Operating manual

PME industrial measurement electronics with fieldbus link

MP60/MP07

A0616-11.4 en

HBM

Safety instructions

Use in accordance with the regulations

The MP60 and MP07 modules and their connected transducers 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 Operating 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 supply voltage may be a maximum of 18 - 30 V_{DC}.

General dangers of failing to follow the safety instructions

The modules correspond to the state of the art and are safe to operate. The instrument can give rise to remaining 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 Operating Manual and in particular the technical safety instructions.

Conditions on site

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

Maintenance and cleaning

The modules are 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.

Remaining dangers

The scope of supply and list of components provided with the MP60 or MP07 cover only part of the scope of measurement technique. In addition, equipment planners, installers and operators should plan, implement and respond to the safety engineering considerations of measurement technique in such a way as to minimise remaining dangers. Prevailing regulations must be complied with at all times. There must be reference to the remaining dangers connected with measurement technique.
Any risk of remaining dangers when working with the MP60 or MP07 is pointed out in this introduction by means of the following symbols:

Symbol:  **DANGER**

Meaning: **Highest risk level**

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

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 **could** lead to property damage or slight to medium 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 modules must be operated with a separated extra-low voltage (supply voltage 18 to 30 V DC [24 V_{DC} nom.]).

Conversions and modifications

The MP60 and MP07 modules 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

The modules may only 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, mounting, 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 Scope of supply and accessories

Scope of supply:

- 1 MP60 module or 1 MP07 module
- For the MP60: 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)
- 10-pin ribbon cable jack-connector
- 1 flat ribbon cable connector, 10-pin
- 1 operating manual for MP60/MP07 module
- For the MP07: shielded MP60-MP07 connector cable,
  Order no.: 2-9269.0226

Accessories:

- Standard ribbon cable, 10pin, 1.27 mm pitch

1.2 General

MP60 module:
The MP60 module, from the PME product line, is a frequency measurement module intended for connecting incremental transducers, frequency generators and HBM T10F-SF1 and T10F-SU2 torque flanges.
The MP60 module is set up and parameters assigned via the keyboard and display or with the aid of the PME Assistent. The PME Assistent gives you a simple operator interface under Windows for assigning parameters to the modules (described in the ”PME Assistent” online help).

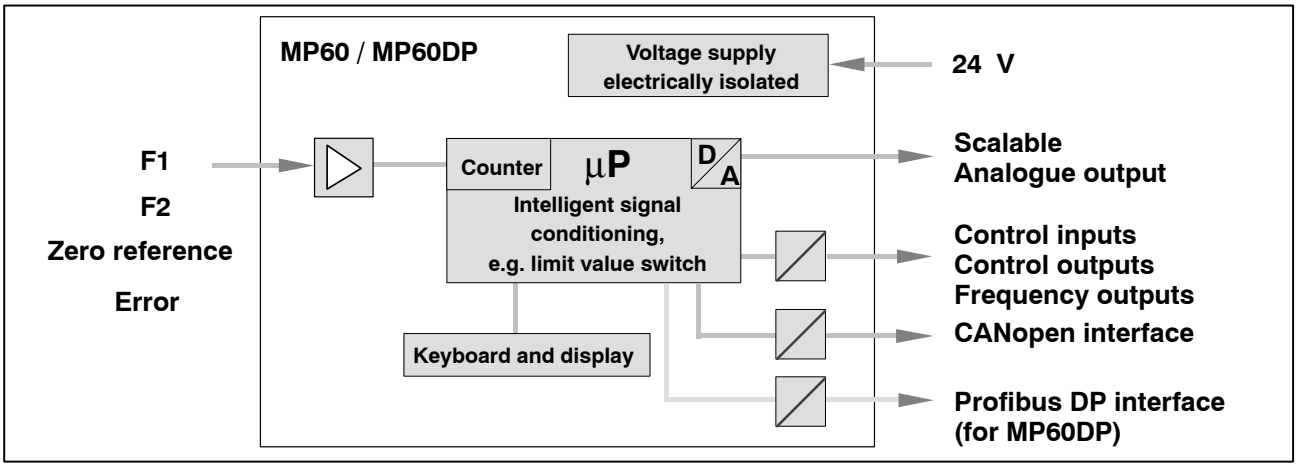
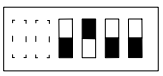


Fig. 1.1: Block diagram of MP60 module

Note: You must set amplifier type MP60 on DIP switch S12 (MP60) (see also page 11).

ON **S12**



1 2 3 4 5 6

Module MP07:

The MP07 module is used for the excitation of torque transducers.

The following HBM torque transducers may derive their excitation from an MP07 module:

T10F-KF1, T30FNA, T32FNA, T34FN, T36FN

The MP07 module, like the MP60, is connected to a 24 V supply voltage and delivers the following output voltages (short-circuit proof):

+15 VDC, 100 mA

-15 VDC, 100 mA

54 V_{PP} / 75 V_{PP}, 150 mA (24 - 25 kHz square-wave excitation voltage)

The supply voltage is electrically isolated from the calibration signal inputs.

The calibration signal is triggered by increasing the excitation voltage of the transducer shaft from 54 V_{PP} to approx. 75 V_{PP} [1)].

The MP07 module has no display and no control keys.

1) See operating manual for torque transducer

2 Selecting amplifier settings with DIP switches

NOTE

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

Various settings are defined with the aid of DIP switches. These are the settings for

terminating resistance, frequency input signals, input connection (asymmetric, symmetric), analogue output, synchronization, bus terminating impedance, slope steepness

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

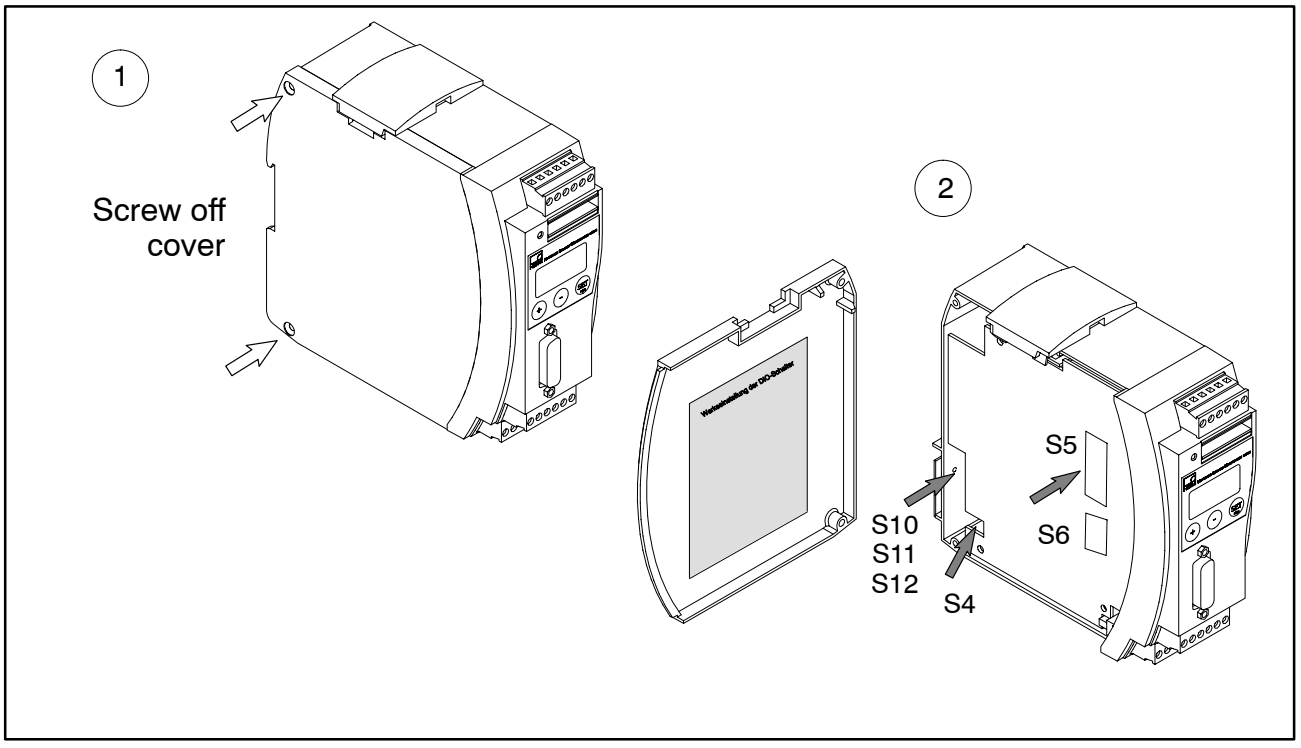
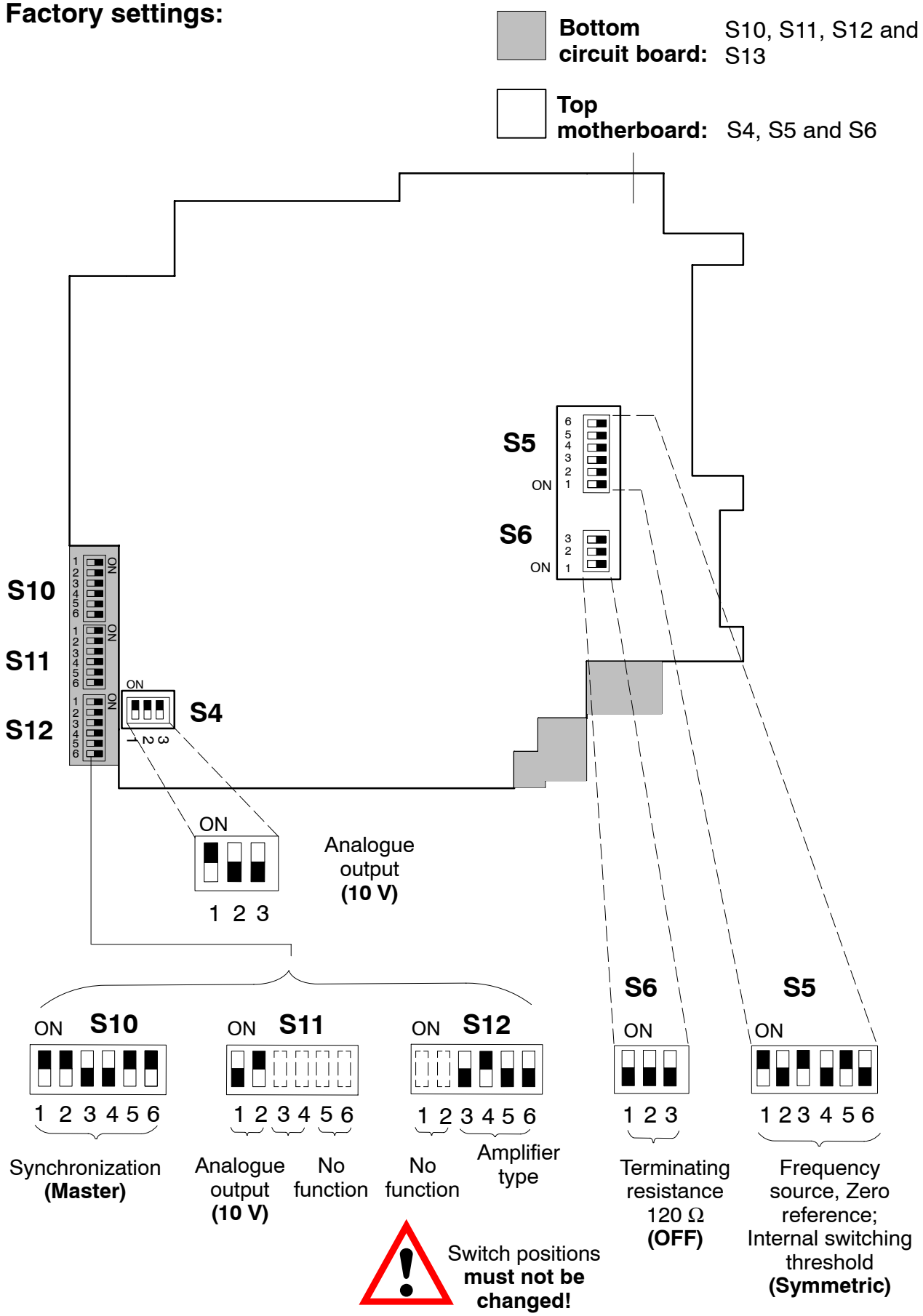


Fig. 2.1: Open housing, position of DIP switch

Factory settings:



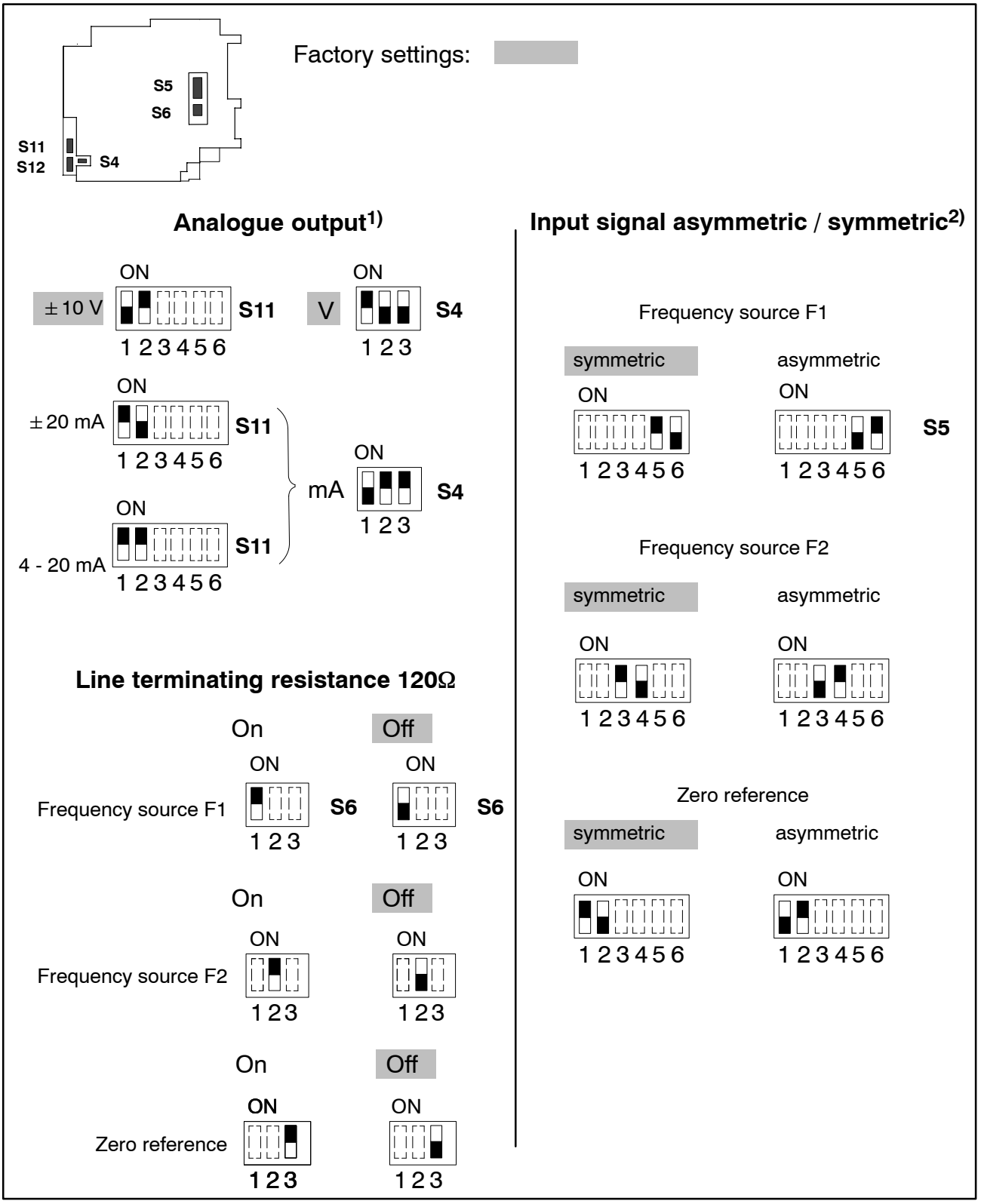


Fig. 2.2: Setting up the amplifier

1) Viewing/checking display under the ANALOGUE OUTPUT group, parameter ”Mode Vo”; see page 30

2) dependent on transducer

3) Connect (F1, F2 zero reference to ON) for symmetrical output signals and long measuring leads (>100 m).

