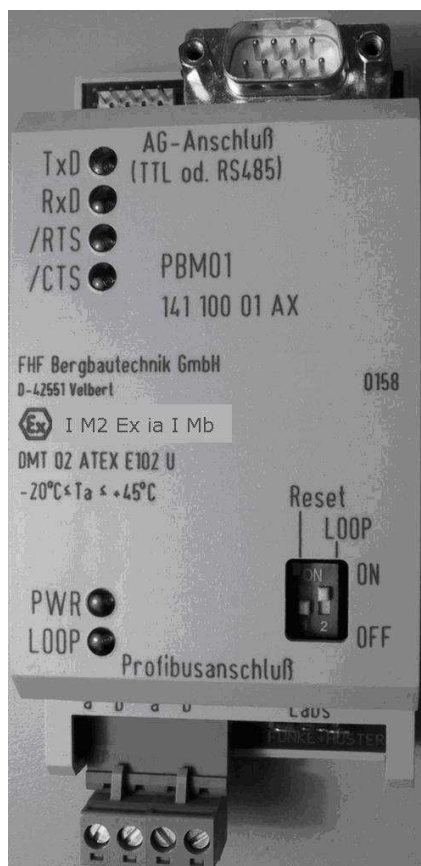


# Profibus modem PBM01

## Ordering data

Designation	Type	Item no.
Profibus modem	PBM01	141 100 01 AX



- Profibus data transmission device
- Profibus input circuit galvanically isolated (transformer decoupled connection)
- Transmission rate: 93.75 kbit/s
- Phase coherent FSK modulation
- TTL and RS485 signal inputs and outputs for connection to an automation device
- Internal LOOP switch to activate the listening function for own transmitted data
- Optical LED status display for signals TxD, RxD, /RTS, /CTS, LOOP and power supply (PWR)
- Internal reset switch
- Connection to bus terminating resistor possible
- Connection to max. 32 PBM01 units to one bus line is possible
- Type of protection I M2 Ex ia I Mb

## Application

The Profibus modem PBM01 is a vendor-neutral Profibus data transmission device in intrinsically safe design. This modem provides access to the bus for those manufacturers of automation devices for use in mining which are equipped with a Profibus interface according to BB22444 T6.

The PBM01 is connected with the Profibus bus line by means of the Profibus connection. The respective automation device (AG) is connected to the AG connection. The 5V<sub>DC</sub> operating voltage is supplied by the automation device.

## Configuration

The electronics of the Profibus modem PBM01 is installed in a module housing for 35mm top-hat rail mounting.

This type of construction ensures the universal application of the Profibus modem.

On the bus side, the Profibus modem is equipped with 4 plug-in screw terminals. The terminals are used to connect the incoming and outgoing 2-wire bus line with the Profibus modem. The polarity of the line does not need to be observed.

Upon closing switch L<sub>abs</sub> a bus line terminating resistor inside the modem is activated which terminates the bus line with the wave impedance connected to this Profibus modem. This resistor may only be activated at the respective end of a bus line which means that only the resistor in the last modem connected to a bus line should be activated.

Note:

Insofar as possible, the bus shall be given a line configuration, spur lines of more than 5m length are not permissible due to a possible interference ( $\lambda/4$  transformations of the open-circuit line end).

On the side of the automation device of the PBM01 modem (AG connection) two plug connectors are available. One 9-pin D-sub ("male") plug connector for connection to an RS485 interface and a two row pin connector for the connection to a TTL interface. The voltage is supplied by the automation device through the particular interface used.

The Profibus modem PBM01 is equipped with three switches for the functions "L<sub>abs</sub>", "LOOP" and "Reset".

**Mode of operation**

The Profibus modem is connected between the Profibus line and the automation device. The bus line is galvanically isolated from the electronics of the Profibus modem by means of a transformer. In case of reception, the transformer features such a high im-

pedance that 32 bus devices can be operated at one bus line. Resistors are installed to adapt the transmitter internal impedances to the impedance of the transmission line. Zener diodes protect the transmission circuit against voltage peaks.

On the transmission side, a corresponding resistor is installed to limit the current. The energetic decoupling between the station and the bus side is obtained by resistors in the control lines of the transmission transistors and in both reception lines.

