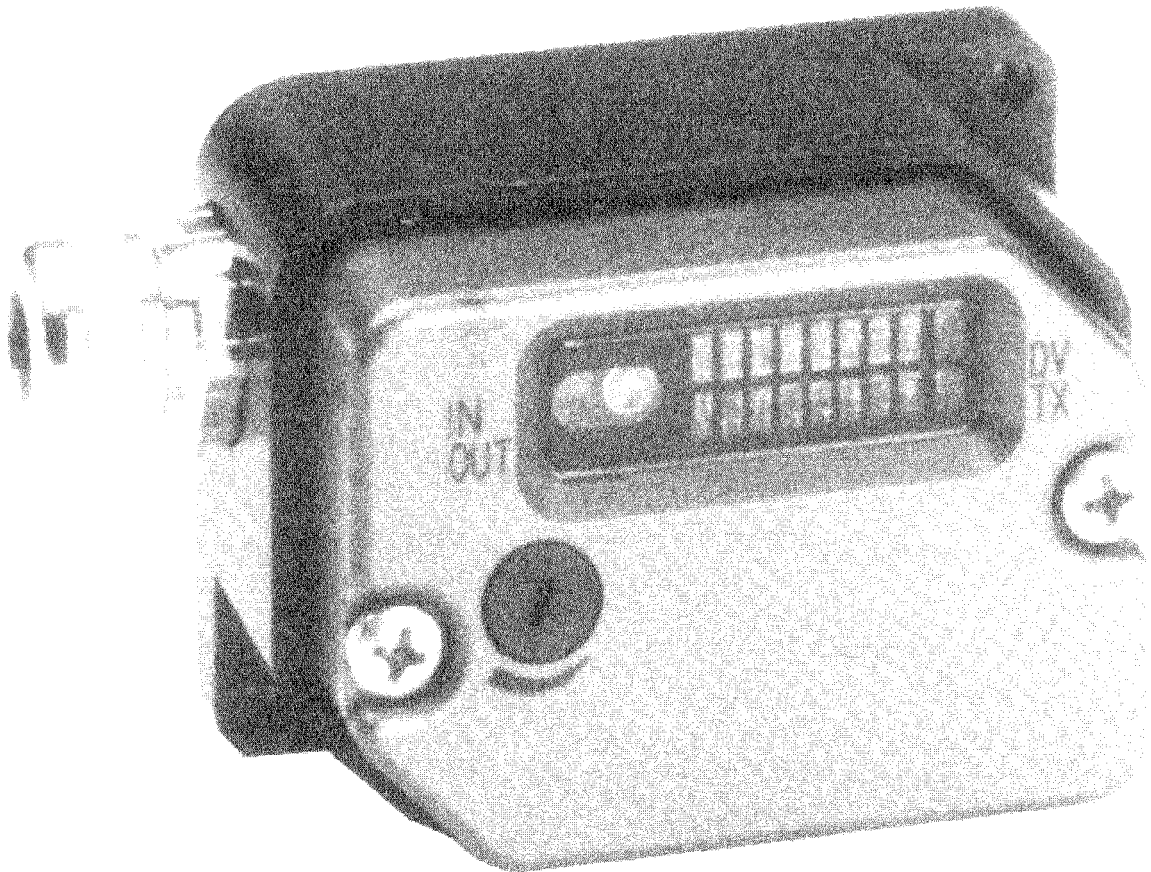




Parallel optical data transmission DLSP 160S

Technical Description



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1 General

1.1 Explanation of symbols

The symbols used in this technical description are explained below.




Danger !


This symbol is positioned in front of remarks or warnings which must be heeded without fail. Failure to comply with these instructions can lead to personal injury or damage to property.



Notice

This symbol indicates places in the text where supplementary information is offered on the installation and handling of data transmission units.

 Cross reference to other chapters or other documentation.

 This symbol indicates activities which must be carried out.

Italics To permit you to find information quickly, key words are listed in the left-hand column in italics.

1.2 Important terms

DLSP Type designation for Leuze electronic data transmission units with parallel interface. The transmitter and receiver are accommodated in a single housing.

DLSP 160S Type designation for the electronic and display unit.

AT 160xx Type designation for the connection unit. "xx" stands for the various configurations.

Tristate High-resistance status of an output. In this status, for example, connected bus conductors are not subjected to load.

Semi-duplex Transmission and reception of data take place in alternating sequence.

1.3 Declaration of conformity

The parallel optical data transmission units DLSP 160 have been developed and produced in accordance with the applicable European standards and directives.



Notice

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

The manufacturer of the product, Leuze electronic GmbH + Co. in D-73277 Owen/Teck, possesses a certified quality management system in accordance with ISO 9001.



2 Safety Notices

2.1 Safety standard

The data transmission unit DLSP has been developed, produced and tested taking into account the applicable safety standards and is in compliance with the state of the art.

2.2 Intended use



Attention !

The protection of personnel and device cannot be guaranteed if the device is operated in a manner not corresponding to its intended use.

Data transmission units of the DLSP series may only be used in areas in which interruption of data transmission, for example as a result of masking of the transmitter or receiver lens, cannot lead to damage or personal injury.

