

**Rotary
Encoders**

Linear Encoders

Motion

System

ID-200



User Manual

Bus-Capable Optical Data Transmission ID-200



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Document information

Release date/Rev. date: 11/23/2009
Document rev. no.: TR - E - BA - GB - 0022 - 01
File name: TR-E-BA-GB-0022-01.DOC
Author: MÜJ

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Revision index

Revision	Date	Index
First release	11/16/04	00
<ul style="list-style-type: none">• Further interfaces added	11/23/09	01

1 General Information

1.1 Explanation of symbols

The symbols used in this operating manual are explained below.



CAUTION !

Pay attention to passages marked with this symbol. Failure to heed this information can lead to injuries to personnel or damage to the equipment.



CAUTION Laser !

This symbol warns of possible danger through hazardous laser radiation.



Note

This symbol indicates text passages containing important information.

1.2 EC Declaration of conformity

The devices have been developed, designed and manufactured under observation of the applicable international and European standards and directives.

A corresponding declaration of conformity can be requested from TR-Electronic GmbH.

The manufacturer of the product, TR-Electronic GmbH in D-78647 Trossingen, operates a certified quality assurance system in accordance with ISO 9001.

1.3 Short description

Where data have to be transmitted to and from moving objects, optical data transmission systems provide an ideal solution.

With the ID-200 series, TR-Electronic offers optical, high-performance data transmission systems. The data transmission units are robust and are not subject to wear.

An ID-200 data transmission system consists of a set of two transmission and reception units: e.g. ID-200 40802-22010 and ID-200 40802-22020.

1.4 Features of the ID-200

The fact that bus systems are found in nearly all areas of industry places high demands on data transmission systems are required. The ID-200 fulfils these requirements, particularly with regard to:

- Transmission safety
- Minimum transmission times (real-time capable)
- Deterministic transmission

The ID-200 data transmission system, which is available in several model variations, makes possible the contact-free transmission of the following bus protocols:

- PROFIBUS FMS, DP, MPI, mixed-operation FMS – DP, up to max. 1.5 MBit/s, PROFISAFE
- INTERBUS 500 kBit/s, RS 422 general, copper cable
- INTERBUS 2 MBit/s / 500 kBit/s, fibre optic cable
- Data Highway + (DH+) from Rockwell Automation (Allen Bradley)
- Remote I/O (RIO) from Rockwell Automation (Allen Bradley)
- DeviceNet
- CANopen
- Ethernet for all protocols on TCP/IP or UDP

Other bus systems on request.

1.5 Operating principle

To prevent the devices from mutually interfering with one another during data transmission in duplex operation, two different frequency pairs must be used. These are indicated by the type designation -xx01x and -xx02x as well as the label **frequency f₁** und **frequency f₂** on the control panel.

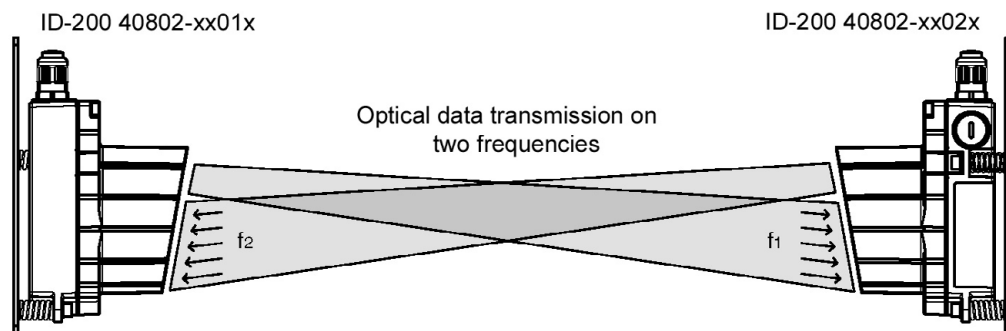


Figure 1-1: Operating principle

The receiving level is checked at both devices and can be read on a bar graph LED indicator. If the receiving level drops below a certain value, e.g. due to increased soiling of the optics, a warning output is activated.

All works on the device (mounting, connecting, aligning, indicator/operating elements) are performed comfortably on the front side.

2 Safety Notices

2.1 Safety standards

The optical ID-200 data transmission system was developed, manufactured and tested in accordance with applicable safety standards. It corresponds to the stand of the art.

2.2 Intended use



The ID-200 optical data transmission system has been designed and developed for the optical transmission of data in the infrared range.

CAUTION !

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

Areas of application

The ID-200 is suitable for the following areas of application:

- Automated high-bay warehouses
- Stationary data transmission between buildings
- Anywhere, where data transmission to and from stationary or moving objects (visual contact) over relatively long distances (up to 200 m) is required.
- Rotary transmission

2.3 Working safely



CAUTION Laser !

The ID-200 data transmission system uses an infrared diode and is a device of LED Class 1 according to EN 60825-1.

When used under reasonable conditions, devices of LED Class 1 are safe. This even includes the use of optical instruments used for the direct observation of the laser beam.

For the operation of the data transmission system with artificial optical radiation, we refer to directive 2006/25/EC or its implementation in the respective national legislation and to the applicable parts of EN 60825.



CAUTION !

Access and changes to the device, except where expressly described in this operating manual, are not authorised.

2.4 Organizational measures

Documentation

All notes in this operating manual must be heeded, in particular those in the sections 2 “Safety Notices” and 12 “Commissioning / Operation (all device models)”. Keep this technical description carefully. It should always be available.

Safety regulations

Consider the legal determination valid locally and the rules of the trade cooperative associations.

Qualified personnel

Mounting, commissioning and maintenance of the device may only be carried out by qualified personnel.

Work on electrical installations may only be carried out by qualified electricians.

Repair

Repairs must only be carried out by the manufacturer or an authorised representative.

3 Technical Data

3.1 General technical data

Electrical data	
Supply voltage V_{in}	18 ... 30 V DC
Current consumption without optics heating	approx. 200 mA at 24 V DC (no load at switching output)
Current consumption with optics heating	approx. 800 mA at 24 V DC (no load at switching output)

Optical data	
Sensing distance	0.2 ... 120 m, ID-200 40802-x10xx 0.2 ... 200 m, ID-200 40802-x20xx
Transmission diode	Infrared light, wavelength 880 nm
Opening angle	$\pm 0,5^\circ$ to optical axis
Ambient light	> 10000 Lux acc. to EN 60947-5-2 (2000)
Laser safety class	1 acc. to EN 60825-1

Input/output	
Input	0 ... 2 V DC: transmitter/receiver deactivated 18 ... 30 V DC: transmitter/receiver activated
Output	0 ... 2 V DC: normal operation $V_{in} - 2$ V DC: limited performance reserve output current max. 100 mA, short-circuit proof, protected against surge voltage, transients and overheating

Operating and display elements	
Membrane buttons	Change the operating mode
Individual LEDs	Indicate voltage supply, operating mode, data transmission (depends on the model)
LED strip	Bar graph display of the receiving level

Mechanical data	
Housing	Aluminium diecast; light inlet/outlet, glass
Weight	approx. 1200 g
Protection class	IP 65 acc. to EN 60529

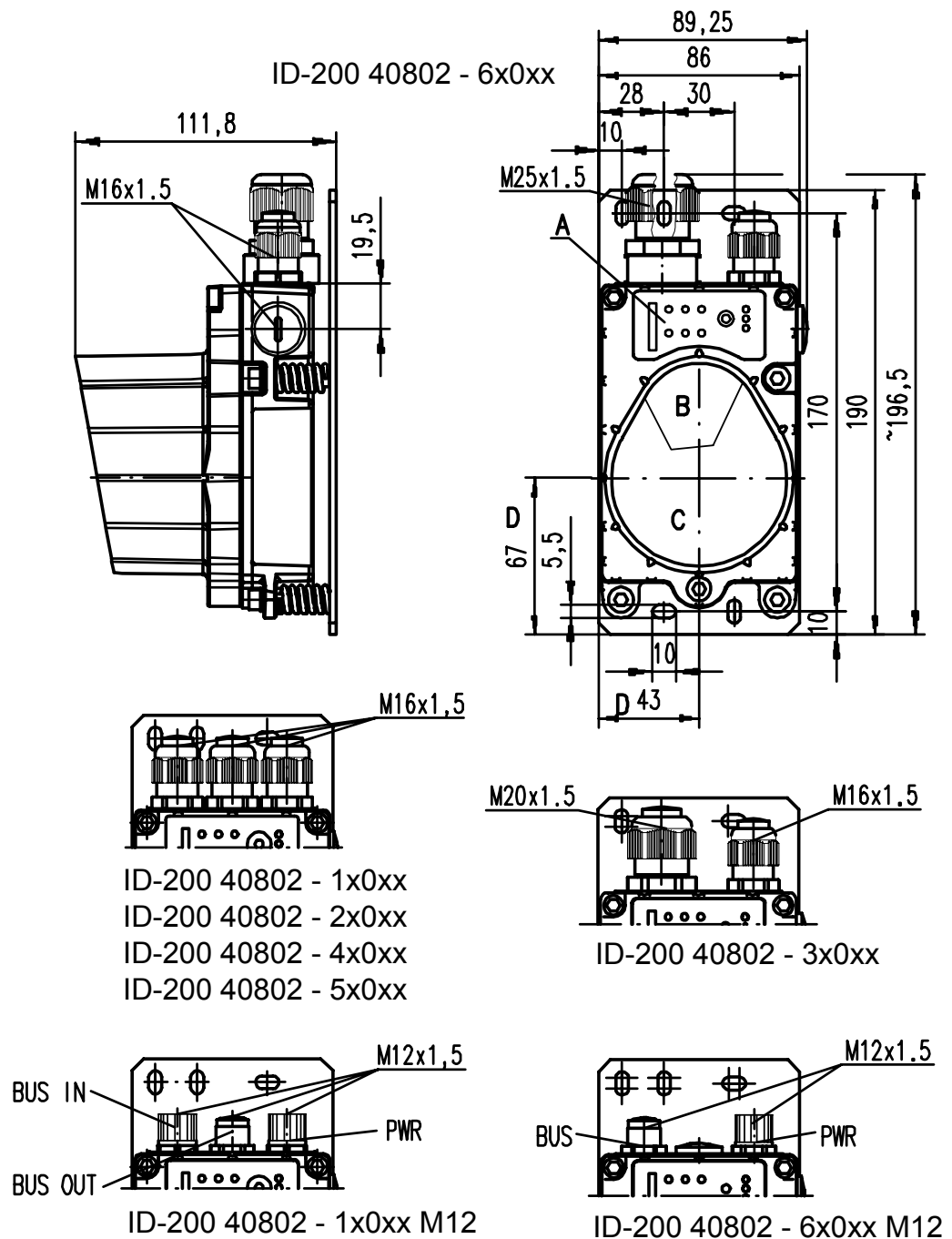
Environmental conditions	
Operating temperature	- 5°C ... +50°C without optics heating -30°C ... +50°C with optics heating (non-condensing)
Storage temperature	-30°C ... +70°C
Air humidity	max. 90% rel. humidity, non-condensing
Vibrations	acc. to EN 60068-2-6
Noise	acc. to EN 60068-2-64
Shock	acc. to EN 60068-2-27 and EN 60068-2-29
EMC ¹⁾	acc. to EN 61326 + A1 + A2 + A3 EN 61000-6-2 : 2005 and EN 61000-6-4 : 2001



¹⁾: **CAUTION !**

This is a Class A product. In a domestic environment this product may cause radio interference in which case the operator may be required to take adequate measures.

3.2 Dimensioned drawing



Permissible cables:

- M16 x 1.5: round cable \varnothing 5 ... 10 mm
- M20 x 1.5: round cable \varnothing 7 ... 12 mm
- M25 x 1.5: round cable \varnothing 4.5 ... 9 mm

- A** Control panel
- B** Transmission optics
- C** Reception optics
- D** Optical axis

Figure 3-1: Dimensioned drawing ID-200

4 Order Designations



Addresses for ordering

Products manufactured by TR-Electronic GmbH can be ordered from any of the distributor and service addresses listed on the last page.

Optical data transmission system ID-200,

Order designation

Explanation of the order designation

The order designation for the ID-200 is structured according to the following scheme:

ID-200 40802-AB0CD

The letters A - D represent the following device variants:

- A interface
 - 1 = PROFIBUS, RS485
 - 2 = INTERBUS 500 kBit/s / RS 422
 - 3 = INTERBUS 2 MBit/s fibre optic cable
 - 4 = Data Highway + (DH+) / Remote I/O (RIO)
 - 5 = DeviceNet / CANopen
 - 6 = Ethernet
- B range
 - 1 = 120 m
 - 2 = 200 m
- 0 extension
 - always 0
- C frequencies
 - 1 = carrier frequency pair 1
 - 2 = carrier frequency pair 2
- D optics heating
 - 0 = without optics heating
 - 1 = with optics heating (-30 - +50°C)



Two complete units with different frequencies (1 and 2) must be ordered for each transmission path.

5 Mounting / Installation (all device variants)

5.1 Mounting and alignment

An optical data transmission system, consisting of 2 ID-200 devices, involves mounting each of the devices on mutually opposing, plane-parallel, flat and usually vertical walls with unobstructed view of the opposing ID-200.

Make certain that, at the minimum operating distance A_{\min} the optical axes of the devices are aligned with one another within $\pm A_{\min} \cdot 0.01$ to ensure that the transmission/reception beams of the two devices lie within the opening angle. This also applies for rotary transmission.



Note

The opening angle (angle of radiation) of the optics is $\pm 0.5^\circ$ to the optical axis! For all device models, the horizontal and vertical adjustment angles of the fine alignment with the adjustment screws is $\pm 6^\circ$ for each. The optical transmission path between the ID-200s should not be interrupted. If interruptions cannot be avoided, please read the notice in chapter 12.4: "Operation".

Therefore, pay close attention when selecting a suitable mounting location!



CAUTION !

In case of a mobile arrangement for a ID-200 pay particular attention that the alignment of the devices relative to one another remains unchanged over the transmission path.

The transmission can be interrupted by e.g. jolts, vibrations or inclination of the mobile device due to irregularities in the floor or path.

Ensure adequate track stability! (see also chapter 14.2: "Diagnostic mode")

Mount each device with 4 screws $\varnothing 5$ mm using 4 of the 5 fastening holes in the mounting plate of the device (see Figure 3-1: Dimensioned drawing ID-200).

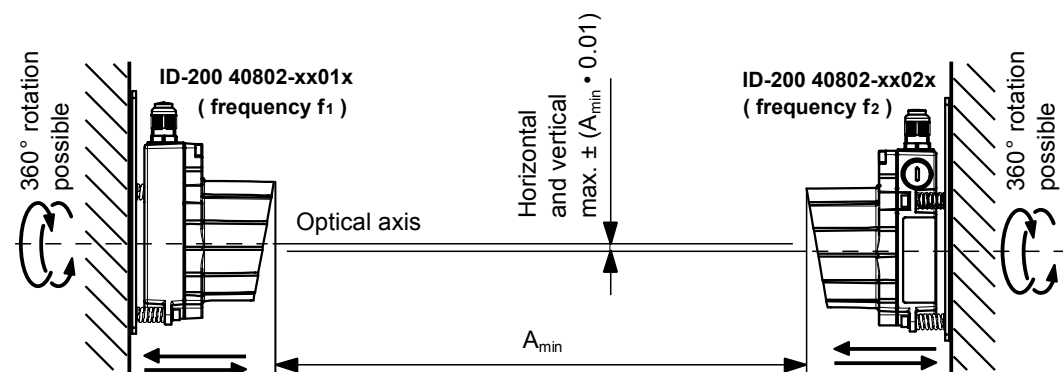


Figure 5-1: Mounting the devices



Note

The fine alignment of the transmission system is performed during commissioning (see chapter 12.3.2: "Fine adjustment"). The position of the optical axis of the ID-200 can be found in Figure 3-1.