If the Profibus modem detects reception signals featuring a level in the permissible range, the reception logic will be activated and the modulator / demodulator stage switched on. Subsequently, a pre-amplifier boosts the reception signals to the internal TTL level of the modem, before the downstream modulator / demodulator converts them back into the original signals. For this purpose, the FSK reception signal at TTL level is linked with the EXOR signal which is delayed by half a bit time. The (NRZ) reception signal derived from this process corre-

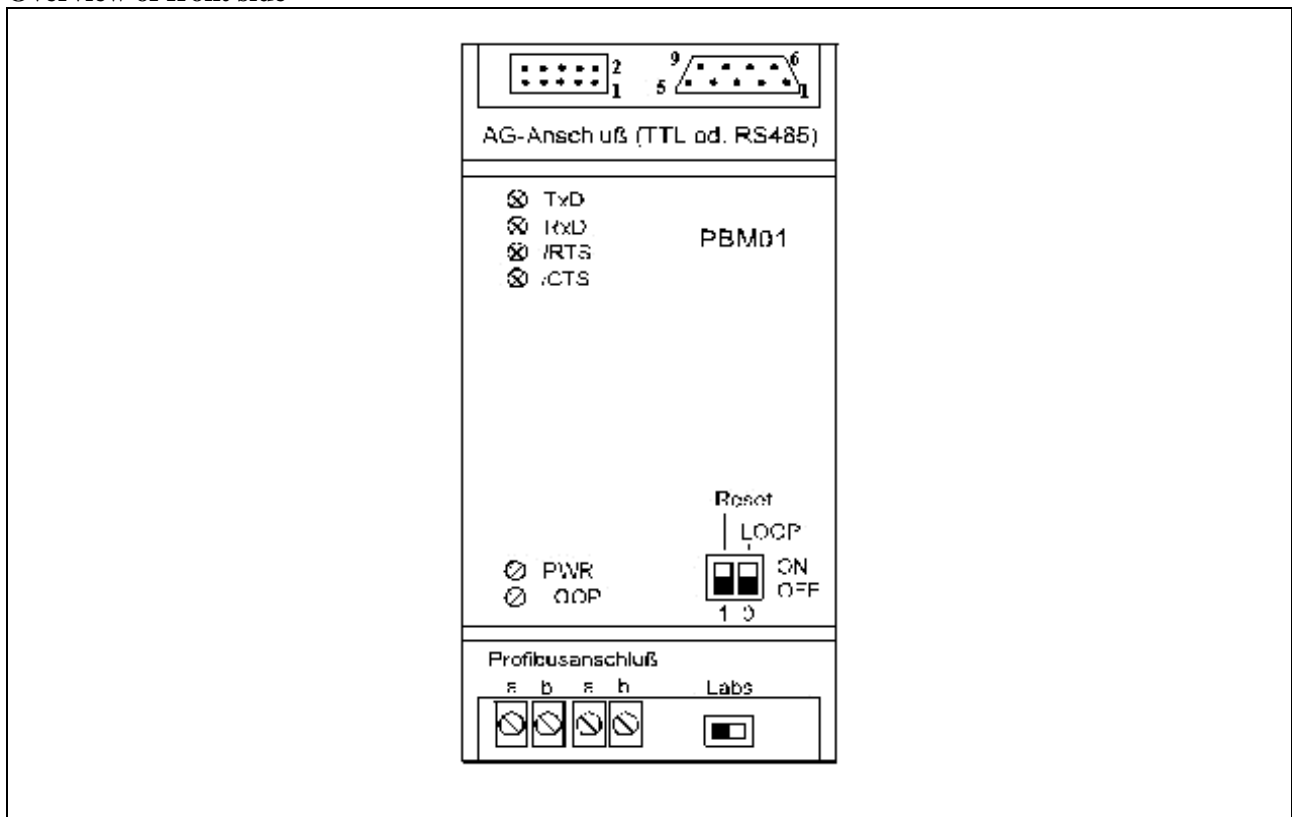
sponds to the original signal and is available to the automation device as "RXD" signal.

On the transmission side, the component features the two reception signals "/RTS" and "TxD" (TTL interface). If "/RTS" is activated (Low), "/CTS" will respond with Low (/RTS, /CTS bridged). The transmission is triggered by a Low to TxD or an active signal at the RS485 interface. The PBM01 puts a preamble of 4 bits (4 times High at 93.75 kHz) in front of the data stream. As a result, the data will be output on the FSK side with a delay of 4 bits. The reception section of the Profibus modem carries out the temporary buffering of the "TxD" signal and the synchronization with the carrier wave at 93.75 kHz and 187.5 kHz (High=93.75 kHz, Low=187.5 kHz).