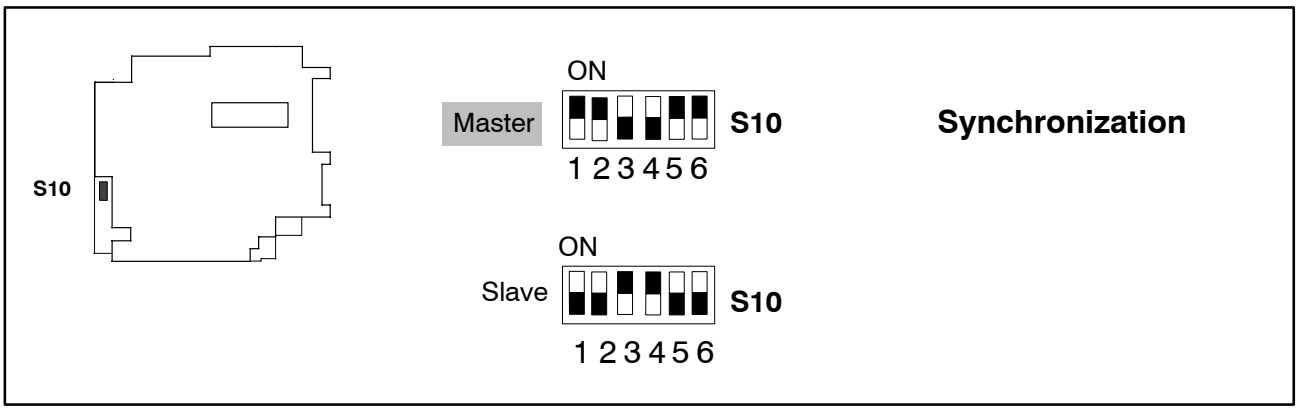


Fig. 2.3: Setting up the amplifier (continued)

Terminating bus resistor

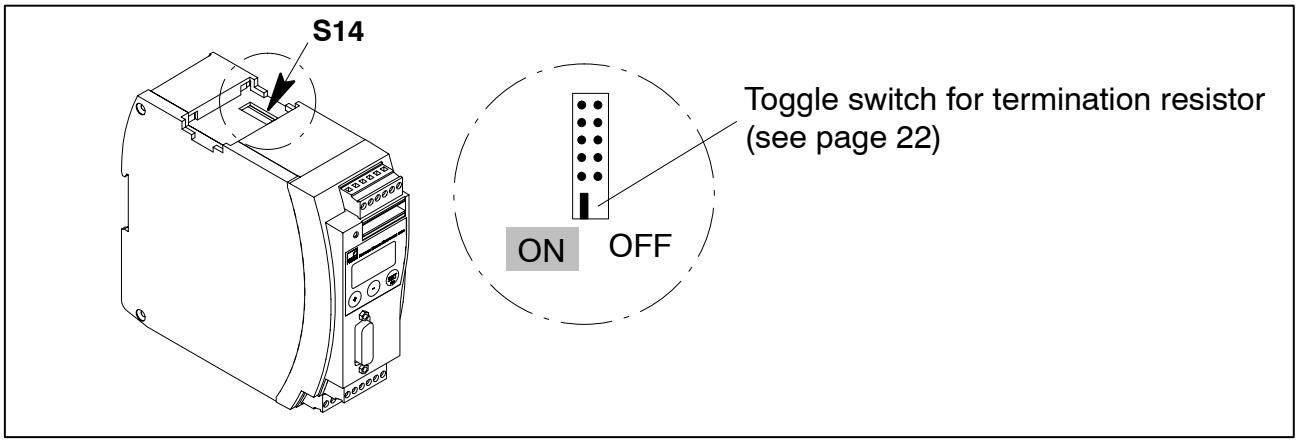


Fig. 2.4: Toggle switch for termination resistor

3 Mounting/dismounting the MP60/MP07

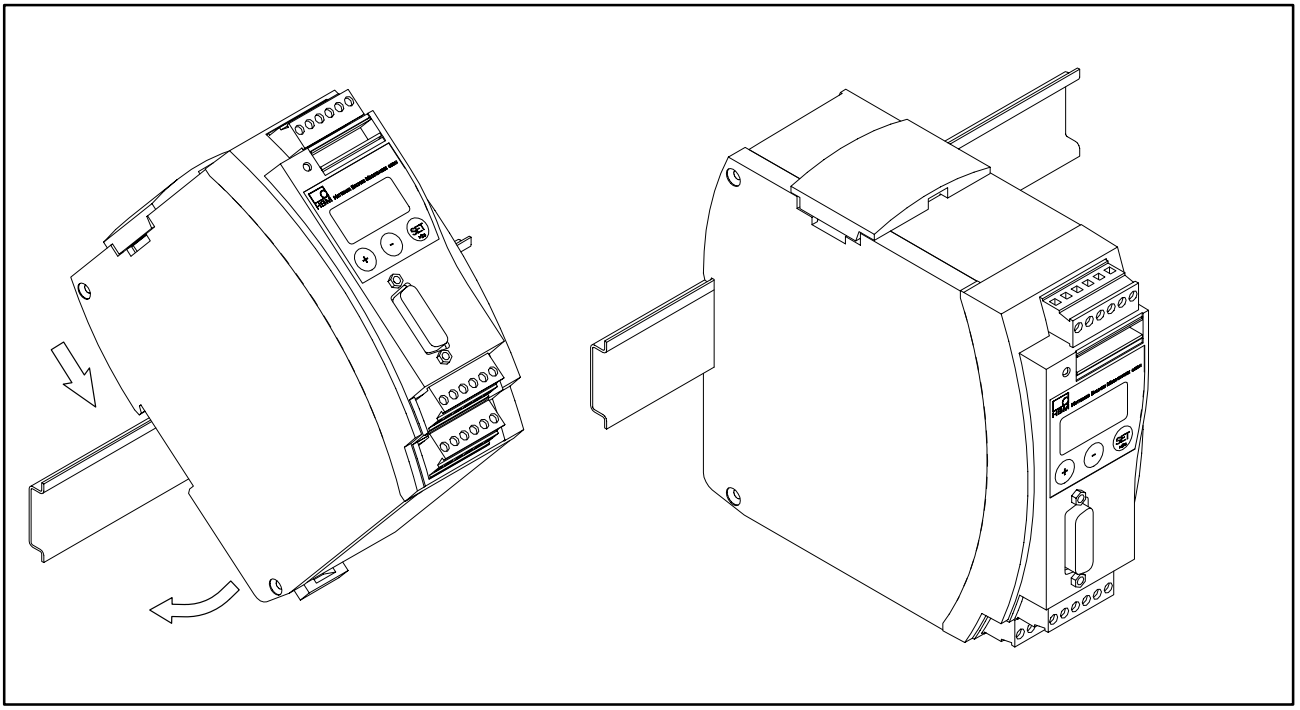


Fig. 3.1: Mounting on a support rail

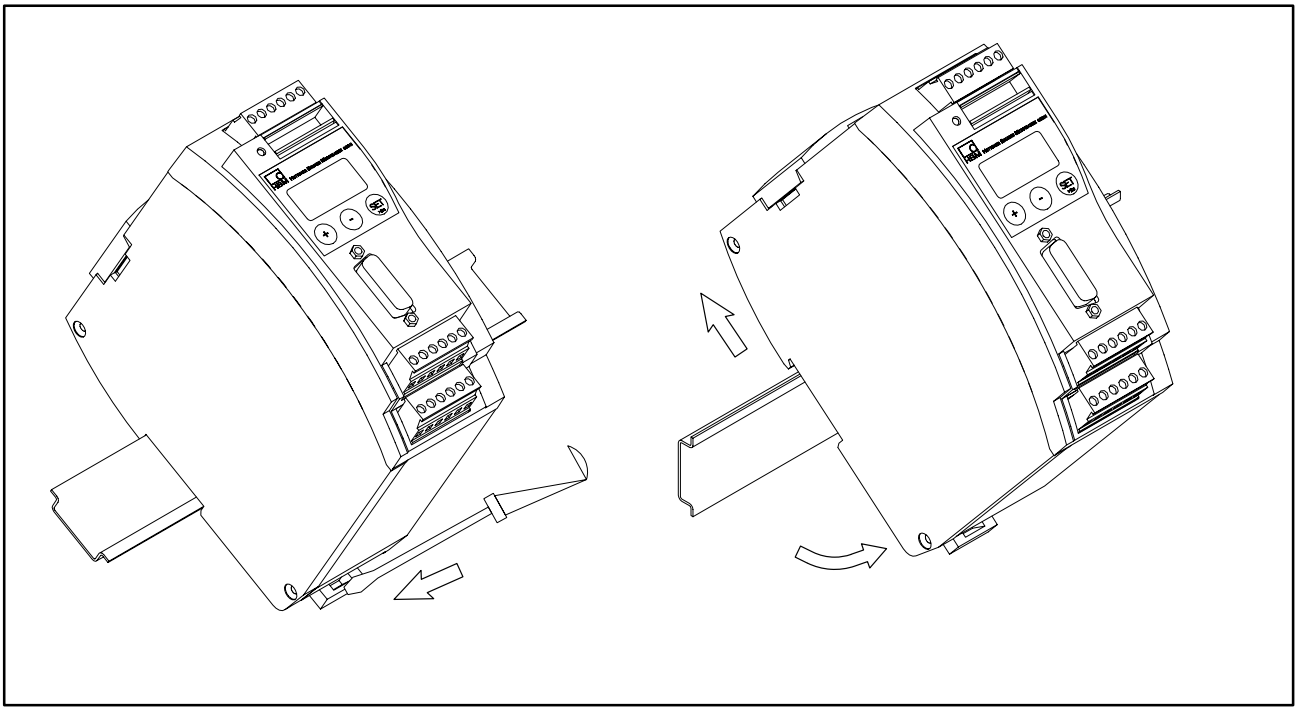


Fig. 3.2: Dismounting

CAUTION

The support rail must be on protection circuit potential .

3.1 Connecting several modules

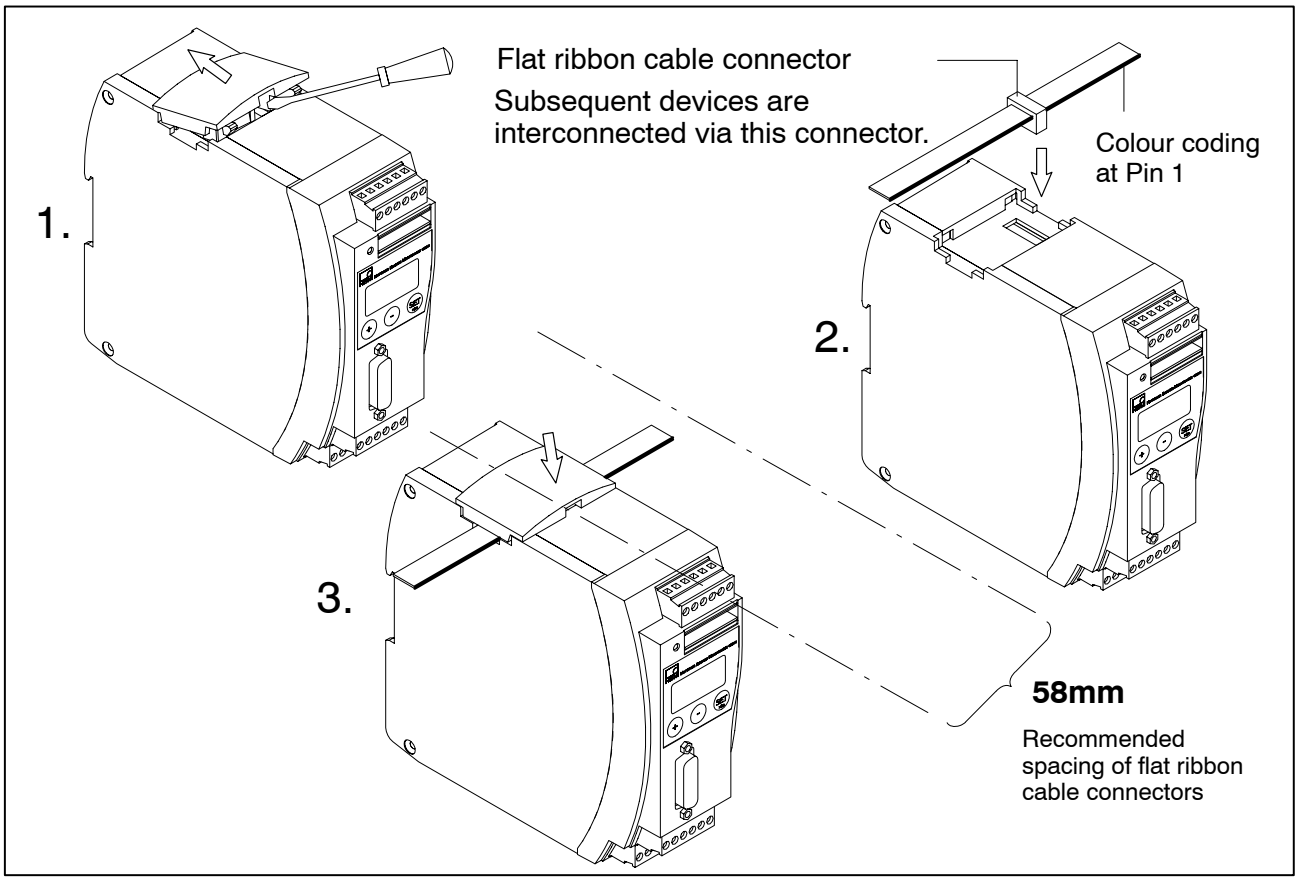


Fig. 3.3: Connecting the flat ribbon cable

Several MP60 or MP07 modules may be connected over one flat ribbon cable. This cable is used for local connection of the supply voltage and synchronization between the modules. You should not interconnect more than 8 modules with one flat ribbon cable.

Connect MP60 to MP07

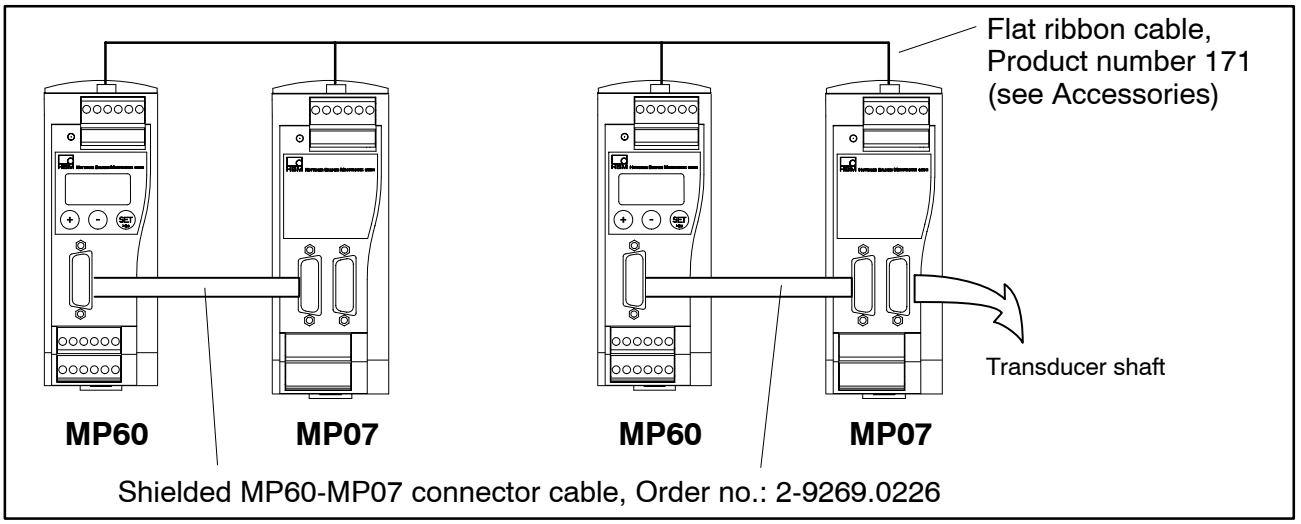


Fig. 3.4: Connect MP60 and MP07 with shielded cable

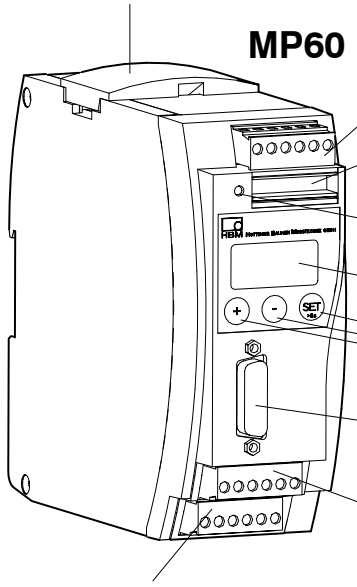
4 Connections

WARNING

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

4.1 Functional overview of MP60/MP07

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



Terminal plug 1:
Voltage supply and CAN-bus, Synchronization

Terminal plug 2: (same pin assignment as terminal plug 1)
CAN adapter for PC/laptop connection, assigning parameters via CAN-bus

