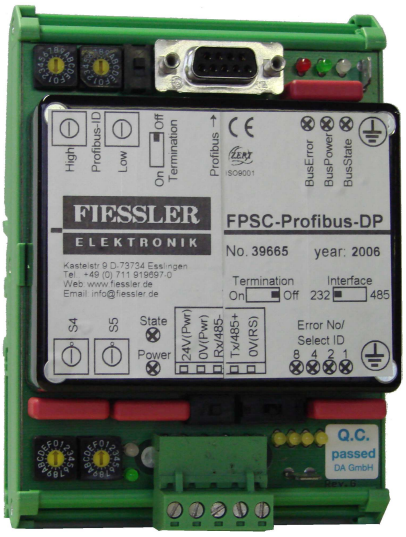
Master Profibus DP

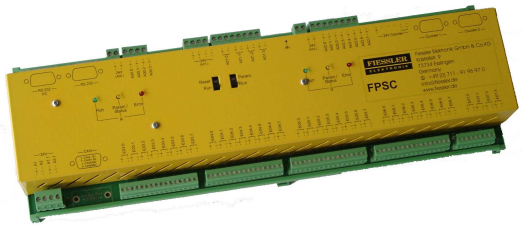
Profibus DP

Feldbus-Gateway



FPSC-Profibus-DP

Modbus ASCII



Fiessler
Parametrierbares
Safety
Center

1 Information on CE marking of the module

1.1 EU Directive EMC

The following applies to the module described in this User Manual:

Products which bear the CE mark comply with the requirements of EU Directive „Electromagnetic Compatibility“ and the harmonized European Standards (EN) listed therein.

1.2 Scope of application

The modules are designed for use in the industrial sector and comply with the following requirements.

Scope of application	Requirement applicable to	
	Emitted interference	Interference immunity
Industry	EN 55011 Kl. A	EN 61000-6-2

1.3 Note installation guidelines

The module complies with the requirements if you

1.1. comply with the installation guidelines described in the User Manual when installing and operating the module.
2.2. also follow the rules below on installation of the equipment and on working on switch cabinets.

1.4 Installation of the unit

Modules must be installed in electrical equipment rooms/areas or in enclosed housings (e.g. switch boxes made of metal or plastic).

Moreover, you must earth the unit and the switch box (metal box) or at least the top-hat rail (plastic box) onto which the module has been snapped.

1.5 Working on switch cabinets

In order to protect the modules against static electrical discharge, the personnel must discharge themselves electrostatically before opening switch cabinets or switch boxes.

2 Information for the machine manufacturers

2.1 Introduction

The FPSC-Profibus-DP module does not constitute a machine as defined by the EU "Machinery“ Directive. Consequently, the module does not have a Declaration of Conformity in relation to the EU Machinery Directive .

2.2 EU Machinery Directive

The EU Machinery Directive stipulates the requirements applicable to a machine. The term "machine" is taken to mean a totality of connected parts or fixtures

The module is a part of the electrical equipment of the machine and must thus be included by the machine manufacturer in the Declaration of Conformity process.

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

3 Introduction

The FPSC-Profibus-DP module serves to adapt a serial port to the ProfibusDP to EN 50 170. In this application, it functions as a gateway and operates as the ProfibusDP Slave. It can be operated by any standard-compliant Master.

FPSC-Profibus-DP supported the folowing transmission protocols at the serial port:

-Modbus-ASCII(FPSC)

4 Mode of operation of the system

4.1 General explanation

Communication can be split into seven layers, Layer 1 to Layer 7, in accordance with the ISO/OSI model.

The Fiessler gateway convert Layers 1 and 2 of the customized bus system (RS485 / RS232) to the corresponding fieldbus system. Layers 3 to 6 are blank, and Layer 7 is forwarded transparently on the standard gateways.

4.2 Interfaces

The gateway features the RS232 and RS485 interfaces. Switchover is performed by means of a slide switch accessible for the customer. The Profibus gateway thus allows access to all devices connected to the RS485 bus via one single Profibus address resp. access to the device connected to the RS232 interface. **Attention do not change selector switch from basic position RS232!!**

4.3 Data exchange

The Profibus Master sends the output data cyclically to the gateway. The data received from the Master is sent in the gateway to the external device in accordance with the selected protocol. The external device responds in accordance with the protocol conventions.

The data received from the external device is written by the gateway into the internal RAM of the SPC3. The updated data is then transferred on the next poll cycle with the gateway.

At the FPSC-Profibus-DP the data exchange via the RS interface can be programmed as follows:

- if trigger byte changes

All data is transferred consistently by the gateway in both directions. The maximum data length of consistent data must be noted in the case of data exchange between Master and CPU(FPSC). This is generally dependent on the Master interface connection and the CPU(FPSC) used.

Structure of the data:

Trigger byte	See "The trigger byte", Chapter 4.6, on page 5
Length byte	See "The length byte", Chapter 4.7, on page 5
User data	User Manual of FPSC, Chapter 8 , Modbus protocol description

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

4.4 Possible data lengths

The table below shows the maximum transferable data:

Input data	max. 244 bytes	Variable: maximum value in this case
Output data	max. 244 bytes	Variable: maximum value in this case
Parameters	8 bytes	No user parameters
Configuration data	max. 16 bytes	Dependent on configuration
Diagnosis	max. 8 bytes	1 user diagnostic bit = error code

4.5 Run-up phase

The Master programs and configures the gateway in the run-up phase. Data exchange with the external device does not occur until after the run-up phase has been completed with no errors.

4.6 The trigger byte at the FPSC-Profibus-DP

Since the data is always transferred cyclically on Profibus, the gateway must detect when the user wishes to send new data via the serial interface. This is normally done by the gateway comparing the data to be transferred via the Profibus with the old data stored internally (data exchange on change). In many cases however, this cannot be used as the criterion, e.g. whenever the same data is to be sent. For this reason, the user can set control of transmission via a trigger byte. In this mode, the gateway always sends (and only sends) when the trigger byte is changed.

Accordingly, the application program in the control in Normal mode cannot detect whether the gateway has received several identical telegrams. If Trigger-Byte mode is activated, the gateway increments the trigger byte each time a telegram has been received.

The first byte in the Profibus input/output data buffer is used as the trigger byte if this mode is activated.

4.7 The length byte at the FPSC-Profibus-DP

The user can configure whether the transmit length is also to be stored as a byte in the input/output data area. In transmit direction, as many bytes as specified in this byte are sent. On reception of a telegram, the gateway enters the number of characters received.

