Operating Manual

Digital
precision measuring amplifier

DMP40, DMP40S2

B0396-4.0 en

HBM

Contents

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E Setting up the DMP

A Introduction

1 Safety instructions

Use as prescribed

The precision measuring amplifier is to be used exclusively for measurement tasks and directly related control tasks. Any other use is deemed to be use not as prescribed.

In the interests of safety the instrument should be operated only as specified in the User Manual. It is also essential to observe the statutory and safety provisions relevant to the particular application. The same applies to the use of accessories.

General dangers in non-observance of the safety instructions

The precision measuring amplifier corresponds to the state of the art and is safe to operate. The instrument can give rise to residual danger if improperly installed and operated by untrained personnel.

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

Residual dangers

The performance and list of components supplied with the measuring amplifier cover only part of the scope of measurement technology. In addition, equipment planners, installers and operators should plan, implement and be responsible for the technical safety aspects of measurement equipment in such a way as to minimise residual dangers. All existing regulations must be complied with. Attention must be drawn to residual dangers associated with measuring equipment.

After setting-up and password-protected activities, ensure that any controllers that may be connected are in a safe status, until the switching behaviour of the measuring amplifier has been tested.

Any risk of remaining dangers when working with the amplifier system is pointed out in this introduction by means of the following symbols:

Symbol:  **DANGER**

Meaning: **Maximum danger level**

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

Symbol:  **WARNING**

Meaning: **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: **Possibly dangerous situation**

Warns of a possibly dangerous situation in which failure to comply with safety requirements **could** cause damage to property or result in some kind of minor physical injury.

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/HBMdoc).

Working safely

Fault-messages must only be acknowledged if the cause of the fault has been eliminated and no further danger exists.

Conversions and modifications

No modifications may be made to the measuring amplifier from the structural or safety-engineering point of view without our express agreement. Any modification precludes liability on our part for any resulting damage.

In particular, all repairs and soldering work on motherboards (replacement of components other than EPROMs) are prohibited. When replacing complete modules only original HBM parts may be used.

Qualified personnel

are persons who are entrusted with the installation, assembly, commissioning and operation of the product and who possess the appropriate professional, trade or craft qualifications.

This instrument is to be installed and used only by qualified personnel in strict accordance with the technical data and the safety rules and regulations mentioned. When using the amplifier it is also essential to comply with the statutory and safety regulations relevant to the particular application. The same applies to the use of accessories.

Maintenance and repair work on an open amplifier with the power on may only be carried out by a trained person who is fully aware of the attendant risks.

Safety requirements

Find out before commissioning whether the circuit being used is adequately protected.

The mains plug must only be inserted into a socket with a protection switch (Protection Class I). Connecting electrical amplifiers to low voltage: connect to extra-low safety voltage only (safety transformer in accordance with DINVDE 0551/EN60742).

Before opening the amplifier make sure that it is off by withdrawing the mains plug from the socket.

Never pull the mains plug from the socket by the mains cable.

Do not operate the amplifier if the mains cable is damaged.

If a connection board is withdrawn, the plug-in unit must be closed off with a blanking plate.

Built-in equipment should be operated only when installed in the housing provided.

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

To ensure sufficient electromagnetic immunity, it is essential to use Greenline shielding only (see HBM brochure ”*Greenline shielding design*”; internet download http://www.hbm.com/Greenline).

2 Notes on the documentation

The complete documentation on the precision measuring amplifier consists of the following publications:

The ***Operating Manual***, (Part 1)
explains how to operate the amplifier manually and use it to take measurements.

The publication ***Operation with computer or terminal***, (Part 2)
shows you how to program and measure using a computer or terminal.

This manual contains all the information you need to operate the DMP.

There are several **guidelines** to help you:

- The *header* shows you which chapter or sub-section you are currently reading.

Example:

Connecting up → Mains connection - - - - C-12

- The *page numbering* consists of a capital letter (corresponding to the chapter heading) and a number.
- Chapter D *Functions and symbols on the DMP* explains the display and the control keys
- Chapter F *Menu structure* gives an overview of the selection and setup windows

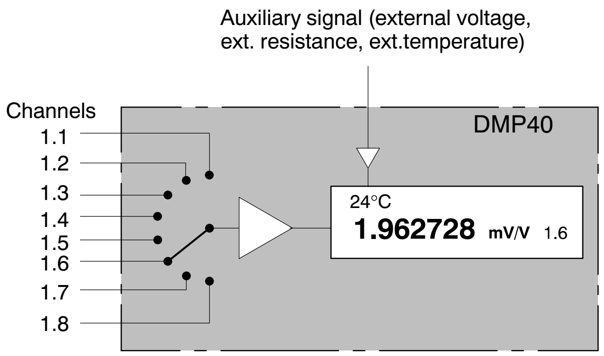
3 How the DMP amplifier works

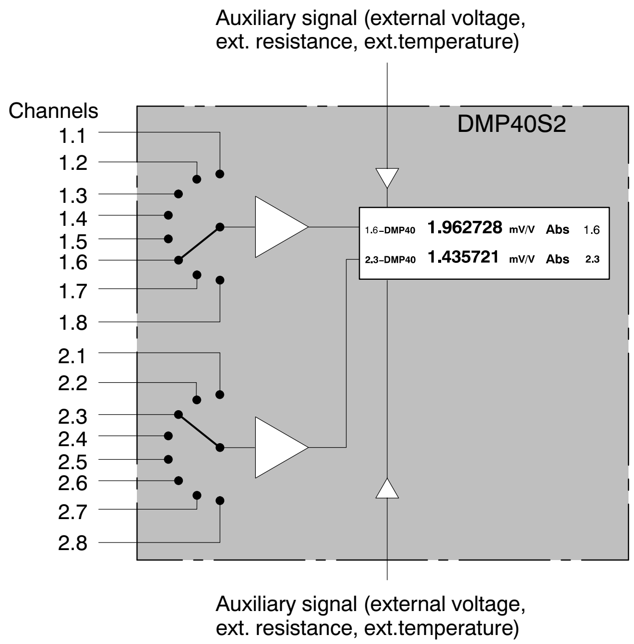
This section gives a clear explanation of how the DMP amplifier works.

You can connect as many as eight sequentially selectable channels to the DMP40. Connected transducers (operating on the SG principle) are excited with a 225 Hz carrier frequency. Since all the transducers are connected to the excitation voltage at the same time and are therefore constantly ”warmed up”, as soon as you switch to the next channel you can begin taking measurements with complete accuracy.

The alternative DMP40S2 version has two amplifiers operating in parallel, each with eight ports. This means that two measured values can be displayed simultaneously from a total of 16 channels.

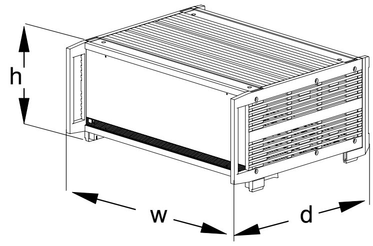
It is possible to display not only the SG signal, but also auxiliary quantities such as the temperature, current and resistance of the channels or an external voltage.





4 Housing

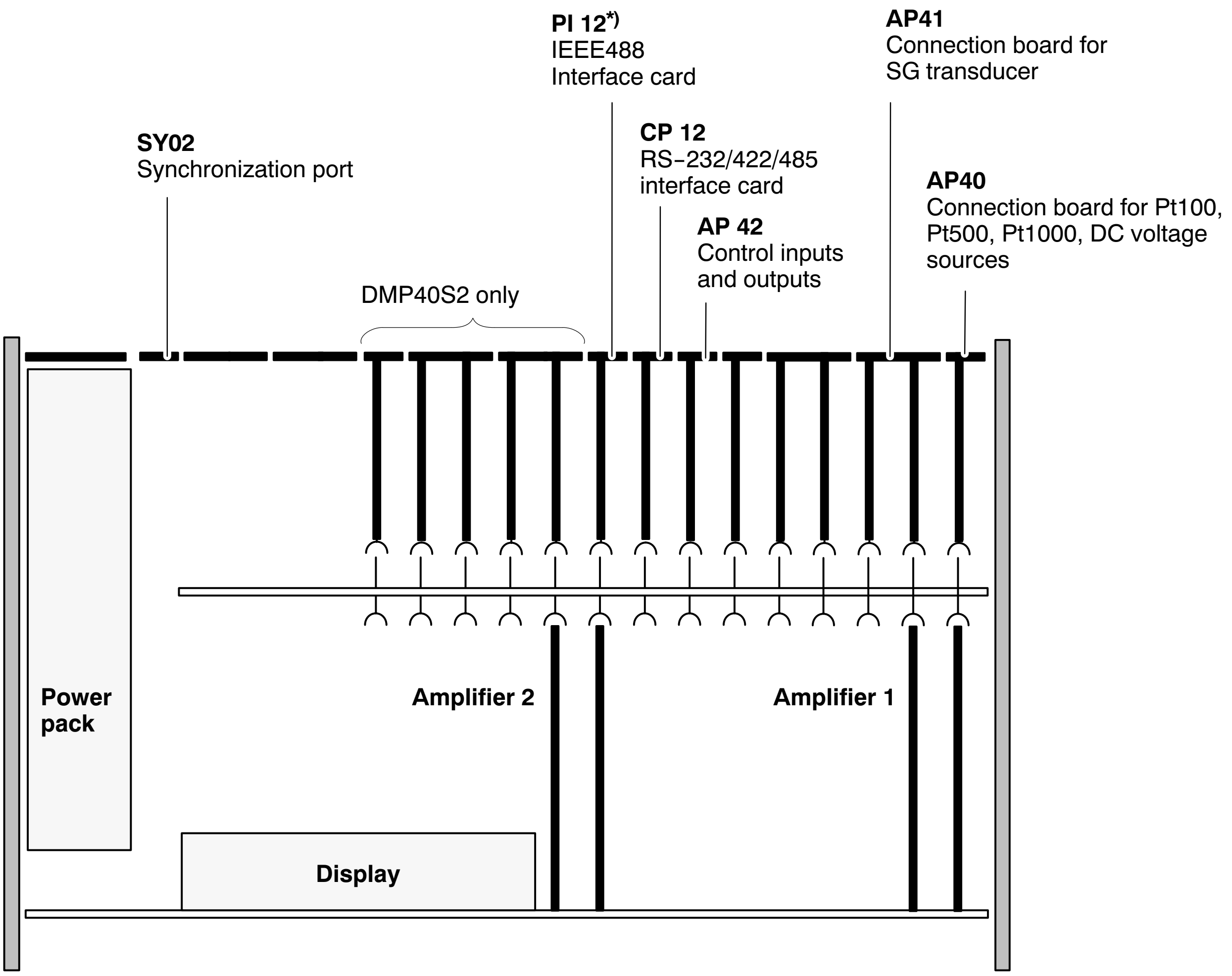
DMP amplifiers are supplied in a 19 inch desktop housing.



Desktop housing with 1 or 2 amplifiers (w x h x d): 458 mm x 171 mm x 367 mm

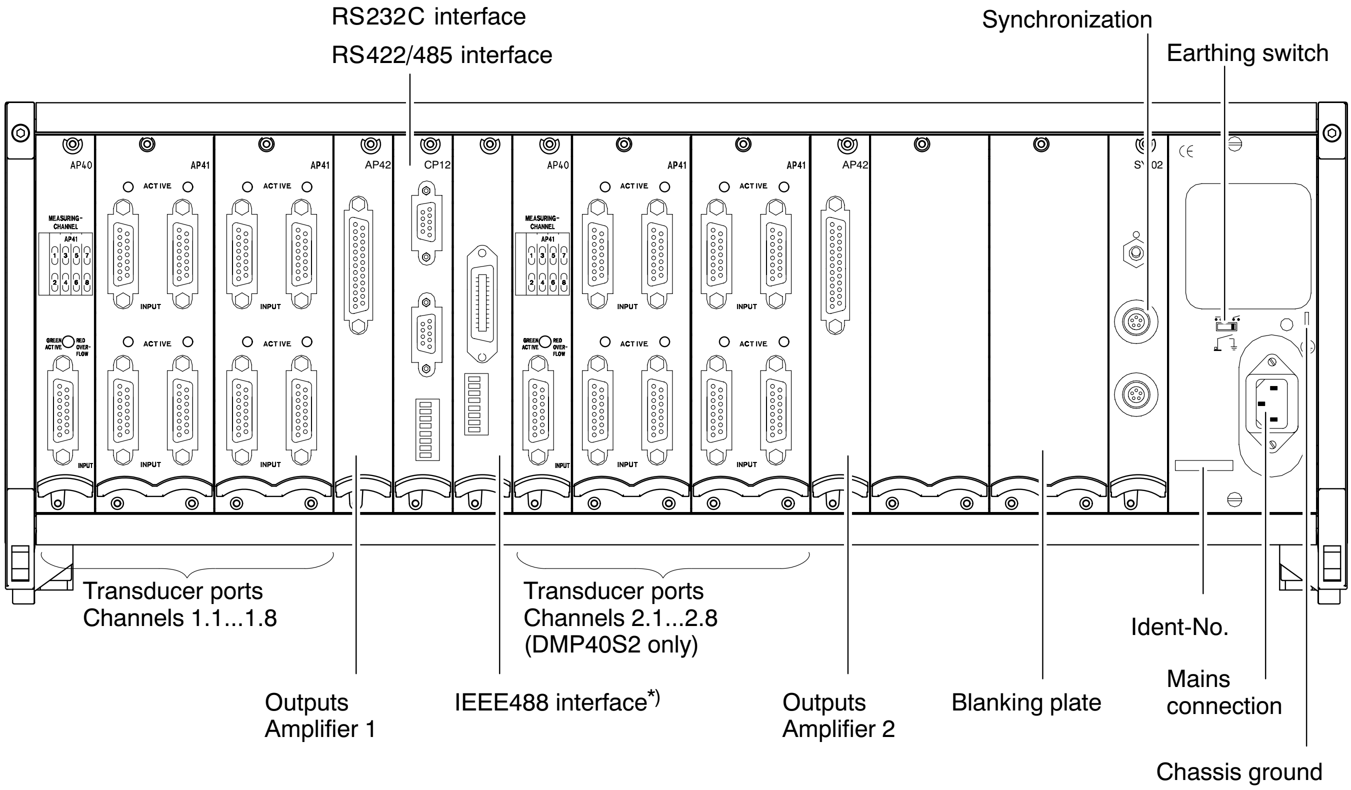
Alternative version	Number of amplifiers	Max. number of channels	Power supply
DMP40	1	8	230 V/115 V ~
DMP40S2	2	16	230 V/115 V ~

5 Structure of the DMP amplifier



*) With devices up to Ident-No. 122820045 only.

6 Back of the amplifier, port jacks



*) With devices up to Ident-No. 122820045 only.

7 Conditions on site

CAUTION

- Protect the amplifier from humidity or atmospheric influences such as rain, snow and so on.
- Please ensure that the ventilation openings in the side and the power pack fan vents in the back of the amplifier are not covered up.

8 Maintenance and cleaning

The precision amplifiers are maintenance-free. Please note the following points when cleaning the housing:

- Remove the power plug from the socket before cleaning.
- Clean the housing with a soft, damp (not wet) cloth. Never use solvents, since these can damage the display field as well as the makings and labeling on the front panel.
- Make sure that no liquids find their way into the amplifier or its connection ports in the course of cleaning.

B Connecting up

1 Mains connection

The NT010 power pack is designed for 230 V/115 V connection as well as for the maximum configuration with 2 amplifiers. Adaptation to the mains supply voltage (115 V/230 V) is automatic. The fan on the power pack is temperature-controlled and is automatically switched on only when needed.

The power pack is protected by an internal 3.15 A/T heat-coil fuse.

CAUTION

The power-pack fuse must only be changed by the manufacturer's service personnel!

Earthing switch

In factory set-up ( ) the earthing switch connects zero operating voltage to the protection circuit. If external devices (transducers, computers) already make this link, giving rise to earth-circuits (hum-pickup), the earthing switch should be opened ().

2 Connecting transducers

2.1 Possible connections

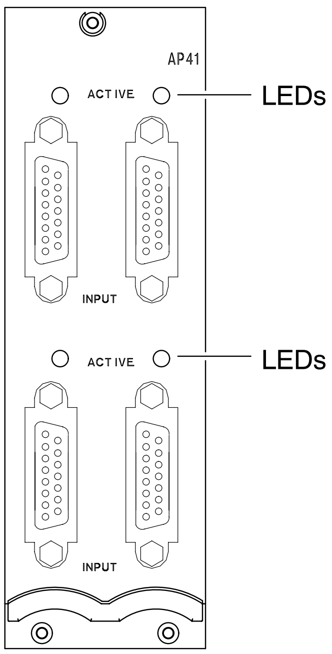
You can connect SG transducers to the DMP amplifier in a full-bridge network. In addition you can connect one Pt100, PT500, Pt1000 thermistor or one DC voltage source (± 10 V) via the AP40 connection board.

2.2 Type of connection

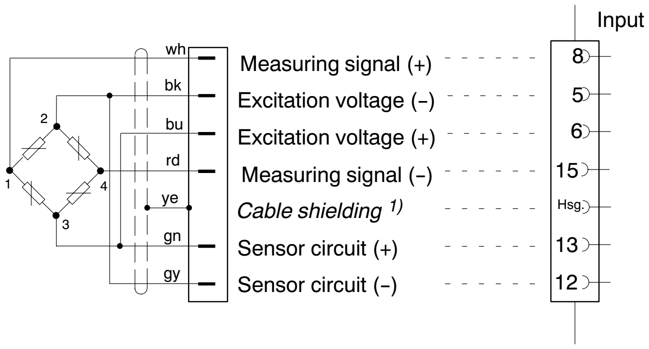
Connect SG transducers in six-wire mode.

2.3 SG full bridges

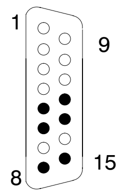
Terminal plate



Connection diagram



Pin assignment

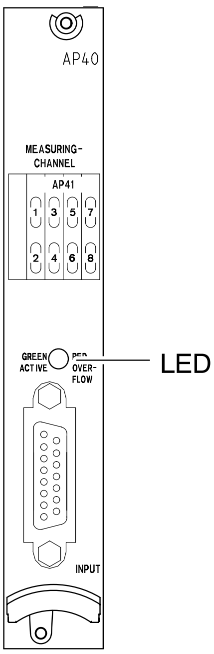


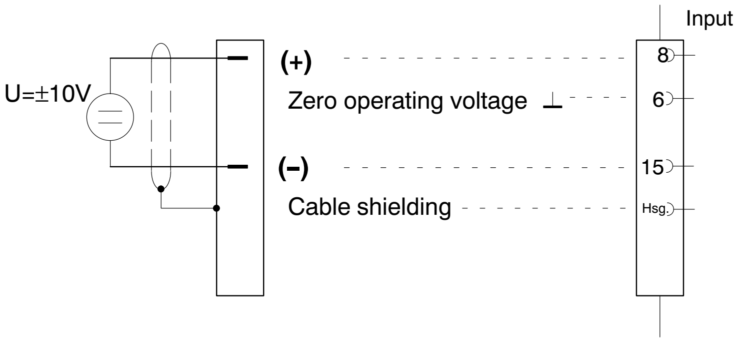
Wiring colours: wh= white; bk= black; bu= blue; rd= red; ye= yellow; gn= green; gy= grey

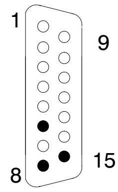
The LEDs above the port jacks indicate the operating status of the channel:
LED on (green) = channel active
LED off = channel inactive

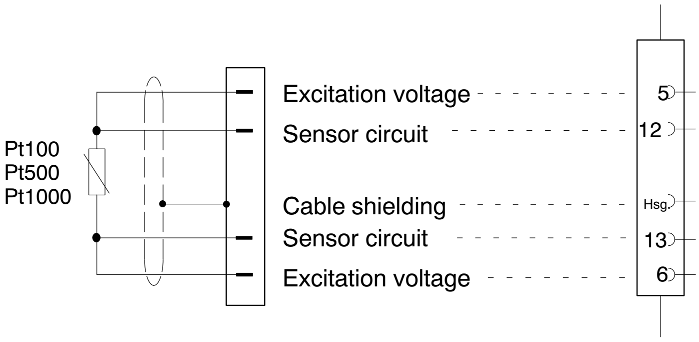
2.4 Auxiliary inputs

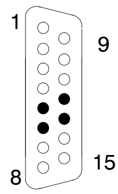
Terminal plate **Connection diagram** **Pin assignment**





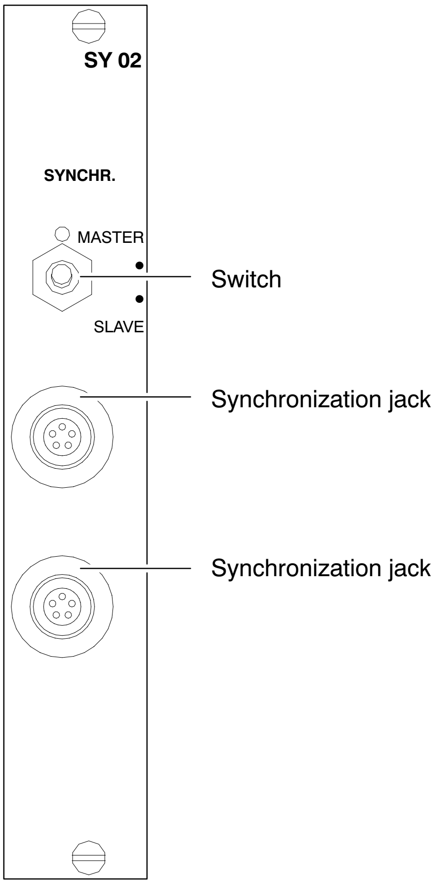






The LED above the port jack indicates the operating status of the channel:
LED on (green) = channel active
LED off = channel inactive

3 Synchronization



Synchronization prevents beat interference due to carrier-frequency differences between several DMP amplifiers.

All the amplifiers within a device are basically synchronized.

We recommend synchronizing the devices if:

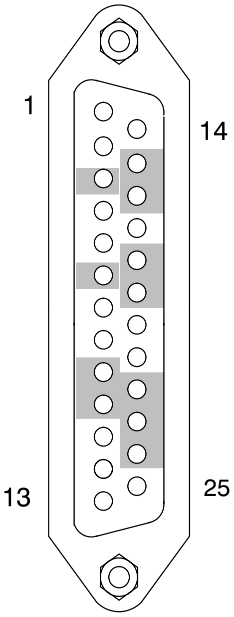
- the transducer cables of several devices are laid side-by-side
- the channels are unshielded and close together

Synchronizing several devices
You can synchronize any number of devices over the synchronization jacks. The synchronization jacks have the same features, so it is equally valid which of the two you use as input or output. Set the switch on one device to MASTER, and on all the others to SLAVE.

Use synchronization cable Kab251-0,5 (accessories).

4 Inputs and outputs; remotes

On the back of the desktop housing are the AP42 connection boards for connecting output and control signals. These connection boards have a 25-pin jack labelled OUTPUT.
The control I/Os are galvanically isolated by optical coupler.



OUTPUT

Pin assignment of the AP42*):

1 Control input 1 (ACAL)
2 Control input 2 (TARE)
3 Ground (control inputs 3+4)
4 Control input 5 (CPV 1)
5 Control input 6 (HLD 1)
6 Ground (control inputs 7+8)
7 24V (limit value 1+2)
8 Ground (limit value 1+2)
9 24V (limit value 3+4)
10 Ground (limit value 3+4)
11 Current output I_{a1}
12 not in use
13 not in use
14 Ground (control inputs 1+2)
15 Control input 3 (RNGE)
16 Control input 4 (FREQ)
17 Ground (control inputs 5+6)
18 Control input 7 (CPV 2)
19 Control input 8 (HLD 2)
20 Limit value output 1
21 Limit value output 2
22 Limit value output 3
23 Limit value output 4
24 Warning
25 Analog ground

*) The signals for control inputs are freely definable (factory set-up is the specified default).

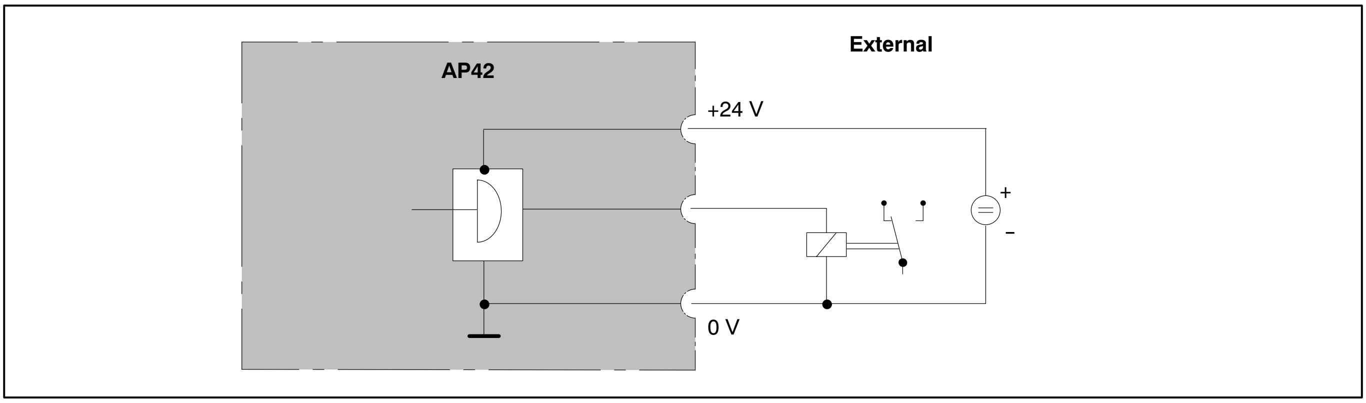
Control inputs:

Function	Level 0 V	Level 24 V
ACAL	Autocal ON	Autocal OFF
TARA	Taring is triggered by a transition from 0V to 24V	
RNGE	Scaling mV/V	User-defined scaling
FREQ	Cutoff frequency 1	Cutoff frequency 2
CPV1/2	Peak values 1 and 2 are stored	Peak values 1 and 2 are replaced by current value
HLD1/2	Peak stores 1 and 2 not frozen	Contents of peak stores 1 and 2 frozen
ZERO	Zero balancing triggered by transition from 0 V to 24 V	
REMT	Remote control contacts inactive	Remote control contacts active
SHNT	Shunt off (XM001)	Shunt on (XM001)
PRNT	Print enabling takes channel into account	Print enabling does not take channel into account
CAL	Input is switched to the measuring signal	Input is switched to internal calibration source
ZERO	Input is switched to the measuring signal	Input is switched to the zero signal

Control outputs:

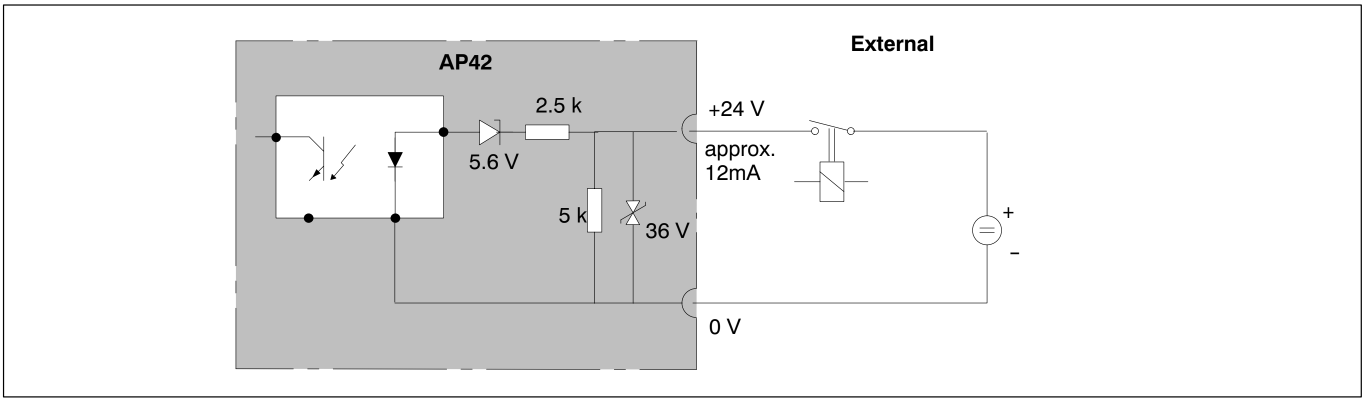
Function	Level 0 V	Level 24 V
Limit val.	Limit switches OFF	Limit switches ON
Warning	Device not ready or error (e.g. overload)	No error

Circuit diagram of control outputs: Limit value outputs 1 ... 4 and Warning



The voltage on output is some 0.5...1 V lower than the externally connected supply voltage. Maximum current is dependent on the load-carrying capacity of the external supply voltage, but is not to exceed 0.5 A.

Circuit diagram of the control inputs: Control inputs 1 ... 8



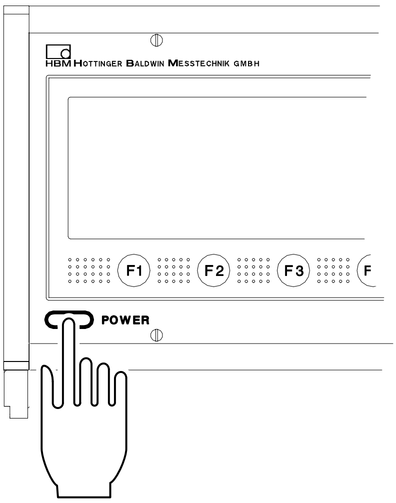
C Commissioning

1 Commissioning

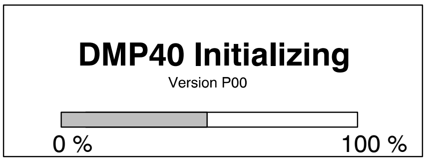
This chapter shows the steps you need to take, in order to make your measuring system (measuring amplifier and transducer) ready for use. After connecting the transducer and running the initial commissioning, you are in a position to get acquainted with the other functions and facilities of the precision measuring amplifier.

- Unpack the DMP.
- Check the DMP for damage.
- Is the delivery complete?
- Compare the contents of packages with the enclosed documentation list. Is the documentation complete?

2 Switch on



Switch on



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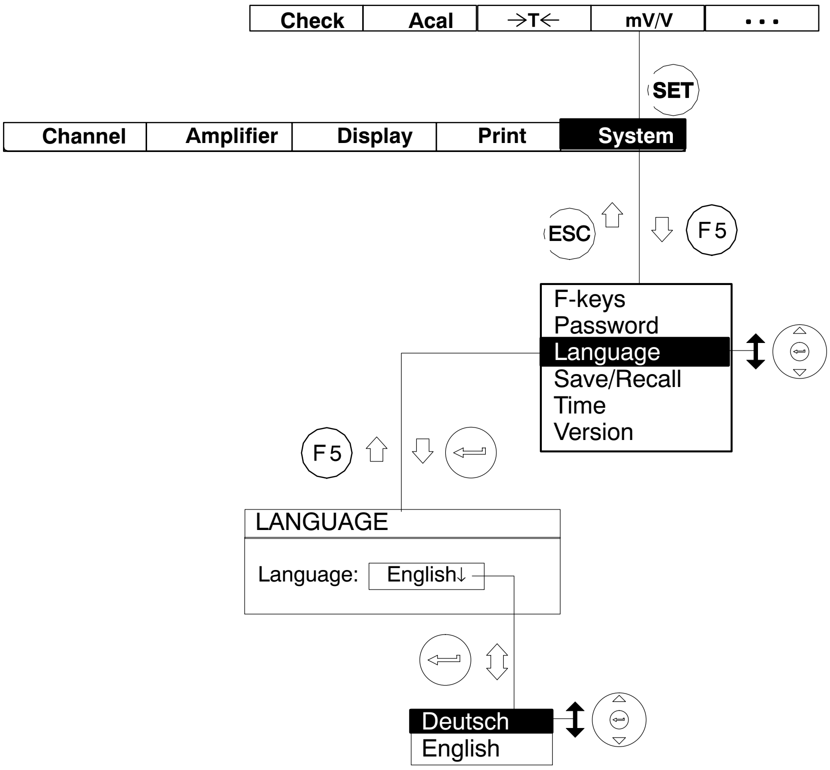
- Unpack the DMP.
- Check the DMP for damage.
- Is the delivery complete?
- Compare the contents of packages with the enclosed documentation list. Is the documentation complete?
- **Please note the safety instructions in chapter 1!**
- Connect your transducer to the jack provided for the purpose on the connection board (named ”Input”). If you use a cable that you have made up yourself, please note the pin assignment for your transducer in chapter B.
- Connect the DMP to the mains supply with the mains cable provided.
- The power pack for the DMP amplifier is designed for 230 V or 115 V connection. Adaptation to the existing mains supply voltage is automatic.
- Switch on the DMP with the POWER button on the front panel of the amplifier (after some 10 seconds the opening display appears).

The DMP is initialised and the components present are detected.

In no transducer is connected, an overflow is displayed!
After the opening display has appeared, a standard measured value display of the ”1 value” type appears (factory set-up). When you press the SET shift key you access the set-up mode, where you can configure the channels, amplifiers, display, print options and system.

3 Choosing dialog language

We recommend that you only set up the dialog language of you want to use a language other than English.



D Functions and symbols on the DMP

1 Control elements on the DMP40

Channel selection keys
They select the active channel

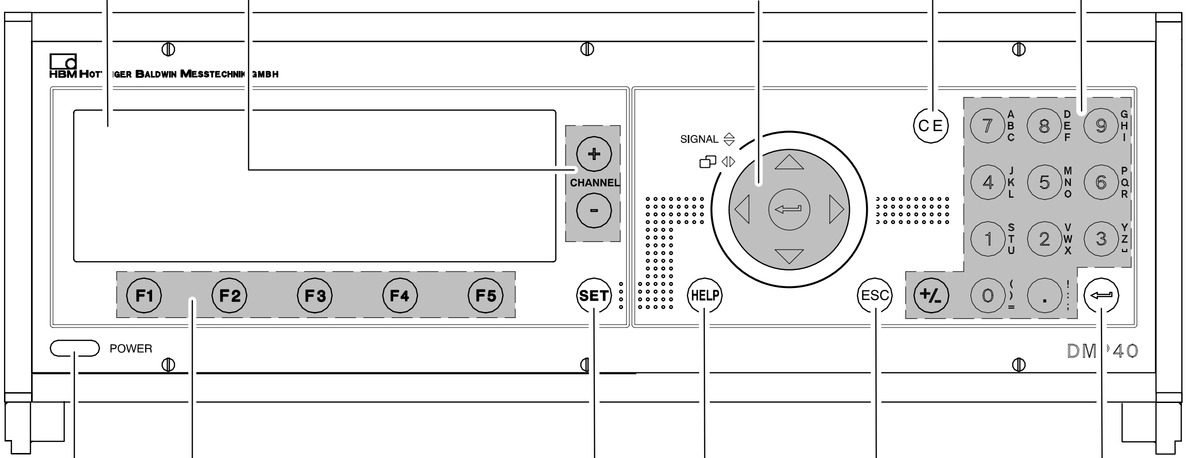
Cursor keys and confirmation key ( )

Measuring mode:	Signal selection (absolute, gross, net)
	Display mode selection (single or multi-channel)
Set-up mode:	Moves you to the selection and setup menus

Clear key
Clears the whole of the entry in the edit fields

Alphanumeric keypad
For inputting figures, letters or special characters in the displayed edit fields

Display



Power switch

Function keys
Have an effect in measuring mode and set-up mode; freely assignable for measuring mode

Shift key
Switches between measuring mode and set-up mode.