The switchover of the carrier signals always occurs at the zero passage (phase coherence).

The interface signals from and to the automation device are operated with TTL and/or RS485 signals.

**Overview of front side**



**Notes for setting the switches "L<sub>abs</sub>", "LOOP", "Reset"**

Switch	Switch setting	Function
L <sub>abs</sub>	closed	Bus terminating resistor activated
	open	Bus terminating resistor deactivated
LOOP	ON *	Listening to the station's own transmitted data (TTL only)
	OFF	No listening to the station's own transmitted data
Reset	ON	PBM01 logic is reset, transmission driver blocked
	OFF	PBM01 activated

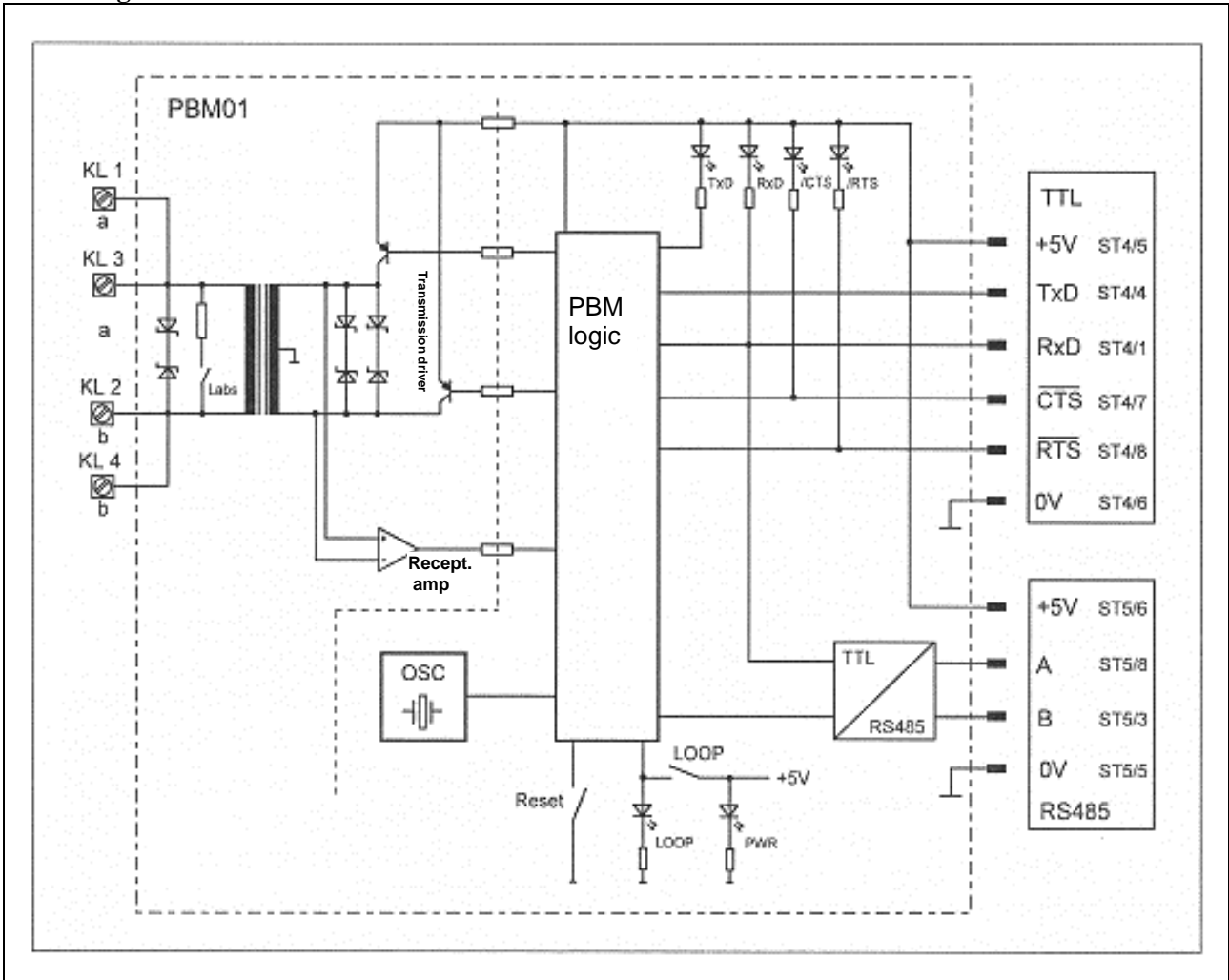
\*) for test purposes only

**Optical status indications**

For diagnostics purposes 6 LEDs exist to optically indicate the status of the signals: TxD, RxD, /RTS, /CTS, LOOP and power "PWR".

Indication	Status	Function
TxD	off	AG transmitted data en route to Profibus connection --> Idle state or data signal of logic level "1" ("High")
	on	--> Data signal of logic level "0" ("Low")
RxD	off	AG transmitted data arriving from Profibus connection --> Idle state or data signal of logic level "1"
	on	--> Data signal of logic level "0"
/RTS	off	Request to Send (activation of transmitter) --> Idle state (transmitter deactivated)
	on	--> Transmitter activated
/CTS	off	Clear to Send (ready to accept data) --> Idle state (no data are accepted through TxD)
	on	--> Ready to accept data through TxD
LOOP	off	Listening function for transmitted data of the station --> Listening function deactivated
	on	--> Listening function activated
PWR	off	Supply voltage control --> No supply voltage exists
	on	-->Supply voltage exists

**Block diagram for PBM01**



**Technical data**


Designation	Profibus modem
Type	PBM01
<b>Parameters</b>	
Power supply circuit (PIN 5/6 TTL interface; PIN 6/5 of RS485 interface)	
Supply voltage $U_i$	5.5 V <sub>DC</sub>
Internal capacitance $C_i$	150 $\mu$ F
Internal inductance $L_i$	negligible
Signal circuits (PIN 1, 4, 7, 8 of TTL interface)	
Voltage $U_0/U_i$	5.5 V <sub>DC</sub>
Internal capacitance $C_i$	150 $\mu$ F
Internal inductance $L_i$	negligible
