Operating manual

PME industrial
measurement electronics
linked to a field bus

MP01 module

A0598-6.6 en

HBM

Contents **page**

Safety instructions

Use in accordance with the regulations

The MP01 module and its connected sensors are to be used exclusively for measurement tasks and directly related control tasks. Use for any additional purpose shall be deemed to be not in accordance with the regulations.

In the interests of safety, the instrument should only be operated as described in the User Manual. It is also essential to observe the appropriate legal and safety regulations for the application concerned during use. The same applies to the use of accessories.

The device must not be connected directly to the mains supply. The voltage supply may be a maximum of 18 - 30 V_{DC}.

General dangers of failing to follow the safety instructions

The MP01 module is a state of the art unit and as such is safe to operate. The instrument can give rise to further dangers if it is inappropriately installed and operated by untrained personnel.

Everyone involved with the installation, commissioning, maintenance or repair of the instrument must have read and understood the User Manual and in particular the technical safety instructions.

Conditions on site

Protect the device from direct contact with water (IP20).

Maintenance and cleaning

The MP01 module is maintenance-free. Please note the following points when cleaning the housing:

- Before cleaning, disconnect the devices from the power supply.
- Clean the housing with a soft, slightly damp (not wet!) cloth. You should **never** use solvent, since this could damage the labelling on the front panel and the display.
- When cleaning, ensure that no liquid gets into the device or connections.

Residual dangers

The scope of supply and list of components provided with the MP01 covers only part of the scope of measurement technology. In addition, equipment planners, installers and operators should plan, implement and respond to the safety engineering considerations of measurement technology in such a way as to minimise residual dangers. Prevailing regulations must be complied with at all times. There must be reference to the residual dangers connected with measurement technology.
Any risk of residual dangers when working with the MP01 is pointed out in this introduction by means of the following symbols:

Symbol:  **WARNING**

Meaning: **Possibly dangerous situation**

Warns of a **potentially** dangerous situation in which failure to comply with safety requirements can lead to **death or serious physical injury**.

Symbol:  **CAUTION**

Meaning: **Potentially dangerous situation**

Warns of a potentially dangerous situation in which failure to comply with safety requirements can lead to **death or serious physical injury**.

Symbol:  **NOTE**

Indicates that important information is given about the product or how to handle it.

Symbol: CE

Meaning: **CE mark**

The CE mark enables the manufacturer to guarantee that the product complies with the requirements of the relevant EC directives (the declaration of conformity is available at http://www.hbm.com/support/dokumentation).

Working safely

Error messages should only be acknowledged if the cause of the error is removed and no further danger exists.

The instrument complies with the safety requirements of DIN EN 61010, Part 1 (VDE 0411, Part 1); Protection Class I.

To ensure adequate immunity from interference, use only *Greenline* shielded ducting (place the shield of the transducer cable onto the connector housing).

The MP01 module must be operated with an extra-low, safe voltage (voltage supply 18 to 30 V DC).

Conversions and modifications

The MP01 module must not be modified from the design or safety engineering point of view except with our express agreement. Any modification shall exclude all liability on our part for any damage resulting therefrom.

In particular, any repair or soldering work on motherboards is prohibited. When exchanging any modules, only original HBM parts must be used.

Qualified personnel

This instrument is only to be installed and used by qualified personnel strictly in accordance with the technical data and with the safety rules and regulations which follow. It is also essential to comply with the appropriate legal and safety regulations for the application concerned during use. The same applies to the use of accessories.

Qualified personnel means persons entrusted with the installation, assembly, commissioning and operation of the product who possess the appropriate qualifications for their function.

Maintenance and repair work on an open device with the power on must only be carried out by trained personnel who are aware of the dangers involved.

1 Introduction

1.1 List of components and accessories supplied

List of components supplied:

- 1 MP01 module
- 3 x 6-pin terminal plugs, coded, Order No.: 3-3312.0222
- 3 x 6-pin terminal plugs, coded
  Order No.: 3.3312-0251 (terminal plug 3);
  3.3312-0252 (terminal plug 4); 3.3312-0250 (terminal plug 1)
- 2x SubCon5 connector (1 set); Order N.: 2-9278.0347
- 1 x 10-pin ribbon cable jack-connector
- 1 operating manual for MP01 module

Accessories:

- Standard ribbon cable, 10pin, 1.27 mm pitch
- Lemosa connector FFA. 0S.302 CLA C27

1.2 General information

MP01 module:
The MP01 module from the PME product line is a multi-channel DC amplifier suitable for connection to DC voltage sources (±10 V), direct current sources (±20 mA; 4 - 20 mA), Pt100 resistance thermometers, and thermocouples. 4 channels are provided for voltage, current and thermocouples, plus 2 channels for Pt100 resistance thermometers or resistors (4-wire measurement). The MP01 module is set up and parameters assigned via the keyboard and display or with the aid of the PME Assistent program. The PME Assistent program gives you a simple operator interface under MS-Windows for assigning parameters to the modules (described in the ”PME Assistent” online help).

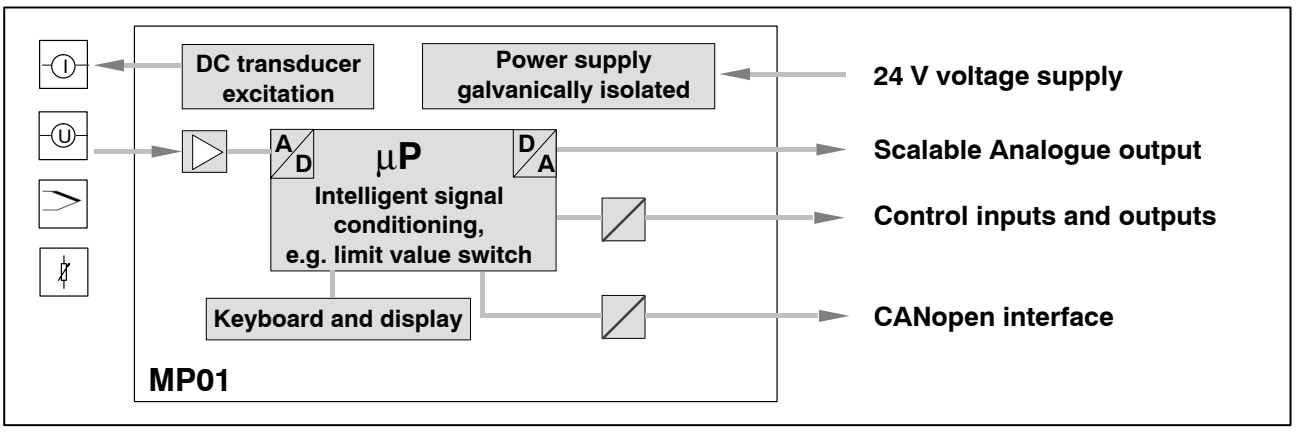


Fig. 1.1: Block diagram of MP01 module

The amplifier (MP01) uses a multiplex process. Channels can be selected or switched off as required, so that a max. of 4 active channels are available.

NOTE

In the event of current measuring, an open input will result in a measured value of 0. In all other cases, an open input can result in any measured values.

2 Selecting amplifier settings with DIP switches

NOTE

The adjustment/alteration of DIP switch settings must take place before fitting the PME.

Various settings are made with DIP switches and can be read off using the display (see Chapter 5.3). These are the settings for

Sensor type, Analogue output, Synchronisation, Terminating bus impedance, Edge steepness.

To set the DIP switches, you must proceed as shown in Fig. 2.1.

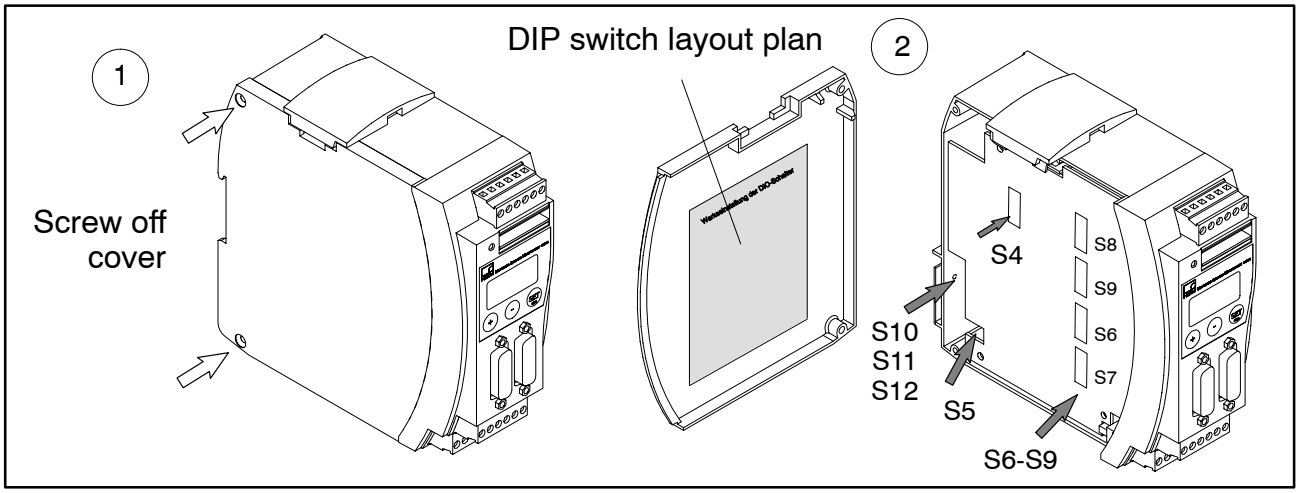


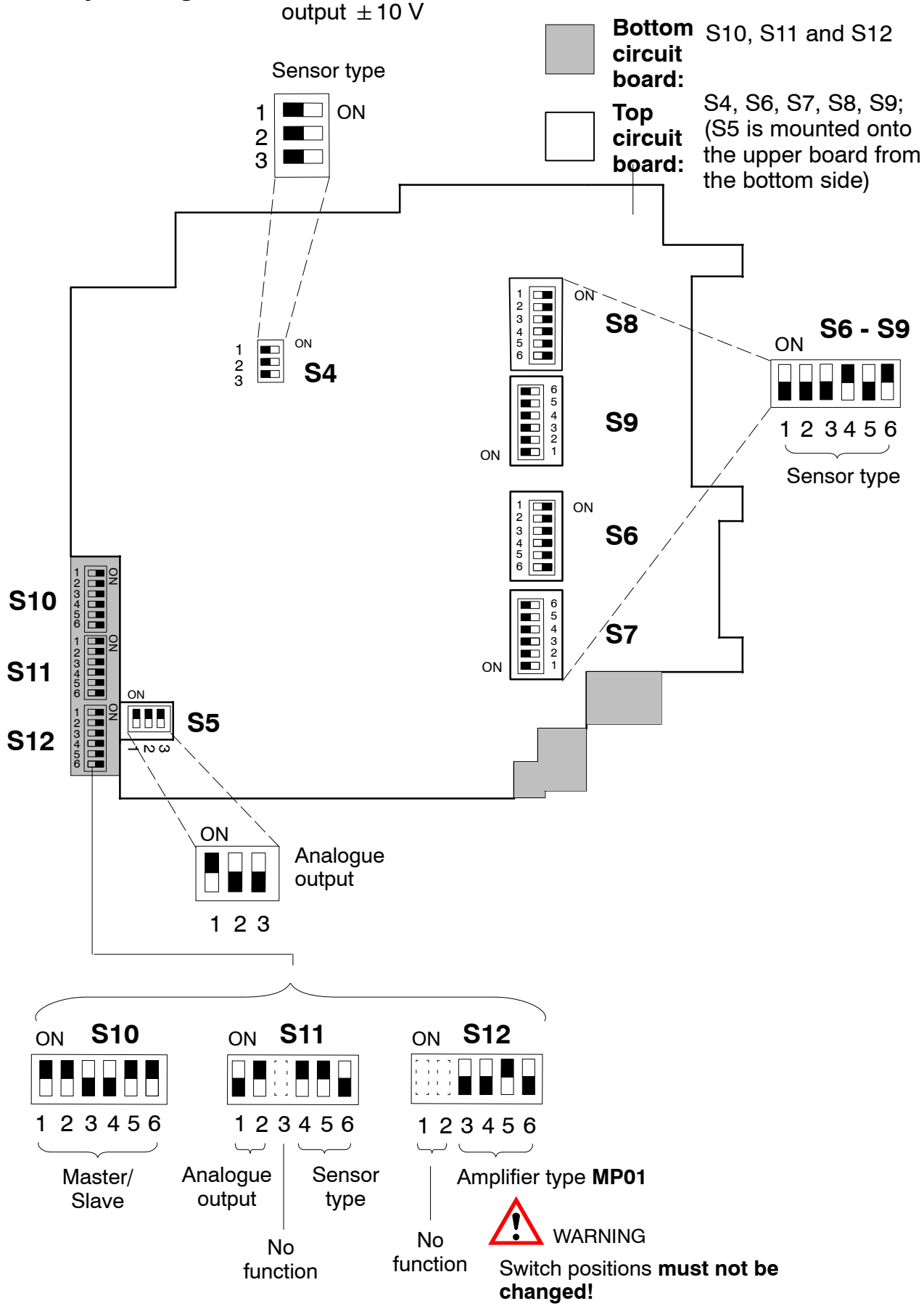
Fig. 2.1: Open housing, position of DIP switch

NOTE

Marking of switches:

The instructions of this manual and the marking inside the cover are authoritative for the switches. The marking on the boards is to be ignored.

Factory settings: Amplifier type MP01; thermocouple sensor type; analogue output ±10 V



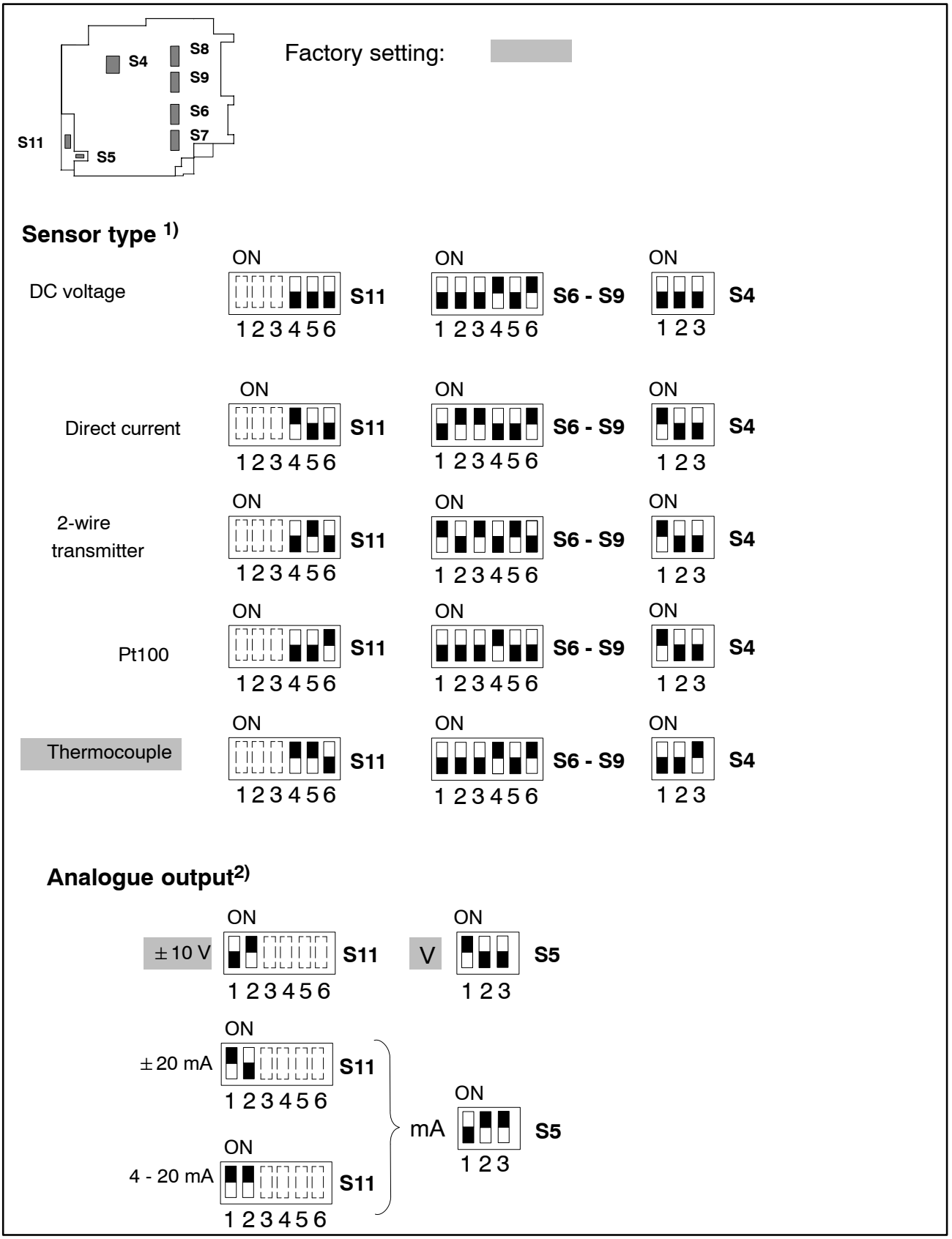


Fig. 2.2: Setting up the amplifier

1) View/check on the display under the TRANSDUCER group, parameter ”TrnsdTyp”; see Page 27