Help key
Activates online help for the active functions.

Confirmation key
Enables the settings you have entered

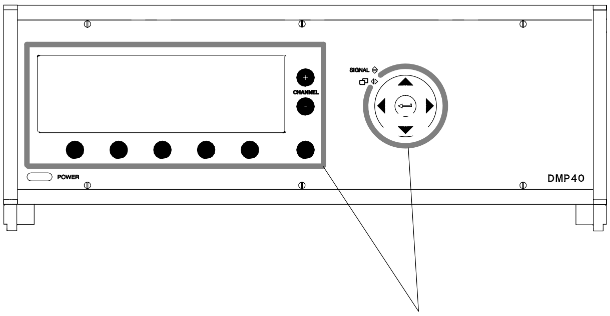
Cancel key
Resets last entry in menus or selection boxes and closes help texts.

You adjust all the settings for your DMP amplifier with the control keys on the front panel. Not all keys have an effect in both operating modes (measuring mode/set-up mode).

Keys inside a green border (on the front panel) affect the current display in measuring mode. Function keys F1...F5 also work in set-up mode, but they have a different effect.

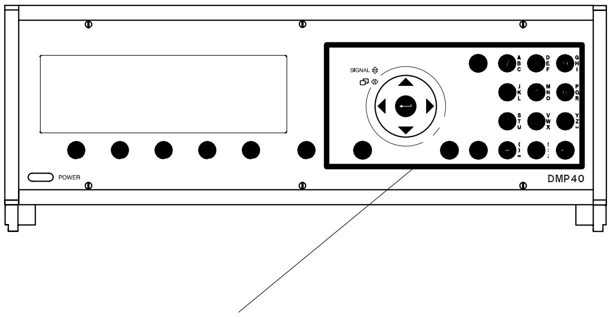
Keys with a black border are those that only work in set-up mode (other than the cursor keys). The (SET) key has a special purpose. Pressing this shift key takes you from one operating mode to the other, i.e. from measuring mode to set-up mode and vice-versa.

Control keys for measuring mode



Green border

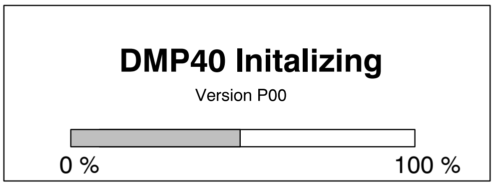
Control keys for set-up mode



Black border

2 Display

2.1 The first display



After switching on the mains supply (after about 10 seconds) the initializing of the DMP40 is shown on the display by a horizontal bar. You are also given information on the current software version.
After the opening display has appeared, a standard measured value display of the ”1 value” display format appears (factory set-up). By pressing the shift key SET you shift to set-up, where you can configure the system, the display, the amplifier, print options and the channel settings. Firstly, we recommend you set up the language, if you want something other than German (see chapter 3).

2.2 Display in measuring mode

In the factory, three display formats (Screen No.1 ... Screen No.3) are defined, which you can call up one after another with the cursor keys:

Screen No. 1: 1 measured value is displayed
Header with range, excitation voltage, channel name
Status line is switched on

Screen No. 2: 1 measured value is displayed
Header with minimum/maximum display
Status line is switched on

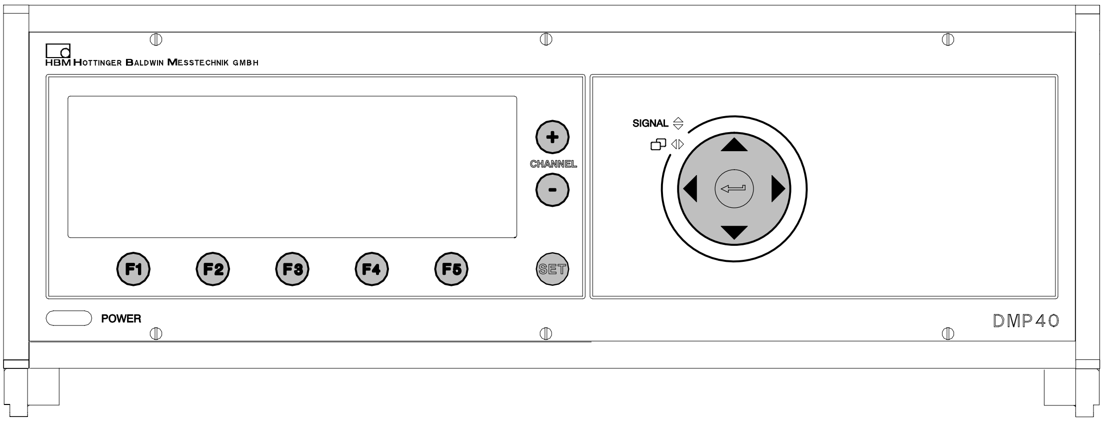
Screen No. 3: 2 values are displayed
Channel names are displayed
Status line is switched on

On changing the display format, the screen number is briefly shown in the status line.

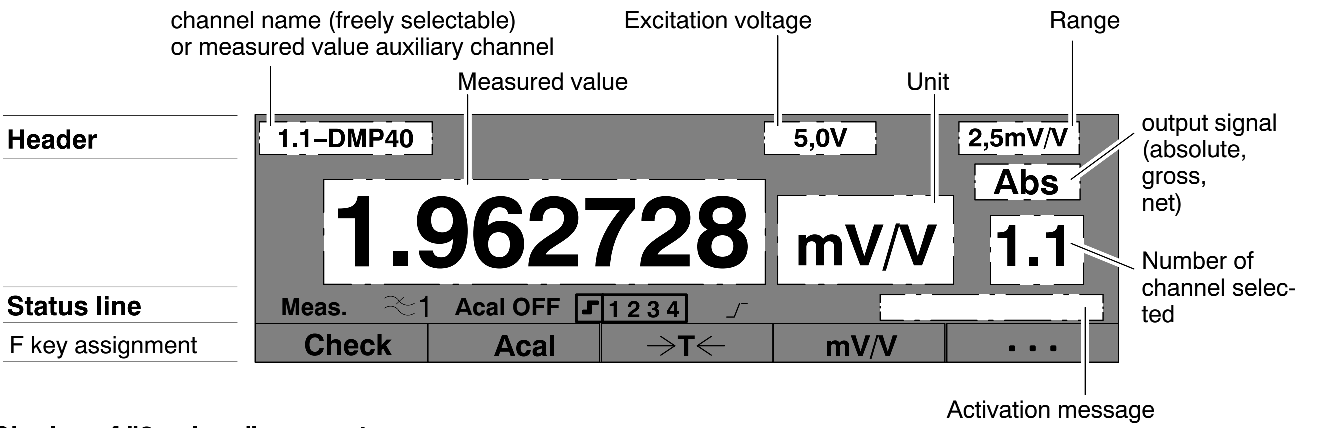
You can define up to ten display formats and allocate a ”Screen number”. Setting the display format options is covered in detail in Chapter 2.4, Page E-27.

Which keys affect the display?
With

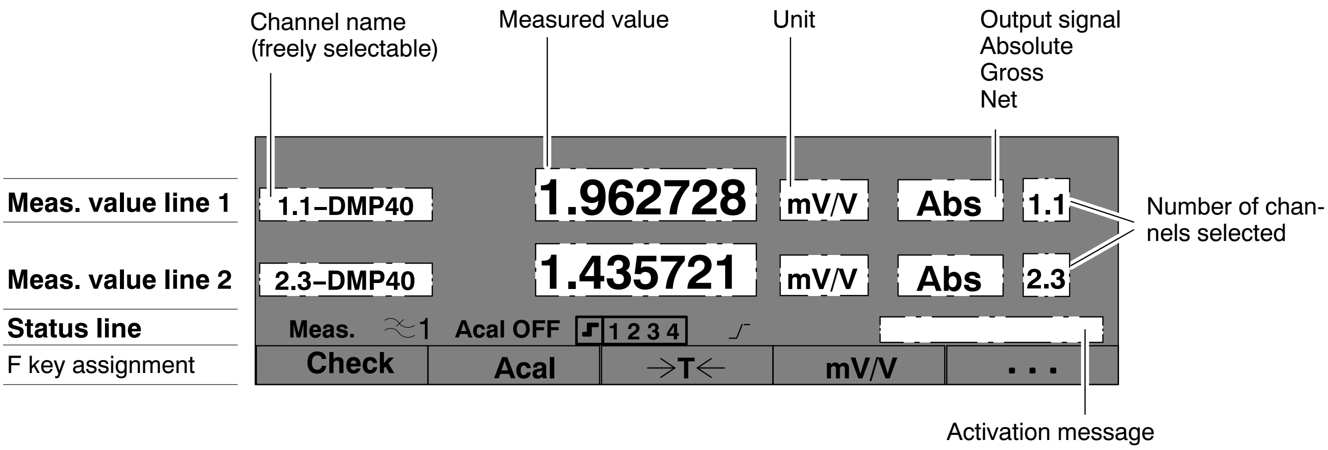
- Cursor keys retrieve the stored display format; symbol .
- Cursor keys change the signal type (gross, net, absolute); symbol SIGNAL .
- Channel selection keys CHANNEL select the required channel.
- Shift key SET change from measuring mode to set-up mode and vice-versa.
- Function key F1 – F5 trigger the assigned function (e.g. tare, calibrate, etc.). Function key F4 as set up in the factory switches between the unscaled value (Abs; mV/V) and the scaling in the physical unit.



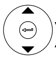
Display of screen type ”1 measured value”



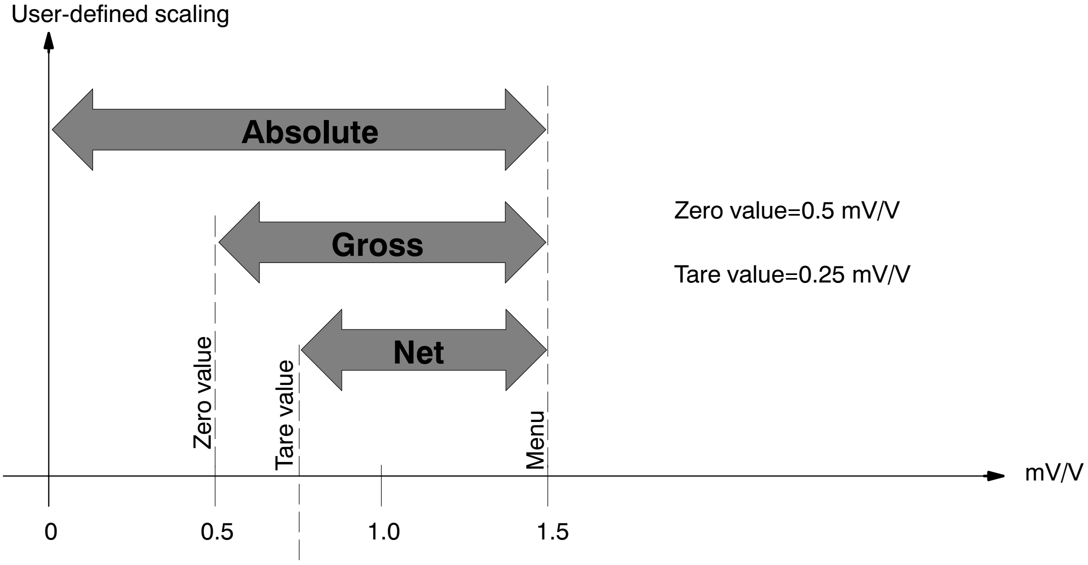
Display of ”2 values” screen type



Signal type in the display

In the factory set-up, you can display the absolute, gross and net signal for each channel one after another (cursor keys ).

Example:

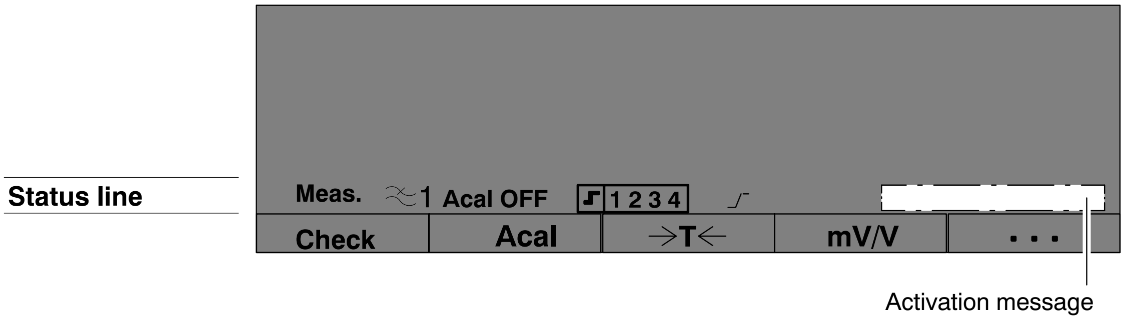


For this example, the following values appear in the display:

Absolute	1.5 mV/V
Gross	1.0 mV/V
Net	0.75 mV/V

Status line

The status line keeps you informed of the current status of the measuring amplifier:



Measure,
Zero,
Calibrate status of amplifier input (”Control” function key)

≈1 Filter selected (”Filter” function key)

Acal ON Automatic calibration On/Off (”Acal” function key)

1 2 3 4 Status of limit value switch. If the set ”on value” of a limit value switch is exceeded, the switch number will be shown on the display with a white background.
Example: On value of limit value switch 1 is exceeded **1 2 3 4**

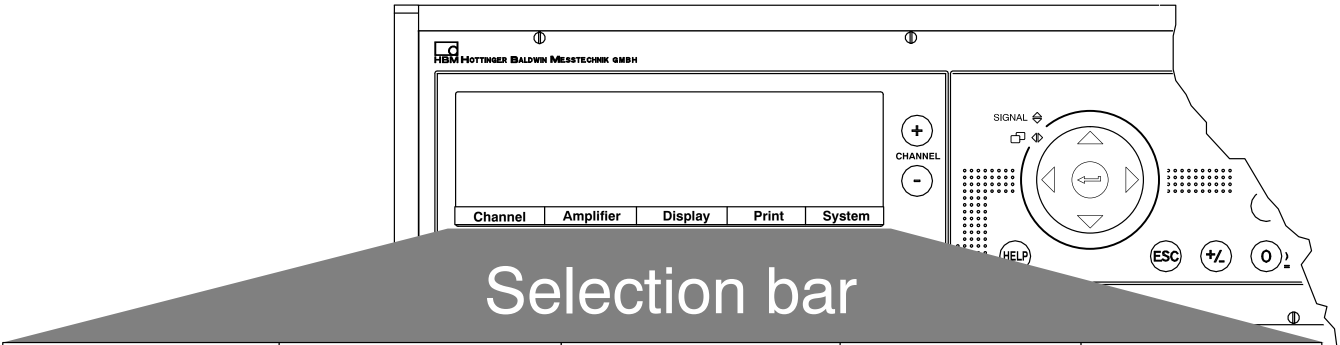
Low pass filter is in the transient phase. In this state, the displayed value is not valid!

In this field, activation or status messages (e.g. clr min/max(clear peak values), calibrate, ...) appear briefly

3 Set-up mode

After switching the DMP amplifier on, ”measurement mode” is always selected. By pressing the shift key, SET you switch into set-up mode and the selection bar appears at the bottom of the display. The setup facilities of the DMP amplifier are summarized according to function in the selection bar.

Display in set-up mode

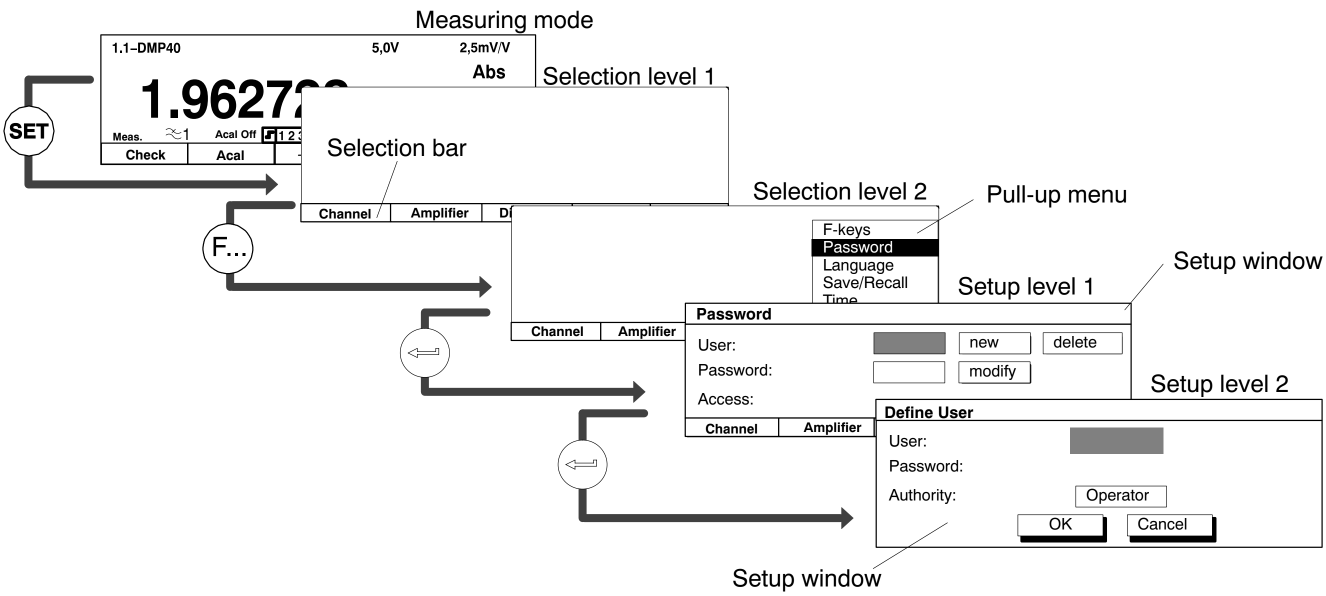


Channel	Amplifier	Display	Print	System
Range **Scal./Linear** **Zero/Tare** **Filter** **Min/Max Store** **Limit values** **Copy**	**Excitation voltage** **Channel select** **Remote contacts**	**Display**	**Screens** **Parameters**	**F-keys** **Password** **Language** **Save/Recall** **Time** **Version**
Settings relating to channels for adaptation of the transducer.	amplifier set-ups	User-oriented settings on the display, such as, for example preferred display of measured values, channel/signal selection, activation of header or status line	Print options	System-related settings, which are mostly undertaken when first put into operation or on starting a new measurement job.

Switch to the setup dialogue, by pressing the shift key (SET). A selection bar appears at the bottom of the display and the function keys underneath it (F1 to F5) are assigned to the various selections (selection level 1).
You can setup your DMP amplifier in different menus which you call up using the selection bar. Depending on the function, you can call in up to 4 menu levels (selection and setup levels). In the first two level you select topics. You are in **Selection levels.** In the next levels, you set specific values or switch functions on and off. You are now in **Setup levels**.

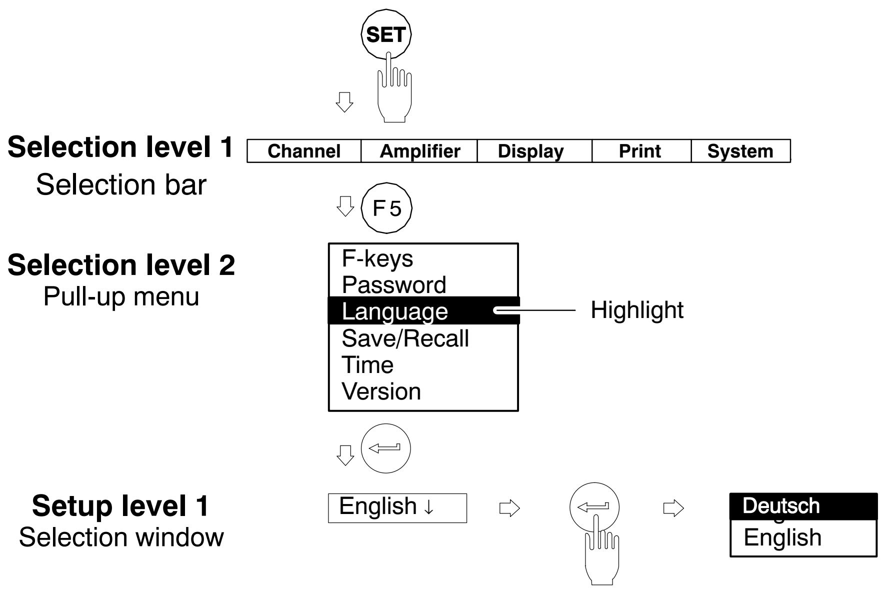
Using the help key, (HELP) you can call up information in any level on selected subjects.

Example: System password setup



3.1 Setup window

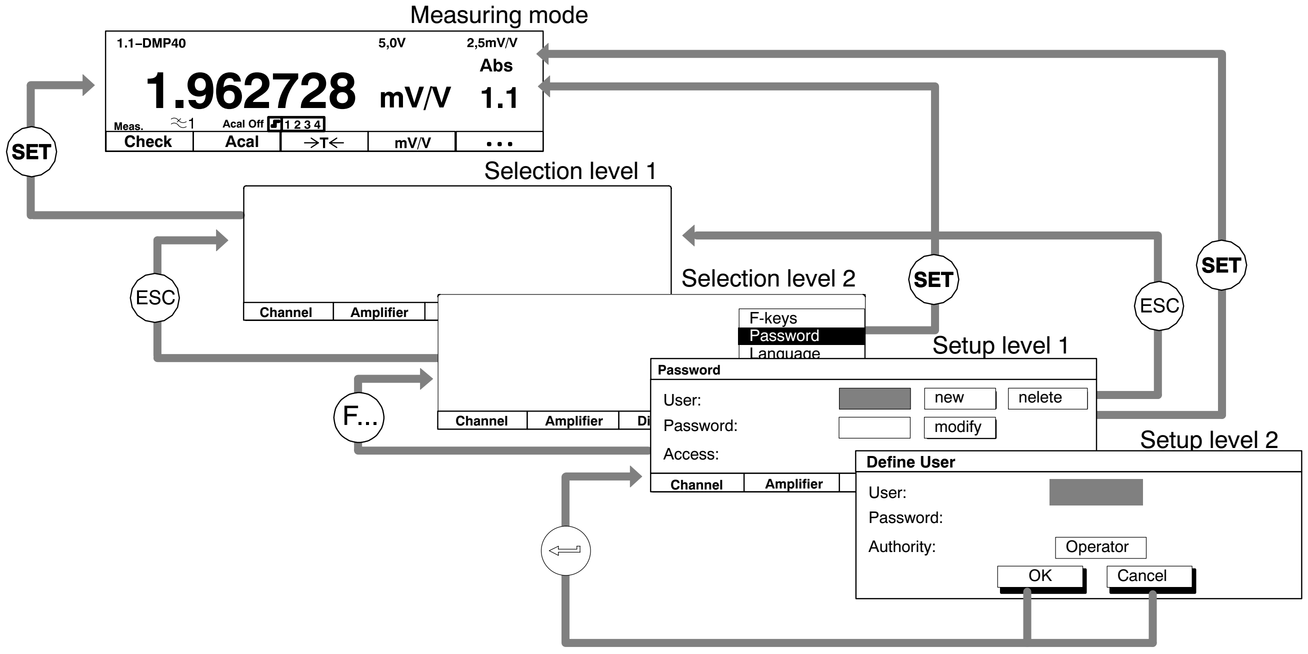
The starting point is measuring mode. Press the shift key (SET). At first, only the selection bar appears. If you now press one of the function keys F1 – F5, the relevant pull-up menu appears above the appropriate subject (in this example ”System”). In the pull-up menu, move the highlight using the cursor keys or the function keys (F...) to the subject required (here ”Language”) and press the confirm key. You are now in the selected subject. The current setup window can lead to other setup levels.

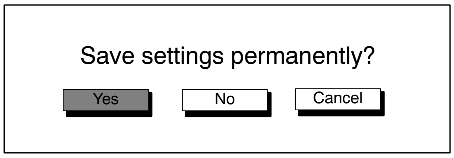


3.2 Quit setup window

If you want to quit a setup level again, press

the shift key SET	Result: Return to measuring mode
or one of the function keys F1 – F5	Result: Return to selection level 2
or (if present) the key symbol Cancel or OK	Result: Return to the previous setup level

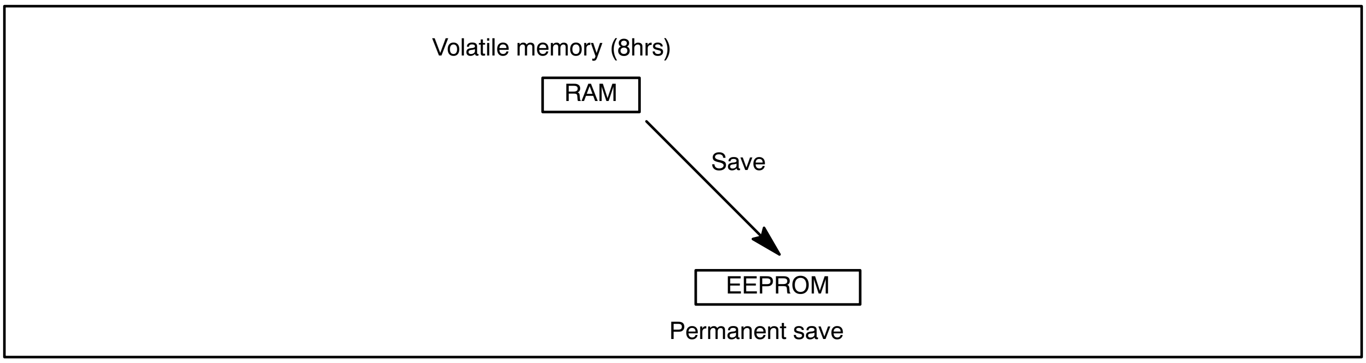




Before you quit a menu window and return to measuring mode, you always have the option of saving or not saving the settings you have made or interrupting quit dialogue window. For this purpose, a security prompt is displayed alongside.

”Yes” is suggested here by the factory set-up. Confirm with .

All settings, which you made before the security prompt are stored temporarily in the RAM as soon as you have made a change and confirmed with . Data is saved permanently, as soon as you confirm with ”Yes” at the security prompt on quitting set-up mode.



3.3 Selection menus

In the first two selection levels, you select subjects. In the first level (menu bar) by pressing the relevant function key (F...), in the second level by selecting from the pull-up menu with the cursor keys or by repeatedly pressing the function keys (F...).

- Making selections from the **selection bar**

Example:

Channel	Amplifier	Display	Print	System

(F2)

The pull-up menu appears after pressing the function key.

- Selecting and confirming in the **pull-up menu**

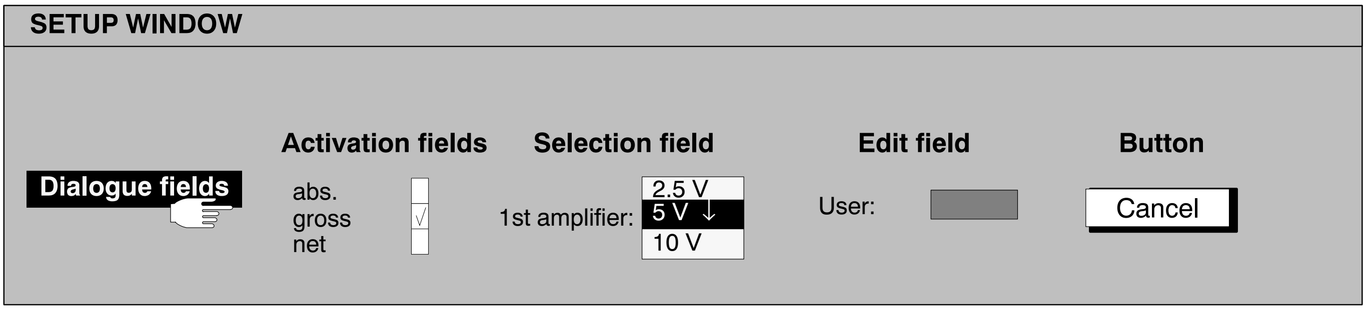
Example:

F-keys
Password
Language
Save/Recall
Time
Version

The field selected is displayed inversely. Confirm your selection with . Pull-up menus can be scrolled, i.e. having gone right through the menu, you return to the first selection again. The item last selected with the highlight is saved.

3.4 Setup window

Enter the parameters with the **setup window** in the setup level. Located in the setup windows are **dialogue fields**, which can be split up into four different types.



- Switching on or off in **activation fields**

Example: abs. √
gross √
net √

The field selected is displayed inversely. Confirm your selection with . A tick appears in the box selected (”activated”). If the confirm key is pressed again, activation is restored.

- Opening and selecting in **selection boxes**

Example: 1st amplifier: 5 V ↓

1st amplifier: 2.5 V
5 V ↓
10 V

The field selected is displayed inversely. After pressing the confirm key, the selection field opens up. Using the cursor keys select and confirm your setting with . In the documentation (not on the display), such fields are indicated by downward pointing arrows↓ .

- **Edit fields**

You can enter numbers or letters in edit fields. In some edit fields, you can only enter numbers (e.g. zero value), because it would not make sense to enter letters here.

Example: *a) Edit field **with no** content* User:

The field selected is displayed inversely. Confirm your entries with .

Example: *b) Edit field **with** content* Zero point: 0.000

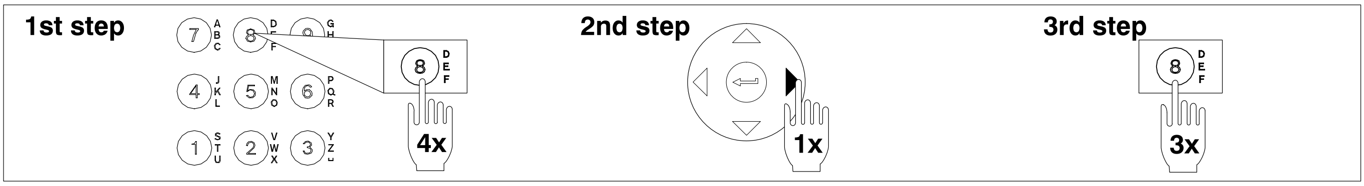
You can
- directly overwrite,
- partially edit
- completely delete with the delete key CE

an edit field with content.

Inputting numbers and letters

The keys of the alphanumeric input field are assigned 7 times: 1 number, 3 upper case letters, 3 lower case letters. The first time you press a key, a number appears, then when pressed again letters follow.

When entering consecutive letters that are on the same key, you must press the cursor key ▶ between the letters. Example for the letter sequence **"FE"**:



The minus sign of the key +/_ can also be used as a separator in text fields.

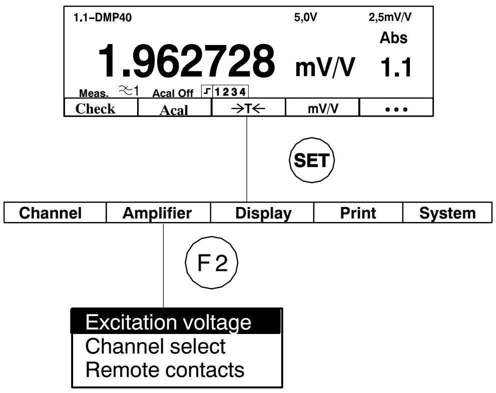
- **Buttons**

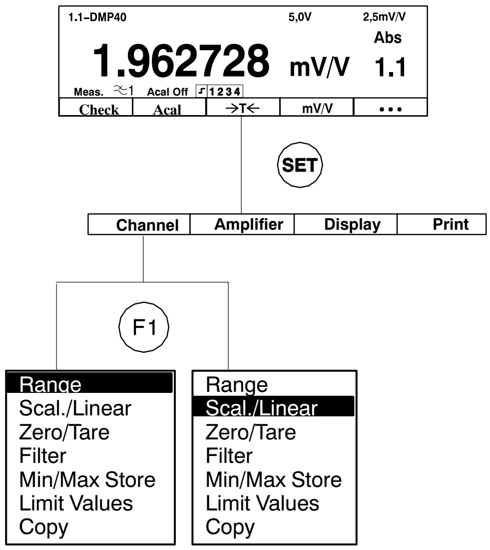
Example: Cancel *or* change...

The field selected is displayed inversely. Confirm with . Three dots (change ...) follow the button designation which appear after confirming another setup window.

E Setting up the DMP

1 Setting up the amplifier





After the opening display has appeared, a standard measured value display of the ”1 value” display format appears (factory set-up). By pressing the shift key SET you shift to set-up, where you can configure the system, the display, the amplifier, print options and the channel settings. Firstly, we recommend you set up the language, if you want something other than German (see chapter 3).

1 Use shift key SET to choose set-up mode

2 If necessary: in the system settings, set up the language you require for menus (see E-47 System → Language)

3 Setting up the amplifier:

➧Excitation voltage

4 Measuring point parameters:

➧Range

➧Unit

➧Zero point and full-scale value (Scal./Linear)

Simple measurements can now be carried out. You can press shift key SET to return to measuring mode, or press 5 to continue.

5 Setting up auxiliary functions (if necessary)

➧Filter

➧Limit values, Min/Max Store

➧Remote control contacts, etc.

