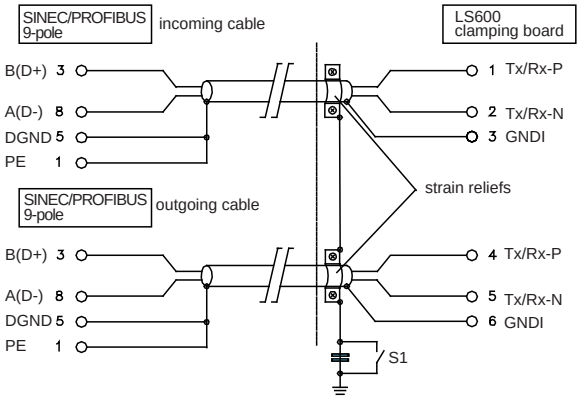
8.3 Diagrams





8.4 Wiring example



The connections of DGND or GNDI to the screen are not compulsory.

8.5 Model number

LS600-DA-P-1,5/F1
LS600-DA-P-1,5/F2
LS600-DA-P-1,5/35/F1
LS600-DA-P-1,5/35/F2
LS600-DA-P-1,5/GUF/F1
LS600-DA-P-1,5/GUF/F2
LS600-DA-P/F1
LS600-DA-P/F2
LS600-DA-P-GUF/F1
LS600-DA-P-GUF/F2
LS600-DA-P-RT/F1
LS600-DA-P-RT/F2

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9 Note

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Date of issue 07/22/2009 Part No. 220470

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