2) Viewing/checking on display under the ANALOGUE OUTPUT group, parameter ”Mode Vo”, see Page 27

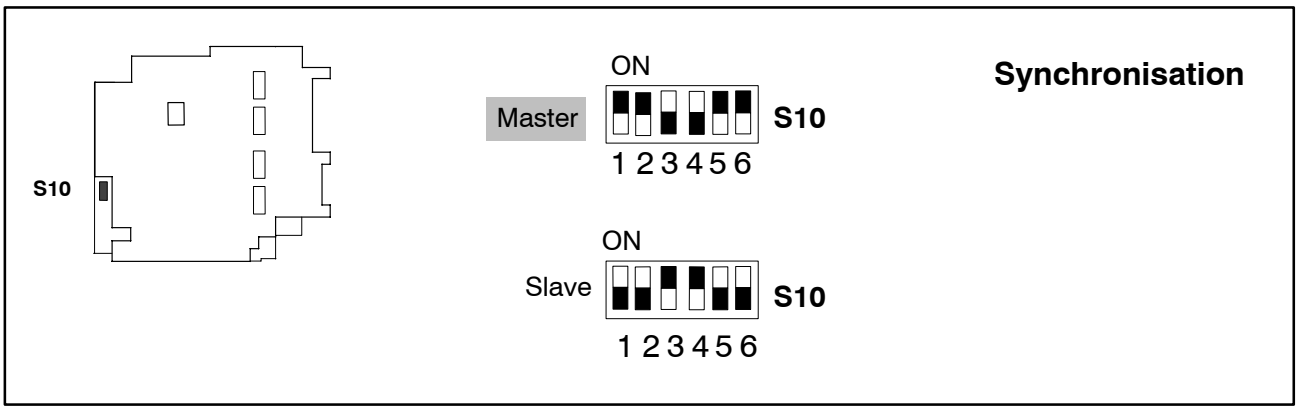


Fig. 2.3: Setting up the amplifier (continued)

Terminating bus resistor

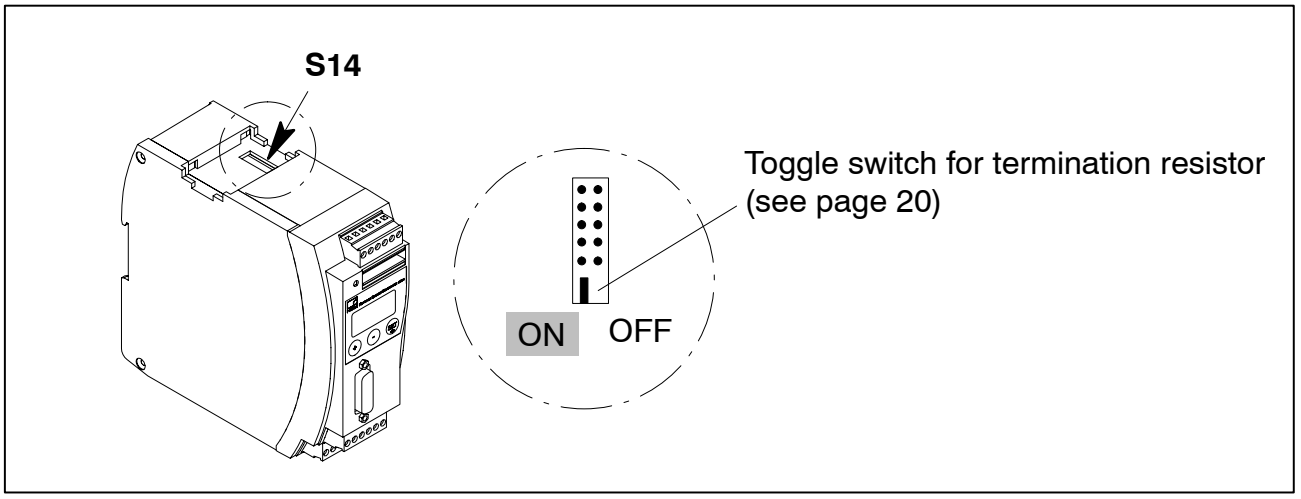


Fig. 2.4: Toggle switch for termination resistor

3 Fitting/removing the MP01

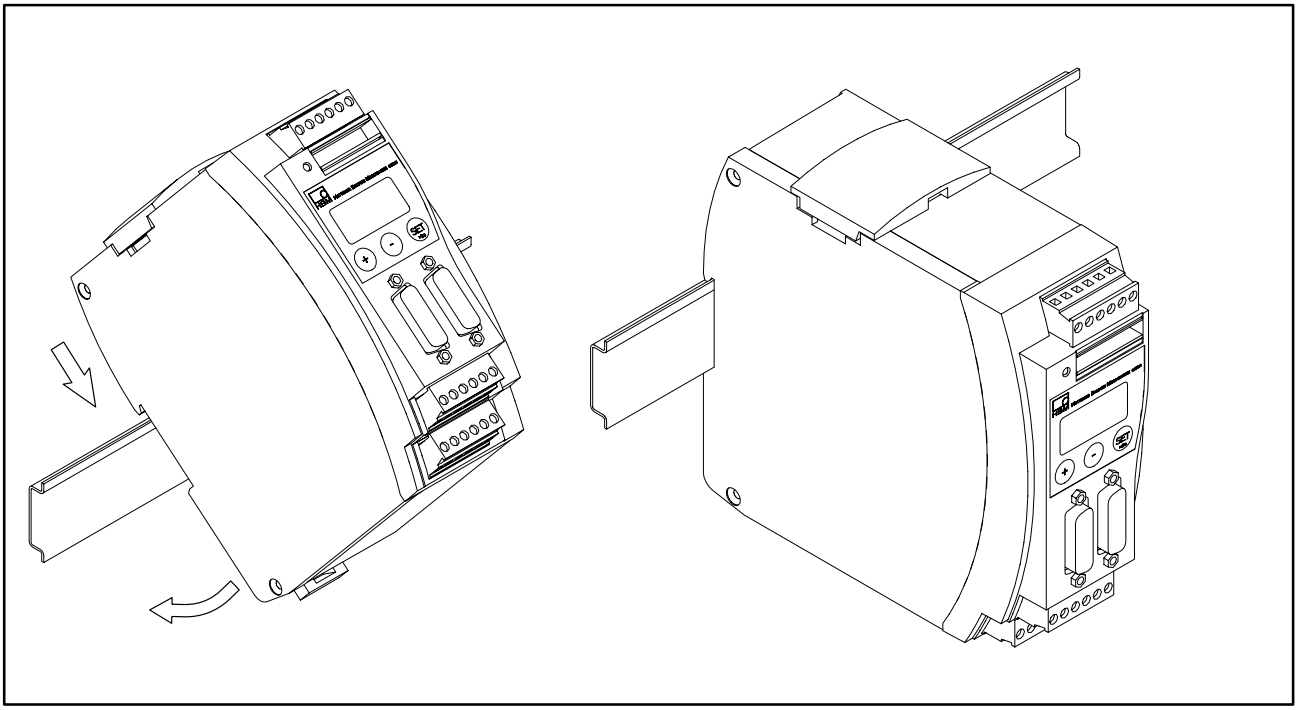


Fig. 3.1: Fitting on a support rail

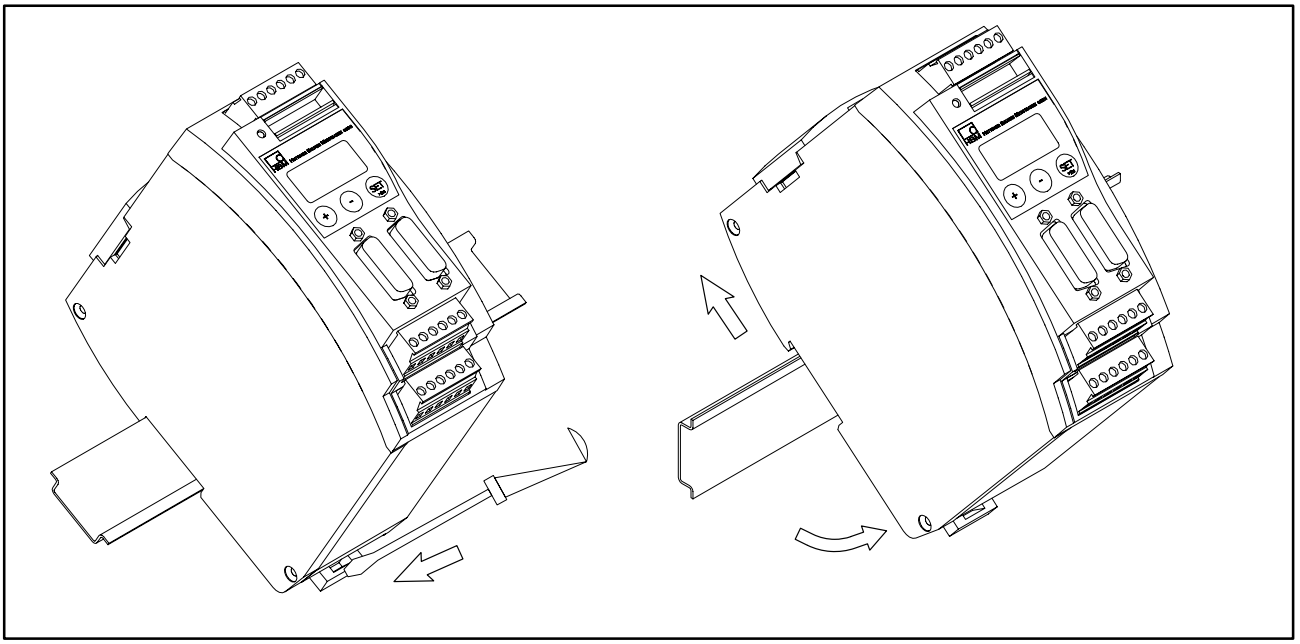


Fig. 3.2: Removing

CAUTION

The support rail must lie on protection circuit potential .

3.1 Connecting several modules

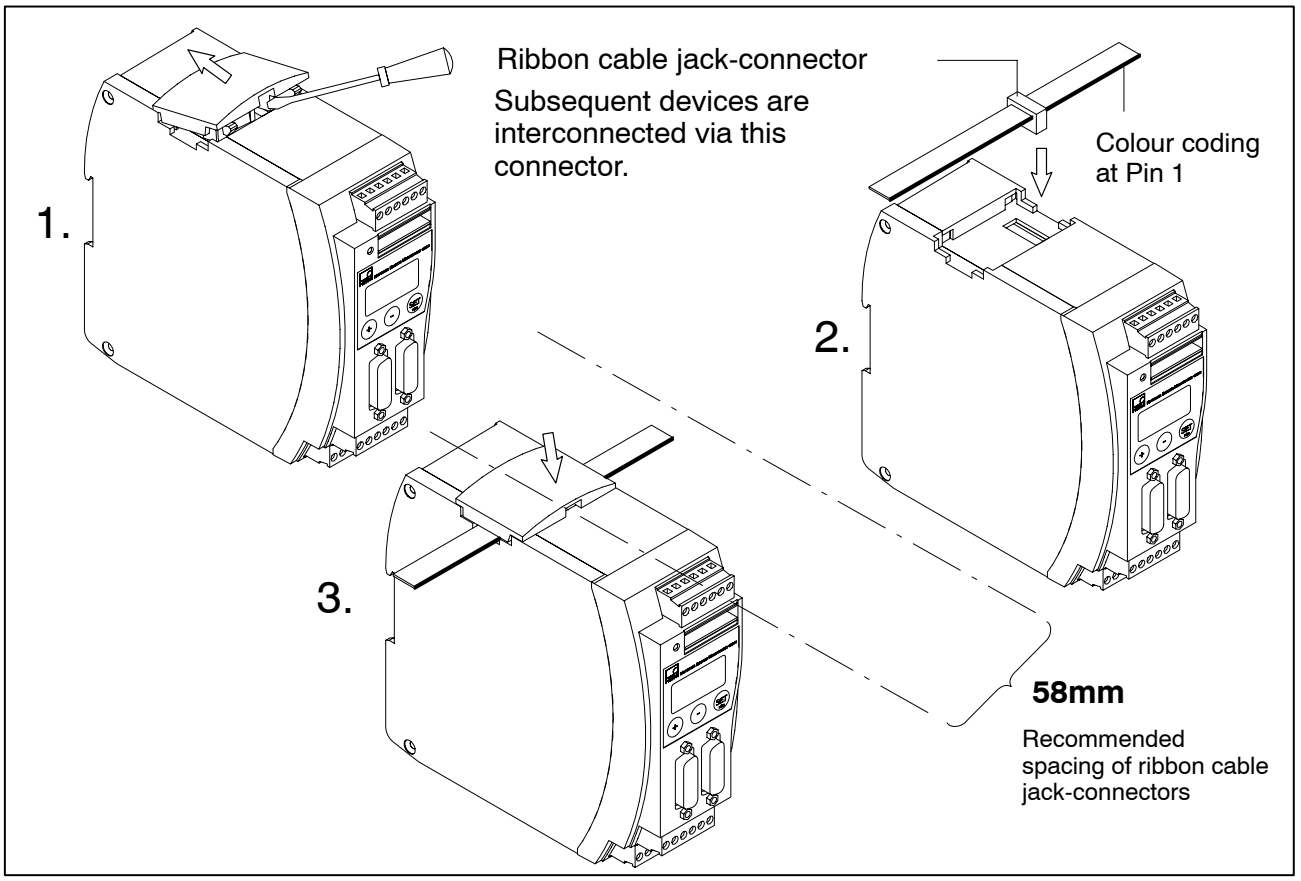


Fig. 3.3: Connecting the ribbon cable

You can connect several MP01 modules with a ribbon cable. This cable is used for local connection of the voltage supply and synchronisation between the modules. You should not interconnect more than 8 modules with one ribbon cable.

4 Connections

Warning

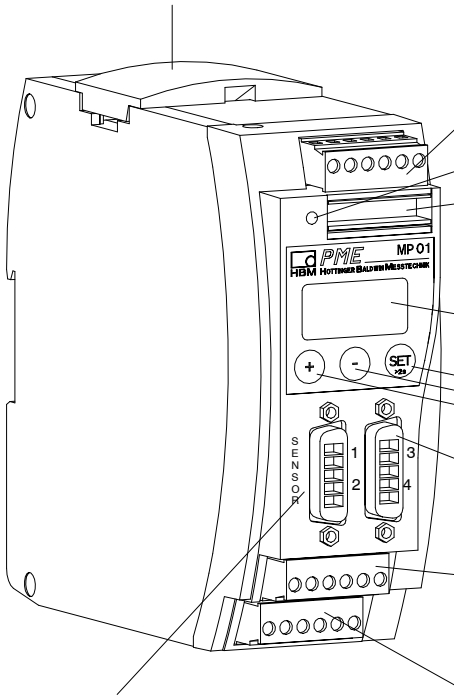
Please take note of the safety instructions before putting the device into operation.