5 Implemented protocols in FPSC-Profibus-DP

5.1 FPSC-Profibus-DP as MODBUS-Master

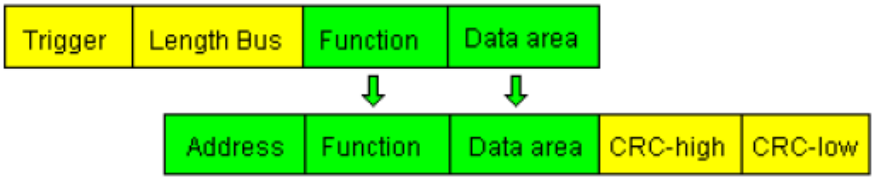
Since the Modbus operates with a variable data format - dependent on the required function and data length - but since the fieldbus requires a fixed data length, this must be preset by means of a selection in the GSD file (input and output are identical). This length should be selected by the user such that the longest Modbus request resp. response can be processed. If a Modbus response is longer than the preset fieldbus length, the gateway signals an "Rx buffer overflow“.

The mode (Modus request on request) necessitates the first byte in the fieldbus containing a trigger byte (see chapter 4.6). This byte is not transferred to the Modbus and serves only to start a Modbus transmission. For this purpose, the gateway constantly monitors this trigger byte and sends data to the Modbus only when this byte has changed. In the reverse direction (to the fieldbus), the gateway transfers the number of received Modbus data records in this byte, i.e. this byte is incremented by the gateway after each data record.

If the "Length byte“ is activated (see chapter 4.7), the gateway transfers only the number of bytes specified there. The number of received Modbus data items is saved in the direction of the fieldbus Master. The length always refers to bytes "Address" to "Dat n" (inclusive in each case), always without CRC checksum.

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

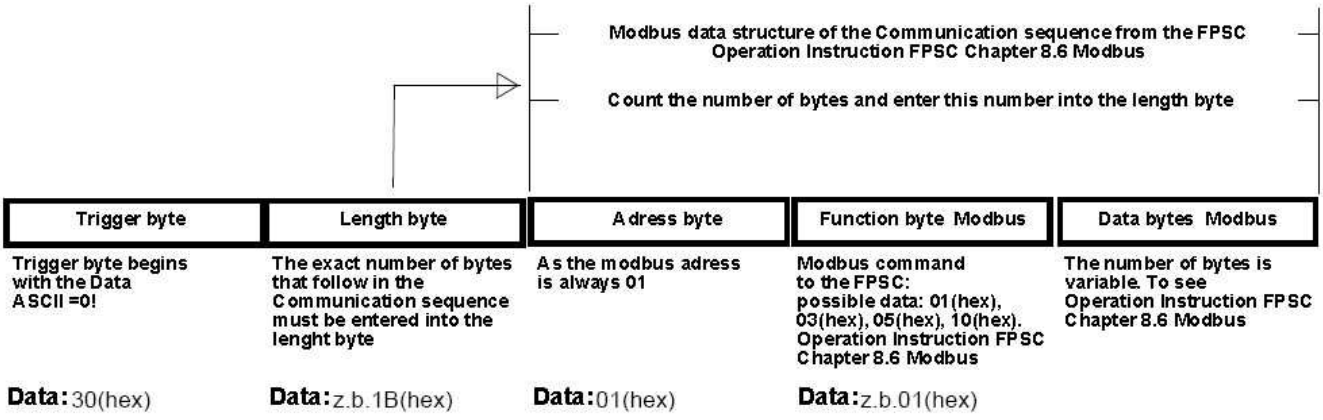
5.2 Data structure



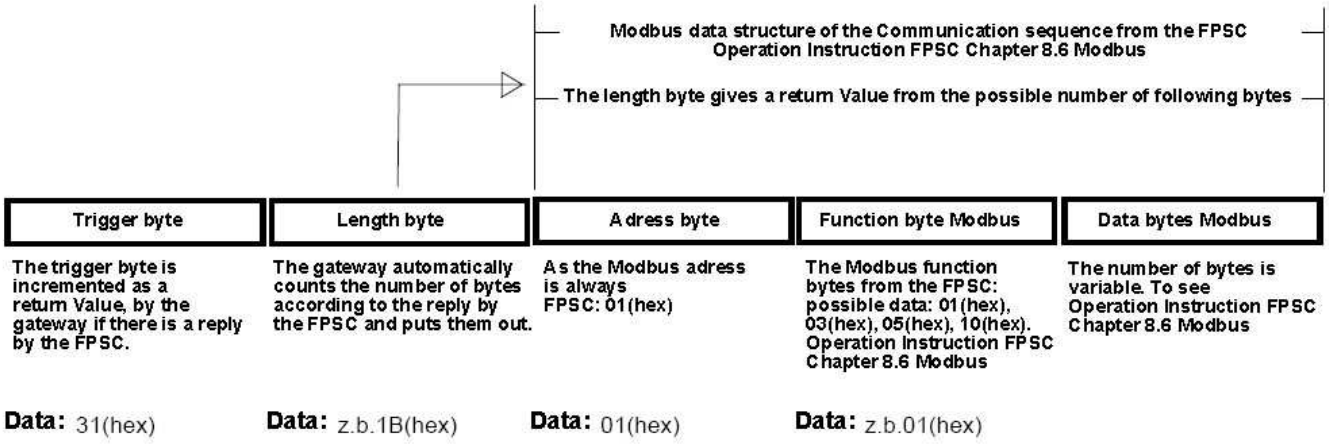
5.3 Communication sequence

The gateway always acts as the Slave with respect to the fieldbus and always acts as the Master at the Modbus end. Thus, data exchange must always be started by the fieldbus Master. The gateway fetches this data which must be structured in accordance with chapter "Data structure“, from the fieldbus Master, determines the valid length of the Modbus data if the length byte is not activated, adds the CRC checksum and sends this data record as a request on the Modbus.

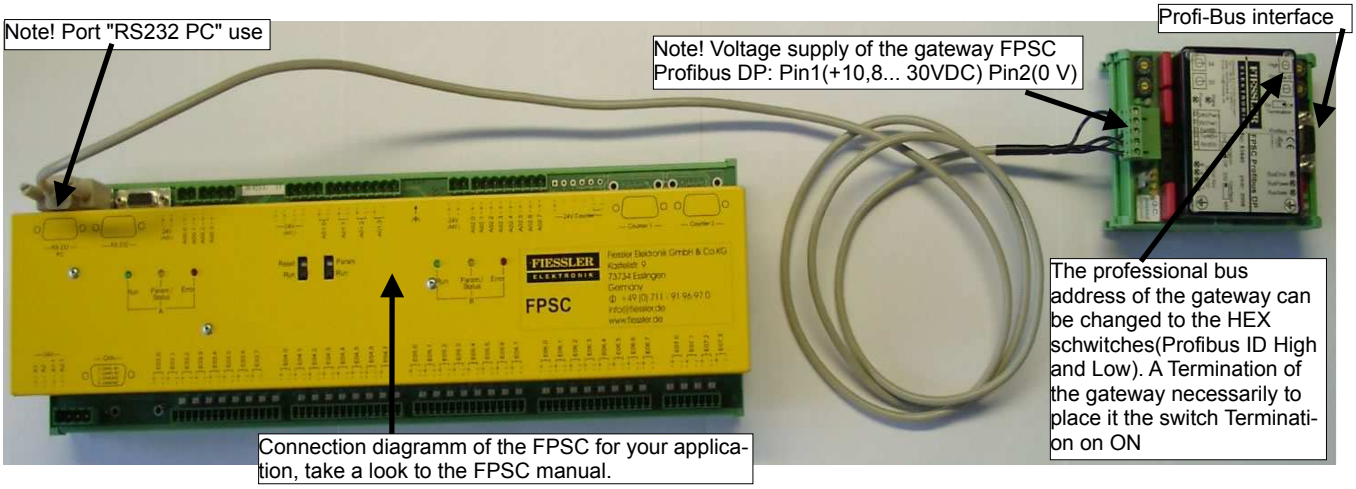
Data structure of the Communication sequence from Profibus Master to the Fiessler Gateway:



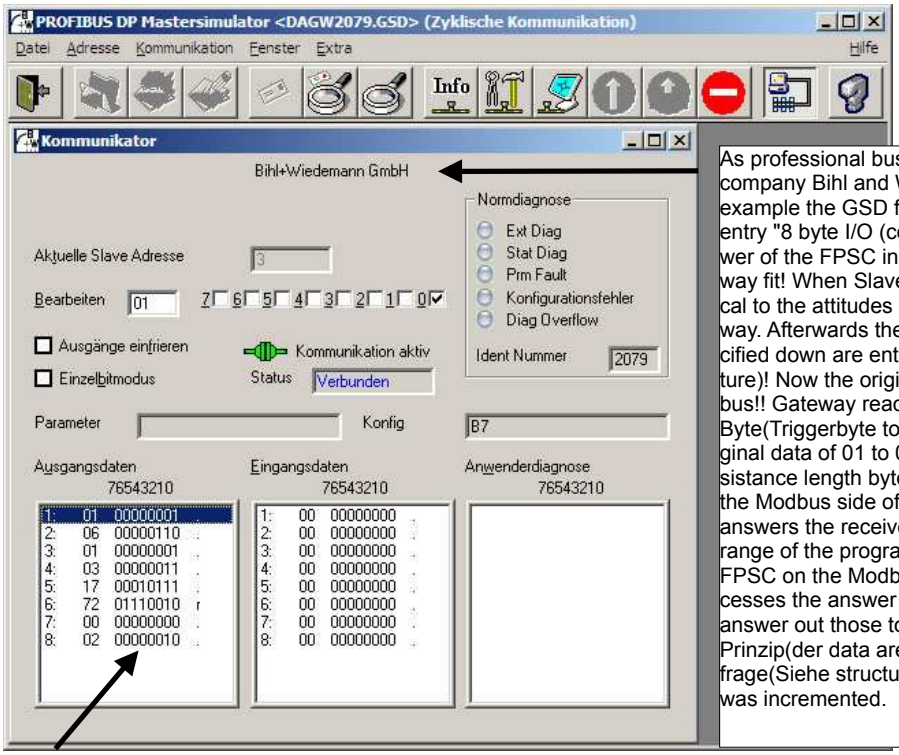
Data structure of the Communication sequence from Fiessler Gateway to the Profibus Master:



Connection and communication of the Profi-Bus master via gateway to the FPSC



Profi-Bus communication:



As professional bus simulator in this example a Dongle of the company Bihl and Wiedemann is used. Select they as in this example the GSD file DAGW2079.GSD and use them e.g. the entry "8 byte I/O (consistent)" selecting you the size that the answer of the FPSC in each case into the number of bytes in such a way fit! When Slave address here 3 used, which should be identical to the attitudes of the High and Low byte switch at the gateway. Afterwards the individual bytes of the minutes example specified down are entered into the range Ausgangsdaten(Siehe picture)! Now the original data lie cyclically on your professional bus!! Gateway reacted however only on this request if we the first Byte(Triggerbyte to 01) aendern(Z.B. in the input mask of the original data of 01 to 02 by hand set) thereafter by the gateway assistance length byte here the relevant data is recognized and to the Modbus side of the gateway spent. The FPSC finished and answers the received data, the period of reply depends on the range of the program in the FPSC! The answer is given of the FPSC on the Modbus to the gateway, this recognizes and processes the answer and gives on the professional bus side the answer out those to answer on the professional bus side is from Prinzip(der data area can be larger) just as developed as the Anfrage(Siehe structure of minutes down) the trigger byte around 1 was incremented.

Example of a Profi-Bus data structure:

The total data length from the Profi-Bus master to the gateway you specify by the selection in the GSD file gateway

These 6 bytes are the data, which are passed on to the FPSC. The structure is explained in the FPSC manual appendix chapter 8. Here as ex. an inquiry is used by diagnose interfaces the macro.

01 06 01 03 17 72 00 02 00 00 00 00 00.....

0002 These 2 bytes indicate the number of registers

1772 are the 2 bytes for the register 6002

03 means the function "read of the FPSC" is selected

01 is the Modbusadresse of the FPSC, so it`s always 1

Length byte indicates the number of following bytes. Attention these data necessarily only the gateway.

Trigger byte changes this byte, starts that for gateway the passing on of the data to the FPSC. Attention these data necessarily only gateway.

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 Fax.: 0711/919697-50 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1057

6 Hardware ports, switches and LEDs

6.1 Profibus

- Configuration data: In accordance with GSD file
- Diagnostic data : Max. 8 bytes (see chapter Error handling)
- Baud rate: Automatic detection up to 12 MBaud
- Sync: Supported
- Freeze: Supported
- Ident. No.: 0x2079

6.2 Connectors

6.2.1 Connector to the external device(FPSC)

The connection cable to the external device must be plugged in at the connector accessible on the underside of the device.

Pin No.	Name	Function
1	10.8..30 V/DC power supply	Power supply
2	0 V power supply	Power supply
3	RX / RS485- (RS485 B)	Receive signal
4	TX / RS485+ (RS485 A)	Transmit signal
5	GND	Reference for PIN 3 + 4

Pin allocation (5pol. Screwing plug-in connection) - in the case of use provided cable connection from the FPSC Profibus DP to the FPSC, must be only attached supply voltage to pin 1 and 2! Note!: The RS interface is not potential is „GND “and „supply 0V “internally connected!

6.2.2 ProfibusDP connector

The connector (labelled: ProfibusDP) for connection to Profibus is located on the upper side of the device

Pin No.	Name	Function
1	Shield	
2		
3	B	Non-inverting input/output signal from Profibus
4		
5	M5	DGND – data reference potential
6	P5	5 V supply voltage
7		
8	A	Inverting input/output signal from Profibus
9		

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

6.2.3 Power supply

The device must be powered with 10.8-30 VDC.
Please note that the devices of the series FPSC Profibus-DP can not be operated with AC voltage.