LED

Two line LCD display

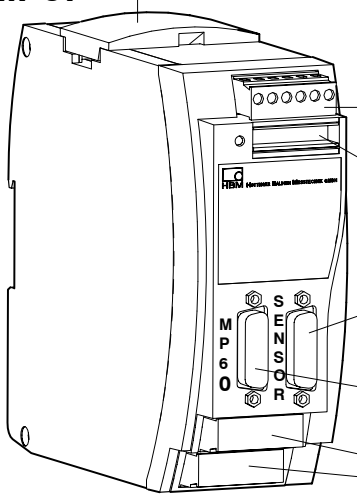
Pressure-sensitive control keys

Transducer connection (15-pin D-Sub connector (male))

Terminal plug 3:
Potential-separated[1)] control inputs (24 V level), analogue output

Terminal plug 4:
Potential-separated control outputs (24V level), external power supply of control inputs

MP07



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

Terminal plug 1:
Voltage supply

Terminal plug 2: (same pin assignment as terminal plug 1)

Transducer connection (15-pin D-Sub connector (male)) complete with transducer excitation for torque transducers

MP60 module connection

Blank plates

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

4.2 Supply voltage and control inputs/outputs MP60

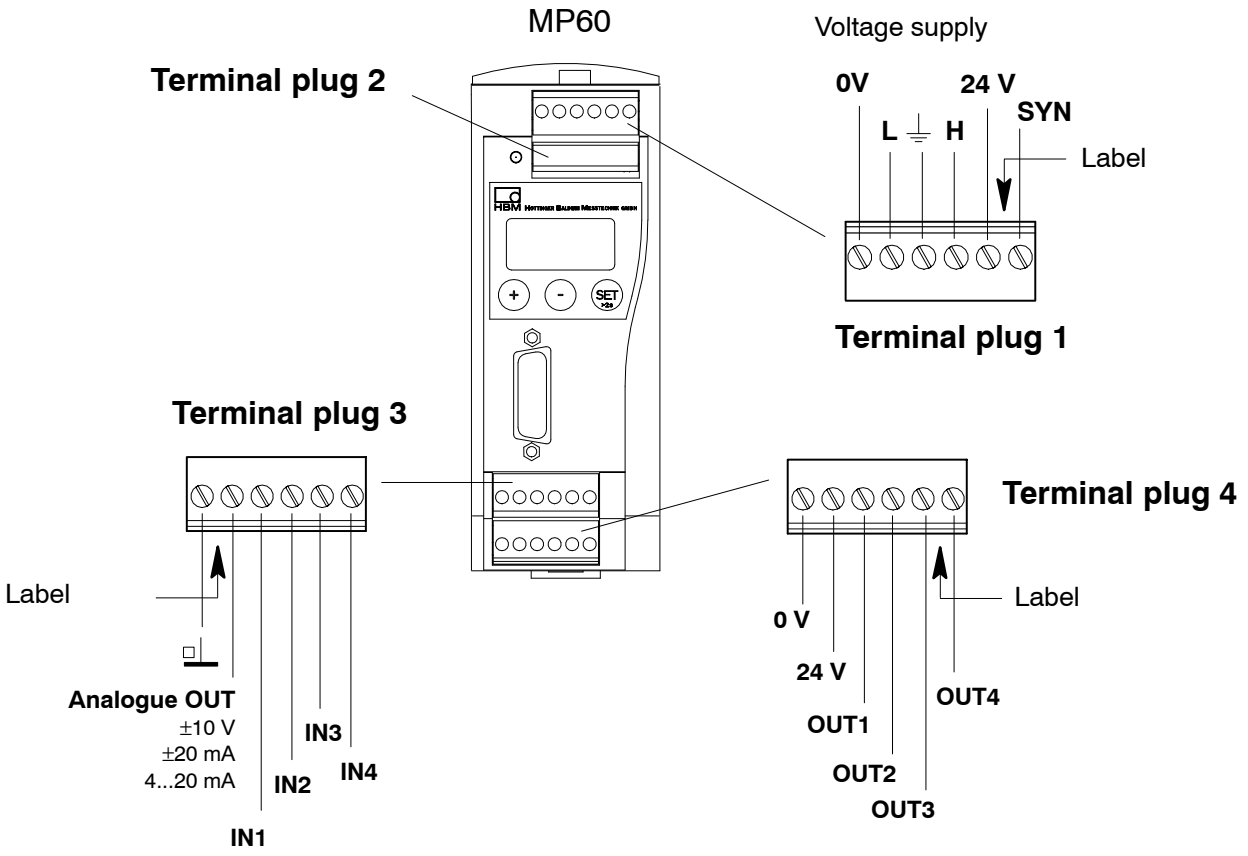
Four removable terminal plugs are provided for connection.

Connect voltage supply

Warning

The MP60 module must be connected to an external voltage supply of 18-30 V_{DC} (24 $V_{nom.}$).

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



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

You will find more about inputs and outputs in Chapter 6, page 41.

CAUTION **In the event of a power failure on the MP60 module, all control outputs are 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 sockets with no danger of a mix-up. The sockets are provided with coded lateral guides and the terminal plugs with coded pins.

4.2.1 External supply voltage for control outputs (MP60)

Example: PLC connection

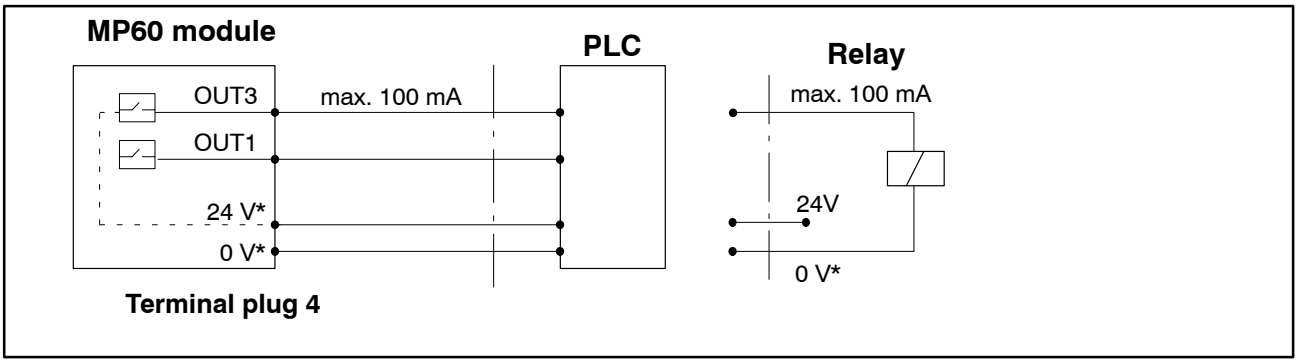


Fig. 4.2: Connection to a PLC

Control **inputs** are provided at terminal plug 3 and control **outputs** at terminal plug 4, and are electrically isolated internally from the supply voltage (see also Chapter 6, ”Declaring the significant parameters” page 41).

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

4.3 Supply voltage MP07

Connect voltage supply

Warning

The MP07 module must be connected to an external voltage supply of 18-30 V_{DC} (24 $V_{nom.}$).

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

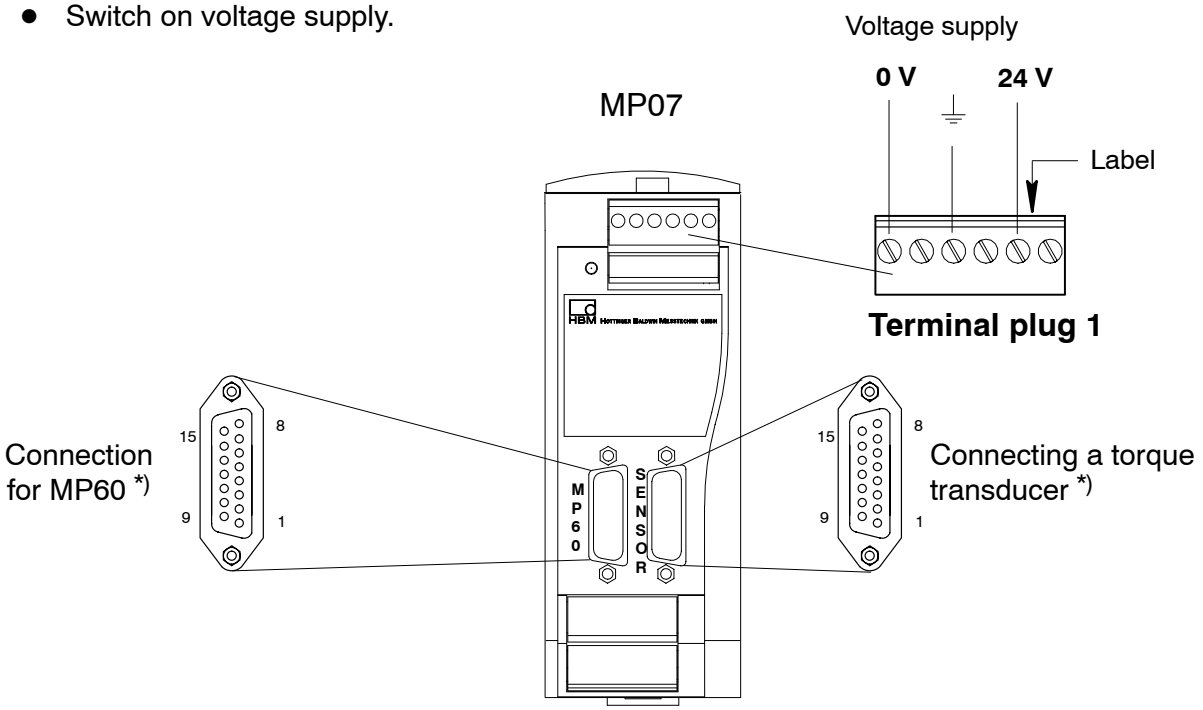


Fig. 4.3: Pin assignment for terminal plug 1

*) See Chapter 4.4

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 Connecting a transducer

Connecting to an **MP60**: HBM torque transducers T10F-SF1, T10F-SU2, T4WAS3, incremental transducer, frequency generator

Connect to an **MP07**: HBM-torque transducer T10F-KF1, T30FNA, T32FNA, T34FN, T36FN

