

## Central module Z51-ZM22

### Ordering data

Designation	Type	Item no.
Central module (Profibus DP master / Profibus DP slave)	Z51-ZM22	150 820 10 AX
Central module (with 2 Profibus DP slave interfaces)	Z51-ZM22	150 820 20 AX



- Acquisition of process signals
- Output of process signals
- Visualization interface (TFT display)
- Optional CAN bus interface
- LED diagnostics indications
- Type of protection: IM1 Ex ia I Ma

### Application and functioning

The central module Z51-ZM22 is used to acquire, link, transmit and receive as well as output process signals (such as messages, measuring values, commands or similar). By means of additional external hardware, the corresponding visualization of signals is possible.

Process signals can be transmitted via several communication connections of the Z51-ZM22.

The Z51-ZM22 contains a powerful, energy saving microprocessor in ARM architecture which is programmable according to IEC61131.

The Z51-ZM22 master board additionally features:

- one 20 pin plug connection (header connector) for a ZM51 I/O bus connector in flat ribbon cable design to connect max. eight Z51 I/O modules,
- one Profibus DP (RS485) fieldbus interface (slave),
- one Profibus DP (RS485) fieldbus interface (master) as an option,
- or a CAN fieldbus interface as an option,
- one serial RS232 interface for connecting a ZM51 fieldbus or a serial coupling as per BB22444
- two Fast Ethernet / TCP/IP interfaces with integrated switch function,
- one connection for a TFT display,
- one connection for an LC text display (option),
- one connection for a matrix keypad,
- terminal connections for the 5V supply of the Z51-ZM22 and the connected modules,
- three encoding switches to set the DP slave address and the ZM51 fieldbus baud rate,
- Reset button, User button
- LED diagnostics indications.

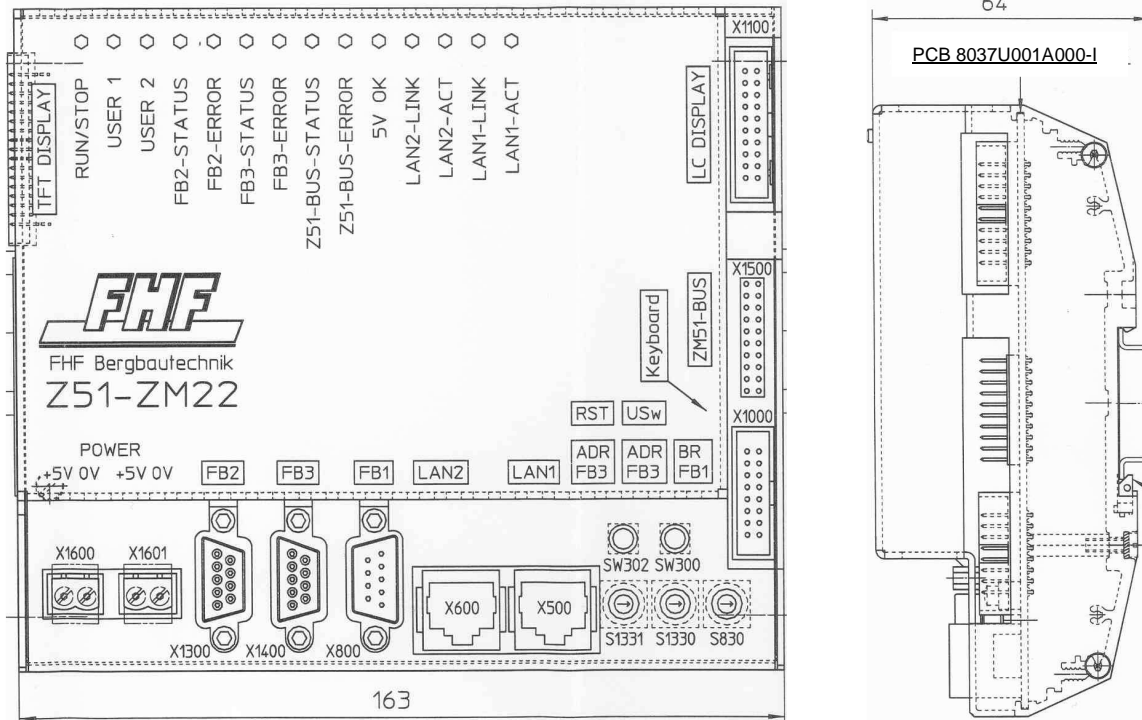
## Central module Z51-ZM22

The central module conforms to category / protection type I M1 Ex

ia I Ma and is destined as an electronic component for installation in

equipment for use in environments susceptible to firedamp.