6.2.4 Shield terminal lead

The shield signal for the electronic circuitry is connected to the top-hat rail via the connector provided. The shield signal for the Profibus cable shield is not electrically connected to the shield signal of the electronic circuitry for reasons relating to interference immunity.

6.3 LEDs

The gateway FPSC Profibus-DP features 9 LEDs with the following significance:

LED Bus Error	red	Profibus error
LED Bus Power	green	Profibus supply voltage
LED Bus State	red/green	Interface state, ProfibusDP
LED Power	green	RS485/RS232 supply voltage
LED State	red/green	Interface status RS485/RS232
LED Error No / Select ID	yellow	Binary display of the connection/error number

6.3.1 LED “Bus Error“

This LED is activated directly by the Profibus ASIC and signals that the Profibus is not in “DATA EXCHANGE” status.

6.3.2 LED “Bus Power“

This LED is connected directly to the electrically isolated supply voltage of the Profibus end.

6.3.3 LED “Bus State“

Lights green	Profibus in Data Exchange state
Blinks green	Gateway waiting for Profibus configuration data
Blinks green/red	Gateway waiting for Profibus parameter data
Lights red	General Profibus error

6.3.4 LED “Power“

This LED is connected directly to the (optionally also electrically isolated) supply voltage of the RS485/RS232 end.

6.3.5 LED “State“

Lights green (only RS)	Data exchange active via RS485/RS232
Flashes green (only RS)	RS485/RS232 ok but no permanent data exchange
Flashes green/red (only RS)	No data exchange since switching on
Lights red	General gateway error (see LEDs Error No.)
Flashes red (only RS)	UNIGATE is in the configuration mode

6.3.6 LEDs “Error No. / Select ID“ at FPSC-Profibus-DP

If these 4 LEDs flash and LED “State“ simultaneously lights red, the error number is displayed in binary notation (conversion table, see Annex) in accordance with the table in chapter "Error handling". Otherwise, the address with which communication is currently running via the RS485 interface is displayed, also in binary notation.

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

6.4 Switches

The gateway features 7 switches with the following functions:

Rotary coding switch, Profibus High	ProfibusDP ID (High Byte)
Rotary coding switch, Profibus Low	ProfibusDP ID (Low Byte)
Slide switch “Termination“	Switchable ProfibusDP terminating resistor
Rotary coding switch S4	RS485 ID (High Byte)
Rotary coding switch S5	RS485 ID (Low Byte)
Slide switch “Interface“	Selector switch for RS485 or RS232 interface
Slide switch “Termination“	Switchable RS485 terminating resistor

6.4.1 Rotary coding switch (Profibus ID)

These two switches are used to set the Profibus ID (00..7D) of the gateway in hexadecimal notation. This value is read in only once when the gateway in activated and cannot be changed via the Profibus

6.4.2 Slide switch Termination Profibus

If the gateway is operated as the first or last physical device in the ProfibusDP, there must be a bus termination at this gateway. In order to do this, either a bus terminating resistor must be activated in the connector or the resistor (220 :) integrated in the gateway must be activated. In order to do this, slide the slide switch to position ON. In all other cases, the slide switch must remain in position OFF. Please refer to the general Profibus literature for further information on the subject of bus termination.

6.4.3 Rotary coding switches S4 + S5 (RS485 ID)-!!Attention on basic adjustment leave!!

These two switches are used to set the RS485 ID of the gateway in hexadecimal notation provided an ID is required for the bus. This value is read in only once when the gateway is activated.

6.4.4 Slide switch (RS485/RS232 interface)-!!Attention on basic adjustment leave!

This slide switch is used to select whether an RS485 interface or an RS232 interface is connected at the connector to the external device.

6.4.5 Slide switch (RS485/RS422 Termination)

If the gateway is operated as the first or last physical device in the RS485 bus, there must be a bus termination at this gateway. In order to do this, either a bus terminating resistor in the connector or the resistor (150 :) integrated in the gateway must be activated. In order to do this, slide the slide switch to position ON. In all other cases, the slide switch must remain in position OFF. Please refer to the general RS485 literature for further information on the subject of bus terminations.
If the integrated resistor is used, please allow for the fact that this also activates a pull-down resistor (390 :) to ground and a pull-up resistor (390 :) to VCC.
At the RS422-interface the transmission line is terminated. The receive line is always firmly terminated.

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

7 Error handling

7.1 Error handling at FPSC-Profibus-DP

If the gateway detects an error, the error is signalled by the “State“ LED lighting red and, simultaneously, the error number being indicated by means of LEDs “Error No.“ as shown in the table below. In addition, this error number is transferred as an external diagnostic byte via the Profibus to the Master. A distinction can be made between two error categories:

Serious errors (1-5): In this case, the gateway must be switched off and switched back on again. If the error occurs again, the gateway must be exchanged and returned for repair.

Warnings (6-15): These warnings are displayed for one minute simply for information purposes and are then automatically reset. If such warnings occur frequently, please inform After-Sales Service.

For user-defined errors the flash frequency is 1 hertz.

LED8	LED4	LED2	LED1	Error no. resp. ID	Error description
0	0	0	0	0	Reserved
0	0	0	1	1	Initialisation error of the RS485/RS232 interface
0	0	1	0	2	EEROM error
0	0	1	1	3	Stack error
0	1	0	0	4	Hardware fault of the fieldbus ASIC
0	1	0	1	5	Configuration error of the gateways (unknown protocol)
0	1	1	0	6	Reserved
0	1	1	1	7	RS485/RS232 transmit buffer overflow
1	0	0	0	8	RS485/RS232 receive buffer overflow
1	0	0	1	9	Time-out on reception RS485/RS232 interface
1	0	1	0	10	Transmit error of the RS485/RS232 interface
1	0	1	1	11	Parity- or frame-check-error
1	1	0	0	12	Addressing error of the RS485/RS232 interface
1	1	0	1	13	Configuration error by Profibus Master
1	1	1	0	14	General error of the RS485/RS232 interface
1	1	1	1	15	Internal error

Tabelle 1: Error handling at FPSC-Profibus-DP

8 Installation guidelines

8.1 Installation of the module

The module of size (90 x 127 x 55 mm W x H x D) has been developed for switch cabinet use (IP 20) and can thus be mounted only on a standard mounting channel (deep top-hat rail to EN 50022).

8.1.1 Mounting

Engage the module from the top in the top-hat rail and swivel it down so that the module engages in position. Other modules may be rowed up to the left and right of the module.
There must be at least 5 cm clearance for heat dissipation above and below the module.
The standard mounting channel must be connected to the equipotential bonding strip of the switch cabinet. The connection wire must feature a cross-section of at least 10 mm².
An earthing terminal must be positioned next to the module so as to allow the shield connection on the device to be implemented as short as possible with a flexible wire (1.5 mm²).