5.2 Arrangement of adjacent transmission systems

To prevent mutual interference of adjacent transmission systems, the following measures should be taken in addition to exact alignment:

- In the case of an **offset frequency arrangement**, the **distance between two parallel** data transmission paths must not be less than
- In the case of **identical frequency arrangement**, the **distance between two parallel** data transmission paths must be at least

300 mm + tan (0.5°) x sensing distance (ID-200 / 120 m), or
500 mm + tan (0.5°) x sensing distance (ID-200 / 200 m)

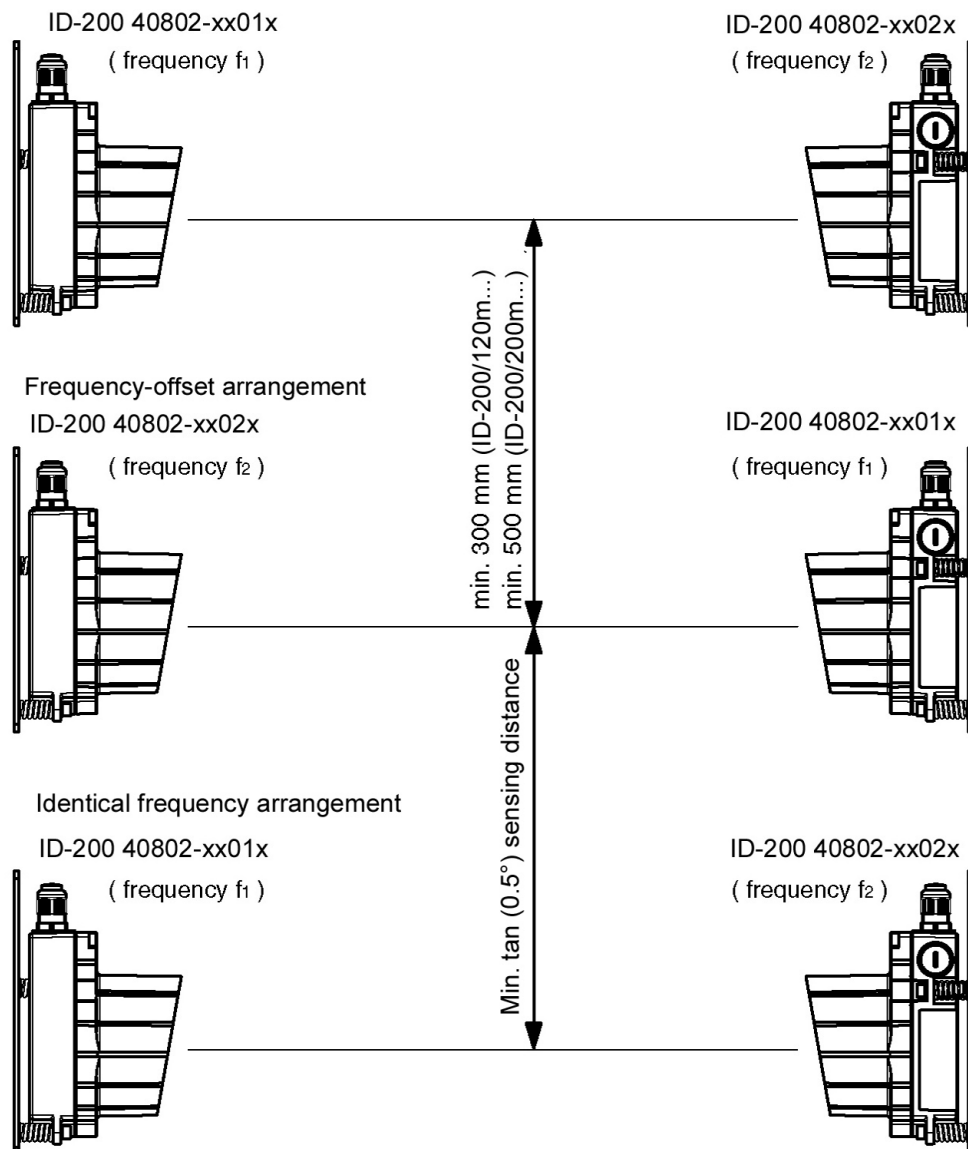


Figure 5-2: Arrangement of adjacent transmission systems

5.3 Cascading (series connection) of several ID-200 data paths

If two communicating participants (TN) are separated by several optical transmission paths between two participants, then this is called cascading. There are further participants between the individual optical transmission paths in this case.

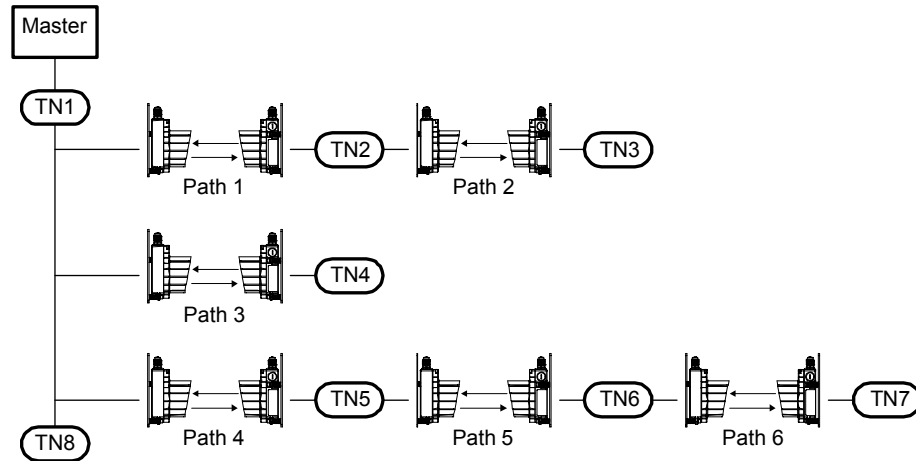


Figure 5-3: Cascading of several ID-200 systems



CAUTION !

If, for example, participant 3 (TN3) of a multi-master bus system wants to exchange data directly with participant 7 (TN7), then 5 optical transmission paths are cascaded. This constellation can also occur if, e.g., a programming device that attempts to access participant 3 (TN3) is connected to participant 7 (TN7) for maintenance purposes or during commissioning of a master-slave-system.

The following table shows the maximum number of optical transmission paths for cascading.

Bus system	Max. number of optical transmission paths for cascading	Remark
Profibus (with retiming)	3	Attention: Profibus FMS is a multi-master bus
RS 485 (without retiming)	2	
Interbus 500 kBit (RS422)	3	
Interbus FOC	3	Applies for 500 kBit and 2 MBit
RIO	3 ¹⁾	
DH+	3 ¹⁾	Attention: DH+ may be a multi-master bus
DeviceNet	3	Depends significantly on the configuration of the master and on the requirements of the plant (timing).
CANopen	3	
Ethernet	3	

¹⁾: See remarks in the respective chapters of the individual bus systems about the switch position filtered / not filtered depending on the transmission rate.



Note

The individual time delay of the optical transmission path is specified in the chapters of the individual bus systems and depends on the type, switch position, and transmission rate.

5.4 Electrical connection



CAUTION !

Connection of the device and maintenance work while under voltage must only be carried out by a qualified electrician.

If faults cannot be corrected, the device should be removed from operation and protected against possible use.

Before connecting the device, be sure that the supply voltage agrees with the value printed on the nameplate.

The ID-200... is designed in accordance with safety class III for supply by PELV (Protective Extra Low Voltage, with reliable disconnection).

For UL applications: only for use in class 2 circuits according to NEC.

Be sure that the functional earth is connected correctly. Error-free operation is only guaranteed if the device is connected to functional earth.

Described in the following two sub-chapters is the electrical connection of the supply voltage, the input and the output.

The connection of the respective bus system is described in the following chapters.

5.4.1 Electrical connection - devices with screwed cable glands and terminals

To establish the electrical connections, you must first remove the red housing top with the optics. To do this, loosen the three housing hex screws. The housing top is now only electrically connected to the base by means of a connector. Carefully pull the housing top straight forward without canting.

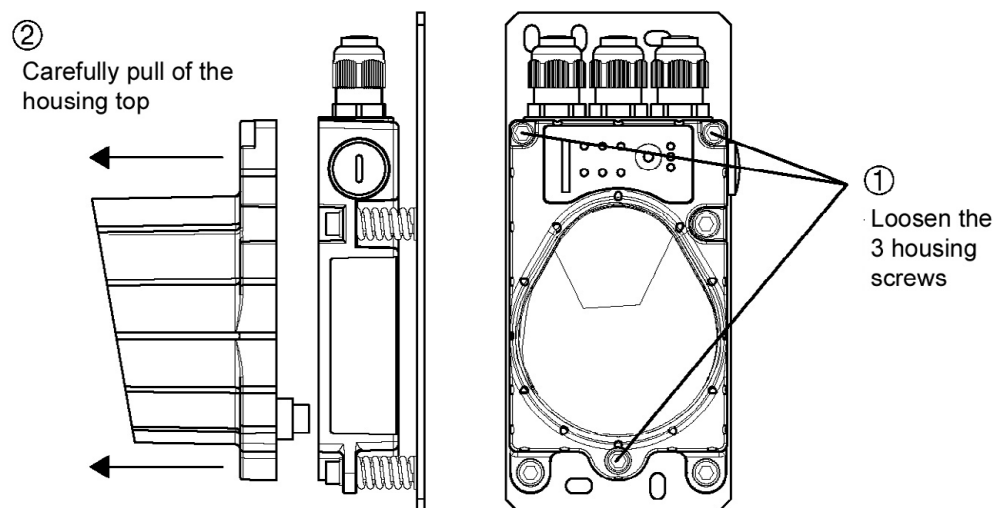
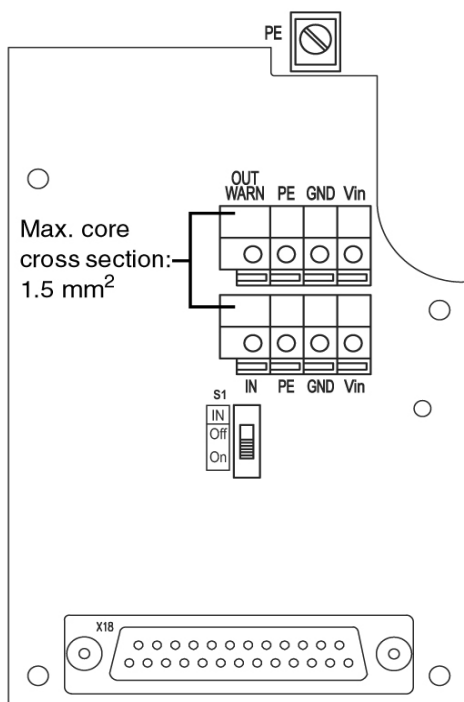


Figure 5-4: Removing the housing top

The connection place in the housing base with the screwed cable glands is now freely accessible.



Terminal	Function
Vin	Positive supply voltage +18 ... +30 V DC
GND	Negative supply voltage 0 V DC
PE	Functional earth
OUT WARN	Switching output , activated if level drops below the warning level
IN	Switching input for transmitter/receiver cut-off: 0 ... 2 V DC: transmitter/receiver switched off, no transmission 18 ... 30 V DC: transmitter/receiver active, normal function

Switch	Function
S1	On (default): The switching input is not analysed. The transmitter/receiver unit is always in operation. Off: The switching input is analysed. Depending on the input voltage, normal function or transmitter/receiver unit switched off.

Figure 5-5: Position of the general, non-bus-specific terminals and switches

5.4.1.1 Supply voltage

Connect the supply voltage, including the functional earth, to the spring terminals labelled **Vin**, **GND** and **PE** (see Figure 5-5).



Note

The connection terminals *Vin*, *GND* and *PE* are provided double to simplify wiring through the supply voltage to other devices.

The functional earth can alternatively be connected at the screw terminal in the housing base (max. cable cross section 2.5 mm²).

If you would like to wire through the supply voltage, you should replace the filler plugs on the right side of the housing base with an M16 x 1.5 screwed cable gland and guide the continuing supply voltage cable through this gland. The housing seal is, in this way, ensured (Protection Class IP 65).

The housing top can be removed and replaced under voltage.

5.4.1.2 Switching input

The ID-200 is equipped with a switching input **IN**, via which the transmitter/receiver unit can be switched off, i.e. no infrared light is transmitted and at the bus terminals the corresponding bus bias level is present / the bus driver is high resistance.

Input voltage:	0 ... 2 V DC:	transmitter/receiver switched off, no transmission
(relative to GND)	18 ... 30 V DC:	transmitter/receiver active, normal function

For easier operation, the switching input can be activated/deactivated via switch S1:

Position S1:	On:	The switching input is not analysed. The transmitter/receiver unit is always in operation (internal preselection of the switching input with Vin).
	Off:	The switching input is analysed. Depending on the input voltage, normal function or transmitter/receiver unit switched off.



Note

When transmitter/receiver unit is switched off, the system behaves in the same way as in the event of a light beam interruption (see chapter 12.4: "Operation").

The switching input can be used, e.g., during a corridor change in order to avoid basely interference effects from other sensors or the data transmission.

Switch S1 is also present on the device models with M12 connectors.

5.4.1.3 Switching output

The ID-200 is equipped with a switching output **OUT WARN** which is activated if the receiving level in the receiver drops.

Output voltage:	0 ... 2 V DC:	operating range
(relative to GND)	Vin – 2 V DC:	warning or shutoff range

The switching output is protected against:
short-circuit, surge current, surge voltage, overheating and transients.



Note

The ID-200 is still completely functional when the level of the receiving signal drops to the warning signal level. Checking the alignment, and, if applicable, a readjustment and/or cleaning of the glass pane leads to a significant improvement of the received signal level.

5.4.2 Electrical connection - devices with M12 connectors

The electrical connection is easily performed using M12 connectors. Corresponding mating connectors are available for connecting supply voltage/switching input/switching output as well as for connecting the respective bus system (see chapter 15: "Accessories").

For all M12 device models, the supply voltage, the switching input and the switching output are connected via the right, A-coded connector **PWR IN** (see Figure 5-6).

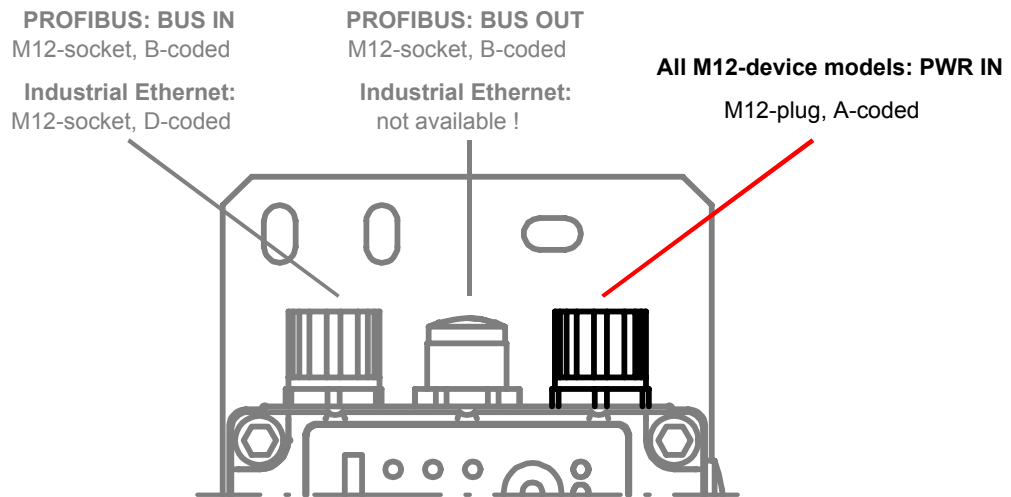


Figure 5-6: Location and designation of the M12 connections

PWR IN (5 pin M12-plug, A-coded)			
	Pin	Name	Remark
<p>M12-plug (A-coded)</p>	1	Vin	Positive supply voltage +18 ... +30 V DC
	2	OUT WARN	Switching output , activated if level drops below the warning level
	3	GND	Negative supply voltage 0 V DC
	4	IN	Switching input for transmitting/receiver cut-off: 0 ... 2 V DC: transmitting/receiver switched off, on transmission 18 ... 30 V DC: transmitting/receiver active, normal function
	5	FE	Functional earth
	Thread	FE	Functional earth (housing)

Figure 5-7: Assignment M12 connector PWR IN

5.4.2.1 Supply voltage

Connect the supply voltage including functional earth according to the pin assignments (see Figure 5-7).

5.4.2.2 Switching input

The ID-200 is equipped with a switching input **IN** (pin 1), via which the transmitter/receiver unit can be switched off, i.e. no infrared light is transmitted and at the bus terminals the corresponding bus bias level is present / the bus driver is high resistance.

The upper part of the housing only needs to be removed if the switching input is to be activated/deactivated via switch **S1** (for further information, see Figure 5-4, Figure 5-5 and chapter 5.4.1.2: "Switching input").

Input voltage:	0 ... 2 V DC:	transmitting/receiver switched off, no transmission
(relative to GND)	18 ... 30 V DC:	transmitting/receiver active, normal function

For easier operation, the switching input can be activated/deactivated via switch S1 (see chapter 5.4.1: "Electrical connection - devices with screwed cable glands and terminals", Figure 1-1 and Figure 5-5):

Position S1:	On:	the switching input is not analysed. The transmitter/receiver unit is always in operation (internal preselection of the switching input with V_{in}).
	Off:	the switching input is analysed. Depending on the input voltage, normal function or transmitter/receiver unit switched off.



Note

When transmitter/receiver unit is switched off, the system behaves in the same way as in the event of a light beam interruption (see chapter 12.4 "Operation").

The switching input can be used, for example, during a corridor change to completely avoid interference effects from other sensors or the data transmission.

Switch S1 is also present on the device models with M12 connectors.

5.4.2.3 Switching output

The ID-200 is equipped with a switching output OUT WARN which is activated if the receiving level in the receiver drops.

Output voltage:	0 ... 2 V DC:	operating range
(relative to GND)	$V_{in} - 2$ V DC:	warning or shutoff range

The switching output is protected against:
short-circuit, surge current, surge voltage, overheating and transients.



Note

The ID-200 is still completely functional when the level of the receiving signal drops to the warning signal level. Checking the alignment, and, if applicable, a readjustment and/or cleaning of the glass pane leads to a significant improvement of the received signal level.

6 PROFIBUS / RS 485

The PROFIBUS model of the ID-200 has the following features:

- Operating ranges 120 m, 200 m
- Electrically isolated interface
- The ID-200 does not occupy a PROFIBUS address
- Integrated repeater function (signal processing), can be switched off
- Protocol-independent data transmission, i.e. transmission of the FMS, DP, MPI, FMS/DP mixed operation protocols
- 2 connection variants: terminal connection with screwed cable glands or M12 connectors
- Connectable bus terminator (termination), or ext. terminator plug on the M12 model
- 6 baud rates can be set (see chapter 6.3: "Device configuration PROFIBUS")
- Optional M12 connector set for conversion available on request
- It is possible to cascade several ID-200 (see chapter 5.3)

6.1 PROFIBUS connection – devices with screwed cable glands and terminals

The electrical connection to the PROFIBUS is made at the terminals **A**, **B**, and **COM**. The terminals **A'**, **B'** and **COM** are provided for wiring through the bus.