The following maximum input values (levels) may be applied at the input terminals (higher values could result in damage to the device):

Operating mode	max. Input value
Voltage, Thermocouples, Pt100	±30V
Current	±100mA

4.1 Functional overview of MP01

Local linking of CAN bus, voltage supply and synchronisation between the modules



Plug-in terminal 1:
24 V power supply with potential separation, CAN bus, synchronisation

LED

Terminal plug 2:
CAN adapter for PC/laptop connection, assigning parameters via CAN bus

Two line LCD display

Touch-sensitive control buttons

Sensor connection SENSOR 3/4 (5-pin terminal plug); **Channel 3** and **Channel 4**

Plug-in terminal 3:
Potential-separated[1)] Control inputs (24 V level), Analogue output

Sensor connection SENSOR 1/2 (5-pin terminal plug); **Channel 1** and **Channel 2**

Plug-in terminal 4:
Potential-separated control outputs (24 V level), external power supply of control outputs

1) Potential separation in relation to amplifier (measuring circuit) and voltage supply
Control inputs and outputs have the same reference potential

4.2 Voltage supply and control inputs/outputs

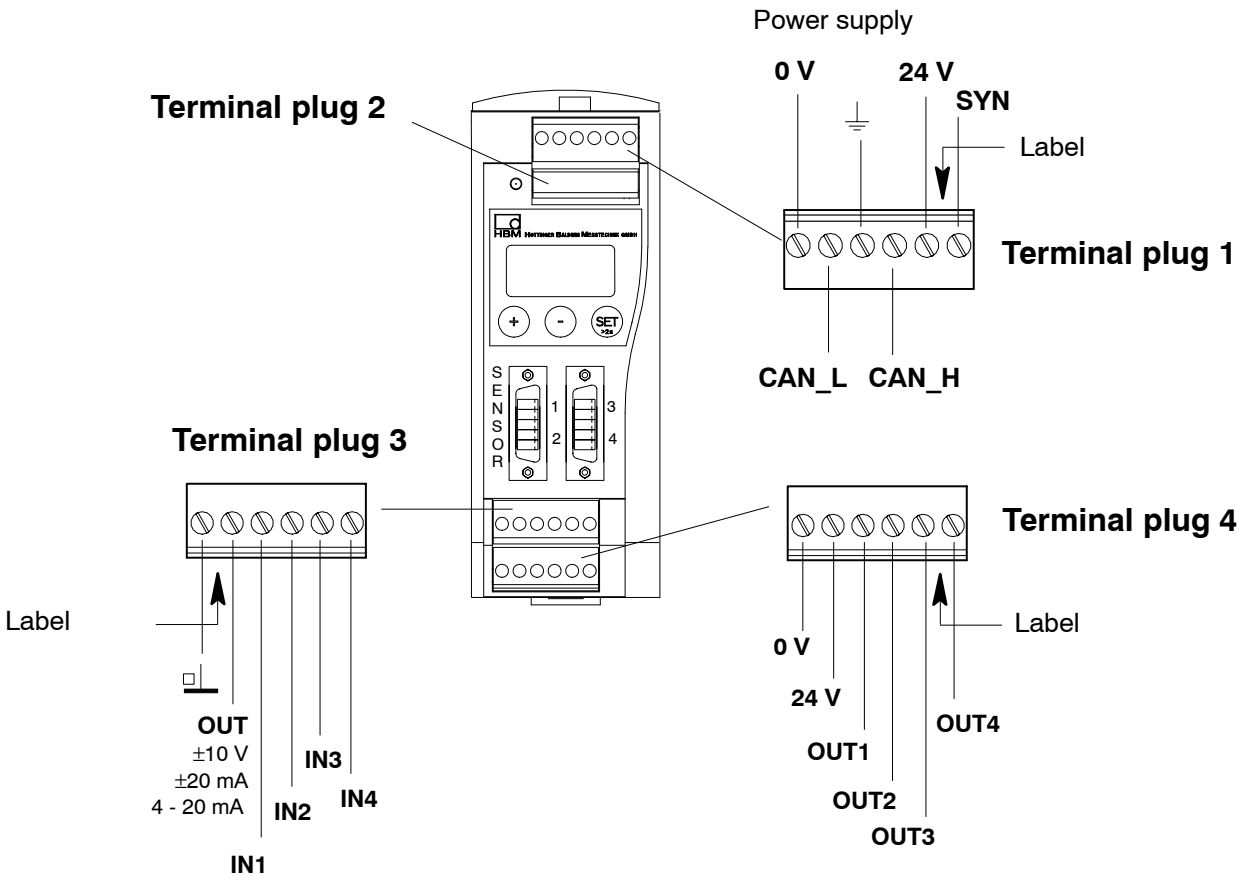
There are four removable terminal plugs provided for making connections.

Connect power supply:

Warning

The MP01 module must be connected to a power supply of 18-30 V (24 V_{nom}).

- Twist wires of the power supply and fit end sleeves.
- Screw ends of conductors to terminal plug 1.
- Insert terminal plug in top jack socket.
- Switch on power supply.



IN = Digital input **OUT = Digital output**

You will find more about inputs and outputs in Chapter 6, Page 31.

CAUTION **In the event of a power failure at the MP01 module, all control outputs will be set to 0 V.**

Fig. 4.1: Pin assignment for terminal plugs

The 4 terminal plugs are coded, so they can be inserted in the 4 jacks with no danger of a mix-up. The jacks are provided with coded lateral guides and the terminal plugs with coded pins.

4.2.1 External voltage supply for control outputs

Example: PLC connection

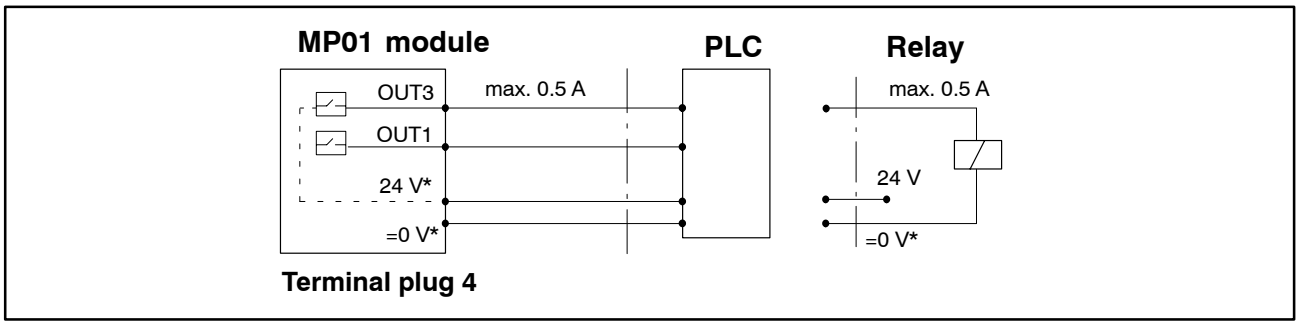


Fig. 4.2: Connection to a PLC

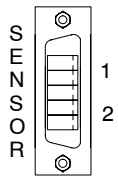
Control **inputs** are provided at terminal plug 3, and control **outputs** at terminal plug 4 and are internally electrically insulated from the supply voltage (see also Chapter 6, ”Declaring the significant parameters” Page 31).

*) The control outputs must be supplied with an external voltage (ground **and** 24 V [maximum +30 V]).

4.3 Sensors

MP01:
A maximum of 4 sensors can be be connected to the sensor connection terminals SENSOR 1/2 and SENSOR 3/4. The individual sensors are assigned parameters via Channels 1-4.
4 channels are provided for connecting voltage/current and thermocouples; for instance, you could connect 4 DC power supplies. **2 channels** (Channel1 at SENSOR1/2 and Channel2 at SENSOR3/4) are supplied for Pt100 resistance thermometers; you can connect a maximum of two Pt100s (using a four-wire connection).

NOTE



The labelling on the front of the MP01 refers to sensors 1 to 4 and is not identical to the terminal labels.

You will find the terminal assignment in Fig. 4.4.

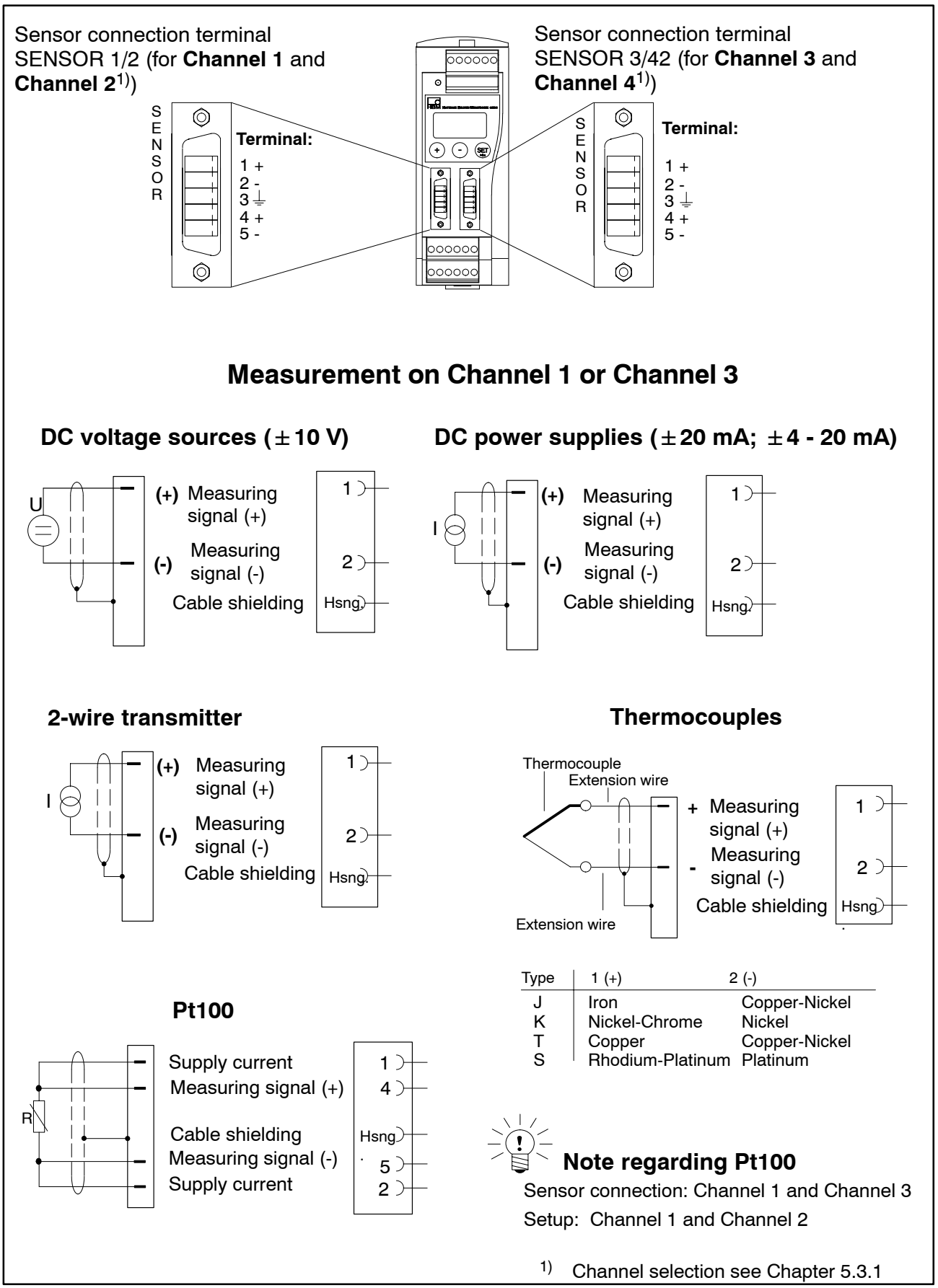
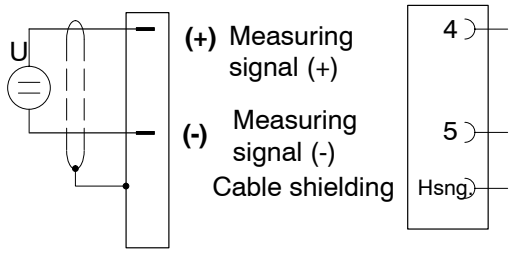


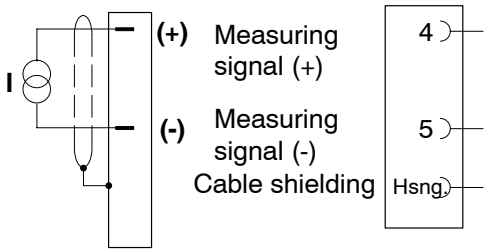
Fig. 4.3: Sensor connection MP01

Measurement on Channel 2 or Channel 4

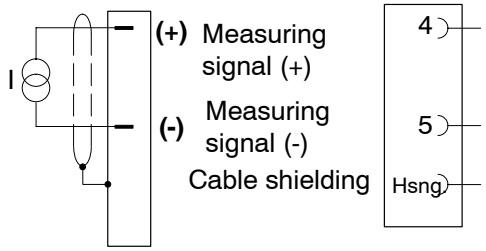
DC voltage sources (±10 V)



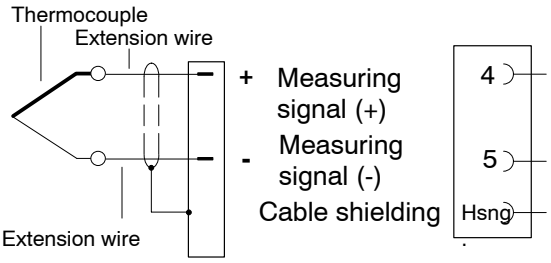
DC power supplies (±20 mA; ±4 - 20 mA)



2-wire transmitter

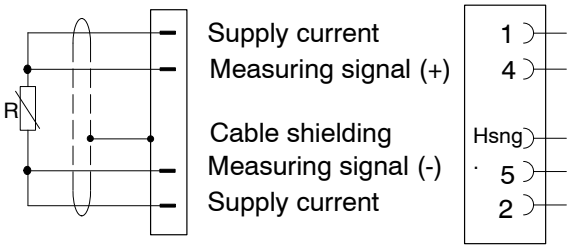


Thermocouples



Type	1 (+)	2 (-)
J	Iron	Copper-Nickel
K	Nickel-Chrome	Nickel
T	Copper	Copper-Nickel
S	Rhodium-Platinum	Platinum

Pt100



Note regarding Pt100

Sensor connection: Channel 1 and Channel 3

Setup: Channel 1 and Channel 2

Note

Measurement on channel	Connect to terminal
1	1 and 2
2	4 and 5
3	1 and 2
4	4 and 5

Fig. 4.4: Sensor connection MP01

NOTE

Use standard HBM cable for the transducer connection. When using other shielded, low-capacitance measuring cable, connect the transducer cable shielding to the connector housing in accordance with the HBM Greenline concept (publication S1578). This ensures EMC protection.

4.4 CAN interface

The CAN bus is connected via terminal plug 1. A maximum of 32 CAN users can be connected in one bus segment - each with different CAN address- (in accordance with the CANopen specification).

The CAN bus needs a 120 Ω terminating resistor in the first and last bus users. A terminating resistor is integrated into the MP01 module which is activated by the toggle switch S14 (see Page 12).