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

8.1.2 Removal

- First disconnect the power supply and signal lines.
- Then push the module up and swivel it out of the top-hat rail.

Vertical installation

The standard mounting channel may also be mounted vertically so that the module is mounted turned through 90°.

8.2 Wiring

8.2.1 Connection systems

The following connection systems must resp. may be used when wiring the module:

•Standard screw-type/plug connection (power supply + RS)

•Push-lock terminals (connection terminals for earthing)

•9-pin SUB-D plug connectors (ProfibusDP and RS232 connection)

a) In the case of standard screw-type terminals, one lead can be clamped per connection point. It is best to then use a screwdriver with a blade width of 3.5 mm to firmly tighten the screw.

Permitted cross-sections of the line:

•Flexible line with wire-end ferrule: 1 x 0.25 ... 1.5 mm²

•Solid conductor: 1 x 0.25 ... 1.5 mm²

•Tightening torque: 0.5 ... 0.8 Nm

b)The plug-in connection terminal strip is a combination of standard screw-type terminal and plug connector. The plug connection section is coded and can thus not be plugged on the wrong way round.

c)The 9-pin SUB-D plug connectors are secured with two screws with "4-40-UNC" thread. It is best to use a screwdriver with a blade width of 3.5 mm to screw the screw tight. Tightening torque: 0.2... 0.4 Nm

8.2.2 ProfibusDP commun ication interface

8.2.2.1 Bus line with copper cable

This interface is located on the module in the form of a 9-pin SUB-D socket on the front side of the housing.
•Plug the Profibus connector onto the SUB-D socket labelled "ProfibusDP".
•Firmly screw the securing screws of the plug connector tight using a screwdriver.
•If the module is located at the start or end of the Profibus line, you must connect the bus terminating resistor integrated in the gateway. In order to do this, slide the slide switch to the position labelled . ..on...
•If the module is not located at the start or at the end, you must set the slide switch to position "off" .

8.2.2.2 Power supply

The device must be powered with 10.8...30 V DC.

•Connect the supply voltage to the 5-pin or optional 2-pin plug-in screw terminal in accordance with the labelling on the front panel of the device.

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

8.2.2.3 Schirmanschluß

The module features two contact points for equipotential bonding and the shield of the RS end. The shield of the Profibus cable is connected to the equipotential bonding system via an RC snubber circuit. This means that there are two electrically isolated shields in the device. This guarantees higher interference immunity of the module since the "cable shield current" which may be up to a few Amperes owing to potential differences between two bus users is not discharged via the device.

If the device is subject to high mechanical or chemical stress, it is advisable to use a tin-plated top-hat rail in order to ensure greater contact stability of the shield connection!

8.2.2.4 Equipotential bonding connection

- Fit an earthing terminal to the top-hat rail directly next to the module. The earthing terminal automatically establishes an electrical connection to the top-hat rail.
- Connect the shield connection terminal to the earthing terminal using a flexible wire with a diameter of 1.5 mm² which should be as short as possible.
- Connect the top-hat rail to the equipotential bonding rail with as low an impedance as possible. Use a flexible earthing wire with a cross-section of at least 10 mm² for this.

8.2.3 Line routing, shield and measures to combat interference voltage

This Chapter deals with line routing in the case of bus, signal and power supply lines, with the aim of ensuring an EMC-compliant design of your system.

8.2.4 General information on line routing

- Inside and outside of cabinets

In order to achieve EMC-compliant routing of the lines, it is advisable to split the lines into the following line groups and to lay these groups separately.

⇒ Group A:
- shielded bus and data lines (e.g. for ProfibusDP, RS232C and printers etc.)
- shielded analogue lines
- unshielded lines for DC voltages ≥ 60 V
- unshielded lines for AC voltage ≥ 25 V
- coaxial lines for monitors

⇒ Group B:
- unshielded lines for DC voltages ≥ 60 V and ≥ 400 V
- unshielded lines for AC voltage ≥ 24 V and ≥ 400 V

⇒ Group C:
- unshielded lines for DC voltages > 400 V

The table below allows you to read off the conditions for laying the line groups on the basis of the combination of the individual groups.

	Group A	Group B	Group C
Group A	1	2	3
Group B	2	1	3
Group C	3	3	1

Table 3: Line laying instructions as a function of the combination of line groups

1) Lines may be laid in common bunches or cable ducts.
2) Lines must be laid in separate bunches or cable ducts (without minimum clearance).
3) Lines must be laid in separate bunches or cable ducts inside cabinets but on separate cable racks with at least 10 cm clearance outside of cabinets but inside buildings.

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

8.2.4.1 Shielding of lines

Shielding is intended to weaken (attenuate) magnetic, electrical or electromagnetic interference fields.
Interference currents on cable shields are discharged to earth via the shielding bus which is connected conductively to the chassis or housing. A low-impedance connection to the PE wire is particularly important in order to prevent these interference currents themselves becoming an interference source.
Wherever possible, use only lines with braided shield. The coverage density of the shield should exceed 80 %. Avoid lines with foil shield since the foil can be damaged very easily as the result of tensile and compressive stress on attachment. The consequence is a reduction in the shielding effect.
In general, you should always connect the shields of cables at both ends. The only way of achieving good interference suppression in the higher frequency band is by connecting the shields at both ends.
The shield may also be connected at one end only in exceptional cases. However, this then achieves only an attenuation of the lower frequencies. Connecting the shield at one end may be more favorable if
•it is not possible to lay an equipotential bonding line
•analogue signals (a few mV resp. mA) are to be transmitted
•foil shields (static shields) are used.
In the case of data lines for serial couplings, always use metallic or metallized plugs and connectors. Attach the shield of the data line to the plug or connector housing.

If there are potential differences between the earthing points, a compensating current may flow via the shield connected at both ends. In this case, you should lay an additional equipotential bonding line.

Please note the following points when shielding:
- Use metal cable clips to secure the shield braiding. The clips must surround the shield over a large area and must have good contact.
- Downstream of the entry point of the line into the cabinet, connect the shield to a shielding bus. Continue the shield as far as the module, but do not connect it again at this point!

Shielded data lines and unshielded power supply lines (< 60 V DC) are routed to and connected to the module. All cable shields must be earthed at both ends in order for the module to comply with all required EMC limits.

- Downstream of the entry point into the switch cabinet, the ProfibusDP cable shield must be connected to the equipotential bonding strip.

- You must earth the shielded RS232C connection cable via the shield terminal on the module using a flexible wire with a cross-section of at least 1.5 mm² which is as short as possible.

- You must also earth the other end of the cable shield of the RS232C connection cable. (see also chapter 8.2.2.3)

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

9 Representation of the data in ProfibusDP

Any standard-compliant ProfibusDP Master can exchange data with the gateway. It is also possible to use very "simple" Master connections owing to the data structure.