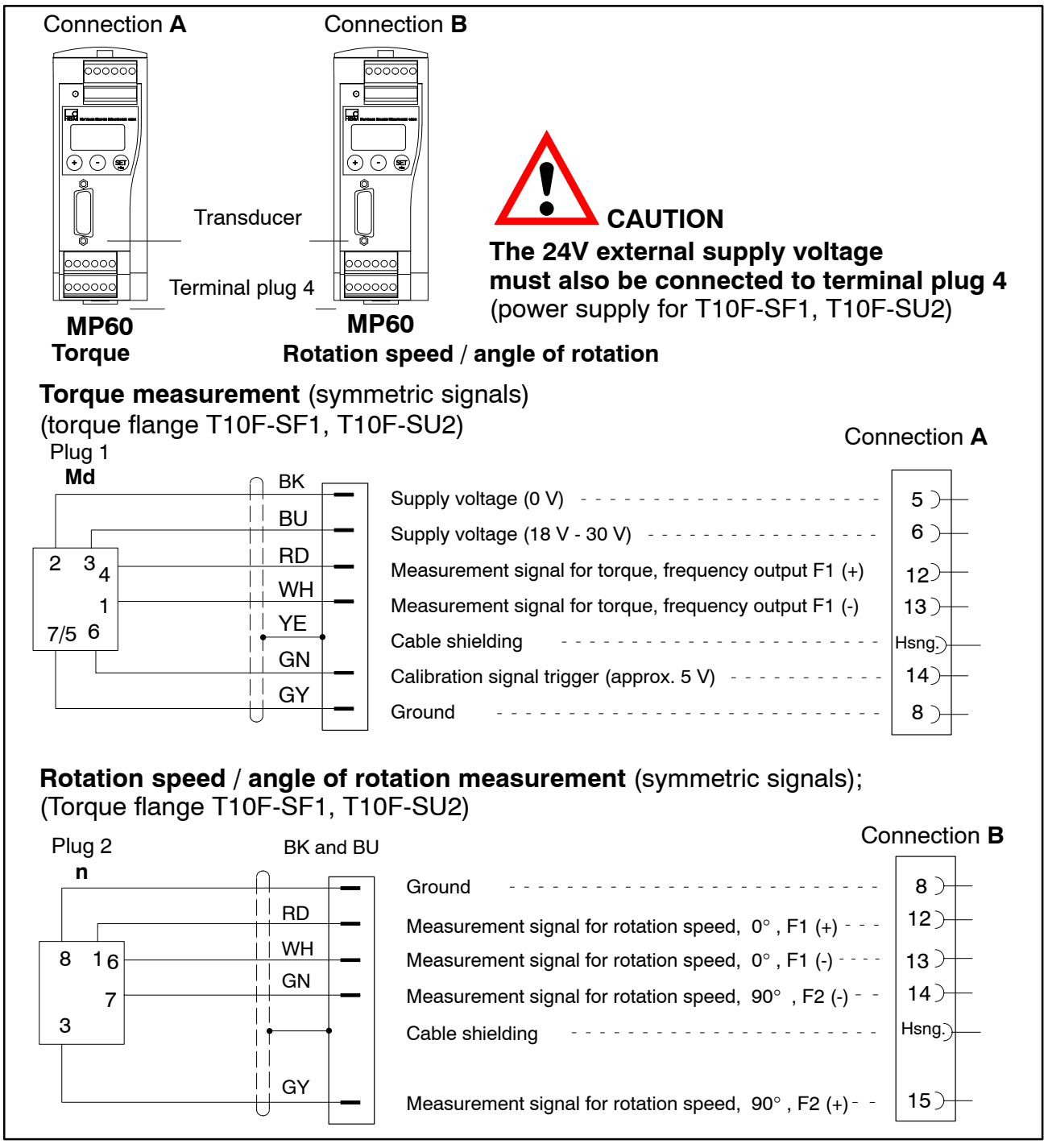


Fig. 4.4: Connection for **MP60**

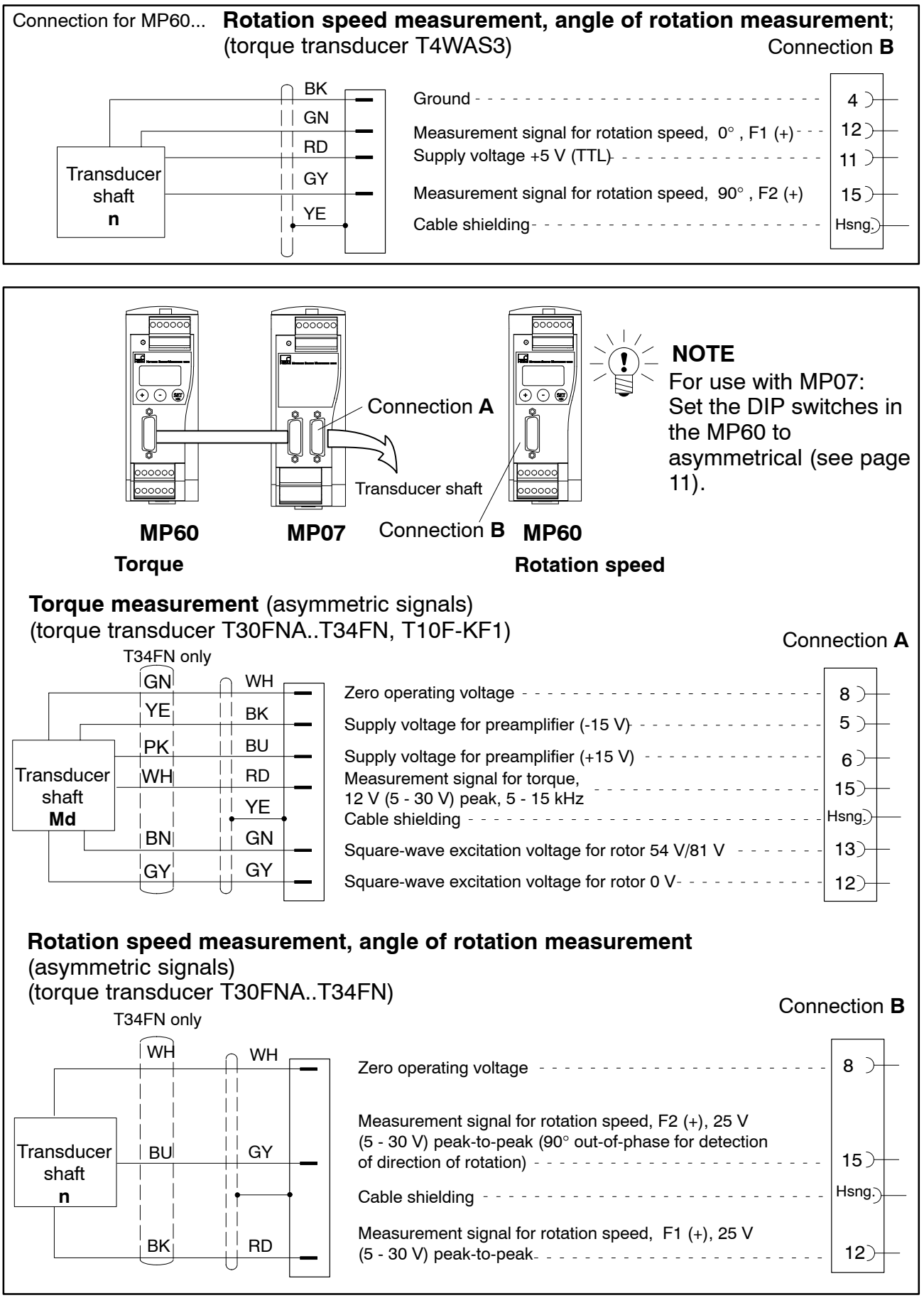


Fig. 4.5: Connection for **MP60** and **MP07**

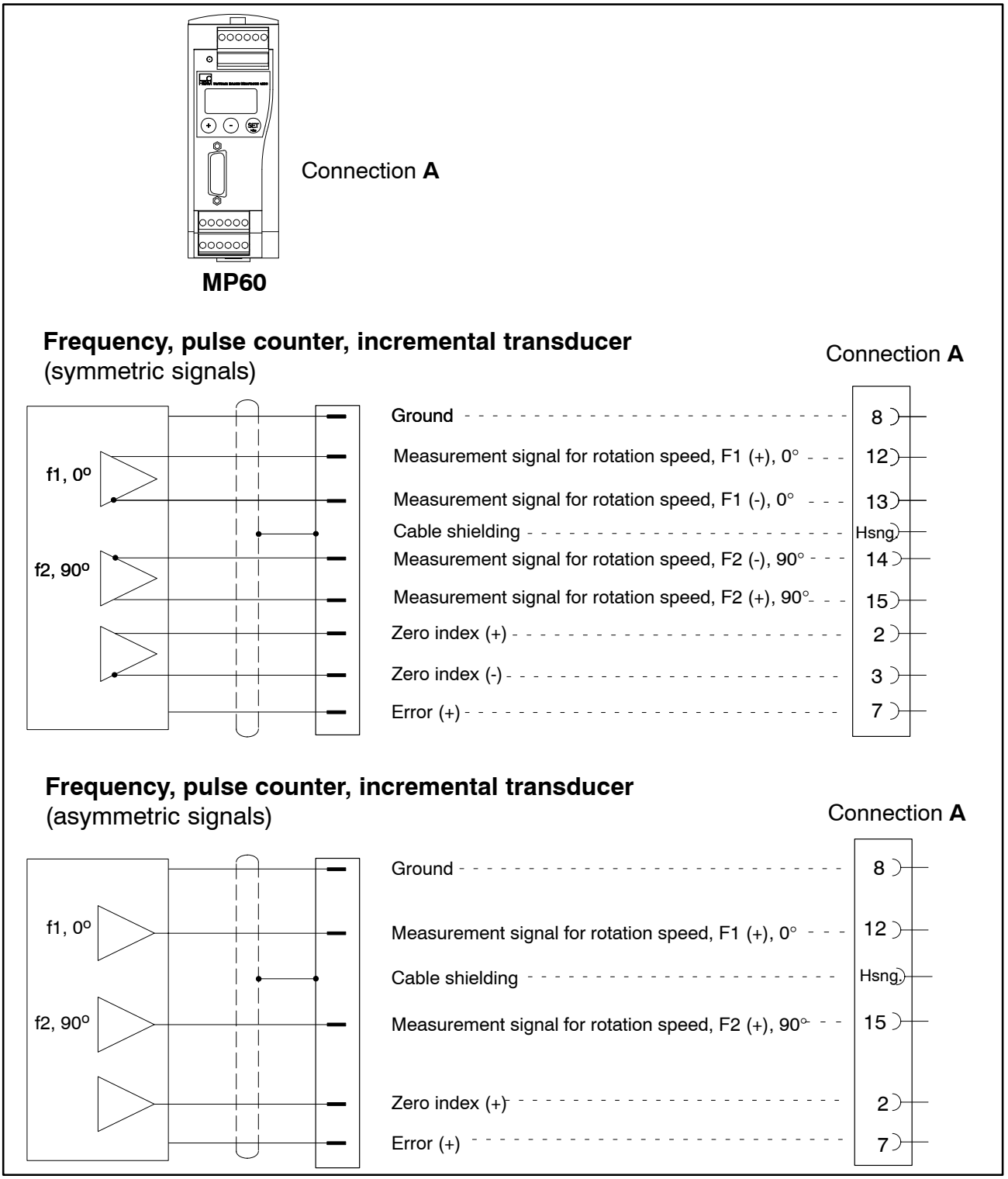


Fig. 4.6: Connection for **MP60**

NOTE

For the automatic recognition of transducer errors, the function must be enabled separately.

4.5 CAN interface

The CAN-bus is connected via terminal plug 1. A maximum of 32 CAN users can be connected in one bus segment.

The CAN-bus needs a terminating resistance of 120 Ω in the first and last bus users. A terminating impedance is integrated into the MP60 module which is activated by the S14 DIP switches (see page 12).

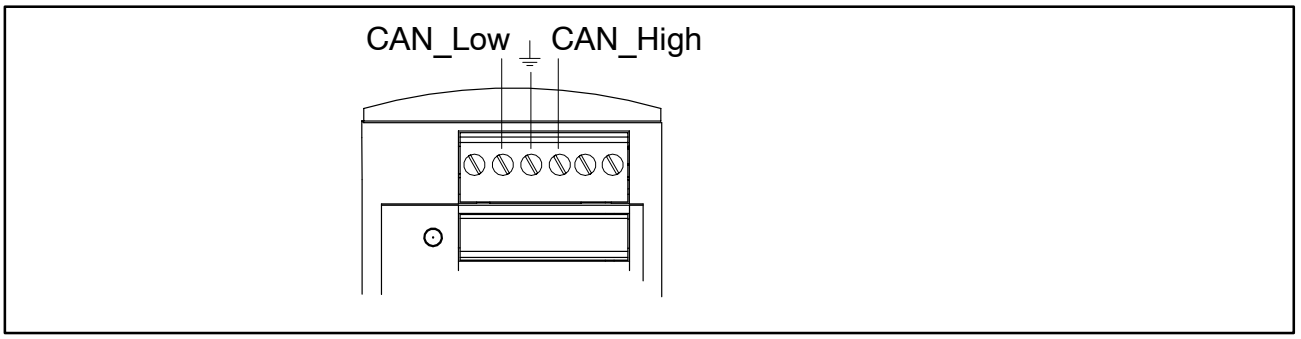


Fig. 4.7: Connect CANinterface

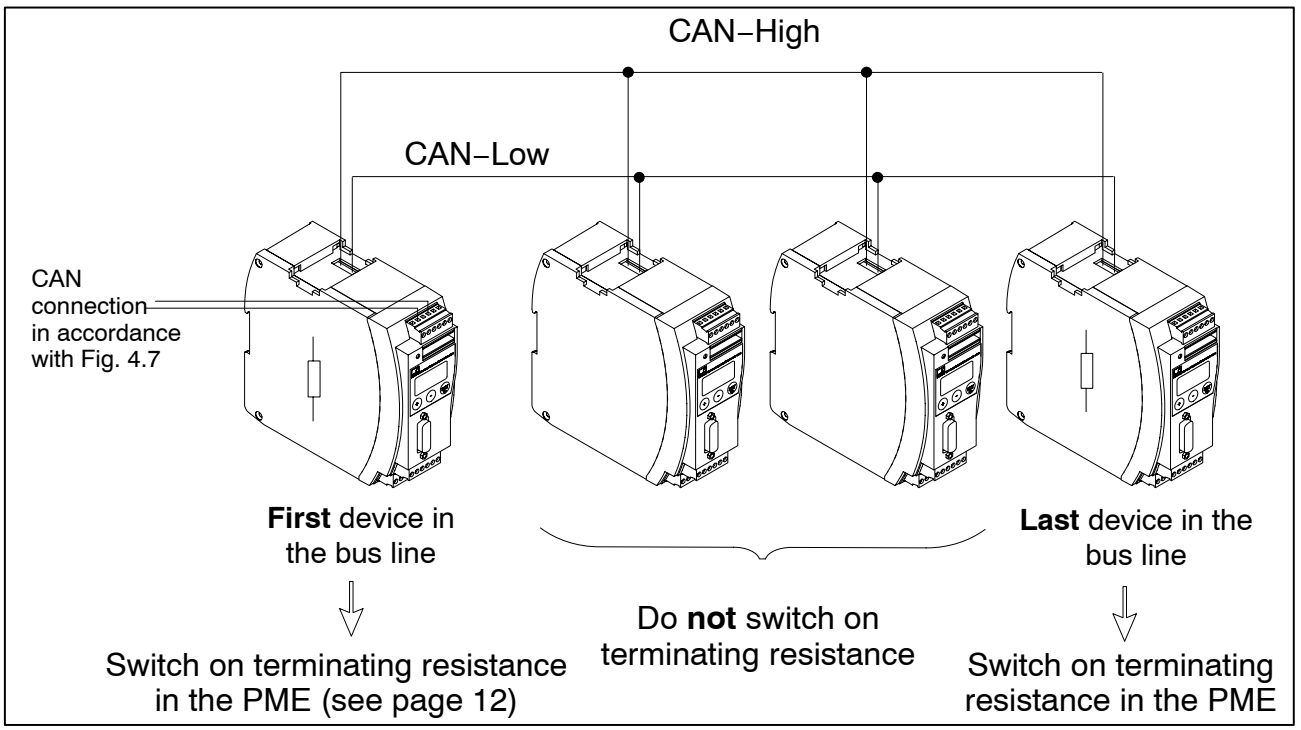


Fig. 4.8: CAN-bus operation with several modules (as per Standard maximum 32)

NOTE

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

4.6 Synchronization (MP60)

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

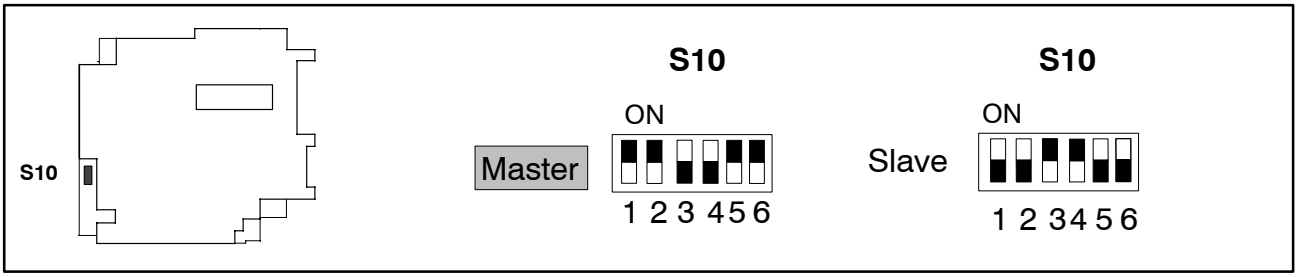


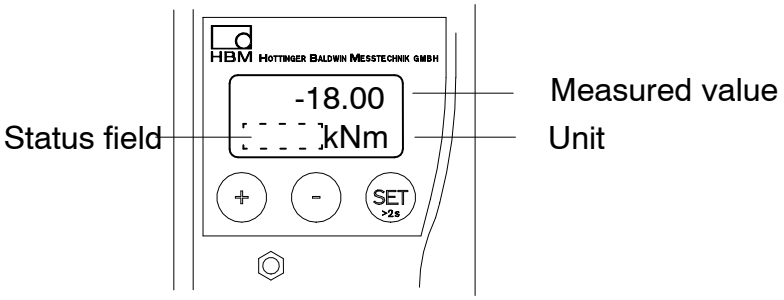
Fig. 4.9: Set up master/slave

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

5 Setting up and operation (MP60)

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

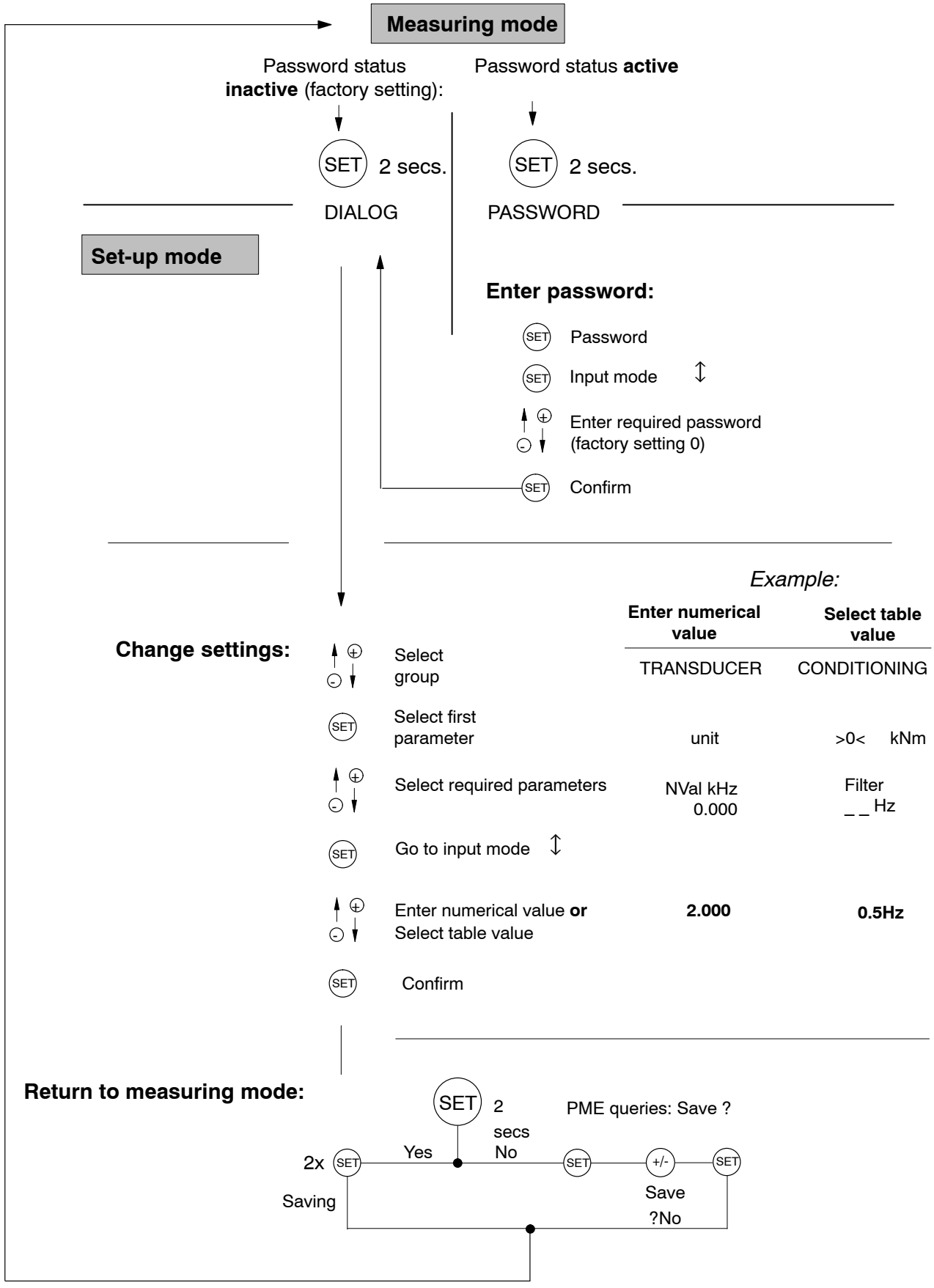
Functions of keys:

SET

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

\+ -

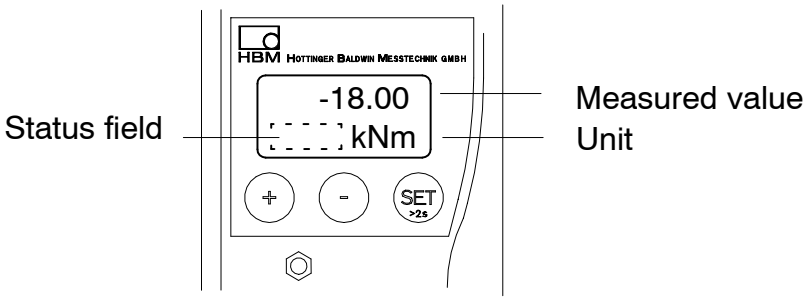
Select parameter/group


Measuring mode
Password status **inactive** (factory setting):
Password status **active**
SET 2 secs.
SET 2 secs.
DIALOG
PASSWORD
Set-up mode
Enter password:
SET Password
SET Input mode
Enter required password (factory setting 0)
SET Confirm
Example:
Change settings:
Enter numerical value
Select table value
Select group
TRANSDUCER
CONDITIONING
Select first parameter
unit
>0< kNm
Select required parameters
NVal kHz 0.000
Filter _ _ Hz
Go to input mode
Enter numerical value **or** Select table value
2.000
0.5Hz
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. measured value
2. analogue output value
3. status of digital I/Os
4. 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
	no character	Gross signal
	>T<	Net signal
	↑ ⫩	Maximum peak value signal
	↓ ⫩	Minimum peak value signal
⊕ ↑ ↓ ⊖ if active	↕ ⫩	Peak-to-peak signal
	kHz[1)]	Input signal
	V or mA	Analog output signal
	Outp ■ □ □ □ Inpt □ □ □ □	■ set, □ not set Status of input and output
	e.g. ERROR PkValMax	**Error messages** During measurement, the character **!** indicates a module error. Errors which have currently occurred are automatically displayed one after another in the ”ERROR” display mode (can be accessed with ⊕).*)

Status field	!	Error occurred

1) During impulse measurement, Imp or kImp is displayed

*) see Chapter 8 ”Error messages”, page 64

5.2 Commissioning

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

- Connect the power supply cable and transducers to the module as described in Chapters 4.2 and 4.4.