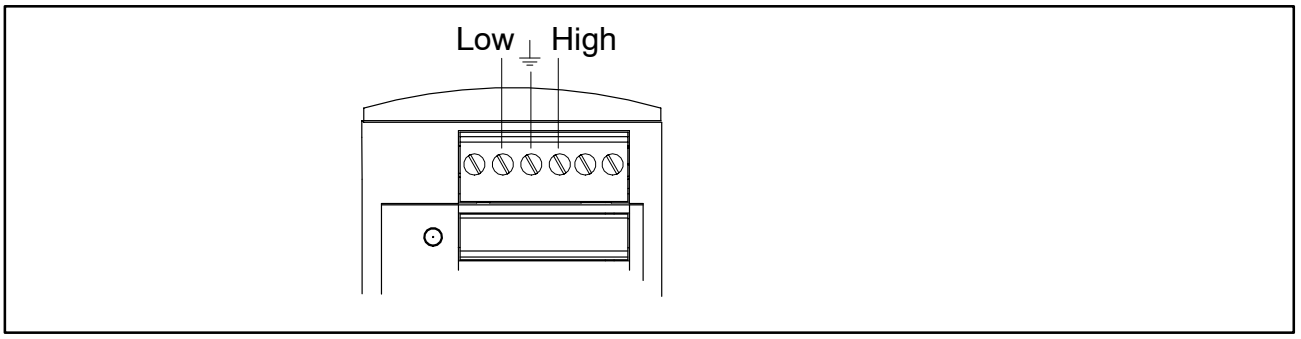


Fig. 4.5: Connect CANinterface

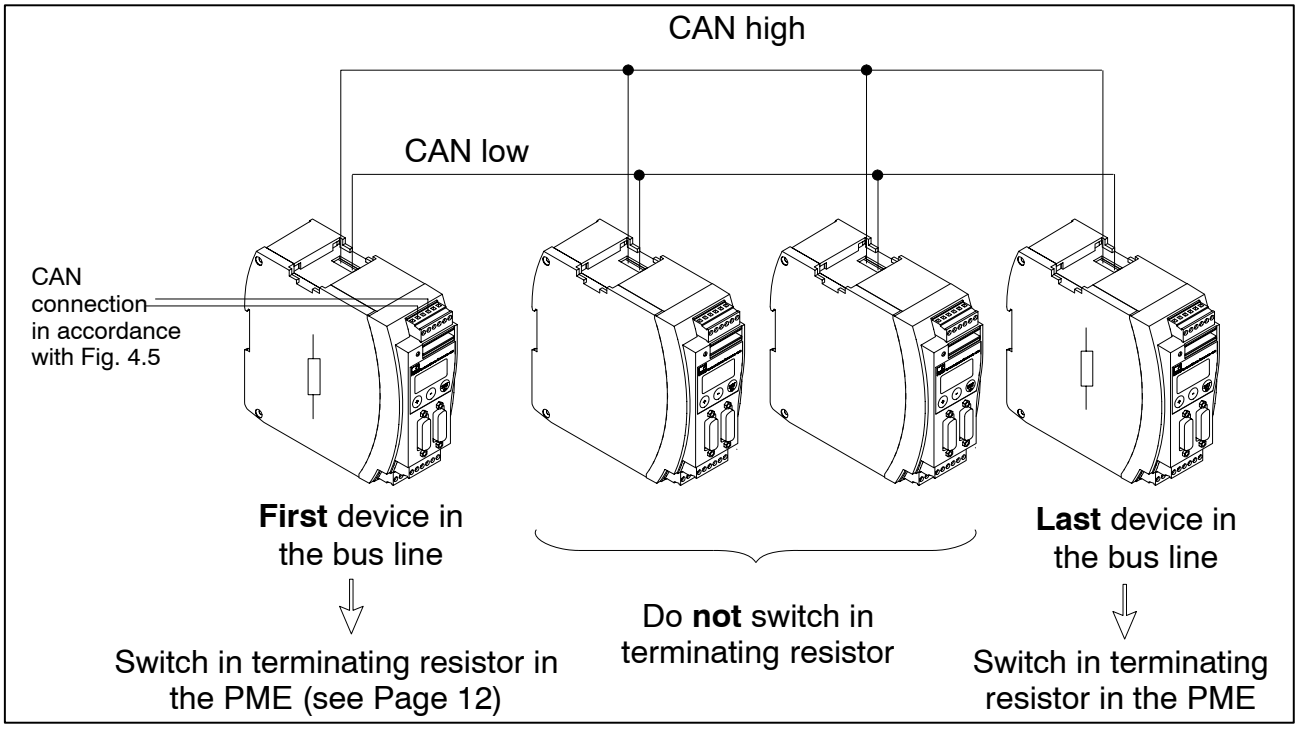


Fig. 4.6: CAN bus operation with several modules (as per Standard maximum 32)

Note

If the first or last device in a bus circuit is not a PME module, then a 120 Ω resistor must be switched on at these pieces of equipment.

4.5 Synchronisation

Synchronisation of modules guarantees the simultaneous acquisition and processing of measurement data.

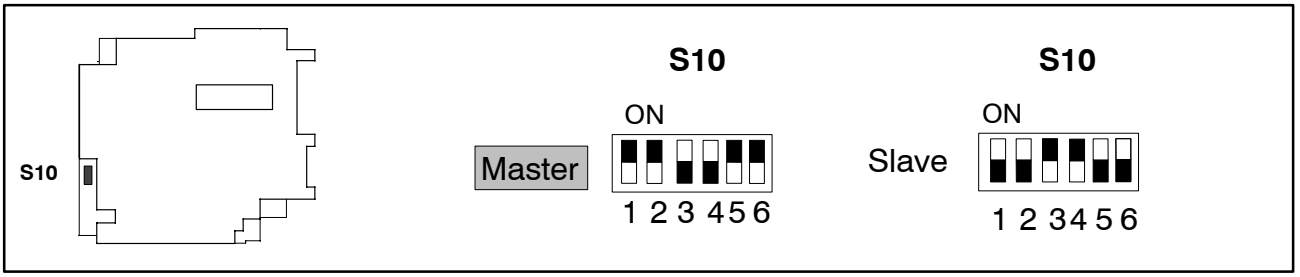


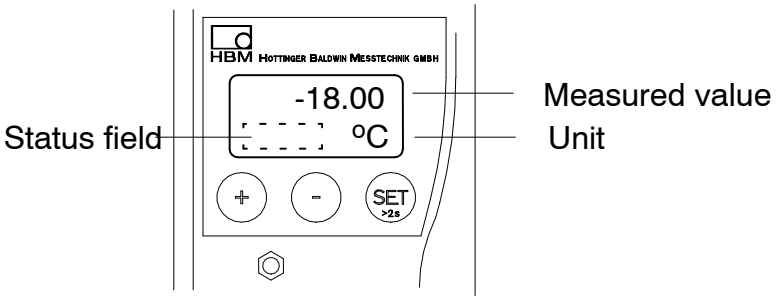
Fig. 4.7: Set up master/slave

Zur When synchronising several modules, **one** device is to be declared as the master. Set up all the other instruments as slaves.
Synchronisation between modules should always - even if working without a CANbus - be effected via the ribbon cable.

5 Setting up and operation

5.1 Operating principles

Display in measuring mode:



↕ Flashes in status field, if parameter value is editable

These keys ⊕ ⊖ are pressure-sensitive:

Hold key down - values run through (the harder you press, the faster they run through)

Hold key down briefly - switch values one at a time

Functions of keys:

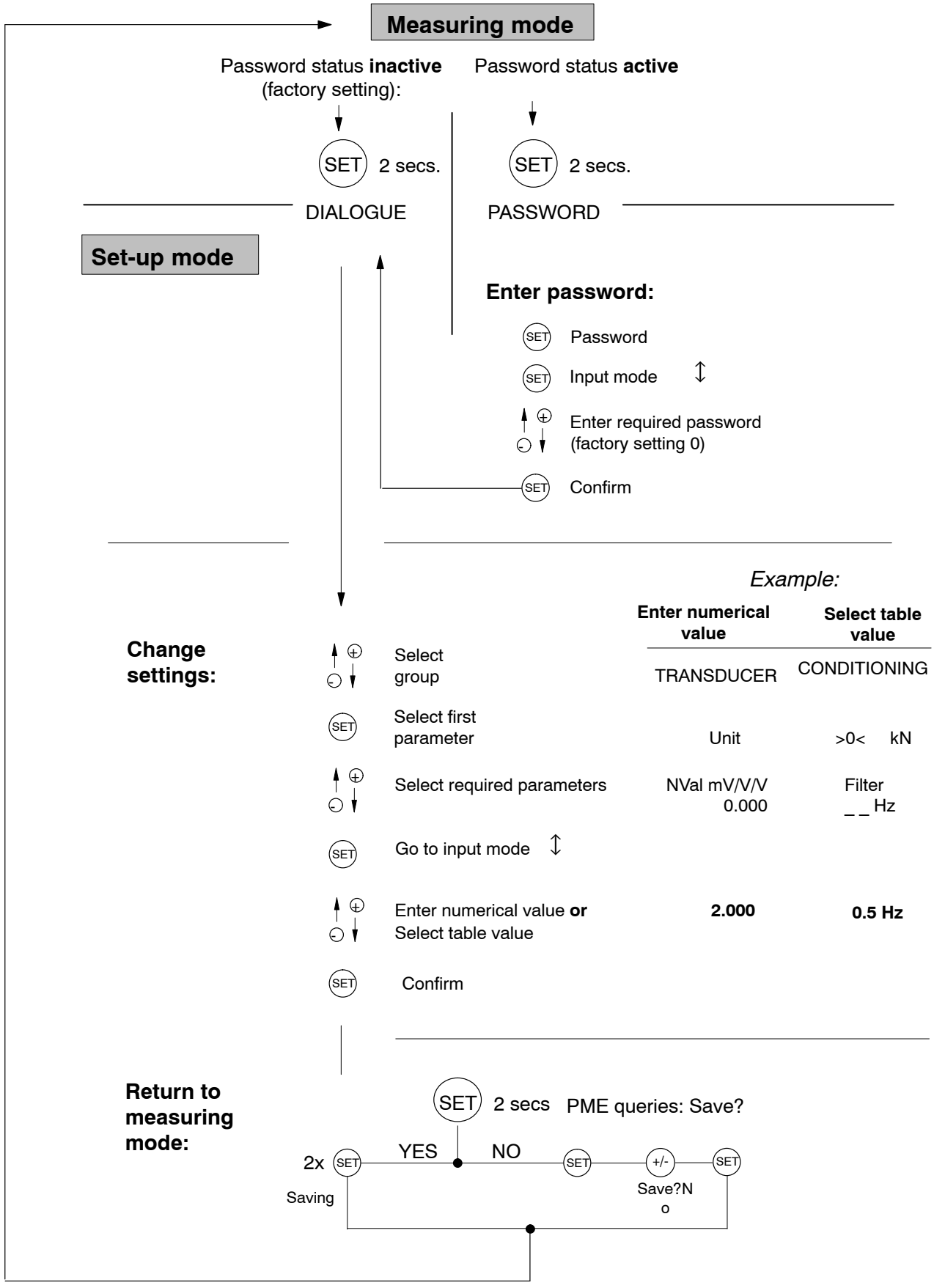
SET

1. Switching from measuring mode to Set-up mode
2. Select the first parameter within the group.
3. Confirm input
4. Return to measuring mode (press for 2 secs.)

+ -

Select parameter/group

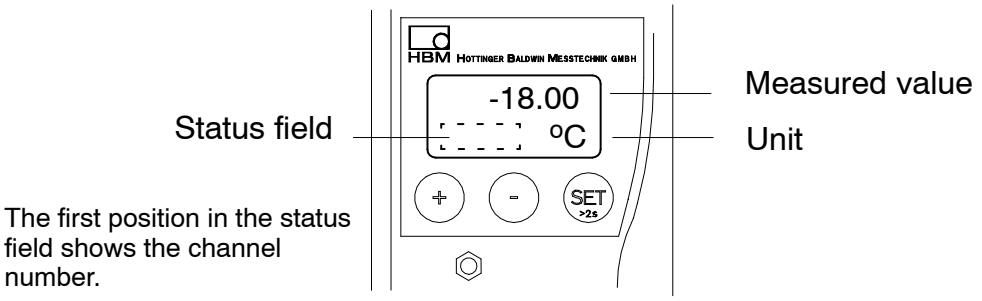
⊕ ⊖


Measuring mode
Password status **inactive** (factory setting):
Password status **active**
SET 2 secs.
SET 2 secs.
DIALOGUE
PASSWORD
Set-up mode
Enter password:
SET Password
SET Input mode
Enter required password (factory setting 0)
SET Confirm
Example:
Enter numerical value
Select table value
Change settings:
Select group
TRANSDUCER
CONDITIONING
SET Select first parameter
Unit
>0< kN
Select required parameters
NVal mV/V/V 0.000
Filter _ _ Hz
SET Go to input mode
Enter numerical value or Select table value
2.000
0.5 Hz
SET Confirm
Return to measuring mode:
SET 2 secs PME queries: Save?
2x SET
YES
NO
SET
+/-
SET
Saving
Save?No

During measurement you can press ⊕ ⊖ - view on display:

1. Values of active channels
2. Analogue output value
2. status of digital I/Os
3. the error list

The symbol is displayed in the status field **!** , this indicates an error which is described in the error list.



	Symbol in status field	Display mode
every 4 times / if active	no character	Gross signal
	>T<	Net signal
	↑ ⫩	Maximum peak value signal
	↓ ⫩	Minimum peak value signal
	↕ ⫩	Peak/peak signal
	VIn[1)]	Input signal
	V or mA	Analogue output signal
	Outp ■ □ □ □ Inpt □ □ □ □	■ set, □ not set Status of input and output
	e.g. ERRORS Ch2StoreMax	**Error messages** During measurement, the character **!** indicates a module failure. Error messages are channel-specific. The current failures which have occurred are automatically displayed one after another in display mode ”ERRORS Ch1...4” (can be reached with ⊕).*)
Status field	**!**	Failure occurred

1) or mAin, mV, Ω

*) see Chapter 8 ”Error messages”, Page 58

5.2 Commissioning

- Set the DIP switches according to Chapter 2 (page 10 and 11) ein.

- Connect the power supply cable and transducers to the module as described in Chapters 4.2 and 4.3.

CAUTION

Please note the safety instructions here!

- Switch on the power supply.
  The device carries out a function test (approx. 15 secs.) and is then in measuring mode, if everything runs correctly. **During the function test, the control outputs remain at 0V.**

In addition, the yellow LED indicates that the MP01 is ready to start measuring.

You will find the meanings of other LED signals in Chapter 8 ”Error messages”.

5.3 Guide to all groups and parameters

SET ↓ ⊕ ⊖ → **Groups**

SET ↓ **Overview of parameters**

⊕ Up

⊖ Down

DIALOGUE	PARAM. SET	CHANNEL	DISPLAY Ch1*)	TRANS-DUCER Ch1*)	TRANSD.-CAL.	CONDI-TION. Ch1*)	ANALOG OUTPUT Ch1*)	LIMIT VAL.1..2 Ch1*)	PEAKVAL. STORE Ch1*)	IN/OUT	CAN-BUS	ADDITION FUNCTION
Password	Load ?	ChSelect	DecPoint	Enable	P1Meas.?	>0< Set ?	SourceVo	Enable	Enable	Output1	Baudrate	AmplType
PassStat	Save ?	**MAINGRP**	Step	Unit	P1 Vin	>0< %1)	Mode Vo	Source	InputMin	ModeOut1	Address	PrgVers
Language	**MAINGRP**		**MAINGRP**	TrnsdTyp	P1 %1)	>T<Enable	Zero %1)	SwtchDir	InputMax	Output2	Profile	>0< Save
I.ParaS				Linearis2)	P2Meas.?	>T< Set ?	Zero V	Level %1)	ClearPkV	ModeOut2	PDO Ch1...Ch4	>T< Save
I.Displ.				Inp.Pola2)	P2 Vin	>T< %1)	FScl %1)	Hyst %1)	**MAINGRP**	Output3	OutR. ms	Keyboard
I.Transd				ZeroVin3)	P2 %1)	Filter	FScl V	OnDelay ms		ModeOut3	PDO-Frmt	SNo prior version
I.TrdCal				Zero %1)3)	**MAINGRP**	FiltChar	**MAINGRP**	OffDlay ms		Output4	**MAINGRP**	HW-Vers.
I.Condit				NVal Vin3)		**MAINGRP**		**MAINGRP**		ModeOut4		**MAINGRP**
I.Analog				NVal%1)3)						Zeroing 1...4		
I.LimVal				**MAINGRP**						Tare 1...4		
I.PStore										PkMomMx1..4		
I.I/O										PkHldMx1...4		
I.CAN										PkMomMn1..4		
I.AddFnc										PkHldMn1...4		
MAINGRP										ParaCo1		
										ParaCo2		
										InpFunc		
										MAINGRP		