➧Setting up display formats

6 System settings

7 Press shift key SET and return to measuring mode

Example:
The transducer is a load cell with the following rated data:
Nominal load: 50 kg
Sensitivity: 2 mV/V

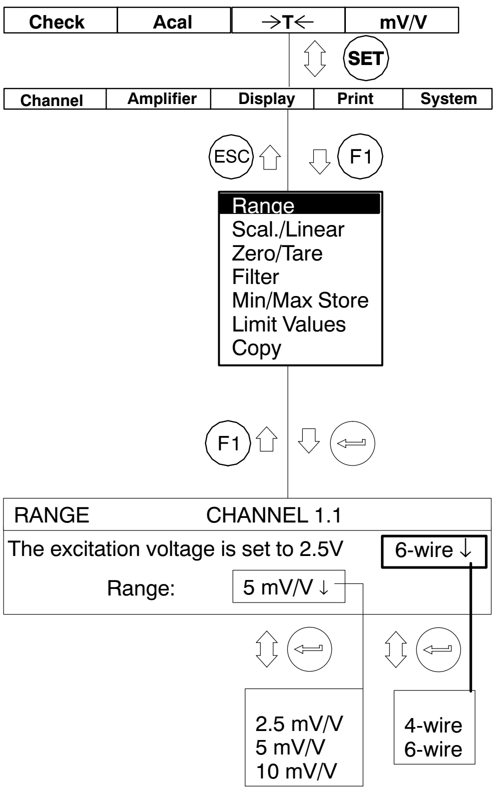
1. Use the measuring point selection keys + CHANNEL - to choose the measuring point you require.
2. Use the shift key SET to change to set-up mode.
3. Press function key F2 "Amplifier" and use to select "Excitation voltage". Press to open the selection box.
4. Select 5V from the selection box and confirm with .
5. Use F1 to change to the "Channel" pop-up menu.
6. Press the confirmation key to open the "Range" setup window.
7. Press the confirmation key to open the "Range:" selection box.
8. Select 2.5mV/V from the selection box and confirm with .
9. Use F1 to change to the "Channel" pop-up menu.

10. Select ”Scal./Linear” with the cursor key and confirm with .
11. Enter the following into the edit fields:

SCALING/LINEARIZATION	CHANNEL 1.1		
Step:	1	1	Save
Num.precision:	3	3	Restore
	kg	mV/V	
1st pt.	0.000	0.000	measure
2nd pt.	50.000...	2.000	measure

12. Select Save with the cursor keys and confirm with to enable the settings.
13. Use the shift key SET to change to measuring mode.
14. Confirm the security prompt with .

1.1 Measuring range



The choice of measuring range is dependent on the excitation voltage selected.

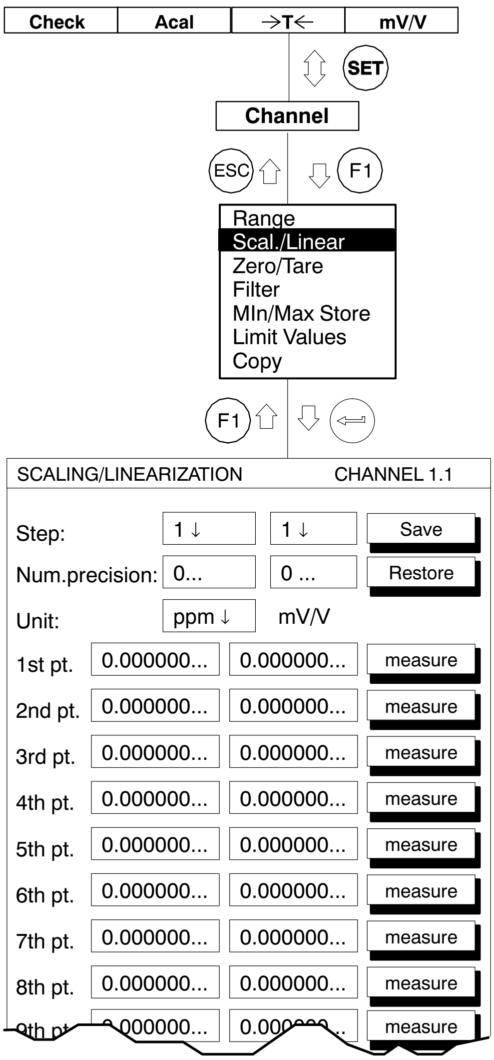
Excitation voltage (V)	2.5	5*)	10
Selectable range (mV/V)	2,5 5 10	2,5 5	2,5*)

*) Factory settings

Notes:

- The maximum accuracy specified in the Technical Data is only reached with the settings: Excitation voltage=10 V and Range=2.5 mV/V.

1.2 Scaling and linearization



You can assign two values to each function in this setup window (with the exception of the unit). The value on the left refers to user-defined scaling, and the one on the right refers to scaling in mV/V. With the "measure" button you adopt only values in mV/V (right-hand edit field).

Save — Saves all changes immediately.

Restore — Resets changes and adopts the values from the last Scal/Lin. points.

measure — Accepts the instantaneous measured value (in mV/V) into the edit field.

Step

Step lets you define the display step size. The step width refers to the last decimal place.

Example: End value 20 kg

Decimal places 1 (20.0 kg)

Step 1 means the display is in steps of 100 g

Step 5 means the display is in steps of 500 g

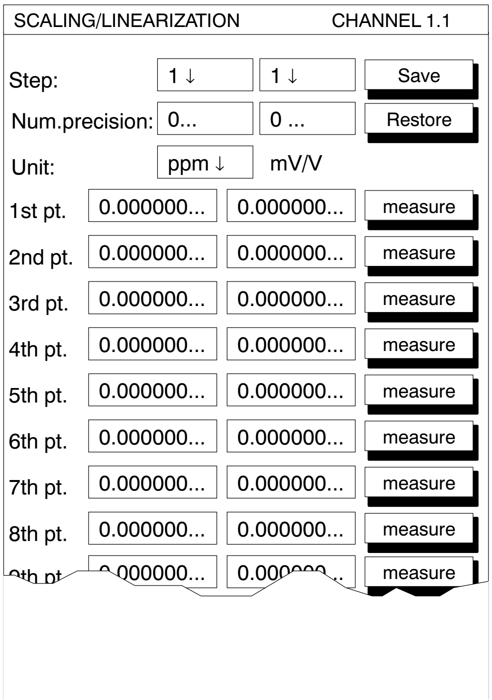
Decimal places 3 (20.000 kg)

Step 1 means the display is in steps of 1 g

Step 5 means the display is in steps of 5 g

Num.precision

Number of decimal places in the display.



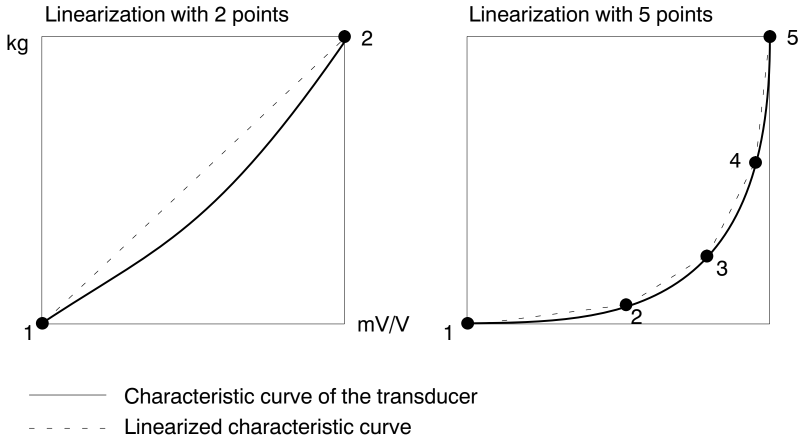
Unit

Required unit in the display (e.g. ppm).

1st pt. ... 11th pt.

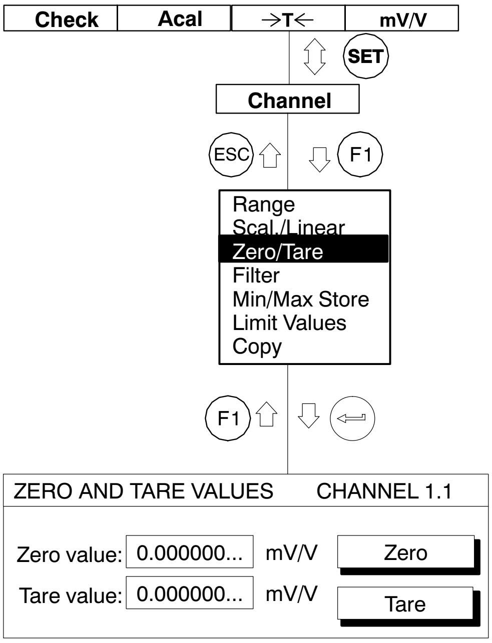
The edit field ”1st pt. to 11th pt.” is used for the linearization of a transducer curve.

Display errors arising from a non-linear characteristic curve can be compensated by this means. Basically, when the characteristic curves are sharply non-linear, more points must be provided on the curve in order to ensure shorter straight-line sections.



Enter the points of the curve in ascending order (in the mathematically positive direction).

1.3 Setting zero/taring



Zero value
Edit field for the zero value.

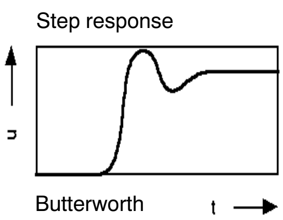
Tare value
Edit field for the tare value..

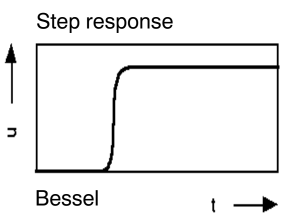
Zero — Transfers the instantaneous measured zero value (in mV/V) into the edit field.

Tare — Transfers the instantaneous measured tare value (in mV/V) into the edit field.

The concepts ”zero value” and ”tare value” are explained in chapter 2.2, page D-9 with an example.

1.4 Low pass filter





Low pass filters are used to suppress undesirable high-frequency interference above a certain cutoff frequency.

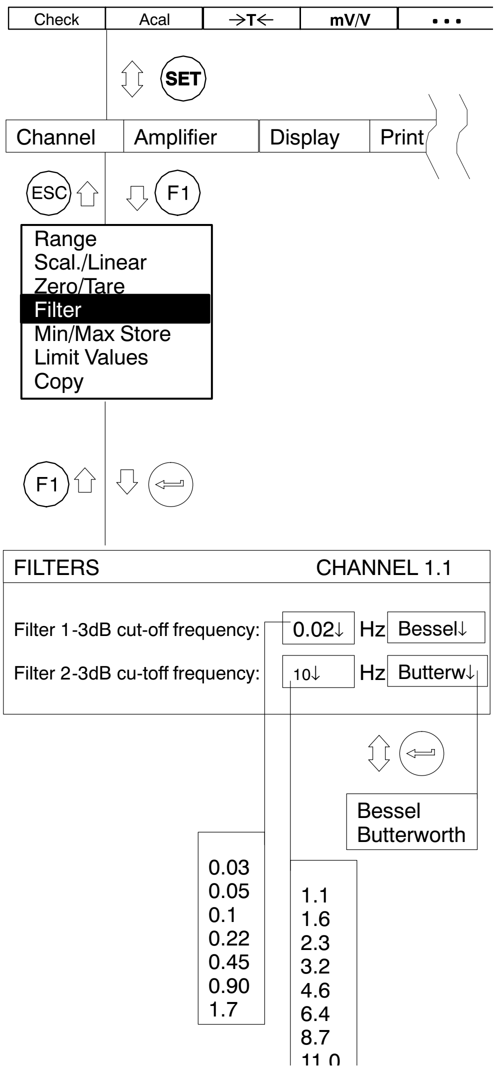
Two different cutoff frequencies are provided for a channel, and you can use whichever you choose (f_{c1}, f_{c2}). You can set up the cut-off frequencies at specified levels.

Amplitude response, transit time and step response are dependent on the filter characteristics. You can choose between the Butterworth characteristic and the Bessel characteristic.

The Butterworth characteristic exhibits a linear amplitude response which falls away steeply above the cut-off frequency. An overshoot of some 10 % occurs.

The Bessel characteristic exhibits a step response with very little (<1 %) or no overshoot. The amplitude response falls away less steeply.

Each amplifier has two defaults (Lowpass 1, Lowpass 2), and only one filter is active.



The following example explains the settings:

Weights are to be determined with a balance. The balance consists of a platform which tends to vibrate at 12 Hz. Disturing frequencies higher than 11 Hz are to be filtered out.

1. Use shift key SET to change to set-up mode.
2. Press F1 .
3. Make your choice from the ”Filter” pull-up menu and press to confirm.
4. Choose ”Butterworth” from the ”Filter 1” selection box and press to confirm.
5. Choose ”11.0 Hz” from the ”Filter 1” selection box and press to confirm.
6. When you want to return to measuring mode, press shift key SET and confirm the security prompt with .

1.4.1 Switching filters

You can switch between the preset filters:

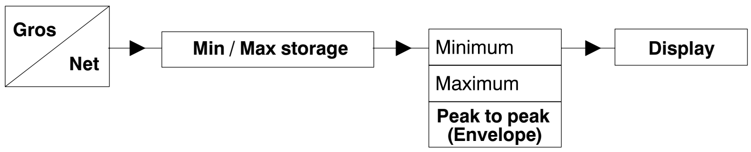
- In measuring mode via the function key (factory set-up F3, 2nd level).
- Via the remote control contacts, when remote control is on.
- With the command ”AFS” (Computer control, Part 2).

1.5 Min / Max store

You can use the 'Min/Max' function to record and save individually occurring signal peaks and minimum/maximum signal amplitudes. Each amplifier contains **two** Min / Max stores.

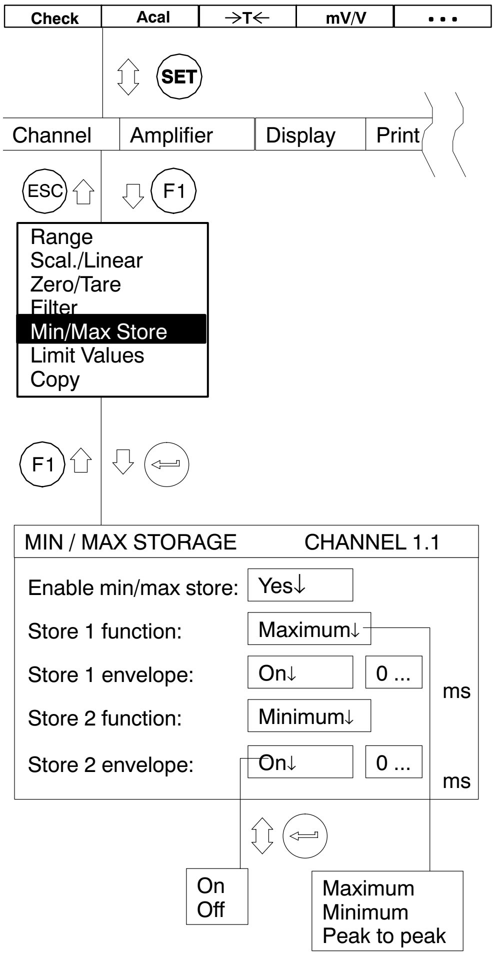
With these you can save:

maxima
minima or
peak-to-peak amplitudes



In the case of rapid dynamic signals, you must take into account that peak values are defined in the time slot of the currently selected filter (1.2 Hz – 75 Hz).

1.5.1 Deactivate / delete Min/Max store



In the factory setup, min/max stores are active (Enable min/max store ”Yes”).

Deactivate Min/Max storage

1. Use the shift key (SET) to change to set-up mode.
2. Press (F1) .
3. Make your selection from the ”Min/Max Store” pull-up menu and press (⟵) to confirm.
4. Select ”Enable min/max store” ”No” from the selection field and press (⟵) to confirm.
5. Use the function key (F1) to return to the pull-up menu or use the shift key (SET) to switch to measuring mode.

To save space, min/max stores are abbreviated to Store1 and Store2 in other setup windows.

Clear Min / Max store
You have three options for clearing the min/max store:

1. Using a function key (factory set-up (F4),/2nd level).
2. Using remote contacts CPV1/CPV2, if the device is set up for remote control.
3. Using a computer with the command ”CPV”.

1.5.2 Controlling Min / Max storage

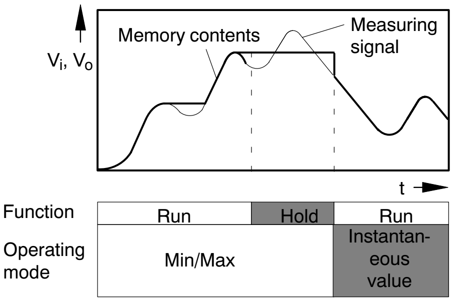
Two remote contacts have an influence on min/max storage:

CPV: is used for deleting the min/max store

HLD: freezes the current content of the store or releases it

You can carry out other functions with these remote control elements, such as, for example, storing the instantaneous value.

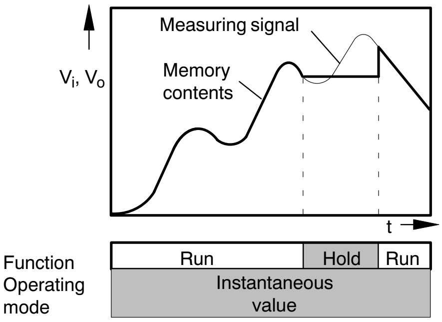
1.5.3 ”Peak value” operating mode



In ”Peak value” operating mode, you can save the minimum value, the maximum value or the peak-to-peak value (”Run” function). With the ”Hold” function you can hold the contents of the store:

Function	CPV control circuit Peak/instantaneous value Store1 =AP42, Pin 4 Store2=AP42, Pin 18	HLD control circuit Run/Hold Store1=AP42, Pin 5 Store2=AP42, Pin 19
Min/Max: Memory running in selected direction with	**24 V**	**0 V**
Freeze value	**any**	**24 V**

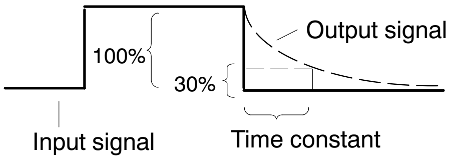
1.5.4 ”Instantaneous value” operating mode

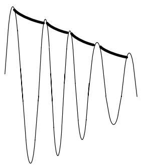


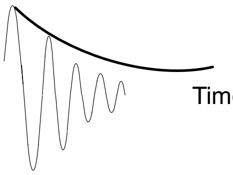
In ”Instantaneous value” operating mode, the store is continuously updated (”Run” function). With the ”Hold” function you can hold the contents of the store: You switch the min/max store to instantaneous value operating mode using the remote contacts.

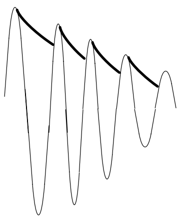
Function	Control circuit Peak/instantaneous value Store1 =AP42, Pin 4 Store2=AP42, Pin18	Control circuit Run/Hold Store1 =AP42, Pin 5 Store2=AP42, Pin 19
Instantaneous value: memory running in either direction with	**0 V**	**0 V**
Freeze value	**any**	**24 V**

1.5.5 Envelope operating mode



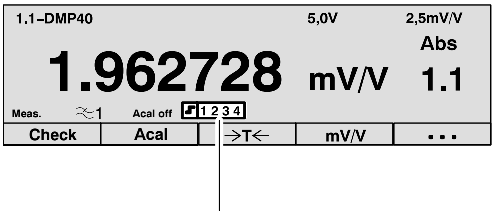

Time constant: OK


Time constant: too large


Time constant: too small

Min/max stores can also be used for displaying envelopes. The envelope function is particularly suitable for the measurement of amplitude modulated oscillations. By entering a time constant, you define how quickly the min/max store discharges to 30% of the peak value, if this is no longer present at the input to the store. The choice of time constant depends on the basic oscillation frequency f_0 and the modulation frequency. In general terms, you get usable envelopes with a time constant which is approximately 10 times the basic frequency period ($t= 10 / f_0$).

1.6 Limit values



Limit value display

For the assessment of mass or weight tolerances, or when monitoring forces, pressures, etc., it is often necessary to keep within certain planned or limit values. Each amplifier has four limit values available for this purpose (as delivered, these are switched on).

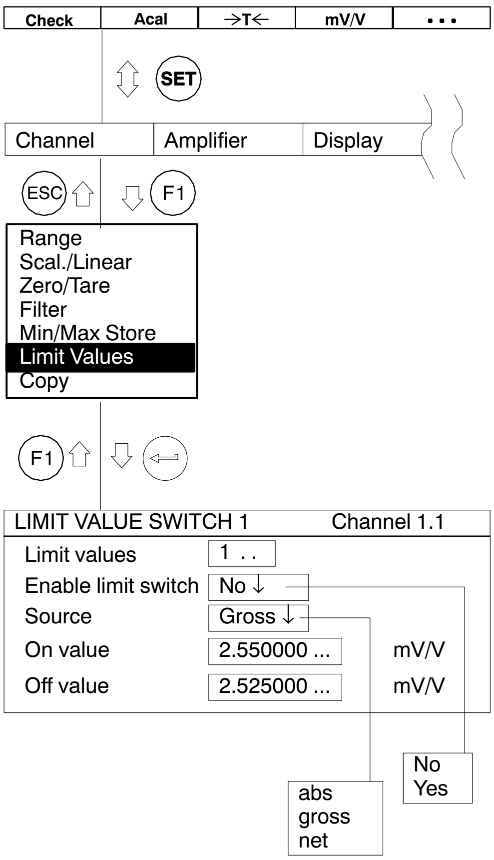
You can preset the limit-value monitoring level. You also select the operating direction and hysteresis. The hysteresis value prevents ”fluttering” of the limit-value switch when the switching threshold is reached. The hysteresis is derived from the difference between the on and off values.

Please note when working with limit values:

- The measuring signal must be present for at least 1ms. The measurement voltage delivered by the amplifier is compared internally with the reference voltage. If the measurement voltage reaches or exceeds the set reference voltage, it triggers the associated logic output.

The factory setting is a hysteresis of 1 % (limit values 1 and 2 below the On value, limit values 3 and 4 above the On value).

1.6.1 Deactivate limit value switches

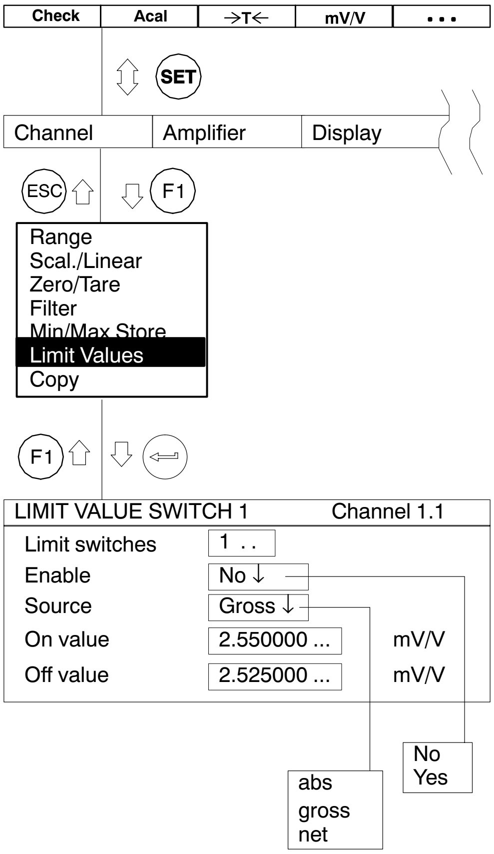


Limit values are enabled in the factory setting (Enable limit switch ”Yes”).

Deactivate limit value switches

1. Use the shift key SET to change to set-up mode.
2. Press function key F1 .
3. Make your choice from the ”Limit values” pull-up menu and press ↵ to confirm.
4. Choose ”No” from the ”Enable limit switch” selection box and press ↵ to confirm.
5. Use the function key F1 to return to the pull-up menu or use the shift key SET to change to measuring mode (confirm the security prompt with ↵).

1.6.2 Adjusting limit values



Setup window *Limit values*

You must select this setup window on every occasion before activating the limit value switches (Enable limit switch).

- *Limit values*

  Number of the limit value switch (1...4)

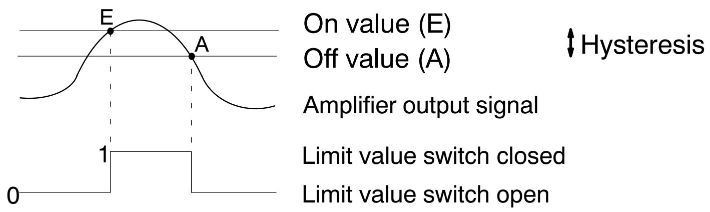
  To select the required limit value switches, enter the number (1...4) and confirm with or use the cursor keys .

- *Enable (limit switch)*
  Switches limit-value monitoring on or off

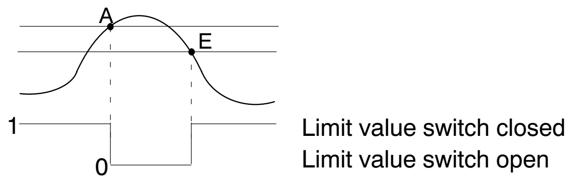
- *Source*
  Selects the signal source that you want to monitor (absolute/gross/net/)

- *On and off values*
  Inputting the operate value

a) Switches when the on value is exceeded (E>A)



b) Switches on dropping below the on value (E<A)



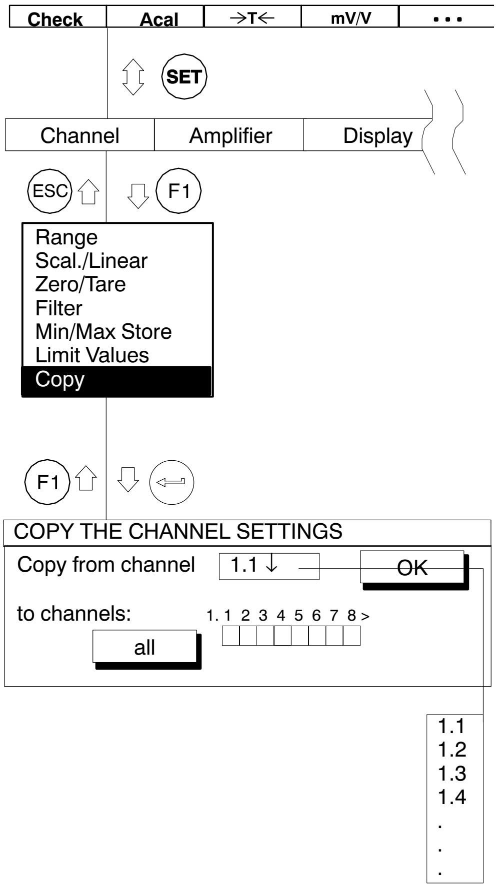
All enabled limit value switches are displayed on the status line.

Example: Limit value switches 1 and 2 enabled

If the On value set for a limit value switch is exceeded, the switch number is highlighted in white on the display.

Example: On value for limit value switch 1 is exceeded

1.7 Copy



You can use the ”Copy” function to send the settings for one channel to other channels.

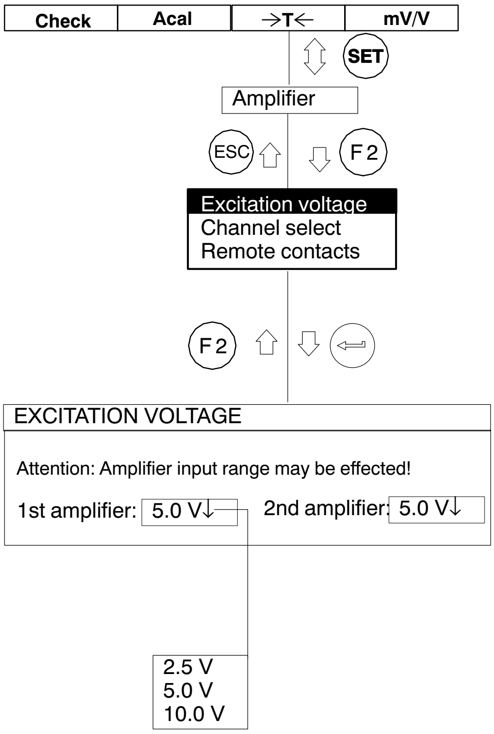
1. Use the shift key (SET) to change to set-up mode.
2. Press function key (F1) .
3. Make your choice from the ”Copy” pull-up menu and press (⟵) to confirm.

You are now in the setup window ”COPY THE CHANNEL SETTINGS”.

4. Press (⟵) , select the required channel number with (⊖) and press (⟵) to confirm.
5. Use (⊖) to select the key symbol ”All” or select from check boxes 1...8 those channels (✓), deren) whose settings are to be overwritten. Confirm with (⟵) .
6. Use (⊖) to select the ”OK” button and confirm with (⟵) .

2 Amplifier settings

2.1 Excitation voltage



The chosen excitation voltage can restrict the choice of measuring range.

Excitation voltage (V)	2.5	5*)	10
Selectable range (mV/V)	2.5 5 10	2.5 5	2.5*)

*) Factory set-up

Note:

The maximum accuracy specified in the Technical Data is only reached with the settings: excitation voltage=10 V and range=2.5 mV/V.

2.2 Selecting a channel

In the "Channel select" setup window, you can enable or disable up to 16 channels (DMP40S2 only; otherwise 8 channels) and specify a name of your choice for each channel (max. 10 characters).

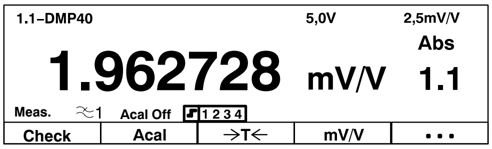
In the factory set-up, the first digit represents the amplifier and the second digit the channel (2.3 = amplifier 2, channel 3).

2.3 Remote control contacts

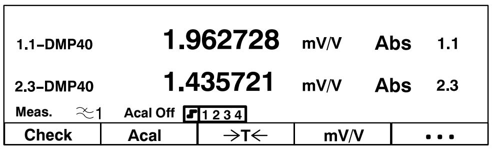
The OUTPUT jack on the AP42 connection board (back of device) has eight remote control contacts. They are used to initiate or switch on/off certain functions of the DMP amplifier by means of 24 V control signals (see also Chap. 4, page B-8). The remote control contacts are only active if remote control is ON (REMT). Assignment of the remotes can be freely chosen.

2.4 Display format

Type 1 value



Type 2 values



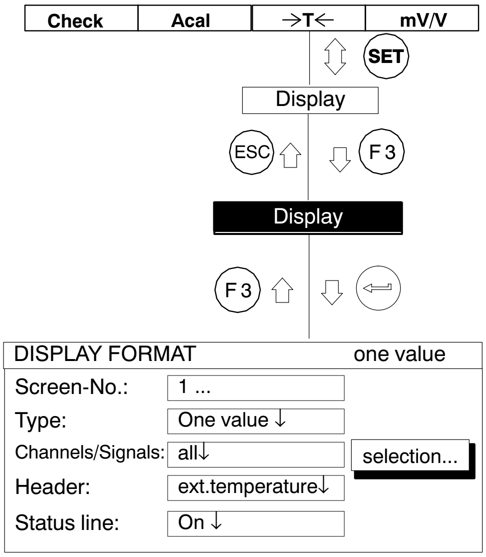
The settings in the setup window **Display format** affect the appearance of the signals you can select in the display. Basically you can choose between three different signals per amplifier (gross, net, absolute value).

The display status details illustrated left are known as screen types or simply **types**, and can be selected in the setup window.

Appearance

- 1 value (with/without status line; with/without header)
- 2 values (with/without status line)

2.4.1 Switching filters



1. Use the shift key (SET) to change to set-up mode.
2. Press (F 3).
3. Confirm with ENTER.

You are now in the ”Display format” setup window.

2.4.2 Setup window components

Screen-No.

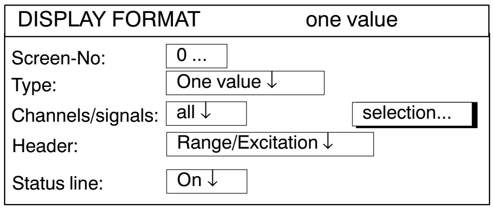
You can enter the figures 1...10 in this edit field. This lets you save your current display settings under a number or recall the factory presettings. You can also define the sequence in which the screen types are selected with the cursor keys in measuring mode.

Type

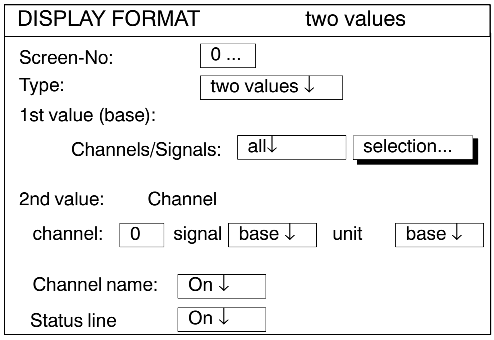
With the type you define the number of measuring signals (as a numerical value) that can appear simultaneously in the display.

The structure of the ”Display format” setup window depends on the screen type selected. The window mask differs depending on the selected screen type.

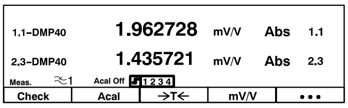
Window for type ”1 value”



Window for type ”2 values”



1st value
2nd value

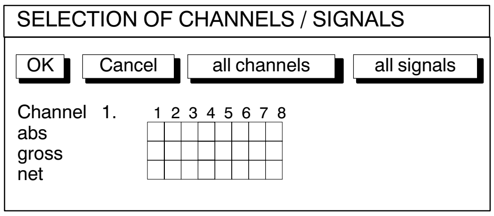


1st value (base)

This appears in first position in the display.

Channels/signals

Here you define which channels will appear with which signals in the display. You can define your settings for all channels or only for certain (selected) ones (button selection...). You can call a maximum of three signals per channel in sequence (absolute, gross, net).



Define...

This button opens a new setup window ***Selection of channels / signals.***

2nd value

It appears in second position in the display.

Channel

There are two ways to enter the channel number. The type of input determines how the system relates to the 1st value (base).

*Input **absolute** to base*: the value entered is identical to the channel number, e.g. ”1.5” . The measured value and the signal type are displayed regardless of the base.