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 0 V.**

NOTE

If the error message HardwOvf is displayed at this point, please refer to the Chapter called 8 ”Error messages” for further details.

In addition, the yellow LED indicates that the MP60 is ready to start measuring.

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

5.3 Guide to all groups and parameters

SET ↓ ⊕ ⊖ → **Groups**

SET ↓ **Overview of parameters**

⊕ Up

⊖ Down

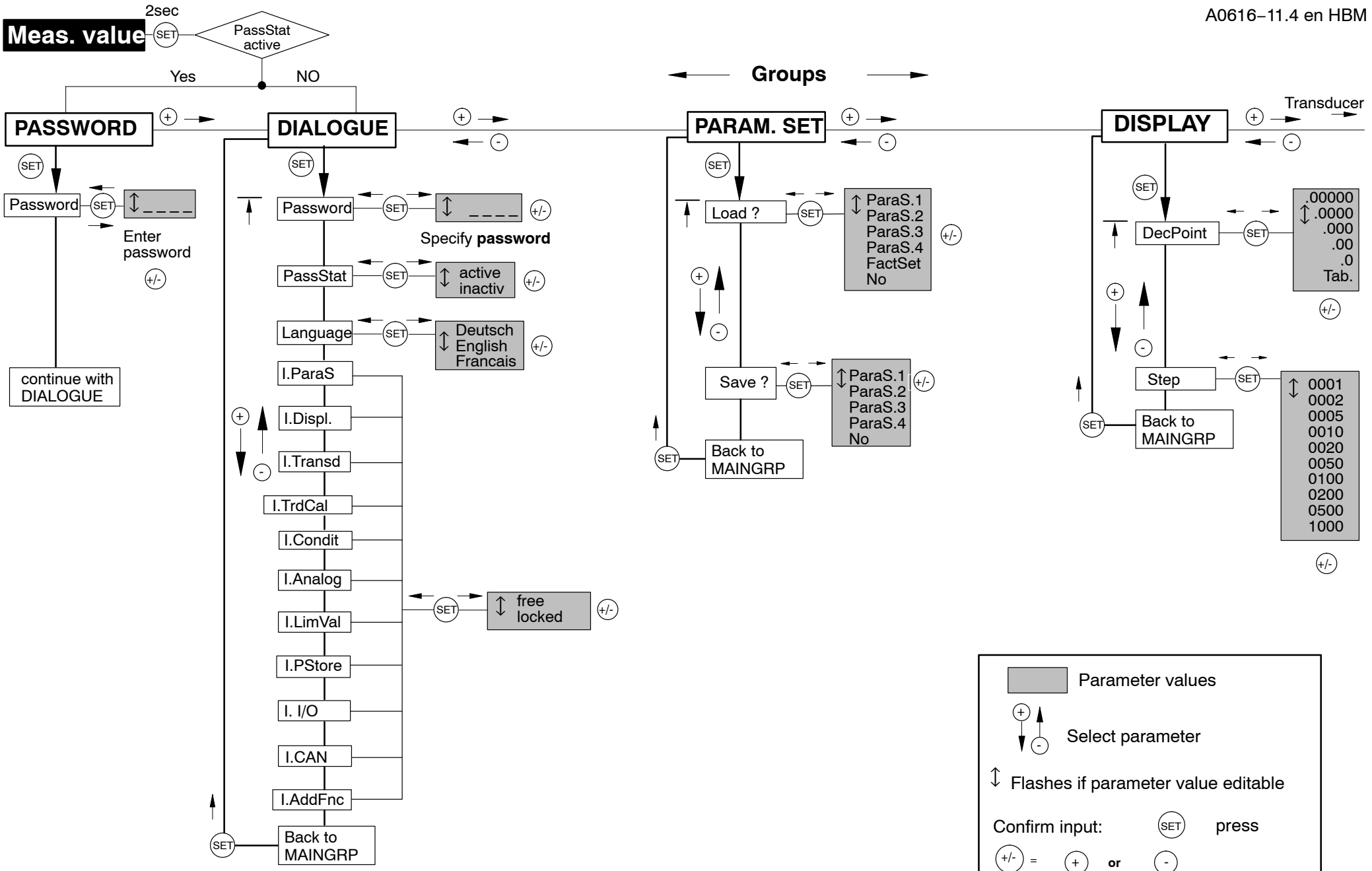
DIALOGUE	PARAM. SET	DISPLAY	TRANSDUCER	TRANSD.-CALIBRAT	CONDITIoNING	ANALOG OUTPUT	LIMIT VAL. 1..4	PEAKVAL. STORE	IN/OUT	CAN-BUS	PROFI-BUS [2]	ADDITION FUNCTION
Password	Load ?	DecPoint	Unit	P1Meas.?	>0< Set ?	SourceVo	Enable	Enable	Output1	Baudrate	Address	AmplType
PassStat	Save ?	Step	InpRange	P1 kHz	>0< kNm[1]	Mode Vo	Source	InputMin	ModeOut1	Address	**MAINGRP**	PrgVers
Language	**MAINGRP**	**MAINGR**	F2	P1 kNm[1]	>0< Save	Zero kNm[1]	SwtchDir	InputMax	Output2	Profile		>0< Rf kNm
I.ParaS		**P**	ZeroIndx	Shunt	>T<Set ?	Zero V	Value kNm[1]	ClearPkV	ModeOut2	Output		MotionDsp
I.Displ.			Frq x 4	P2Meas.?	>T< Nm[1]	EndV kNm[1]	Hyst kNm[1]	⟍ kNm/s[1]	Output3	OutR. ms		MTime ms
I.Transd			Direct.	P2 kHz	Filter	EndV V	OnDelay ms	**MAINGRP**	ModeOut3	PDO-Frmt		MAmp kNm
I.TrdCal			Threshol	P2 kNm[1]	FiltChar	**MAINGRP**	OffDlay ms		Output4	AutoOPER		LoadwZer
I.Condit			GltchFlt	**MAINGRP**	**MAINGRP**		**MAINGRP**		ModeOut4	**MAINGRP**		HW syncr
I.Analog			Zero kHz						Zeroing			Keyboard
I.LimVal			Zero kNm[1]						Tare			SNo
I.PStore			NVal kHz						PkMomMax			HW-Vers.
I.I/O			NVal kNm[1]						PkHldMax			**MAINGRP**
I.CAN			TransErr						PkMomMin			
I.AddFnc			**MAINGRP**						PkHldMin			
MAINGRP									Shunt			
									ParaCo1			
									ParaCo2			
									InpFunc			
									MAINGRP			