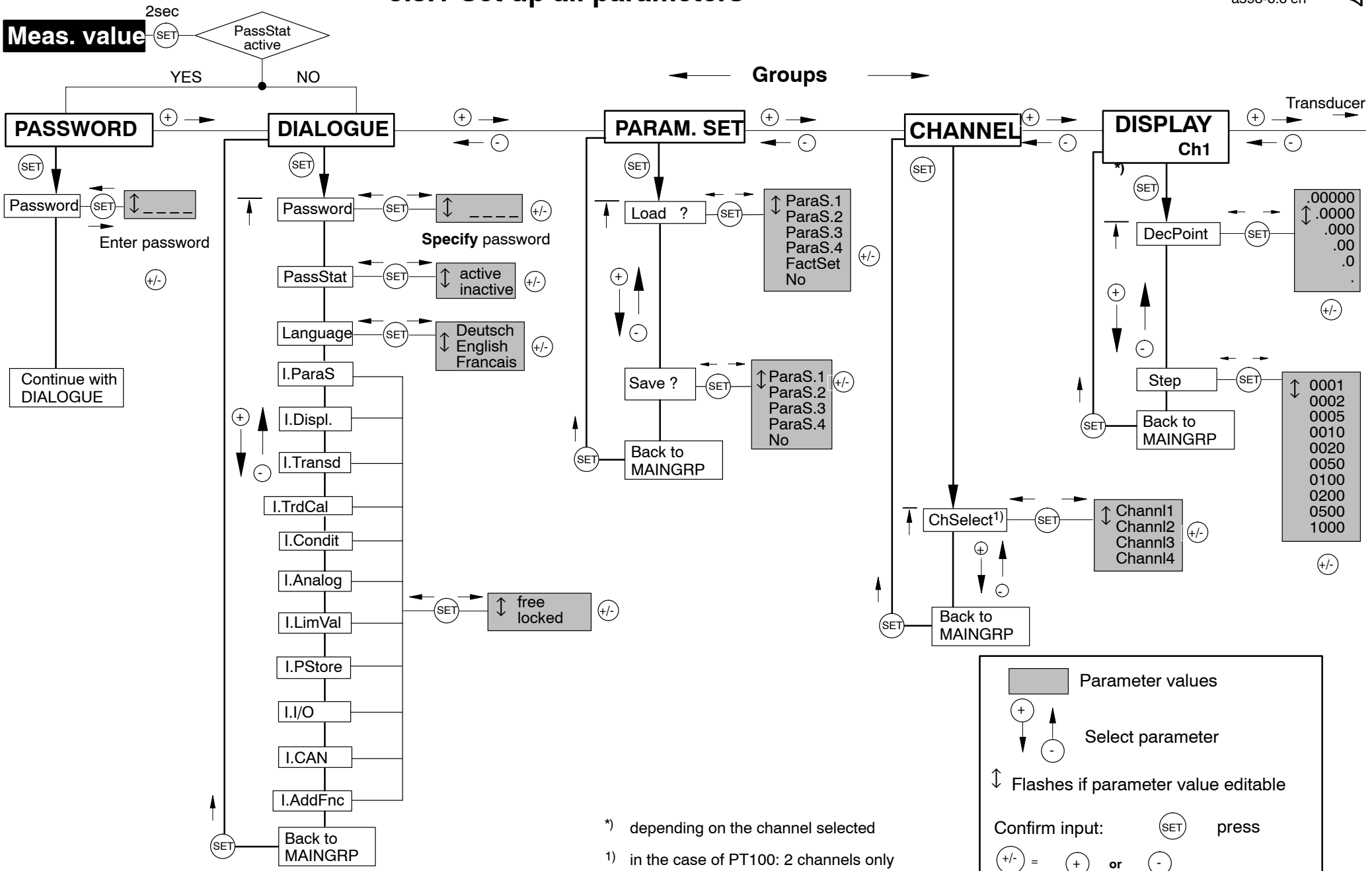
Preset with DIP switches

MAINGRP: with SET return to group

1) Depending on the unit selected 2) only in the case of thermocouples 3) not in the case of thermocouples and not in the case of Pt100

*) Ch1 to Ch4, depending on the channel selected

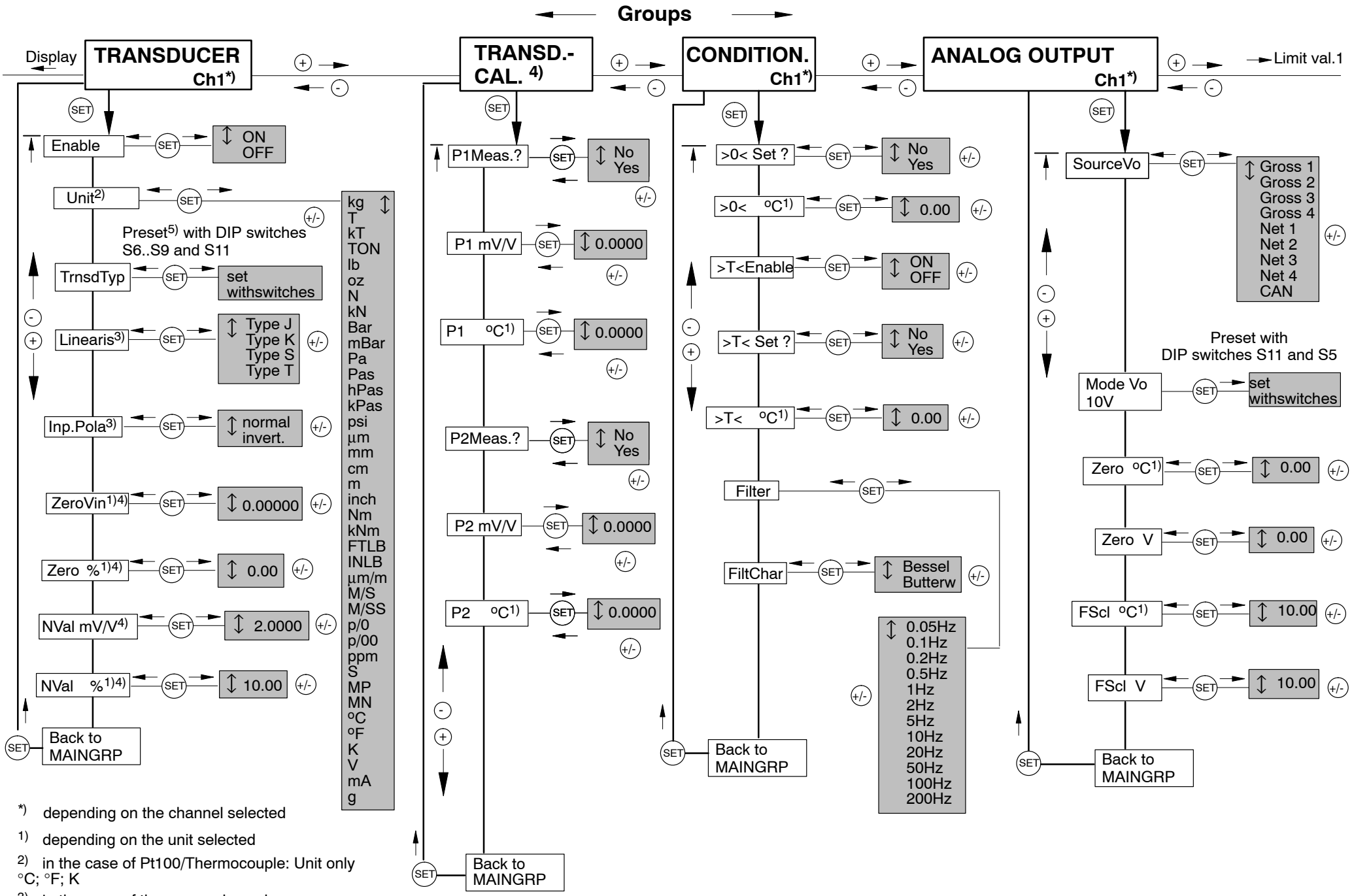
5.3.1 Set up all parameters



*) depending on the channel selected

1) in the case of PT100: 2 channels only

Note:
If a group cannot be selected, check under DIALOGUE whether the group has been enabled.



*) depending on the channel selected

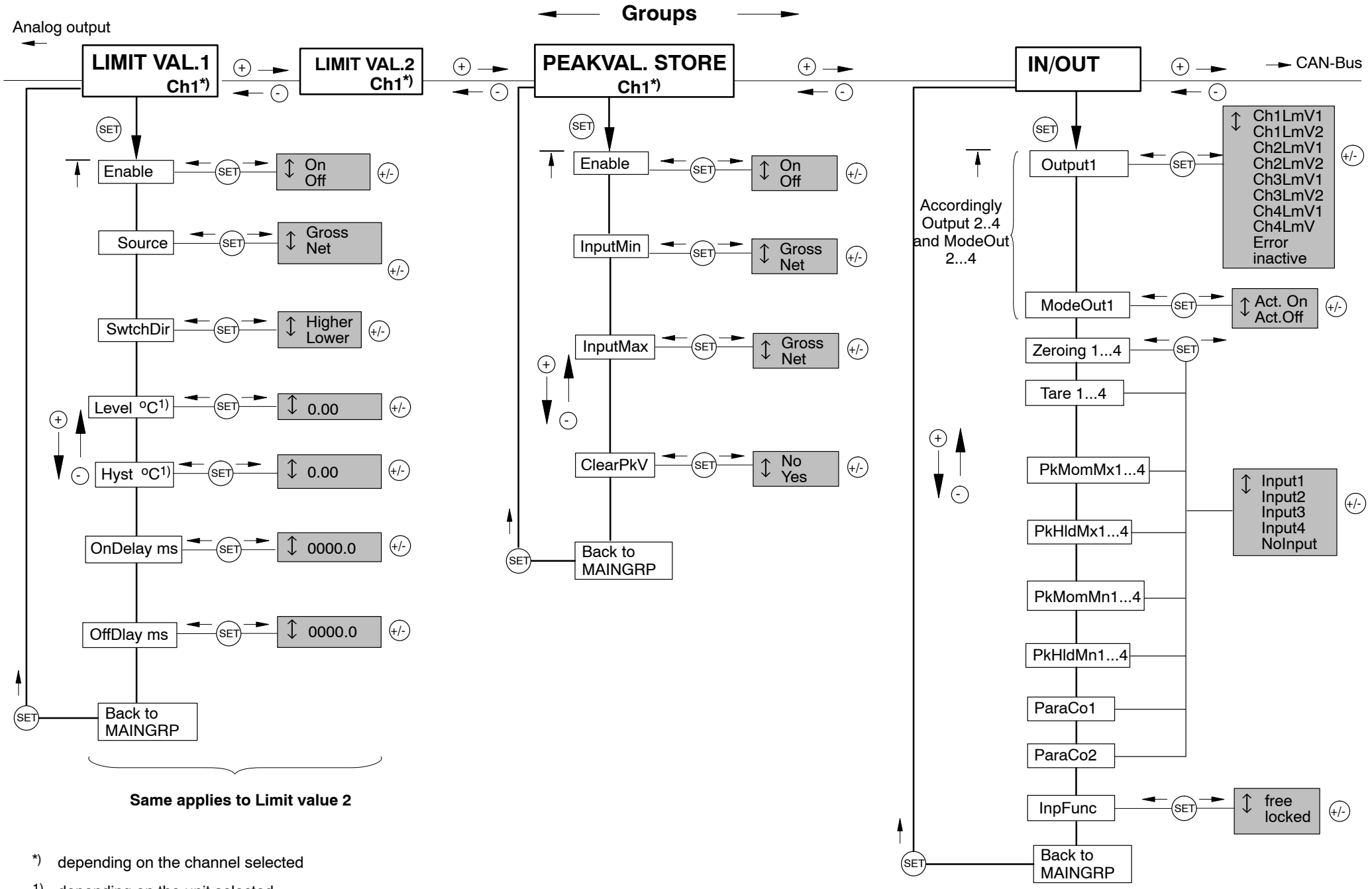
1) depending on the unit selected

2) in the case of Pt100/Thermocouple: Unit only °C; °F; K

3) in the case of thermocouples only

4) not in the case of thermocouples and not in the case of Pt100

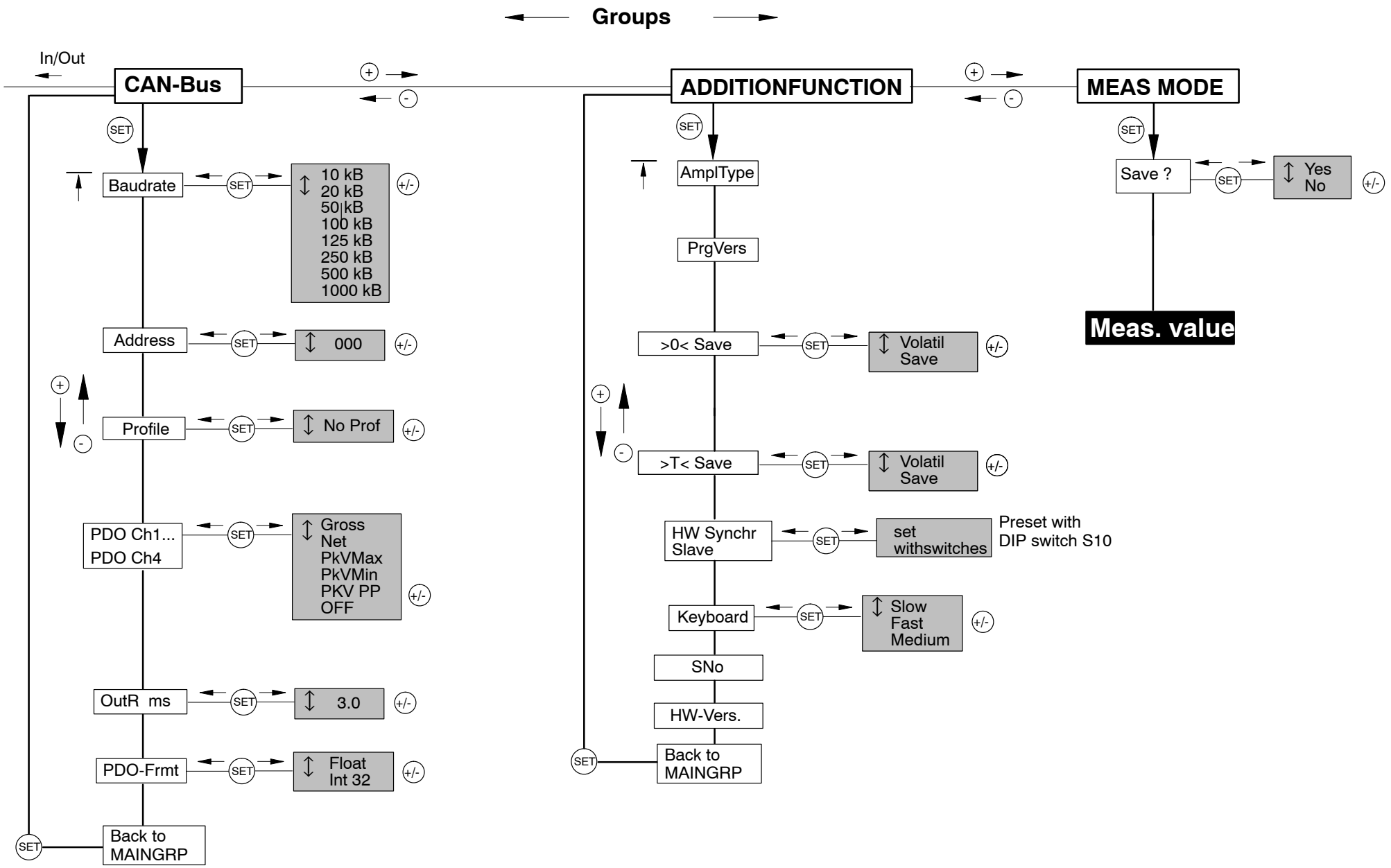
5) see Page 11,



Same applies to Limit value 2

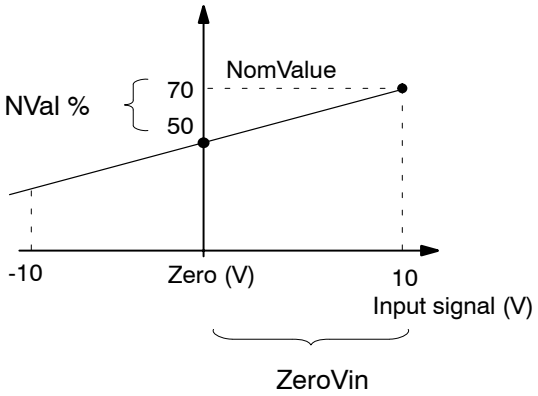
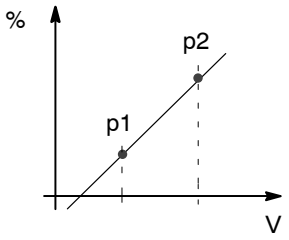
*) depending on the channel selected