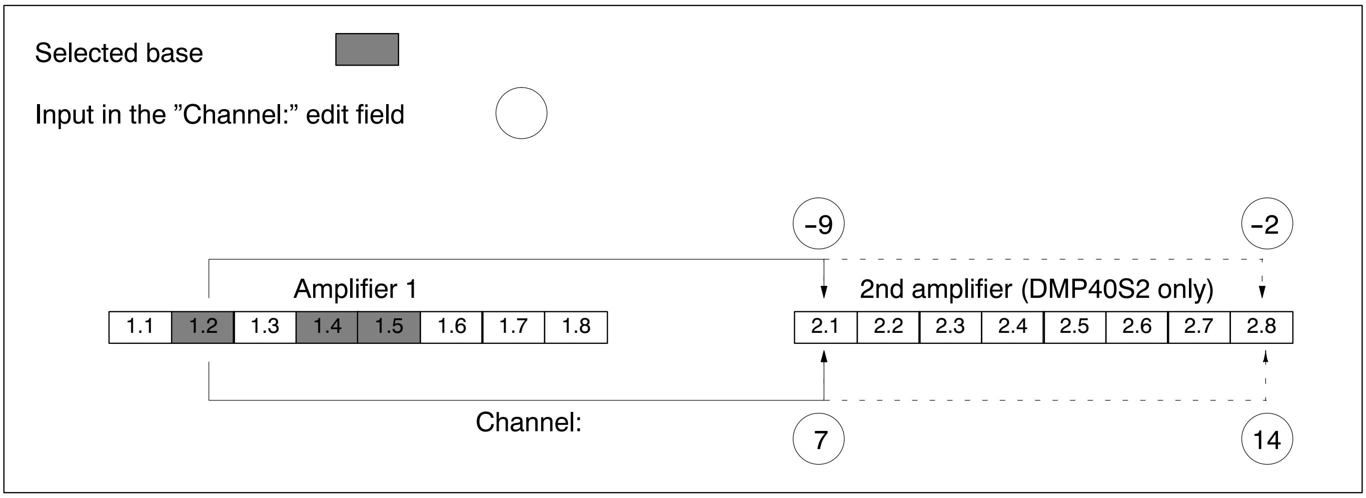
Input ***relative*** *to base*: the value entered relates to the base channel (1st value). Channels located to the left of the base channel are entered with a negative operating sign, and those to the right are entered with a positive operating sign.

Please note that it is **not** possible to display two channels **from the same** amplifier simultaneously. This means that the channel specified for the 2nd value is only accepted if the channel of the second amplifier (DMP40S2 only) or the base channel itself (relative=0) functions in response to it. If this is not the case, the second display line stays blank.

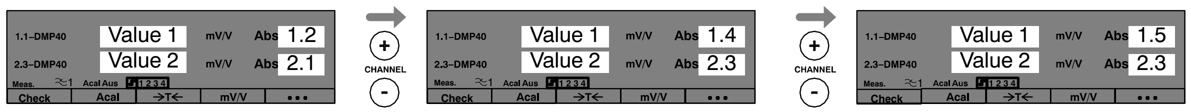
Example:

Channels 1.2, 1.3 and 1.4 have been defined as base values.

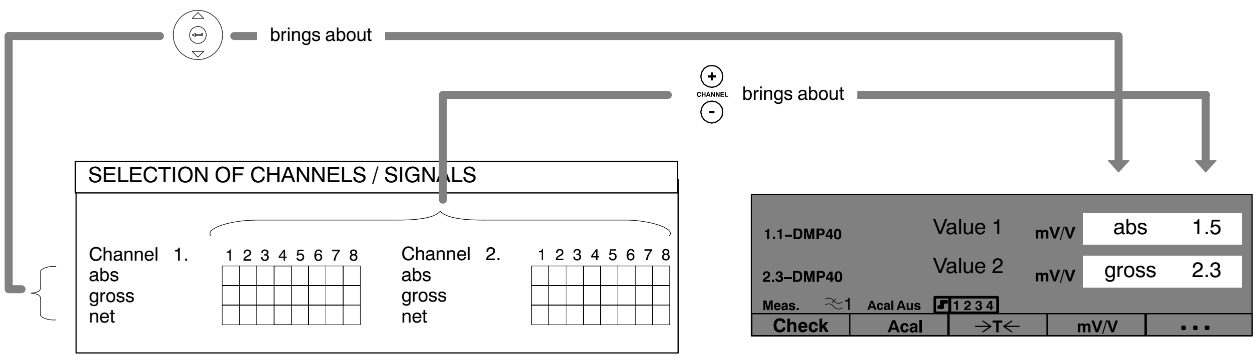
In order to display the channels of the second amplifier, it only makes sense to input the numbers −2 ...−9 and +7 ...+14 in the ”Display” edit field. The input was actually 7.



With the aid of the channel selection keys CHANNEL + / - all channels, starting from the base channel, are selected in sequence in measuring mode.



With the aid of the cursor keys (SIGNAL) all signals set up in the ”Selection of channel/signal” setup window that function **with the base value** are displayed in measuring mode.



Signal

Choice of signal type (absolute, gross, net). If you want the signal type to depend on the signal type of the base channel, choose Base, Base+1 or Base+2.

Base → signal type is identical to the signal type of the base channel.

Base+1 → is moved one position (to the right) in the sequence Absolute/Gross/Net in relation to the base signal.

Base+2 → is moved two positions in relation to the base signal

Example:

”Gross” has been chosen as the base signal.

Base+1 = Net

Base+2 = Absolute

Unit

The preferred unit of measure in the display. Besides ”mV/V” scaling and ”Udim” user-defined scaling, you can accept the unit of measure of the base (Base) or invert it (Toggle). Toggling means changing between base units, e.g. if the base unit is mV/V then the unit ”Scaled” is displayed for the second value and vice-versa.

Channel name

Fades the channel name in or out of the display.

Header (1 value)

Fades the header in or out of the display. In the header you have the option of displaying:

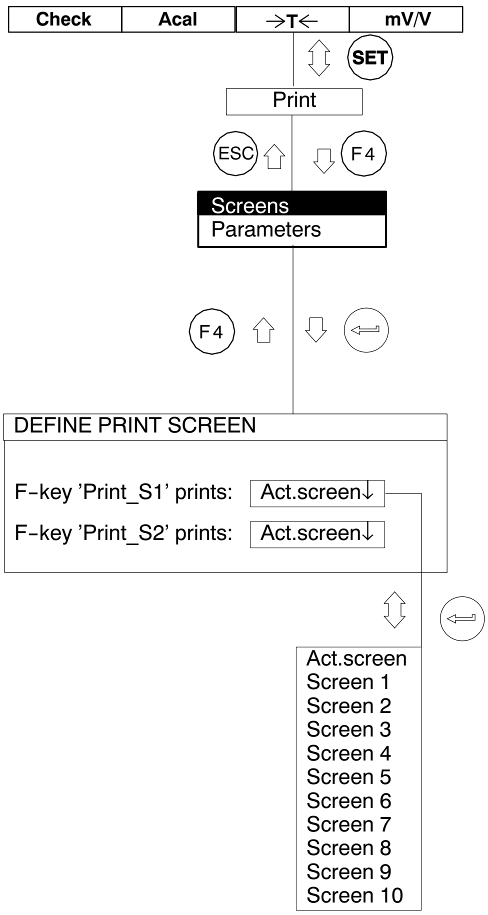
- Min/Max Store (Minimum/Maximum)
- Range and excitation voltage
- External voltage
- External resistance
- External temperature

Status line

Fades the status line in or out of the display. The details on the status line refer to the 1st value.

2.5 Print

2.5.1 Print screen



The settings in the setup window **Define print screen** define which screen types are to be printed.

For printing, you can assign two function keys to the "Print" function (see "System, F keys"; page E-37).

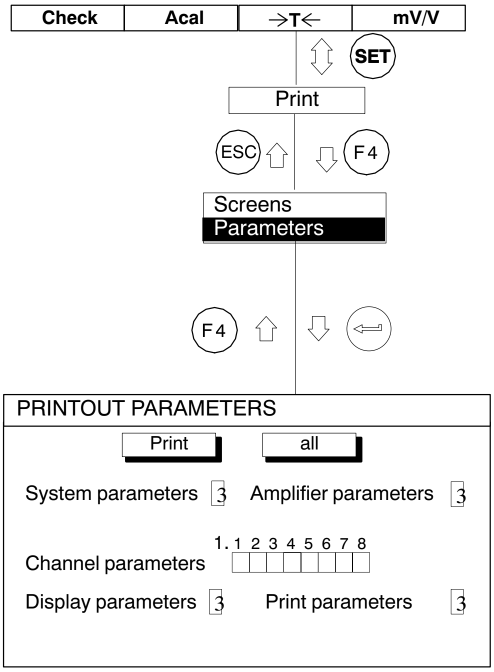
Example 1: Printout of "Display"

```
1.1  1.1-DMP40        15862 ppm   Gross  23-Jul-96  11:06:12
Measure  Filt: 0.22 Hz Be  AutoCal: On  LV:1=0,2=0,3=0,4=0
```

Example 2: Printout of "Screen 2"

```
1.1  1.1-DMP40        15862 ppm   Gross  23-Jul-96  11:05:40
1.1  1.1-DMP40      0.039656 mV/V  Abs
Measure  Filt: 0.22 Hz Be  AutoCal: On  LV:1=0,2=0,3=0,4=0
```

2.5.2 Printout parameters



With the ”Printout parameters” function you can print out:

- System parameters
- Amplifier parameters
- Channel parameters
- Display parameters
- Print parameters

Select the parameters you require or enable all parameters with the button [all] .

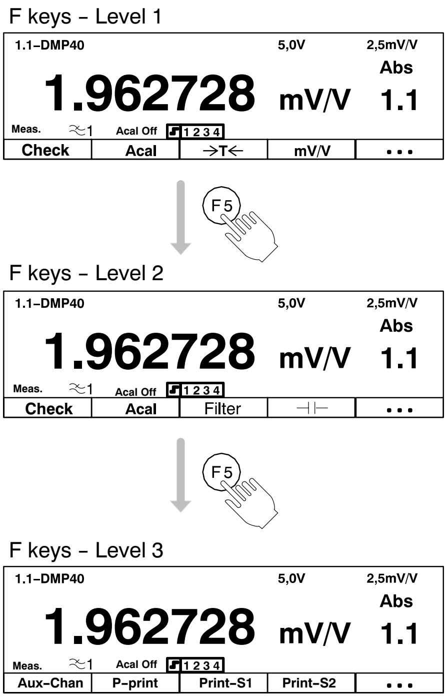
The button [Print] activates the print run. You can also assign a function key to the ”Printout parameters” function (see ”System, F keys”; page E-37).

Example 3: Printout the parameters

```
System Parameter:
-----------------
System version : DMP40,P10
Dialog language: English
Time        : 11:00:59
Date        : 23-07-96
User        : HBM
Password    : SESAM
Function keys:
1st level
 F1 =  Check   (zero/cal/measure signal)        One channel
 F2 =  Autocal (autocalibr. on/off)             One channel
 F3 =  ->T<-   (taring)                         One channel
 F4 =  mV/V    (unscaled/scaled)                One channel
 F5 =  . . .   (Next F-level)
```

2.6 Function keys

2.6.1 F-keys in measuring mode



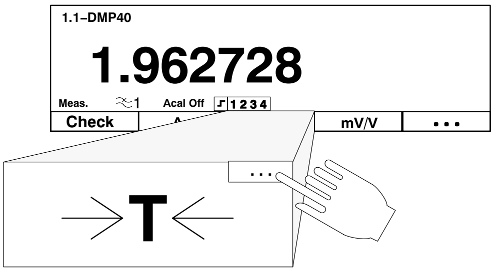
Function keys F1...F5 work in measuring mode and in set-up mode.

In measuring mode you can make use of a total of 9 functions on three levels (factory set-up):

- F1 Check
- F2 Autocalibration On/Off
- F3 Taring
- F4 Switch range
- F5 . . . (move to next level)

- F1 Check
- F2 Autocalibration On/Off
- F3 Filter 1/Filter2 Print values
- F4 Clear Store
- F5 . . . (move to next level)

- F1 Auxiliary channels
- F2 Printout parameters
- F3 Print screen 1
- F4 Print screen 2
- F5 . . .

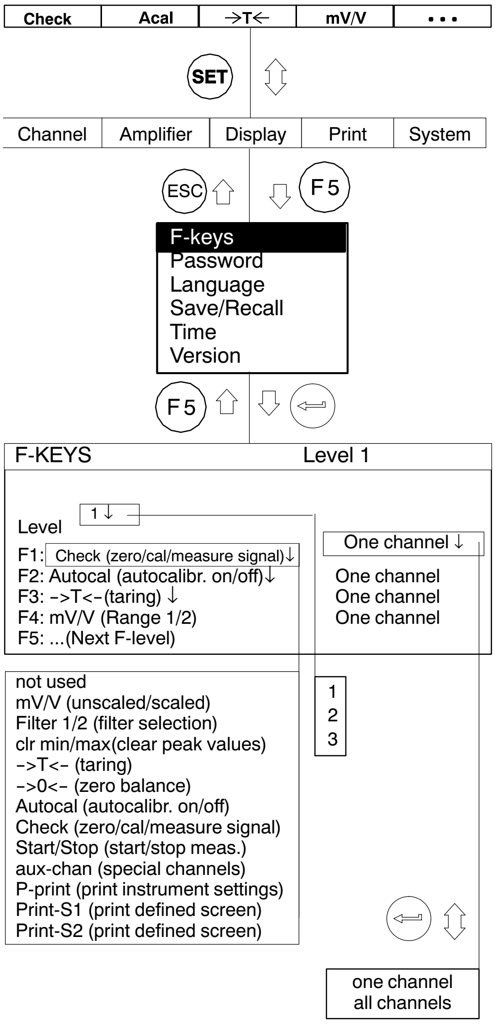


The ”Taring” function being defined for all channels

The key assignment can be freely selected; the allocation shown here corresponds to the factory settings. In the factory set-up, key F5 switches switches to the next appropriate level (...F-level).

You can extend the effect of the functions to all channels or restrict it to one (selected) channel.

In measuring mode for all screen types, the bottom line of the display shows the current key assignment. If you have defined the function for all channels, this is shown by the symbol [...] in the top right-hand corner of the F-key field.



Select setup menu

1. Use the shift key (SET) to change to set-up mode.
2. Press function key (F5) .
3. Make your choice from the ”F-keys” pop-up menu and press ⏎ to confirm.

You are now in the ”F-KEYS” setup window.

4. Choose the required selection box with ⇕ and open it with ⏎ .
5. Make your choice with ⇕ and press ⏎ to confirm.

When you want to return to measuring mode, press shift key (SET) and confirm the security prompt with ⏎.

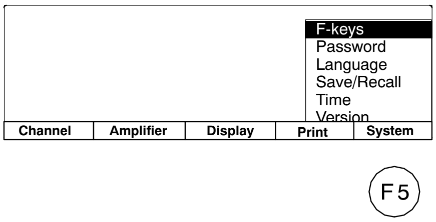
Revers Sign

The resulting function key is labeled ”Rev.Sign”. If pressed, the display will toggle between normal and reversed values. If reversed, a new ”+/–” sign will be shown above the unit and the sign of the measured value will be changed (if not 0).

If the 1st line of the display shows Max–or Min–Values, these are also reversed and the text will change from Max to Min and vice versa. Zero and tare values are also inverted.

On the other hand: limit, linearization and scaling values keep their normal, physical sense. When the polarity is inversed, the effect will also be present at the serial and parallel interfaces.

2.6.2 F-keys in set-up mode



In **set-up mode** use the function keys to call the pop-up menus on the menu bar.

2.7 Password

You can protect all the settings with a password. This password protection is switched off in the factory settings. As soon as password protection is enabled, a password must be entered every time the machine is switched on. Only then are changes to the settings possible. It is not necessary to enter a password for measuring mode.

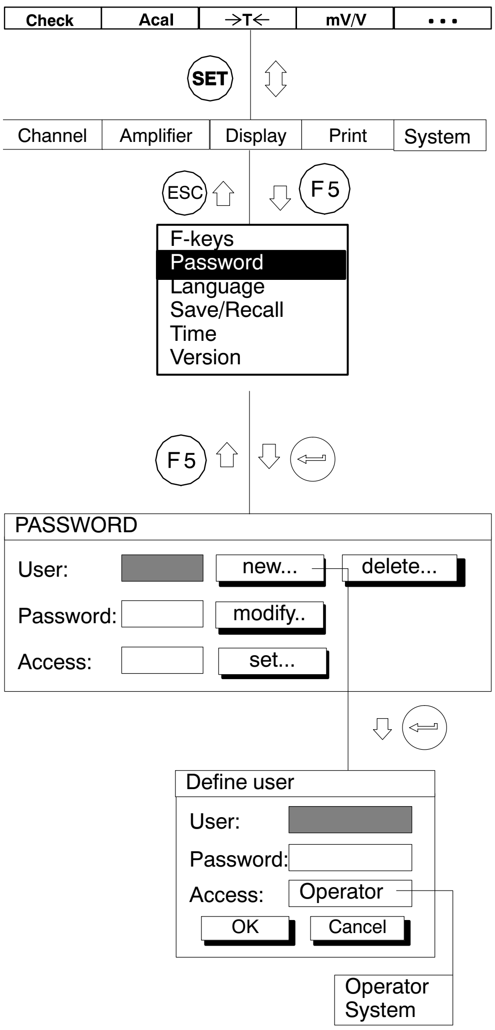
Coupled with the password is access authorisation:

- System (all settings can be modified)
- Operator (only enabled settings can be changed)

You can define a password and access authorisation for a maximum of 9 users.

Important: password protection can only be switched on if at least one new user is defined with the ”System” access authorisation.

2.7.1 Defining new users

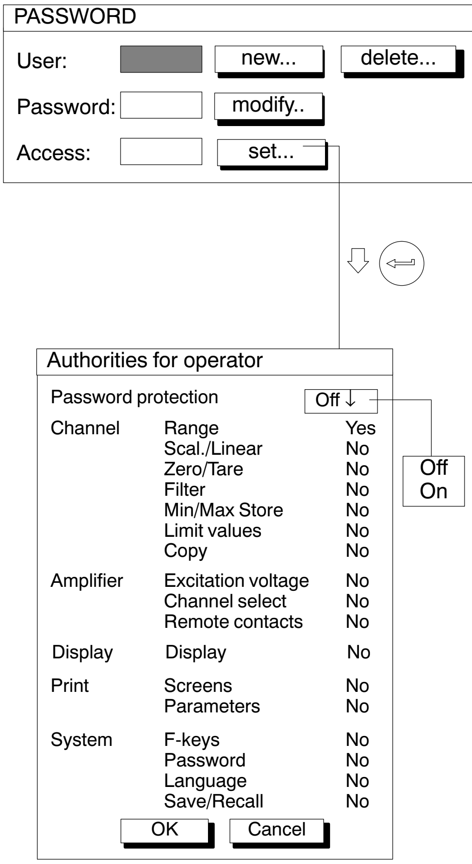


1. Use the shift key SET to change to set-up mode.
2. Press function key F5 .
3. Make your choice from the ”Password” pop-up menu and press to confirm.

You are now in the ”PASSWORD” setup window.

4. Use to select the ”New...” button and press to confirm.
5. Enter user name and press to confirm.
6. Use to select the ”Password” edit field, enter the password and confirm with .
7. Use to select the ”Access” selection field, select the required access authorisation and press to confirm.
8. Use to select the ”OK” button and confirm with .

2.7.2 Switch on password protection



If you are still in the ”Password” setup window, carry on with Point 4.

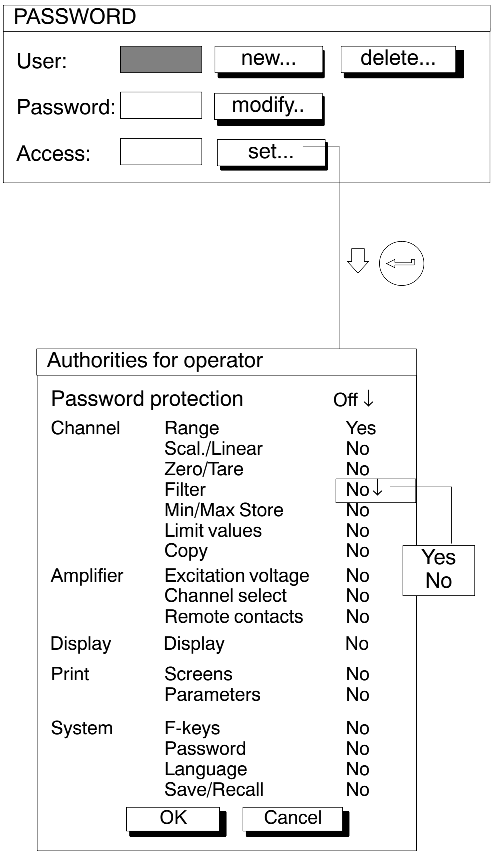
1. Use the shift key SET to change to set-up mode.
2. Press function key F5 .
3. Make your choice from the ”Password” pop-up menu and press to confirm.

You are now in the ”PASSWORD” setup window.

4. Use to select the ”Set...” button and confirm with .
5. Press .
6. Use to select the ”Password protection” selection field, select the required setting and press to confirm.
7. Press ESC (jump to OK button) and confirm with .

If, at this stage, the error message ”No user present with system privileges” appears, firstly press the cancel key ESC, to delete the error message. Select with Off and press ESC again. Press ESC twice. You are now in the ”PASSWORD” setup window.
Now define a user with system privileges as described in Chapter 2.7.1.

2.7.3 Set access privileges for operator

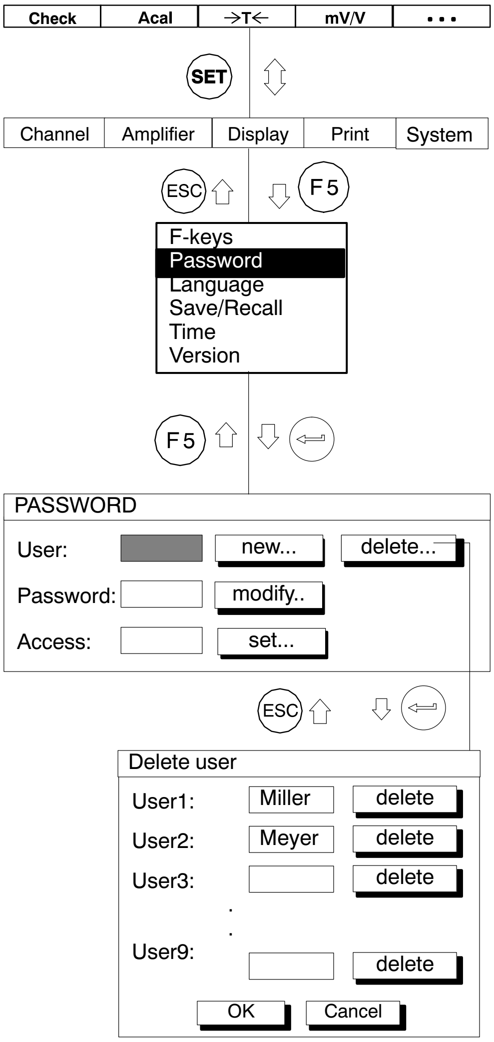


If you are still in the ”Password” setup window, carry on with Point 4.

1. Use the shift key SET to change to set-up mode.
2. Press function key F5 .
3. Make your choice from the ”Password” pop-up menu and press to confirm.
4. Use to select the ”Set...” button and confirm with .
5. Use to select the required ”No/Yes” selection field and press to confirm.
6. Use to select the required setting and press to confirm.
7. Press ESC (jump to OK button) and confirm with .

When you want to return to measuring mode, press shift key SET and confirm the security prompt with .

2.7.4 Delete user



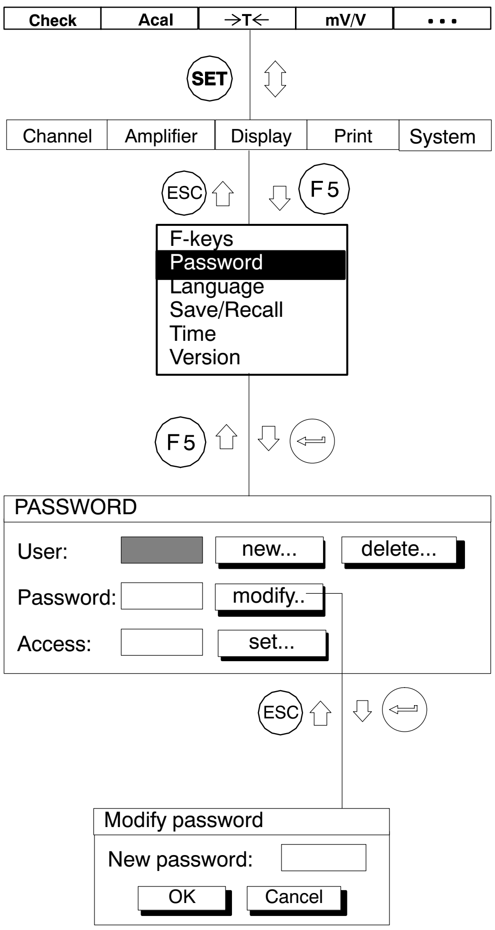
If you are still in the ”Password” setup window, carry on with Point 4.

1. Use the shift key SET to change to set-up mode.
2. Press function key F5 .
3. Make your choice from the ”Password” pop-up menu and press ⟻ to confirm.

You are now in the ”Password” setup window.

4. Use ⊝▸ to select the ”delete...” button and press ⟻ to confirm.
5. Use ⊝ to select the ”delete...” button behind the required user and press ⟻ to confirm.
6. Press ESC (jump to OK button) and confirm with ⟻.

2.7.5 Change password



If you are still in the ”Password” setup window, carry on with Point 4.

1. Use the shift key SET to change to set-up mode.
2. Press function key F5 .
3. Make your choice from the ”Password” pop-up menu and press to confirm.

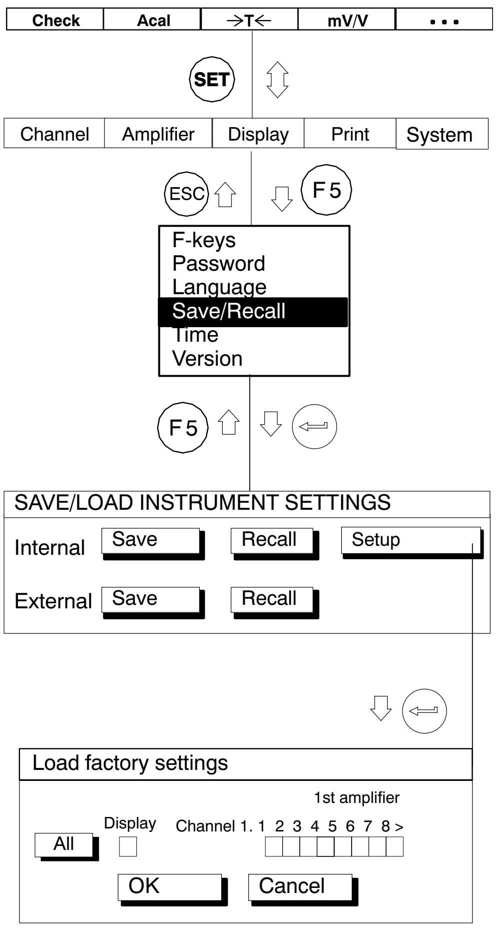
You are now in the ”Password” setup window.

4. Use to select the ”modify...” button and press to confirm.
5. In the edit field and press to confirm.
6. Press ESC (jump to OK button) and confirm with .

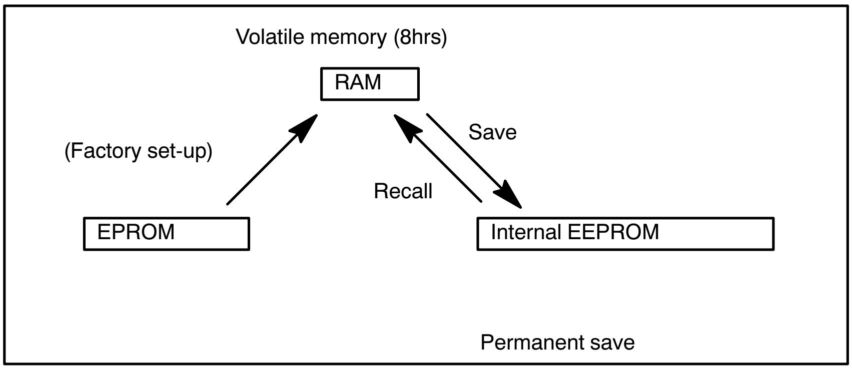
2.8 Language

You can use this function to select the language for the display, menus and help texts.

2.9 Save/Recall



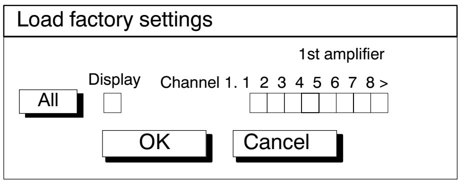
You can use the ”**Internal** Save/Recall” function to save the current amplifier settings permanently, to recall stored settings or to load the factory settings.



1. Use the shift key SET to change to set-up mode.
2. Press function key F5 .
3. Make your choice from the ”Save/Recall” pop-up menu and press ⟻ to confirm.

You are now in the setup menu ”Save/recall settings”.

4. Use ⟻ to select the required button and press ⟻ to confirm.

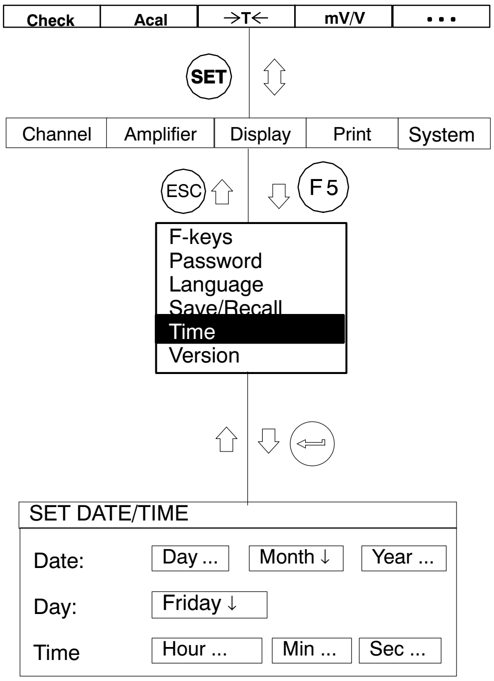


Another setup menu opens under ”Factory settings” in which you define whether all channels or only certain of them are to be set to factory status.

5. Use to select from check boxes 1...8 (and display) those channels (✓), deren Werkseinstellungen) whose factory settings are to be recalled, or select the key symbol ”All”. Confirm with .
6. Use to select the ”OK” button and confirm with .

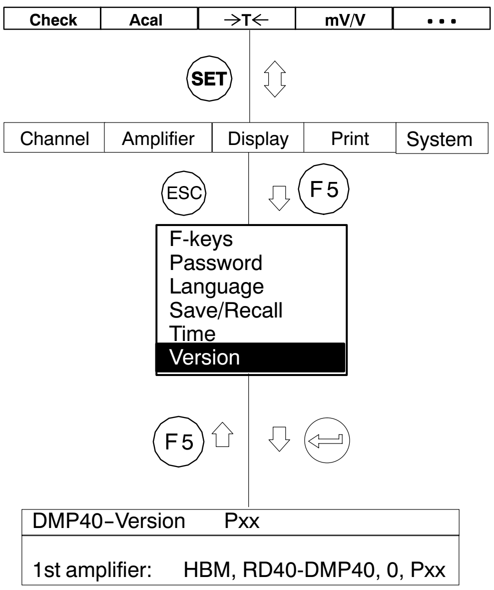
When you want to return to measuring mode, press shift key **SET** and confirm the security prompt with .

2.10 Time



Use this function to set up the date, day and time.

2.11 Version



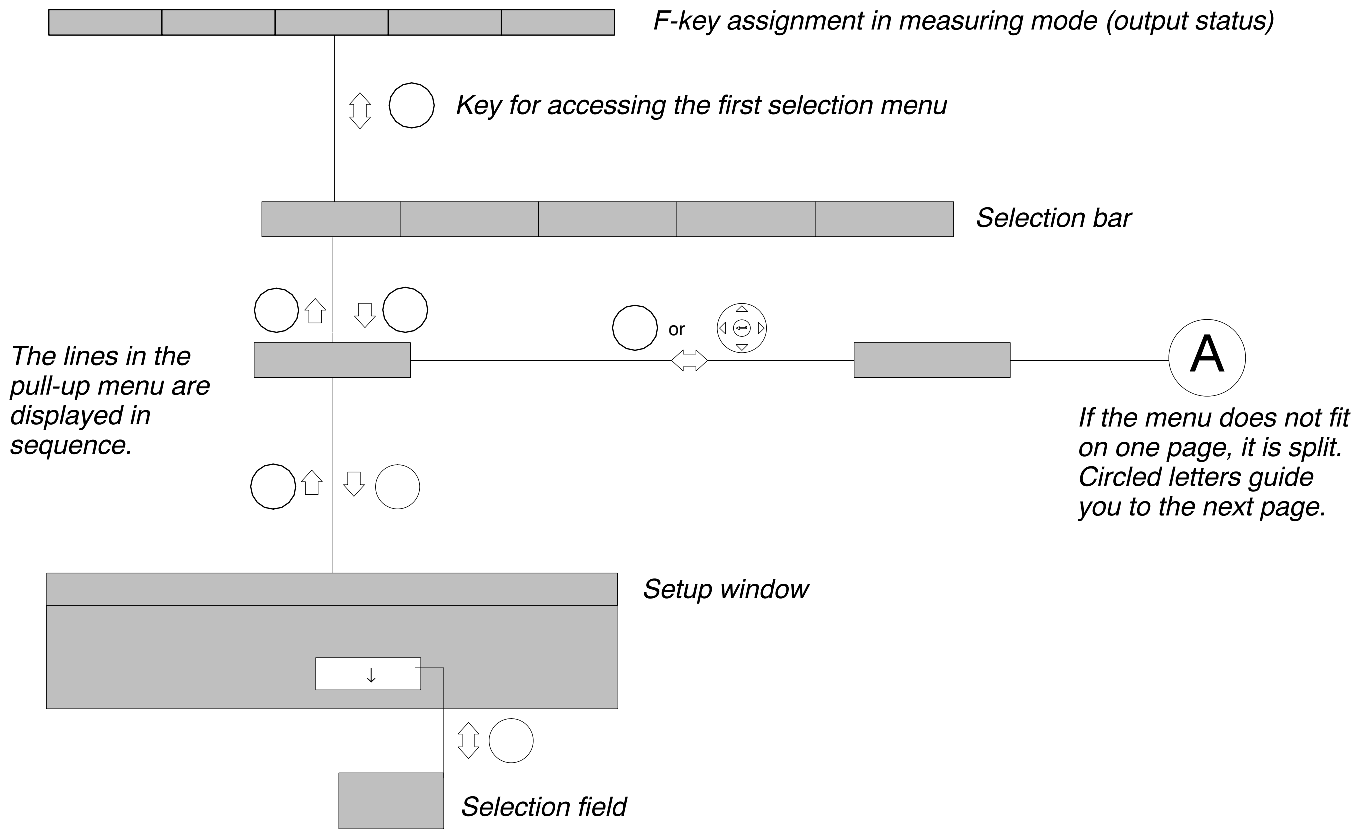
The header in the ”Version” setup window shows the system version.