PROFIBUS – terminals and switches

Terminal	Function
A, -	(N) PROFIBUS or (-) RS 485
B, +	(P) PROFIBUS or (+) RS 485
COM	Potential equalisation
A', -'	(N) PROFIBUS (-) respectively RS 485 of the wired-through bus
B', +'	(P) PROFIBUS or (+) RS 485 of the wired through bus

Switch	Function
S2	Termination On/Off
S3-1 ... S3-3	Setting the baud rate of the PROFIBUS segment
S3-4	Changeover PROFIBUS (Off) / RS 485 (On)

Figure 6-1: Connection board of PROFIBUS model with terminals and screwed cable glands



CAUTION !

Please be sure to observe the installation requirements (bus cables, cable lengths, shielding, etc.) defined in the PROFIBUS standard EN 50170 (Vol.2).

6.1.1 Converting the PROFIBUS model with terminals to M12 connectors

On request an optional M12 connector set is available. It consisting of a M12 connector (A-coded, power), M12 connector (B-coded, bus) and M12 socket (B-coded, bus), with ready-made wires. This can be used to convert the PROFIBUS models with terminals/screwed cable glands to M12 connectors.

6.1.2 Conversion to M12 connectors

1. Remove screwed cable gland 1, 2 and 3 (spanner size = 20mm)
2. Screw M12 plug (power) into the thread of the screwed cable gland 1 that you have just removed and tighten it with spanner SW18.
3. Screw M12 socket (bus) into the thread of the screwed cable gland 2 that you have just removed and tighten it with spanner SW18.
4. Screw M12 plug (bus) into the thread of the screwed cable gland 3 that you have just removed and tighten it with spanner SW18.
5. Connect cables acc. to Figure 6-2 and Table 6-1.

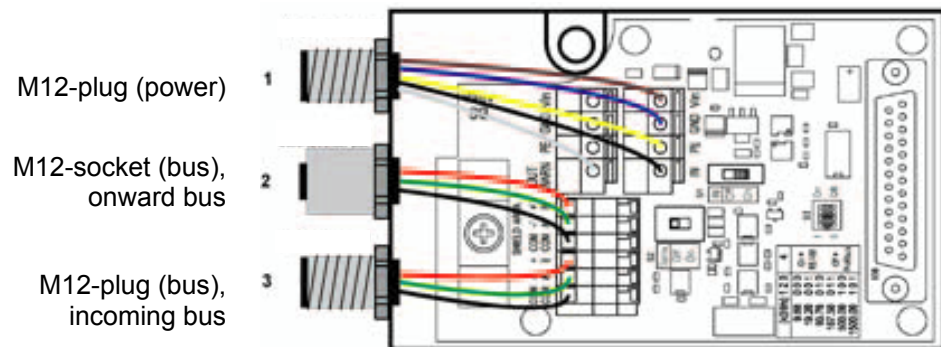


Figure 6-2: Installation and connection of the optional M12 connectors

(1) M12 plug (Power)		(2) M12 socket (bus), onward bus		(3) M12 plug (bus), incoming bus	
Pin 1 (brown)	Vin	Pin 1 (not used)	-	Pin 1 (not used)	-
Pin 2 (white)	OUT	Pin 2 (green)	A-OUT	Pin 2 (green)	A-IN
Pin 3 (blue)	GND	Pin 3 (black)	COM	Pin 3 (black)	COM
Pin 4 (black)	IN	Pin 4 (red)	B-OUT	Pin 4 (red)	B-IN
Pin 5 (yellow/green)	PE	Pin 5 (not used)	-	Pin 5 (not used)	-
		Screw fitting	Shield	Screw fitting	Shield

Table 6-1: Connection of M12 connectors



Note

The orientation of the M12 connectors is not defined. The use of angular M12 connectors as counterparts is therefore discouraged.

An external termination on the M12 socket is **not** possible. For terminating the device, the termination switch **S2** must be used always

6.2 PROFIBUS connection - devices with M12 connectors

The electrical connection of the PROFIBUS is easily performed using M12 connectors. Corresponding mating connectors are available for connecting the incoming bus as well as for connecting the continuing bus (see chapter 1.2: "PROFIBUS").

For all M12 device models, the connection is made via the two left, B-coded connectors **BUS IN** and **BUS OUT** (see Figure 6-3).

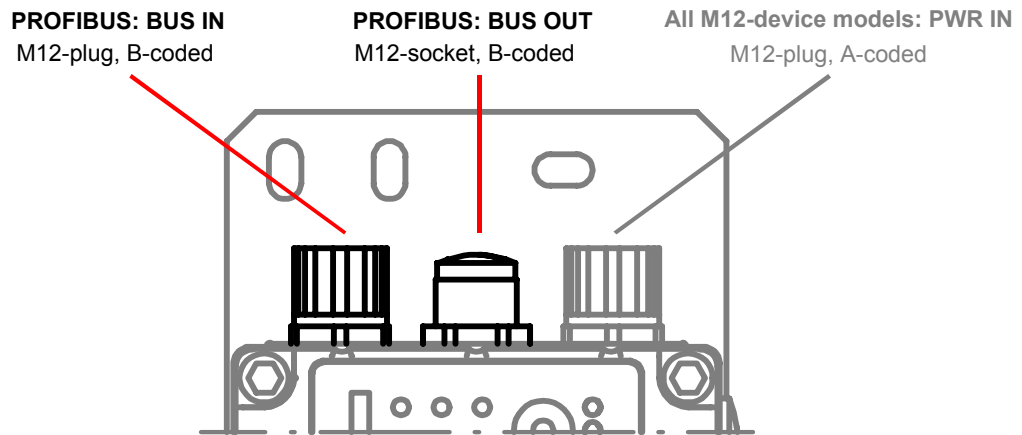


Figure 6-3: Location and designation of the M12 PROFIBUS connections

BUS IN (5 pin. M12-plug, B-coded)			
BUS IN	Pin	Name	Remark
<p>M12-plug (B-coded)</p>	1	NC	Not used
	2	A (N)	Receive/transmit data A-line (N)
	3	GNDP	Data reference potential
	4	B (P)	Receive/transmit data B-line (P)
	5	NC	Not used
	Thread	FE	Functional earth (housing)

Figure 6-4: Assignment M12 connector BUS IN

BUS OUT (5 pin M12-socket, B-coded)			
BUS OUT A (N) VCC 1 2 3 GNDP B (P) NC M12-socket (B-coded)	Pin	Name	Remark
	1	VCC	5 V DC for bus terminator (termination)
	2	A (N)	Receive/transmit data A-line (N)
	3	GNDP	Data reference potential
	4	B (P)	Receive/transmit data B-line (P)
	5	NC	Not used
	Thread	FE	Functional earth (housing)

Figure 6-5: Assignment M12 connector BUS OUT

6.2.1 Termination for devices with M12 connectors



Note

If the PROFIBUS network begins or ends at the ID-200 (not a continuing bus), the **BUS OUT** connection must be terminated with the terminator plug which is available as an optional accessory.

In this case, please also order the “terminator plug” 40803-40005 (see chapter 1.2.1: “Terminator plug PROFIBUS”).

6.3 Device configuration PROFIBUS

6.3.1 Termination for devices with screwed cable glands and terminals

The PROFIBUS can be terminated via the switch **S2** in the ID-200. If the **termination is active (S2 = On)**, internal bus resistors are connected as per the PROFIBUS standard and the PROFIBUS is not wired through at terminals **A'** and **B'**.

Activate the termination when the PROFIBUS segment begins or ends at the ID-200. The default setting is **termination inactive (S2 = Off)**.

6.3.2 Adjustment of the transmission rate

You must set the transmission rate of your PROFIBUS segment using the three DIP switches S3-1 up to S3-3. Possible transmission rates are:

- 9.60 kBit/s
- 19.20 kBit/s
- 93.75 kBit/s
- 187.50 kBit/s
- 500.00 kBit/s
- 1500.00 kBit/s

Set the transmission rate in accordance with the table printed on the connection circuit board (see Figure 6-1). The default setting is:

- 9.6 kBit/s for ID-200 PROFIBUS device models with terminal connection
- 1500 kBit/s for ID-200 PROFIBUS device models with M12 connection

6.3.3 Changeover PROFIBUS / RS 485 (default: 'Off' = PROFIBUS)

The ID-200 has, as a standard function, a repeater function (signal processing) and is, with regard to the PROFIBUS, to be viewed as a repeater.



Note

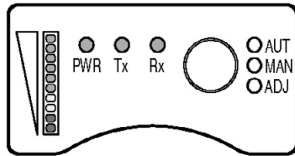
Please observe the guidelines specified in EN 50170 (Vol.2) regarding the use of repeaters. The delay time of a data transmission path is maximum $1.5 \mu\text{s} + 1 T_{\text{Bit}}$.

It is also possible to transmit other RS 485 protocols. For PROFIBUS applications, S3-4 should be set to 'Off' ('0'). DIP-switch S3-4 can be used to switch off the repeater function for non-PROFIBUS applications (S3-4 = 'On'). In this case, no signal regeneration takes place. The RS 485 protocol must, however, still provide certain features.

Please contact the manufacturer if you would like to use the ID-200 for general RS 485 protocols.

6.4 LED Indicators PROFIBUS

In addition to the indicator and operating elements present in all device models (bar graph, buttons, LEDs AUT, MAN, ADJ; see chapter 12.1 "Indicator and operating elements") the PROFIBUS model also has the following indicators:



LED PWR :	green	= operating indicator
	green flashing	= transmitter/receiver unit switched off via switching input IN or hardware error
	off	= no operating voltage
LED Tx :	green	= data are being transmitted to the bus
	green flashing	= with baud rates set to very low values, the LEDs Tx and Rx flicker. At very high baud rates (> 50 kBit/s), flashing LEDs Tx and Rx indicate faulty bus communication.
	off	= no data on the transmission line
LED Rx :	green	= data are being received by the bus
	green flashing	= with baud rates set to very low values, the LEDs Tx und Rx . flicker. At very high baud rates (> 50 kBit/s) flashing LEDs Tx and Rx indicate faulty bus communication.
	off	= no data on the reception line

Figure 6-6: Indicator/operating elements for the PROFIBUS model

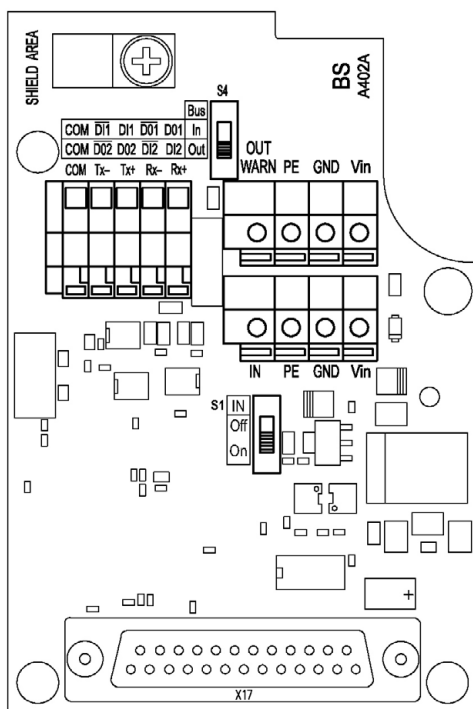
7 INTERBUS 500 kBit/s / RS 422

The INTERBUS model of the ID-200 has the following features:

- Operating ranges 120 m, 200 m
- Electrically isolated interface
- The ID-200 is **not an** INTERBUS subscriber
- Protocol-independent data transmission, transparent compared to other RS 422 protocols
- 500 kBit/s fixed transmission rate with INTERBUS, with RS 422 generally lower transmission rates as well
- Cascading of several ID-200 is possible (see chapter 5.3: “Cascading (series connection) of several ID-200 data paths”)

7.1 Electrical connection INTERBUS 500 kBit/s

The electrical connection to the INTERBUS is made at terminals **DO.../ DI...** and **COM** as shown in Figure 7-1.



INTERBUS – terminals and switches

Terminal	Function
DO1; DI2, Rx+	Reception line +
/DO1; /DI2, Rx-	Reception line -
DI1; DO2, Tx+	Transmission line +
/DI1; /DO2, Tx-	Transmission line -
COM	Potential equalisation

Switch	Function
S4	Position In : incoming bus with shielding connection via RC circuit
	Position Out (default) : outgoing bus with direct shielding connection

Figure 7-1: Connection circuit board of the INTERBUS model



CAUTION !

Please be sure to observe the installation requirements (bus cables, cable lengths, shielding, etc.) defined in the INTERBUS standard EN 50254.

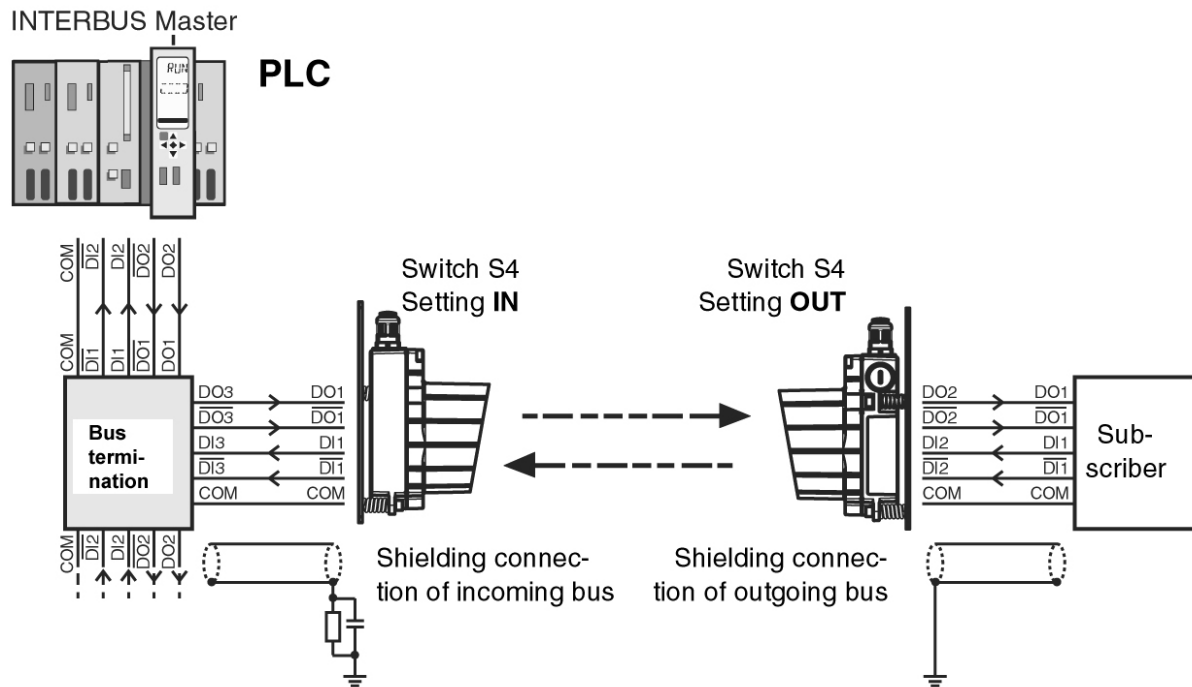


Figure 7-2: Connection ID-200 to the INTERBUS (copper line)

7.2 Device configuration INTERBUS 500 kBit/s / RS 422

7.2.1 Device configuration INTERBUS

Changeover incoming/outgoing bus and shielding connection (default: 'Out')

Switch **S4** must be used to specify in the ID-200 whether the connected bus cable is for the incoming bus (In) or outgoing bus (Out):

- Switch 4:**
- Setting **In:** incoming bus, the shielding connection (clamp) is connected via a RC circuit to PE
 - Setting **Out:** outgoing bus, the shielding connection (clamp) is connected directly to PE

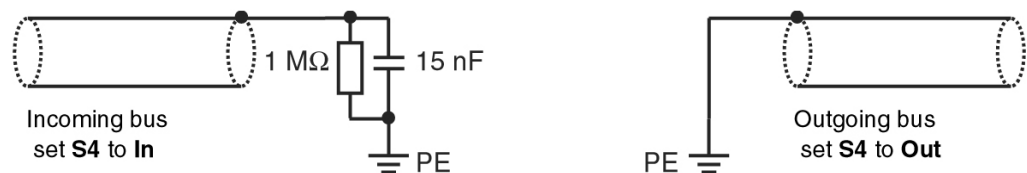


Figure 7-3: Shielding connection for incoming/outgoing bus

7.2.2 Device configuration RS 422

General RS 422 protocols can be transmitted with the ID-200. No baud rate setting is necessary (max. 500 kBit/s). The shielding connection can be set via switch S4 as with the Interbus.

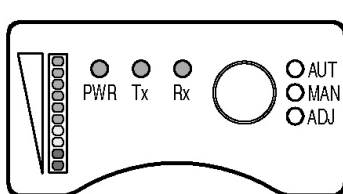


Note

The delay time of a light path is 1.5 μs (depending on the distance).