1) depending on the unit selected

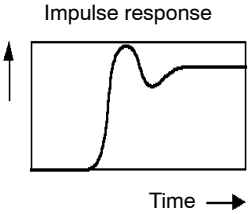
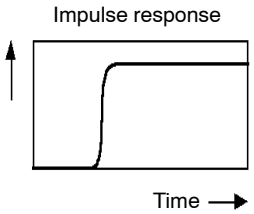

Groups
In/Out
CAN-Bus
ADDITIONFUNCTION
MEAS MODE
SET
+
-
Baudrate
10 kB
20 kB
50 kB
100 kB
125 kB
250 kB
500 kB
1000 kB
+/-
Address
000
Profile
No Prof
PDO Ch1...
PDO Ch4
Gross
Net
PkVMax
PkVMin
PKV PP
OFF
OutR ms
3.0
PDO-Frmt
Float
Int 32
Back to
MAINGRP
AmplType
PrgVers
>0< Save
Volatil
Save
>T< Save
HW Synchr
Slave
set
withswitches
Preset with
DIP switch S10
Keyboard
Slow
Fast
Medium
SNo
HW-Vers.
Back to
MAINGRP
Save ?
Yes
No
Meas. value

6 Declaring the significant parameters

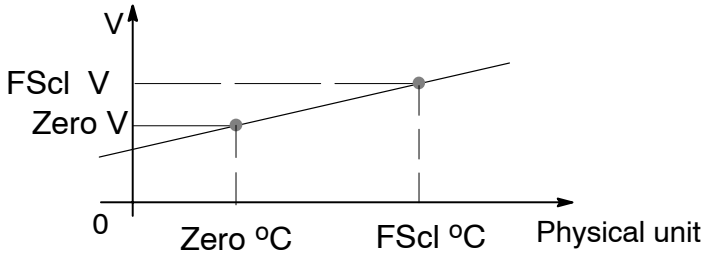
Group	Parameters	Meaning
DIALOGUE	Password	Specifying (changing) a password, 0000 - 9999 (Factory preset password: 0000)
	PassStat	Define password status: active=password must be entered; inactiv=PME can be operated without a password
	I.ParaS to I.AddFnc	Access to group via keyboard free or locked.
PARAM. SET	Load ?	You can either load the factory settings (into all 4 channels simultaneously) or one of the four stored parameter sets.
	Save ?	All device settings can be saved in four parameter sets and not be affected by a power failure. Every time you switch from Setup to Measuring mode, you are asked whether or not the change is to be saved. The data is backed up permanently if you confirm the query with ”Yes” on quitting Setup mode.
CHANNEL	ChSelect	Specify channel to which parameters are to be assigned. **Note:** channels (maximum 4) can be selected and switched off as required.

Group	Parameters	Meaning
TRANSDUCER	TrnsdTyp	Selection of sensor type: DC voltage, direct current, transmitter with 2-wire connectivity, Pt100, thermocouple
	Zero VIn Zero %[1)] NVal VIn NVal %[1)]	**Setting up in accordance with transducer characteristics** Example: Display (%)  **Information on scaling** Input characteristics: The range of values of scale factors is limited. Scaling depends on the resolution selected. In the event of settings which lead to exceeding the respective limits, the message "Scaling error" appears (see Page 59). maximum display resolution: 999 999 digits at 6.67 % of amplifier input range minimum display resolution: 10 digits at 100 % of amplifier input range
TRANSD.-CAL.	P1Meas.? P1 V P1 %[1)]	**Acceptance of signals emitted by sensor in case of defined loading**  P1Meas.? YES 0 V P1 enter 50 % (allocate physic. unit) P2Meas.? YES 10 V P2 enter 70 % **Note**: If the zero point or nominal value are modified, P1 and P2 will be lost.

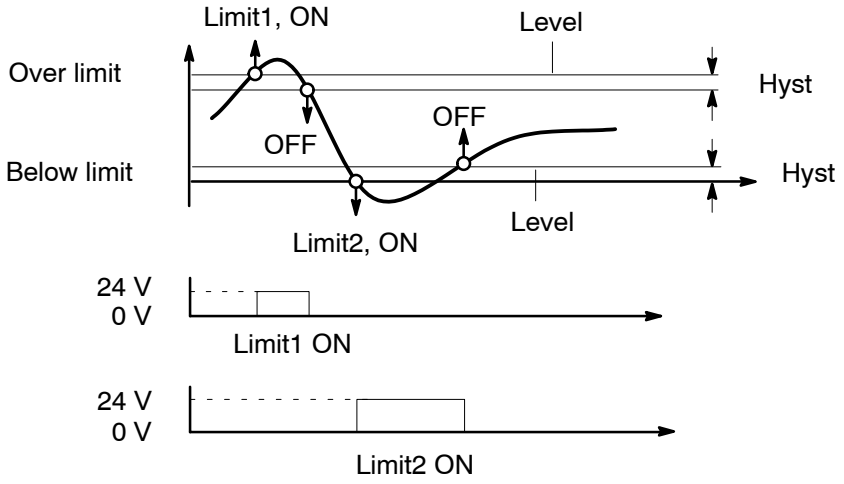
[1)] Depending on the unit selected

Group	Parameters	Meaning
CONDITION		Difference tare/zero: the zero (>0<) affects the gross and net values. The Tare (>T<) only affects the net value.
	>0< Set ?	Trigger zero balance; current value (physical unit) zero
	>0< %[1)]	Enter zero value. Zeroing effects both, the gross value and the net value.
	>T< Enable	Tara value for indication on the display.
	>T< Set ?	Trigger taring; net value set to 0
	>T< °C[1)]	Input tare value. Taring has an effect on the net value.
	Filter	0.05 Hz 1 Hz 20 Hz 0.1 Hz 2 Hz 50 Hz 0.2 Hz 5 Hz 100 Hz 0.5 Hz 10 Hz 250 Hz
	FiltChar	 **Best frequency response** (Butterworth) The diagram shows an impulse response with an overshoot of approx. 10 %. The amplitude response drops off steeply.  **Best course over time** (Bessel) The diagram shows an impulse response with a very small overshoot (<1 %) or none at all. The amplitude response drops off less steeply.

[1)] Depending on the unit selected

Group	Parameters	Meaning
ANALOG OUTPUT	SourceVo	You can choose the gross or net values, as well as the peak value as the source of the analog signal.
	Mode Vo	With DIP switches S11 and S5, you specify the signal mode for the analog output. The following options are available: ±10 V, ±20 mA, 4...20 mA
	Zero °C[1)] Zero V FScl °C[1)] FScl V	 **Information on scaling** Output characteristics: The scale factor for the analog output is a result of the input and output characteristics. If the set nominal value corresponds to the measuring range of, for example, 10 V, then the minimum output voltage to be set is 0.5 V. In the case of settings which lead to exceeding the respective limits, you are given the message ”Analog scaling error” (see Page 59). Scale range analog output min.: 0.5 V at 100 % of input measuring range Scale range analog output max.: 10 V at 3.5 % of input measuring range

[1)] Depending on the unit selected

Group	Parameters	Meaning
LIMIT VAL. 1...2	Source	You can select one of the following as the source of the limit value signal: Gross, Net, Peak value Max/Min/Peak-to-peak
	SwtchDir Level Hyst	Functions and parameters of limit values 
	OnDelay ms	Starting delay; if the limit value level is exceeded, this change only has an effect at the output after the delay time (OnDelay).
	OffDlay ms	Cut-off delay, as OnDelay

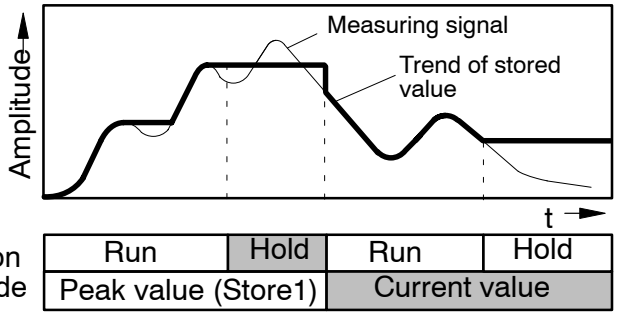
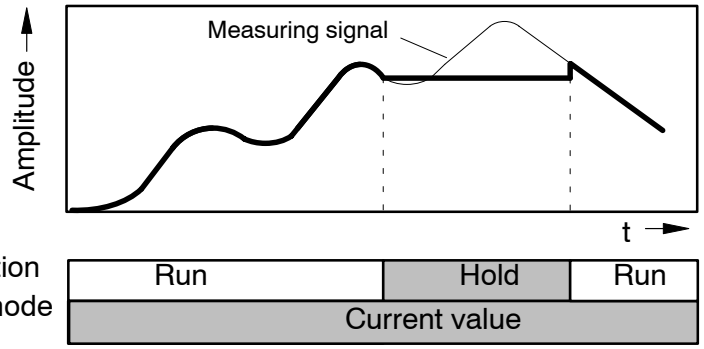
PEAKVAL. STORE*)	InputMin/ Max	You can select one of the following as the source of the peak value signal: gross, net
	ClearPkV	The peak value can be deleted.

Inputs /Outputs

Terminal plug 3: provided here for the control of PME functions **are 4 inputs**.

Terminal plug 4: here you have **4 outputs** at your disposal.

<table>
<tr><th>Group</th><th>Parameters</th><th colspan="4">Meaning</th></tr>
<tr><td rowspan="2">IN/OUT</td><td>Output1...4</td><td colspan="4">Outputs 1 - 4 can be assigned the following functions for each channel:
Limit value 1 to 2, error, inactive</td></tr>
<tr><td>ModeOut 1...4</td><td colspan="4">Output signal is inverted (Act. On) or not inverted (Act.Off).</td></tr>
<tr><td rowspan="11"></td><td></td><td colspan="4">The functions listed can be freely allocated to the remotes (I/Os).</td></tr>
<tr><td>Functions</td><td colspan="2">Input value 0 V</td><td colspan="2">Input value 24 V</td></tr>
<tr><td>Taring</td><td colspan="4">Taring is started upon alternation from 0 V to 24 V</td></tr>
<tr><td>Zero balance</td><td colspan="4">Current measuring signal is set to zero upon alternation from 0 V to 24 V</td></tr>
<tr><td>PkMomMx</td><td colspan="2">”Peak value” operating mode for PkMax</td><td colspan="2">”Current value” operating mode for PkMax</td></tr>
<tr><td>PkMomMn</td><td colspan="2">”Peak value” operating mode for PkMin</td><td colspan="2">”Current value” operating mode for PkMin</td></tr>
<tr><td>PkHldMx</td><td colspan="2">Memory contents of PkMax are updated</td><td colspan="2">Memory contents of PkMax are frozen</td></tr>
<tr><td>PkHldMn</td><td colspan="2">Memory contents of PkMin are updated</td><td colspan="2">Memory contents of PkMin are frozen</td></tr>
<tr><td>ParaCo1
ParaCo2</td><td colspan="4">Selection of parameter sets and binary coded inputs</td></tr>
<tr><td></td><td>Parameter set</td><td>ParaCo2</td><td>ParaCo1</td></tr>
<tr><td></td><td>1</td><td>0</td><td>0</td></tr>
<tr><td></td><td>2</td><td>0</td><td>1</td></tr>
<tr><td></td><td>3</td><td>1</td><td>0</td></tr>
<tr><td></td><td>4</td><td>1</td><td>1</td></tr>
</table>

Group	Parameters	Meaning
IN/OUT	PkMomMx PkMomMn PkHldMx PkHldMx PkHldMn	”Peak value” operating mode  ”Current value” operating mode 

CAN -Bus	Baud rate	10 kB, 20 kB, 50 kB, 100 kB, 125 kB, 250 kB, 500 kB, 1000 kB
	Address	From 1 to 127 (8 data bits)
	Profile	DS401 (Device profile for I/O modules) or DS404 (Device Profile for Measuring Devices and Closed Loop Controller) in preparation
	PDO Ch1... PDO Ch4	The signal output via the CAN bus is selected: Gross, Net or Peak value max/min; Peak-to-peak; OFF[1)] PDO Ch1: 1.PDO (sends the selected signal from Channel 1 as the first PDO) PDO Ch2: 2.PDO (sends the selected signal from Channel 2 as the 2nd PDO) PDO Ch3: 3.PDO (sends the selected signal from Channel 3 as the first PDO at the next higher ID)[3)] PDO Ch4: 4.PDO (sends the selected signal from Channel 4 as 2nd PDO)[2)3)]
	OutR. ms	Output rate. Specifies the interval (in ms) at which PDOs are sent via the CAN interface.

ADDITION FUNCTION	>0< Save*)	With each zeroing procedure, the zero value is adopted into the EEPROM (service life 100,000 cycles)
	>T< Save*)	Save tare value immediately after taring

*) For all four channels simultaneously

1) In the case of OFF, the PDO is not transferred (PDO not valid)

2) Device address 127: 3rd and 4th PDO is sent to Address 1

3) If PDO Ch3 and/or PDO Ch4 are selected, the module address following the module must be left free without fail.

7 CAN interface description

7.1 General

The MP01 module has a built-in CAN interface, via which both measured values (data) can be transferred and parameters can be assigned to the module. You are free to select the baud rate, but the maximum is 1 MBaud. The protocol of the interface is orientated towards CANopen Standard.

7.2 Cyclical data transmission

Cyclical data is transferred in the form of “Process Data Objects” (PDOs, according to CANopen specifications). Data which is of interest is sent cyclically without further labelling under a CAN identifier specified previously. A prompt message is not needed. How often PDOs are sent is set up as a parameter (see object directory). Data formats with a length of more than one byte are always sent in the sequence LSB-MSB.

Send PDO:

CAN identifier	384 (180 Hex) + module address
1st - 4th data byte	Measured value (LSB-MSB)
5th data byte	Status (object 2010)

Receive PDO:

CAN identifier	512 (200 Hex) + module address
1st data byte	Control word (object 2630)

Apart from these predefined PDOs, others can be set up according to CANopen specifications (CIA-DS301) using mapping. Appropriate tools for this are commercially available.

The exchange of cyclical PDOs is only started after the module has been put into ”Operational” status. This takes place using the message ”Start_Remote_Node”

CAN identifier	0
1st data byte	1
2nd data byte	Module address (0 = all)

You can exit ”Operational” status again by means of the message ”Enter_Pre_Operational_State”:

CAN identifier	0
1st data byte	128
2nd data byte	Module address (0 = all)

7.3 Parameter assignment

Messages for assigning parameters to the module are transferred as so-called “Service Data Objects” (SDOs, as per CANopen specifications). In this case, the different parameters are addressed via an index number as well as a sub-index number. Please see the object directory regarding the allocation of these index numbers. Data formats with a length of more than one byte are always sent in the sequence LSB-MSB.

Reading a parameter:

Query (PC or PLC at MP01)

CAN identifier	1536 (600 Hex) + module address
1st data byte	64 (40 Hex)
2nd + 3rd Data byte	Index (LSB_MSB)
4th data byte	Sub-index
5th - 8th data byte	0

Response (MP01 at PC or PLC)

CAN identifier	1408 (580 Hex) + module address
1st data byte	79 (4F Hex); 1 byte data 75 (4B Hex); 2 bytes data 67 (43 Hex); 4 bytes data
2nd + 3rd Data byte	Index (LSB-MSB)
4th data byte	Sub-index
5th - 8th data byte	Value (LSB-MSB)

Writing a parameter:

Send value (PC or PLC at MP01)

CAN identifier	1536 (600 Hex) + module address
1st data byte	47 (2FHex) = 1Byte write 43 (2BHex) = 2Byte write 35 (23Hex) = 4Byte write)
2nd + 3rd Data byte	Index (LSB-MSB)
4th data byte	Sub-index
5th - 8th data byte	Value (LSB-MSB)

Acknowledge (MP01 at PC or PLC)

CAN identifier	1408 (580 Hex) + module address
1st data byte	224 (E0Hex)
2nd + 3rd Data byte	Index (LSB_MSB)
4th data byte	Sub-index
5th - 8th data byte	0

Response in the event of an error when reading or writing parameters:

Error acknowledge (MP01 at PC or PLC)

CAN identifier	1408 (580 Hex) + module address
1st data byte	128 (80Hex)
2nd + 3rd Data byte	Index (LSB_MSB) or 0
4th data byte	Sub-index or 0
5th - 6th data byte	Additional error code: 10H: parameter value invalid 11H: Sub-index does not exist 12H: Length too big 13H: Length too small 20H: This service currently not executable 21H: - Due to local control 22H: - Due to device status 30H: Value range of parameter exceeded 31H: Value of parameter too large 32H: Value of parameter too small 40H: Value is incompatible with other settings 41H: Data cannot be mapped 42H: PDO length exceeded 43H: General incompatibility
7th data byte	Error code: 1: Object access not supported 2: Object does not exist 3: Parameters inconsistent 4: Prohibited parameter 6: Hardware failure 7: Type conflict 9: Object attributes inconsistent (sub-index does not exist)
8th data byte	Error class: 5: Service defective 6: Access error 8: Other error

7.4 Emergency objects

Byte	0 byte	1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte
Contents	Emergency error code		Error register (Object 1001H)	Manufacturer-specific error field				

Error code	Meaning
0	No error
1000	Fatal error (original calibration error)
5032	ADC overflow (cable break in case of thermocouples)
6311	Scaling error
6312	Scaling error analog output
F001	Measuring range overflow
F002	Analog output overflow
F020	Net overflow
FF03	Gross overflow
FF06	Peak value min.
FF07	Peak value max.