### Mechanical configuration



The central module housing consists of an extruded profile as a bottom part onto which an edged hood is mounted. Both parts consist of anodized aluminium. The two housing parts are screw-mounted on the sides with 4 screws.

Inserted into the top guiding groove of the profiled bottom part is a board which carries all electronic components of the Z51-ZM22. The board is screw-mounted to the housing bottom part with a fastening bolt.

Holes in the hood enable observing the status LEDs of the central module through light conductors. Corresponding cutouts provide access to plug connectors, plug-in terminals, switches and buttons of the Z51-ZM22.

The labels for the LEDs and the position and designation of the connecting terminals and plug connectors, the buttons ("Reset", "User") and the setting switches for PB Slave address and fieldbus baud rate are printed onto the hood.

The profiled housing bottom part is equipped with a snap-open mechanism for fastening the module on 35mm DIN type top-hat rails.

**Interfaces**

Voltage supply, plug-in terminals X1600 and X1601

The central module Z51-ZM22 is fed by an intrinsically safe 5 V<sub>DC</sub> (-2% / +5%) supply voltage. During the booting process, the module absorbs approx. 300mA. Afterwards, the power consumption without connected I/O modules, modems and display and control unit is approx. 550mA.

The supply voltage is connected to plug-in terminals X1600 or X1601. The pairs of terminals are connected in parallel so that the supply voltage can also be connected through the terminals. The pcb is equipped with anti-parallel diodes as protection against polarity reversal.

Plug-in terminal	Pin	Assignment
X1600	1	0 V
X1600	2	+5 V
X1601	1	0 V
X1601	2	+5 V

**Table: Power supply connection**

In case of undervoltage (approx. 4.8V) or overvoltage (approx. 5.4V) the I/O bus is deactivated.

Serial interface fieldbus interface 1 (RS232) on X800

In the device, one serial interface with electrical specifications as per RS232 and the most commonly used control signals is available (see below table). The interface is designed as a 9-pin subminiature D plug connector (male) X800. At present, the transmission protocols ZM51 fieldbus and BB22444 are realised.

Pin	Signal designation
1	DCD
2	RxD
3	TxD
4	NC
5	GND
6	NC
7	RTS
8	NC
9	NC

**Table: Connector assignment of the RS232 interface (NC =not connected)**

The baud rate of the interface is set via baud rate selector switch S830.

Setting	Meaning
0	Interface switched off
1	1200
2	2400 (not applicable for ZM51)
3	4800
4	9600 (not applicable for ZM51)
5	19200
6 – 0x0F	invalid

**Table: Setting of baud rate selector switch S830**

Profibus DP master (option) or Profibus DP slave fieldbus interface 2 on X1300

After activation by means of an electronic key in form of an IC, the NETX500 network controller of Messrs. Hilscher which is installed in central module Z51-ZM22, makes available a Profibus DP master interface (item no.:150 820 10 AX). Without activation, the interface functions like a Profibus DP slave (item no.:150 820 20 AX). A 9-pin D-sub female plug connector is used as connecting socket in the device, the electric diagram corresponds to RS485. The assignment conforms to the relevant standard and is shown in the following table:

Pin	Signal designation
1	NC
2	NC
3	PB_DATA_P
4	PB_CTRL
5	GND
6	+5V
7	NC
8	PB_DATA_N
9	NC

**Table: Connector assignment of the Profibus interface (NC =not connected)**

**Remark:** The data lines Pin 3 and Pin 8 are internally connected to terminating resistors /Pull Up / Pull Down. Operation of the interface is possible with the usual data transmission rates between 39400 bit/s to 12Mbit/s. The speed is set up through the software. For connection of Profibus FSK modems (e.g. PBM01), a rate of 93.75 kbit/s has to be configured.