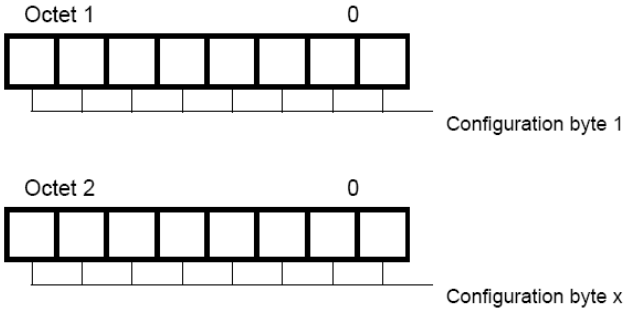
9.1 Configuration telegram

After programming, the Master must send a configuration telegram to the corresponding Slave. The configuration telegram provides the Slave with information on the length of the input/output data. If the user has set the 'Length byte' flag, this means the maximum data lengths. Otherwise, it means the actual lengths.

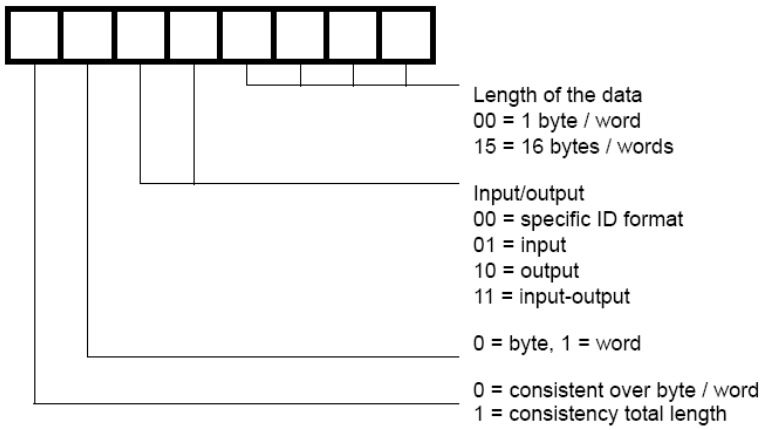
The user normally also configures the configuration telegram in the project planning tool where he may also, if necessary, enter the address range in which the useful data is stored.

You can write up to 16 bytes or words in one octet of the DataUnit (DU). Inputs and outputs hav¬ing the same format can be combined in one octet. Otherwise, you must use as many octets as the number of different bytes/words you wish to use and which cannot be combined in one octet. If the module detects, during the check, that the maximum permitted input/output data lengths have been exceeded, it signals incorrect configuration to the Master during a subsequent diagnostic scan. It is then not ready for useful data communication.

Configuration telegram



Structure of an octet in the configuration telegram:



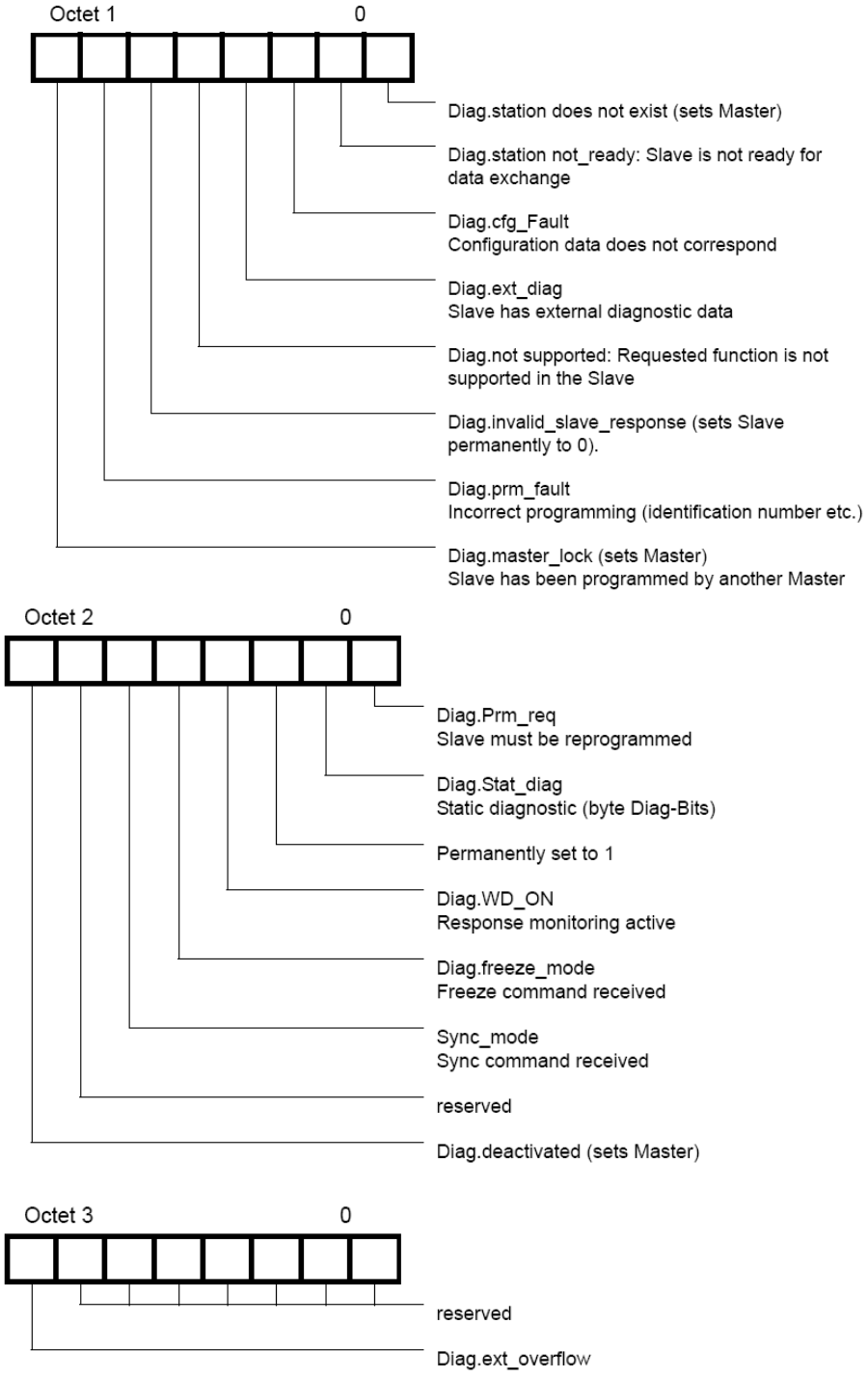
9.2 Diagnosis

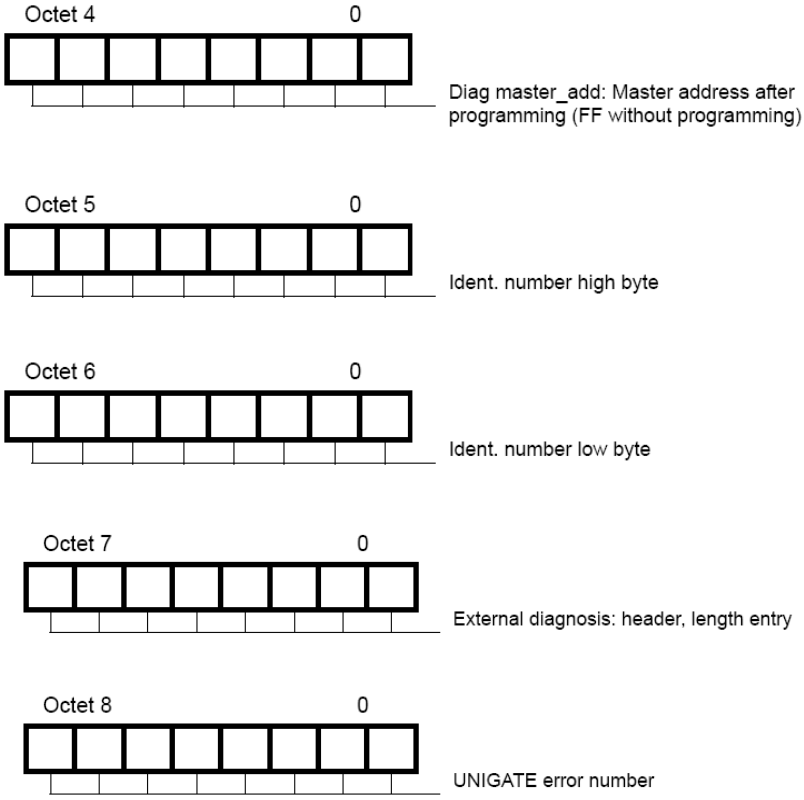
Diagnostic data is high-priority data. The gateway runs an external diagnostic if it detects an internal error.

Representation of the information in the external diagnostic byte:

The diagnostic information of a DP Slave consists of standard diagnostic information items (6 bytes) and a user-specific diagnostic information item. (Error number)

Telegram for diagnostic request:





9.2.1 Diagnosis in DPV1

The "external diagnosis" of DPV0 (old PB) is used differently at DPV1. At DPV1 the alarms and the status messages are transfered there. Since the gateway's error numbers have been transfered in the external diagnosis it became necessary then to carry out an adaptation at DPV1. Now the 3 bytes "0x81, 0x00, 0x00" have been inserted in front of the actual error message in order to be compatible with DPV1-masters. With it a DPV1-master identifies our gateway's error as status message now.
This results in a different representation of our gateway error in Profibus. At DPV0 the error number is transmitted in unmodified form as 1 byte external diagnosis. In case DPV1 has been activated in the gateway through the GSD-file, the error number occurs as 1 byte status message. Supposing the DPV1 is activated and a master (which does not support the alarms and status messages) is connected, then our gateway error number is presented as "external diagnosis" with 4 bytes (see above), at which point the 4th byte contains the error number and the preceding 3 bytes (0x81, 0x00, 0x00) can be ignored.

9.3 Data exchange

After the Master, in the diagnostic, detects that the Slave is ready for data exchange, it sends data exchange telegrams. Either the Master stores the data in the input/output direction in the address area specified during project planning or the control program must fetch or retrieve the data using specific function blocks.

10 Technical data

10.1 Device data

The technical data of the module is given in the table below.

No.	Parameter	Data	GL-certified design	Explanations
1	Location	Switch cabinet	On ships	Top-hat rail mounting
2	Enclosure	IP24 / IP66	IP 66	Protection against foreign bodies and water to IEC 529 (DIN 40050)
4	Service life	10 years	10 years	
5	Housing size	90 x 127 x 55 mm	120 x 122x 80 mm	W x H x D
6	Installation position	Any	Any	
7	Weight	0.3 kg	1.15 kg	
8	Operating temperature	-20°C ... +55°C humidity (non-condensing)	0°C ... +55°C	
9	Storage/transport temperature	-40 °C ... +70 °C	-40°C..70°C	
10	Atmospheric pressure during operation during transport	 795 hPa ... 1080 hPa 660 hPa ... 1080 hPa	-	
11	Installation altitude	2000 m 4000 m	Not applicable	Unrestricted Restricted - Ambient temperature ≤ 40 °C
12	Relative humidity	Max. 80 %	Max. 100 %	No condensation, no corrosive atmosphere
14	External power supply	10.8...30 V DC	24 V ± 20%	Standard power supply unit to DIN 19240
15	Current consumption at 24 V DC	Typ. 120 mA max 150 mA	Max. 150 mA	At 10.8V. typ. 350 mA
16	Power supply at the Profibus interface	5 V DC / max. 50 mA		(Max. 50 mA at < 30 °C ambient temperature)
17	Reverse voltage protection	Yes	Yes	But does not function!
18	Short-circuit protection	Yes	Yes	
19	Overload protection	Poly-switch	Poly-switch	Thermal fuse
20	Undervoltage detection (USP)	≤ 9 V DC	-	
21	Emergency power supply	≥ 5 ms	-	Device fully operable

Table: Technical data of the module

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

The table below lists all tests, standards and regulations on the basis of which the module has been tested.

No.	Parameter	Data	GL-certified design	Explanations
1	Vibration test	5 Hz ≤ f ≤ 26 Hz, amplitude = 0.75 mm 26 Hz ≤ f ≤ 500 Hz, acceleration = 20 m/s^2 → Frequency sweep : 1 octave/min. → 10 frequency sweeps each in x, y, z	2 Hz ≤ f ≤ 25 Hz : ±1.6 mm 25 Hz ≤ f ≤ 100 Hz: 4 g	(IEC 68-2-6Fc sinusoidal)
2	Shock test	Shock waveform = semi-sinusoidal Acceleration = 15g (150 m/s^2) Shock duration = 11 ms → 3 shocks in +/- direction in x, y, z	-	(IEC 68-2-27-Ea)
3	ESD	8 kV discharge in air 4 kV contact discharge	8 kV discharge in air 4 kV contact discharge	EN 50082-2
4	Electromagnetic fields	10 V/m	80 MHz.1GHz, 10V/m	EN 50082-2
5	BURST	2 kV / 5 kHz supply voltage 1 kV / 5 kHz data lines	2 kV / 5 kHz supply voltage 1 kV / 5 kHz data lines	EN 50082-2
6	Emitted interference	Limit value class A	Wire-bound: 10 KHz ..150 KHz: 120 dBµV .. 69 dBµV 150 KHz.. 1.5 MHz: 79 dBµV .. 63dBµV 1.5 MHz..30 MHz: 63 dBµV Radiation: 150 KHz..30 MHz: 80 dBµV..50dBµV 30 MHz.. 100 MHz: 60 dBµV.. 54dBµV 100 MHz.. 1GHz: 54 dBµV 156 MHZ.. 165 MHz: 24 dBµV	EN 55011
7	Approvals	CE mark Profibus certification	GL	→ Certificate of Conformity → Profibus User Organisation

Table: Tests, standards and regulations

10.1.1 Interface data

The table below lists the technical data of the interfaces and ports on the device. The data has been taken from the corresponding Standards.