It is defined in the 3rd byte in which channel the error has occurred:

3rd byte	
1	Channels 1 to 4
2	
3	
4	
0	total device

7.5 Object directory: communications profile section as per CANopen (CIA-DS301)

Index (hex)	Sub-index	Name	Data type	Attr.	Values
1000	0	Device type	unsigned32	ro	
1001	0	Error register	unsigned8	ro	Bit 0: Fatal error Bit 4: Communi-cation error Bit 7: Manufacturer-specific
1003	0	Predefined error array	unsigned8	rw	Number of errors
1003	1..7	Predefined error array	unsigned32	ro	Byte 0..1:Error code: corresponds to bytes 0 and 1 of emergency object Byte 2..3: corresponds to bytes 3 and 4 of emergency object
1005	0	Identifier SYNC message	unsigned32	rw	
1008	0	Manufacturer's device designation.	Vis string	ro	I=8
1009	0	Manufacturer's hardware version	Vis string	ro	I=8
100A	0	Manufacturer's software version	Vis string	ro	I=15
100B	0	Device address	Unsigned32	ro	
1012	0	Identifier EMERGENCY message	Unsigned32	rw	
1200	0..2	Server SDO parameter	SDOParam eter	ro	
1400	0..2	1. Receive PDO parameter	PDOComm Par	rw	
1401	0..2	2. Receive PDO parameter	PDOComm Par	rw	
1402	0..2	3. Receive PDO parameter	PDOComm Par	rw	
1403	0..2	4. Receive PDO parameter	PDOComm Par	rw	
1600	0..2	1. Receive PDO mapping	PDO mapping	rw	
1601	0..2	2. Receive PDO mapping	PDO mapping	rw	
1602	0..2	3. Receive PDO mapping	PDO mapping	rw	

1603	0..2	4. Receive PDO mapping	PDO mapping	rw	
1800	0..2	1. Send PDO parameter	PDOComm Par	rw	
1801	0..2	2. Send PDO parameter	PDOComm Par	rw	
1802	0..2	3. Send PDO parameter	PDOComm Par	rw	
1803	0..2	4. Send PDO parameter	PDOComm Par	rw	
1A00	0..2	1. Send PDO mapping	PDO mapping	ro	
1A01	0..2	2. Send PDO mapping	PDO mapping	rw	
1A02	0..2	3. Send PDO mapping	PDO mapping	rw	
1A03	0..2	4. Send PDO mapping	PDO mapping	rw	

Data structures:

PDO CommPar:

Index	Sub-index	Name	Data type
0020	0	Number of entries	unsigned 8
	1	CAN identifier for PDO	unsigned32
	2	Transmission type	unsigned8
	3	Off-time	unsigned16
	4	Priority group	unsigned8

CAN identifier for PDO (Sub-index 1):

Bits	Value	Meaning
31 (MSB)	0 1	PDO valid PDO invalid
30	0 1	RTR allowed RTR not allowed
29	0 1	11 bit ID 29 bit ID
28..0	X	CAN ID

PDO mapping:

Index	Sub-index	Name	Data type
0021	0	Number of mapped objects	unsigned8
	1	1. mapped object	unsigned32
	2	2. mapped object	unsigned32
	...	...	unsigned32

Structure of a PDO mapping entry:

Index (16 bit)	Sub-index (8 bit)	Object length in bits (8 data bits)

SDO parameter:

Index	Sub-index	Name	Data type
0022	0	Number of entries	unsigned8
	1	COB ID client->server	unsigned32
	2	COB ID server->client	unsigned32
	3	node ID (optional)	unsigned8

7.6 Object directory: manufacturer-specific objects

Parameters relating to measured values are coded with figures scaled in the appropriate range as Long (32 bit integer). The position of the decimal point is defined in the object 2120Hex. Alternatively, these quantities are also available as floating decimal point values (IEEE754-1985 32 Bit format) (see Page 55).

Note: rop, rwp: PDO mappable

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Measured values:			
2000	1-4	Gross measured value	integer32	rop	
2001	1-4	Net measured value	integer32	rop	
2002	1-4	Maximum	integer32	rop	
2003	1-4	Minimum	integer32	rop	
2004	1-4	Peak-to-peak	integer32	rop	
2005	1-4	Measured value as input quantity	integer32	rop	5 Decimal places depending on type
2006	1	Analog output value V	integer32	rop	3 Decimal places
2010	1-4	Measured value status	unsigned8	rop	Bit 0: Meas. value Overflow Bit 1: Analog output Overfl. Bit 2: Scaling defective Bit 3: EEPROM error Bit 4: Limit value 1 Bit 5: Limit value 2
2011	1-4	Measured value status_2	unsigned32	rop	Bit 0: Channel OFF Bit 1: Overfl. ADC Bit 2: Overfl. Gross Bit 3: Overfl. Net Bit 4: Overfl. Analog output Bit 5: Overfl. Maximum Bit 6: Overfl. Minimum Bit 7: Negative Overfl. Bit 8: Limit value 1 Bit 9: Limit value 2 Bit 12: Scaling input Bit 13: Scaling output Bit 14: Nom.val. excdd. Bit 15: Orig. cal. error Bit 17: CAN bus Off Bit 18: CAN Tx error
2020	1	I/O status	unsigned8	rop	Bit 0..3: Inputs 1...4 Bit 4...7: Outputs 1...4

Index (hex)	Sub-index	Name	Format	Attr.	Values
2080	0	Edit mode	unsigned8	ro	1: Edit mode ON 0: Edit mode OFF
2081	0	Restart executed	unsigned8	rw	1: Restart executed 0: Write = Delete
2082	0	Serial number	vis. string	ro	12 characters
2083	0	Exit edit mode	unsigned8	wo	Write any value to measured value display afterwards

		Dialogue:			
2101	0	Dialogue language	unsigned16	rw	1500 deutsch 1501 English
2103	0	Password	integer16	rw	
2104	1	Enable keyboard and menu	unsigned16	rw	0: Enable input 1: Input locked Bit 0: Password entry Bit 1: Dialogue Bit 2: Parameter set Bit 3: Display Bit 4: Sensor Bit 5: Conditioning Bit 6: Analog output Bit 7: Limit values Bit 8: Peak values Bit 9: Inputs/outputs Bit 10: CAN Bit 11: Additional functions Bit 12: Calibrate Bit 13: Channel selection Bit 15: Keyboard lock
		Parameter sets			
2110	1	Enable parameter set	unsigned16	rw	6600: Factory setting 6601: Parameter set 1 6602: Parameter set 2 6603: Parameter set 3 6604: Parameter set 4
2111	1	Save parameter set	unsigned16	rw	See above
2112	1	Number of enabled parameter set	unsigned16	ro	See above

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Display adaptation			
2120	1	Decimal point position	unsigned16	rw	0..5
2121	1	Step	unsigned16	rw	110: 1 111: 2 112: 5 113: 10 114: 20 115: 50 116: 100 117: 200 118: 500 119: 1000

		Sensor			
2122	1	Physical unit	unsigned16	rw	1601: V 1602: mA 1603: g 1604: kg 1605: T 1606: kT 1607: TON 1608: lb 1609: oz 1610: N 1611: kN 1612: bar 1613: mbar 1614: Pa 1615: Pas 1616: hPas 1617: kPas 1618: psi 1619: µm 1620: mm 1621: cm 1622: m 1623: inch

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Sensor			
2122	1	Physical unit	unsigned16	rw	1624: Nm 1625: kNm 1626: FTLB 1627: INLB 1628: µm/m 1629: m/s 1630: m/s^2 1631: percent 1632: per mille 1633: ppm 1634: S 1635: MPas 1636: MN 1637: Blanks 1638: ^oC 1639: ^oF 1640: K

Index (hex)	Sub-index	Name	Format	Attr.	Values
2130	1	Sensor type	unsigned16	ro	420: Volt 421: mA 422: 2-wire transmitter 449: Thermocouple 501: Pt100
2132	1-4	Linearisation	unsigned16	ro	450: Type J 451: Type K 452: Type T 453: Type S
2133	1-4	Inverting input signal in the case of thermocouple	unsigned16	rw	1: inverted 0: not inverted
2134	1-4 5	Enable channel Enable reference point	unsigned16 unsigned16	rw ro	1: Yes 0: No
2140	1-4	Transducer null	integer32	rw	Value as input quantity
2141	1-4	Transducer null	integer32	rw	Value as physical unit
2142	1-4	Transducer sensitivity	integer32	rw	Value as input quantity
2143	1-4	Transducer nominal value	integer32	rw	Value as physical unit
2150	1-4	Input characteristic 1. Point	integer32	rw	Value as input quantity
2151	1-4	Input characteristic 2. Point	integer32	rw	Value as input quantity
2160	1-4	Input characteristic 1. Point	integer32	rw	Value as physical unit
2161	1-4	Input characteristic 2. Point	integer32	rw	Value as physical unit

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Conditioning			
2180	1-4	Tare value	integer32	rw	
2181	1-4	Zero balance value	integer32	rw	
2182	1	Memory mode for taring	unsigned16	rw	6611: transient 6610: permanent
2183	1	Memory mode for zeroing	unsigned16	rw	6611: transient 6610: permanent
2184	1-4	Enable net signal (for display only)	unsigned16	rw	1: Yes 0: No
2190	1	Filter frequency	unsigned16	rw	908: 0.05Hz 914: 0.1Hz 917: 0.2Hz 921: 0.5Hz 927: 1Hz 931: 2Hz 935: 5Hz 941: 10Hz 945: 20Hz 949: 50Hz 955: 100Hz 959: 250Hz
2191	1	Filter characteristics	unsigned16	rw	141: Butterworth 142: Bessel

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Analog output			
21C0	1	Analog output mode (voltage/current)	unsigned16	ro	290: ±10V 291: ±20mA 292: 4..20mA
21C1	1	Signal at analog output	unsigned16	rw	214: Gross Ch1 280: Gross Ch2 281: Gross Ch3 282: Gross Ch4 215: Net Ch1 285: Net Ch2 286: Net Ch3 287: Net Ch4 204: Max Ch1 260: Max Ch2 261: Max Ch3 262: Max Ch4 205: Min Ch1 265: Min Ch2 266: Min Ch3 267: Min Ch4 218: Peak-to-peak Ch1 270: Peak-to-peak Ch2 271: Peak-to-peak Ch3 272: Peak-to-peak Ch4
21D0	1-4	Zero point analog output	integer32	rw	Value as physical unit
21D1	1-4	End value analog output	integer32	rw	Value as physical unit
21D2	1-4	Zero point analog output	integer32	rw	Value in V or mA
21D3	1-4	End value analog output	integer32	rw	Value in V or mA

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Limit switches			
2210	1-4	Enable Limit value 1	unsigned16	rw	1: Yes 0: No
2211	1-4	Input signal Limit value 1	unsigned16	rw	214: Gross 1-4 215: Net 1-4 204: Min 1-4 205: Max 1-4 218: Peak-to-peak 1-4
2212	1-4	SwtchDir Limit value 1	unsigned16	rw	130: Above limit 131: Below limit
2214	1-4	Starting delay LVS 1	integer32	rw	ms
2215	1-4	Cut-off delay LVS 1	integer32	rw	ms
2216	1-4	Switching level Limit value 1	integer32	rwp	
2217	1-4	Hysteresis Limit value 1	integer32	rw	
2218	1-4	Status Limit value 1	unsigned8	rop	
2220	1-4	Enable Limit value 1	unsigned16	rw	1: Yes 0: No
2221	1-4	Input signal Limit value 1	unsigned16	rw	214: Gross 1-4 215: Net 1-4 204: Min 1-4 205: Max 1-4 218: Peak-to-peak 1-4
2222	1-4	SwtchDir Limit value 1	unsigned16	rw	130: Above limit 131: Below limit
2224	1-4	Starting delay LVS 1	integer32	rw	ms
2225	1-4	Cut-off delay LVS 1	integer32	rw	ms
2226	1-4	Switching level Limit value 2	integer32	rwp	
2227	1-4	Hysteresis Limit value 2	integer32	rw	
2228	1-4	Status Limit value 1	unsigned8	rop	
		Peak values			
2260	1-4	Input signal Min store	unsigned16	rw	214: Gross 1-4 215: Net 1-4
2261	1-4	Input signal Max store	unsigned16	rw	214: Gross 1-4 215: Net 1-4
2263	1-4	Enable peak store	unsigned16	rw	1: enable 2: locked
		Additional functions			
2272	0	Keyboard sensitivity	unsigned16	rw	7601: low 7602: medium 7603: high

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Digital I/Os			
2310	1	Function Output 1	unsigned16	rw	200: No function 221: Limit value 1 Ch1 241: Limit value 1 Ch2 243: Limit value 1 Ch3 245: Limit value 1 Ch4 222: Limit value 2 Ch1 242: Limit value 2 Ch2 244: Limit value 2 Ch3 246: Limit value 2 Ch4 230: Error / Warning
2311	1	Mode output 1	unsigned16	rw	135: Normal 136: Inverse
2312	1	Function Output 2	unsigned16	rw	See above
2313	1	Mode output 2	unsigned16	rw	See above
2314	1	Function Output 3	unsigned16	rw	See above
2315	1	Mode output 3	unsigned16	rw	See above
2316	1	Function Output 4	unsigned16	rw	See above
2317	1	Mode output 4	unsigned16	rw	See above
2320	1-4	Remote function taring	unsigned16	rw	100: no input 101: Input 1 102: Input 2 103: Input 3 104: Input 4
2322	1-4	Remote function max./current value	unsigned16	rw	See above
2323	1-4	Remote function min./current value	unsigned16	rw	see above
2324	1-4	Remote function Hold Max value	unsigned16	rw	See above
2325	1-4	Remote function Hold Min value	unsigned16	rw	See above
2326	1-4	Remote function zero balance	unsigned16	rw	See above
2327	1	Remote function Select parameter set 1	unsigned16	rw	See above
2328	1	Remote function Select parameter set 2	unsigned16	rw	See above
2330	1	Enable remote contacts	unsigned16	rw	5: free 4: locked

Index (hex)	Sub-index	Name	Format	Attr.	Values
		CAN interface			
2400	0	Baud rate in CAN	unsigned16	rw	1409: 10kBaud 1411: 20kBaud 1413: 50kBaud 1427: 100kBaud 1417: 125 kBaud 1419: 250kBaud 1421: 500kBaud 1424: 1000kBaud
2405	0	Device address	unsigned8	rw	1...127
2410	1-4	PDO contents (Channel 1 - PDO 1, Channel 2 - PDO 2, Channel 3 - PDO 3, Channel 4 - PDO 4); PDO 3 and PDO 4 send at the next highest node ID ! [1)]	unsigned16	rw	214: Gross 215: Net 204: Max 205: Min 218: Peak-to-peak 200: Off
2411	1	Data transmission rate	integer32	rw	min. 2 ms during single channel operation min. 10 ms during multi-channel operation (per channel)
2412	1	Format measured values	unsigned16	rw	1253: Integer32 1257: Floating
		Functions			
2600	1-4	Set zero	unsigned8	rwp	1: Zero balance
2610	1-4	Tare	unsigned8	rwp	1: Tare
2620	1-4	Delete Max store	unsigned8	rwp	1: Constant delete 2: 1x delete
2621	1-4	Delete Min store	unsigned8	rwp	1: Constant delete 2: 1x delete
2622	1-4	Hold Max store	unsigned8	rwp	1: Hold
2623	1-4	Hold Min store	unsigned8	rwp	1: Hold
2630	1-4	Control word	unsigned8	rwp	Bit 0: Zero balance Bit 1: Tare Bit 4: Clear Max. Bit 5: Clear Min. Bit 6: Hold Max. Bit 7: Hold Min.