Fields of application

The DLSP is particularly suited to the following fields of application:

- Automatic guided vehicle systems to VBG 12b
- Rack handling devices, warehouse transport systems etc.
- Trolley conveyors
- Optical rotary transfer units
- Storage and handling systems
- Optical data storage systems

2.3 Organisational measures

Documentation

All specifications made in this technical description, in particular the section "safety remarks" must be observed without fail.

The technical description should be kept readily accessible at all times.

Safety regulations

All applicable legislation and rulings of the relevant professional associations must also be complied with.

Qualified staff

Installation, commissioning and maintenance may only be carried out by suitably qualified staff.

Electrical work may only be carried out by qualified electricians.

Maintenance and repair

All maintenance work on the DLSP must be carried out in accordance with the instructions in this manual. Repairs may only be performed by the Leuze electronic after-sales service.

3 Description

3.1 Survey of parallel data transmission systems

Functional characteristics The data transmission unit DLSP is a no-contact device for the transmission of electrical signals. Each unit is equipped with 8 inputs and outputs. The transmitter transforms the input signals into a serial telegram which is carried by an invisible light beam to the receiver. Here, the telegram is read out again in the form of electrical signals at the outputs. Data transmission takes place simultaneously in both directions.

Application Because the transmission method involves no contact and is insensitive to interference, the DLSP can be used even in tough industrial environments, in particular where movement is unavoidable.

Using the DLSP, all types of vehicle (AGVS, rack handling vehicles, warehouse transport systems etc.) can now be effectively controlled without cumbersome trailing cables and temperamental sliding contacts.

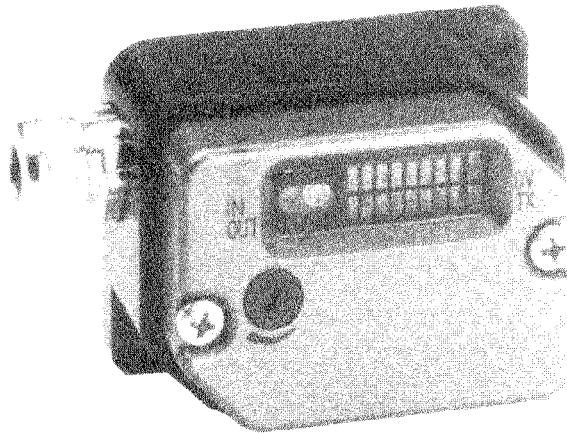


Fig. 1 DLSP

3.2 Features of the DLSP 160

The data transmission unit DLSP is characterized by the following features:

- During installation*
- Minimal space requirement (base plate 75 x 46 mm²)
 - Rapid assembly due to two-part structure with terminal plate or mounting and a plug-on electronic unit
 - Quickly installed using efficient connection methods (solder terminals, ribbon cable, or spring-type terminals)
 - Transmitter and receiver in a single housing (same units)
 - Simple, rapid alignment with wide beam angle
 - Simple commissioning with display of inputs and outputs
 - No transmission parameter setting work required

- In operation*
- Very high transmission rate (max. 400 μ s per telegram)
 - Reliable transmission due to ample performance reserve
 - Insensitive to interference
 - Insensitive to outside light
 - Multiple transmission repeats
 - Storage of output signals
 - Adjustable transmit and receive addresses

3.3 Structure

- Housing* The data transmission unit DLSP is accommodated in a durable housing. Each unit comprises a transmitter and receiver. The housing is protected against the effects of splash water (IP 65).
- Displays* There are 18 LEDs located on the front of the unit which indicate the operating status of the DLSP, as well as signals to the inputs and outputs.
- Setting* The range can be set by altering the sensitivity of the receiver at a potentiometer.
- Installation* The connection unit AT 160xx is prepared for screw mounting onto panels or brackets (dimensional drawing: see Specifications).
- Connection* Depending on the configuration of the connection unit, the DLSP is connected by means of solder terminals, spring-type terminals or ribbon cable with crimp-type connection. Cable feed-in is either at the side or through the rear wall by means of a cable gland.

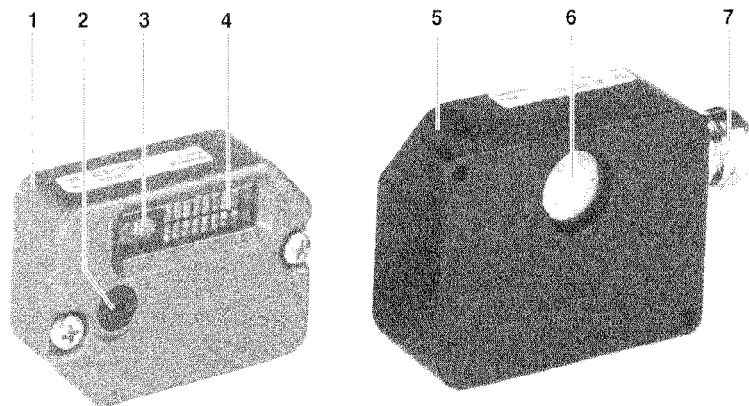


Fig. 2 DLSP structure

- 1 Electronic and display unit DLSP 160S
- 2 Sensitivity setting
- 3 Transmit/receive window
- 4 Input/output status displays
- 5 Connection unit AT 160xx (mounting, connection)
- 6 Cable gland (rear wall)
- 7 Cable gland (side)