Profibus DP slave fieldbus interface 3 on X1400

The NETX500 network controller of Messrs. Hilscher which is installed in central module Z51-ZM22, features a Profibus DP slave interface. A 9-pin D-sub female plug connector is used as connecting socket in the device, the electric diagram corresponds to RS485. The assignment conforms to the relevant standard and is shown in the following table.

For setting the address of the PB slave, the two hexadecimal rotary switches S1330 and S1331 (see Fig.) are used. Their values are evaluated only decimally, i.e. the digits A to F are invalid.

Pin	Signal designation
1	NC
2	NC
3	PB_DATA_P
4	PB_CTRL
5	GND
6	+5V
7	NC
8	PB_DATA_N
9	NC

**Table: Connector assignment of the Profibus interface (NC =not connected)**

**Remark:** The data lines Pin 3 and Pin 8 are internally connected to terminating resistors /Pull Up / Pull Down. Operation of the interface is possible with the usual data transmission rates between 39400 bit/s to 12Mbit/s. The speed is set up through the software. For connection of Profibus FSK modems (e.g. PBM01), a rate of 93.75 kbit/s has to be configured.

Ethernet interfaces on X500 and X600

The standard configuration of central module Z51-ZM22 features two Ethernet interfaces which are connected through a switch function. Currently, the physical connection 100BaseT is supported, which means a 100 Mbit/s transmission through twisted-pair cable. In this case, typically, at least one cable of category 5 (cat-5) or of higher grade is used. The plug connector used is a RJ45 female connector with shielding. The connector assignment corresponds to the industry standard and is shown in the following table. The IP address of the Z51-ZM22 is factory-set to 192.168.0.215.

Pin	Signal designation
1	TXD+
2	TXD-
3	RXD+
4	NC
5	NC
6	RXD-
7	NC
8	NC

**Table: Assignment of RJ45 socket for Ethernet**

**LED indications**

In the housing cover of the Z51-ZM22, the following LEDs are visible through light conductors:

LED	Colour	Status	Meaning
RUN/STOP	green	0.1s on / 0.9s off	PLC ready, no project
		0.5s on / 0.5s off	PLC in Stop Mode
		0.8s on / 0.2s off	PLC signals error
		on	PLC in Run Mode
USR1	red	on / off / flashing	Operated by the user through PLC program
USR2	green	on / off / flashing	Operated by the user through PLC program
FB2 ST	green	on / off or flashing	Fieldbus OK / Fieldbus defective
FB2 ERR	red	on / off	Fieldbus defective / Fieldbus OK
FB3 ST	green	on / off or flashing	Fieldbus OK / Fieldbus defective
FB3 ERR	red	on / off	Fieldbus defective / Fieldbus OK
ZM51 BUS ST	green	on / off	I/O bus OK / I/O bus defective
ZM51 BUS ERR	red	on / off	I/O bus defective / I/O bus OK
5V OK	green	on / off	Operating voltage OK / not OK
LAN 1 LNK	green	on / off	Link to Ethernet channel 1 / no link
LAN 1 ACT	yellow	flashing	Activity on Ethernet channel 1
LAN 2 LNK	green	on / off	Link to Ethernet channel 2 / no link
LAN 2 ACT	yellow	flashing	Activity on Ethernet channel 2

**Table: LED indications**

## Buttons

### Reset

A device reset results in a restart of the control and is possible in three ways.

Manually by the user, actuating the reset button (RST, SW302). While the button is only accessible through a hole in the cover, this design also offers protection against inadvertent actuation. After actuation of the reset button, all LEDs go off and the central module will restart.

The second option to launch a reset is to activate the installed watchdog circuit. In this case, the watchdog task will trigger a hardware reset after a cycle time overrun. The third option is the direct access of the application software to the  $\mu$ C.

### User

If the user button (USW SW300) is actuated during the starting process, the boot project will not be loaded. During operation, the button is evaluated through the user in the PLC program.

## Installation and mounting

The central module Z51-ZM22 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. The interconnection with other equipment must be certified separately.

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## Commissioning and settings

Prior to the commissioning, the fastening of the module, the installation and the related cables and connection as well as the correct setting of address switches and baud rate shall be checked.