7.3 LED indicators INTERBUS 500 kBit/s / RS 422

In addition to the indicator and operating elements present in all device models (bar graph, buttons, LEDs AUT, MAN, ADJ; see Chapter 12.1 “Indicator and operating elements”) the INTERBUS model also has the following indicators:



- | | | |
|------------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| LED PWR : | green | = operating indicator |
| | green flashing | = transmitter/receiver unit switched off via switching input IN or hardware error |
| LED Tx : | off | = no operating voltage |
| | green | = data are being transmitted to the bus |
| | green flashing | = with baud rates set to very low values, the LEDs Tx and Rx flicker. At very high baud rates (> 50 kBit/s), flashing LEDs Tx and Rx indicate faulty bus communication. |
| LED Rx : | off | = no data on the transmission line |
| | green | = data are being received by the bus |
| | green flashing | = with baud rates set to very low values, the LEDs Tx and Rx flicker. At very high baud rates (> 50 kBit/s), flashing LEDs Tx and Rx indicate faulty bus communication. |
| | off: | = no data on the reception line |

Figure 7-4: Indicator/operating elements for the INTERBUS model

8 INTERBUS 2 MBit/s Fibre Optic Cable

The INTERBUS fibre optic cable model of the ID-200 has the following features:

- Operating range 200 m
- Transmission protected against interference by the use of fibre optic cables
- Bus connection by means of polymer-fibre cable with FSMA connector
- The ID-200 is an INTERBUS subscriber (Ident-Code: 0x0C = 12_{dec}), but does not occupy data in the bus
- Adjustable transmission rate 500 kBit/s or 2 MBit/s
- Cascading of several ID-200 is possible (see chapter 5.3: “Cascading (series connection) of several ID-200 data paths”)

8.1 Fibre optic cable connection INTERBUS 2 MBit/s

The connection to the INTERBUS occurs by the FSMA connectors **H1** and **H2** as shown in Figure 8-1.

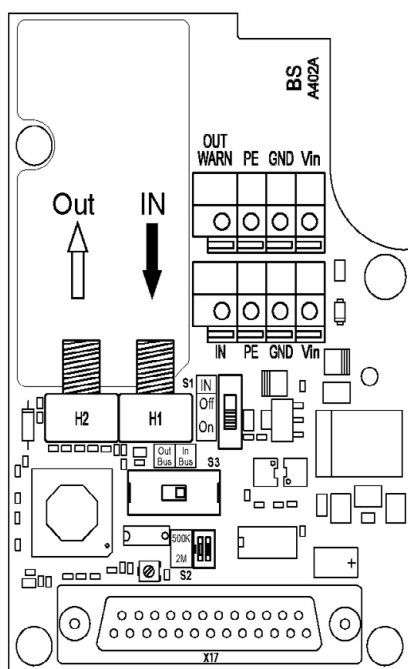
Recommended fibre optic cable:

- PSM-LWL-KDHEAVY... (Phoenix Contact)
- PSM-LWL-RUGGED... (Phoenix Contact)



Note

The maximum length of the fibre-optic cables is 50 m.



INTERBUS – terminals and switches

Fibre optic cable socket	Function
H1	Receiver fibre optic cable
H2	Transmitter fibre optic cable

Switch	Function	
S2	Setting 500k :	INTERBUS fibre-optic-cable transmission rate 500 kBit/s
	Setting 2 M (default) :	INTERBUS fibre-optic-cable transmission rate 2 MBit/s
S3	Setting In Bus (default) :	incoming bus fibre optic cable
	Setting Out Bus :	outgoing bus fibre optic cable

Figure 8-1: Connection circuit board of the INTERBUS model

8.3 LED indicators INTERBUS 2 MBit/s fibre optic cable

In addition to the indicator and operating elements present in all device models (bar graph, buttons, LEDs AUT, MAN, ADJ; see chapter 12.1 “Indicator and operating elements”), the INTERBUS model also has the following indicators:

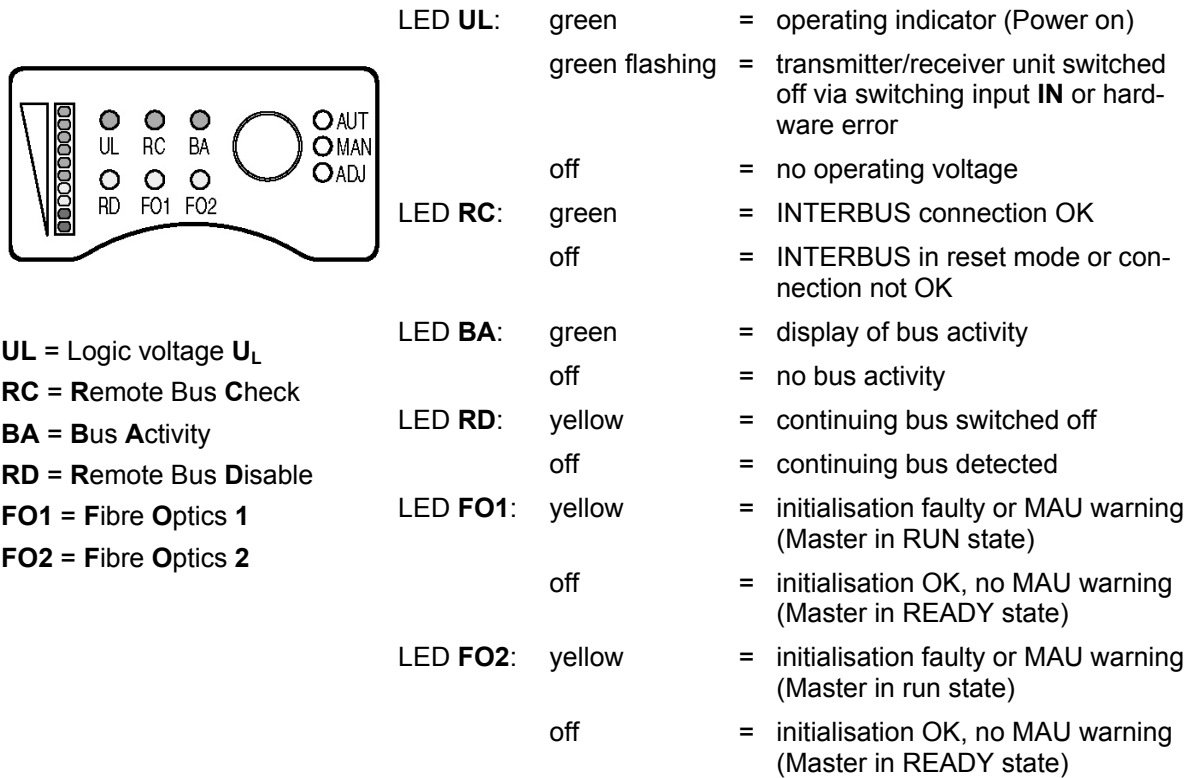


Figure 8-3: Indicator/operating elements for the INTERBUS model



Note

The ID-200 is an INTERBUS subscriber (Ident-Code: 0x0C = 12 dec.).

If the value falls below the warning level (bar graph), a peripheral error message is transmitted via the INTERBUS. When this error message is transmitted, the usual cause is soiling of the glass optics (see chapter 13.1 “Cleaning”), an incorrectly adjusted data transmission path, or an interrupted light path.

You can also use the diagnostic options available via the INTERBUS.

9 Data Highway + (DH+) / Remote I/O (RIO)

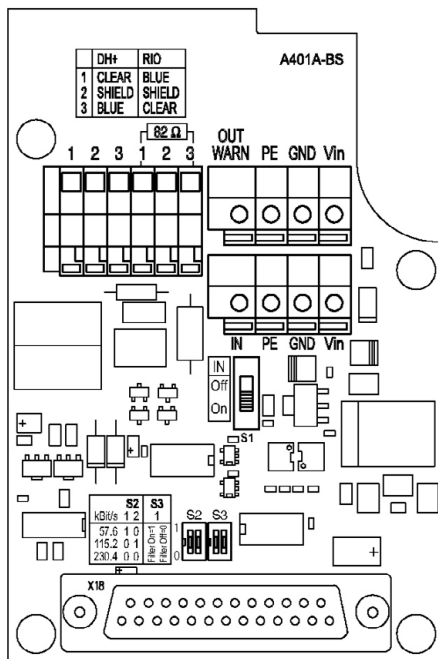
The DH+/RIO model of the ID-200 has the following features:

- Operating ranges 120 m, 200 m
- Electrically isolated interface
- Direct connection to the Data Highway + and Remote I/O bus from Rockwell Automation (Allen Bradley)
- Adjustable transmission rate 57.6 / 115.2 or 230.4 kBit/s
- Cascading of several ID-200 is possible (see chapter 5.3: “Cascading (series connection) of several ID-200 data paths”)

9.1 Electrical connection DH+ / RIO

The electrical connection to the DH+ / RIO bus is made according to the table on the connection circuit board at the terminals **1**, **2** and **3**. These terminals are provided double for wiring through the bus.

Cable to be use: Bluehouse Twinax (Belden 9463 or Allen Bradley 1770-CD)



DH+/RIO – terminals and switches

Terminal	Assignment DH+	Assignment RIO
1	CLEAR	BLUE
2	SHIELD	SHIELD
3	BLUE	CLEAR

Switch	Function
S2-1, S2-2	Setting the transmission rate (see table on the connection circuit board), default: 230.4 kBit/s
S3-1	Filter for interference-peak rejection. Setting On (1): filter switched on (default) Setting Off (0): filter switched off
S3-2	not used

Figure 9-1: Connection circuit board of the DH+ / RIO model



CAUTION !

The right DH+ / RIO connections 1 and 3 are equipped standard with an 82 Ω resistor for terminating the bus. Remove this terminating resistor when the bus cable in the ID-200 is to be wired through to another bus subscriber, i.e. the ID-200 is not the last device on the bus cable. The use of the ID-200 is limited to bus systems with 82 Ω-termination.

9.2 Device configuration DH+ / RIO

Cascading of multiple ID-200 transmission paths (filter, default: 'On' = on)

If multiple ID-200 transmission paths are to be cascaded within a bus segment (see Figure 9-2), the filter for interference-peak suppression (switch **S3-1**) must be adjusted according to the selected transmission rate. Observe also the informations in chapter 5.3: "Cascading (series connection) of several ID-200 data paths".

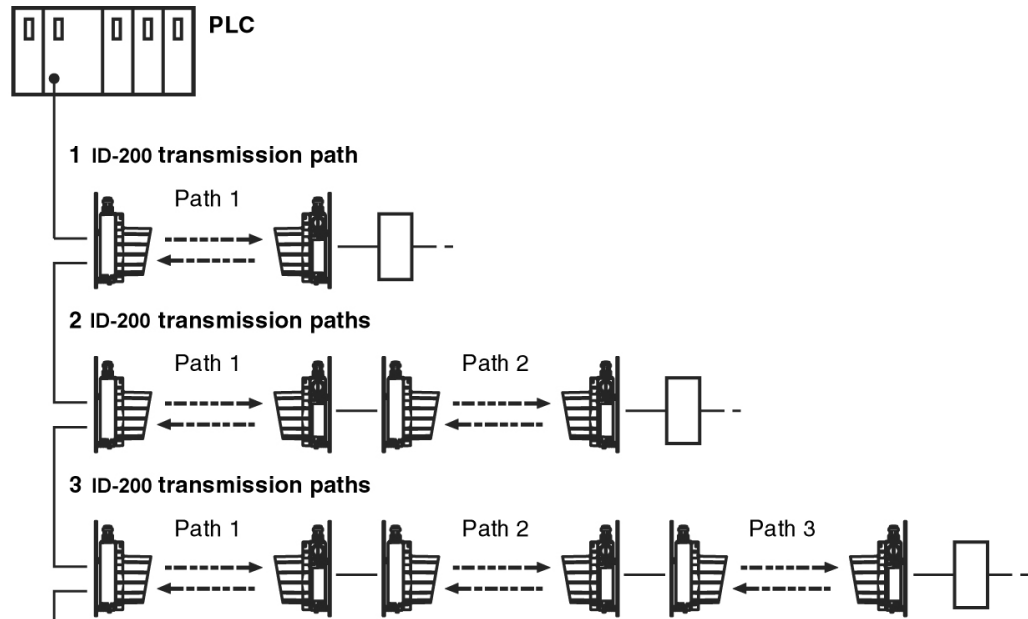


Figure 9-2: Cascading multiple optical transmission paths with DH+ / RIO

In accordance with the following table, set the filter for each ID-200 transmission path at both devices for the given path using switch S3-1.

Baud rate	Setting of S3-1 for		
	1 path	2 paths	3 paths
57.6 kBit/s	Path 1: On (1)	Path 1: On (1) Path 2: Off (0)	Path 1: On (1) Path 2: Off (0) Path 3: Off (0)
115.2 kBit/s and 230.4 kBit/s	Path 1: On (1)	Path 1: On (1) Path 2: On (1)	Path 1: On (1) Path 2: On (1) Path 3: On (1)

Table 9-1: Filter settings when cascading multiple ID-200 transmission paths

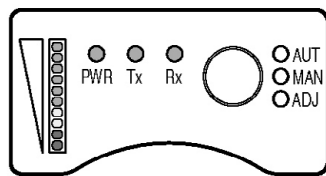


Note

The delay time of a light path is: $S3-1 \text{ On (1)} = \text{approx. } 1.5 \mu\text{s} + 1.5 T_{\text{Bit}}$
 $S3-1 \text{ Off (0)} = \text{approx. } 1.5 \mu\text{s}$

9.3 LED indicators DH+ / RIO

In addition to the indicator and operating elements present in all device models (bar graph, buttons, LEDs AUT, MAN, ADJ; see chapter 12.1 "Indicator and operating elements"), the DH+/RIO model also has the following indicators:



LED PWR :	green	= operating indicator
	green flashing	= transmitter/receiver unit switched off via switching IN or hardware error
	off	= no operating voltage
LED Tx :	green	= data are being transmitted to the bus
	green flashing	= with baud rates set to very low values, the LEDs Tx and Rx flicker. At very high baud rates (> 50 kBit/s), flashing LEDs Tx and Rx indicate faulty bus communication.
	off	= no data on the transmission line
LED Rx :	green	= data are being received by the bus
	green flashing	= with baud rates set to very low values, the LEDs Tx and Rx flicker. At very high baud rates (> 50 kBit/s), flashing LEDs Tx and Rx indicate faulty bus communication.
	off	= no data on the reception line

Figure 9-3: Indicator/operating elements of the DH+/RIO-model



Note

You can also use the diagnostic options available via the bus system.

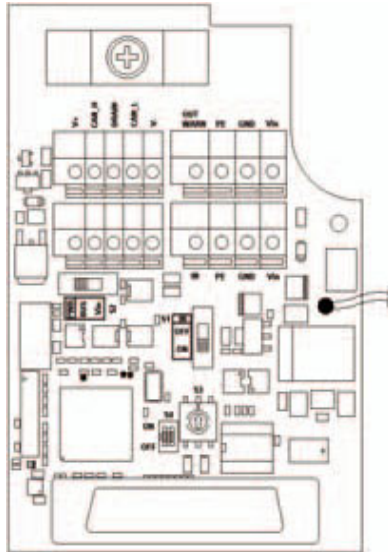
10 DeviceNet / CANopen

The DeviceNet/CANopen model of the ID-200 has the following features:

- Operating ranges 120 m, 200 m
- The ID-200 40802-5x0xx can transmit both DeviceNet as well as CANopen protocols
- Electrically isolated interface
- The ID-200 does not occupy an address
- CAN controller acc. to 2.0B standard
- Can simultaneously process 11-bit and 29-bit identifiers
- 8 baud rates can be set (10, 20, 50, 125, 250, 500, 800 kBit/s, 1M Bit/s)
- Baud rate conversion possible
- With ID-200 it is possible to extend the overall size of a CAN network
- Optional M12 connector set for conversion available on request
- Various supply options are possible for the device
- Cascading of several ID-200 is possible (see chapter 5.3: "Cascading (series connection) of several ID-200 data paths")

10.1 Electrical connection DeviceNet / CANopen

The electrical connection to DeviceNet / CANopen is made at terminals V-, CAN_L, DRAIN, CAN_H, V+. The terminals are available as double connectors for wiring through the bus.



No.	Terminal	Cable colour	Function
1	V-	black	neg. supply (CAN ground reference)
2	CAN_L	blue	bus signal (LOW)
3	DRAIN	transparent	shield
4	CAN_H	white	bus signal (HIGH)
5	V+	red	pos. supply

Switch	Position	Function	
S2	BUS	bus transceivers are supplied via the bus cable (V- and V+ lines)	
	Vin default	bus transceivers are supplied via internal DC/DC converters	
S3	0 default	125 kBit baud	CANopen/DeviceNet
	1	250 kBit baud	CANopen/DeviceNet
	2	500 kBit baud	CANopen/DeviceNet
	3	10 kBit baud	CANopen
	4	20 kBit baud	CANopen
	5	50 kBit baud	CANopen
	6	800 kBit baud	CANopen
	7	1000 kBit baud	CANopen
	8	Reserved	
9	Reserved		
S4.1	ON	sorting memory is active	
	OFF default	sorting memory is deactivated (FIFO)	
S4.2	ON/OFF	Reserved	

Figure 10-1: DeviceNet / CANopen, connection-board variant



CAUTION !

The maximum permissible current which may pass over terminals V+ / V- is 3 A; the maximum permissible voltage is 25 V (11 ... 25 V)!