The lower line shows the type name and program version of the selected amplifier (e.g. HBM, RD40–DMP40, 0, P00).

F Menu structure

The menu structure displayed below will help you find the setup menus you require more quickly. The necessary sequence of keys is shown at the same time.

Structural components



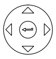
Symbols

mV/V ↓ Selection field

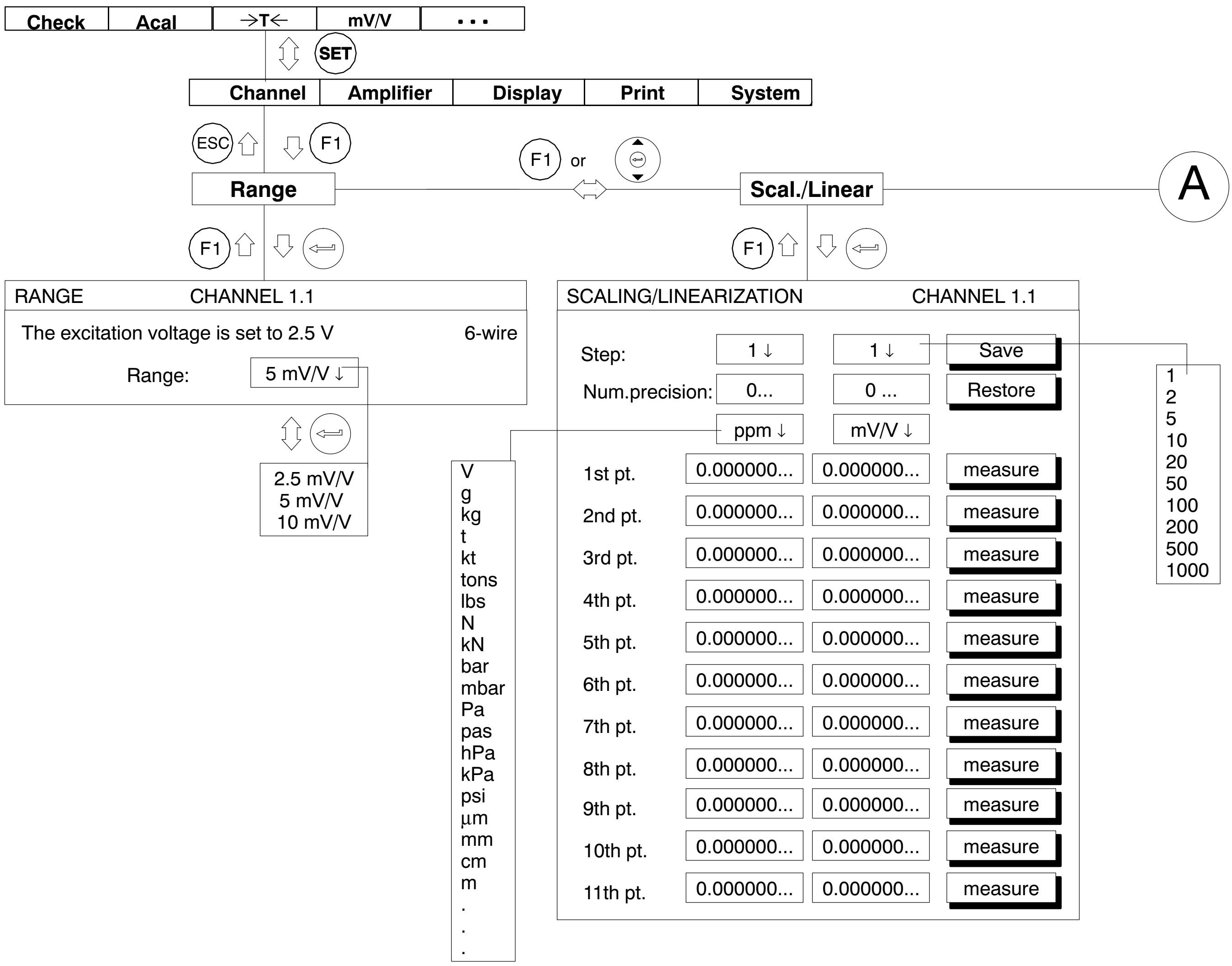
0.000000... Edit field

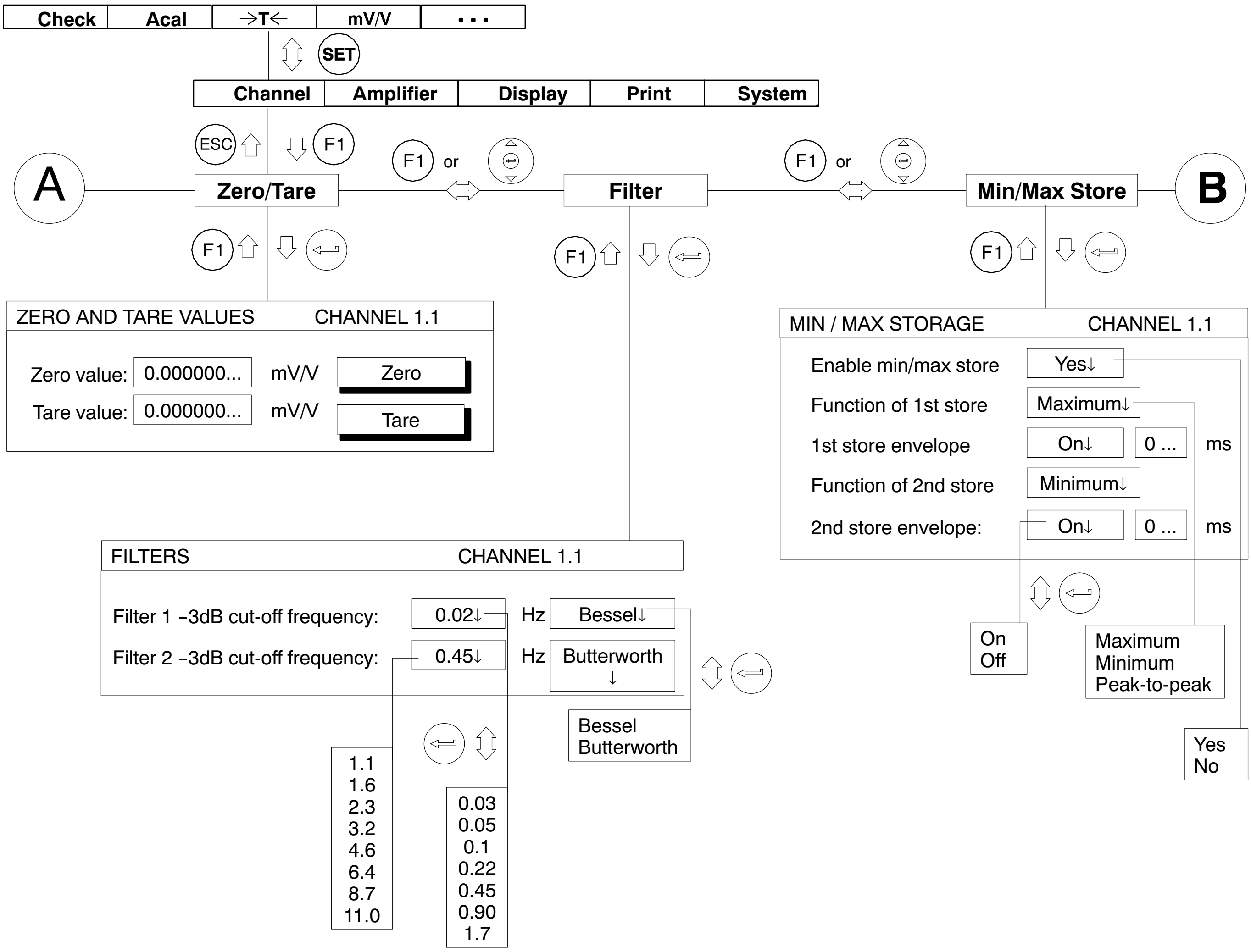
measure Button

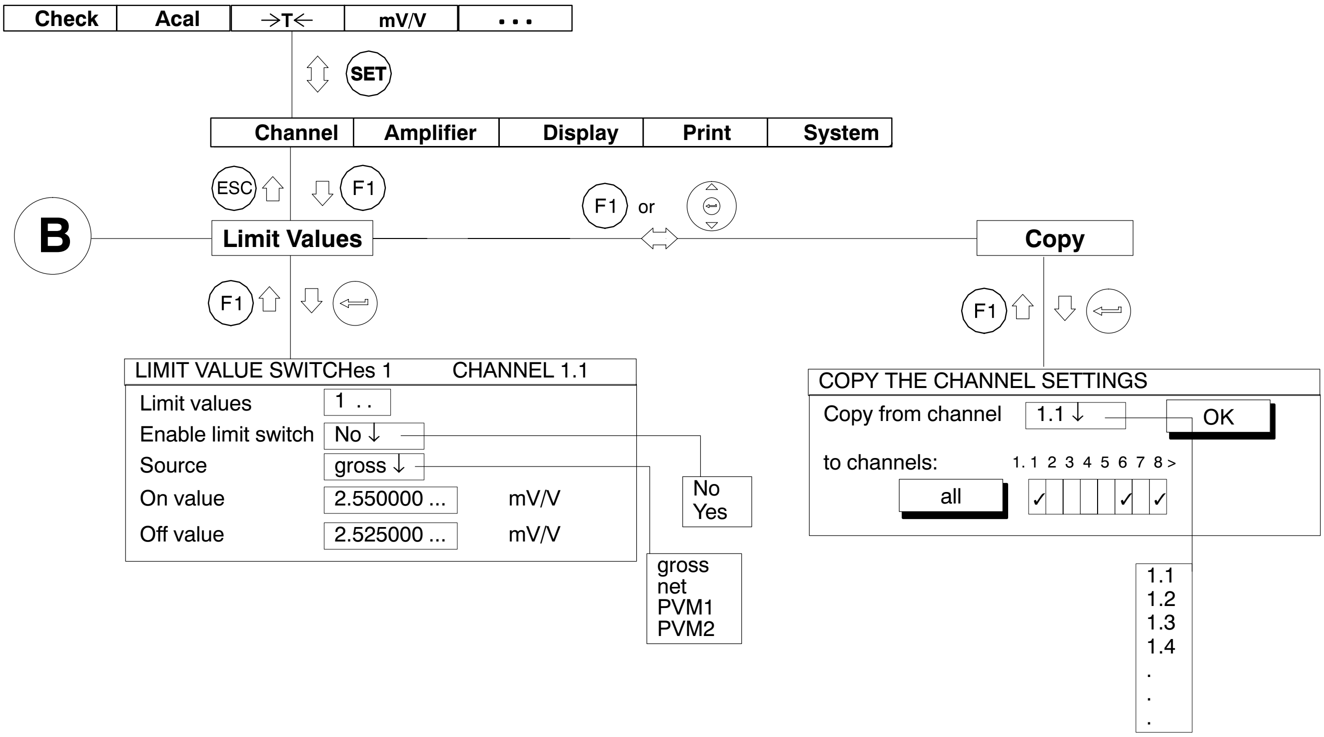
√ √√√ √√ Activation fields

 Cursor keys

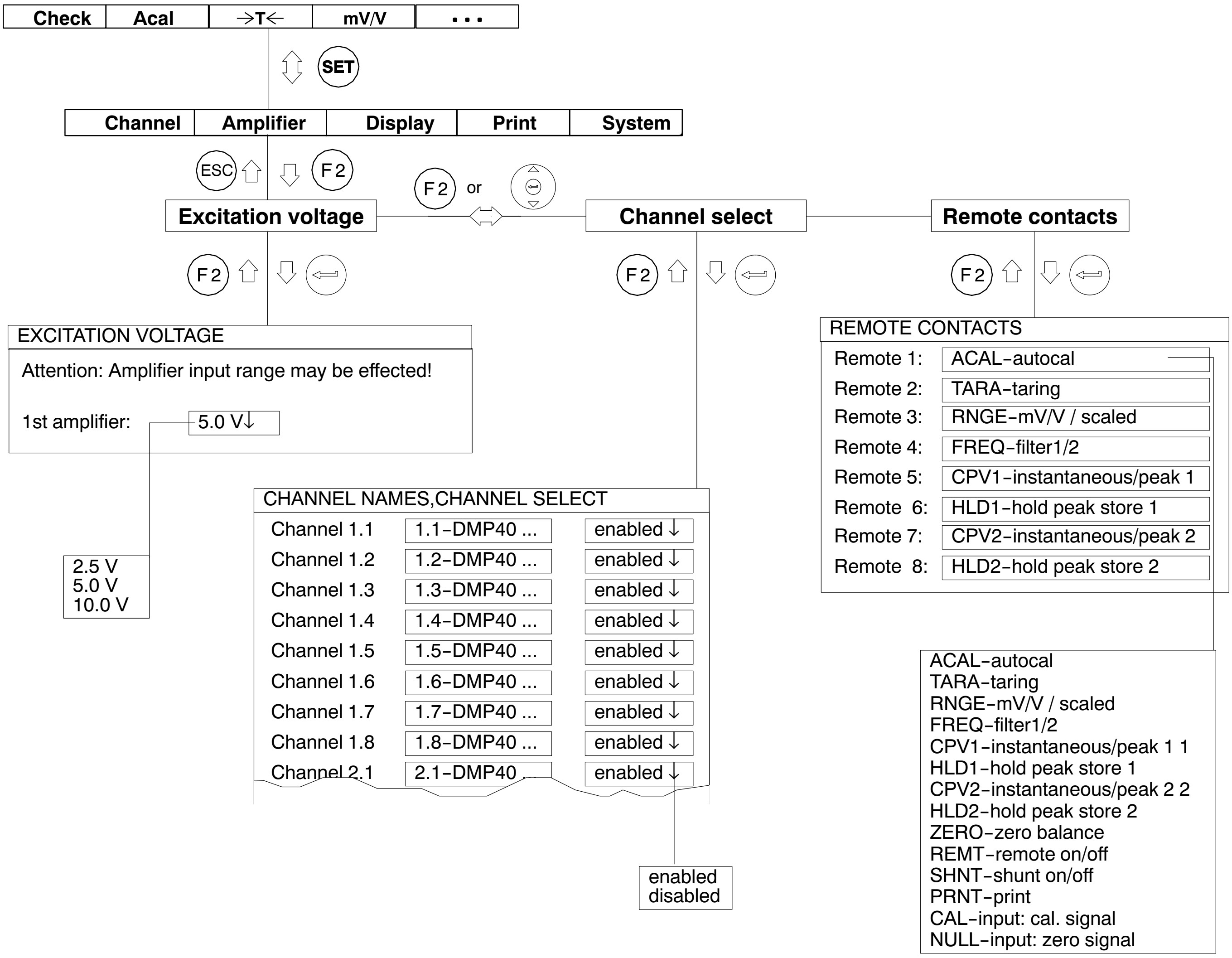
⇳ ⇧ ⇩ Arrows show the direction in which the keys work

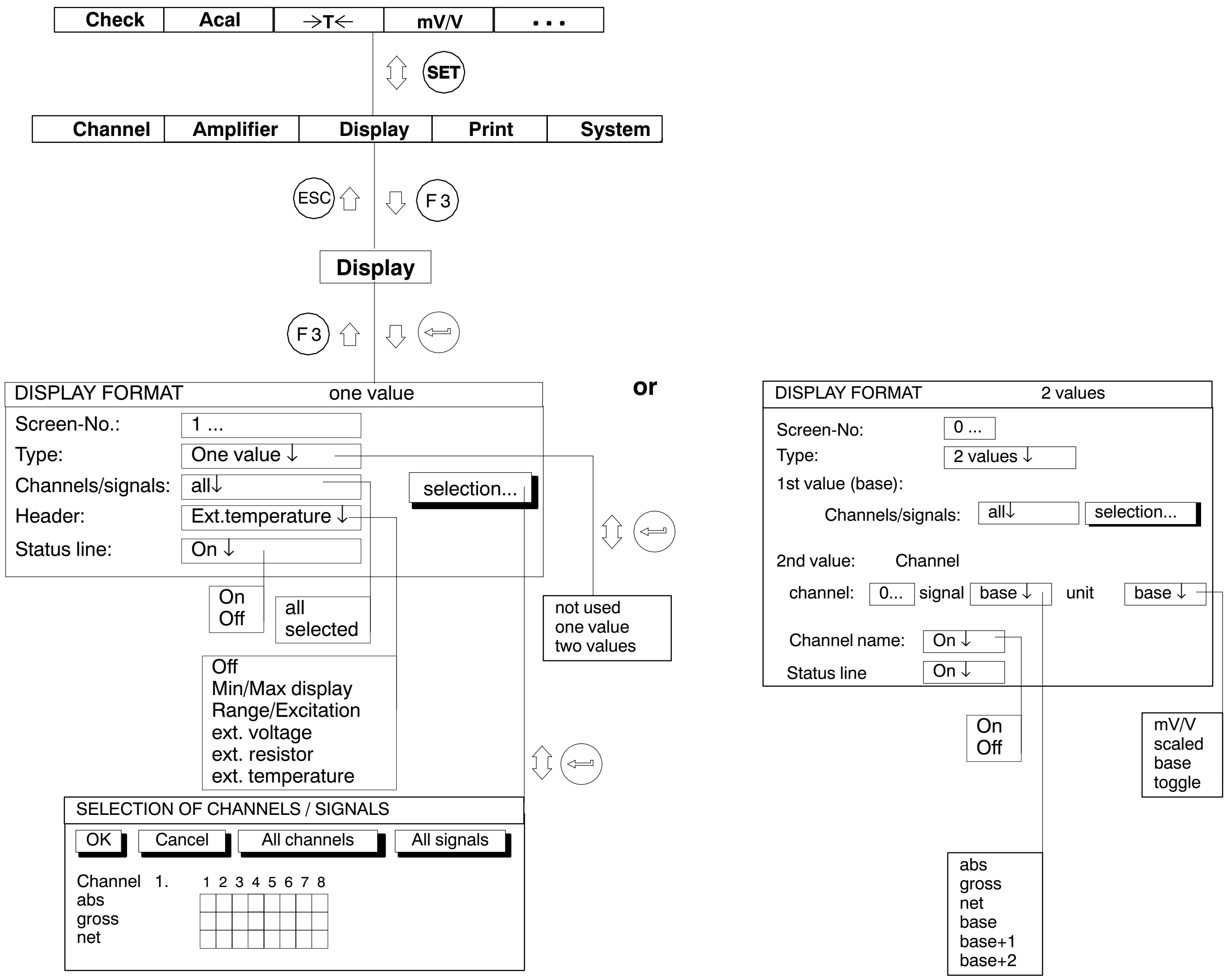

Check
Acal
→T←
mV/V
• • •
SET
Channel
Amplifier
Display
Print
System
ESC
F1
F1 or
Range
Scal./Linear
A
F1
F1
RANGE CHANNEL 1.1
The excitation voltage is set to 2.5 V
6-wire
Range: 5 mV/V ↓
2.5 mV/V
5 mV/V
10 mV/V
SCALING/LINEARIZATION CHANNEL 1.1
Step: 1 ↓ 1 ↓ Save
Num.precision: 0... 0 ... Restore
ppm ↓ mV/V ↓
1st pt. 0.000000... 0.000000... measure
2nd pt. 0.000000... 0.000000... measure
3rd pt. 0.000000... 0.000000... measure
4th pt. 0.000000... 0.000000... measure
5th pt. 0.000000... 0.000000... measure
6th pt. 0.000000... 0.000000... measure
7th pt. 0.000000... 0.000000... measure
8th pt. 0.000000... 0.000000... measure
9th pt. 0.000000... 0.000000... measure
10th pt. 0.000000... 0.000000... measure
11th pt. 0.000000... 0.000000... measure
V
g
kg
t
kt
tons
lbs
N
kN
bar
mbar
Pa
pas
hPa
kPa
psi
µm
mm
cm
m
.
.
.
1
2
5
10
20
50
100
200
500
1000

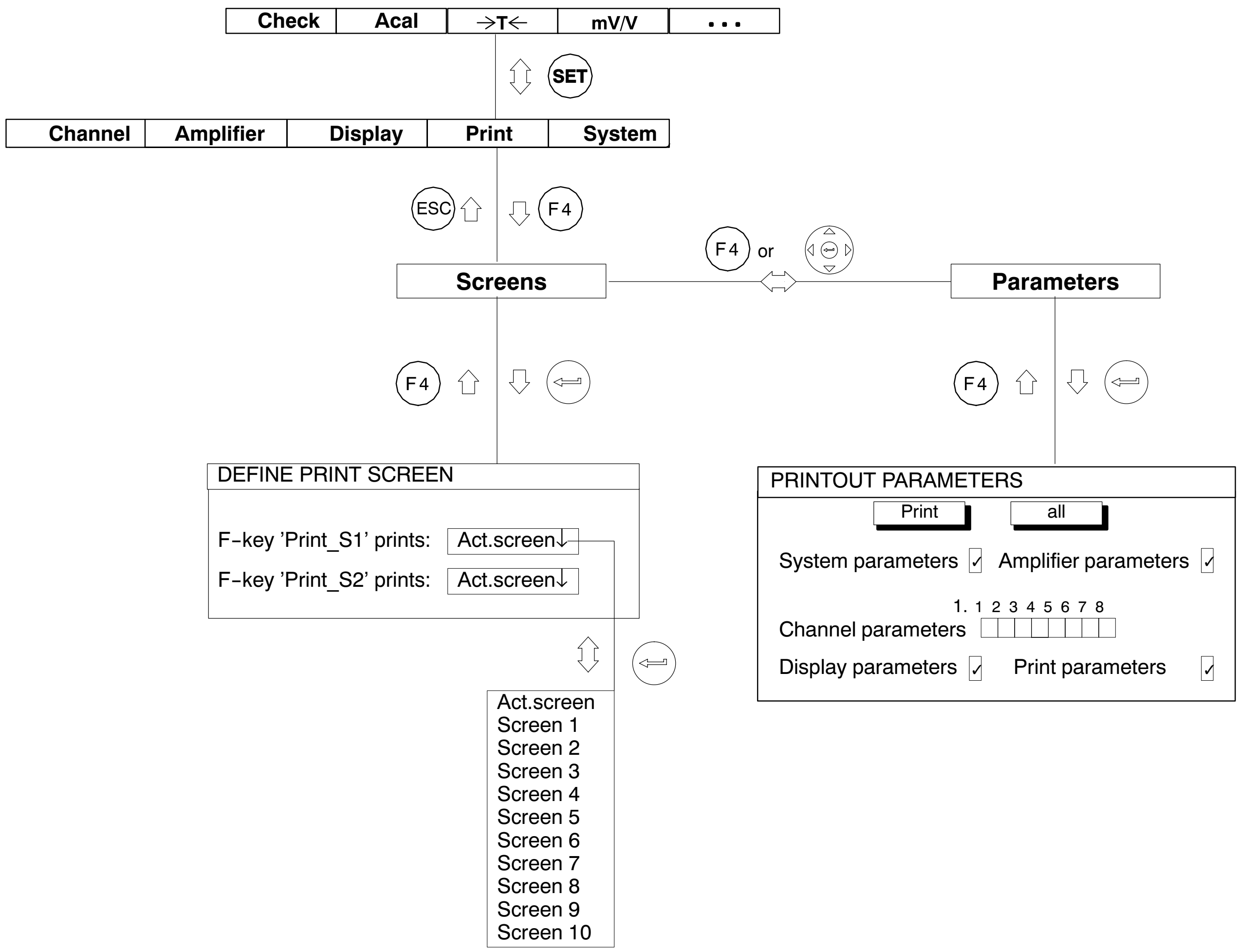

Check
Acal
→T←
mV/V
• • •
SET
Channel
Amplifier
Display
Print
System
ESC
F1
A
Zero/Tare
F1
or
Filter
F1
or
Min/Max Store
B
F1
F1
F1
ZERO AND TARE VALUES CHANNEL 1.1
Zero value: 0.000000... mV/V
Zero
Tare value: 0.000000... mV/V
Tare
MIN / MAX STORAGE CHANNEL 1.1
Enable min/max store Yes↓
Function of 1st store Maximum↓
1st store envelope On↓ 0 ... ms
Function of 2nd store Minimum↓
2nd store envelope: On↓ 0 ... ms
On
Off
Maximum
Minimum
Peak-to-peak
Yes
No
FILTERS CHANNEL 1.1
Filter 1 –3dB cut-off frequency: 0.02↓ Hz Bessel↓
Filter 2 –3dB cut-off frequency: 0.45↓ Hz Butterworth ↓
Bessel
Butterworth
1.1
1.6
2.3
3.2
4.6
6.4
8.7
11.0
0.03
0.05
0.1
0.22
0.45
0.90
1.7



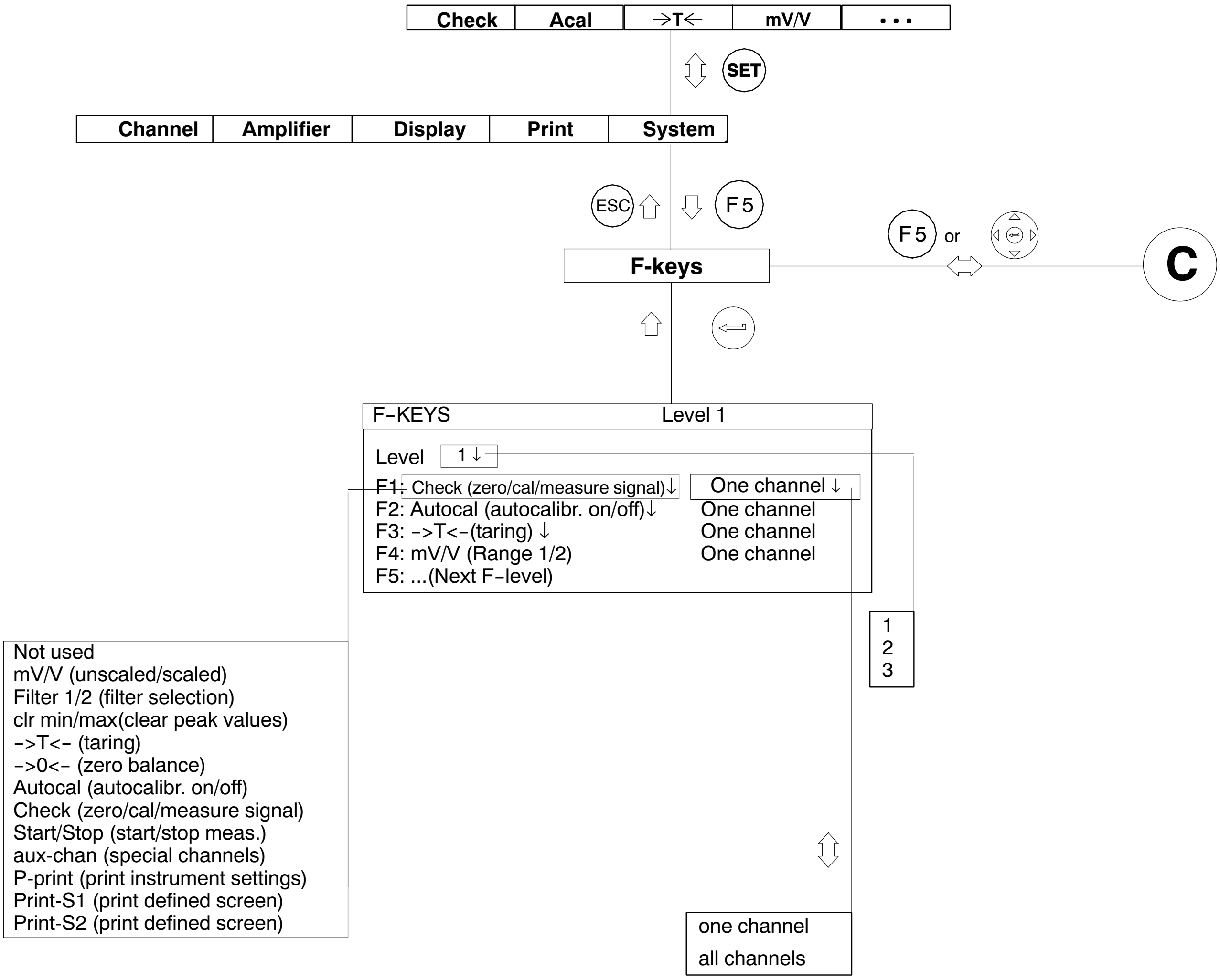
Check
Acal
→T←
mV/V
. . .
SET
Channel
Amplifier
Display
Print
System
ESC
F1
B
Limit Values
F1 or
Copy
F1
LIMIT VALUE SWITCHes 1
CHANNEL 1.1
Limit values
1 . .
Enable limit switch
No ↓
Source
gross ↓
On value
2.550000 ...
mV/V
Off value
2.525000 ...
mV/V
No
Yes
gross
net
PVM1
PVM2
F1
COPY THE CHANNEL SETTINGS
Copy from channel
1.1 ↓
OK
to channels:
1. 1 2 3 4 5 6 7 8 >
all
1.1
1.2
1.3
1.4

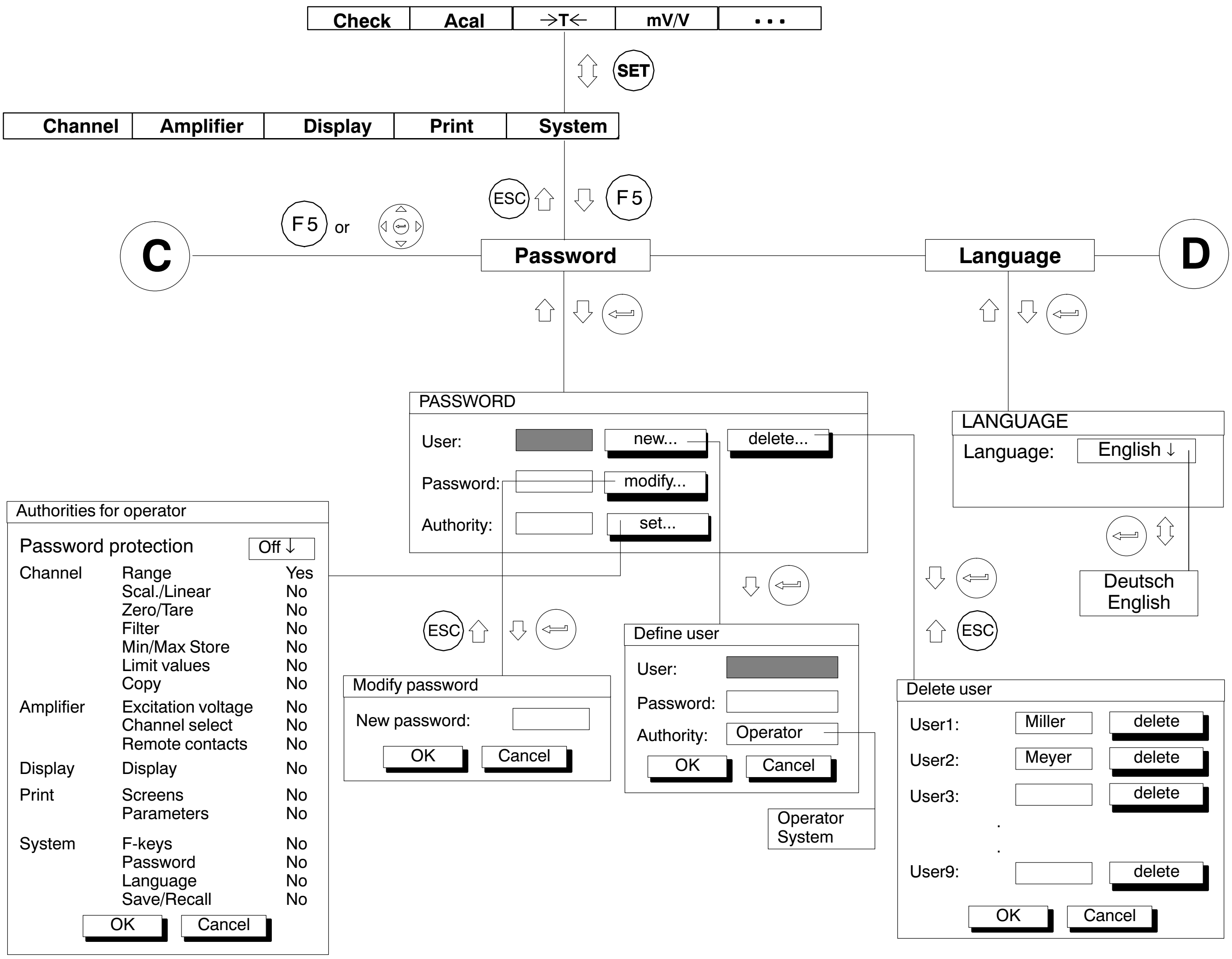

Check
Acal
→T←
mV/V
• • •
SET
Channel
Amplifier
Display
Print
System
ESC
F 2
F 2
or
Excitation voltage
Channel select
Remote contacts
F 2
F 2
F 2
EXCITATION VOLTAGE
Attention: Amplifier input range may be effected!
1st amplifier:
5.0 V↓
2.5 V
5.0 V
10.0 V
CHANNEL NAMES,CHANNEL SELECT
Channel 1.1
1.1–DMP40 ...
enabled ↓
Channel 1.2
1.2–DMP40 ...
enabled ↓
Channel 1.3
1.3–DMP40 ...
enabled ↓
Channel 1.4
1.4–DMP40 ...
enabled ↓
Channel 1.5
1.5–DMP40 ...
enabled ↓
Channel 1.6
1.6–DMP40 ...
enabled ↓
Channel 1.7
1.7–DMP40 ...
enabled ↓
Channel 1.8
1.8–DMP40 ...
enabled ↓
Channel 2.1
2.1–DMP40 ...
enabled ↓
enabled
disabled
REMOTE CONTACTS
Remote 1:
ACAL–autocal
Remote 2:
TARA–taring
Remote 3:
RNGE–mV/V / scaled
Remote 4:
FREQ–filter1/2
Remote 5:
CPV1–instantaneous/peak 1
Remote 6:
HLD1–hold peak store 1
Remote 7:
CPV2–instantaneous/peak 2
Remote 8:
HLD2–hold peak store 2
ACAL–autocal
TARA–taring
RNGE–mV/V / scaled
FREQ–filter1/2
CPV1–instantaneous/peak 1 1
HLD1–hold peak store 1
CPV2–instantaneous/peak 2 2
HLD2–hold peak store 2
ZERO–zero balance
REMT–remote on/off
SHNT–shunt on/off
PRNT–print
CAL–input: cal. signal
NULL–input: zero signal