Signal circuits (PIN 3, 8 of RS485 interface)	
Voltage $U_0/U_i$	5.5 V <sub>DC</sub>
Internal capacitance $C_i$	150 $\mu$ F
Internal inductance $L_i$	negligible
Profibus interface (terminals Kl.1/Kl.3 and Kl.2/Kl.4)	
Voltage $U_0/U_i$	7.0 V <sub>DC SS</sub>
Power $P_0$	75 mW
Internal resistance $R_i$	$\geq 88 \Omega$
Internal capacitance $C_i$	negligible
Internal inductance $L_i$	negligible
The values of the max. permissible inductance / capacitance can only be determined through the interconnection of all galvanically connected devices.	
Ambient temperature range	$-20^\circ\text{C} \leq T_a \leq +45^\circ\text{C}$
Power consumption:	
with active transmitter	60-75 mA
Quiescent current draw - reception only	12 mA
mean value with telegrams	20 mA
Preamble (generated by PBM01)	min. 4 bits
Interval between two telegrams	min. 33 bits (acc. to BB22444 part 6)
Transmission rate	93.75 kBd
Character format	UART (1 start bit, 8 data bits, 1 parity bit, 1 stop bit) no slip between two characters permissible
Interface signals to bus line	
Signal a	galvanically isolated, transformer decoupled connection KL 1, 3
Signal b	KL 2, 4
Transmission level	4 V <sub>SS</sub> at 75 $\Omega$
Characteristic frequencies	93.75 kHz ("1") / 187.5 kHz ("0")
Type of modulation	phase coherent FSK
Operating mode	100 % ON-time
Service position	at choice
Operating conditions	Inside or outside of operating areas susceptible to fire-damp
Reception level range	0.12 to 5 V <sub>SS</sub>
Terminating resistor	150 $\Omega$ (connectable with $L_{abs}$ )

**Technical data (continued)**

Dimensions	55 x 110 x 40 mm (W x H x D)
Weight:	approx. 0.12 kg
Temperature range	
-Operation	- 20 to + 45°C
-Storage	- 25 to + 70°C
-Transport	- 25 to + 70°C
Approval:	DMT 02 ATEX E 102 U
Type of protection:	I M2 Ex ia I Mb

**Marking**

The nameplate is marked as follows:

Company	FHF Bergbautechnik 42551 Velbert
Type	PBM01  I M2 Ex ia I Mb DMT 02 ATEX E102 U CE 0158 F. No.... Test....(short sign, month/year) 20°C ≤ T <sub>a</sub> ≤ +45°C

**Installation / Mounting**

The Profibus modem of type PBM01 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 6.4.11 and 7.6.e of EN50020:1994.