Preset with DIP switches

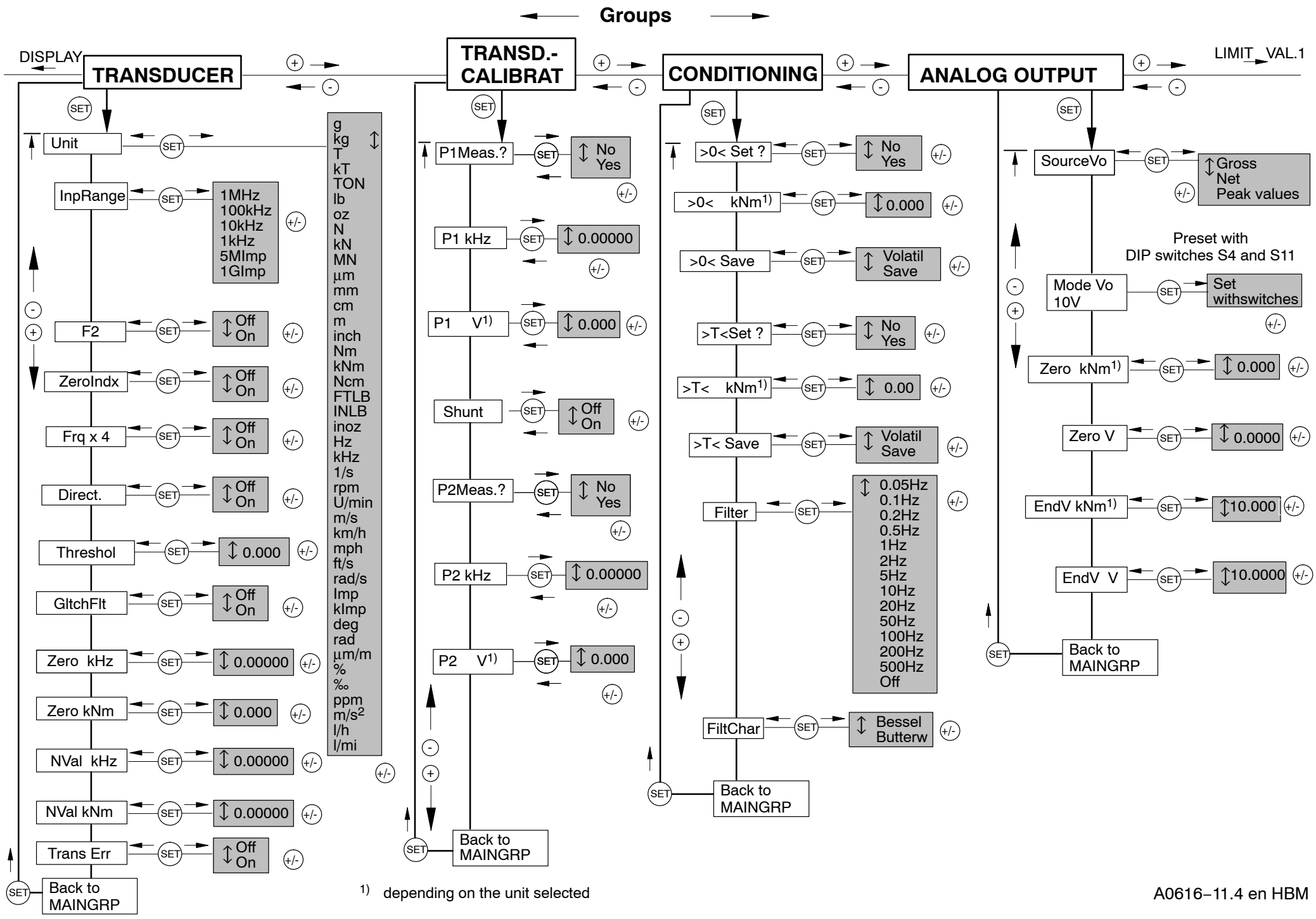
MAINGRP with SET return to group

[1] Depending on the unit selected [2] only for MP60DP

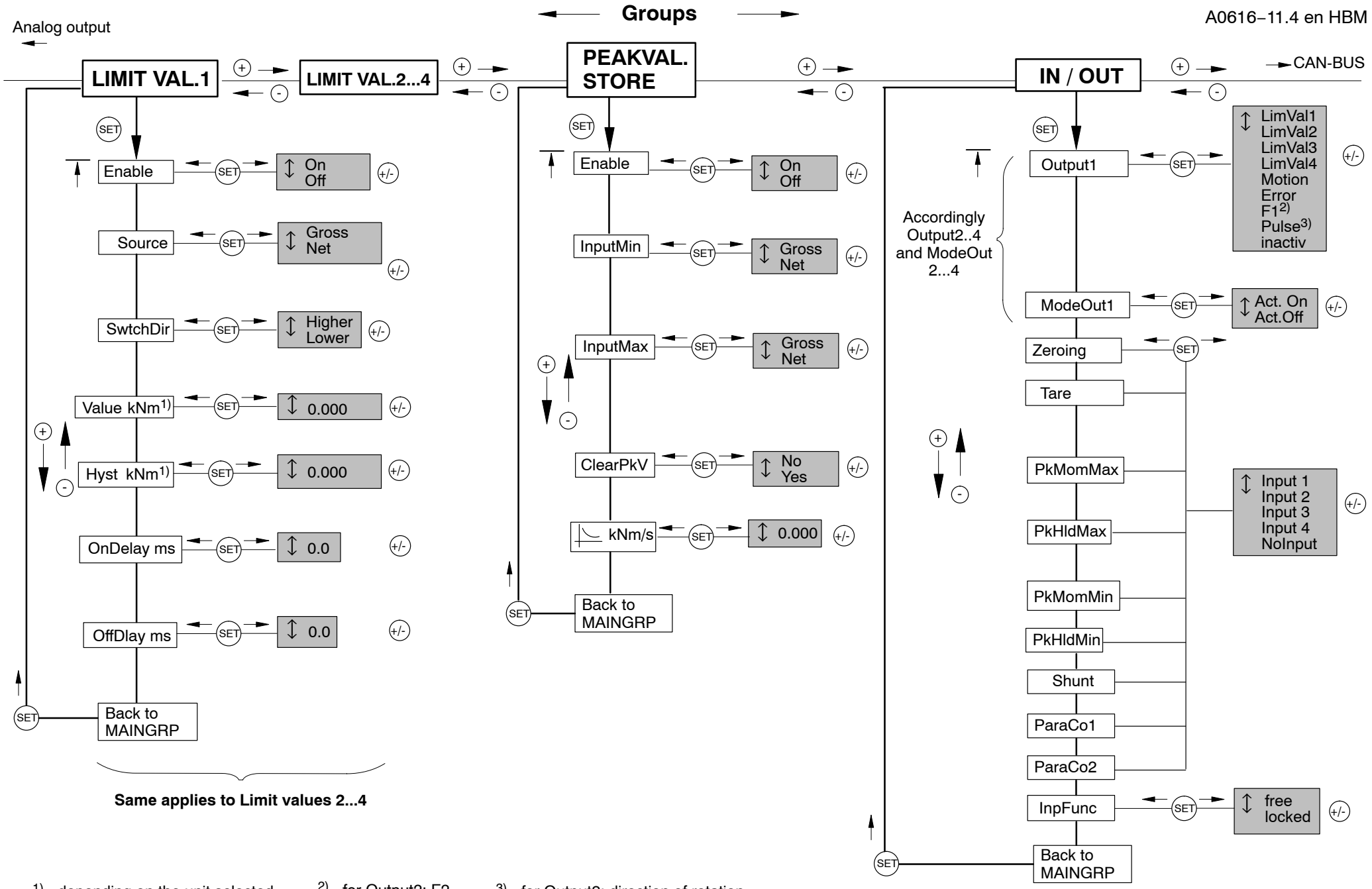
5.3.1 Set up all parameters



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



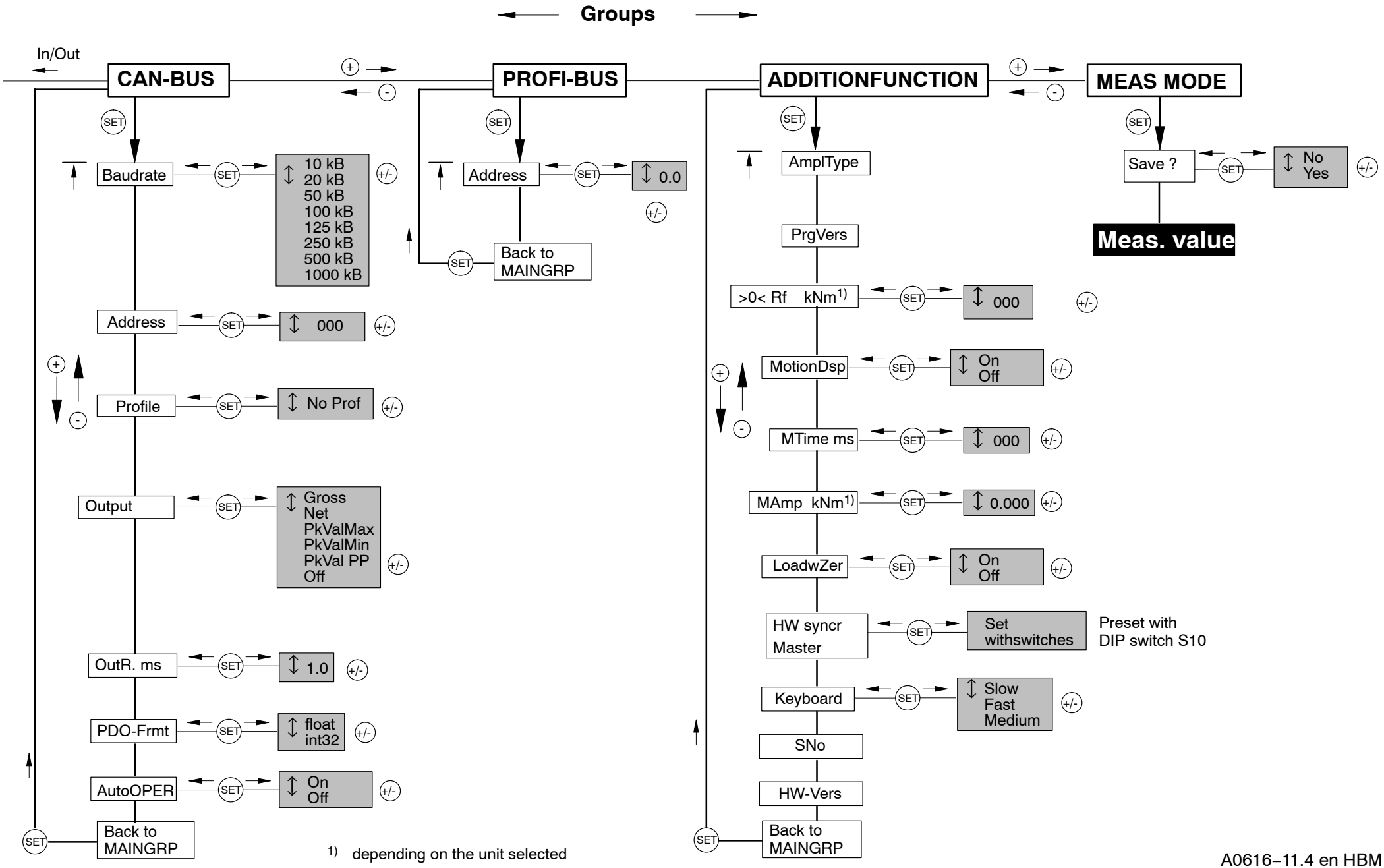
1) depending on the unit selected



1) depending on the unit selected

2) for Output2: F2

3) for Output2: direction of rotation



1) depending on the unit selected

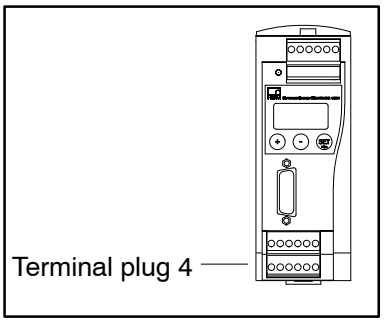
5.4 Example: measuring Md and N with torque transducer T10F (24 V supply)

Both the T10F and the MP60 are set to symmetrical signals at the factory.

Torque measurement

Measurement preparation:

- ▶ Use the standard cable md-cab149.
- ▶ Connect the 24 V external supply voltage to terminal plug 4 as well (see page 16).



- ▶ Connect the transducer (see Connection **A**, page 19)
- ▶ **No** DIP switch position changes!

Enter T10F characteristic values:

Group: TRANSDUCER

Unit:	**kNm**	
Input range:	**100 kHz**	
F2	**OFF**	
Zero index (+)	**OFF**	
Frq x 4	**OFF**	
Direction of rotation	**OFF**	
Switching threshold	**2.5 V**	
Glitch filter	**ON**	
Zero kHz	**10**	
Zero kNm	**0**	
NVal kHz	**5 kHz**	
NVal kNm	**100 kNm**	(see transducer identification plate)
Trans Err	**OFF**	

The T10F is set by using sensitivity. To achieve greater accuracy, you must use the integrated shunt to calibrate the T10F.

Calibration with integrated shunt:

The transducer must be load–free!

Group: TRANSD.-CALIBRAT

P1Meas.?	**YES** (corresponds to zero point measurement)
P1 kHz	is displayed
P1 kNm	**0 kNm**
Shunt	**ON**
P2 Meas.?	**Yes**
P2 kHz	is displayed
P2 kNm	enter the calibration value in accordance with the identification plate or the T10F test log

Rotation speed measurement

Measurement preparation:

- ▶ Use the standard cable md-cab150.
- ▶ Use the MD cable (cab149) to supply the transducer or use an external supply voltage
- ▶ Connect the transducer (see Connection **B**, page 19)
- ▶ **No** DIP switch position changes!

Defaults: T10F at 360 increments/revolution

U = 6000 rpm

this corresponds to: 6000 U/min = 6000/60 U/sec = 100 U/sec

at 360 pulses/revolution: **f = 36 kHz**[1)]

In this example, the F2 signal (required for detection of direction of rotation) is to be evaluated.

1) choose the next highest frequency as the input range, here: 100 kHz

Enter T10F characteristic values:

Group: TRANSDUCER

Unit:	**U/min**	
Input range:	**1 MHz**	
F2	**ON**	
Zero index (+)	**OFF**	
Frq x 4	**ON** [1)]	
Direction of rotation	**ON**	(only possible if F1 and F2 are active)
Switching threshold	**2.5 V**	
Glitch filter	**ON**	
Zero kHz	**0**	
Zero U/min	**0**	
NVal kHz	**144 kHz**	
NVal U/min	**6000 U/min**	
Trans Err	**OFF**	

1) every slope is counted, not just the pulses; this quadruples the resolution

NOTE

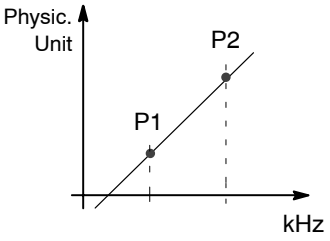
For frequency quadrupling, you have to adapt the input characteristics. 144 kHz (instead of 72 kHz with F2 = OFF) then correspond to a revolution count of 6000 U/min.

Switch: F2	OFF	ON	OFF	ON
Switch: Frq x 4	OFF	OFF	ON	ON
Frequency display	1x	1x	2x	4x
Detection of direction of rotation	no	yes	no	yes

6 Declaring the significant parameters

Group	Parameters	Meaning
DIA–LOGUE	Password	Specifying (changing) a password, 0000 - 9999 (Factory preset password: 0000)
	PassStat	Define password status: active=password must be entered; inactive=PME can be operated without a password
	I.ParaS to I.AddFnc	Access to group via keyboard free or locked.

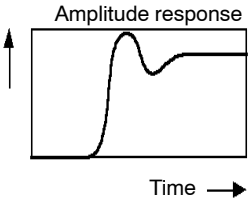
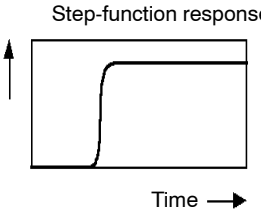
PARAM. SET	Load ?	You can either load the factory settings or one of the four stored parameter sets.
	Save ?	All device settings can be saved in four parameter sets and will be unaffected by a power failure. Every time you switch from Setup to Measuring mode, you are asked whether or not the change is to be saved. The data is backed up permanently if you confirm the query with ”Yes” on quitting Setup mode.

Group	Parameters	Meaning
TRANS–DUCER	InpRange	1 MHz, 100 kHz, 20 kHz, 10 kHz, 1 kHz, 5 MImp, 1 GImp
	F2[2)]	Frequency signal F2 is activated (if rotation speed and direction of rotation are to be measured, F2 has to be activated). Signal F2 is 90° out-of-phase.
	ZeroIndx	Zero index: Evaluating the zero signal
	Frq x 4	Frequency quadrupling when F2 is activated (F2 deactivated: frequency doubling). When frequency quadrupling is enabled, input characteristics must be adapted, as double the input count is evaluated.
	Direct.	The direction of rotation information is analysed when F2 is activated [2)]. A negative direction of rotation as defined by HBM is shown by a - (minus) sign.
	Threshol	Switching threshold from which the input signal is detected
	GltchFlt	Suppresses interference spikes with a duration of $< 3.2\ \mu s$
	Zero kHz Zero kNm NVal kHz NVal kNm	Setting input characteristics by using transducer sensitivity
	Transducer errors active	(Enable hardware input for transducer error recognition)
TRANSD.-CALIBRAT	P1Meas.? P1 kHz P1 kNm[1)]	**Acceptance of signals emitted by transducer in case of defined loading**  P1Meas.? YES 0kHz P1 (physic. unit) Enter 50 kNm P2Meas.? YES 10 kHz P2 Enter 70 kNm **Note**: If the zero point is modified, P1 and P2 will be lost.
	Shunt	Shunt mismatch On/Off (automatically switched off after approx. 3 minutes).

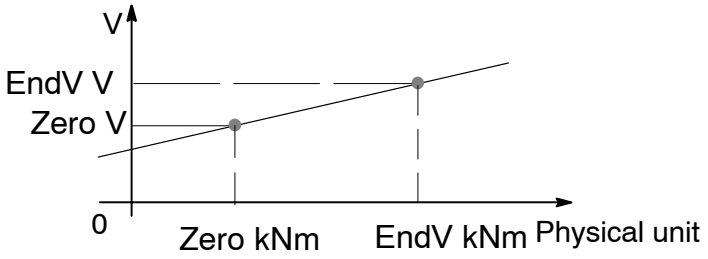
1) Depending on the unit selected

2) Please refer to the Operating Manual for your transducer

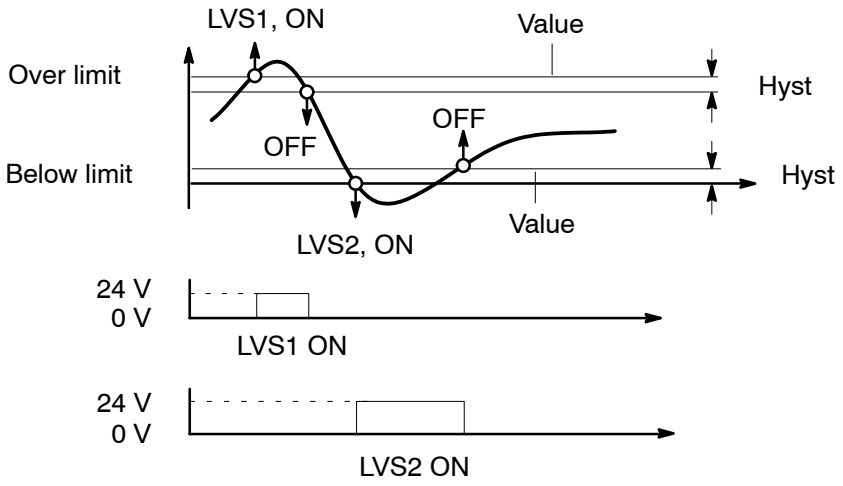
Group	Parameters	Meaning
CONDITIO NING		Difference tare/zero: the zero (>0<) affects the gross and net values. The Tare (>T<) only affects the net value.

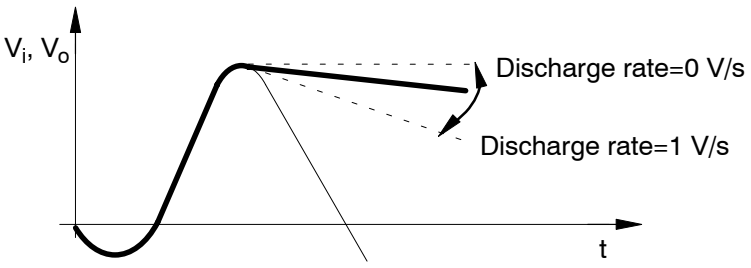
Group	Parameters	Meaning
CONDITIONING	>0< kNm	Enter zero value. Zeroing effects both, the gross value and the net value.
	>0< Set ?	Trigger zero balance; current measurement value (physical unit) zero
	>0< save	Each time there is a zeroing procedure the zero value is adopted into the EEPROM (service life 100.000 cycles)
	>T< kNm[1)]	Input tare value. Taring has an effect on the net value.
	>T< Set ?	Trigger taring; net value set to 0
	>T<Save	Save tare value immediately after taring
	Filter	0.05 Hz 1 Hz 20 Hz 500 Hz 0.1 Hz 2 Hz 50 Hz Off 0.2 Hz 5 Hz 100 Hz 0.5 Hz 10 Hz 200 Hz
	FiltChar	 **Best frequency response** (Butterworth) The diagram shows a linear amplitude response that falls away steeply above the cut-off frequency. An overshoot of approx. 10 % occurs.  **Best course over time** (Bessel) The diagram shows an step-function 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 analogue signal.
	Mode Vo	Use DIP switches S11 to specify the signal mode for the analogue output. The following options are available: ±10 V, ±20 mA, 4 - 20 mA
	Zero %[1)] Zero V EndV kNm[1)] EndV V	 **Information on scaling** Output characteristics: The scale factor for the analogue output is a result of the input and output characteristics. If the set nominal value corresponds to the measuring range in kHz, 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 ”Analogue scaling error” (see page 65). Scale range analogue output min.: 0.5 V at 100 % of input measuring range Scale range analogue output max.: 10 V at 1 % of input measuring range

1) Depending on the unit selected

Group	Parameters	Meaning
LIMIT VAL. 1...4	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 Value 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[1)]	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.
	kNm/s	Discharge rate (in physical unit/sec) of the envelope function for both peak-value memories. Peak-value memories can also be used for displaying envelope curves. The envelope function is suitable for measuring amplitude-modulated oscillations. The discharge rate (time constant of the discharge function) defines how fast the peak-value memory drops to the current value. 

1) See also the following page (remote controls)

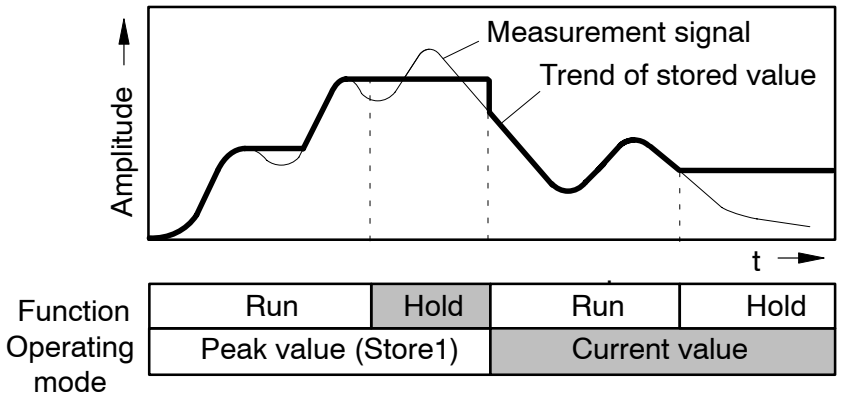
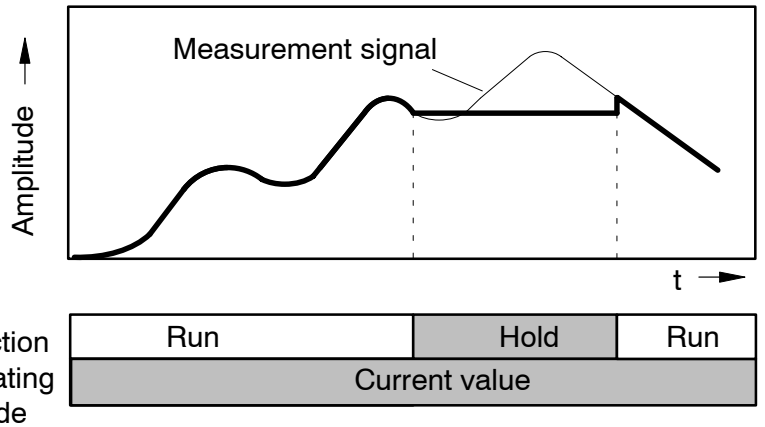
Inputs /Outputs

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

Terminal plug 4: Here you have **4 outputs** available.