3.4 Functional characteristics

3.4.1 Transmit/receive mode

<i>Transmission</i>	Every DLSP comprises a transmitter and a receiver. The transmitter transforms active data signals at the 8 data inputs into a serial telegram. The transformation process is performed using pulse pause modulation (PPM). The logic statuses "0" and "1" at the inputs correspond to pauses of differing lengths between 2 pulses.
<i>Signal transmission</i>	The serial telegram is converted into a modulated light signal. Transmission takes place using invisible infrared light. The transmission time is around 400 μ s (8 signals in each direction).
<i>Receiving</i>	The receiver reconstructs the serial telegram from the received light signal (demodulation).
<i>Data output</i>	Following serial-parallel transformation, the signals are available at the 8 outputs. The output signals can be optionally saved or not saved.
<i>Data safety</i>	The high degree of data safety offered by the DLSP is guaranteed by a check of amplitude, address and parity, repetition of each telegram and the indication of valid data with the Data Valid (DV) signal.
<i>Transmission in parallel operation</i>	Transmission takes place using the burst mode, i.e. each telegram is transmitted in the form of a short package with a long pause between 2 telegrams. The scanning ratio is appr. 1:100. Data is actually being transmitted for only 1 % of the unit's duty cycle.



Notice

During parallel operation of several DLSPs, the possibility of mutual interaction cannot be excluded. If interference between neighbouring transmissions paths (see page 13) occurs, mount small metal lateral shielding plates between the individual units. They should extend approx. 5 - 10 cm beyond the front surface of the unit.

Both the units forming a transmission path can transmit and receive. Data is transmitted and received using the handshake mode, i.e. in alternating sequence. Synchronization is taken care of automatically by the DLSP.

Benefit Both the units forming a transmission path operate on an identical basis, i.e. no master/slave operation and no need for different settings.

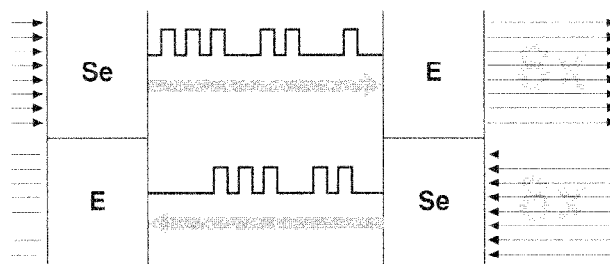


Fig. 3 Transmit/receive principle

3.4.2 Addressing

The DLSP can be addressed by means of DIP switches. Separate setting of four different addresses is possible using 2 x 2 DIP switches for the transmitter and receiver.

Data transmission is only possible if the transmit and receive address of a transmission direction are in agreement. The transmit and receive addresses of one unit do not need to be identical.

Benefits This permits several transmission paths to be set up even in restricted conditions, with up to 32 parallel transmission channels achievable in both directions. By address differentiation between transmitter and receiver, it is possible to define interleaved transmission ranges.

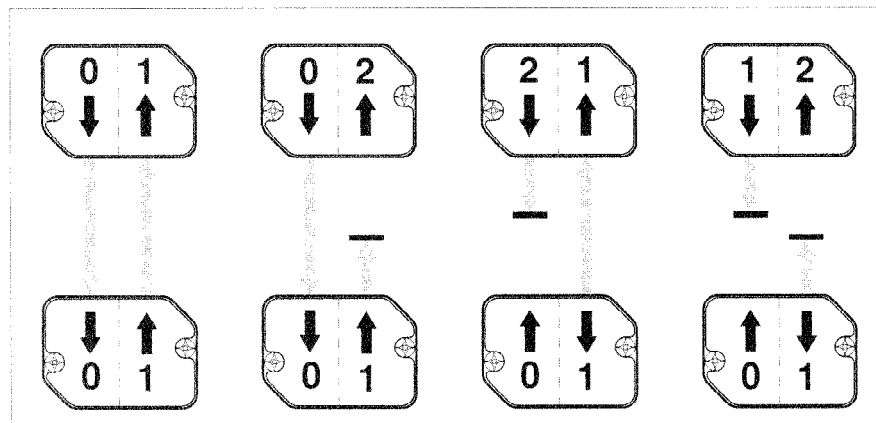


Fig. 4 Interleaved transmission



Notice

When operating several DLSP units in parallel, a minimum distance between the single units has to be kept. This minimum distance depends on the application, e.g.:

- Transmission while a vehicle is passing by
- Constant transmission with variable transmission distance (see "Transmission in parallel operation" above)

3.4.3 Storage of data outputs

The DLSP's data outputs can be stored if required. In this case, when the light beam is interrupted, the output data is retained.

The setting "save (0) / do not save (1)" is carried out using a DIP switch.

Benefit Following a data exchange, the outputs can be scanned at any time.

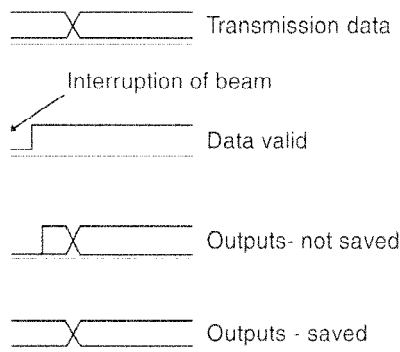


Fig. 5 Storage / non-storage of data outputs

3.4.4 Signal profile

Fig. 6 demonstrates the signal profile from the transmitter to the receiver during transmission of 1 serial telegram.