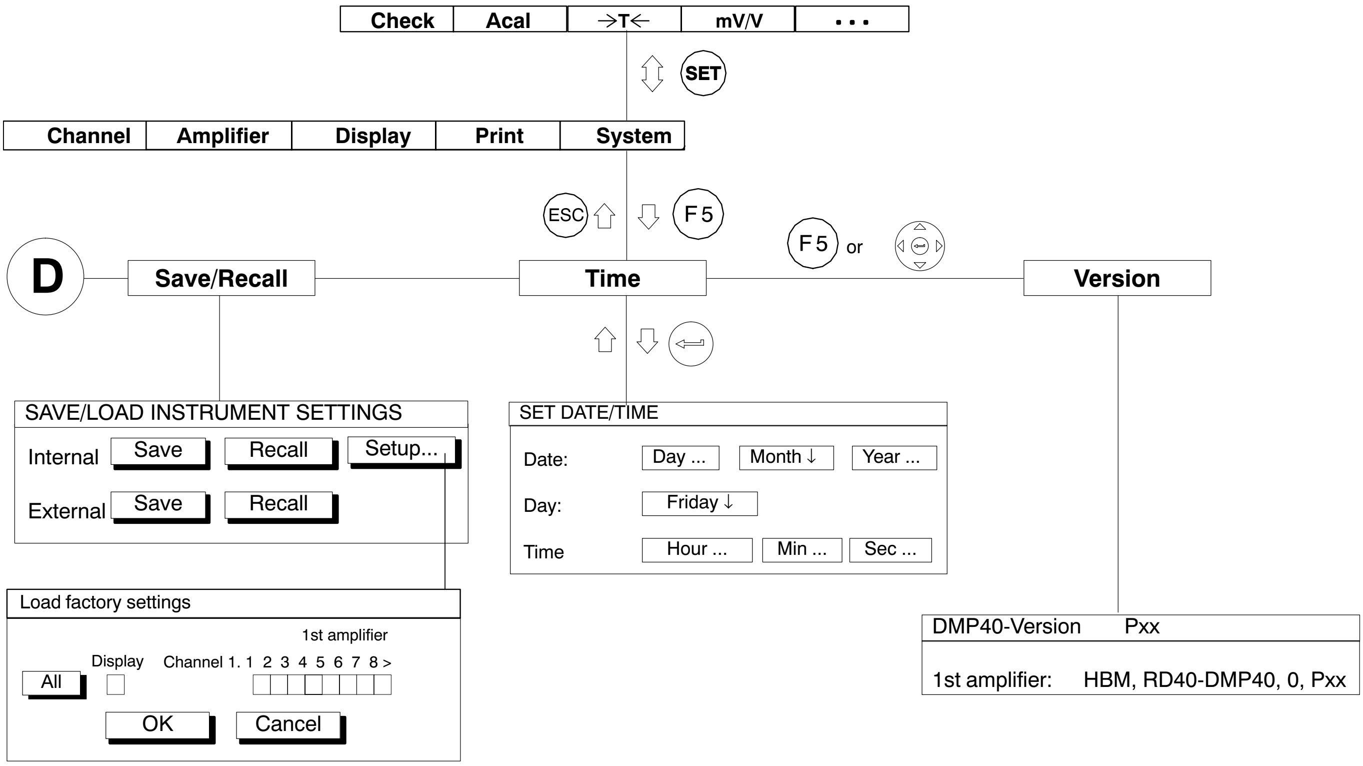

Check
Acal
→T←
mV/V
. . .
SET
Channel
Amplifier
Display
Print
System
ESC
F 3
Display
F 3
DISPLAY FORMAT one value
Screen-No.: 1 ...
Type: One value ↓
Channels/signals: all↓
selection...
Header: Ext.temperature ↓
Status line: On ↓
On
Off
all
selected
Off
Min/Max display
Range/Excitation
ext. voltage
ext. resistor
ext. temperature
not used
one value
two values
or
SELECTION OF CHANNELS / SIGNALS
OK
Cancel
All channels
All signals
Channel 1.
1 2 3 4 5 6 7 8
abs
gross
net
DISPLAY FORMAT 2 values
Screen-No: 0 ...
Type: 2 values ↓
1st value (base):
Channels/signals: all↓
selection...
2nd value: Channel
channel: 0... signal base ↓ unit base ↓
Channel name: On ↓
Status line On ↓
On
Off
mV/V
scaled
base
toggle
abs
gross
net
base
base+1
base+2



Check
Acal
→T←
mV/V
...
SET
Channel
Amplifier
Display
Print
System
ESC
F4
F4 or
Screens
Parameters
F4
F4
DEFINE PRINT SCREEN
F-key 'Print_S1' prints: Act.screen
F-key 'Print_S2' prints: Act.screen
Act.screen
Screen 1
Screen 2
Screen 3
Screen 4
Screen 5
Screen 6
Screen 7
Screen 8
Screen 9
Screen 10
PRINTOUT PARAMETERS
Print
all
System parameters
Amplifier parameters
1. 1 2 3 4 5 6 7 8
Channel parameters
Display parameters
Print parameters


Check
Acal
→T←
mV/V
• • •
SET
Channel
Amplifier
Display
Print
System
ESC
F 5
F 5
or
F-keys
C
F–KEYS Level 1
Level 1 ↓
F1: Check (zero/cal/measure signal)↓ One channel ↓
F2: Autocal (autocalibr. on/off)↓ One channel
F3: –>T<–(taring) ↓ One channel
F4: mV/V (Range 1/2) One channel
F5: ...(Next F–level)
1
2
3
Not used
mV/V (unscaled/scaled)
Filter 1/2 (filter selection)
clr min/max(clear peak values)
–>T<– (taring)
–>0<– (zero balance)
Autocal (autocalibr. on/off)
Check (zero/cal/measure signal)
Start/Stop (start/stop meas.)
aux-chan (special channels)
P-print (print instrument settings)
Print-S1 (print defined screen)
Print-S2 (print defined screen)
one channel
all channels


Check
Acal
→T←
mV/V
. . .
SET
Channel
Amplifier
Display
Print
System
ESC
F5
F5
or
C
Password
Language
D
PASSWORD
User:
new...
delete...
Password:
modify...
Authority:
set...
LANGUAGE
Language:
English ↓
Deutsch
English
Authorities for operator
Password protection
Off ↓
Channel
Range Yes
Scal./Linear No
Zero/Tare No
Filter No
Min/Max Store No
Limit values No
Copy No
Amplifier
Excitation voltage No
Channel select No
Remote contacts No
Display
Display No
Print
Screens No
Parameters No
System
F-keys No
Password No
Language No
Save/Recall No
OK
Cancel
ESC
Modify password
New password:
OK
Cancel
Define user
User:
Password:
Authority:
Operator
OK
Cancel
Operator
System
ESC
Delete user
User1:
Miller
delete
User2:
Meyer
delete
User3:
delete
User9:
delete
OK
Cancel


Check
Acal
→T←
mV/V
. . .
SET
Channel
Amplifier
Display
Print
System
ESC
F5
F5
or
D
Save/Recall
Time
Version
SAVE/LOAD INSTRUMENT SETTINGS
Internal
Save
Recall
Setup...
External
Save
Recall
SET DATE/TIME
Date:
Day ...
Month ↓
Year ...
Day:
Friday ↓
Time
Hour ...
Min ...
Sec ...
Load factory settings
1st amplifier
Display
Channel 1. 1 2 3 4 5 6 7 8 >
All
OK
Cancel
DMP40-Version Pxx
1st amplifier: HBM, RD40-DMP40, 0, Pxx

G Technical Data

1 Amplifier plug-in units

Type		DMP40	DMP40S2
Accuracy class		0.0005[1)]/0.005[2)]	
Number of amplifiers		1	2
Attachable transducers		8 SG full bridges	2 x 8 SG full bridges
Transducer excitation voltage U_b	V	2.5; 5; 10	
Carrier frequency	Hz	225 ±100ppm	
Transducer resistance per amplifier			
for U_b = 2.5 V; 5 V	Ω	30...2000	
for U_b = 10 V	Ω	60...4000	
Transducer cable length	m	<< 200	
Range	mV/V	±2.5; ±5, ±10	
Digital filter to 16th order	Hz	11...0.03 (15 steps)	
Display resolution	digit	> 1.000.000	
In-phase rejection	dB	> 120	
Input resistance	MΩ	1000	
Measuring rate, per amplifier	1/s	1.2...75	
Taring range		full range	
Linearisation of transducer characteristic curve		2...11 points	
Linearity variation			
by reference to final scale value	%	<< 0.0005	
Influence of temperature per 10 K in rated temperature range			
– on zero point (by reference to final scale value)	%	<< 0.0002	
– on sensitivity (by reference to actual value)	%	<< 0.0005	
Short-term drift over 5 min, from 2 hrs after switching on	ppm	max. ±2, typically ±1	
Long-term drift over 24 h, from 2 hrs after switching on	ppm	max. ±5, typically ±2	
Variance due to electromagnetic irradiation in accordance with EN 500082-1	%	<< 0.005	
Rated temperature range	°C	0...+40	
Service temperature range	°C	0...+50	
Storage temperature range	°C	-10...+60	
Permitted relative humidity at 31 °C (non-condensing) with linear reduction to 50 % at 40 °C.	%	80	

1) With excitation voltage 10V; range 2.5mV/V; transducer resistance 350Ω; length of cable <10m

2) With irradiation in accordance with EN 50082-1

Operating voltage (mains voltage)	V	230 (115) −15% +10 %, (45...65 Hz)	
Power consumption	VA	approx. 40	approx. 60
Weight	kg	approx. 14	approx. 15
Dimensions (W x H x D)	mm	458 x 171 x 367	
Connection for			
Transducers		8 x DB-15S	2 x 8 x DB-15S
Limit value outputs, remote inputs		DB-25S	
Computer interface RS232		DB-9S	
Computer interface RS422/485		DB-9S	

H Index

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E-mail: support@hbm.com www.hbm.com

measurement with confidence

Operating Manual

Digital
precision measuring amplifier

DMP40, DMP40S2

Operation with computer
or terminal

B0396-4.0 en

HBM

Contents

E Communicating with the DMP

F Program creation

G HBM Interpreter instruction set

A Introduction

Operation with computer or terminal

1 Summary of documentation

The following publications comprise the complete product documentation of the DMP40/DMP40S2 precision measuring amplifier:

The Operating Manual
explains to you how to operate the amplifier manually

Operation with computer or terminal
shows you how to program and measure via terminal or computer

1.1 How to use this manual

This manual is intended to enable you quickly to operate the DMP amplifier through a computer. It is equally suitable for beginners without experience in the PC world and for users with computing experience.
Several **guidelines** are available to you:

- The contents list at the beginning of the manual gives you an initial overview.
- The header tells you which chapter or sub-section you are currently reading.

  Example:

  HBM Interpreter commands ➞ *Data-output structure* G11

  The manual's title (Operation with computer or terminal, User Manual, ...) appears in the footer.
- The page numbers are linked to capital letters corresponding to the chapter titles. Each chapter begins with page 1.
- If you are looking for individual commands it is best to refer to the command summaries in Appendix IV or Appendix V.
- The keyword index contains an index register which enables you to find your way round the manual quickly.

1.2 Operation with computer or terminal

This manual explains how to operate your HBM amplifier with a terminal or computer.

- With a terminal, dialogue with the DMP amplifier is possible.
- You can effect all device settings by sending an appropriate command sequence from the computer. With a computer and the appropriate programs recurrent measurement sequences can be automated.

For the signals sent by the various devices (computer, plotter, printer, measuring devices etc.) to be adapted to one another the devices must be interconnected through interfaces.
So that devices from different manufacturers can be used, interfaces have been standardised.
You can operate the DMP system through the following standardised interfaces:

the RS232C interfaces (V.24)
the RS485 and
the IEEE 488-78 interface (also IEC bus interface).

Note

The IEEE 488-78 interface was built into devices up to Ident-No. 122820045 only. The Ident-No. will be found on the device rear next to the mains connection.

1.2.1 Summary of chapters and appendices

Chapter A
Introduction
General notes on using this manual. The documentation summary lists for you all the documents pertaining to the DMP system.

Chapter B
The RS 232C, RS 485 and IEEE 488-78 interfaces compared
This tells you which interfaces are incorporated in the DMP amplifier and the essential differences between them.

Chapter C
RS 232C and RS 485 interfaces
Description of the two interfaces and their assignment.

Chapter D
IEEE 488-78 interface
Description of the interface and its address setting.

Chapter E
Communicating with the DMP amplifier
You are shown how to enable the different interfaces and how the DMP amplifier must be connected to your computer.

Chapter F
Program creation
Here you will find routines for programming the interfaces of IBM PC's and compatibles for creating your own programs.

Chapter G
HBM Interpreter commands
Important conventions governing the syntax, structure and notation of commands are highlighted. The complete HBM Interpreter command-set completes this chapter.

Appendix I
Program versions
Alterations in the present CP12 program version P17 relative to older versions are listed here.

Appendix II
Transmission rates
Tables of the CP12 measured-value transmission rates

Appendix III
Glossary
The Glossary describes in dictionary form the most important technical terms used in this manual.

Appendix IV
Alphabetical summary of commands
The alphabetical summary of commands helps you find your way about more quickly.

Appendix V
Summary of commands by functions
You can also access a summary of commands arranged by functions.

Appendix VI
Keyword index

Note:
We advise users without computer experience to read Chapters B to D as well. Users with computer experience can skip these chapters and proceed to Chapter E.

B Interfaces compared

The DMP40 incorporates three different interfaces:

- an RS232C,
- an RS485 and
- an IEEE 488-78.

At any one time the device can be operated through one
interface only; each has certain advantages but also disadvantages.
The following is intended to simplify the choice of interface for you. For how the interfaces function please see the appropriate chapter.

General properties of the interfaces:
RS232C interface (Chapter C)

Serial data transfer

- Transmission rate relatively ”low”.
- In the simplest case a 3-wire cable is required for transmission in both directions (duplex or bidirectional).
- Only one device can be connected.

RS485 interface (Chapter C)
- Transmission rate is as for the RS232.
- Requires a four-wire bus.
- More than one device can be connected to a serial interface on your computer.

IEEE 488-78 interface (Chapter D)

Parallel data transfer

- Transmission rate relativly ”high”.
- Several devices can operate in a link-up.
  Data transfer is faster than when using a serial interface. The maximum transmission rate for measured values is no higher than when communication is serial (at least 9600 baud). The parallel interface is however advantageous when communicating with more than one device, since in this case a serial bus rapidly reaches the limits of its capacity.

Link		**Max. distance**	**Interface**
from	to		
terminal / computer	measuring device	20 m	RS232C[1)]
computer / terminal	measuring device	infinite	RS-232-C/modem
computer	one or more measuring devices	1200 m	RS485
computer	one or more measuring devices	2...20 m	IEEE 488-78[2)] (Distance between individual measuring devices not more than 2m.)

Tab. 1: Length of transmission distance with different interfaces

In the two following chapters the interfaces are described in detail.

1) By inserting modems the distance can be increased as required.
2) Greater distances are possible using extenders.

C RS 232/RS 422/485 serial interfaces

Operation with computer or terminal

1 RS 232C and RS 42/485 interfaces

Both interfaces are designated serial interfaces since data is transferred in sequence, bit by bit. They differ in the voltage level used and in construction; the RS 232C interface is suitable for point-to-point connections, the RS 422/485 for bus operation.

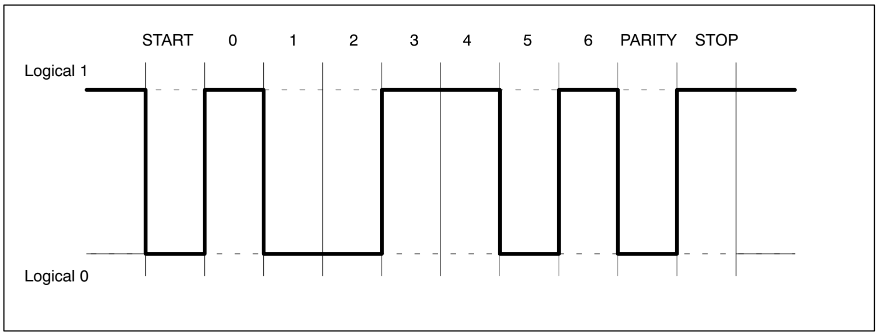


Fig. : Line level of the character Y with negative logic

A START-bit is placed in front of each character (data byte). Then follow the data bits and a STOP-bit. Since data is transferred sequentially, the speed of the transmitter must match that of the receiver.

The number of bits per second is termed the baud rate. A receiver's exact baud rate is synchronized for each byte transmitted by means of the START-bit . Then follow the data bits, all of equal length. Once the STOP-bit has been reached, the receiver enters its waiting state until reactivated by the next START-bit.

Data transfer is controlled by means of the software handshake X-ON (DC1) and X-OFF (DC3).
If the computer is ready to receive data, it sends the control character X-ON (DC1) down the data line. If it cannot accept data, e.g. if its memory is full, the control character X-OFF (DC3) is sent.

Characteristics of serial interfaces

Word length	8 bits
Stop bits	1
Parity	Even
Baud rate	300[2)], 600[3)], 1200[2)], 2400[3)], 4800[3)], 9600* [2)], 19 200[2]
Software handshake	X-ON, X-OFF

* factory set-up
2) to be set with DIP switch
3) to be set only with command BDR

1.1 RS 422/485 bus

The bus shown here is an extension of the RS 422 interface permitting – unlike the latter – more than one transmitter. Each DMP40 has a receiver and a transmitter; the transmitter can be switched on or off with the SELECT commands.

You can connect up to 32 devices to this four-wire bus. In contrast to the RS232C interface only **one** computer interface is needed to connect several devices. You need the serial converter only if the computer has no RS422 interface (see Chapter E).

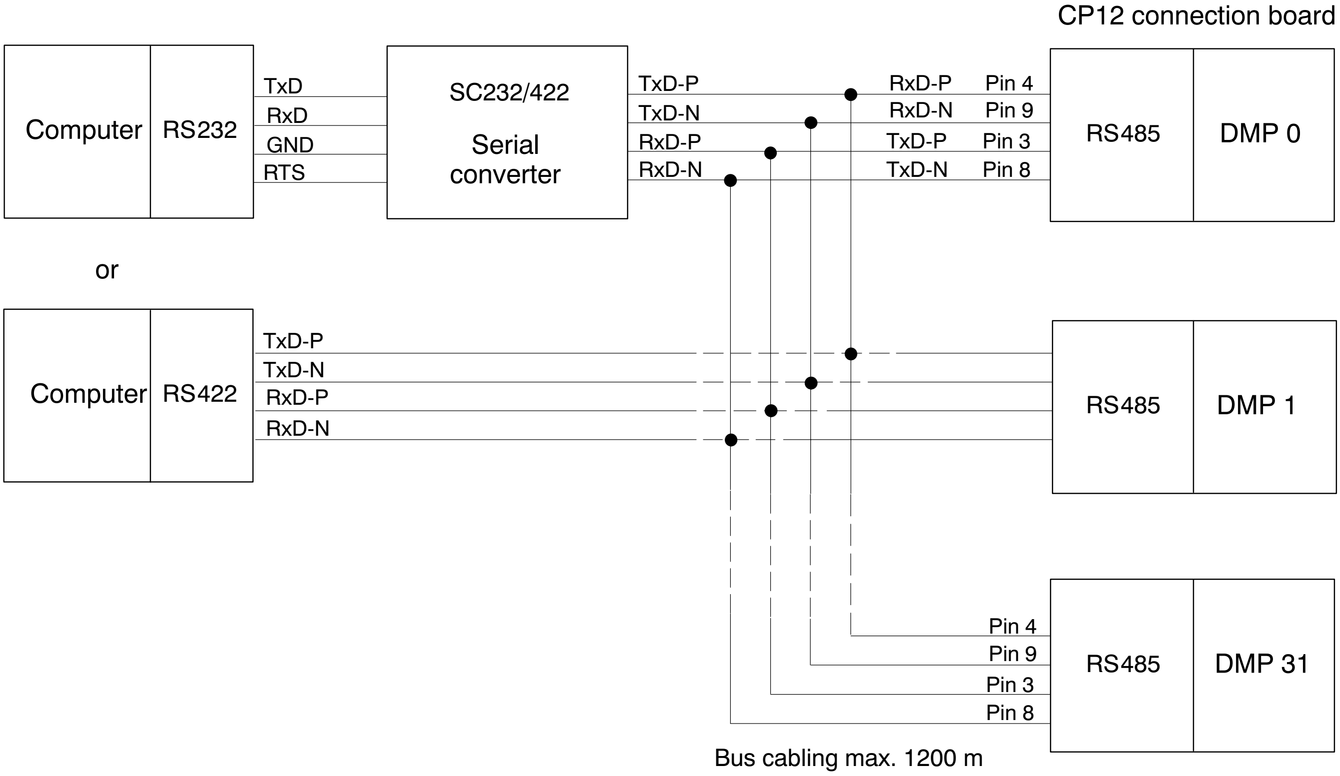


Fig. : The RS422/485 bus with and without serial converter

D IEEE 488-78 parallel interface

1 IEEE 488-78 bus*)

The IEEE 488-78 interface was developed as a bus system for connecting computers and measuring amplifiers. It has been standardised and its properties are adhered to by many manufacturers.

In practice two types of connector have become standard:

the 24-pin Amphenol connector conforming to the US Standard and the 25-pin subminiature D-connector conforming to the international IEC 625 Standard.

Electrically the two connectors are equivalent; on the PI12 connection board HBM use the 24-pin Amphenol connector.

This bus enables a maximum of 15 devices to be connected to a system in parallel. Data is transferred in parallel and asynchronously using the handshake procedure.

*) Not all devices have this interface (see also page A-5).

2 Addressing

Each of the devices functioning together in a link-up must have its own address so that they can be correctly distinguished by the controller.

These addresses are generally set with a switch and numbered consecutively from 0 to 30. Each device can be addressed at its individual address.

3 Service Request (SRQ)

Each of the devices functioning together in a link-up must have its own address so that they can be correctly distinguished by the controller.

In a link-up of several measuring amplifiers a measurement run can occupy a considerable time-span. The controller waits for this task to finish. All other devices connected are however blocked during this period. To give other important tasks a signalling opportunity despite this there is the Service Request.

Mode of operation:
The device requiring immediate processing (e.g. in the case of measured-value overshoot) requests an SRQ. On receiving this request the controller interrupts the action currently in progress and identifies by means of a serial or parallel poll the device which has requested the SRQ. This device is then requested to deliver its data or give the reason for the Service Request.

In an IEEE bus system a theoretical maximum of 14 devices can request a Service Request at the same time. The controller must then identify the requesting device by sequential (serial) poll.

In a parallel poll eight devices can be polled simultaneously. In contrast to a parallel poll, in a serial poll the reason for the SRQ can also be transmitted.

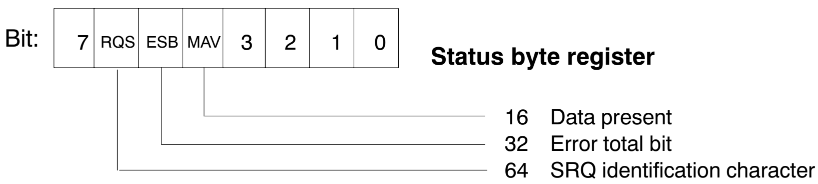
3.1 Serial poll (SPOLL)

If a Service Request occurs during a measurement, by initiating a serial poll the computer can identify the device which has caused the interrupt. The computer must address all devices and query the status value. By this means the computer can also determine the cause of the interrupt. A serial poll takes longer than a parallel poll.
For a device to be able to respond in a serial poll the SR interface function must have been provided for in it. It must also be able to function as talker and decoding of the two interface commands SPE and SPD must be possible.

If the controller has identified an SRQ, it must initiate a serial-poll routine. For this purpose the devices are put into the serial-poll state with the command SPE. The devices are then addressed in turn as talker so that the status byte can be set.

If the device addressed as talker has set the SRQ line, it must set the data line DI07 and enable the SRQ line. The other circuits DIO1 to DIO6 and DIO8 can be used to transfer status bits. After polling of the device(s) the controller sends the command SPD to restore the normal state.

The status bits transmitted during a serial poll have the following meaning:



RQS Request Service ESB Event Status Bit MAV Message Available

3.2 Parallel poll (PPOLL)

In a parallel poll too the computer can identify the device which has caused the interrupt. The cause for it is however not identified.

The PPOLL interface function has been implemented in the DMP40. For this purpose one of the eight DI0 lines must be allocated to the connected devices. The controller is thus in a position to poll eight devices simultaneously.

In a parallel poll the controller receives no indication as to the reason for the SRQ. If the controller transmits the identification command (EOI + ATN = IDY = True), the devices must set the data line assigned to them. HBM devices are activated with the interface command PPM.

4 Interface commands

These commands are not among the device commands described later. They apply to the IEEE interface only. The table below lists the most important of these commands.

The commands are to be output via the interface as ASCII code. If this does not happen automatically in the computer an appropriate translation routine is required.

Universal commands		**These affect all connected devices if the ATN circuit is active.**
DCL -	Device Clear	Puts all devices into the precisely-defined switched-on state.
SPE -	Serial Poll Enable	Initiates a serial poll; the device addressed as talker transmits its status-byte.
SPD -	Serial Poll Disable	Deactivates the serial-poll state.
Addressed commands:		**These affect only the devices currently addressed by the controller.**
GTL -	GoTo Local	Returns the device addressed to the manual-operation state. Disables remote-control operation.
SDC -	Selected Device Clear	Puts one or more devices into the defined initial state.

Addressing commands:		
TAG -	Talker Address Group	Addresses the device as talker.
LAG -	Listener Address Group	Addresses the device as listener.
Signing-off commands:		
UNL -	Unlisten	Deletes all listener addresses.
UNT -	Untalker	Deletes the address of the most recently active talker.

5 IEEE 488 interface function in HBM devices

Your device's HBM Interpreter is equipped with the following interface functions:

Interface function	Abbreviation	Meaning
Source Handshake	SH1	All functions are included.
Acceptor Handshake	AH1	All functions are included.
Talker	T1	All functions are included.
Listener	L1	All functions are included.
Service Request (SRQ)	SR1	All functions are included.
Remote/Local	RL2	All functions except the setting "Remote control with locking" are included.

Connector:

Parallel poll	PP2	The parallel-poll response must be configured with the HBM command PPM. Afterwards a standard parallel poll can be performed. Configuration by means of the interface commands PPC and PPU etc. is not possible.
Device Clear	DC1	All functions are included.
Device Trigger	DT1	All functions are included.
Controller	CO	No function provided for.

24-pin Cannon connector (IEEE 488-78 Standard) on the connection board of the PI12.

E Communicating with the DMP

Operation with computer or terminal

Operation with computer or terminal

1 HBM Interpreter

The HBM Interpreter ”translates” the command received from an interface and the associated character strings into a code understood by the DMP40.

You can call the Interpreter via the

RS 232C,
RS 422/485 and
IEEE 488-78 interfaces.

As soon as it has been called from an interface, access through the other interfaces is blocked.
The commands and generated data are identical for all interfaces.

All HBM Interpreter commands are listed in Chapter G ”HBM Interpreter commands”.

2 Activation of the RS 232C interface

The HBM Interpreter is activated with the following control characters:

- CTRL B (STX) – computer operation without echo
- CTRL R (DC2) – computer operation without echo

Inputting one of these control characters puts the device into the remote-control operation state ”Computer Control”; except for the screen’s display functions the device cannot now be operated via the front panel.

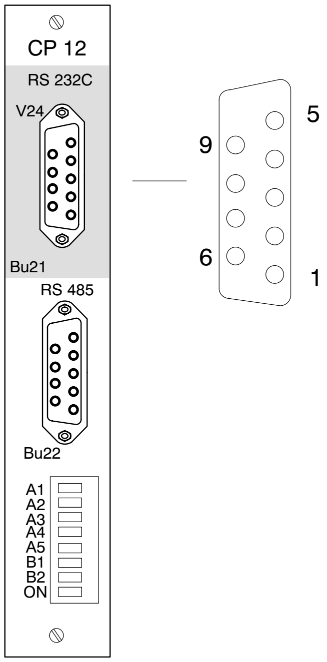
Computer operation without echo means:
The generated data but no command characters are returned to the computer by the DMP40.

With the RS 232C interface each information-item generated is output as soon as it is complete in the output buffer.

You can deactivate remote-control operation with the following commands:

DCL **or**
CTRL A (SOH) or
with the commands RES and RST

2 .1 Serial poll (SPOLL)



The RS 232C (V.24) and RS 485 interface jacks are located on the CP12 connection board. Only one of these interfaces may be used at a time.
The RS 485 interface is intended for bus operation.

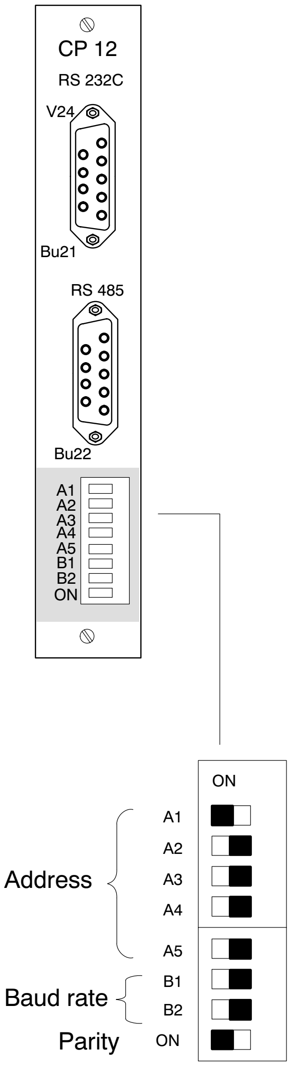
Assignment RS 232C (V.24) interface

Remotes	Assignment
1	Free
2	RD (input)
3	TD (output)
4	Free
5	RTS (internal 3kOhm to +10V)[1)]
6	DTR (internal 3kOhm to +10V)[1)]
7	Ground
8	External print enabling (enabled low, internal 10kOhm to +5V)
9	+5V
Shield	Container connection via bolt-secured plug.

[1)] No function in the DMP40 amplifier

Note: This assignment differs from that of a PC. For this reason we recommend that you use the connection cable supplied.

2 .2 Setting the interface



With the eightfold DIP switch on the CP12's connection board you can set the

baud rate and
parity.

Baud rate

Baud rate	B1	B2
300	ON	ON
1200	OFF	ON
9600	OFF	OFF[1]
19200	ON	OFF

Parity

Parity	Switch position
even	ON[1]
none	OFF

1) Factory set-up

With this interface the device address is not significant (only one device is connected).

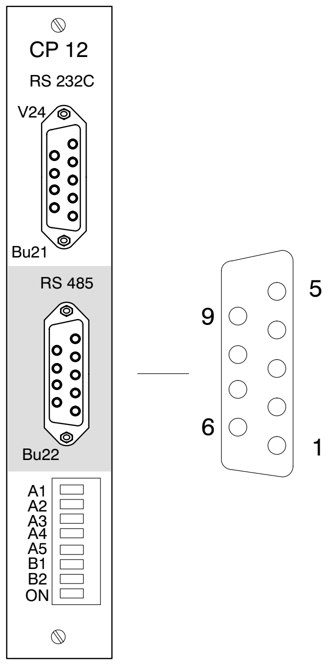
3 Activation of the RS 485 interface

The HBM Interpreter is activated/deactivated with the same control characters as for the RS 232C interface. The requested information-items are likewise output as soon as they are present in the output buffer.

The HBM devices have been factory-set to address ”1”. If several devices are being operated on this bus, they must be set to different addresses.

Individual devices are activated with the Select command (Sxx).

3 .1 Serial poll (SPOLL)



RS 485 interface assignment

Remotes	Assignment
1	+5V
2	Ground
3	TxD-P(B) Transmitted data (+)
4	RxD-P(B') Received data (+)
5	Ground
6	Not used
7	Ground
8	TxD-N (A) Transmitted data (–)
9	RxD-N (A') Received data (–)
Shield	Container connection through bolted-in plug.

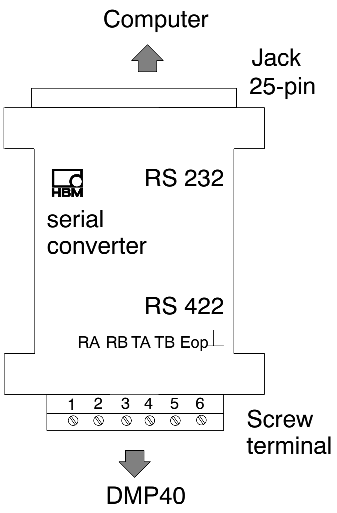
Through the RS 485 interface (Bu22) you can connect the DMP40 to a computer and so address up to 32 devices. Use a cable with a 9-pin connector and unattached ends to do this. The unterminated cables are connected to the screw terminals of the SC232/422 serial converter. The converter is needed only if the computer has no RS 485 interface.

- Computer with 25-pin RS 232 jack:

Connect converter to the computer direct.

- Computer with 9-pin RS 232 jack:

Fit the Kab 413 adapter to the converter and connect it to the computer.