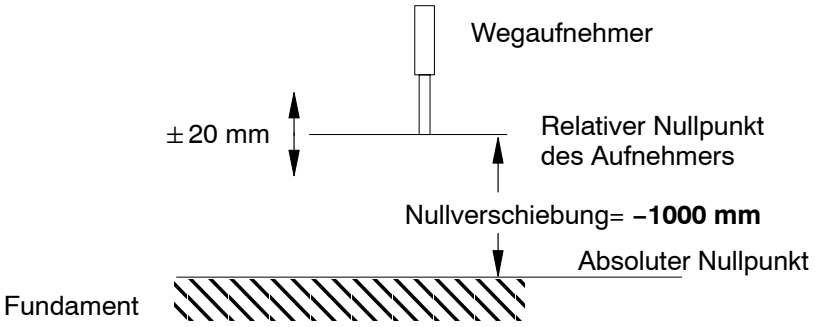
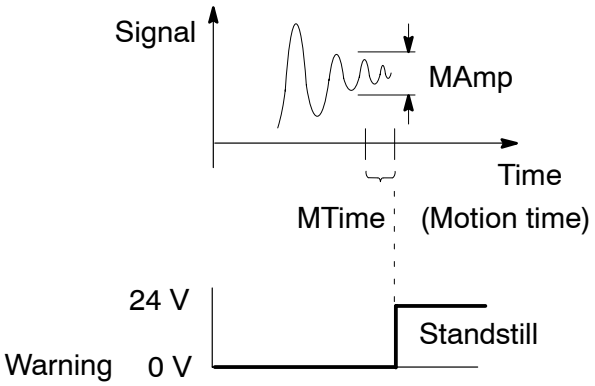
<table>
<tr><th>Group</th><th>Parameters</th><th colspan="3">Meaning</th></tr>
<tr><td rowspan="2">IN/OUT</td><td>Output[1)]
1 - 4</td><td colspan="3">Outputs 1 - 4 can be assigned the following functions for each channel:
Limit value 1 to 4, standstill, error, inactive
Output1: F1, pulses; Output2: F2, direction of rotation</td></tr>
<tr><td>Mode
Off1...4</td><td colspan="3">Output signal is inverted (Act. On) or not inverted (Act.Off).</td></tr>
<tr><td rowspan="13"></td><td></td><td colspan="3">The functions listed can be freely allocated to the remote controls (I/Os).</td></tr>
<tr><td>Functions</td><td>Input level 0V</td><td colspan="2">Input level 24V</td></tr>
<tr><td>Taring</td><td colspan="3">Taring is started upon alternation from 0 V to 24 V.</td></tr>
<tr><td>Zero balance</td><td colspan="3">Current measuring signal is set to zero upon alternation from 0 V to 24 V.</td></tr>
<tr><td>Shunt</td><td>Shunt disconnected</td><td colspan="2">Shunt connected</td></tr>
<tr><td>PkMomMax</td><td>”Peak value” operating mode for PkMax</td><td colspan="2">”Current value” operating mode for PkMax</td></tr>
<tr><td>PkMomMin</td><td>”Peak value” operating mode for PkMin</td><td colspan="2">”Current value” operating mode for PkMin</td></tr>
<tr><td>PkHldMax</td><td>Memory contents of PkMax are updated</td><td colspan="2">Memory contents of PkMax are frozen</td></tr>
<tr><td>PkHldMin</td><td>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="3">Selection of parameter sets and binary coded inputs</td></tr>
<tr><td rowspan="5"></td><td>Parameter set</td><td>ParaCo2</td><td>ParaCo1</td></tr>
<tr><td>1</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>0</td><td>1</td></tr>
<tr><td>3</td><td>1</td><td>0</td></tr>
<tr><td>4</td><td>1</td><td>1</td></tr>
</table>

1) see “Control outputs” in the Specifications on page 69

Group	Parameters	Meaning
IN/OUT	PkMomMax PkMomMin PkHldMax PkHldMin	”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
	OutR. ms	Output rate. Specifies the interval (in ms) at which PDOs are sent via the CAN interface.
	PDO-Frmt	The signal which is output over the CAN-bus is selected and sent as a PDO: Gross, Net or Peak value Max/Min., Peak-to-peak, Off, User
	AutoOPER	if activated: automatically set to Operational

PROFI-bus	Address	Address setting from 3 - 123

Group	Parameters	Meaning
ADDITION FUNCTION	>0<Rf	Referenznull Ein Wegaufnehmer ⟨ ± 20 mm Nennmeßweg) ist vom Fundament aus gemessen in einer Höhe von 1 m befestigt. Bei einem Nullsetzen wird der *Analogausgang* auf 0 V abgeglichen. Der *Anzeigewert* wird auf >0<Ref (+1000 mm) abgeglichen. Es ist ein Anzeigebereich von 980 mm bis 1020 mm möglich. 
	MotionDsp	Standstill indication. When standstill occurs, selecting On displays the sign ◺◿
	MTime ms MAmp kg	Motion time; standstill is reported when amplitude MAmp is not exceeded in motion time ”t”. 
	LadnmNul	AUS: Nullwertspeicher wird nicht überschrieben bei Parameterwechsel
	HW synchr	Master or Slave

7 CAN interface description (MP60 only)

7.1 General

The MP60 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 from the measurement module 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 (80 hex)
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 MP60/MP07)

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

Response (MP60/MP07 on 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 (4B Hex); 4 bytes data
2nd + 3rd data byte	Index (LSB-MSB)
4th data byte	Subindex
5th - 8th data byte	Value (LSB-MSB)

Writing a parameter:

Send value (PC or PLC on MP60/MP07)

CAN identifier	1536 (600 Hex) + module address
1st data byte	47 (2F Hex); write 1 byte 43 (2B Hex); write 2 bytes 35 (2B Hex); write 4 bytes
2nd + 3rd data byte	Index (LSB-MSB)
4th data byte	Subindex
5th - 8th data byte	Value (LSB-MSB)

Acknowledge (MP60/MP07 on PC or PLC)

CAN identifier	1408 (580 Hex) + module address
1st data byte	96 (60Hex)
2nd + 3rd data byte	Index (LSB_MSB)
4th data byte	Subindex
5th - 8th data byte	0

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

Error acknowledge (MP60/MP07 on 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 error 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 Object directory (communications profile section)

Communications profile section according to CAN-open (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 1 - 2: Error code Byte 3 - 4: Additional information
1005	0	Identifier SYNC message	unsigned32	rw	
1008	0	Manufacturer's device designation.	Vis string	ro	l=8
1009	0	Manufacturer's hardware version	Vis string	ro	l=8
100A	0	Manufacturer's software version	Vis string	ro	l=15
100B	0	Device address	Unsigned32	ro	
1012	0	Identifier EMERGENCY message	Unsigned32	rw	
1200	0..2	Server SDO parameter	SDOParamet er	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
1A00	0..2	1. Send PDO mapping	PDO mapping	ro
1A01	0..2	2. Send PDO mapping	PDO mapping	rw

Data structures:

PDO CommPar:

Index	Subindex	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	Subindex	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	Subindex	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

Error code (object 1003HEx):

Value	Meaning
0	No error
1000	Fatal error
8100	Communication
FF00	Device-specific

Error code - additional information:

Value	Meaning
0	No error
1	Transmission Error
2	System Error
3	Unknown Command
4	Wrong number of parameters
5	Wrong parameter value
6	Filter frequency error
7	Amplifier overflow
8	Command cannot be run
10	Incorrect channel selection
11	Measurement error
12	Triggering error
13	Measuring range error
14	Taring error
21	Filter frequency warning
22	Tare status warning

7.5 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)
5030	transducer error
6311	Scaling error
6312	Scaling error analogue output
F001	Measuring range overflow
F002	Analogue output overflow
F020	Net overflow
FF03	Gross overflow
FF06	Peak value min.
FF07	Peak value max.

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 61).
Note: rop, rwp: PDO mappable

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Measured values:			
2000	1	Gross measured value	integer32	rop	
2001	1	Net measured value	integer32	rop	
2002	1	Maximum	integer32	rop	
2003	1	Minimum	integer32	rop	
2004	1	Peak-to-peak	integer32	rop	
2005	1	Measured value as input quantity	integer32	ro	Input range: 1MHz: 2 decimal places 100kHz: 3 decimal places 10kHz: 4 decimal places 1kHz: 5 decimal places Pulse: 0 decimal places
2006	1	Analogue output value V	integer32	ro	3 Decimal places
2010	1	Measured value status	unsigned 8	rop	Bit 0: Range overflow Bit 1: Analogue output Overfl. Bit 2: Scaling defective Bit 3: EEPROM error Bit 4 - 7: Limit value 1 - 4

Index (hex)	Sub-index	Name	Format	Attr.	Values
2011	1	Measured value status_2	unsigned32	rop	Bit 0: Counter OVFL. Bit 1: Input OVFL. Bit 2: Overfl. Gross Bit 3: Overfl. Net Bit 4: Overfl. Analogue output Bit 5: Overfl. Maximum Bit 6: Overfl. Minimum Bit 7: Negative Overfl. Bit 8: Limit value 1 Bit 9: Limit value 2 Bit 10: Limit value 3 Bit 11: Limit value 4 Bit 12: Scaling input Bit 13: Scaling output Bit 15: Init.Error Bit 16: Transducer 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
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 Sign
2083	0	Exit edit mode	unsigned8	wo	Write any value to measured value display afterwards

Index (hex)	Sub-index	Name	Format	Attr.	Values
		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: Transducer Bit 5: Conditioning Bit 6: Analogue 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: DP 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
		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

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Transducer			
2122	1	Physical unit	unsigned16	rw	1603: g 1604: kg 1605: T 1606: kT 1607: TON 1608: lb 1609: oz 1610: N 1611: kN 1619: µm 1620: mm 1621: cm 1622: m 1623: inch 1624: Nm 1625: kNm 1626: FTLB 1627: INLB 1628: µm/m 1629: m/s 1630: m/s^2 1631: % 1632: ‰ 1633: ppm 1636: MN 1637: NoUnit 1641: Hz 1642: kHz 1643: 1/s 1644: rpm 1645: U/min 1646: Imp 1647: kImp 1648: deg 1649: rad 1650: rad/s 1651: km/h 1652: mph 1653: ft/s 1654 inoz 1655 Ncm 1656: l/h 1657: l/mi

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Transducer			
2122	1	Physical unit	visible String	rw	4 char
2131	1	Measuring range	unsigned16	rw	533: 1 MHz 534: 100 kHz 531: 20 kHz 535: 10 kHz 536: 1 kHz 1646: 5 MImp 1647: 1 GImp
2132	1	F2 Enable (2nd frequency source)	unsigned16	rw	1: On 0: Off
2133	1	Zero index	unsigned16	rw	1: On 0: Off
2134	1	Frequency quadrupling	unsigned16	rw	1: On 0: Off
2135	1	Direction of rotation	unsigned16	rw	1: On 0: Off
2136	1	Trigger level	floating	rw	Value in range ±5 V (keyboard: 250 mV steps)
2137	1	Glitch Filter	unsigned16	rw	1: On 0: Off
2138	1	Shunt	unsigned16	rw	1: On 0: Off
2140	1	Transducer null in kHz	integer32	rw	Value in kHz
2141	1	Transducer null in physical unit	integer32	rw	Value in e.g. kN
2142	1	Transducer sensitivity in kHz	integer32	rw	Value in kHz
2143	1	Transducer sensitivity in physic. unit	integer32	rw	Value in e.g. kN
2150	1	Input characteristics 1st point in kHz	integer32	rw	Value in kHz
2151	1	Input characteristics 2nd point in kHz	integer32	rw	Value in e.g. kN
2160	1	Input characteristics 1st point in physic. unit	integer32	rw	Value in e.g. kN
2161	1	Input characteristics 2nd point in physic. unit	integer32	rw	Value in e.g. kN

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Conditioning			
2180	1	Tare value	integer32	rw	
2181	1	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
2185	1	Reference zero	integer32	rw	
2190	1	Filter frequency	unsigned16	rw	908: 0.05 Hz 914: 0.1 Hz 917: 0.2 Hz 921: 0.5 Hz 927: 1 Hz 931: 2 Hz 935: 5 Hz 941: 10 Hz 945: 20 Hz 949: 50 Hz 955: 100 Hz 958: 200 Hz 962: 500 Hz 0: Off
2191	1	Filter characteristics	unsigned16	rw	141: Butterworth 142: Bessel
21A0	1	Motion control time window	unsigned32	rw	ms
21A1	1	Motion control amplitude	integer32	rw	Value in physic. unit
21A2	1	Activate standstill indication	unsigned16	rw	1: On 0: Off
		Analogue output			
21C0	1	Analogue output mode (voltage/current)	unsigned16	ro	290: ± 10 V 291: ± 20 mA 292: 4..20 mA
21C1	1	Signal at analogue output	unsigned16	rw	214: Gross 215: Net 204: Max 205: Min 218: Peak-to-peak
21D0	1	Zero point analogue output	integer32	rw	Value as physical unit
21D1	1	Full scale analogue output	integer32	rw	Value as physical unit
21D2	1	Zero point analogue output	integer32	rw	Value in V
21D3	1	Full scale analogue output	integer32	rw	Value in V

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Limit value switches			
2210	1	Enable Limit value 1	unsigned16	rw	1: Yes 0: No
2211	1	Input signal Limit value 1	unsigned16	rw	214: Gross 215: Net 204: Min 205: Max 218: Peak-to-peak
2212	1	SwtchDir Limit value 1	unsigned16	rw	130: Above limit 131: Below limit
2214	1	Starting delay LVS 1	integer32	rw	ms
2215	1	Cut-off delay LVS 1	integer32	rw	ms
2216	1	Switching level Limit value 1	integer32	rwp	
2217	1	Hysteresis Limit value 1	integer32	rw	
2218	1	Status Limit value 1	unsigned8	rop	
2220	1	Enable Limit value 1	unsigned16	rw	1: Yes 0: No
2221	1	Input signal Limit value 1	unsigned16	rw	214: Gross 215: Net 204: Min 205: Max 218: Peak-to-peak
2222	1	SwtchDir Limit value 1	unsigned16	rw	130: Above limit 131: Below limit
2224	1	Starting delay LVS 2	integer32	rw	ms
2225	1	Cut-off delay LVS 2	integer32	rw	ms
2226	1	Switching level Limit value 2	integer32	rwp	
2227	1	Hysteresis Limit value 2	integer32	rw	
2228	1	Status Limit value 1	unsigned8	rop	
2230	1	Enable limit value 3	unsigned16	rw	1: Yes 0: No
2231	1	Input signal Limit value 3	unsigned16	rw	214: Gross 215: Net 204: Min 205: Max 218: Peak-to-peak
2232	1	SwtchDir Limit value 3	unsigned16	rw	130: Above limit 131: Below limit
2234	1	Starting delay LVS3	integer32	rw	ms
2235	1	Cut-off delay LVS3	integer32	rw	ms
2236	1	Switching level Limit value 3	integer32	rwp	
2237	1	Hysteresis Limit value 3	integer32	rw	
2238	1	Status Limit value 4	unsigned16	rop	

Index (hex)	Sub-index	Name	Format	Attr.	Values
2240	1	Enable Limit value 4	unsigned16	rw	1: Yes 0: No
2241	1	Input signal Limit value 4	unsigned16	rw	214: Gross 215: Net 204: Min 205: Max 218: Peak-to-peak
2242	1	SwtchDir Limit value 4	unsigned16	rw	130: Above limit 131: Below limit
2244	1	Starting delay LVS4	integer32	rw	ms
2245	1	Cut-off delay LVS4	integer32	rw	ms
2246	1	Switching level Limit value 4	integer32	rwp	
2247	1	Hysteresis Limit value 4	integer32	rw	
2248	1	Status Limit value 4	unsigned8	rop	
		Peak values			
2260	1	Input signal Min store	unsigned16	rw	214: Gross 215: Net
2261	1	Input signal Max store	unsigned16	rw	214: Gross 215: Net
2262	1	Envelope discharge	integer32	rw	Display / s
2263	1	Enable peak-value store	unsigned16	rw	1: enable 0: locked
		Additional functions			
2271	0	Hardware synchronisation	unsigned16	ro	6700: Master 6701: Slave
2272	0	Keyboard sensitivity	unsigned16	rw	7601: low 7602: medium 7603: high
2273	0	Take over zero value store when loading parameter set	unsigned16	rw	1 = ON 0 = OFF