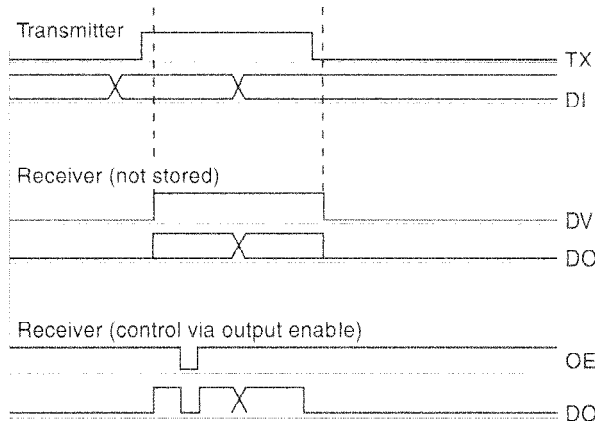


Fig. 6 Signal profile

- Data inputs (DI)* The signals at the 8 data inputs are transformed into a serial telegram with a parity bit and an address, and transmitted.
- Transmit input (TX)* With the positive flank of the TX signal, the waiting data is taken over by the inputs and transmitted. The transmit signal must be applied for at least 300 μ s.
- Continuous activation of TX is possible, in which case the input data is transmitted continuously.
- In the case of inactivation, transmission of the current telegram is completed. TX does not affect the receiving characteristics.
- Benefits*
- The receiver never receives garbled telegrams
 - Point-by-point data transmission is possible (transmission of a single telegram)
- Data valid output (DV)* This output signals the presence of valid data at the receiver. In the event of a faulty transmission or if the light beam has been interrupted, the output remains inactive ("O").
- Data outputs (DO)* In the no-signal status, the outputs are set at "O", active signals are indicated by "I".



Notice

If no data transmission takes place (e.g. TX in "O" status), all 8 outputs are set to "O".

Output enable input (OE)

If a "1" is applied at this input, the outputs are switched to the active operation status, i.e. it is possible for received signals to be read out. A "0" at this input results in "0" at all the outputs and the green indicator LEDs.

Benefits

The status of output drivers can easily be automatically checked by a programmable control system. "0" at the OE generally forces a signal change at the outputs.

4 Applications

4.1 Simple data transmission

The DLSP permits non-contact data exchange, for instance between industrial trucks (automatic guided vehicle systems) and fixed stations.

Benefits The wide optical beam angle does away with the need for unit adjustment. Even where the automatic guided vehicle deviates from the ideal travel path, reliable data transmission still takes place. Transmission is possible while the vehicle travels past the fixed station.

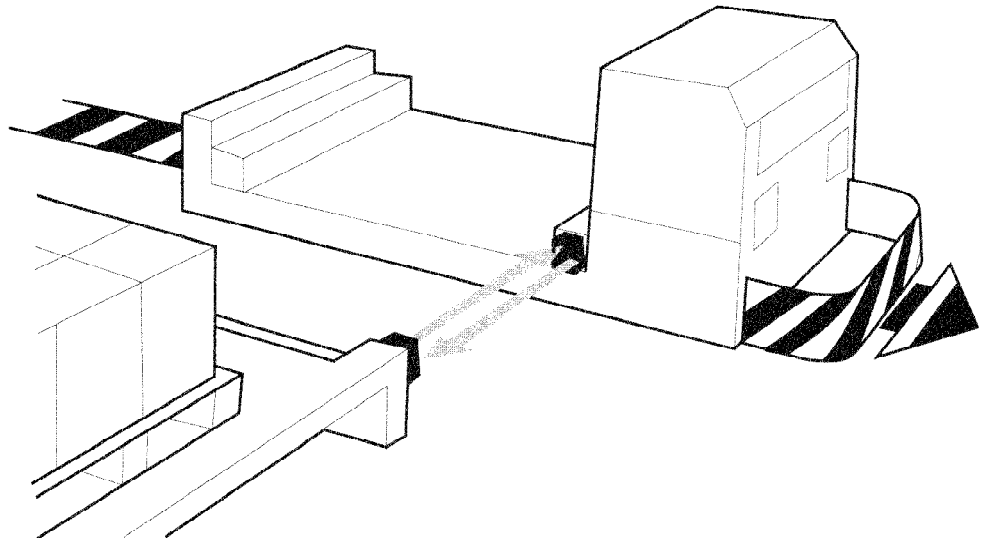


Fig. 7 Data exchange between the AGVS and the fixed station

4.2 Operation of several DLSPs - extending the number of channels

The facility for separate setting of the transmit and receive addresses permits

- parallel transmission of max. 32 signals per direction,
- interleaved transmission ranges.

With 2 (4) units operating in parallel, it is possible to transmit up to 16 (32) signals from the vehicle to the fixed station and back.

- By using different addresses, it is possible to prevent transmission between the fixed stations (1).
- By using different addresses, it is possible to prevent transmission between fixed stations positioned opposite each other (2).

