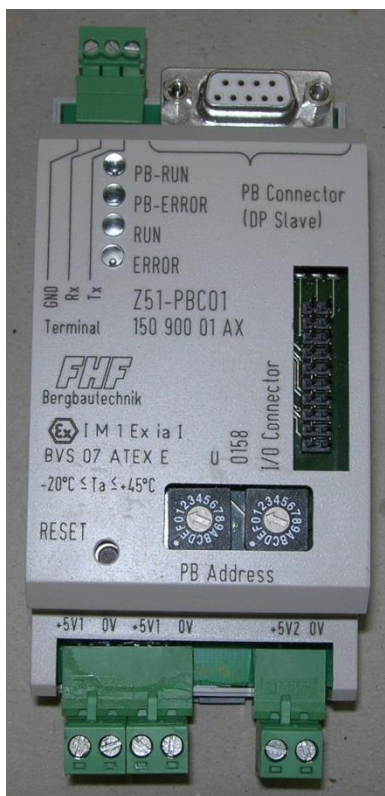


Profibus controller of type Z51-PBC01

Ordering data

Designation	Type	Item no.
Profibus controller	Z51-PBC01	150 900 01 AX



- Process data acquisition through input modules of the station and data storage
- Data output through output modules
- Data processing for serial data transmission according to "Profibus DP" standard
- Communication through "Profibus DP" fieldbus connection with "Profibus DP" master
- Type of protection I M1 Ex ia I

Application and functioning

The Profibus controller Z51-PBC01 is the central, intelligent control unit of a ZM51 station configured as a Profibus DP slave and provides it with the functionality of an "intelligent terminal strip" ("remote I/O", "decentral periphery").

The basic functions of this microcontroller controlled module are:

- acquisition of process data through the input modules of the station and storage of these data,
- output of data to the process through the output modules,
- processing of data for the serial data transmission according to "Profibus DP" standard,
- communication through Profibus DP fieldbus connection with a "Profibus DP" master,
- I M1 Ex ia I.

The Profibus controller Z51-PBC01 contains:

- one powerful 16-bit microcontroller
- with one internal program memory (max. 512k Flash-EPROM) with the operating system for data acquisition, data output, data transmission
- with internal data memory (max. 32k RAM) for the data to be acquired and output
- one non-volatile memory (8k Ferroelectric RAM) for the retentive storage of transmission data and parameter data of the operating system
- one 3-pin plug-in terminal (top section) to connect a laptop for configuration purposes (RS232)
- one 9-pin Sub-D socket (RS485) (top section) to connect a Profibus modem (e.g. PBM01)