10.1.1 Bus transceiver and device supplied via separate power connection

- Switch S2 = Vin.
- Bus electrically insulated (isolated node)
- CAN_GND must be connected to V-

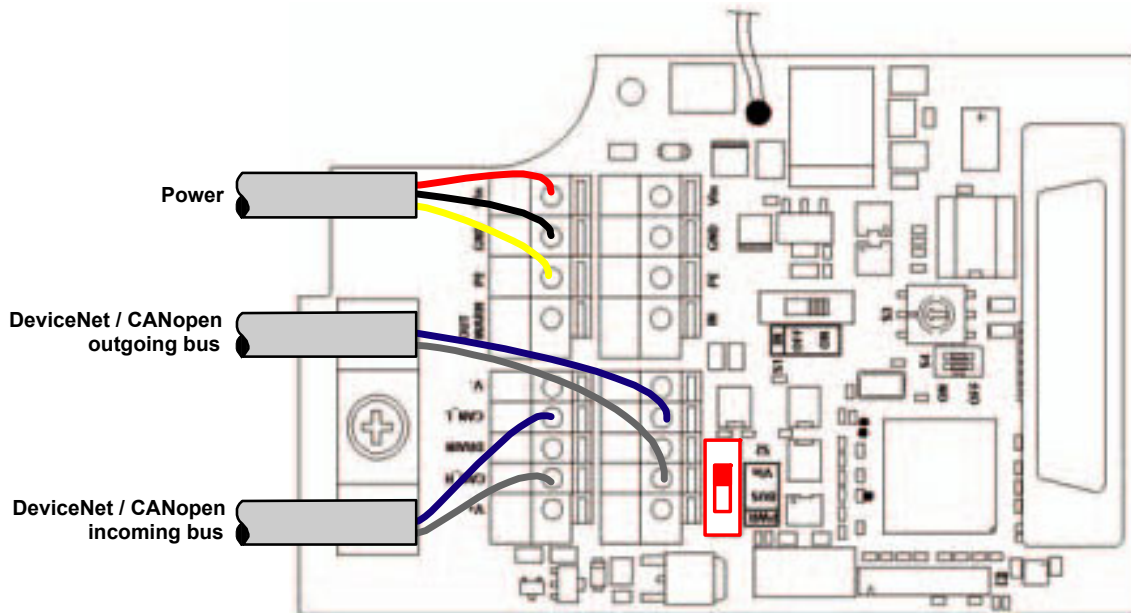


Figure 10-2: Bus transceiver and device supplied via separate power connection

10.1.2 Bus transceiver supplied via bus cable, device supplied separate

- Switch S2 = BUS.
- Bus electrically insulated (isolated node)

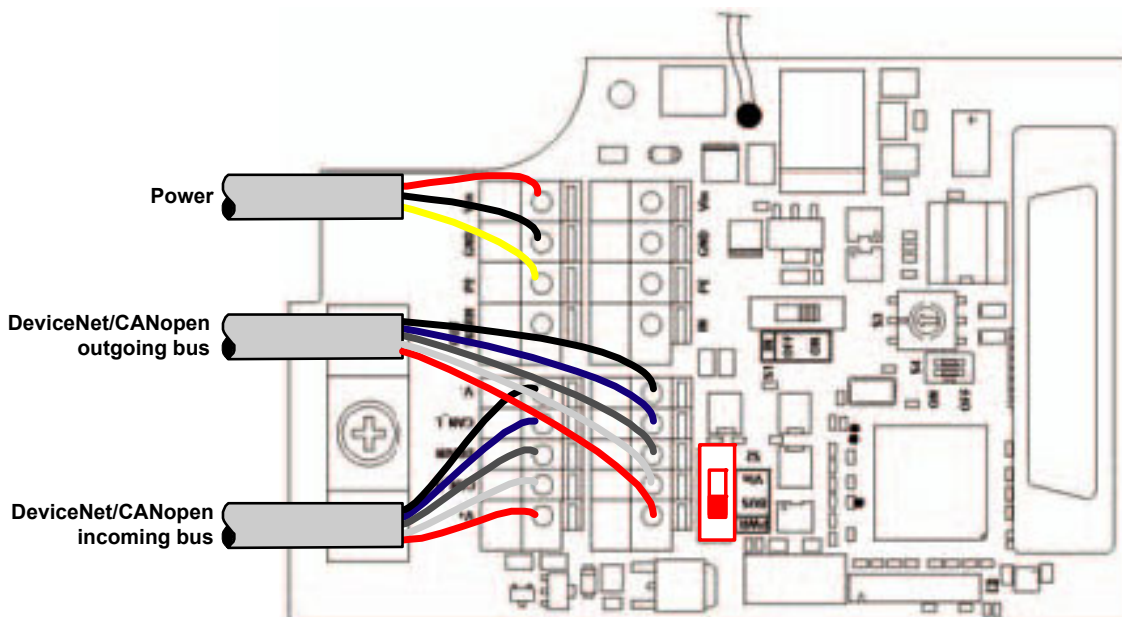


Figure 10-3: Bus transceiver supplied via bus cable, device supplied via separate power line

10.1.3 Bus transceiver and device supplied via bus cable

- Switch S2 = BUS.
- Bus not electrically insulated (non-isolated node).
- Current consumption see chapter 3 “Technical Data”.

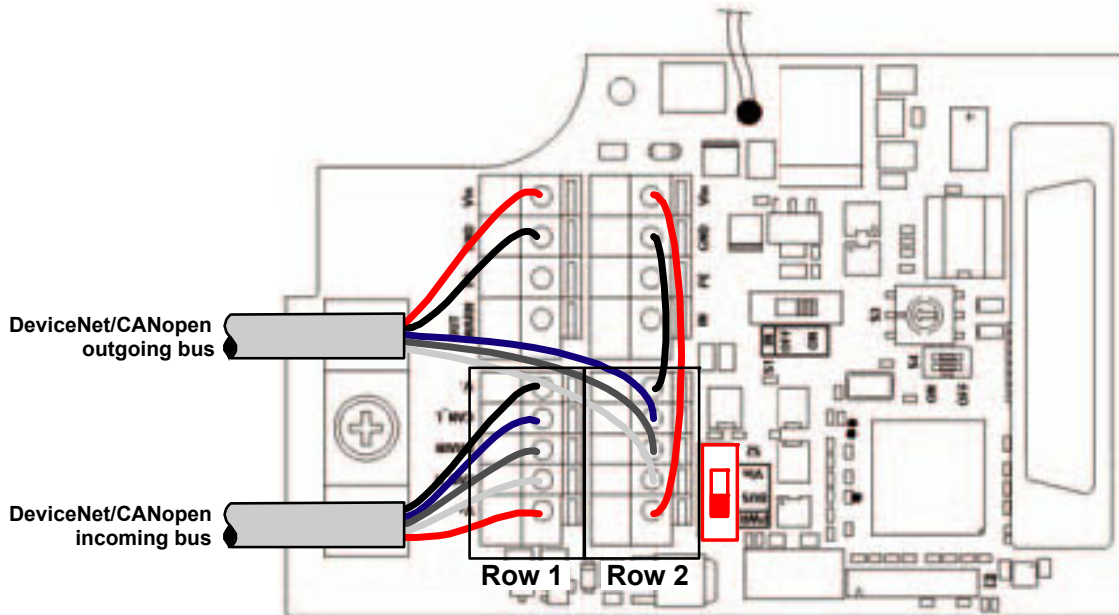


Figure 10-4: Bus transceiver and device supplied via bus cable

Incoming bus cable		Outgoing bus cable	
Cable	Terminal	Cable	Terminal
V- (black)	V- (row 1)	V- (black)	GND
CAN_L (blue)	CAN_L (row 1)	CAN_L (blue)	CAN_L (row 2)
DRAIN (transparent)	DRAIN (row 1)	DRAIN (transparent)	DRAIN (row 2)
CAN_H (white)	CAN_H (row 1)	CAN_H (white)	CAN_H (row 2)
V+ (red)	V+ (row 1)	V+ (red)	Vin
Bridge between Vin and V+ (row 2)			
Bridge between GND and V- (row 2)			

Table 10-1: Connection table



Note

In order for this interface connection to be conformant with the DeviceNet Ground concept, the load on the switching output and/or the source at the switching input must be potential free.

If the complete device is operated using the supply in the bus cable, it must be ensured that the voltage is at least 18V.

The total current of the device is the device current plus the current drawn at the switching output.

10.1.4 Installation and connection of the optional M12 connectors

On request an optional M12 connector set is available. It consists of an M12 plug (power), an M12 plug (bus), and an M12 socket (bus) with ready-made wires. If the M12 connector set is used, a possible termination should be carried out with the optionally available terminal connector. Corresponding mating connectors are available for connecting the incoming bus as well as for connecting the continuing bus (see chapter 15.2: "DeviceNet / CANopen").

10.1.4.1 Conversion to M12 connectors

1. Remove screwed cable gland 1, 2 and 3 (spanner size = 20mm)
2. Screw M12 plug (power) into the thread of the screwed cable gland 1 that you have just removed and tighten it with spanner SW18.
3. Screw M12 socket (bus) into the thread of the screwed cable gland 2 that you have just removed and tighten it with spanner SW18.
4. Screw M12 plug (bus) into the thread of the screwed cable gland 3 that you have just removed and tighten it with spanner SW18.
5. Connect cables acc. to Figure 10-5 and Table 10-2.

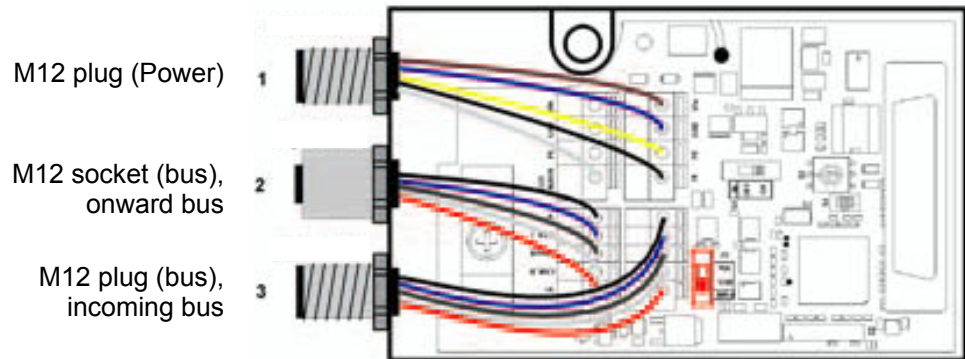


Figure 10-5: Installation and connection of the optional M12 connectors

(1) M12 plug (Power)		(2) M12 socket (bus), onward bus		(3) M12 plug (bus), incoming bus	
Pin 1 (brown)	Vin	Pin 1 (transparent)	DRAIN	PIN 1 (transparent)	DRAIN
Pin 2 (white)	OUT	Pin 2 (red)	V+	Pin 2 (red)	V+
Pin 3 (blue)	GND	Pin 3 (black)	V-	Pin 3 (black)	V-
Pin 4 (black)	IN	Pin 4 (white)	CAN_H	Pin 4 (white)	CAN_H
Pin 5 (yellow/green)	PE	Pin 5 (blue)	CAN_L	Pin 5 (blue)	CAN_L

Table 10-2: Connection of M12 connectors



Note

The orientation of the M12 connectors is not defined. The use of angular M12 connectors as counterparts is therefore discouraged.

10.2 Device configuration DeviceNet / CANopen

10.2.1 Baud rate conversion

Through the use of an optical transmission system, the bus is divided into two segments. Different baud rates can be used in the physically separated segments. The ID-200s then function as baud rate converters. During baud rate conversion, it must be ensured that the bandwidth of the segment with the lower baud rate is adequate for processing the incoming data.

10.2.2 Sorting (switch S4.1)

With the aid of switch S4.1, sorting of the internal memory can be activated and deactivated. If sorting is deactivated (**switch S4.1 = OFF, default**), CAN frames are handled according to the FIFO principle (First-In-First-Out).

If sorting is active (switch S4.1 = ON), CAN frames are sorted according to their priority. The message with the highest priority in memory is the next one to be put onto the connected network for arbitration.

10.2.3 Bus lengths as a function of the baud rate

Switch position S3	Baud rate	max. cable length per bus segment	Interface
0 (Default)	125 kBit	500 m	CANopen / DeviceNet
1	250 kBit	250 m	CANopen / DeviceNet
2	500 kBit	100 m	CANopen / DeviceNet
3	10 kBit	5000 m	CANopen
4	20 kBit	2500 m	CANopen
5	50 kBit	1000 m	CANopen
6	800 kBit	50 m	CANopen
7	1000 kBit	30 m	CANopen

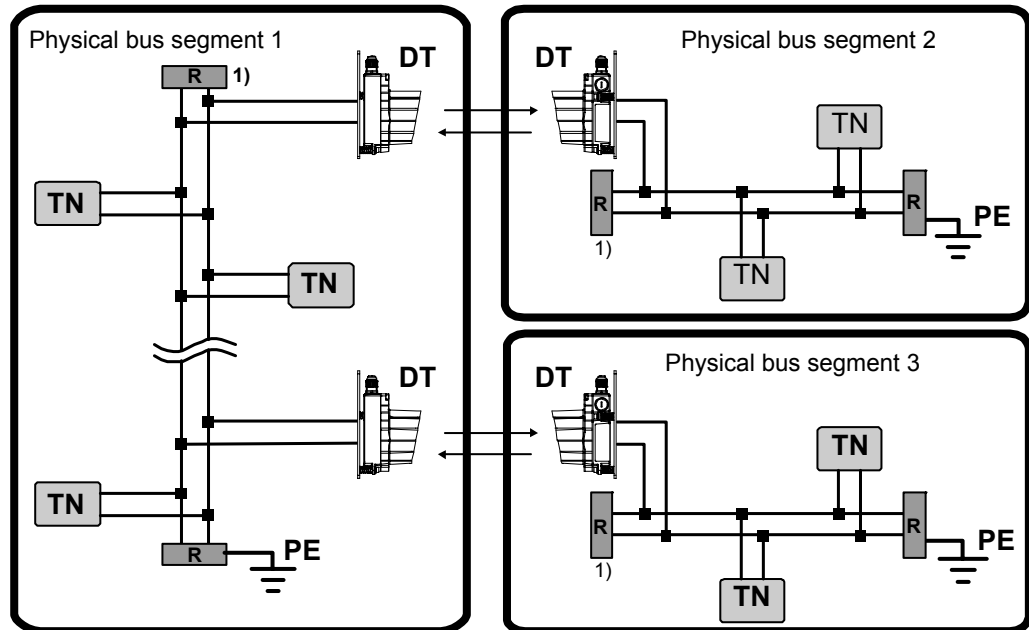


Note

The mechanical expansion of the bus system can be increased through the use of the ID-200.

10.3 Wiring

- The ends of the bus lines must be terminated between CAN_L and CAN_H for each physical bus segment (see Figure 10-6 **R**).
- Typical CAN cables consist of a twisted-pair cable with a shield that is usually used as CAN_GND. Only use cables recommended for DeviceNet or CANopen.
- The ground reference CAN_GND must only be connected to earth potential (PE) at one place on a physical bus segment (see



TN = bus subscriber
 1): Part of the communication device

Figure 10-6: DeviceNet / CANopen wiring

10.3.1 Termination

10.3.1.1 DeviceNet

- External termination for M12 connector version is available as an option
- Resistance and other features are described in the DeviceNet specifications of the ODVA (Open DeviceNet Vendor Association).

10.3.1.2 CANopen

- Resistance: typically 120 Ω (supplied with the device, installed between CAN_L and CAN_H)
- External termination for M12 connector version is available as an option
- Resistance and other features are described in the CANopen specification ISO 11898.

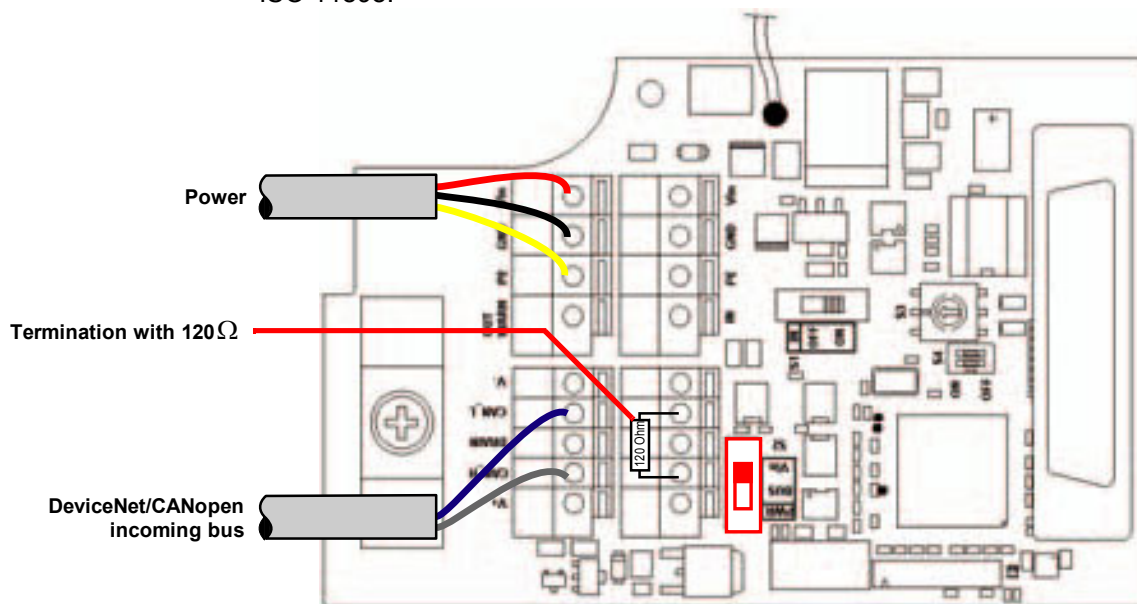
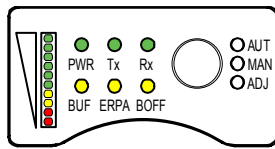


Figure 10-7: Termination in the unit

A 120 Ω resistor is connected standard between terminals CAN_L and CAN_H. If the device is not the last subscriber of the bus segment, the resistor must be removed and the outgoing bus cable connected to the terminal strip.