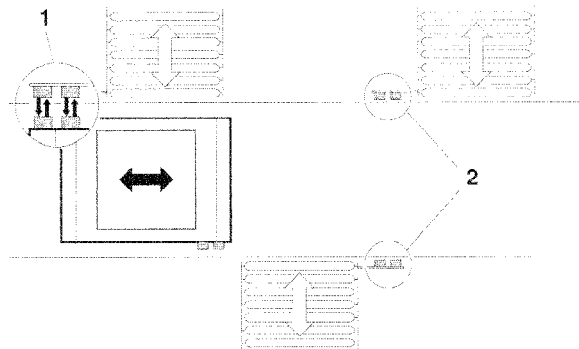


Fig. 8 Several DLSPs with addressing

4.3 Bus operation

The DLSP can also be used within bus systems, provided the following conditions exist:

- The 8 data inputs must be connected to the data outputs.
- For control of the transmission direction, the signals "Transmit" (TX) and "Output enable" (OE) are used.

In this way, it is possible to create, for example, isolated partial bus systems. By using up to 4 DLSP units per side, 32 bit wide bus systems can be configured.

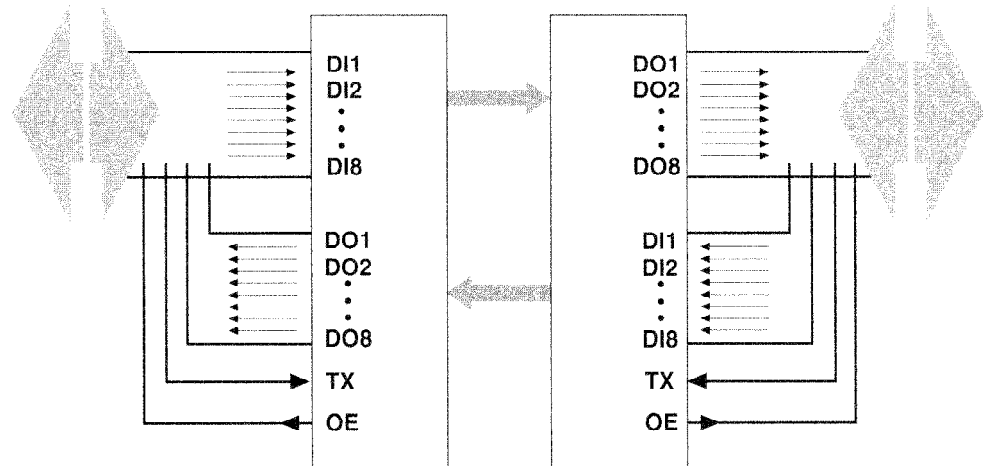


Fig. 9 DLSP in bus operation

4.4 Optical data storage

The DSLP offers the possibility of storing the output signals. This function can be used to configure the DLSP as a data storage device.

Application example:

- Information from a fixed station is transferred to a mobile station (storage device). These data are further directed to a corresponding fixed station.

DLSP setting - storage device

- Storage mode
- Connect inputs with outputs
- Transmit address: same as station receive address
- Receive address: same as fixed station transmit address (output point)

5 Specifications

5.1 Characteristic data

Manufacturer	Leuze electronic GmbH + Co. D-73277 Owen-Teck
Transmission medium	IR modulated light
Modulation	Pulse Pause Modulation (PPM)
Range	0 - 1.8 m
Time per data exchange	< 400 μ s
Resistance to outside light	30 klux
Optical beam angle	+/- 20°
EMC (IEC 801.4)	Supply: severity 4 I/O conductor: severity 3

Transmit / receive characteristics

(all specifications in cm)

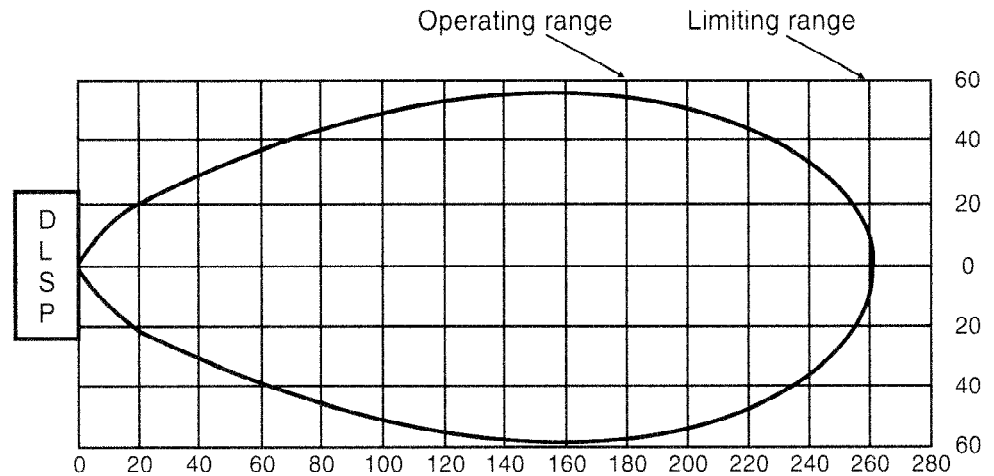


Fig. 10 Transmit / receive characteristics

5.2 Mechanical data

Housing	Aluminium
Surface finish	Anodized
Colour	Red/black
Dimensions	75 x 55 x 45 mm (W x H x D)
Terminals	Soldered, flat ribbon cable or spring-type
Fixture	2 M4 screws
Protection class	IP 65 (splash water protection)