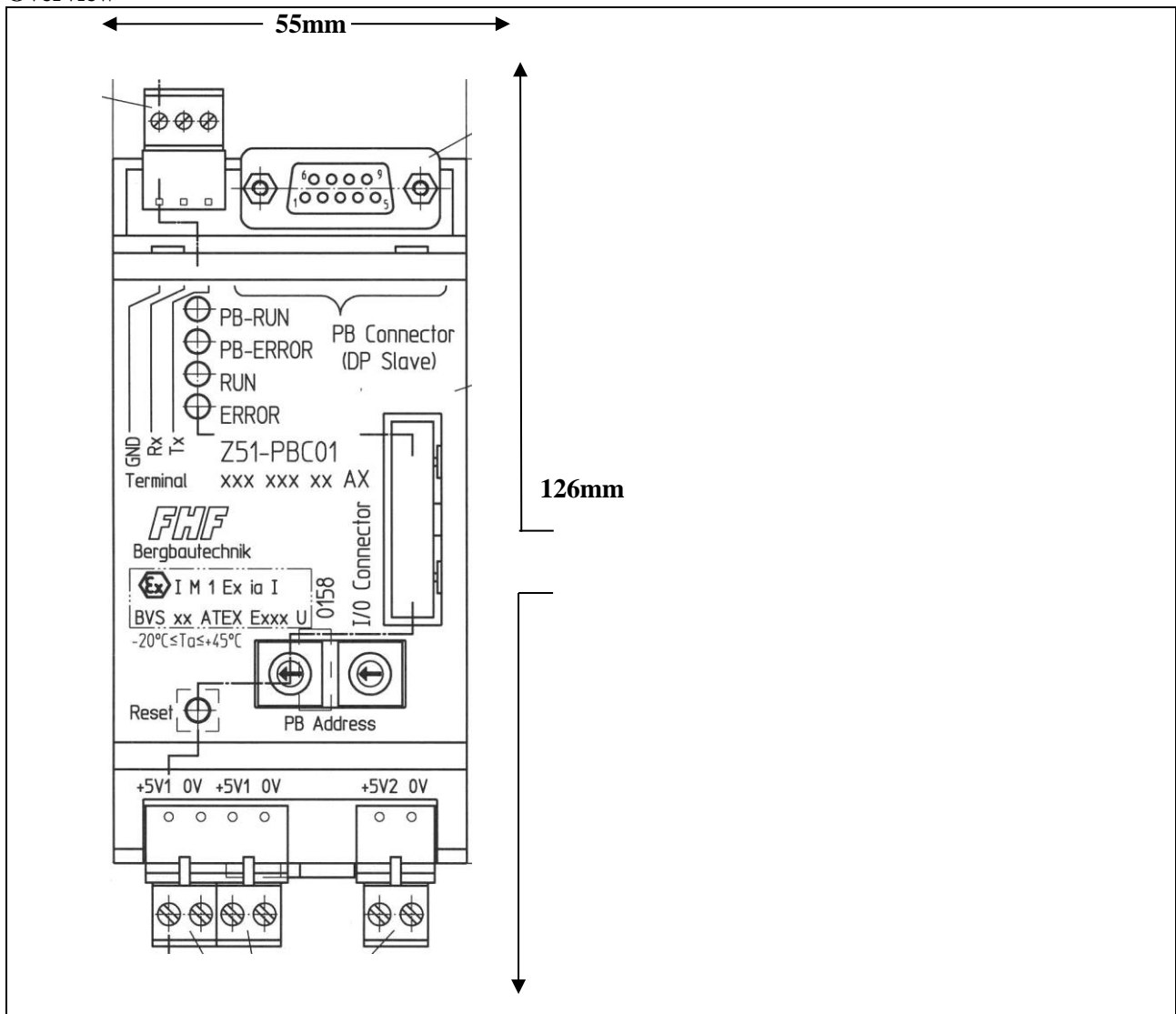
Profibus controller of type Z51-PBC01

- plug-in terminal connections (bottom section) for 5V supply of CPU and I/O modules
- one plug connection (RH side) for the ZM51 station bus, i.e. for the flat ribbon cable connector which starts at the Profibus controller and is connected to all I/O modules
- two miniature rotary switches to set the Profibus slave address
- Reset button
- Diagnostics indications:

- RUN (green: Z51-PBC01 in operating condition)
 - ERROR (red: Z51-PBC01 in error condition)
 - PB RUN (green: communication on Profibus DP)
 - PB ERROR (red: no communication connection on Profibus DP).
- On the occasion of the initial commissioning and in case of each change to the configuration of the I/O modules, it must be taken over by the

Profibus controller Z51-PBC01 (learnt) to ensure that the process data mirror and the Profibus DP telegram are configured correspondingly. This is initialised locally by pressing the Reset button for more than 5s or remotely, by setting bit 8 in byte 16 (rising edge) in the Profibus DP telegram (or the process image). The data transmission rates (up to 1.5Mbit/s) are set automatically.


Overview



Technical data

Designation	Profibus controller	
Type	Z51-PBC01	
Electrical parameters		
Intrinsically safe power supply circuit X1301 (+5V1, 0V)		
Terminals Kl.1-Kl.4		
Voltage U_i	5.5 V _{DC}	
Effective internal capacitance C_i	$\leq 65 \mu\text{F}$	
Effective internal inductance L_i	negligible	
Intrinsically safe power supply circuit X1300 (+5V2, 0V)		
Terminals Kl.1 – Kl.2		
Voltage U_i	5.5 V _{DC}	
Effective internal capacitance C_i	$\leq 13 \mu\text{F}$	
Effective internal inductance L_i	negligible	
X1301 and X1300 electrically connected: common GND		
ZM51 I/O data bus		
Plug connector X400 ZM51 BUS		
Supply		
Voltage U_0	5.5 V _{DC}	
Power P_0	3 W	
C_i and L_i of connector pins “supply” of the data bus plug connectors are identical with the values indicated for “intrinsically safe supply circuit X1300”.		
Data lines		
Signal voltage U_0	5.5 V _{DC}	
Signal current I_0	15 mA	
Power P_0	18 mW	
Effective internal capacitance C_i	negligible	
Effective internal inductance L_i	negligible	
Diagnostics interface serial interface parameterization / programming (RS232)		
Terminals X1400 (Tx out, Rx in, GND)		
Data lines		
Signal voltage U_0	+10 / -10 V _{AC/DC}	
Signal current I_0	7.5 mA	
Power P_0	18.5 mW	
Effective internal capacitance C_i	negligible	
Effective internal inductance L_i	negligible	
Fieldbus connection (RS485)		
Plug connector X1401 (9-pin D-sub)		
Signal voltage U_i/U_0	5.5 V _{DC}	
Signal current I_0	246 mA) ¹	
Power P_0	340 mW) ¹	
Effective internal capacitance C_i	negligible	
Effective internal inductance L_i	negligible	
) ¹ per ea. signal line (SPB_A, SPB_B, SPB_PB_CTRL)		
Other technical data		
Supply voltage	5 V \pm 5%	
Power consumption	approx. 80 mA	
Processor	Freescale 16-bit microcontroller of type MC9S12XD	
Program processing	cyclic	
Cycle monitoring	Watchdog	
RAM memory	internal, max. 512 kbyte	
EPROM (Flash) memory	internal, max. 32 kbyte	