Connecting terminals or plug connectors for the intrinsically safe circuits have to be arranged as per section 6.3.1 and/or 6.3.2 of EN 50020:2002.

The interconnection with other equipment must be certified separately.

If the TTL interface is used, the line length between PBM01 and the automation device should not exceed 0,5m.

**Commissioning and settings**

Prior to the commissioning, the fastening of the module, the installation and the related cables and connection shall be checked.

**Maintenance / Repairs**

The Profibus modem of type PBM01 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 equipment item is a device of explosion-proof design destined for operation inside an explosive atmosphere. It belongs to equipment group I M2 and is suited for use underground. Especially the following warnings and safety advice shall be observed:</p>
<p>The interconnection with other electrical equipment must be certified separately.</p>
<p>Connection and installation of the component have to be carried out by an instructed qualified expert in due consideration of the specified type of protection and in accordance with the applicable regulations for installation.</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 component 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. Devices/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"> <li>• moisture, dusts (pay attention to degree of protection).</li> <li>• combustible gases, vapours, solvents which the type of protection does not cover.</li> <li>• excessively high ambient temperatures (&gt;+45°C)</li> <li>• excessively low ambient temperatures (&lt;-20°C)</li> </ul>
<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>

<p>FHF Bergbautechnik GmbH &amp; Co. KG Eintrachtstr. 95 42551 Velbert</p>	 <p>FHF Bergbautechnik GmbH &amp; Co. KG</p>	<p>Tel: +49 (0) 2051 270 – 0 Fax: +49 (0) 2051 270-366 Email: info@fhf-bt.de www.fhf-bt.de</p>
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# EG-KONFORMITÄTSERKLÄRUNG

## EC DECLARATION OF CONFORMITY

Wir erklären in alleiniger Verantwortung, dass das Produkt auf das sich diese Erklärung bezieht mit der/den folgenden Norm(en) oder normativen Dokumenten übereinstimmt:

Herewith we declare bearing sole responsibility that the product referred in this declaration is in conformity with the following standards or normative documents and regulations of the directive:

<b>Bezeichnung Erzeugnis / Komponente</b> Name of product or component	<b>Profibusmodem</b> Profibus modem
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<b>Geräte- oder Typenbezeichnung</b> Equipment type or mark of equipment	<b>PBM01</b>
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<b>Bestimmung der Richtlinie</b> Provisions of the directive	<b>Nr. und Ausgabedatum der Norm(en)</b> No. and date of issue of the standard(s)
<b>94/9/EG: Geräte und Schutzsysteme zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen</b> 94/9/EC: Equipment and protective systems intended for use in potentially explosive atmospheres	<b>EN 50014:1997+A1-A2</b> General requirements  <b>EN 50020:1994</b> Intrinsic safety „i“
<b>EG-Baumusterprüfbescheinigung</b> EC-Type-Examination Certificate	<b>DMT 02 ATEX E 102 U</b>
<b>Benannte Stelle für die Bescheinigung</b> Notified body of the certificate <i>Kennnummer/Inspection number</i>	<b>DEKRA EXAM GmbH</b>  <b>0158</b>
<b>Benannte Stelle für die Überwachung</b> Notified body of inspection	<b>DEKRA EXAM GmbH</b> Fachstelle für Sicherheit elektrischer Betriebsmittel – BVS Postfach 10 27 048 D 44727 BOCHUM

<b>Hersteller / Anschrift</b> Manufacturer / Factory address	<b>FHF Bergbautechnik GmbH &amp; Co. KG</b> Eintrachtstr. 95 D – 42551 Velbert
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**Geschäftsführer:**  
Managing director:

Dr. Opitz, Hans-Peter


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(name, prename)

Velbert

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(Ort / place)

21.8.09

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(Datum / date)

  
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