1) If PDO Ch3 and/or PDO Ch4 are selected, the module address following the module must be left free without fail.

7.7 Manufacturer-specific objects in floating data format

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Measured values:			
3000	1-4	Gross measured value	floating	rop	
3001	1-4	Net measured value	floating	rop	
3002	1-4	Maximum	floating	rop	
3003	1-4	Minimum	floating	rop	
3004	1-4	Peak-to-peak	floating	rop	
3005	1-4	Measured value in mV/V	floating	rop	
3006	1	Analog output value V	floating	rop	
		Sensor			
3140	1-4	Transducer null	floating	rw	Value as input quantity
3141	1-4	Transducer null	floating	rw	Value as physical unit
3142	1-4	Transducer sensitivity	floating	rw	Value as input quantity
3143	1-4	Transducer nominal value	floating	rw	Value as physical unit
3150	1-4	Input characteristic 1. Point input group	floating	rw	
3151	1-4	Input characteristic 2. Point input group	floating	rw	
3160	1-4	Input characteristic 1. Point phys. unit	floating	rw	
3161	1-4	Input characteristic 2. Point phys. unit	floating	rw	
		Conditioning			
3180	1-4	Tare value	floating	rw	
3181	1-4	Zero balance value	floating	rw	
		Analog output			
31D0	1-4	Zero point analog output phys. unit	floating	rw	
31D1	1-4	End value analog output phys. unit	floating	rw	
31D2	1-4	Zero point analog output V	floating	rw	
31D3	1-4	End value analog output V	floating	rw	

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Limit switches			
3216	1-4	Switching level Limit value 1	floating	rw	
3217	1-4	Hysteresis Limit value 1	floating	rw	
3226	1-4	Switching level Limit value 2	floating	rw	
3227	1-4	Hysteresis Limit value 2	floating	rw	

7.8 Examples

Example 1:

Reading the net measured value as a floating value using SDO transfer from the amplifier with Module address 3.

Protocol at the amplifier:

Identifier	1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte
0603	**40**	**01**	**30**	**01**	**X**	**X**	**X**	**X**
CAN identifier	Read	Index low byte	Index high byte	Sub-index	don't care			

Response from amplifier:

Identifier	1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte
0583	**43**	**01**	**30**	**01**	**m0**	**m1**	**m2**	**m3**
CAN identifier	Read Acknowledgement	Index low byte	Index high byte	Sub-index	Low byte	Measured value as floating		High byte

Example 2:

Setting the filter frequency to 250 Hz.

Protocol at the amplifier:

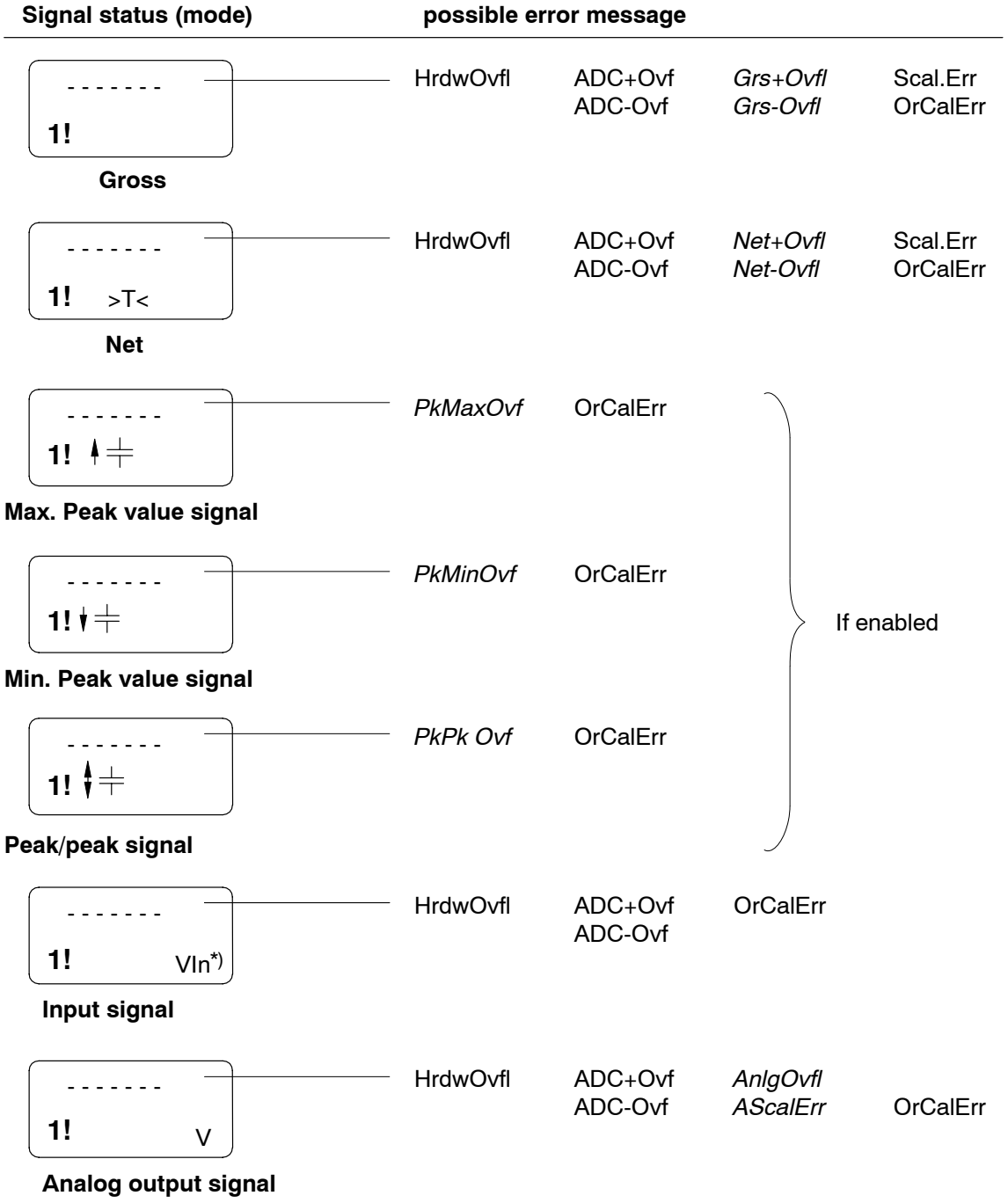
Identifier	1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte
0603	**2B**	**90**	**21**	**01**	**BB**	**03**	**X**	**X**
CAN identifier	Write 2Byte	Index low byte	Index high byte	Sub-index	Low byte High byte 959 = (3BF Hex)		don't care	

Response from amplifier:

Identifier	1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte
0583	**60**	**90**	**21**	**01**	**X**	**X**	**X**	**X**
CAN identifier	Write Acknowledgement	Index low byte	Index high byte	Sub-index	don't care			

8 Error messages/operating status (LED)

Depending on the display mode, the most varied error messages can appear on the display instead of the measured value:



*) mV, mAIn, Ω

The current errors are continuously displayed for each channel (see also Page 24). Dr press here ⊕, until you get into ”ERROR” display mode.

Error message	Cause	Remedy
AD Conv (ADC+Ovfl, ADC-Ovfl)	Input signal of AD converter too large, cable break in the case of thermocouples	adapt hardware measuring range, replace thermocouple cable
AnlgOutp (AnlgOvfl)	analog output overflow	Check allocation of display value analog output
StoreMin (PkMinOvf)	Minimum peak value overflow	1. Delete peak value via external remote or 2. In PEAK STORE group ”ClearPkV” Yes
StoreMax (PkMaxOvf)	Maximum peak value overflow	1. Delete peak value via external remote or 2. In PEAK STORE group ”ClearPkV” Yes
Net (Net+Ovf; Net-Ovf)	Net value overflow1)	Decrease display by one decimal place
Gross (Grs+Ovf; Grs-Ovf)	Gross value overflow1)	Decrease display by one decimal place
NomV over	Nominal value exceeded	Adapt measuring range
Sensor	Sensor not connected No sensor conductors connected	Connect sensor Connect sensor conductors
Scaling2) (Scal.Err)	Input characteristic too steep	Change input characteristic
AnlgScal (AScalErr)	Input or output characteristic too steep	Change input or output characteristic
(OrCalErr)	No valid original calibration values	Restart, send PME to manufacturer (HBM)
CAN Tx	No PDO request on bus	Check CAN bus configuration

1) ±1 000 000 output at CAN bus

2) see Page 32

Operating status:

LED colour	Status	Meaning	
		Measuring mode	Bus mode
Green	Steady light	Ready to take measurements	CAN Operational (PDO transfer possible)
Green	Flashing	-	Data is transferred via the interface
Yellow	Steady light	Ready to take measurements	CAN bus Pre-operational (no PDO transfer possible)

LED co-lour	Status	Meaning		Remedy
		Measuring mode	Bus mode	
Red	Flashing	Measured value overflow LCD error	CAN transmission error	Adapt measuring range Restart
Red	Steady light	Initialisation phase: not ready to take measurements yet, calibration error No internal synchronisation Original calibration error	CAN bus not ready for communication (CAN bus OFF)	Please wait Connect sensor, if necessary Restart Send PME to manufacturer (HBM)

9 Technical data

Description		MP01
Accuracy class		**0.1**
Supply voltage	V_{DC}	24
Voltage supply range	V_{DC}	18...30
Potential separation	V_{rms}	350 compared with measuring system, type-tested as per EN61010-1:1993
Power consumption		
without transducer excitation	W	4.5
with 4 excited transducers (each 20mA)	W	6
DC amplifier		
Attachable process quantity transducer		Voltage source, current source, 2-wire transmitter, Pt100, thermocouple (types J, K, S, T)
Number of channels, maximum		4 channels
in the case of Pt100		2 channels
Measuring rate		
in single channel operation	1/s	1200 measured values
Total measuring rate in multi-channel operation	1/s	600 measured values (in the case of thermocouples, the reference point is caluclated as an additional channel)
Voltage source		
Nominal measuring range	V	±10
Input signal range	V	±10.8
Scaling:		
max. display resolution	d	999 999 at 40 % of the nom. meas. range
min. display resolution	d	10 at 100 % of the nom. measuring range
current		
Nominal measuring range	mA	±20
Input signal range	mA	±20.5
Scaling:		
max. display resolution	d	999 999 at 40 % of the nom. meas. range
min. display resolution	d	10 at 100 % of the nominal meas. range
2-wire transmitter		
Nominal measuring range	mA	4...20
Input signal range	mA	±20.5
Scaling:		
max. display resolution	d	999 999 at 40 % of the nom. meas. range
min. display resolution	d	10 at 100 % of the nom. measuring range
Supply voltage	V	14, typically
Pt100		
Nominal measuring range	Ω	18.5...390, accordingly -200...850 °C as per IEC751
Input signal range	Ω	0...450

Scaling		fixed allocation of the input quantity to the temperature, max. 2 decimal places
Supply current	mA	1
Thermocouple		
Nominal measuring range		corresponds to the linearisation table of the thermocouple type, see below
Input signal range	mV	± 100
Scaling		fixed allocation of the input quantity to the temperature, max. 2 decimal places
Linearisation		
Type J	°C	-200...+1000
Type K	°C	-200...+1360
Type S	°C	0...+1700
Type T	°C	-260...+400
Effect of the line resistance	µV/kΩ	< 35 typically[1]
cold-spot compensation via internal reference point at the connecting terminal		
Maximum permitted in-phase voltage	V	± 10
In-phase rejection		
DC	dB	90, typically
50 Hz	dB	80, typically
60 Hz	dB	80, typically
Linearity variation	%	0.05
Low pass filter		Bessel or Butterworth filter characteristics
Cut-off frequency at -1 dB:		
Single channel operation which can be set up	Hz	0.05...250
Multi-channel operation, which can be set up	Hz	0.05...20
Effect of operating voltage in the event of change in specified range		
on zero point	%	< 0.01 of end value
on sensitivity	%	< 0.01 of end value
Effect of 10 K change in ambient temperature		
on zero point voltage	mV	3
current	mA	0.01
Thermovoltage	µV	50[1]
Pt100	Ω	0.5[2]
on sensitivity	%	0.1

1) 50µV in the case of thermocouple J at 0°C corresponds to an error of approximately 1 °C
The actual measurement accuracy also depends on the thermocouple used and its tolerances (Class 1, 2 amongst others: see IEC-584-2).

2) 0.5 Ω in the case of Pt100 at 0 °C corresponds to an error of approximately 1 °C

Long-term drift over 48 hours (30 mins. after switching on)			
	voltage	mV	3
	current	mA	0.01
	Thermovoltage	µV	50[1)]
	Pt100	Ω	0.5[2)]
Running-in process in the event of measurement with thermocouples		°C	typically 2.5
Analog output			
Impressed voltage		V	±10 V
permissible load resistance		kΩ	min. 10
Internal resistance		Ω	max. 10
Impressed current		mA	±20; +4...+20
permissible load resistance		Ω	max. 500
Internal resistance		kΩ	min. 100
Noise voltage		mV_{PP}	10, typically
Long-term drift over 48 hours (30 mins. after switching on)		mV	3
Effect of 10K change in ambient temperature (additional to the digital value)			
on zero point	voltage	mV	<3
	current	µA	<6
on sensitivity		%	<0.1
Scaling			
Voltage, current, 2-wire transmitter		V	min. 0.5 at 100 % of the nominal measuring range max. 10 at 3.5 % of the nominal measuring range
Pt100, Thermocouples		V	min. 10 at 10 °C max. 10 at 1000 °C
Limit value switch (per channel)			2
Balancing value			Gross, net, peak values
Hysteresis, adjustable		%	0...100
Adjustment accuracy		%	0.0033
Response time		ms	3.4
Address and drop-out time lag, adjustable		s	0...50
Peak store (per channel)			2
Function			Positive, negative, peak-to-peak
Updating time in single channel mode		ms	1
Updating time in multi-channel mode		ms	3.4
Clear, reaction time		ms	<5
Capture, reaction time		ms	<5

1) 50µV in the case of thermocouple J at 0°C corresponds to an error of approximately 1 °C
The actual measurement accuracy also depends on the thermocouple used and its tolerances (Class 1, 2 amongst others: see IEC-584-2).

2) 0.5 Ω in the case of Pt100 at 0 °C corresponds to an error of approximately 1 °C

Control outputs (you are free to assign control outputs to individual channels)		4
Rated voltage	V	24; ext. Supply voltage
Permissible voltage supply	V	18...30
Output current max.	A	0.5
Short-circuit current typically	A	0.8
Short-circuit period		unlimited
Isolation voltage typically	V_{rms}	350
Control inputs (you are free to assign control inputs to individual channels)		4
Input voltage range LOW	V	0...5
Input voltage range HIGH	V	10...30
Input current typically (HIGH level = 24V)	mA	12
CAN interface		
Measuring rate in single channel mode	1/s	max. 500 measured values
Measuring rate in multi-channel mode	1/s	max. 100 values per channel
Protocol		CAN 2.0B, CAL/CANopen compatible
Hardware bus link up		in accordance with ISO 11898
Baud rate	kBit/s	1000 / 500 / 250 / 125 / 100 / 50 / 20 / 10
max. Lead length	m	25 / 100 / 250 / 500 / 600 / 1000 / 1000 / 1000
Parameter memory (EEPROM)		4 (plus factory setting)
Display		2-line, 8 character, alphanumeric; LCD
Keyboard	Buttons	Keypad with 3 touch-sensitive control buttons
Rated temperature range	°C	0...50
Service temperature range	°C	-10...50
Storage temperature range	°C	-20...70
Protection class as per DIN IEC 60529		IP20
Dimensions (W x H x D)	mm	approx. 55 x 146 x 156
Weight	g	approx. 750

10 Index

H

I

L

M

O

P

R

S

T

Z

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