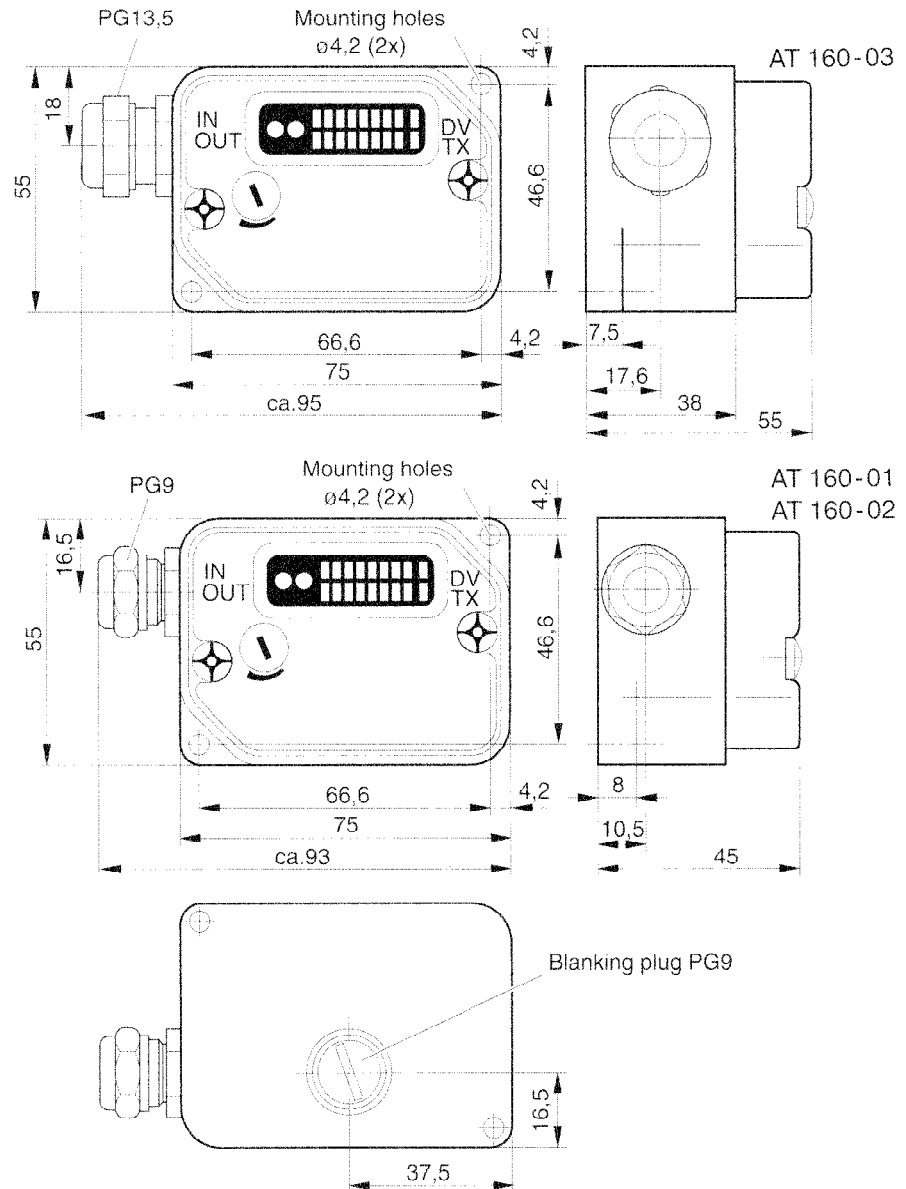


Fig. 11 Dimensions (mm)

5.3 Ambient conditions

Ambient temperature	-20°C to +60°C
Storage temperature	-30°C to +70°C

5.4 Electrical data

Supply	
Operating voltage	16-35V DC
Residual ripple	15%
Current consumption	appr. 130 mA (all LEDs on)

Inputs

Data inputs (Data IN)	max. 35 V DC, 4.5 mA
Transmit (TX)	H >= 8 V, L <= 5 V
Output enable (OE)	H >= 8 V, L <= 5 V

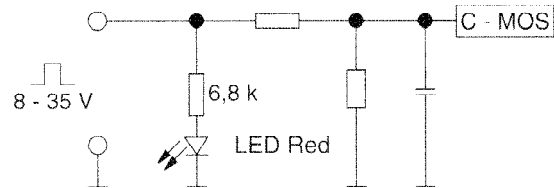


Fig. 12 Input circuit

Outputs

Data outputs (DO)	High-side driver, short-circuit proof	
	H >= UB - 2V, L <= 1.5 V	
max. load	2 outputs	each 250 mA
	3 outputs	each 160 mA
	4 outputs	each 120 mA
	5 outputs	each 100 mA
	6 outputs	each 80 mA
	7 outputs	each 70 mA
	8 outputs	each 60 mA

With a total data output load greater than 0.6 A, the back-up fuse triggers. The supply voltage must be switched off and back on again one time in order to activate the back-up fuse.