Technical data (continued)

Retentive memory	Ferroelectric RAM, 8 kbyte
Address area I/O modules	8 I/O module addresses
Data transmission (Profibus)	
- Protocol	Profibus DP
- Rate	up to 1.5 Mbit/s
Diagnostics LEDs	
RUN	Green: Z51-PBC01 in operating condition 500ms on – 500ms off – no module found 750ms on – 250ms off – modules found but configuration does not match
ERROR	Red: error condition of Z51-PBC01, e. g. 5V supply voltage tolerance exceeded or fallen short of, internal 3.3V supply voltage defective, 5V supply voltage of I/O bus defective
PB RUN	Green: communication on Profibus DP
PB ERROR	Green flashing: communication errors on Profibus DP Red: no communication connection on Profibus DP
Settings	
- Profibus slave station address	2 miniature rotary switches (decimal-coded)
- Number of addresses	0 to 99
- Reset	Button
Operating mode	100 % ON-time
Service position	at choice
Operating conditions	Inside or outside of operating areas susceptible to fire-damp
Dimensions	55 x 110 x 40 mm (W x H x D)
Weight:	55 x 126 x 40 mm (W x H x D) (incl. plug-in terminals) approx. 0.12 kg
Temperature range	
- Operation	- 20 to + 45°C
- Storage	- 25 to + 70°C
- Transport	- 25 to + 70°C
Approval:	BVS 08 ATEX E 004 U
Type of protection:	I M1 Ex ia I
Marking	
The nameplate is marked as follows:	
Company	FHF Bergbautechnik GmbH & Co. KG 42551 Velbert
Type	Z51-PBC01  I M 1 Ex ia I BVS 08 ATEX E004 U CE 0158 F. No.... Test....(short sign, month/year) -20°C ≤ T _a ≤ +45°C

Telegram configuration

The I/O modules (digital inputs or outputs, analog inputs or outputs) connected to the Profibus controller of type Z51-PBC01 by means of the type ZM51 - I/O bus in flat ribbon cable design occupy a number of bytes in the process data mirror which differs according to the module type, and for this reason also differs in the Profibus-DP send / receive telegram.

In detail, the reserved / occupied bytes in the Profibus DP telegram for each module / module type are as follows:

Module	Reserved bytes	
	Send telegram (inputs)	Receive telegram (outputs)
Z51-DE44	1 byte	-
Z51-DE87	1 byte	-
Z51-DE88/1	1 byte + 1 bit message "Bridging" + 1 bit message "Line Fault"	-
Z51-AE251 (8-bit) or Z51-AE241, -AE25, -AE29 etc.	2 bytes	-
Z51-AE251 (12-bit)	8 bytes	2 bytes
Z51-AEW11 / Z51-AEK221	4 bytes	-
Z51-DA44	-	1 byte
Z51-DA86	-	1 byte
Z51-AA25	-	2 bytes

In the send and receive telegrams, the reserved / occupied bytes of the I/O modules are placed successively without gaps in accordance with the address-based sequence of the modules at the I/O bus (ascending address sequence).

Send telegram (inputs)

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	etc.
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The first byte of the receiver module featuring the lowest address at the I/O bus!!!

Receive telegram (outputs)

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	etc.
----------	----------	----------	----------	----------	----------	----------	------



The first byte of the output module featuring the lowest address at the I/O bus!!!

Example configuration

Z51-PBC01	Z51-DE87 (addr. 0)	Z51-AE251 (8-bit) (addr.1)	Z51-DA86 (addr.2)	Z51-AA25 (addr.3)
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This leads to the following result for the telegrams:

Send telegram (inputs)

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	etc.
Z51-DE87	Z51-AE251 (channel 1)	Z51-AE251 (channel 2)	-	-	-	-	-

Receive telegram (outputs)

1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	etc.
Z51-DA86	Z51-AA25 (channel 1)	Z51-AA25 (channel 2)	-	-	-	-	-

A special case represents the digital input module Z51-DE88/1 (eight inputs with line-fault monitoring for pick-ups with terminating element in double-diode configuration). In addition to the information of the eight process inputs, this input module also generates a group message "Line Fault" (LF) and a group message "Bridging" (B).

Starting from bit 8 / bit 7 of the last byte and progressing downwards, the two group messages are used to fill the last two bytes of the send telegram.