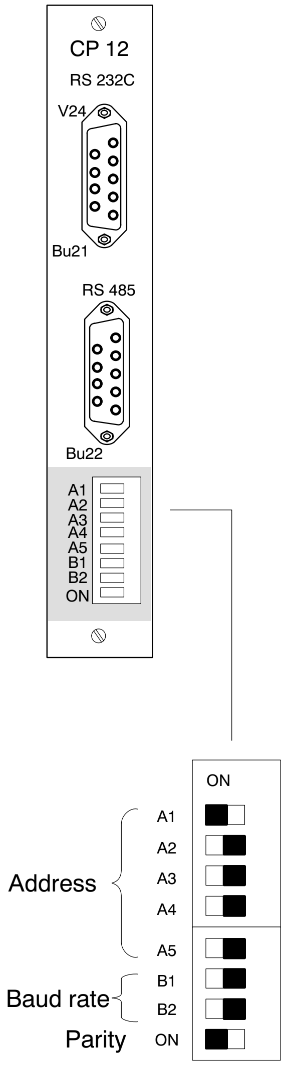


Converter assignment

Screw terminal (converter)	**Wire colour** (Unterminated)	**Bu22** (CP12)
1	wh	8
2	bk	3
3	bu	9
4	re	4
5	+ [1]	
6	– [1]	

[1] Supply voltage (9V DC) for the serial converter.
A plug-in power-supply unit is supplied with the converter.

3 .2 Setting the interface



An eightfold DIP switch on the connection board enables you to

set the device address,
baud rate and
parity.

Device address

	A1	A2	A3	A4	A5
0	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF[1]
2	OFF	ON	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF
.	.	.	.	.	.
31	ON	ON	ON	ON	ON

Baud rate

Baud rate	**B1**	**B2**
300	ON	ON
1200	OFF	ON
9600	OFF	OFF[1]
19200	ON	OFF

Parity

Parity	**Switch position**
even	ON[1]
none	OFF

[1] Factory setting

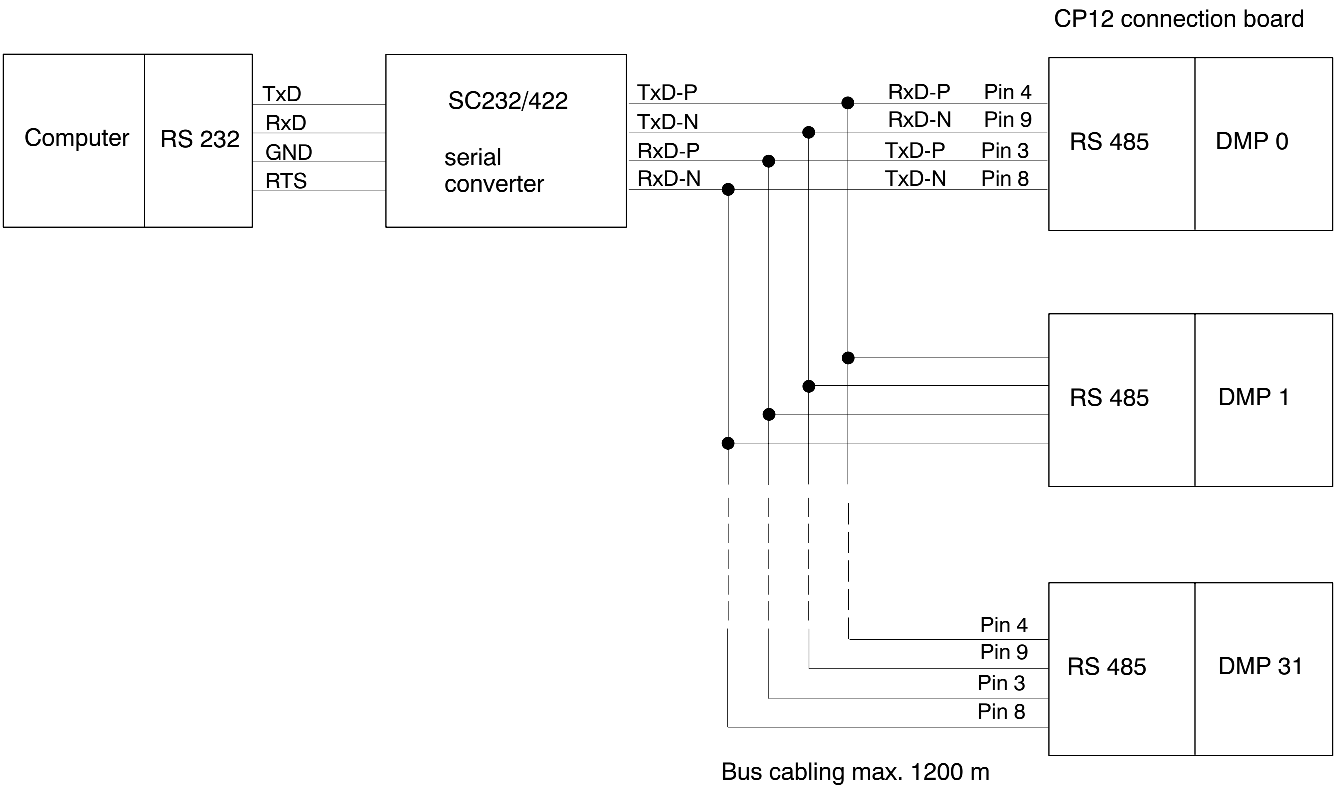


Fig. 1: RS 422/485 bus with RS 232C interface in the computer and SC232/422 serial converter

4 Activation of the IEEE 488-78 interface

The interface message Remote Enable (REN, usually set automatically by the computer when the IEEE 488-78 interface is initialised) activates the HBM Interpreter together with the first command.
The DMP40 is thus in remote-control mode and, except for the screen's display functions, cannot now be operated through the control panel on the front panel.

You can re-enable the control panel with one of the following commands. You then quit the HBM Interpreter.

- HBM command DCL
- Interface message DCL (Device Clear)
- Interface message GTL (Go To Local)
- Disabling of the REN circuit

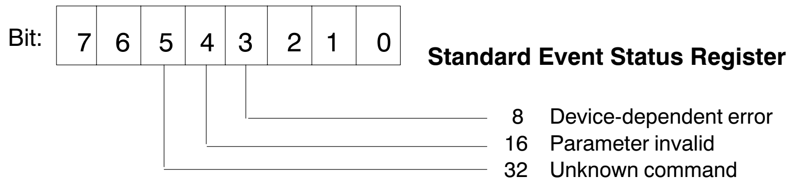
This returns the device to the Local state. You can operate the DMP40 through the keys on the front panel again.

The factory-set address of HBM devices is 4 (see page E-15).
If several devices are being operated on this bus you must set them to different addresses.

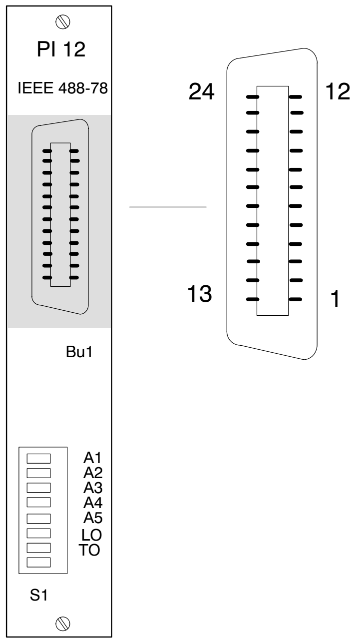
The computer must respond to the message **Data present** with an **INPUT** or **ENTER** and accept the data. Only when all data-items pertaining to a command have been output can the HBM device interpret the next command.

Errors are recorded in the Standard Event Status Register and can be queried with the HBM command *ESR?.

Errors are also totalled in the Status Byte Register into an error-total bit (ESB). When the Standard Event Status Register is read the individual error bits and total bit are cleared.



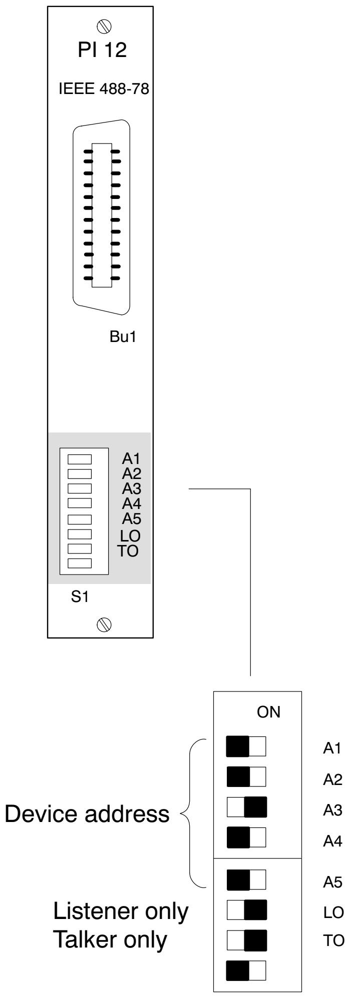
4 .1 Interface assignment



IEEE 488 interface assignment

Remotes	Assignment
1	DIO1
2	DIO2
3	DIO3
4	DIO4
5	EOI
6	DAV
7	NRFD
8	NDAC
9	IFC
10	SRQ
11	ATN
12	Shield
13	DIO5
14	DIO6
15	DIO7
16	DIO8
17	REN
18	Ground 6
19	Ground 7
20	Ground 8
21	Ground 9
22	Ground 10
23	Ground 11
24	Ground

4 .2 Address setting on the DMP40



An eightfold DIP switch on the PI12’s connection board enables you to

set the device address and
interface configuration.

	A1	A2	A3	A4	A5
0	OFF	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF	OFF
2	OFF	ON	OFF	OFF	OFF
3	ON	ON	OFF	OFF	OFF
4	OFF	OFF	ON	OFF	OFF[1)]
5	ON	OFF	ON	OFF	OFF
6	OFF	ON	ON	OFF	OFF
7	ON	ON	ON	OFF	OFF
8	OFF	OFF	OFF	ON	OFF
9	ON	OFF	OFF	ON	OFF
10	OFF	ON	OFF	ON	OFF
11	ON	ON	OFF	ON	OFF
12	OFF	OFF	ON	ON	OFF
13	ON	OFF	ON	ON	OFF
14	OFF	ON	ON	ON	OFF
15	ON	ON	ON	ON	OFF
16	OFF	OFF	OFF	OFF	ON
17	ON	OFF	OFF	OFF	ON
18	OFF	ON	OFF	OFF	ON
19	ON	ON	OFF	OFF	ON
20	OFF	OFF	ON	OFF	ON
21	ON	OFF	ON	OFF	ON
22	OFF	ON	ON	OFF	ON
23	ON	ON	ON	OFF	ON
24	OFF	OFF	OFF	ON	ON
25	ON	OFF	OFF	ON	ON
26	OFF	ON	OFF	ON	ON
27	ON	ON	OFF	ON	ON
28	OFF	OFF	ON	ON	ON
29	ON	OFF	ON	ON	ON
30	OFF	ON	ON	ON	ON
31	–	–	–	–	–

1) Factory setting

Setting Talker/Listener:

Switch	not allowed	only Listener	only Talker	Addressable [1]
LO	OFF	ON	OFF	ON
TO	OFF	OFF	ON	ON

[1] Factory setting

5 Connect the computer to the DMP

Connect the DMP40 and computer to the mains supply

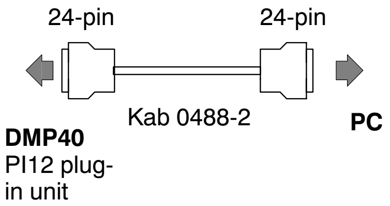
Leave DMP40 and computer switched off for the present

RS 232C interface:

- connect the DMP40 (Bu21, CP12) to the computer with the Kab 255–3 cable (supplied with the unit)
- Set baud rate (9600*)
- Set parity (ON*)
- Switch on the DMP40 and the computer

RS 485 interface:

- attach a cable with a 9-pin connector and unterminated ends to the DMP40 (Bu22, CP12) and connect it to the SC232/422 serial converter; connect the latter direct or with the fitted Kab 255-3 adapter-plug to the computer (the unterminated cable and serial converter are not supplied with device)
- Set baud rate (9600*)
- Set parity (ON*)
- Set address
  1.DMP40: Bus address 1
  2.DMP40: Bus address 2 etc.
- Switch on the DMP40, the computer and the converter's power-pack



IEEE 488 interface:

- connect the DMP40 (Bu1, PI12) to the computer with the Kab 0488-2 cable (not supplied with the unit)
- Set address:
  1.DMP40: Bus address 4
  2.DMP40: Bus address 5 etc.
- Switch on the DMP40 and the computer

Computer and DMP40 are now ready to measure.
(Follow 'Connection' chapter in the User Manual)

F Program creation

Operation with computer or terminal

Operation with computer or terminal

1 IBM PCs and compatibles

To make embarking on program creation a little easier for you, you will find here the routines for programming the interfaces of IBM PCs and compatibles.

Caution:

- First attach all cable connections.
- Switch on the devices concerned only after you have done this.

1.1 Communicating via the RS 232C interface

Connect the PC and the DMP40 using the Kab 255‑3 cable and set the DIP switches as shown in the adjacent diagram. The interface has now been set to 9600 baud and no parity.

Test program (Quick-BASIC 4.5)

```
'Program "DEMO232"                    'Demo program for the RS 232 interface
                                      'Q-Basic

DECLARE SUB dmpcmd (cmd$)             'Transmit command to DMP40, read response
DECLARE SUB delay (seconds!)  'Delay

init:
q$ = CHR$(34)                         'Quotation marks: for text-string
OPEN "com1:9600,n,8,1,cs,ds,cd,rb256" FOR RANDOM AS #1
                                      'Open interface with
                                      'baud rate 9600, no parity, 8 data-bits,
                                      'ignore control signals,
                                      'input-store 256 bytes
PRINT #1, CHR$(18)                    'Activate HBM Interpreter
CALL delay(2)                         'wait two seconds
CALL dmpcmd("SRB1")                   'Command acknowledgment on
CALL dmpcmd("CHS1")                   'Select amplifier 1
CALL dmpcmd("CHM1")                   'Select transducer 1
CALL dmpcmd("ASA2,1")                 'Set excitation voltage, range
CALL dmpcmd("ASS2")                   'Transducer signal = measure
CALL dmpcmd("AFS1")                   'Select filter 1
CALL dmpcmd("ASF1,6,0")               'Set filter cutoff frequency
CALL dmpcmd("CMR2")                   'Select scaled signal
CALL dmpcmd("ENU2," + q$ + "KG  " + q$)  'Set unit of measurement
CALL dmpcmd("IAD2,,3,1")              'decimal places and step
                                      'for scaling
CALL dmpcmd("LTB2,0,0,2,500")  'Set measured-value scaling
```

```
CALL dmpcmd("COF0")                        'Define measured-value output format
CALL dmpcmd("CAL")                         'Start calibration

measure:
DO                                         'Query measured-value status
   PRINT #1, "XST?;";                      'Transmit command to device
   INPUT #1, a                             'Accept response
   dummy$ = INPUT$(1, #1)                  'Read end marker LF
LOOP WHILE a <> 0
PRINT #1, "MSV?2,1; ";                     'Measurement command, net"
LINE INPUT #1, rd$                         'Read measured value
dummy$ = INPUT$(1, #1)                     'Read end marker LF
PRINT "Value,Channel,Status: "; rd$        'Display measured value on screen

end:
PRINT
PRINT #1, "DCL;";                          'Switch off HBM Interpreter
END                                        'End of program


SUB delay (seconds!) STATIC
begin! = TIMER

DO UNTIL (TIMER - begin! > seconds!) OR (TIMER - begin! < 0)
LOOP

END SUB


SUB dmpcmd (wrt$)

PRINT "Command:   "; wrt$,                 'Display command on screen
PRINT #1, wrt$; ";"                        'Transmit command to DMP40
LINE INPUT #1, rd$                         'Read response from DMP40
dummy$ = INPUT$(1, #1)                     'Read end marker LF
PRINT " Response: "; rd$                   'Display response on screen

END SUB
```

NOTES:

12. The control character CTRL-R switches on the command interpreter in the measuring amplifier. At the end of the print-command a terminating sequence comprising the control characters CR (Carriage Return) and LF (Line Feed) is transmitted automatically. These characters are ignored by the measuring amplifier but cause the next command to be correctly detected even if the command interpreter was already switched on beforehand.

14. "SRB1" causes each command to output a response acknowledging receipt.

16.–26. These commands initialise Channel 1 of Amplifier 1.

27. "CAL" causes the amplifier to calibrate itself with the new settings, so that the subsequent measurement command's values are output with the greatest possible accuracy.

29.–33. After the CAL command the amplifier must settle again. The amplifier waits until the settling time is over before measuring.

34.–37. A value is requested; the value is read in and displayed on the screen.

38.–41. The command interpreter is switched off and manual operation of the measuring amplifier is enabled again.

42.–46. With critical commands, e.g. after the command interpreter has been switched on, a delay routine can be used in order to wait until the measuring amplifier is ready again.

47.–53. In this sub-program the command is transmitted to the measuring amplifier, the response read in and both displayed on the screen.

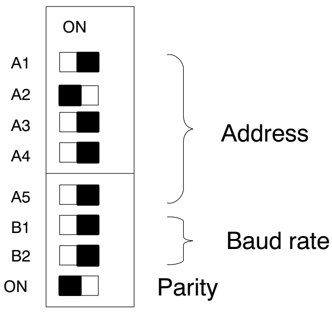
The command is transmitted here with ";" as end marker, suppressing the PRINT# command's standard terminating sequence.

If the program has run correctly, the following is displayed on the screen:
Value, channel, status: 0.000,1,0

1.2 Communicating via the RS 485 interface

Device 1

Device 2



Connect the PC to the DMP40.

Set the DIP switches on the CP12 connection board as shown in the adjacent diagram.
The interface has now been set to 9600 baud and even parity.

Address allocation:

Device 1: Address 1 (DIP switch A1 to the left, A2–A5 to the right)

Device 2: Address 2 (DIP switch A2 to the left, A1, A3–A5 to the right)

1.3 Communicating via the IEEE interface

Setting of the GPIB board (IF488/PC2A) with National Instruments GPIB PC software to:

GPIB0

Primary GPIB address	0 (other addresses also possible)
Secondary GPIB address	none
Timeout setting	T 10 µs
EOS byte	00H (different byte also possible)
Terminate read on EOS	no
Set EOI with EOS on write	no
Type of compare on EOS	7-bit
Set EOI w/last byte of write	no
GPIB PC model	PC2A (or as appropriate)
Board is system controller	yes
Local lockout on all devices	no (yes also possible)
Disable auto serial polling	yes
Disable device unaddressing	yes
High-speed timing	yes (no also possible)
Interrupt jumper setting	none
Base I/O address	02E1H (or as appropriate)
DMA channel	none
Internal clock freq. (in MHz)	8

For the HBM device the following settings should be made:

DEV4
Primary GPIB address: 04H
Secondary GPIB address: none
Timeout setting: T10s
EOS byte: 00H
Terminate read on EOS no
Set EOI with EOS on write no
Type of compare on EOS 7-bit
Set EOI w/last byte write no

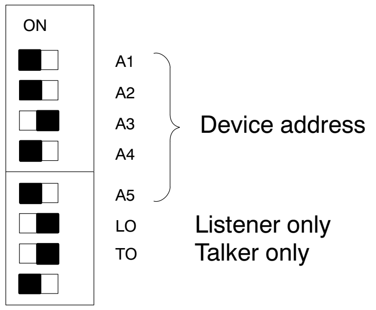
Additional devices may be defined as required, provided they are given a different primary address. After these settings have been saved on quitting IBCONF* the computer must be warm-started in order to activate them.

Note:

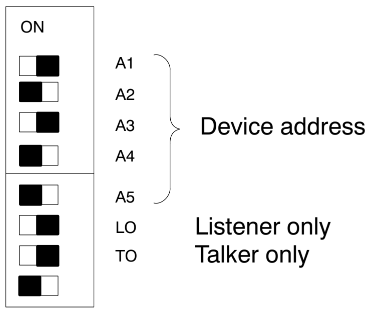
Other versions of the GPIB PC software may order the parameters to be input differently or have differently-defined questions. In this case the settings should be effected analogously.

* Configuration program for the GPIB IF488/PC2A board

Device 1



Device 2



Connect the PC and DMP40 amplifiers using an IEEE connecting cable (HBM cable: Kab 0488-2), and set the DIP switches LO, TO on the PI12 connection boards as shown in the diagram on the right.
The interface has now been set to ”addressable”.

Address allocation:

Device 1: Address 4 (DIP switch A3 to the right, A1, A2, A4, A5 to the left)

Device 2: Address 5 (DIP switches A1, A3 to the right, A2, A4, A5 to the left)

Operation with computer or terminal

G HBM Interpreter instruction set

Operation with computer or terminal

Operation with computer or terminal

1 Important conventions

These conventions and general notes make working with the HBM Interpreter commands easier for you.

Notation

- All commands can be input in lower or upper case.

Short commands

- Short commands consist of 3 to 5 characters and, depending on the command, a list of parameters separated by commas.
  e.g. CHS255(x)

Blanks

- Prefixed and following blanks in parameters are suppressed.

IEEE commands

- IEEE Standard commands start with an asterisk (*).
  e.g. *ESE

Command types: – Set-up commands – Query commands

- Set-up and query commands affect all selected (active) channels (see in this connection the CHS command).
- Query commands – used for reading out information – are distinguished by an appended question-mark (?).
  e.g. ADR?

Responses

- The device's responses shown in the examples are printed in italics.
  The responses are shown for one channel only.

Character strings

- For input purposes character strings must be enclosed in quotation marks. Quotation marks are also used in output.
  e.g. UCC"TEST"(x)

Command terminator

in input commands:

- The command terminator is marked with an (x).
  Permitted command terminators are:
  ';', LF, LFCR, CRLF, <EOI>

in output commands:

- The command terminator is marked with a (y).
  The command terminator is always CRLF and for the IEEE interface <EOI> also.

I/O with numbers

- Handling of numbers:

  under the IEEE488.2 Standard all numeric parameters can be input in floating-point format even if they are integers or fixed-point numbers.

The numbers input are converted to the numeric format of the parameter concerned and – if necessary – rounded.

- Numbers are always output in fixed-point format.

Interfaces: serial

- With the RS 232C interface communication via computer begins with the permitted control characters.

  'CTRL R' or 'CTRL B' and ends with 'CTRL A' or
  the command DCL.

- The software handshake 'CTRL Q' (X-ON) ad 'CTRL S' (X-OFF) is supported.

Acknowledgement

- You can choose whether or not the DMP40's response to set-up commands is output.
  Output commands, identified by a ? – always give rise to output data (see SRB command).

Output in response to set-up commands:
a '0' for satisfactory execution or
a '?' if an error has occurred.
This also applies to unknown commands.

e.g. ASS3,(x)
0(y)

Activate Interpreter

- When the HBM Interpreter is activated, manual operation via the front panel is disabled with few exceptions (displayed: 'Remote').

Change parameter

- If parameters affecting the actual measurement are changed, then after the input a calibration is performed which can last about 3s.

Norms and standards

- The IEEE 488.2 Standard, which defines the codes and format and also some general commands, has been followed as far as possible.

1.1 Command syntax

All the commands used are based on a specific structure.
There are essentially two types of command:

- **Set-up commands:**

The DMP40 is set up via the computer.

Example: BDR4800(x)
0(y)
The interface has been set to 4800 baud.

- **Query commands:**

Measured values or device settings are read from the DMP40 and appear on the screen.

Example: BDR?(x)
4800,2,1,1(y)
The RS 232 interface has been set to 4800 baud, even parity and 1 stop-bit.

1.2 Command structure

Short command	Parameters	End marker
***TTT?**	**p1, p2, ...pn**	**(x)**

Example:
*PRE?(x)

*	only in IEEE Standard commands
TTT	Short command in alphabetical characters (a ... z)
?	only in query commands
p1, p2...pn	Parameter value, consisting of operating sign (+/−) and digits (0...9) or character strings (always in quotation marks ” ”). A positive sign may be omitted.
,	Separator
(x)	Command terminator: Line Feed (LF), semicolon (;), Carrige Return/Line Feed (CRLF) or Line Feed/Carrige Return (LFCR). When operating via the IEEE 488 interface also the setting of the EOI line when the last character is transmitted.

CR	ASCII character Carriage Return = decimal 13
LF	ASCII character Line Feed = decimal 10
;	ASCII character semicolon = decimal 59

If an additional parameter – e.g. parameter 2 – is omitted, at least the separator must be input.
e.g. ASA1,,0(x)

If from a particular point all additional parameters are omitted, input can be concluded with the command terminator.

The commands always affect all selected active channels (see CHS command).

1.3 Data-output structure

q1, q2...qn(y)

Example 1:

*IDN?(x)
HBM,CP12,0,P17(y)

Example 2:

CHS?0(x)
3(y)

The responses sent by the DMP40 are printed in *italics* in this documentation (second line in the examples).

Values output:

q1,q2...qn	Numerical values with sign, character strings (always in ” ”) or ’?’ as error-signal
,	Separator
(y)	End of sequence (CRLF). With the IEEE interface also EOI.

1.4 The commands individually

On the following pages each command is listed, its structure analysed and explained with an example.

Command

The character string which you must enter in order to operate the DMP40.

e.g. **DCL**

Syntax

Command notation to be adhered to:

e.g. ASA p1,p2,p3(x)

Parameters

The meaning of any parameters is explained:

e.g. if with the command ASA parameter p1=1, this signifies: 2.5 V bridge excitation voltage

Effect

e.g. Explanation of how to set the DMP40.

Response

The DMP40 responds to your input. If you are operating through a terminal you will see this response on the screen (always with output commands, with input commands if required).

Example

The example shows you the command input and the DMP40's response. The response is always shown in italics .

Appended you will find an alphabetical list of the individual commands sorted by function.

2 Communication

2.1 Addressing

Control characters (for RS 232C / RS 485 only):

CTRL R: Start of communication via computer (ASCII code 18 decimal)
CTRL B: Start of communication via computer (ASCII code 2 decimal)

After entering one of these control characters, the DMP40 can (with a few exceptions) no longer be operated via the front panel ('Remote' display).

CTRL A: End of communication via computer (ASCII code 01 decimal)

After entering this control character, the DMP40 can be operated via the front panel again.

DCL

Device Clear
Terminate communication

Syntax:	DCL (x) or with RS 232C / RS 485 control character CTRL A (ASCII code 01 decimal).
Parameters:	none
Effect:	Remote-control operation is terminated.
Response:	none
Example:	DCL(x)
	Interpreter is no longer active, the device can be operated via the AB12 control panel again.
Note:	After this command, you can only enter a new command after approx. 3 s.

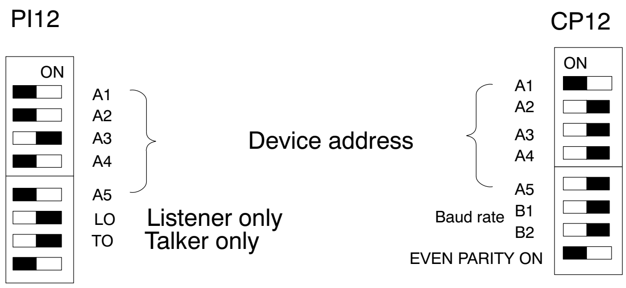
ADR?

Address Query
Output the device address

Syntax: ADR?(x)

Parameters: none

Effect: Depending on the interface selected, the relevant DMP40 address is output. The address is set with switches (A1-A5) on the CP12 connection board for the RS 485 interface and on the PI12 connection board for the IEEE interface. Both address settings are necessary for bus control.



Response: q1(y)

q1	Device address
	0 – 31

Example 1: Input of commands via RS 232C/RS 485 interface.

ADR?(x)
1(y)

Address 1 is set on the CP12 connection board (factory set-up) for the RS 485 interface.

Example 2: Input of command via IEEE488 interface

ADR?(x)
4(y)

Address 4 is set on the PI12 connection board (factory set-up) for the IEEE interface.

Sxx

Select
Selects the DMP40 with the address xx

Syntax: S00(x) to S99(x)

Parameters: none

Effect: With the Select command, you can individually address a maximum of 32 DMP40 units connected to a RS 422/485 bus.
There are 32 usable addresses 0...31 (switches A1-A5 on the CP12 connection board, rear panel). With the Select command these addresses are mapped again on to addresses 32...63 and 64...95, i.e. the commands S00, S32, S64 actuate the DMP40 amplifiers with the address 00, but have a different effect on them
Addresses 96...99 are provided for special functions.

Address Sxx	**Device with the specified address Sxx**		**All other devices**	
	Execute command	Responses	Execute command	Responses
00...31	Yes	Yes[2)]	No	No
32...63	Yes	Yes[2)]	Yes	No[1)]
64...95	Yes	No[1)]	as for last address selected	
96	No	No	No	No
97,98	Yes	No[1)]	Yes	No[1)]
99[3)]	Yes	Yes[2)]	Yes	Yes[2)]

1) The response to the previous command is stored internally.
2) The stored response to the previous command is output subsequently.
3) Factory set-up

Explanation:

S00...S31(x)

Only the instrument with the specified address receives commands, executes them and responds.

S32...S63(x)

All instruments receive all commands and execute them. Only the instrument with the specified address
(S32 = device 0) responds on behalf of all instruments.

S64...S95(x)

The instrument with the specified address is accepted as a supplementary station which receives and executes all commands but sends no responses.

S96(x)

All instruments wait for Select and send no responses.

S97 (x) or S98(x)

All instruments receive all commands and execute them, but send no responses.

S99(x)

All instruments on the bus are active, receive all commands and send responses (where there are multiple stations this leads to collisions on the bus). Presetting of the devices after switching-on (default).

Response: none

Example: S03(x)

Device with the address 03 executes all commands and responds.

S35(x)

All devices at the bus receive all commands and execute them. Instrument with the address 03 (35-32) responds on behalf of all instruments.

Note: The command is ignored at the IEEE and RS 232C interfaces.

CHS

Channel Select
Select amplifier channels

The DMP40S2 has two amplifier channels, the DMP40 has one.

Syntax: CHS p1(x)

Parameters: p1

p1	Channel coding value
	1 – 3

Channel combinations are set up using the total of the relevant channel coding values.

Channel coding value p1	Channel number
1	1
2	2
3	Both channels

Effect: The amplifier channels are selected according to the binary value of parameter p1. It is established in this way which amplifier channels are addressed by the following command.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example 1: CHS3(x)
0(y)

Channels 1 and 2 are selected
(Coding value 1+2=3)

Example 2: Only Channel 2 is to be selected:

CHS2(x)
0(y)

Channel 2 is selected

Note: The commands for amplifier set-ups and amplifier functions only affect the channels selected.

After switching on, all channels are always selected (active).

CHS?

Channel Select Query
Output of amplifier channels

Syntax: CHS? p1(x)

Parameters:

p1	present / selected channel numbers
0	The channels present
1	The channels selected

Effect: The channels present and selected come from the total of the channel coding values.

Response: q1(y)

Channel coding value q1	Channel number
1	1
2	2
3	Both channels

Example 1: Query: what channels are present in the device?

CHS?0(x)
3(y)

DMP40S2 is equipped with Channels 1 and 2.

Example 2: Query: Which channels are selected?

CHS?1(x)
1(y)

Channel 1 is selected.

CHM

Channel Multiplexer
Select input

Syntax: CHM p1(x)

Parameters:

p1	Channel number
1 – 8	1 – 8

Note: All measurement parameters can change, as a new channel is selected with the command (filter setting, calibration, etc.)

CHM?

Channel Multiplexer Query
Output number of current input channel

Parameters: none
Effect: output of current channel number
Response: q1(y)

Response	Channel number
1 – 8	1 – 8

RES

Reset
Carry out warmstart

Syntax:	RES (x)
Parameters:	none
Effect:	The device carries out a warmstart. Communication is ended.
Response:	none
Example:	RES(x)
Note:	The RES command is an HBM command.

*RST

Reset
Carry out warmstart

Syntax:	*RST (x)
Parameters:	none
Effect:	The device carries out a warmstart. Communication is ended (same function as RES).
Response:	none
Example:	*RST(x)
Note:	The *RST command is a standard IEEE command.

2.2 Communication computer – DMP40

BDR

Baud Rate
Set baud rate of serial interface

Syntax: BDR p1,p2,p3,p4(x)

Parameters:

p1 Baud rate		p2	Parity
300		0	No
600		1	Odd
1200		2	Even[1)]
2400			
4800			
9600[1)]			
19 200			

p3	Stop bits		p4	The settings apply to the following interfaces:
1	1 Stop bit[1)]		0	The interface, via which the DMP40 is operated
2	2 stop bits		1	RS 232C
			2	RS 485

1) Factory set-up

Transmission is always carried out with a character length of 8 bits.

Effect: baud rate, parity bit and number of stop bits of the serial interfaces are re-set.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example 1: The DMP40 is operated via the RS 232C interface:

BDR19200,2,1,1(x)
0(y)

The RS 232C interface is set to 19200 Baud, Even Parity, 1 stop bit.

Example 2: The DMP40 is operated via the RS 485 interface:

BDR4800,0,2(x)
0(y)

The RS 485 interface has been set to 4800 Baud, No Parity, 2 stop bits.

Note: The response after a BDR command is always output with modified set-up.

After switching on, the device is always set up according to the switch setting on the CP12 connection board.

BDR?

Baud Rate Query
Output baud rate of serial interfaces

Syntax: BDR? p1(x)

Parameters:

p1	Interface, the baud rate of which is being queried
0	The interface, via which the DMP40 is operated
1	RS 232C interface
2	RS 485 interface

Effect: The serial interface's set baud rate, parity bit and number of stop bits are output.

Response: q1,q2,q3,q4(y)

q1	Baud rate *
q2	Parity
q3	Stop bits
q4	Interface ID

Example 1: The DMP40 is operated via the RS 232C interface:
BDR?(x)
4800,0,2,1(y)
The RS 232C interface is set to 4800 Baud,
No Parity, 2 stop bits.

Example 2: BDR?2(x)
4800,0,2,2(x)
The RS 485 interface is set to 4800 Baud,
No Parity, 2 stop bits.

* see tables p1 – p4 on BDR command

IBY?

Internal Byte Query
Baud rates/address switch query

Syntax: IBY? p1(x)

Parameters:

p1	
1	DIP switch settings step width
2	Carry out RAM test in CP12

Effect: On the CP12 or PI12 connection boards, there is an 8-way DIP switch for setting the address and interface configuration. The ”IBY?” command outputs the ON/OFF setting of the switch as a decimal figure.