No.	Interface designation Physical interface	ProfibusDP RS485	RS232-C RS232-C	RS485/RS422 RS485/RS422
1	Standard	EIA Standard	DIN 66020	EIA Standard
2	Transmission mode	Symmetrical asynchronous serial half-duplex → Difference signal	Asymmetrical asynchronous serial full duplex → Level	Symmetrical asynchronous serial half-duplex full duplex at RS422 → Difference signal
3	Transmission method	Master / Slave	Master / Slave	Master / Slave
4	Number of users : - Transmitters - Receivers	32 32	1 1	32 32
5	Cable length: - Maximum - Baud rate-dependent	1200 m 93.75 kBd → 1200 m 187.5 kBd → 1000 m 500 kBd → 400 m 1.5 MBd → 200 m >1.5 MBd → 100 m	15 m no	1200 m <93.75 kBd → 1200 m 312, kBd → 500 m 625 kBd → 250 m
6	Bus topology	Line	Point-to-point	Line
7	Data rate: - Maximum - Standard values	12 Mbit/s 9.6 kBit/s 19.2 kBit/s 93.75 kBit/s 187.5 kBit/s 500 kBit/s 1.5 Mbit/s 3 MBit/s 6 MBit/s 12 Mbit/s	120 kBit/s 2.4 k/B 4.8 k/B 9.6 kBit/s 19.2 kBit/s 38.4 kBit/s	625 kBaud 2.4 kBit/s 4.8 kBit/s 9.6 kBit/s 19.2 kBit/s 57.6 kB 312.5 kB 625 kB
8	Transmitter: - Load - Maximum voltage - Signal, unloaded - Signal, loaded	54 Ω - 7 V ... 12 V ± 5 V ± 1.5 V	3 ... 7 kΩ ± 25 V ± 15 V ± 5 V	54 Ω - 7 V ... 12 V ± 5 V ± 1.5 V
9	Receiver: - Input resistance - Max. input signal - Sensitivity	12 Ω - 7 V ... 12 V ± 0.2 V	3 ... 7 Ω ± 15 V ± 3 V	12 Ω - 7 V ... 12 V ± 0.2 V
10	Transmit range (SPACE): - Voltage level - Logic level	- 0.2 ... + 0.2 V 0	+ 3 ... + 15 V 0	- 0.2 ... + 0.2 V 0
11	Transmit pause (MARK): - Voltage level - Logic level	+ 1.5 ... +5 V 1	- 3 ... –15 V 1	+ 1.5 ... +5 V 1

Table: Technical data of the interfaces and ports on the module

11 Commissioning guide

11.1 Note

Only trained personnel following the safety regulations may commission the FPSC-Profibus-DP

11.2 Components

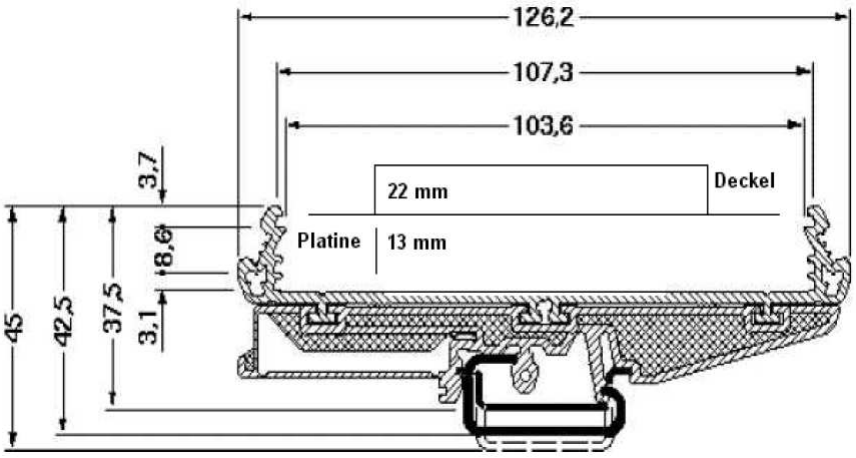
You will require the following components to commission the FPSC-Profibus-DP:

- FPSC-Profibus-DP
- Connection cable from gateway to the FPSC
- Connector for Profibus connection to the gateway
- Profibus cable (this cable is generally already installed on site!)
- 10.8..30 V DC power supply (DIN 19240)
- Type fileresp. GSD file and User Manual (the GSD file as well as the user manual can be ordered separately or downloaded free of charge from our homepage at www.fiessler .de)

11.3 Installation

The FPSC-Profibus-DP module features enclosure IP 20 and is thus suitable for switch cabinet use. The device is designed for snapping onto a 35 mm top-hat rail.

11.4 Dimensional drawing DIN-rail mounting



11.5 Commissioning

It is essential that you perform the following steps during commissioning in order to ensure that the module operates correctly:

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08

11.6 Setting the Profibus address

Set the Profibus address at the fieldbus end of the module on the two rotary switches designated "Profibus-ID High" and "Profibus-ID Low" This adjustment is carried out in a hexadecimal way.

Example:
The Profibus-ID is 26 decimal = 1A hexadecimal
The switch "Profibus-ID High" has to be set to 1 and the switch "Profibus-ID Low has to be set to A.

In case the rotary switch is set to a value between 0...125, the gateway operates - with this Profibus-ID and a change via the master is not possible.

Attention:
The Pro fibus address set must correspond to the planned address under COM Pro fibus !
It is read in only on power-up of the gateway!

11.7 Profibus connection

Connect the device to the Profibus at the interface labelled "ProfibusDP".

11.8 Connection to the process device(FPSC)

Please also read the User Manual provided for the process device(FPSC) when commissioning the process device.

Please you note that for communication on side of the FPSC the macro is to be inserted “diagnose interface” into the user program!

11.9 Connecting the supply voltage

Please connect 10.8...30 DC voltage to the terminals provided for this.

11.10 Shield connection

Connect the PE wire at the terminal provided for this. Earth the top-hat rail onto which the module has been snapped.

11.11 Project planning

Use any project planning tool for project planning.

If the required GSD file was not supplied with your project planning tool, please copy this file from the enclosed diskette or download this file from the Internet (www.fiessler.de).

11.12 Project planning-Tipps

Projektierungstools for Siemens Step7: Consider to respond the FPSC Profibus DP over profibus SFC14/15 to be used must, since those is larger word width 4!

Fiessler Elektronik Gmbh & Co. KG Kastellstr. 9 73734 Esslingen Tel.: 0711/919697-0 email:info@fiessler.de web:www.fiessler.de Doku.Nr.:1058 vom 14.05.08