Index (hex)	Sub-index	Name	Format	Attr.	Values
		Digital I/Os			
2310	1	Function Output1	unsigned16	rw	200: No function 221: Limit value 1 222: Limit value 2 223: Limit value 3 224: Limit value 4 230: Error / Warning 231: Standstill 232: Frequency 1 235: F1 metering pulse
2311	1	Mode output 1	unsigned16	rw	135: Normal 136: Inverse
2312	1	Function Output2	unsigned16	rw	200: No function 221: Limit value 1 222: Limit value 2 223: Limit value 3 224: Limit value 4 230: Error / Warning 231: Standstill 233: Frequency 2 234: Direction of rotation
2313	1	Mode output 2	unsigned16	rw	See above
2314	1	Function Output3	unsigned16	rw	200: No function 221: Limit value 1 222: Limit value 2 223: Limit value 3 224: Limit value 4 230: Error / Warning 231: Standstill
2315	1	Mode output 3	unsigned16	rw	See above
2316	1	Function Output4	unsigned16	rw	See Output3
2317	1	Mode output 4	unsigned16	rw	See above
2320	1	Remote control function Taring	unsigned16	rw	100: no input 101: Input 1 102: Input 2 103: Input 3 104: Input 4
2322	1	Remote control function Max./current value	unsigned16	rw	See above
2323	1	Remote control function Min./current value	unsigned16	rw	see above
2324	1	Remote control function Hold Max value	unsigned16	rw	See above
2325	1	Remote control function Hold Min value	unsigned16	rw	See above

Index (hex)	Sub-index	Name	Format	Attr.	Values
2326	1	Remote control function Zeroing	unsigned16	rw	See above
2327	1	Remote control function Select parameter set 1	unsigned16	rw	See above
2328	1	Remote control function Select parameter set 2	unsigned16	rw	See above
2330	1	Enable remote contacts	unsigned16	rw	5: free 4: locked
		CAN interface			
2400	0	Baud rate in CAN	unsigned16	rw	1409: 10 kBaud 1411: 20 kBaud 1413: 50 kBaud 1417: 125 kBaud 1419: 250 kBaud 1421: 500 kBaud 1424: 1000 kBaud
2405	0	Device address	unsigned8	rw	1...127
2410	1	PDO contents	unsigned16	rw	214: Gross 215: Net 204: Max 205: Min 218: Peak-to-peak 200: Off
2411	1	Data transmission rate	integer32	rw	0.1ms
2412	1	Format measured values	unsigned16	rw	1253: Integer32 1257: Floating
		Functions			
2600	1	Zeroing	unsigned8	wop	1: Zeroing
2610	1	Tare	unsigned8	wop	1: Tare
2620	1	Delete Max store	unsigned8	wop	1: Constant deletion; 2: 1x deletion
2621	1	Delete Min store	unsigned8	wop	1: Constant deletion; 2: 1x deletion
2622	1	Hold Max store	unsigned8	rwp	1: Hold
2623	1	Hold Min store	unsigned8	rwp	1: Hold
2630	1	Control word	unsigned16	rwp	Bit 0: Zeroing Bit 1: Tare Bit 4: Clear Max. Bit 5: Clear Min. Bit 6: Hold Max. Bit 7: Hold Min.

7.7 Manufacturer-specific objects in floating data format

Index (hex)	Sub-index	Name	For-mat	Attr.	Values
		Measured values:			
3000	1	Gross measured value	float	rop	
3001	1	Net measured value	float	rop	
3002	1	Maximum	float	rop	
3003	1	Minimum	float	rop	
3004	1	Peak-to-peak	float	rop	
3005	1	Measured value in kHz or pulse	float	ro	
3006	1	Analogue output value V	float	ro	
		Transducer			
3140	1	Transducer null	float	rw	Value as physical unit
3141	1	Transducer null in physical unit	float	rw	Value in e.g. kN
3142	1	Transducer sensitivity	float	rw	Value as physical unit
3143	1	Transducer nominal value in physical unit	float	rw	Value in e.g. kN
3150	1	Input characteristics 1st point input group	float	rw	
3151	1	Input characteristics 2nd point input group	float	rw	
3160	1	Input characteristics 1st point phys. unit	float	rw	
3161	1	Input characteristics 2nd point phys. unit	float	rw	
		Conditioning			
3180	1	Tare value	float	rw	
3181	1	Zero balance value	float	rw	
3185	1	Reference zero	float	rw	
31A1	1	Motion control amplitude	float	rw	
		Analogue output			
31D0	1	Zero point analogue output phys. unit	float	rw	
31D1	1	Full scale analogue output phys. unit	float	rw	
31D2	1	Zero point analogue output V	float	rw	
31D3	1	Full scale analogue output V	float	rw	

Index (hex)	Sub-index	Name	For-mat	Attr.	Values
		Limit switches			
3216	1	Switching level Limit value 1	float	rwp	
3217	1	Hysteresis Limit value 1	float	rw	
3226	1	Switching level Limit value 2	float	rwp	
3227	1	Hysteresis Limit value 2	float	rw	
3236	1	Switching level Limit value 3	float	rwp	
3237	1	Hysteresis Limit value 3	float	rw	
3246	1	Switching level Limit value 4	float	rwp	
3247	1	Hysteresis Limit value 4	float	rw	
		Peak values			
3262	1	Envelope discharge	float	rw	Display value/s

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	Subindex	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	Subindex	Low byte Measured value as floating			High byte

Example 2:

Setting the filter frequency to 200 Hz.

Protocol at the amplifier:

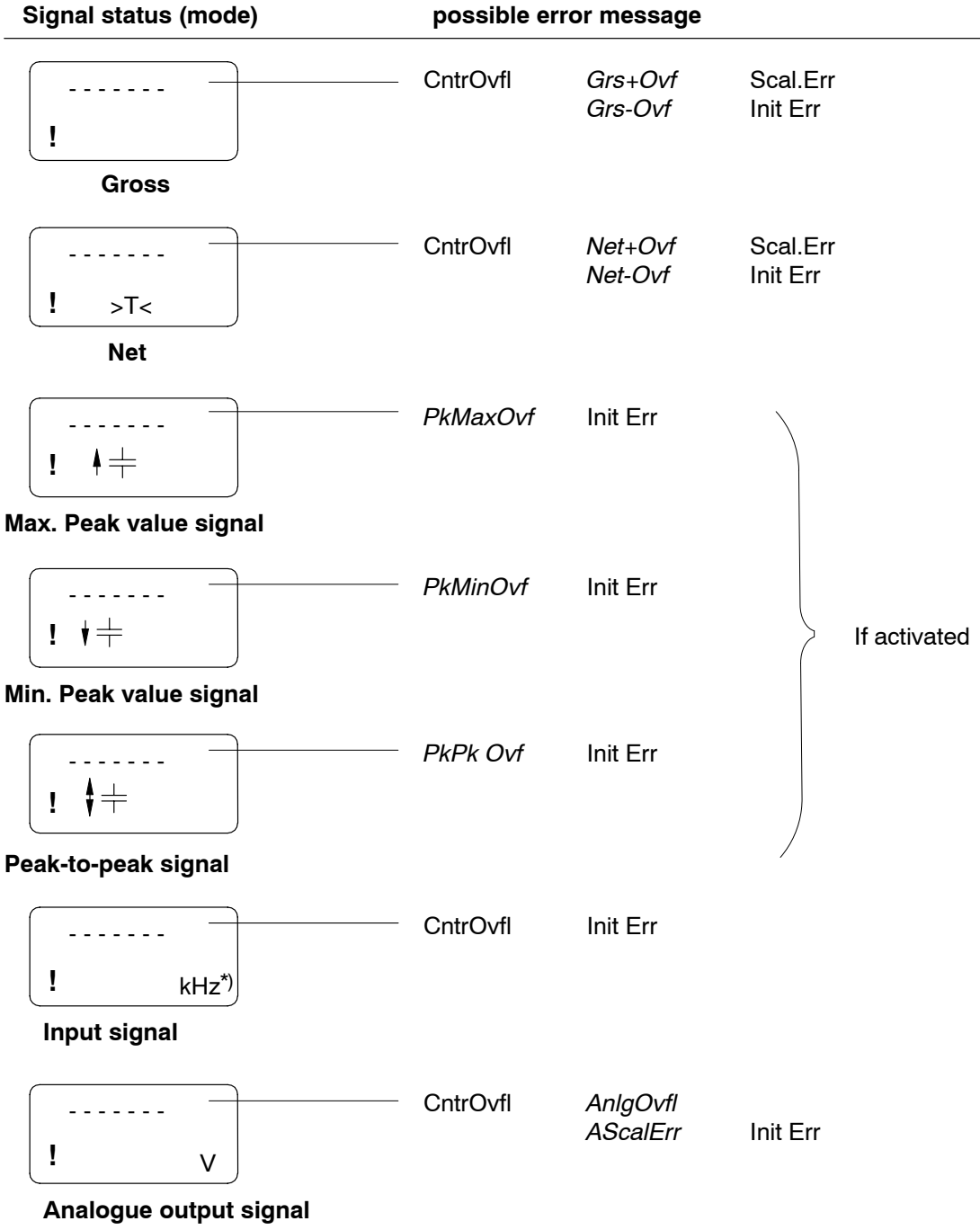
Identifier	1st byte	2nd byte	3rd byte	4th byte	5th byte	6th byte	7th byte	8th byte
0603	**2B**	**90**	**21**	**01**	**BB**	**03**	**X**	**X**
CAN identifier	Write 2byte	Index low byte	Index high byte	Subindex	Low byte High byte 958 = (3BF Hex)		don't care	

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	Subindex	don't care			

8 Error messages/operating status (LED)

Depending on the display mode, various error messages may be displayed in place of the measured value:



*) Imp, kImp

The current errors are continuously displayed for each channel (see also page 26). Press ⊕, until you get into ”ERROR” display mode.

Error message	Cause	Remedy
Counter (Cntr Ovfl)	Maximum number of metering pulses exceeded	Zeroing
Input (Inp Ovf)	Input frequency too high	Adapt measuring range
AnlgOutp (AnlgOvfl)	analogue output overflow	Check assignment of display value analogue output
PkValMin (PkMinOvf)	Minimum peak value overflow	1. Delete peak value via external remote or 2. In PEAKVAL. STORE group ”ClearPkV” Yes
PkValMax (PkMaxOvf)	Maximum peak value overflow	1. Delete peak value via external remote or 2. In PEAKVAL. STORE group ”ClearPkV” Yes
Net (Net+Ovf; Net-Ovf)	Net value overflow[1)]	Decrease display by one decimal place
Gross (Grs+Ovf; Grs-Ovf)	Gross value overflow[1)]	Decrease display by one decimal place
Transduc	Transducer error signal (Low active)	See the Operating Manual for the transducer
Scaling[2)] (Scal.Err)	Input characteristic too steep	Change input characteristic
AnlgScal (AScalErr)	Input or output characteristic too steep	Change input or output characteristic
(Init Err)	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 37

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 colour	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 Original calibration error	CAN-bus not ready for communication (bus OFF)	Please wait Send PME to manufacturer (HBM)

9 Specifications

Type		**MP60**
Accuracy class		**0.05**
Supply voltage **Permitted supply voltage range** **Power consumption**	V_{DC} V_{DC} W	24; Potential separation from measurement system (typically 350 V_{rms}). 18...30 max. 4.5
Amplifier		
Attachable process quantity transducer **Permissible cable length between transducer and amplifier, max.**	 m	HBM torque transducers in the model ranges T10F (KF1, SF1, SU2), T4WAS3, T30FNA - T34FN in conjunction with MP07, Incremental transducer Frequency signal sources 70
Input		Differential inputs for symmetric and asymmetric frequency signals
Hysteresis	V	0.25
Input level[1)] each line to measurement earth Signal amplitude	 V V_{PP}	 -5 ... +5 >1
Trigger level	V	± 5 (adjustable in steps of 250 mV)
Input impedance[2)] (input level -5... +5V)	 kΩ	 >100
Input filter		Glitch filter, disconnectable
Detection of direction of rotation		via additional $\pm 90^o$ phase-shifted frequency signal at F2
Frequency quadrupling **Input range:** Frequency measurement Impulse counting	 kHz kHz kHz kHz kHz Imp.	connectable 0.0001...1 0.001...10 0.02...20 0.01...100 0.1...1000 0...999999 $0...5x10^6$ $0...1x10^9$ (kilo-pulse steps)
Resolution (for frequency measurement)	%	0.01 of measured value
Maximum pulse rate	Imp./s	1 000 000
Linearity deviation	%	0.01
Low-pass filter Measuring rate when filter disconnected	Hz 1/s	disconnectable and adjustable in steps of 0.05 to 500 Hz (Bessel and Butterworth filter characteristics) 4800

1) Levels of up to ± 30 V are permitted and are internally limited to ± 5 V

2) The input impedance for level $> \pm 5$ V is approx. 3 kΩ

Calibration accuracy	%	0.01
Long-term drift over 48 hours (30 minutes after switching on)	%	< 0.01
Effect of the supply voltage in the event of changes in the specified range, by reference to the full scale on sensitivity	%	0.01
Effect of change in ambient temperature of 10 K on sensitivity	%	0.01
Analogue output Applied voltage Permissible load resistance, min. Internal resistance, max. Applied current Permissible load resistance, max. Internal resistance, min. The analogue output can show gross, net, positive and negative peaks and peak-to-peak values.	 V kΩ Ω mA Ω kΩ	 ±10 10 10 ±20; 4...20 500 100
Scale range analogue output min.		0.5 V at 100 % of input measuring range
Scale range analogue output max.		10 V at 1 % of input measuring range
Interference voltage at the output	mV_{PP}	typ. 10
Long-term drift over 48 hours (30 minutes after switching on)	mV	< 3
Effect of the ambient temperature in the event of a change of 10K (additional effect to the digital value) on zero point voltage current on sensitivity	 mV µA %	 < 3 < 10 < 0.1
Limit switches Number Reference level Hysteresis Adjustment accuracy Response time	 % % ms	 4 Gross, net, peak values 0...100 0.0033 1

Peak-value memory		
Number		2
Function		Positive, negative, peak-to-peak
Update rate	ms	1
Clearing peak-value memory	ms	2
Capturing current measurement value/ peak value	ms	2
Discharge rate of the envelope curve	Physic. unit/s	0 to 999999
Control outputs		
Number		4
Nominal voltage, external power supply	V	24
Permitted supply voltage range	V	18...30
Output current, max.		
Short-circuit current, typically	A	0.1
Short-circuit period	A	0.2
Isolation voltage, typically		unlimited
Assignment:	V_{rms}	350
Output1		selectable: LVS1...LVS4, Error, Standstill, Signal F1 (typically to 300 kHz), Metering pulse (1.6 µs width)
Output2		selectable: LVS1...LVS4, Error, Standstill, Signal F2 (typically to 300 kHz), Direction of rotation
Output3, output4		selectable: LVS1 - LVS4, Error,
Control inputs		
Number		4
Input voltage range, LOW	V	0...5
Input voltage range, HIGH	V	10...30
Input current, typically, HIGH level = 24V	mA	12
Interface		
Measuring rate, approx.		Maximum 1000 measured values/sec.
Protocol		CAN 2.0B, CAL/CANopen compatible
Hardware bus link		in accordance with ISO 11898
Baud rate	kBit/s	1000 500 250 125 100 50 20 10
Maximum length of cable	m	25 100 250 500 600 1000 1000 1000
Parameter memory (EEPROM)		4 (plus factory setting)
Display		
Type		Two line, 8 character alphanumeric, LCD
Keyboard		Touch-sensitive keyboard with 3 touch-sensitive keypad
Nominal temperature range	°C [°F]	0...50 (32...122)
Operating temperature range	°C [°F]	-20...+50 (–4...122)
Storage temperature range	°C [°F]	-20...+70 (–4...158)
Degree of protection		IP20
Dimensions (W x H x D), approx.	mm	55 x 148 x 156
Weight, approx.	g	750

Type		MP07
Supply voltage	V_{DC}	24
Supply voltage range	V_{DC}	18...30
Output voltages	V	+15 V, 100 mA -15 V, 100 mA
Measurement/CAL	V_{PP}	54/80; 24...25 kHz
Potential separation (type-tested to EN6100-1:1993)		
Supply voltage for ±15 V	V_{rms}	350
Supply voltage for driving CAL signal	V_{rms}	350
Driving CAL signal for ±15 V	V_{rms}	350
Power consumption	W	7.5 (T32FNA)
Effect of supply voltage in the event of a change in the specified range		
on output voltage ±15 V_{DC}	%	0.5 of full scale
on output voltage 54/75 V_{PP}	%	2 of final value
Effect of 10K change in ambient temperature		
on output voltage ±15 V_{DC}	%	0.5 of full scale
on output voltage 54/75 V_{PP}	%	1 of full scale
Long-term drift over 48 hours		
all output voltages	%	1
Nominal temperature range	°C [°F]	0...50 (32...122)
Operating temperature range	°C [°F]	-20...+50 (–4...122)
Storage temperature range	°C [°F]	-20...+70 (–4...158)
Degree of protection		IP20
Dimensions (W x H x D), approx.	mm	55 x 148 x 156
Weight, approx.	g	565