10.4 DeviceNet / CANopen LED indicators

In addition to the indicator and operating elements present in all device models (bar graph, buttons, LEDs AUT, MAN, ADJ; see chapter 12.1 "Indicator and operating elements"), the DeviceNet/CANopen model also has the following indicators:



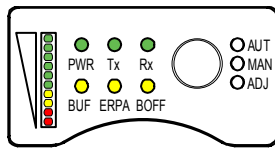
	LED PWR :	green green flashing off	= operating indicator = transmitter / receiver unit switched off via switching input IN or hardware error = no operating voltage
	LED Tx :	green green flashing off	= data being transmitted to the bus = with baud rates set to very low values, or with low bus traffic, the LEDs Tx and Rx flicker. = no data being transmitted to the bus
	LED Rx :	green green flashing off	= data are being received = with baud rates set to very low values, or with low bus traffic, the LEDs Tx and Rx flicker. = no data on the reception line
	LED BUF :	yellow yellow flashing off	= buffer load : > 70 % = buffer load : 30 % ... 70 % = buffer load : < 30 %
	LED ERPA :	yellow off	= ID-200 is in " Error Passive " state, full communication functionality, however in the event of an error, a passive error flag is sent (see also "BOSCH CAN Specification 2.0"). Measures: - check termination, wiring, baud rate = ID-200 is in " Error Active " state, full communication functionality, however in the event of an error, an active error flag is sent, normal state
	LED BOFF :	yellow yellow flashing off	= ID-200 in " BusOff " state, does not reattempt to participate in bus traffic → manual intervention necessary Measures: - check termination, wiring, baud rate - power OFF/ON of the devices supply or bus supply = ID-200 in the " BusOff " state, but does reattempt to participate in bus traffic = ID-200 not in the " BusOff " state, normal state

Figure 10-8: Indicator/operating elements of the DeviceNet/CANopen model

1.1 Interruption of the data transmission path

10.4.1 Response upon interruption of the optical data transmission path

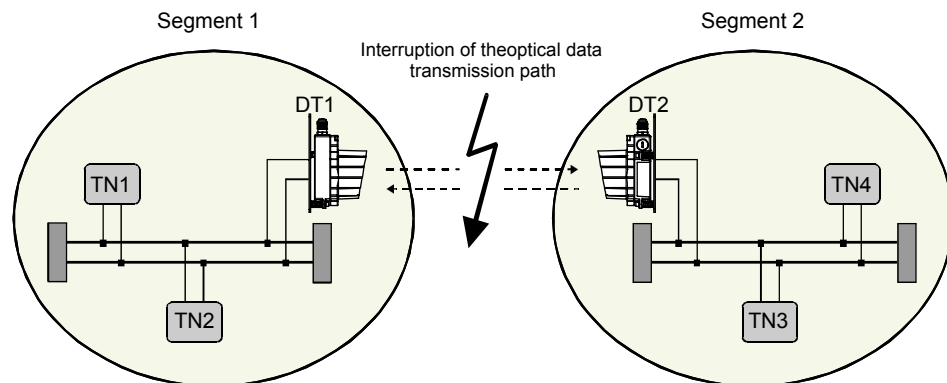


Figure 10-9: Interruption of the optical data transmission path

If only data fragments are received as the result of the interruption in the optical transmission path, these are detected and are not transmitted to the CAN bus segment. The connected subscribers are not informed of an interruption in the optical transmission path via the protocol (switching output is activated). Data transmitted during the interruption are lost. The primary protocol is responsible for management of the subscribers. For this reason, the monitoring mechanisms of the primary protocol should be used (Node/Life Guarding, Heartbeat, ...).

10.4.2 "Monitoring" of subscribers

If an ID-200 optical data transmission system is used in a DeviceNet or CANopen system, it is beneficial to monitor all subscribers to determine whether they are still participating in data exchange. The following mechanisms are available for this purpose:

10.4.2.1 Heartbeat

Subscribers transmit cyclical heartbeat messages. If a message is not received for a certain period of time, this is detected by the connected subscribers as a "Heartbeat Error".

10.4.2.2 Node / Life Guarding (CANopen)

The NMT Master (Network Management Master) cyclically queries all subscribers and expects an answer within a certain period of time. If this response is not received, a "Guarding Error" is detected.

10.4.3 Response in the event of buffer overload

If, as the result of errors on the CAN bus segment, no ID-200 data can be transmitted to this segment or data can be transmitted only sporadically, the ID-200 reacts as follows:

1. CAN frames are temporarily stored (64 frames for baud rates * 800 kBit and 128 frames for baud rates < 800 kBit).
2. If between 30 % and 70 % of the memory is occupied, the "BUF" LED flashes
3. If > 70 % of the memory is occupied, the "BUF" LED is constantly illuminated
4. In the event of a buffer overflow, the memory is completely deleted.

10.4.4 Response in the event of errors on a sub-segment

Other segments are not informed of errors on a sub-segment.

10.5 Important notices for system integrators



CAUTION !

The notices provide initial information and describe the working principles of the optical data transceiver with DeviceNet and CANopen.

The notices must be read by each user before the first commissioning of the ID-200 with DeviceNet and CANopen.

Possible restrictions in the timing of the optical data transmission in comparison to copper based data transmission are described here.

Due to the bit-synchronous arbitration mechanism in the CAN and the resulting high time requirements, arbitration via the optical, free-space data transmission system (abbreviated DT) is not possible. One original segment is divided into two sub-segments. Because of the division into multiple segments, there are several points which must be observed when designing the system.

10.5.1 Schematic drawing of the inner construction

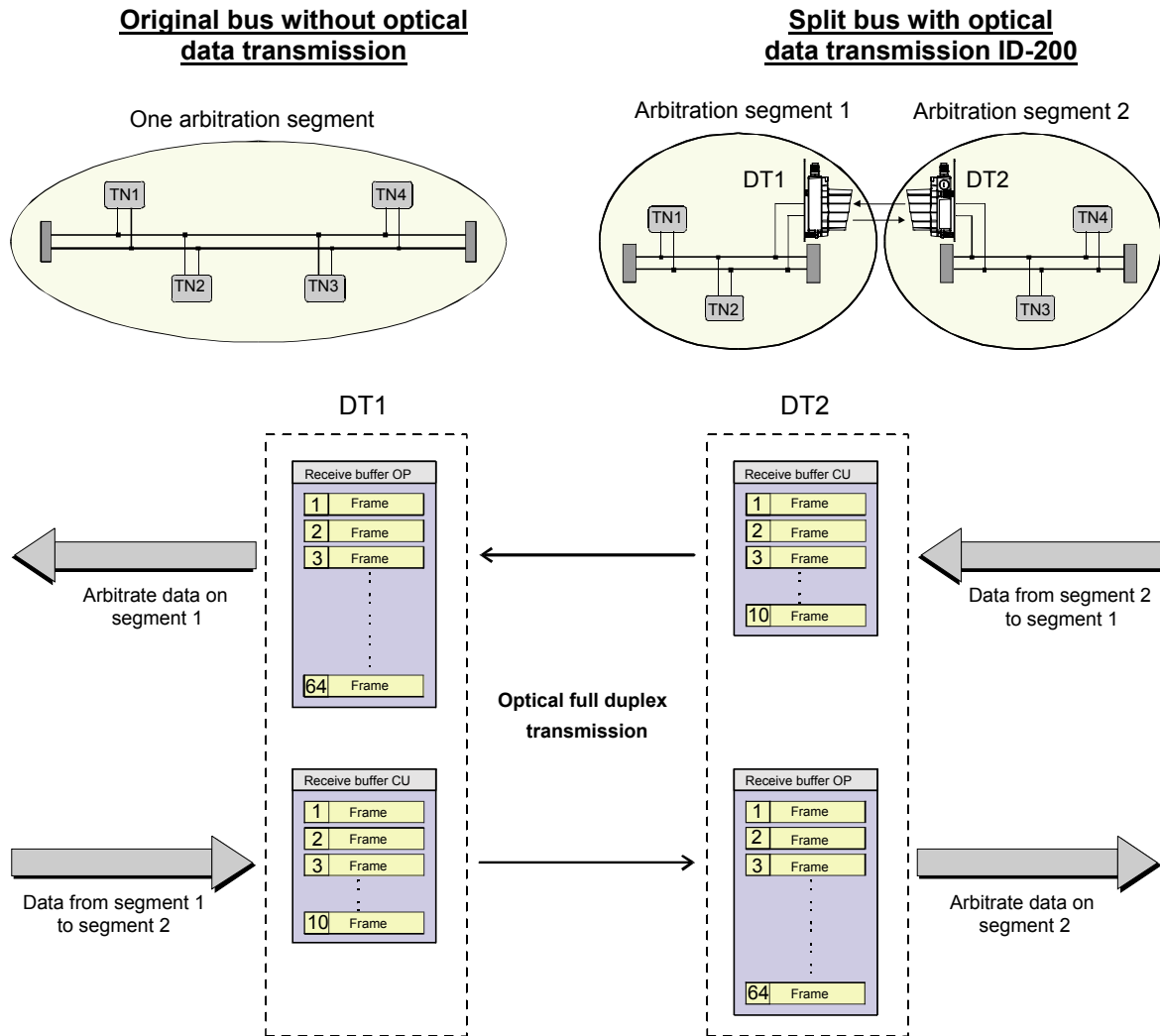


Figure 10-10: Segmentation

- Data from Segment 1 are written in reception buffer CU (10 frames) and optically transmitted directly from there.
- The transmitted data are received by the DT2 and written in reception buffer OP (64 frames > 800 kBit and 128 frames < 800 kBit).
- Data in reception buffer OP are sorted by priority or processed according to the FIFO principle (depending on the operating mode used)
- Data in reception buffer OP are passed to Segment 2 for arbitration.
- The same process also occurs when transmitting data from Segment 2 to Segment 1.

10.5.2 Timing

Telegram delay from segment to segment

- typical run-time delay of the messages in one direction
- calculated with 10 % stuffing bits

Message memory not sorted (FIFO)

$$\text{Number of bits in the telegram} \cdot 1.1 \cdot (0.5 \mu\text{s} + T_{\text{Bit}}) + 10 \mu\text{s}$$

Message memory sorted

$$\text{Number of bits in the telegram} \cdot 1.1 \cdot (0.5 \mu\text{s} + T_{\text{Bit}}) + 45 \mu\text{s}$$

Example 1: DeviceNet			Example 2: CANopen		
<ul style="list-style-type: none"> • 125 kBit/s ($\rightarrow T_{\text{Bit}} = 8 \mu\text{s}$) • 4 bytes of data • Message memory sorted 			<ul style="list-style-type: none"> • 1 MBit/s ($\rightarrow T_{\text{Bit}} = 1 \mu\text{s}$) • 8 bytes of data • Message memory not sorted (FIFO) 		
Protocol overhead	47 bits		Protocol overhead	47 bits	
Data	32 bits		Data	64 bits	
Stuffing bits	8 bits		Stuffing bits	12 bits	
\rightarrow number of bits in the telegram	87 bits		\rightarrow number of bits in the telegram	123 bits	
1 • telegram length		696 μs	1 • telegram length		123 μs
1 • Number of bits • 0.5 μs		44 μs	1 • Number of bits • 0.5 μs		62 μs
Processing		45 μs	Processing		10 μs
Typ. gross delay		785 μs	Typ. gross delay		195 μs

The maximum delay is dependent on various boundary conditions:

- bus load
- message priority
- history
- sorting active / not active

If a slave is addressed by a subscriber along an entire segment and expects an answer, twice the propagation time must be planned for (twice the optical path).

If multiple optical paths are used in a system, the delay times may be added (depending on the constellation in the bus).

The increased delay times must be taken into consideration when parameterising the system.

10.5.3 Synchronous messages

As a result of dividing the network into multiple segments and the resulting delay of messages between the segments, there are limitations associated with synchronous transmission. The following types of telegrams are affected:

DeviceNet

Message	Function	Effects caused by DT
Bit strobe	Master simultaneously transmits 1 bit of output data to all subscribers.	All subscribers receive the message, but not simultaneously. Should therefore not be used for synchronisation purposes.
Broadcast messages	One message is simultaneously transmitted to several subscribers.	All subscribers receive the message, but not simultaneously.

CANopen

Message	Function	Effects caused by DT
Sync	All subscribers are synchronised on a sync telegram, e.g. input data are read in and transmitted	The message is transmitted to all subscribers. Subscribers in another segment, e.g. Segment 2, receive this telegram with a time delay and are, thus, not synchronised with the subscribers in Segment 1.
Time stamp	Transmits time information.	All subscribers receive the message. Subscribers in a segment other than the producer of the message receive this information with a time delay. An error in the timing information results: min. $T_{tot} = \text{number of bits in the telegram} \times (0.5 \mu\text{s} + T_{Bit}) + 100 \mu\text{s}$

10.5.4 Other implementation notes

Bus expansion is maximised by dividing into two sub-segments

- **without data transmission equipment:** 1 x max. bus length
- **with data transmission equipment:** 2 x max. bus length + optical path

With the DeviceNet, make certain that subscribers with large quantities of data or long response times are as high as possible in the scan list.

If the master of a DeviceNet network regularly begins a new scanning process even though not all slave responses have been received, proceed as follows

1. Make certain that subscribers with large quantities of data or long response times are as high as possible in the scan list. If not, the order should be rearranged.
2. Increase interscan delays until all responses are received within a single scanning cycle.

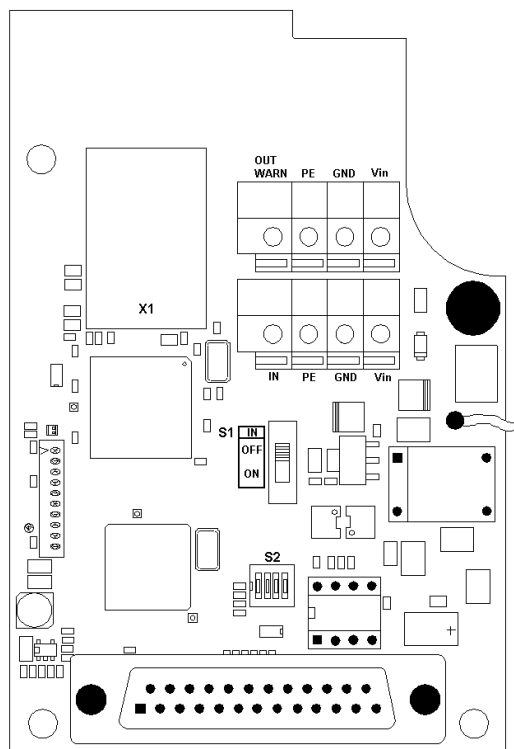
11 Ethernet

The Ethernet model of the ID-200 has the following features:

- Operating ranges 120 m, 200 m
- Supports 10Base-T and 100Base-TX (half and full duplex)
- Effective data transmission with 2 MBit/s full duplex
- Supports autopolarity and autonegotiation (Nway)
- Supports frames up to 1522 bytes in length
- The ID-200 for Ethernet does not occupy a MAC address
- Protocol-independent (transmits all protocols that are based on TCP/IP and UDP, e.g., Ethernet, Modbus TCP/IP, ProfiNet V1+V2)
- RJ-45 connector (a separate screwed cable gland is used to achieve protection class IP 65)
- M12 connectors, D-coded
- Conversion of 10Base-T to 100Base-TX and vice versa is possible
- Internal 16 kByte message memory (sufficient for approx. 250 short telegrams)
- Increased network expandability owing to optical data transmission:
 - without optical data transmission = 100 m
 - with optical data transmission = 2 • 100 m + optical transmission path
- It is possible to cascade several ID-200 (see chapter 5.3: “Cascading (series connection) of several ID-200 data paths”)

11.1 Ethernet connection - devices with screwed cable glands and terminals

Electrical connection to Ethernet is realised using the RJ45 socket **X1**.



Socket	Function	
X1	RJ-45 socket for 10 Base-T or 100Base-TX	
Switch	Position	Function
S2.1	ON	Autonegotiation active (default)
	OFF	Autonegotiation deactivated
S2.2	ON	100 MBit
	OFF	10 MBit (default)
S2.3	ON	Full duplex
	OFF	Half duplex (default)
S2.4	ON	Reserved
	OFF	Reserved (default)



Note

If autonegotiation is active (S2.1 = ON), the position of switches S2.2 and S2.3 is irrelevant. The operating mode is determined automatically.



CAUTION !

Please observe the notices on cabling in chapter 11.4 “Wiring”.

Figure 11-1: Connection circuit board of the Ethernet model

11.2 Ethernet connection - devices with M12 connectors

The electrical connection of the Ethernet is easily performed using M12 connectors. For the Ethernet connection corresponding mating connectors are available. (see chapter 1.3 “Ethernet”).

For all M12 device models, the connection is made via the left, D-coded connector **BUS IN** (see Figure 11-2).