## Maintenance

Except for the installed lithium battery, the central module Z51-ZM22 is maintenance-free and does not contain any parts requiring maintenance.

The battery service life depends on the operating time / operating mode of the central module and the battery should be replaced after an operating time of 7 years, at the latest. Afterwards, the proper disposal of the removed battery should be ensured.

## 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.

**Technical data Z51-ZM22**

<b>Designation Type</b>	<b>Central module Z51-ZM22</b>
<b>Parameters</b>	
1.) Power supply circuit (plug-in terminals X1600, X1601)	
Voltage $U_i$	5.5 V <sub>DC</sub>
Current $I_i$	2.7 A
Effective internal capacitance $C_i$	202 $\mu$ F
Effective internal inductance $L_i$	0.56 $\mu$ H
2.) Ethernet interfaces; Ports 1 and 2; RJ45 plug connectors X500, X600	
Signal voltage $U_0$	4 V <sub>AC</sub>
Power $P_0$	per ea. port 2 x $\leq$ 320 mW
Signal voltage $U_i$	5.5 V <sub>AC</sub>
Power $P_i$	per ea. port 2 x $\leq$ 320 mW
Effective internal capacitance $C_i$	negligible
Effective internal inductance $L_i$	per ea. port 2 x $\leq$ 1.4mH
The Ethernet interfaces Port 1 and Port 2 galvanically connected with each other, are galvanically isolated from the other circuits of the central module.	
3.) ZM51 I/A data bus	
Header connector X1500	
Supply:	
Voltage $U_0$	5.5 V <sub>DC</sub>
Power $P_0$	3 W
$C_i$ and $L_i$ of connector pins "supply" are identical to the values mentioned under 1.) for $C_i$ and $L_i$ for the power supply circuit.	
Data lines:	
Signal voltage $U_0$	5.5 V <sub>DC</sub>
Signal current $I_0$ (per ea. wire)	12 mA
Power $P_0$	18 mW
Effective internal capacitance $C_i$	negligible
Effective internal inductance $L_i$	negligible
4.) Fieldbus connection 1 D-sub plug connector X800 (RS232)	
Signal voltage $U_0$	+ / -7.2 V <sub>AC/DC</sub>
Signal current $I_0$ (per ea. wire)	27 mA
Power $P_0$	50 mW
Effective internal capacitance $C_i$	negligible
Effective internal inductance $L_i$	negligible
5.) Fieldbus connection 2 D-sub plug connector X1300 (Profibus RS485)	
Supply (contacts 6 (+5V), 5 (0V))	
Voltage $U_0$	5.5 V <sub>DC</sub>
Power $P_0$	1.17 W
$C_i$ and $L_i$ of connector pins "supply" are identical to the values mentioned under 1.) for $C_i$ and $L_i$ for the power supply circuit.	
Data lines (contacts 3 (A), 8 (B))	
Signal output voltage $U_0$	3.6 V <sub>AC/DC</sub>
Signal current $I_0$	153 mA
Power $P_0$	140 mW
Signal input voltage $U_i$	5.5 V <sub>AC/DC</sub>
Effective internal capacitance $C_i$	negligible
Effective internal inductance $L_i$	negligible
6.) Fieldbus connection 3 D-sub plug connector X1400 (Profibus RS485 /CAN)	
Supply (contacts 6 (+5V), 5 (0V))	
Voltage $U_0$	5.5 V <sub>DC</sub>
Power $P_0$	1.17 W
$C_i$ and $L_i$ of connector pins "supply" are identical to the values mentioned under 1.) for $C_i$ and $L_i$ for the power supply circuit.	

**Technical data Z51-ZM22**

Data lines Profibus RS485 contacts 3 (A), 8 (B)

Signal output voltage $U_0$	3.6 V <sub>AC/DC</sub>
Signal current $I_0$	153 mA
Power $P_0$	140 mW
Signal input voltage $U_i$	5.5 V <sub>AC/DC</sub>
Effective internal capacitance $C_i$	negligible
Effective internal inductance $L_i$	negligible

Data lines PCAN bus contacts 4 (CAN Low), 8 (CAN High)

Signal output voltage $U_0$	3.6 V <sub>AC/DC</sub>
Power $P_0$	765 mW
Signal input voltage $U_i$	5.5 V <sub>AC/DC</sub>

$C_i$  and  $L_i$  of connector pins "supply" are identical to the values mentioned under 1.) for  $C_i$  and  $L_i$  for the power supply circuit.