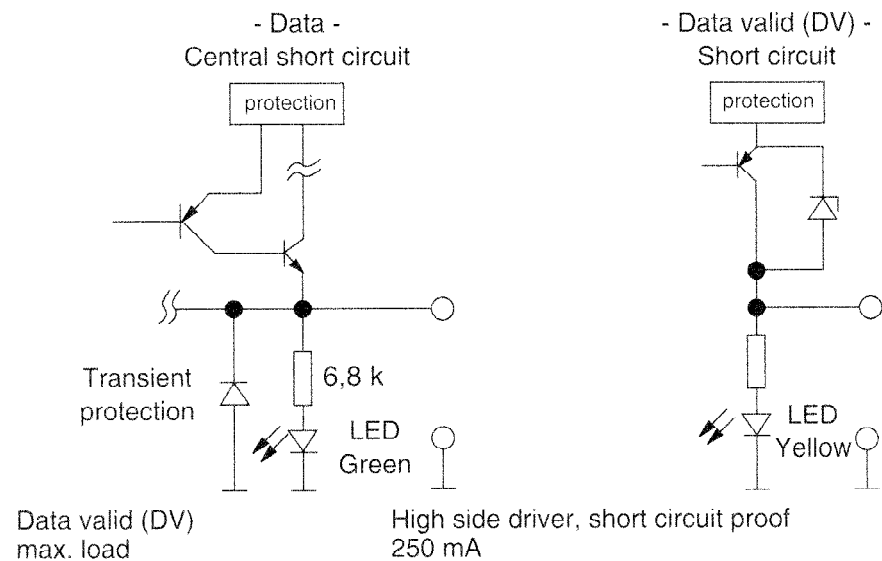
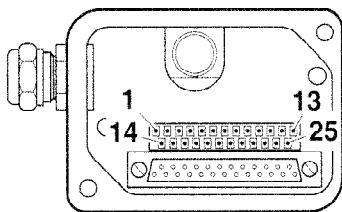


Fig. 13 Output circuit

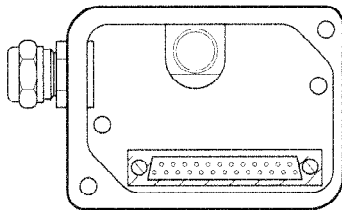
6 Installation and commissioning

6.1 Installation

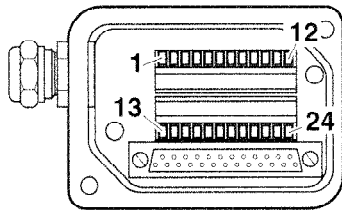
- Fasten the DLSP in position by tightening two M4 fixing screws with washers and circlips.
- Prepare the connecting cable
 - Cable cross-section 0.14-0.5 mm²
 - Cable outside diameter 5 - 9 mm (PG 9) or 13 mm (PG 13.5)
 - Shielding only necessary in case of strong interference fields
- Unscrew the housing
- Guide the connecting cables through the cable glands and solder in accordance with the plug assignment plan or crimp the ribbon cable in the crimping plug or insert the cores in the spring-type terminals and clamp.



Solder terminal



Ribbon cable



Spring-type terminal

Fig. 14 Plug assignment

Signal	Description	Assignment	
		Solder terminal Ribbon cable	Spring terminal
PE	Protective earth	1	1
U _B	Operating voltage 16 – 35 VDC	2	2
GND	Earth operating voltage	3	3
DI 8	Data input 8	4	4
DI 7	Data input 7	5	5
DI 6	Data input 6	6	6
DI 5	Data input 5	7	7
DI 4	Data input 4	8	8
DI 3	Data input 3	9	9
DI 2	Data input 2	10	10
DI 1	Data input 1	11	11
DV	Data valid	15	13
DO 8	Data output 8	16	14
DO 7	Data output 7	17	15
DO 6	Data output 6	18	16
DO 5	Data output 5	19	17
DO 4	Data output 4	20	18
DO 3	Data output 3	21	19
DO 2	Data output 2	22	20
DO 1	Data output 1	23	21
OE	Output enable	24	22
TX	Transmit data	25	23
			24/NC
			25/NC

6.2 Commissioning

6.2.1 Setting the DLSP

- Setting the transmit and receive address.
- Setting the output storage characteristics.