Send telegram (inputs)

xxx							
xxx							
Last byte but one							
Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
LF	B	LF	B	LF	B	LF	B
Last byte							
Bit 8	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1
LF	B	LF	B	LF	B	LF	B

The maximum length of the input and output modules of the send / receive telegrams assigned to the slave (Z51-PBC01) is set in the corresponding Profibus DP master (e.g. Z51-ZM22) by means of the GSD file assigned to the slave.

Possible options are (also see *.GSD file for Z51-PBC01):

- 16-byte input / 16-byte output
- 32-byte input / 32-byte output
- 48-byte input / 16-byte output
- 64-byte input / 16-byte output

Installation and mounting / Advice on use

The Profibus controller Z51PBC01 has to be installed in an enclosure which ensures at least an IP54 degree of protection conforming to EN 60529.

The internal wiring (in this enclosure) has to be configured as per section 6.3.11 and 7.6.e of EN 60079-11.

Connecting terminals or plug connectors for the intrinsically safe circuits have to be arranged as per section 6.2.1 and/or 6.2.2 of EN 60079-11.

If the power supply circuits X1300 and X1301 are fed by a common 5V source, the effective internal capacitance C_i is $\leq 78 \mu\text{F}$. For this purpose, corresponding bridges shall be provided between terminals +5V1 / 0V, +5V2 / 0V.

The interconnection with other equipment must be certified separately.

Commissioning and settings

Prior to the commissioning, the fastening of the module, the installation and the related cables and connection shall be checked. The Profibus slave address can be set between 0 and 99 at both miniature rotary switches designated "PB Address".

In the case of the initial commissioning and each change to the configuration of the I/O modules, the configuration must be taken over by the Profibus controller Z51-PBC01 (learnt) to ensure that the process data mirror and the Profibus DP telegram are configured correspondingly. This is initialised either locally by pressing the Reset button for more than 5s or remotely, by setting bit 8 in byte 16 (rising edge) in the Profibus DP telegram (or in the process image).

If the LED "RUN" is on at the Z51-PBC01, the configuration was taken over.

If the LED "ERROR" is on, the hardware-based module configuration at the I/O bus connection of the Z51-PBC01 does not match the configuration stored in the Z51-PBC01. In this case, the I/O modules will be ignored.

The Profibus controller should be supplied with 5.0V. If the tolerance exceeds a value of $\pm 0.3V$, the "RUN" LED will go off and the "ERROR" LED be on. If the supply voltage is in the negative tolerance range, the processing of the I/O modules will be stopped.

Maintenance / Repairs

The Profibus controller Z51PBC01 is maintenance-free and does not contain any parts requiring maintenance.

Disposal

The disposal of the packaging material and of used parts must be realised in compliance with the regulations of the country in which the device is installed.

Warnings & Safety Advice

<p>This device is a component of explosion-proof design destined for operation inside an explosive atmosphere. It belongs to equipment group I M 1 and is suited for use underground. Especially the following warnings and safety advice shall be observed:</p>
<p>Connection and installation of the component have to be carried out by instructed qualified personnel in due consideration of the specified type of protection and in accordance with the applicable regulations for installation.</p>
<p>The interconnection with other devices and components must be certified separately.</p>
<p>This component may only be connected and operated with the specified voltage. Any polarity specifications have to be observed.</p>
<p>For the operation of the device in industrial facilities, the accident prevention regulations of the employer's liability insurance association for electrical installations and equipment have to be observed.</p>
<p>Make sure to avoid any damage to the housing. Components with damaged housing must not be operated and have to be put out of service immediately.</p>
<p>Attachment and installation of further parts is prohibited.</p>
<p>The device must only be operated under the indicated ambient conditions. Harsh ambient conditions can result in damage to the device and therefore lead to a possible risk for the life of the user. Harsh ambient conditions can be:</p> <ul style="list-style-type: none"> • excessive air humidity (> 75% rel., condensing) • moisture, dusts (pay attention to degree of protection). • combustible gases, vapours, solvents which the type of protection does not cover. • excessively high ambient temperatures (>+45°C) • excessively low ambient temperatures (<-20°C)
<p>The ambient temperature range specified for the component must neither be exceeded nor fallen short of during operation.</p>
<p>Make sure to replace defective parts by corresponding original spare parts only.</p>
<p>Repairs must only be carried out by the manufacturer or a person committed by the manufacturer for this work in connection with a new routine test for this device.</p>
<p>In case of transport and storage as well as when not in use the devices and components have to be protected against damage and ingress of dirt.</p>
<p>Non-observance of the above mentioned points results in loss of the explosion protection. In this case the device will constitute a danger for the life of the operator and can cause an explosive atmosphere to ignite.</p>

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