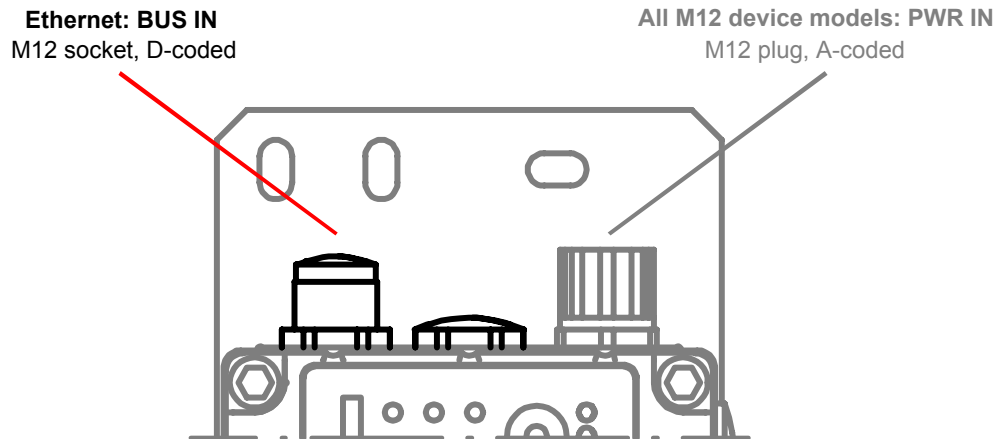


Figure 11-2: Location and designation of the M12 Ethernet connections

BUS IN (4-pin. M12 socket, D-coded)			
	Pin	Name	Remark
<p>M12 socket (D-coded)</p>	1	TD+	Transmit Data +
	2	RD+	Receive Data +
	3	TD-	Transmit Data -
	4	RD-	Receive Data -
	SH (thread)	FE	Functional earth (housing)

Figure 11-3: Assignment M12 connector BUS IN for Ethernet

11.3 Device configuration Ethernet

11.3.1 Autonegotiation (Nway)

If the switch S2.1 of the ID-200 is set to ON (default), the device is in autonegotiation mode. This means that the ID-200 detects the transmission characteristics of the connected partner unit automatically (10 MBit or 100 MBit, full or half duplex) and adjusts itself accordingly.

If both devices are in autonegotiation mode, they adjust to the highest common denominator.

If a certain transmission type is to be required, the autonegotiation function must be deactivated (S2.1 = OFF). The transmission characteristics can then be set using the switches S2.2 and S2.3.

11.3.2 Transmission rate conversion

Through the use of an optical transmission system, the Ethernet is divided into two segments. Different transmission rates can be used in the physically separated segments. The ID-200s then functions as transmission rate converter. During transmission rate conversion, it must be ensured that the bandwidth of the segment with the lower transmission rate is adequate for processing the incoming data.

11.3.3 Network expansion

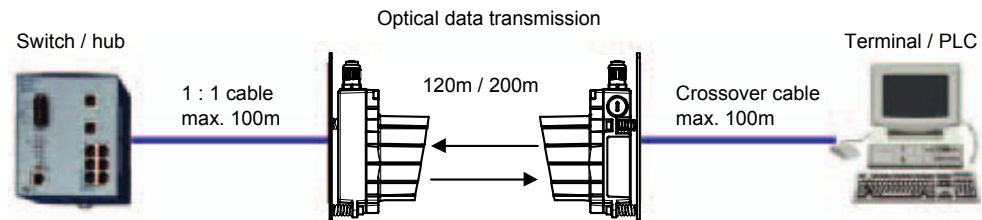


Figure 11-4: Network extension



Note

The network expansion of the bus system can be increased through the use of the ID-200.

11.4 Wiring



Note

As shown in Figure 11-5 through Figure 11-7, a distinction is to be made between a 1 : 1 cable and a "crossover" cable. The "crossover" cable is required whenever the participants (switch, hub, router, PC, PLC, etc.) connected to the ID-200 do not provide "autocrossing". If the "autocrossing" function is available in the connected participants, a normal 1 : 1 cable can be used.

11.4.1 ID-200 between switch/hub and terminal/PLC

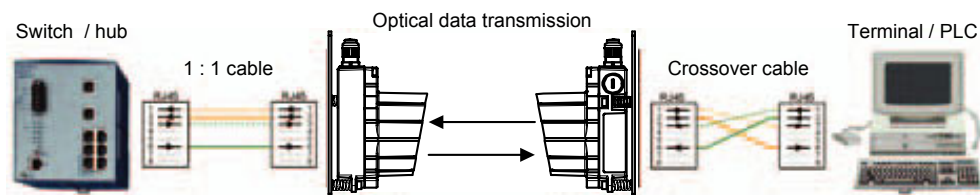


Figure 11-5: ID-200 between switch/hub and terminal/PLC



Note

Make sure that the 1 : 1 cable and crossover cable are connected correctly. Do not plug the 1 : 1 cable to the switch/hub into the "Uplink" port.

11.4.2 ID-200 between switch/hub and switch/hub

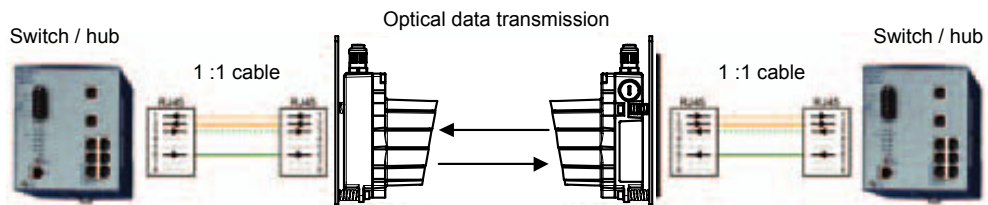


Figure 11-6: ID-200 between switch/hub and switch/hub



Note

Make sure that the 1 : 1 cable and crossover cable are connected correctly. Do not plug the 1 : 1 cable to the switch/hub into the "Uplink" port.

11.4.3 ID-200 between terminal/PLC and terminal/PLC

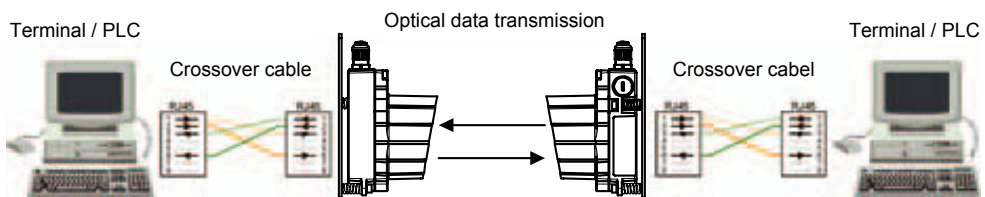


Figure 11-7: ID-200 between terminal/PLC and terminal/PLC

11.4.4 Assignment of the RJ45 and M12 Ethernet cables

For the Ethernet models of the ID-200, the following pin assignments apply for the RJ45 and M12 connection cables.

11.4.4.1 RJ45 to RJ45 - 1 : 1

Signal	Function	Core colour	Pin RJ45		Pin RJ45
TD+	Transmit Data +	yellow	1 / TD+	< - >	1 / TD+
TD-	Transmit Data -	orange	2 / TD-	< - >	2 / TD-
RD+	Receive Data +	white	3 / RD+	< - >	3 / RD+
RD-	Receive Data -	blue	6 / RD-	< - >	6 / RD-

11.4.4.2 RJ45 to RJ45 - "Crossover"

Signal	Function	Core colour	Pin RJ45		Pin RJ45
TD+	Transmit Data +	yellow	1 / TD+	< - >	3 / RD+
TD-	Transmit Data -	orange	2 / TD-	< - >	6 / RD-
RD+	Receive Data +	white	3 / RD+	< - >	1 / TD+
RD-	Receive Data -	blue	6 / RD-	< - >	2 / TD-

11.4.4.3 M12 plug - D-coded with open cable end

Signal	Function	Core colour	Pin M12		Strand
TD+	Transmit Data +	yellow	1 / TD+	< - >	yellow
TD-	Transmit Data -	orange	3 / TD-	< - >	orange
RD+	Receive Data +	white	2 / RD+	< - >	white
RD-	Receive Data -	blue	4 / RD-	< - >	blue

11.4.4.4 M12 plug to M12 plug - D-coded

Signal	Function	Core colour	Pin M12		Pin M12
TD+	Transmit Data +	yellow	1 / TD+	< - >	1 / TD+
TD-	Transmit Data -	orange	3 / TD-	< - >	3 / TD-
RD+	Receive Data +	white	2 / RD+	< - >	2 / RD+
RD-	Receive Data -	blue	4 / RD-	< - >	4 / RD-

11.4.4.5 M12 plug, D-coded to RJ45 - 1 : 1

Signal	Function	Core colour	Pin M12		Pin RJ45
TD+	Transmit Data +	yellow	1 / TD+	< - >	1 / TD+
TD-	Transmit Data -	orange	3 / TD-	< - >	2 / TD-
RD+	Receive Data +	white	2 / RD+	< - >	3 / RD+
RD-	Receive Data -	blue	4 / RD-	< - >	6 / RD-

11.4.4.6 M12 plug, D-coded to RJ45 - "Crossover"

Signal	Function	Core colour	Pin M12		Pin RJ45
TD+	Transmit Data +	yellow	1 / TD+	< - >	3 / RD+
TD-	Transmit Data -	orange	3 / TD-	< - >	6 / RD-
RD+	Receive Data +	white	2 / RD+	< - >	1 / TD+
RD-	Receive Data -	blue	4 / RD-	< - >	2 / TD-

11.4.5 Installing cable with RJ45 connector

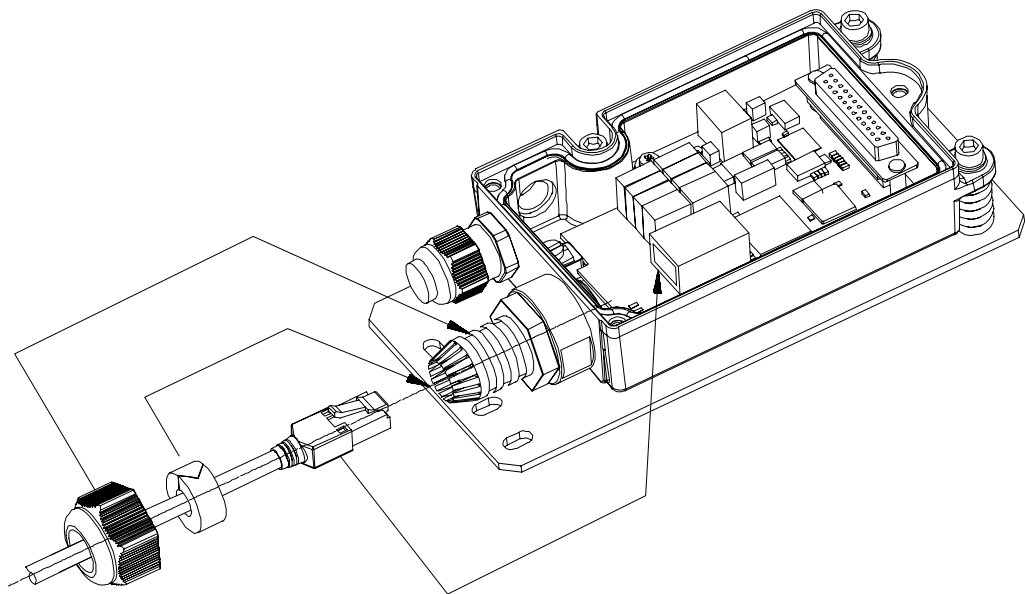
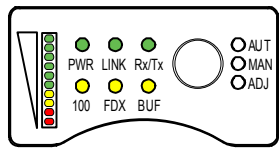


Figure 11-8: Installing cable with RJ45 connector

11.5 LED Indicators Ethernet

In addition to the indicator and operating elements present in all device models (bar graph, buttons, LEDs AUT, MAN, ADJ; see chapter 12.1 “Indicator and operating elements”), the Ethernet model also has the following indicators:



LED PWR :	green green flashing off	= operating indicator = transmitter / receiver unit switched off via switching input IN or hardware error = no operating voltage
LED LINK :	green off	= LINK OK. = no LINK present
LED Rx/Tx :	green red orange off	= data are being received by the bus. = data are being transmitted to the bus. = data are simultaneously received and transmitted via the bus = no data are being received by the bus or transmitted to the bus
LED 100 :	yellow off	= 100 Base-Tx connected = 10Base-T connected
LED FDX :	yellow off	= full duplex (F ull- D uplex) = half duplex
LED BUF :	yellow off	= internal buffer (B uffer) full, message rejected. = message not rejected

Figure 11-9: Indicator/operating elements for the Ethernet model

11.6 Important notices for system integrators



CAUTION !

The notices provide initial information and describe the working principles of the optical data transceiver with Ethernet.

The notices must be read by each user before the first commissioning of the ID-200 with Ethernet.

Possible restrictions in the timing of the optical data transmission in comparison to copper based data transmission are described here.

Using the ID-200 for Ethernet, 10Base-T or 100Base-TX with 2MBit is transmitted optically e.g. to a moving rack serving unit where it is then converted back into 10Base-T or 100Base-TX.

The ID-200 is connected to the Ethernet via a twisted pair port with an RJ45 connector or an M12 connector. An external switch reduces the data flow along the optical transmission path by filtering the messages. Only messages for nodes located downstream of the optical data transmission path are actually transmitted. The data throughput rate of the optical transmission path is max. 2 MBit/s.

11.6.1 Typical bus configuration

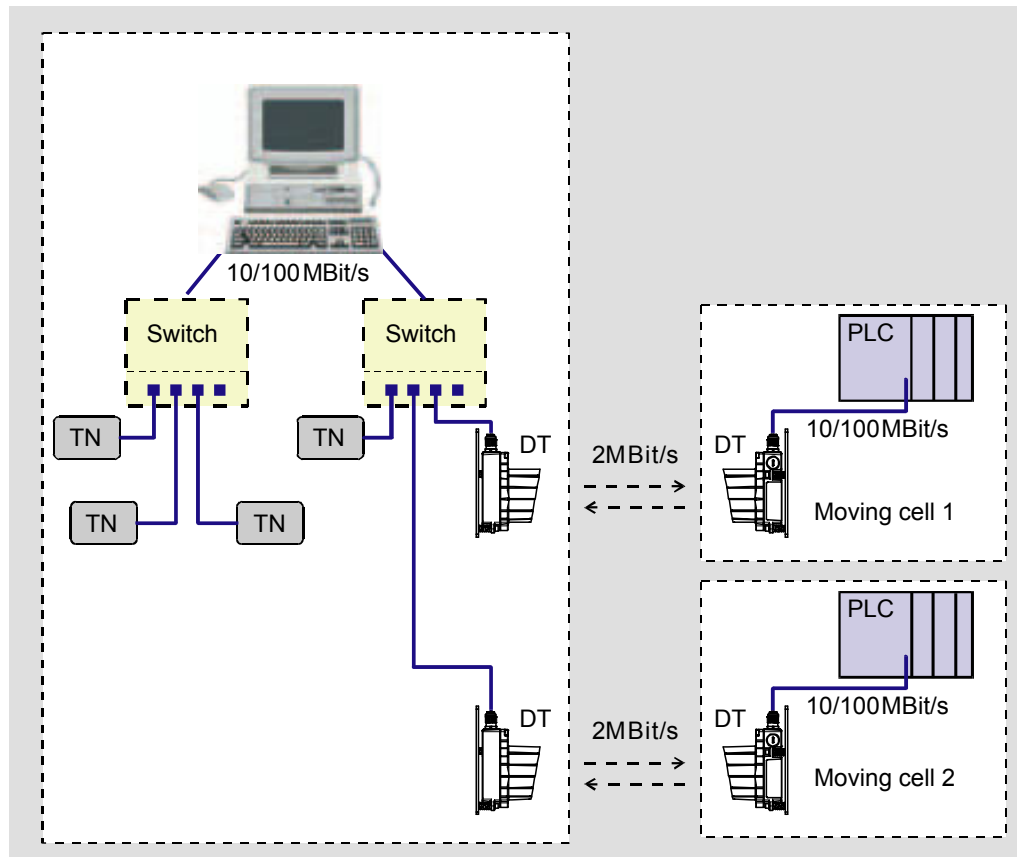


Figure 11-10: Typical Ethernet bus configuration

The optical data path has a maximum data rate of 2 MBit/s in each direction of data transmission. In the network, it must be ensured that the **average** data rate in each direction of transmission is less than or equal to 2 MBit/s. This is, amongst others, achieved by the following measures.

- **Address filtering by a preceding switch:** The preceding switch ensures that only messages are transmitted that are intended for the participant on the other end of the optical data transmission path. This leads to a significant reduction in data
- **Receiver buffer:** Via the 16 kByte receiver buffer, brief peak loads can be managed without data loss. If the receiver buffer overflows, the subsequent messages are rejected (dropped).
- **Primary transmission protocol:** The primary protocol (e.g., TCP/IP) ensures that messages are re-sent if they are lost or have remained unacknowledged. In addition, protocols such as TCP/IP automatically adapt to the available bandwidth of the transmission medium.

11.6.2 Timing

11.6.2.1 Sequence diagram

Assumption: the host computer wants to transmit a run command to PLC via optical data transmission path (see Figure 11-10).