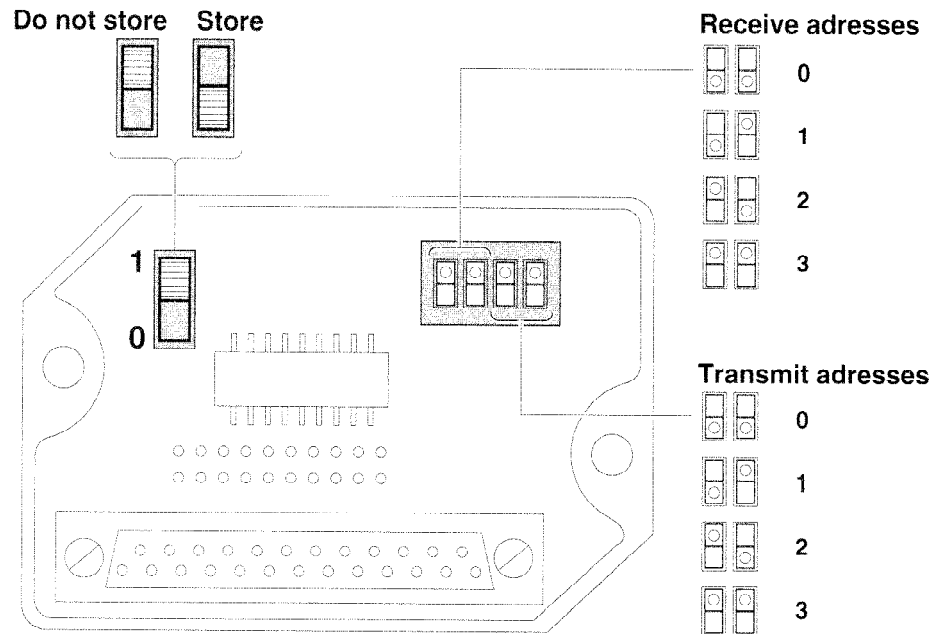


Fig. 15 Setting the DLSP

6.2.2 Performance test

- Switch on the supply voltage.
- Apply one or more input signals.
- Transmit data (input TX at "1").
The relevant input LEDs light up in red.
- Receive data (input Output enable at "1")
- Check receiver:
 - the relevant output LEDs light up in green,
 - the "Data valid" display lights up in yellow.
- Repeat the process for the other transmission direction.

6.2.3 Sensitivity adjustment

- Create the worst transmission conditions which can conceivably occur during use:
 - greatest possible distance,
 - greatest possible lateral offset.
- At the first unit, remove the cover over the potentiometer for sensitivity adjustment.
- Turn the potentiometer as far to the right as it will go.
- Then turn the potentiometer slowly to the left until the display "Data valid" goes out at the unit positioned opposite.
- Turn the potentiometer around back to the right by around 1/4 turn.
- Replace the cover over the potentiometer.
- Repeat the process at the other DLSP.

7 Maintenance

The DLSP 160 data transmission units are maintenance-free.

- Clean the transmit/receive window at the DLSP regularly. For cleaning, use a soft cloth and a cleaning agent (standard commercially available glass cleaner).



Attention

Do not use aggressive cleaning agents such as thinner or acetone for cleaning the device. These can destroy the window.

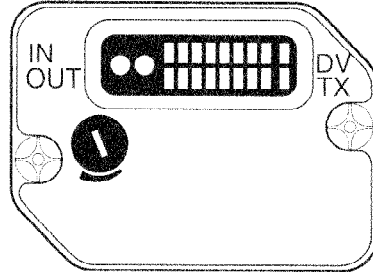
8 Faults and their remedy

Fault	Possible cause	Remedy
No data transmission, all LEDs are off.	Power supply fuse has blown.	Check fuses.
	No power supply.	Check power supply.
	Connection fault.	Check solder, plug-in terminals in the DLSP.
No data transmission, some LEDs are on.	Window requires cleaning.	Clean window.
	Incorrect addressing.	Check transmit and receive addresses at both DLSPs.
	Sensitivity of receiver incorrectly adjusted.	Check settings (page 17)
	No TX signal (the TX LED in the transmitter is not alight).	Check solder and plug-in terminals in the DLSP. Check signalling.
	No OE signal (DV LED is on at the receiver).	Check solder and plug-in terminals in the DLSP. Check signalling.
No data transmission, LEDs flicker.	Inadequate shielding.	Check shielding.
	Electrical earth is connected to housing earth.	Separate two earth connections.
	Major interference fields in close proximity.	Provide adequate insulation between DLSP and underlay.
Transmission error.	Influence from parallel or consecutive transmission paths.	Check transmit and receive addresses at all DLSPs. For every transmission path, a different address must be selected.
	Power supply earth is connected to housing.	Isolate the power supply earth from the housing.

9 Order designations

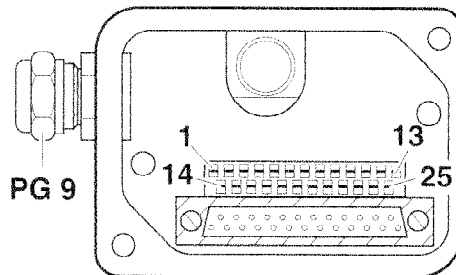
Electronic unit

Order designation: **DLSP 160S**



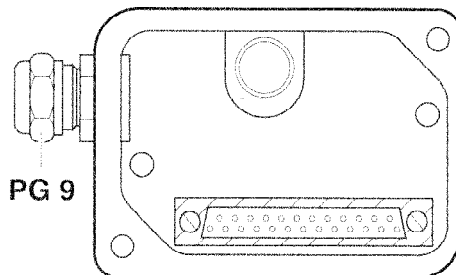
Connection unit with solder terminal

Order designation: **AT 160 - 01**



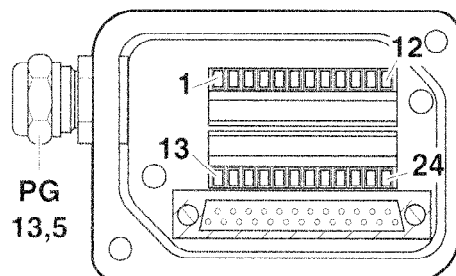
Connection unit with terminals for ribbon cable

Order designation: **AT 160 - 02**



Connection unit with spring-type terminals

Order designation: **AT 160 - 03**





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