7.) Matrix keypad connection; header connector X1000

Supply

Voltage $U_0$	3.6 V <sub>DC</sub>
Power $P_0$	400 mW

$C_i$  and  $L_i$  of connector pins "supply" are identical to the values mentioned under 1.) for  $C_i$  and  $L_i$  for the power supply circuit.

Data lines

Signal output voltage $U_0$	3.6 V <sub>DC</sub>
Signal current $I_0$ (per ea. wire)	≤ 30 mA
Power $P_0$	≤ 27 mW
Effective internal capacitance $C_i$	negligible
Effective internal inductance $L_i$	negligible

8.) LCD text display connection; header connector X1100

Supply

Voltage $U_0$	5.5 V <sub>DC</sub>
Power $P_0$	590 mW

$C_i$  and  $L_i$  of connector pins "supply" are identical to the values mentioned under 1.) for  $C_i$  and  $L_i$  for the power supply circuit.

Data lines

Signal output voltage $U_0$	5.5 V <sub>DC</sub>
Signal current $I_0$ (per ea. wire)	45 mA
Power $P_0$	65 mW
Effective internal capacitance $C_i$	negligible
Effective internal inductance $L_i$	negligible

9.) TFT colour display connection; header connector X1900

Supply display + backlighting (3.3 V<sub>M</sub>)

Voltage $U_0$	3.6 V <sub>DC</sub>
Current $I_0$	590 mA
Power $P_0$	≤ 2.125 W

$C_i$  and  $L_i$  of connector pins "supply" are identical to the values mentioned under 1.) for  $C_i$  and  $L_i$  for the power supply circuit.

Data lines

Signal output voltage $U_0$	3.6 V <sub>DC</sub>
Signal current $I_0$ (per ea. wire)	590 mA
Power $P_0$	≤ 2.125 W

$C_i$  and  $L_i$  of connector pins "supply" are identical to the values mentioned under 1.) for  $C_i$  and  $L_i$  for the power supply circuit.

10.) Internal data backup battery

Voltage $U_0$	3 V <sub>DC</sub>
Current $I_0$	100 mA
Capacity	190 mAh

11.)  $L_0$  and  $C_0$  of the circuits mentioned under 2.) to 9.) can only be determined in connection with the connected equipment /electronic components.





**Technical data Z51-ZM22**

12.) Ambient temperature range	- 20°C ≤ T <sub>a</sub> ≤ + 45°C
Supply voltage (- 2% / + 5%)	5 V <sub>DC</sub>
Power consumption (during starting process)	300 mA
(during operation)	550 mA
Operating mode	100% ON-time
Service position	at choice
Operating conditions	inside or outside of operating areas susceptible to fire-damp
Dimensions	163 x 141.5 x 60.5 mm (W x H x D)
Weight	approx. 0.8 kg.
Test and approval:	
- Type of protection	I M1 Ex ia I Ma
- Approval no.:	BVS 11 ATEX E 098 U

**Marking**

The central module of type Z51-ZM22 is marked as follows:

Company	FHF Bergbautechnik 42551 Velbert
Type	Z51-ZM22  IM1 Ex ia I Ma BVS 11 ATEX E 098 U  0158 F. No..... Test (short sign, month/year) - 20°C ≤ T <sub>a</sub> ≤ + 45°C

**Warnings & Safety Advice**

<p>This component is an equipment item of explosion-proof design which is destined for operation inside an explosive atmosphere. It belongs to equipment group I M1 and is suited for use underground.</p> <p>Especially the following warnings and safety advice shall be observed:</p>
<p>Connection and installation of this 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 components and equipment must be certified separately.</p>
<p>This component may only be connected and operated with the specified voltage.</p>
<p>Components with damaged housing must not be operated or have to be put out of service immediately.</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>The component 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.</p> <p>Such 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 of the device 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>Attachment and installation of further parts is prohibited.</p>
<p>Repair work 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 the component.</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 leads to loss of the explosion protection for the device.</p>

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