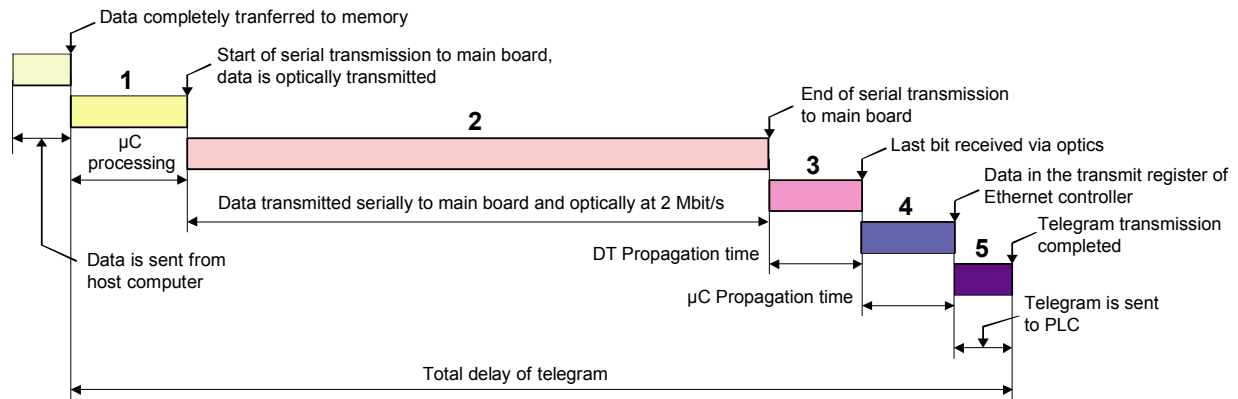


Figure 11-11: Typical Ethernet telegram structure

11.6.2.2 Description of time segments

Pos.	Description	Time (estimated)		Remark
1	DSP processing time for preparing data to be sent via optical interface	approx. 30 µs		Telegrams which are still being sent or still in memory may delay further processing.
2	Sending data via optical interface with 2 MBit/s	Number of bits in telegram • 550 ns		
3	Delay caused by optical conversion and light propagation time	1.2 µs	2.2 µs	Signal is delayed by approx. 3.3 ns per metre of optical transmission path
4	DSP processing of data between optics and writing to Ethernet controller	approx. 30 µs		
5	Data is sent to PLC	Number of bits in the telegram • 0.1 µs at 10M Bit/s (0.01 µs at 100 MBit/s)		

11.6.2.3 Signal delay

The typical delay of a message from an ID-200 to the opposing ID-200 is:

$$\text{Number of bits in the telegram} \cdot (0.55 \mu\text{s} + T_{\text{Bit}}^1) + 60 \mu\text{s}$$

¹⁾: T_{Bit} for 10Base-T = 0.10 μs , T_{Bit} for 100Base-Tx = 0.01 μs



Note

The maximum delay is dependent on various factors (bus loading, history, ...).

11.6.2.4 Examples 10Base-T Ethernet

	Minimum telegram (64 Byte)	Medium telegram (500 Byte)	Maximum telegram (1,518 Byte)
Header	18 Byte	18 Byte	18 Byte
Data	46 Byte	482 Byte	1,500 Byte
1	30 μs	30 μs	30 μs
2	282 μs	2,200 μs	6,680 μs
3	Disregarded	Disregarded	Disregarded
4	30 μs	30 μs	30 μs
5	52 μs	400 μs	1,214 μs
Total	394 μs	2,660 μs	7,954 μs

11.6.2.5 Examples 100Base-TX Ethernet

	Minimum telegram (64 Byte)	Medium telegram (500 Byte)	Maximum telegram (1,518 Byte)
Header	18 Byte	18 Byte	18 Byte
Data	46 Byte	482 Byte	1,500 Byte
1	30 μs	30 μs	30 μs
2	282 μs	2,200 μs	6,680 μs
3	Disregarded	Disregarded	Disregarded
4	30 μs	30 μs	30 μs
5	5 μs	40 μs	121 μs
Total	347 μs	2,300 μs	6,861 μs

12 Commissioning / Operation (all device models)

12.1 Indicator and operating elements

All ID-200 device models have the following indicator and operating elements:

- Bar graph with 10 LEDs
- Operating mode LEDs AUT, MAN, ADJ
- Operating mode buttons

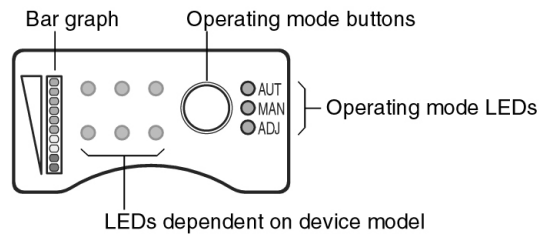


Figure 12-1: Indicator and operating elements common to all ID-200 device models

Bar graph

The bar graph displays the quality of the received signal (receiving level) at its own (operating modes 'Automatic' and 'Manual') or opposing (operating mode 'Adjust') ID-200 (Figure 12-2).

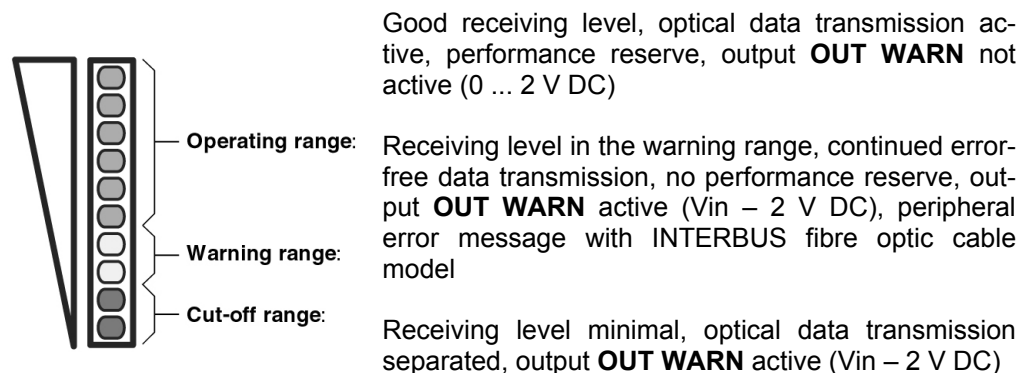


Figure 12-2: Meaning of the bar graph for displaying the receiving level

Operating mode LEDs

The three green LEDs **AUT**, **MAN** and **ADJ** indicate the current operating mode (see chapter 12.2 “Operating modes”), of the ID-200.

- **AUT**: operating mode 'Automatic'
- **MAN**: operating mode 'Manual'
- **ADJ**: operating mode 'Adjust'

Operating mode buttons

With the operating mode button, you can switch between the three operating modes 'Automatic', 'Manual' and 'Adjust' (see chapter 12.2 “Operating modes”)

12.2 Operating modes

The following table provides an overview of the ID-200 operating modes.

Operating mode	Description	Optical data transmission	Bar graph assignment
Automatic, AUT LED illuminates	Normal operation	Active	Its own receiving level, display of the alignment quality of the opposing device
Manual, MAN LED illuminates	Adjustment operation, cut-off threshold on higher level	Active	Its own receiving level, display of the alignment quality of the opposing device
Adjust, ADJ LED illuminates	Adjustment operation, cut-off threshold on higher level	Separated	Receiving level of the opposing device, display of the alignment quality of own device

12.2.1 Changing the operating mode

- AUT→MAN** Press the operating mode button for more than 2 seconds. Only the device on which the button was pressed switches to the 'Manual' operating mode (**MAN** LED illuminates).
- MAN→ADJ** Press the operating mode button on one of the two devices. Both devices switch to the 'Adjust' operating mode (both **ADJ** LEDs illuminate) when both were previously in the 'Manual' operating mode.
- ADJ→MAN** Press the operating mode button on one of the two devices. Both devices switch to the 'Manual' operating mode (both **MAN** LEDs illuminate).
- MAN→AUT** Press the operating mode button for more than 2 seconds. Only the device on which the button was pressed switches to the 'Automatic' operating mode (**AUT** LED illuminates).



Note

*If, while in the AUT operating mode, the operating mode button is pressed for longer than 13 s, the device switches to a special diagnostic mode. The **AUT**, **MAN** and **ADJ** LEDs illuminate simultaneously (see chapter 14.2: "Diagnostic mode").*

To switch to the 'Adjust' (ADJ) operating mode, both devices belonging to a transmission path must first be in the 'Manual' (MAN) operating mode. It is not possible to switch directly from the 'Automatic' to the 'Adjust' operating mode or vice versa.

12.3 Initial commissioning

12.3.1 Switch on device / function check

After applying the operating voltage, the ID-200 first performs a self-test. If the self-test is successfully completed, the **PWR** or **UL** LED illuminates continuously and the ID-200 switches to the 'Automatic' operating mode. If the connection to the opposing device exists, data can be transmitted immediately.

If the **PWR** or **UL** LED flashes after switching on, there are two possible causes: either a hardware error has occurred or the transmitter/receiver unit has switched off via the switching input **IN** (chapter 5.4.1.2: "Switching input").

If the **PWR** or **UL** LED remains dark after switching on, there is either no voltage supply present (check connections and voltage) or a hardware error has occurred.

12.3.2 Fine adjustment



If you have mounted and switched on the two ID-200s of a given optical transmission path and they are both in the 'Automatic' operating mode, you can perform the fine adjustment of the devices relative to one another with the aid of the three alignment screws.

Note

Note that with "alignment" the transmitter with the beam which is to be positioned as exactly as possible on the opposing receiver is always meant.

At the maximum sensing distance, the bar graph does not show end-scale deflection even with optimal alignment.

The ID-200 supports fast and easy fine adjustment. The **optimisation of the alignment** between the two devices of one transmission path can be performed **by just one person**. Use the following descriptive steps as a set of numbered instructions:

1. Both devices are located close to one another (> 1 m). Ideally, the bar graphs of both devices display maximum end-scale deflection.
2. Switch both devices to 'Manual' (**MAN**) by pressing the button for a relatively long time (> 2 s). Data transmission remains active, only the internal cut-off threshold is changed to the warning threshold (yellow LEDs).
3. While in the 'Manual' operating mode, move until data transmission of the ID-200 is interrupted. The devices are not yet optimally aligned with one another.
4. Briefly press the button to switch both devices to the 'Adjust' operating mode (**ADJ**). Data transmission remains interrupted.
5. The devices can now be individually aligned. The result of the alignment can be read directly in the bar graph.
6. When both devices are aligned, briefly pressing the button on one of the devices is enough to switch both back to the 'Manual' operating mode (**MAN**). Data transmission is again active; the vehicle can continue its path. If data transmission is interrupted again, repeat steps 3 – 6.
7. If the data transmission and the alignment are OK up to the end of the path of motion, switch both devices back to the 'Automatic' (**AUT**) operating mode by pressing the button for a relatively long time (> 2 s). The optical data transceiver is now ready for operation.

12.4 Operation

In running operation ('Automatic' operating mode) the ID-200 operates maintenance-free. Only the glass optics need to be cleaned occasionally in the event of soiling. This can be checked by analysing the switching output **OUT WARN** (with the INTERBUS fibre optic cable model, a peripheral error message is also available). If the output is set, soiling of the ID-200's glass optics is often the cause (see chapter 13.1 "Cleaning").

It must still be ensured that the light beam is not interrupted at any time.



CAUTION !

If, during operation of the ID-200, the light beam is interrupted or one of the two devices is switched voltage free, the effect of the interruption on the entire network is equivalent to the interruption of a data line!

In the event of an interruption (light beam interruption or switched voltage-free), the ID-200 switches off the network to a non-interacting state. The system reactions in the event of an interruption are to be defined together with the supplier of the PLC.

13 Maintenance

13.1 Cleaning

The optical window of the ID-200 is to be cleaned monthly or as needed (warning output). To clean, use a soft cloth and a cleaning agent (standard glass cleaner).



CAUTION !

Do not use solvents and cleaning agents containing acetone. Use of improper cleaning agents can damage the optical window.

14 Diagnostics and Troubleshooting

14.1 Status display on the device

The LEDs on the control panel of the ID-200 provide information about possible faults and errors. The descriptions of the states of the ID-200's LEDs are found for

- | | |
|----------------------------------------------------|--------------|
| • all models in | chapter 12.1 |
| • the model PROFIBUS / RS 485 in | chapter 6.4 |
| • the model INTERBUS 500 kBit/s / RS 422 in | chapter 7.3 |
| • the model INTERBUS 2 MBit/s fibre optic cable in | chapter 8.3 |
| • the model Data Highway + / Remote I/O in | chapter 9.3 |
| • the model DeviceNet / CANopen in | chapter 10.4 |
| • the model Ethernet in | chapter 11.5 |



Note

The INTERBUS 2 MBit/s fibre optic cable model of the ID-200 is an INTERBUS subscriber (Ident-Code: 0x0C = 12 dec). You can also use the diagnostic options available via the INTERBUS.

14.2 Diagnostic mode

In the diagnostic mode, the optical received signal level of the ID-200 is monitored. This function is designed to support the diagnosis of short optical light beam interruptions as part of the bus diagnosis.

To enter the diagnostic mode, the ID-200 must be in the **AUT** state and the operating mode button must be pressed for longer than 13 s. After the button is released, all 3 operating mode LEDs illuminate. If the light beam is interrupted now, the 3 operating mode LEDs start to flash. This state is maintained until the flashing is acknowledged by a brief press of the button. Afterwards, the 3 operating mode LEDs light-up permanently again. To exit the diagnostic mode, the button must be pressed for more than 13 s.

Function-wise, the ID-200 acts during the diagnosis as if it were in **AUT** state. Hence, just a normal data transmission takes place, and the thresholds for warning and switch-off are also the same as in **AUT** mode.

Each ID-200 must individually be set to diagnostic mode. This is in contrast to switching from **MAN** to **ADJ** mode, where both ID-200 change to **ADJ** state if one side has its button pressed.

14.3 Troubleshooting

Error	Possible causes	Remedy	
PWR or UL LED does not illuminate	<ul style="list-style-type: none"> no supply voltage 	<ul style="list-style-type: none"> Check connections and supply voltage at the device; switch back on 	
	<ul style="list-style-type: none"> Hardware defect 	<ul style="list-style-type: none"> In event of defect, replace device and send in for repair. 	
PWR or UL LED flashes	<ul style="list-style-type: none"> Transmitter/receiver unit is switched off via input IN. 	<ul style="list-style-type: none"> Check input IN and setting of switch S1 	
	<ul style="list-style-type: none"> Hardware defect. 	<ul style="list-style-type: none"> In event of defect, replace device and send in for repair. 	
ADJ LED flashes	<ul style="list-style-type: none"> Light beam interruption or no visual connection to opposing device (when opposing device is in the 'Manual' operating mode). 	<ul style="list-style-type: none"> Check light path 	
	<ul style="list-style-type: none"> Misalignment of an ID-200 (when opposing device is in the 'Manual' operating mode). 	<ul style="list-style-type: none"> Realign transmission path 	
Bus operation not possible	<ul style="list-style-type: none"> Transmission error 	<ul style="list-style-type: none"> See error transmission error 	
	<ul style="list-style-type: none"> Wiring error 	<ul style="list-style-type: none"> Check wiring 	
	<ul style="list-style-type: none"> Adjustment error (termination, baud rate, configuration) 	<ul style="list-style-type: none"> Check settings 	
	<ul style="list-style-type: none"> Incorrect bus cable 	<ul style="list-style-type: none"> Use specified bus cable 	
	<ul style="list-style-type: none"> Transmitter/receiver unit deactivated 	<ul style="list-style-type: none"> Check for correct wiring and S1 setting Set to 'Adjust' operating mode, ADJ LED must not flash 	
Transmission error	<ul style="list-style-type: none"> Receiving level too low due to: <ul style="list-style-type: none"> - Misalignment - Soiling - Operation with excessively large operating ranges 	<ul style="list-style-type: none"> Realign (check in 'Adjust' operating mode) Cleaning optical window Observe operating limits 	
	<ul style="list-style-type: none"> Influenced by parallel data path 	<ul style="list-style-type: none"> Operate data transmission units with alternating frequency assignments, check parallel distances 	
	<ul style="list-style-type: none"> Influenced by cascading data paths 	<ul style="list-style-type: none"> Operate data transmission units with alternating frequency assignments 	
	<ul style="list-style-type: none"> Shielding not connected 	<ul style="list-style-type: none"> Connect shielding correctly 	
	<ul style="list-style-type: none"> Incorrect bus termination 	<ul style="list-style-type: none"> Disconnect/connect terminating resistors 	
	<ul style="list-style-type: none"> Earth lead not connected 	<ul style="list-style-type: none"> Connect earth lead 	
	<ul style="list-style-type: none"> Intense, direct ambient light 	<ul style="list-style-type: none"> Remove ambient light source 	

15 Accessories

15.1 Contact assignment of PWR IN for voltage supply

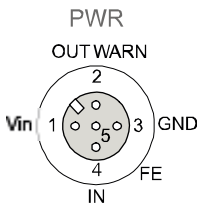

PWR connection cable (5-pin socket, A-coded)		
 <p>M12socket (A-coded)</p>	Pin	Name
	1	Vin
	2	OUT WARN
	3	GND
	4	IN
	5	FE
	Thread	FE

Figure 15-1: M12 voltage supply




1.2 PROFIBUS

Connection	PWR IN	BUS IN	BUS OUT
Manufacturer	Binder	Binder	Binder
Order no.	99-0436-14-05	99-1436-810-05	99-1437-810-05
Series	713	715	715
Remark	socket 5-pin. M12 A-coded	socket 5-pin. M12 B-coded	plug 5-pin. M12 B-coded
Figure			

1.2.1 Terminator plug PROFIBUS

Function	terminating resistor	
Supplier	TR-Electronic	
Order No.	40803-40005	
Remark	terminator plug 4-pin. M12 B-coded	

15.2 DeviceNet / CANopen

Connection	PWR IN	BUS IN	BUS OUT
Manufacturer	Binder	Binder	Binder
Order no.	99-0436-14-05	79-3540-15-05	79-3539-15-05
Series	713	763	763
Remark	socket 5-pol. M12 A-coded	socket 5-pol. M12 A-coded 5m PVC-cable	plug 5-pin. M12 A-coded 5m PVC-cable
Figure			

1.3 Ethernet

Connection	PWR IN	BUS IN/OUT
Manufacturer	Binder	Binder
Order no.	99-0436-14-05	99-3729-810-04
Series	713	825
Remark	socket 5-pin. M12 A-coded	plug 4-pin. M12 D-coded
Figure		