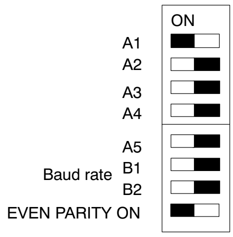
Response: q1, q2(y) On querying the switch setting
p1=1

q1	DIP switch on the CP12 connection board
q2	DIP switch on the PI12 connection board

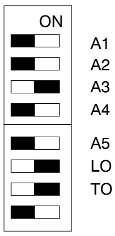
q1,(y) On RAM test
p1=2

q1	
0	No error in RAM
miscellaneous	address of faulty memory cell

Example 1: The positions of the DIP switches on the CP12 connection board correspond with the factory set-up



The positions of the DIP switches on the PI12 connection board correspond to the factory set-up



IBY?1(x)
129,100(y)

Note: 129 = 1 + 128 (Address 1, 9600 Baud, Even Parity)
100 = 4 + 32 + 64 (Address 4, addressable)

Example 2: IBY?2(x)
0 (y)
RAM test completed without errors.

Example 3: IBY?2(x)
8192(y)
RAM cell 8192 (corresponds to 2000 Hex) is faulty.

SRB

Select Response Behavior
Selection of behavior on acknowledgment of interface

Syntax: SRB p1(x)

Parameters:

p1	Switch acknowledgment output on/off
0	Switch acknowledgment output off
1	Switch acknowledgment output on

Effect: There are two command types:

a.

Output commands (e.g. MSV?), which are flagged with a question mark, give rise to output data irrespective of the behavior on acknowledgement of the interface selected. The output of this data cannot be suppressed with this command.

b.

Set-up commands (e.g. SRB) give rise to acknowledgment data (0 or ?). The output of this data can be switched on or off with this command.

After switching the DMP40 on, the following default settings apply:

Interface	p1	Note
IEEE	0	Off
RS 232C	1	On
RS 485	1	On

The IEEE interface gives no acknowledgments to set-up commands. If there should be a response, this must be switched on with this command (SRB).

Response:

Acknowledgment	Meaning
0	Command is executed if SRB 1(x) has been entered
?	Error, if SRB 1(x) has been entered
none	Command has been executed or Error, if SRB 0(x) has been entered

Example: The DMP40 is driven from the IEEE interface.

SRB1(x)
0(y)

The command is acknowledged.
The set-up commands now output the acknowledgment 0 or ?.

SRB?

Select Response Behavior Query
Output of behavior on acknowledgement of interface

Syntax: SRB?(x)

Parameters: none

Effect: The output behavior (acknowledgment on or off) of the interface is output (see SRB command).

Response: q1(*y)*

q1	Switch acknowledgment output on/off
0	Acknowledgment Off
1	Acknowledgment On

Example: The DMP40 is driven from the IEEE interface.

SRB?(x)
0(y)

Set-up commands do not output a response.

2.3 Error correction, status register

*ESR?

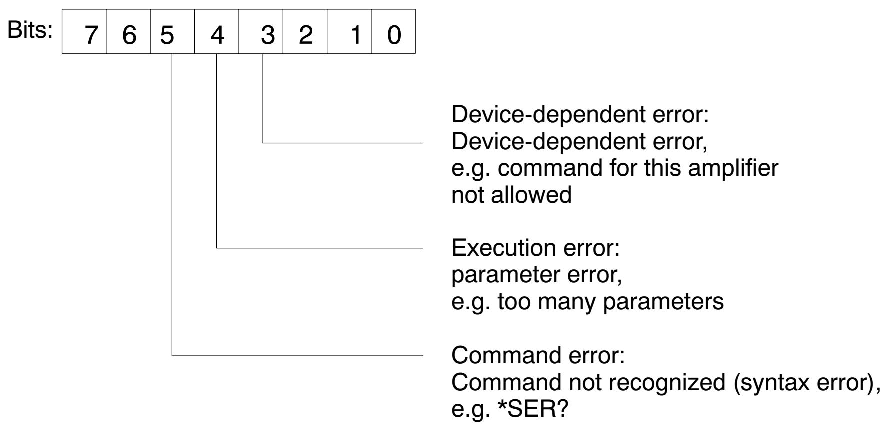
Standard Event Status Register
Output of the event-status register

Syntax: *ESR? (x)

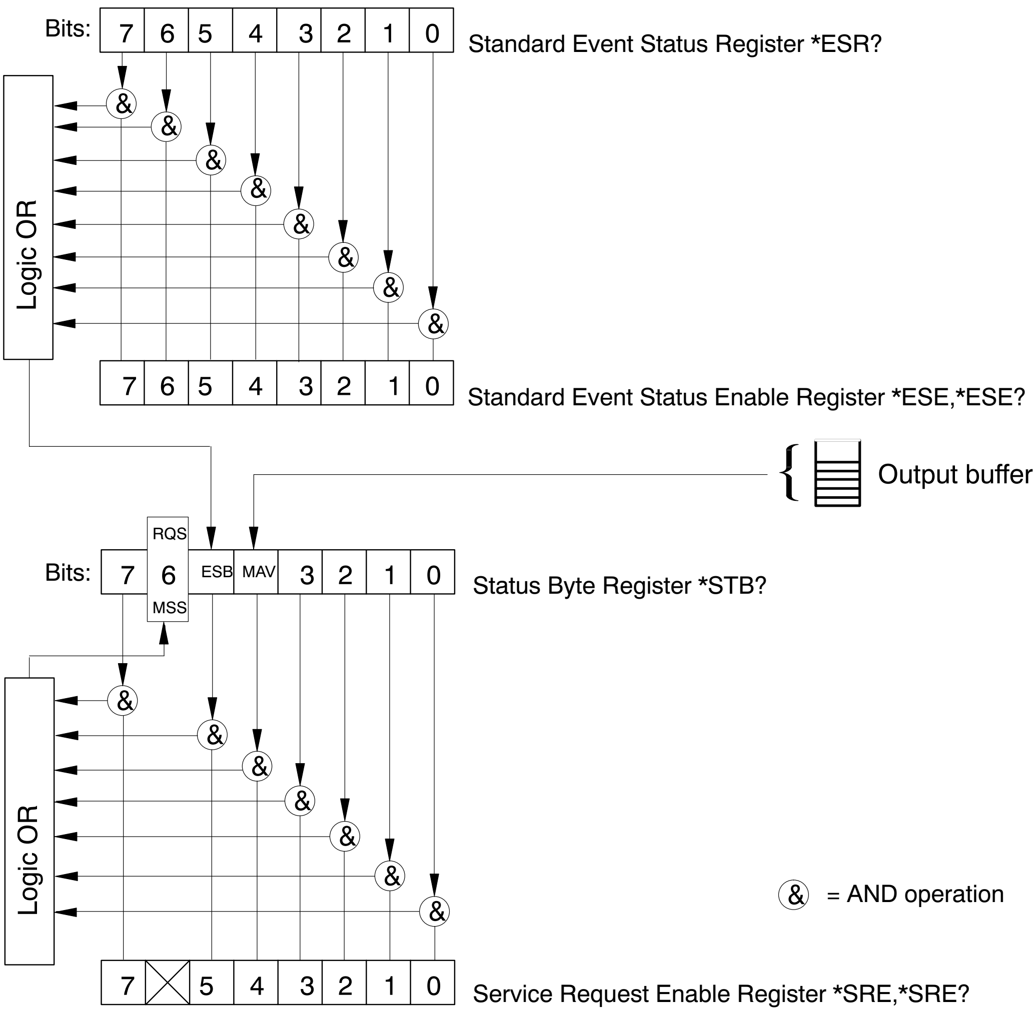
Parameters: none

Effect: Output of contents of standard Event Status Register (ESR) as decimal equivalent.
The standard event-status register (ESR) is set if errors occur in communication. Different causes of error set different bits, so that errors can be specified precisely.

Response: q1*(y)*
q1 8, 16 or 32



All other bits are undefined.



You will find an explanation of the various registers under the commands SRE, STB, ESR, ESE, as well as in the glossary.

RQS	Request Status:
RQS	Request status:
	Service request has been made.
ESB	Event Summary Bit:
	Summary of all the bits of the Standard Event Status Register enabled in the Standard Event Status Enable Register.
MAV	Message available:
	There is a message ready to be retrieved from the output buffer.
MSS	Master Summary Status
	Summary of all Status Byte Register bits enabled in the Service Request Enable Register.
Example:	*ESR?(x) *32(y)*
	Command error, e.g. command not recognized (syntax error).

*ESE

Standard Event Status Enable Register
Input of ESR enable bit mask

Syntax: *ESE p1(x)

Parameters:

p1	Decimal equivalents of 8-Bit ESE register
	0 – 255

Effect: This command sets the ESE masks. It makes it possible to suppress error messages. An error bit is set in the Standard Event Status Register. This only results in the Event Summary Bits (ESB) being set in the Status Byte Register if the associated bit is set in the Standard Event Status Enable Register (see also *ESR? command).
In this way it can be established which error causes lead to a Service Request.
Initial status:
255(free), i.e. all errors occurring in the ESR give rise to an Event Summary Bit (ESB) in the Status Byte Register (STB).

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: *ESE 32(x)
0(y)

Bit 5 is set by the ESE register, i.e. only command errors generate an ESB bit.

*ESE?

Standard Event Status Enable Query
Output of ESR enable bit mask

Syntax: *ESE?(x)

Parameters: none

Effect: Current contents of Standard Event Status Enable (ESE) register output.

Response: q1(y)

q1	Contents of ESE register
	0 – 255

Example: *ESE?(x)
32(y)

Bit 5 from the ESE register is masked, i.e. only command errors generate an ESB bit.

PPM

Parallel Poll Mode
Inputting the parallel poll response (IEEE-488 only)

Syntax: PPM p1(x)

Parameters:

p1	
0	No parallel poll response (Sense = 1)
1 – 8	Parallel poll response (Sense = 1)
9 – 16	Parallel poll response (Sense = 0)
17	No parallel poll response (Sense = 0)

Effect: Indicates on which data line and at what level the device answers in the event of parallel polling. This command must be used instead of the IEEE interface commands PPE and PPD.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example 1: PPM1(x)
0(y)

The device answers with with 1 on data line 1, if one bit of the status byte registers and the associated bit of the parallel poll enable register are set (see also command *IST?, *PRE).

Example 2: PPM9(x)
0(y)

The device answers with with 0 on data line 1, if one bit of the status byte registers and the associated bit of the parallel poll enable register are set (see also Command *IST?, *PRE).

PPM?

Parallel Poll Mode Query
Output of parallel poll response (IEEE-488 only)

Syntax: PPM?(x)

Parameters: none

Effect: The parallel poll response setting is output.

Response : q1(y)

q1	
0	No parallel poll response (Sense = 1)
1 – 8	Parallel poll response (Sense = 1)
9 –16	Parallel poll response (Sense = 0)
17	No parallel poll response (Sense = 0)

Effect: Indicates on which data line and at what level the device answers in the event of parallel polling.

Example 1: PPM?(x)
1(y)

The device answers with 1 on data line 1 in the event of parallel polling if one bit of the status byte register and the associated bit of the parallel poll enable register have been set (see also *IST?, *PRE command).

Example 2: PPM?(x)
10(y)

The device answers with with 0 on data line 2, if one bit of the status byte registers and the associated bit of the parallel poll enable register are set (see also command *IST?, *PRE).

*STB?

Status byte register query
Output of STB register

Syntax: *STB?(x)

Parameters: none

Effect: Output of status byte register.
The status byte register receives information on whether there is a message in the output buffer, an error has occurred or a service request has been made (see also *ESR? command).
With a serial poll via the IEEE interface, the status byte register of the device addressed is output.

Response: q1(y)

q1		
16	MAV	Message present in output buffer.
32	ESB	Error summary bit set.
64	RQS	Service request made.

Example: *STB?(x)
32(y)

Event summary bit set, error has occurred.

*ESR?(x)
32(y)

Command error, e.g. command not recognized (syntax error).

*SRE

Service Request Enable Register
Input of TB enable bit mask

Syntax: *SRE p1(x)

Parameters:

p1	Decimal equivalents of 8-Bit SRE register
	0 – 63, 128 – 191

Effect: This command sets the SRE register bits. It makes it possible to allow or suppress service requests to the IEEE interface.

If one bit of the status byte register is set and the associated bit of the service request enable register is masked, this has the following effects:

- The master summary status byte (MSS) of the status byte register (STB) is set.
- A service request (RQS) is executed (see also *ESR? command).

Initial status:
191 (free), i.e. all available status changes in the STB register give rise to an MSS bit (master summary status bit) in the STB register.
This leads to a service request.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: *SRE32(x)
0(y)

5 from the SRE register is set, i.e. so that the MSS bit is set and a service request made if the ESB bit has been set in the STB register.

*SRE?

Service request enable query
Output of STB enable bit mask

Syntax: *SRE?(x)

Parameters: none

Effect: Current contents of service request enable (SRE) registers is output.

Response: q1(x)

q1	Contents of SRE register
	0 – 63, 128 – 191

Example: *SRE?(x)
32(y)

Bit 5 from the SRE register is masked, i.e. so that the MSS bit is set and a service request is generated if the ESB bit has been set in the STB register.

*CLS

Clear status
Delete all queues and event registers

Syntax:	*CLS(x)
Parameters:	none
Effect:	All event status registers, which are represented by a summary bit in the status byte register, as well as the output buffer, are deleted.
Response:	none
Example:	*CLS(x)
	ESR register, ESB bit and output buffer are all deleted.

*IST?

Individual status query
Output of readiness to respond in event of parallel poll

Syntax: *IST?(x)

Parameters: none

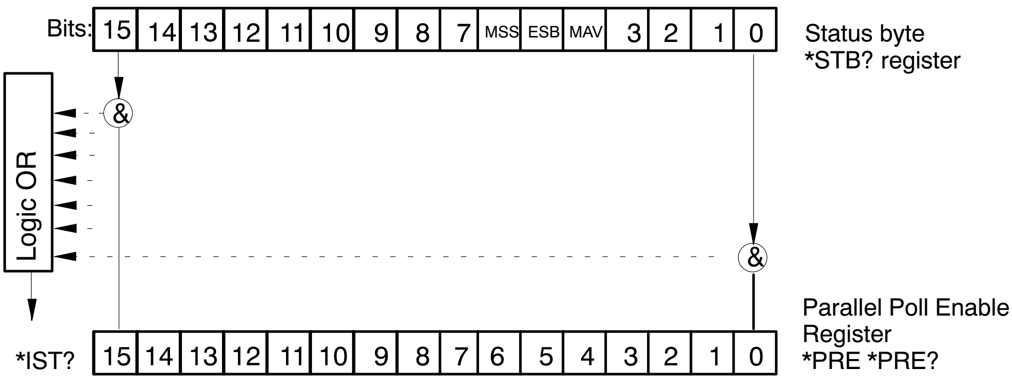
Effect: Output of readiness to respond in event of parallel poll (summary bit from the status byte register and parallel poll enable register interconnection).

Response: q1(y)

q1	
0	The DMP40 gives no response in the event of a parallel poll query
1	In the event of a parallel poll query, the DMP40 answers

Example: *IST?(x)
1(y)

The DMP40 answers on a parallel poll query.



*PRE

Parallel Poll Enable Register
Input of PRE bit mask

Syntax: *PRE p1(x)

Parameters:

p1	Decimal equivalents of 16-Bit PRE register
	0 – 65 535

Effect: This command sets the PRE register bits. Each bit in this register is assigned to a bit in the status byte register. If a bit from the status byte register and the associated bit from the parallel poll enable register are set, in the event of a parallel poll query, the parallel poll response set with the command PPM is output (see also *IST? command).

Initial status:
65 535 (free), i.e. all available status changes in the STB register bring about a response in the event of a parallel poll query.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example 1: *PRE0(x)
0(y)
No response in event of parallel poll query

Example 2: *PRE64(x)
0(y)
The DMP40 should answer in the event of a parallel poll query, if the MSS bit (master summary status) is set.

*PRE?

Parallel Poll Enable Register Query
Output of PRE bit mask

Syntax: *PRE?(x)

Parameters: none

Effect: Current contents of PRE register output.

Response: q1(y)

q1	Decimal equivalents of 16-Bit PRE register
	0 – 65 535

Example: *PRE?(x)
64(y)

Bit 6 from PRE register is set.

The DMP40 answers in the event of a parallel poll query, if the MSS bit (master summary status) has been set in the status byte register.

XST?

Extended Status Query

Syntax: XST?(x)

Parameters: none

Effect: The DMP40 answers with one decimal number, which is bit-coded.

Bit	Hex	Decimal
0	0001	1
1	0002	2
2	0004	4
3	0008	8
4	0010	16
5	0020	32
6	0040	64
7	0080	128
8	0100	256
9	0200	512
10	0400	1024

Bit0: not used
Bit1: Calibration error
Bit2: Sensor-Current limit
Bit3: Sensor short cut to GND
Bit4: Input signal clipped = overflow, open
Bit5: no transducer, sensor lines open
Bit6: not used
Bit7: not used
Bit8: Calibration in progress
Bit9: Settling time of filter (after calibration or filter change)
Bit10: maesurement value is inverted (with SGN 1)

XST? returns the sum of all relevant bits, so XST? → 258 is 256 (Calibration in progress) and 2 (Calibration error). This is the typical situation after change of channel and before the 1st calibration is executed.

2.4 Identification

AID?

Amplifier identification query
Output of amplifier identification

Syntax: AID?(x)

Parameters: none

Effect: Output of amplifier identification.

Response: Character string (20 characters per active amplifier)(y)

Example: AID?(x)
HBM,RD001-MC30,0,P13(y)

Company, device designation, serial number, version number.

***IDN?**

Identification query
Output of device identification

Syntax: *IDN?(x)

Parameters: none

Effect: Output of device identification.

Response: Character string (14 characters)(y)

Example: *IDN?(x)
HBM,CP12,0,P13(y)

Company, device designation, serial number, version number.

3 Amplifier set-ups

3.1 Amplifier input

ASA

Amplifier Sensor Adaptation
Entering excitation voltage and transducer type

Syntax: ASA p1,p2,p3(x)

Parameters: p1

Code number of required bridge excitation voltage

p1	Bridge excitation voltage
1	2.5 V
2	5 V
3	10 V

Parameters: p2

Code number of required input sensitivity

p2	Input sensitivity
1	2.5mV/V
2	5 mV/V (Excitation 2.5 V or 5 V)
3	10mV/V (Excitation 2.5 V)

Parameters: p3
Shunt status

p3	Shunt
0	Off
1	On

Effect: Amplifier sets itself to the selected transducer configuration.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: ASA3,1,0(x)
0(y)

The amplifier is set to 10 V excitation voltage, 2.5 mV/V sensitivity and shunt 'OFF'.

Note: This command initiates a calibration procedure at the amplifier.

ASA?

Amplifier sensor adaptation query
Output excitation voltage and transducer type

Syntax: ASA? p1(x)

Parameters:

p1	
0	Output excitation voltage and input sensitivity set-up
1	Output table of available set-ups for excitation voltage and input sensitivity

Effect: The amplifier outputs the excitation voltage, input sensitivity and shunt statuses.

Response: ASA?0(x)
q1,q2,q3(y)

q1	Bridge excitation voltage
q2	Input sensitivity
q3	Shunt status

Response: ASA?1(x)
q1,q2,q3(y)

Table of available settings

q1	Available excitation voltage
q2	Available sensitivity
q3	Shunt status

Excitation voltage

p1	Excitation voltage (V)
02.5	2.5
05.0	5.0
10.0	10.0

The index corresponds to the excitation voltage to be set up (each element in the table is 4 characters long).

Sensitivity

p2	Sensitivity
1	only 2.5 mV/V possible (10 V excitation)
12	2.5 mV/V or 5 mV/V possible (5 V excitation)
123	2.5 mV/V, 10 mV/V possible (2.5 V excitation)

Each element corresponds to the transducer type to be set up (see assignment of code numbers to transducer types. Each element in the table is 1 characters long).

Shunt:

p3	Shunt status
0	Shunt is switched off

ASS

Amplifier Signal Select
Select amplifier input signal

Syntax: ASS p1(x)

Parameters:

p1	Input source	
0	ZERO	Internal zero signal
1	CAL	Internal calibration signal
2	MEAS	Measuring signal

Effect: Definition of amplifier input signal.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: ASS0(x)
0(y)

Amplifier input is switched to ZERO (internal zero signal).

ASS?

Amplifier Signal Select Query
Output of source type

Syntax: ASS?(x)

Parameters: none

Effect: The type of amplifier input signal is output.

Response: q1(y)

q1	Amplifier's input signal source
0	Amplifier input is switched to ZERO.
1	Aplifier input is switched to CAL.
2	Amplifier input is switched to MEAS.

Example: ASS?(x)
2(y)

Amplifier input is switched to MEAS (measuring signal).

SFB

Select Feedback
Select type of transducer connection

Syntax: SFB p1(x)

Parameters:

p1	Circuit type
0	6-wire circuit
1	4-wire circuit

Note: Accurate measurement results can only be obtained with 6-wire circuit (factory set-up)! In special cases you can switch to 4 wires.

SFB?

Select Feedback Query
Output transducer connection type

Parameters: q1
Effect: Output of types of connection selected
Response: q1(y)

Response	Circuit type
0	6-wire circuit
1	4-wire circuit

3.2 Filter set-up

AFS

Amplifier Filtering Select
Filter switching (fc 1/2)

Syntax: AFS p1(x)

Parameters:

p1	Filter code number
1	fc1
2	fc2

Effect: Switching between two filters (see also ASF).

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: AFS 2 (x)
0(y)

Filter fc2 is switched on.

AFS?

Amplifier Filtering Select Query
Output of filter setting

Syntax: AFS?(x)

Parameters: none

Effect: Output of filter set up

Response: q1(y)

q1	Filter code number
1	fc1
2	fc2

Example: AFS?(x)
1(y)
Filter fc1 is switched on

ASF

Amplifier Signal Filtering
Input of cutoff frequency and filter characteristics

Syntax: ASF p1,p2,p3(x)

Parameters:

p1	Filter code number
1	fc1
2	fc2

p2	Filter frequency
1 – n	Code number for frequency value (corresponds to the index from the frequency table, which can be output with the command ASF?0).

p3	Filter characteristics
0	Bessel
1	Butterworth

Effect: A frequency value and filter characteristics are assigned to the low pass filter fc1 or fc2.
(see frequency table for ASF? command).

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: Input of cutoff frequency and filter characteristics for filter fc2 e.g. for MC30.

ASF 2,10,0 (x)
0(y)
Filter fc2 is set to a cutoff frequency of 0.22Hz and Bessel characteristic.

(see tables for ASF? command)

ASF?

Amplifier Signal Filtering Query
Output of cutoff frequency and filter characteristics

Syntax: ASF? p1(x)

Parameters:

p1	Filter code number
0	Frequency table (Bessel und Butterworth)
1	Filter fc1
2	Filter fc2

Effect: Output of cutoff frequency and filter characteristics set in low pass filter.

Response: If p1=0
q1, q2(y)

q1	Table of Bessel frequencies
q2	Table of Butterworth frequencies

If p1≠0
q1, q2, q3(y)

q1	Filter number fc1 / fc2
q2	Cutoff frequency of filter fc1/fc2
q3	Filter characteristics (0=Bessel, 1= Butterworth)

Example 1: Table of available filter frequencies, e.g. for MC30.

ASF?0(x)
”0.0300.0500.1000.2200.04500.9001.700”,
”1.1001.6002.3003.2004.6006.4008.70011.000”(y)

In the following tables you will find the available cutoff frequencies with Bessel or Butterworth characteristics with the maximum possible measuring rate (speed) (see also ISR command).

The index corresponds to the frequency to be set up (each element in the table is 5 characters long).

Index	Bessel frequency (Hz)		Butterworth (Hz)	
		Measuring rate (Hz)		Measuring rate (Hz)
1	0.030	1.2	1.100	75
2	0.050	2.3	1.600	
3	0.100	4.7	2.300	
4	0.220	9.4	3.200	
5	0.450	18.8	4.600	
6	0.900	37.5	6.400	
7	1.700	75	8.700	
8	–	–	11.00	

3.3 Measuring range

CDW

Calibration Dead Weight
Start zeroing/enter zero value (balance)

Syntax: CDW(x) or CDW p1(x)

Parameters:

q1	**Zero value in ADU units**
	7 680 000 ADU units correspond to the final value of the measuring range currently set at 2.5mV/V, 5mV/V or 10mV/V.

Effect: The value entered is saved to the amplifier's zero store.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example 1: Start zeroing
CDW(x)
0*(y)*

Example 2: CDW10000(x)
0(y)

Note: For p1, if the value read off with CDW?1 (zero value plus gross measured value) is sent, the current gross measured value is set to zero.

Note: There also exists the possibility of setting the basic unbalance to zero, with the zero value to be calculated according to the following equation:

$$\text{Zero value (ADU units)} = \frac{7\,680\,000 \text{ x basic unbalance (mV/V)}}{\text{Final value of the measuring range (mV/V)}}$$

CDW: The output value is reversed, if programmed so
CDW?: The input value is reversed, if programmed so

See also SGN.

CDW?

Calibration Dead Weight Query
Output of zero value

Syntax: CDW? p1(x)

Parameters:

p1	Code number of zero value
0	Zero value
1	Zero value plus current gross measured value

Effect: With this command, the zero value is output from the memory or the sum of the zero value and gross measured value.

Response: q1(y)

q1	Zero value in ADU units
	7 680 000 ADU units correspond to the final value of the measuring range currently set at 2.5 mV/V, 5 mV/V or 10 mV/V.

Example 1: CDW?1(x)
10000(y)
Zero value and gross measured value are output.
With CDW 10 000(x) this signal would now be set to zero.

CMR

Change Measuring Range
Switch measuring range (Range 1/2)

Syntax: CMR p1(x)

Parameters:

p1	Measuring range code number
1	Measuring range (Range) 1
2	Measuring range 2

Effect: Whichever of the two measuring ranges you require is switched on.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: CMR2(x)
0(y)
Measuring range 2 is set.

CMR?

Change Measuring Range Query
Output of measuring range

Syntax: CMR?(x)

Parameters: none

Effect: The measuring range selected is output.

Response: q1(y)

q1	Measuring range code number
1	Measuring range (Range) 1
2	Measuring range 2

Example: CMR?(x)
2(y)
Measuring range 2 is set.

IMR

Input Measuring Range
Input of the final value of the measuring range

Syntax: IMR p1,p2(x)

Parameters:

p1	Measuring range code number
1	Measuring range (Range) 1
2	Measuring range 2

Effect: p1 is set to the measuring range 'p2'.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: IMR2,2.5(x)
0(y)

Measuring range 2 is set to 2.5 mV/V

Note: This command is implemented into the existing software in the DMP40 for reasons of compatibility only; permitted input value is only that with the ASA selected measuring range.

IMR?

Input Measuring Range Query
Output of final value of the measuring range

Syntax: IMR? p1(x)

Parameters:

p1	Measuring range code number
0	The signal S1 in ADU units without zero and tare
1	Measuring range (Range) 1
2	Measuring range 2
3	maximum and minimum adjustable final value of the measuring range

Effect: Output of the set measuring range.

Response: q1,q2(y)

p1=0	q1=0, q2	Signal S1 in ADU units
p1=1	q1	1 = Measuring range code number,
	q2	final value set up for measuring range 1
p1=2	q1	2 = Measuring range code number,
	q2	final value set up for measuring range 1
p1=3	q1	maximum adjustable final value of the measuring range (depending on the amplifier)
	q2	minimum adjustable final value of the measuring range (depending on the amplifier)

See also note on IMR, page G-69.

Example 1: IMR?2(x)
2,2.5(y)

Measuring range 2 is set to 2.5 mV/V.

Note: If no measuring range code number (p1) is input, the device sends the code number for the measuring range that is currently set and the final value of the measuring range.

3.4 Tare

TAR

Tare instruction
Start taring /Enter tare value

Syntax: TAR p1(x)

Parameters: p1 (optional)
Tare value in ADU units

Effect: The signal S2 is tared (set to zero).
If p1 is not sent, the current measured value is tared by S2.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example 1: Start taring

TAR(x)
0(y)

Note: Taring is done computationally, not by balancing of the input signal.

Example 2: TAR3840000(x)
0(y)

Input value is written to the tare memory.

Example 3: TAR0(x)
0(y)
The tare memory is deleted (S2=S1).

TAR?

Tare Value Query
Output tare value

Syntax:	TAR?(x)
Parameters:	none
Effect:	The tare value is output in ADU units.
Response:	q1(y) Tare value in ADU units
Example:	TAR?(x) *3840000(y)*
Note:	Using the following equation, you can convert the tare value into the correponding units:

$$\text{Tare value (unit)} = \frac{\text{Final value of the measuring range (unit) x Tare value (ADU units)}}{7\ 680\ 000}$$

TAR: The output value is reversed, if programmed so
TAR?: The input value is reversed, if programmed so

See also SGN.

3.5 Analog outputs

OPS

Output Path Select[1)]
Assign analog outputs

Syntax: OPS p1,p2(x)

Parameters:

p1	Output
1	Vo1
2	Vo2

p2	Signal
0	No link
1	S1 (Gross)
2	S2 (Net)
3	S3 (min / max storage 1)
4	S4 (min / max storage 2)
5	S16 (absolute)

Effect: With the aid of this command, the analogue output p1 is linked with the signal p2.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: OPS1,1(x)
0(y)
Output Vo1 is switched to signal S1.

1) From Hardware Rev. 1.05, this command is no longer supported.

OPS?

Output Path Select Query[1)]
Query allocation of analog outputs

Syntax: OPS? p1(x)

Parameters: p1
Code number of required output (see OPS command).

Effect: With this the allocation between the analogue output p1 to one of the signals S1 – S4, S16 is output.

Response: q1(y)
Code number of allocated signal (see OPS command).

Example: OPS?2(x)
2(y)
The signal S2 is present at output Vo2.

1) From Hardware Rev. 1.05, this command is no longer supported.

3.6 Peak store

PVS

Peak Value Select
Input of peak-value store settings

Syntax: PVS p1,p2,p3,p4(x)

Parameters:

p1	**Min / Max storage**
1	S3
2	S4

p2	**Peak value determination** (always applies to both Min / Max storage)
0	Off
1	On

p3	**Signal**
−1	−S1
−2	−S2
+1	+S1
+2	+S2
+3	Peak-to-peak S1
+4	Peak-to-peak S2

p4	Envelopes
0	Envelope function is off
1..60000	Timing constant in ms

Effect: This command is used to set the function of the peak-value store p1.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: PVS1,1,+1,0(x)
0(y)
Min / Max storage 1 (S3) is switched on, allocated to signal +S1; the envelope function is switched off.

PVS?

Peak Value Select Query
Output of peak-value store settings

Syntax: PVS?p1(x)

Parameters: p1
Code number of Min / Max storage (see PVS command).

Effect: This command causes the setting of peak-value store p1 to be output.

Response: q1,q2,q3,q4(y)
Format: see PVS command

q1	Code number for the peak-value store
q2	Peak-value determination On/Off
q3	Code number of signal with polarity
q4	Timing constant for envelope function in ms

Example: PVS?2(x)
2,0,2,0(y)
Min / Max storage 2 (S4) is off and allocated to signal +S2. The envelope function is off.

CPV

Clear Peak Value
Clear peak-value store

Syntax: CPV(x)

Parameters: none

Effect: This command clears the peak-value stores

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: CPV(x)
0(y)
Min / Max storage 1 and 2 (S3,S4) are deleted.

Note: After clearing of the peak-value store the output signal of the store is the adjacent measured value.

3.7 Limit-value monitoring

LIV

Limit Value
Input of limit value switching thresholds

Syntax: LIV p1,p2,p3,p4,p5(x)

Parameters:

p1	Limit monitors
1	1
2	2
3	3
4	4

p2	Limit-value monitoring
0	Off
1	On

p3	Source
1	S1
2	S2
3	S3
4	S4
5	S16

p4, p5 Switching points

Input in ADU units, 7680000 at final value of the measuring range.

Effect: With the aid of this command, limit value switch p1 is set to limit-value monitoring, to source p3, to switching point p4 (closer) and switching point p5 (opener).

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example 1: LIV1,1,2,3840000,–3840000(x)
0(y)

Limit value switch 1 is set to limit-value monitoring, source S2 and switching points +50 % (closer) or -50 % (opener).

Note: With the following equations, you can convert the switching points into ADU units

$$\text{Switching point (ADU units)} = \frac{7\,680\,000 \ \text{x switching point (unit)}}{\text{Final value of measuring range (unit)}}$$

LIV?

Limit Value Query
Output of limit value switching thresholds

Syntax: LIV? p1,p2(x)

Parameters:

p1	Limit monitors
0	Query signal value of p2 (output in ADU units)
1	1
2	2
3	3
4	4

p2	Signal code-number, if p1=0
1	S1
2	S2
3	S3
4	S4
5	S16

Effect: This command causes the setting of limit value switch p1 to be output.

Response: q1,q2,q3,q4,q5(y) or q6(y)

q1	Limit monitors
q2	Limit-value monitoring On/Off
q3	source of the limit monitor
q4	Switching point 1 (closer) in ADU units
q5	Switching point 2 (opener) in ADU units
q6	Level of signal p2 in ADU units

Example 1: Query settings of limit value 2
LIV?2(x)
2,1,3,3840000,1920000 (y)

Example 2: Query level of signal S1 (Range 1).
LIV?0,1(x)
7680000(y)

Note: With the following equations, you can convert the switching points or levels inot the selected unit of measurement.

$$\text{Switching point (Unit)} = \frac{\text{Final value of measuring range (unit) x switching point (ADU units)}}{7\,680\,000}$$

$$\text{Level (Unit)} = \frac{\text{Final value of measuring range (unit) x level (ADU units)}}{7\,680\,000}$$

3.8 Transferring amplifier settings and comments

MDD

Memory Device Data
Input of amplifier set-up data

Syntax: MDD p1(x)

Parameters: p1

Amplifier set-up data, retrieved from the amplifier with the command MDD? (as hexadecimal string ”___”, 123 Bytes = 246 characters.

Effect: The command is used to save and recall complete set-ups. If you want to change individual parameters, please use the relevant command Amplifier set-up parameters are reloaded into the amplifier channel, then a warmstart is executed. In the set-up data, the amplifier channel number, for which the set-up data is specified, is coded.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: MDD ”_____ (Hexadecimal string)___”(x)
0(y)
Amplifier is set up.

MDD?

Memory Device Data Query
Output of amplifier set-up data

Syntax:	MDD? p1(x)
Parameters:	p1 Channel number of amplifier (1-2)
Effect:	Set-up parameters of amplifier are output
Response:	”____hexadecimal string____”(y) (123 Bytes= 246 characters)
Example:	MDD? 1(x) *”0a00ff....”(y)* Output amplifier set-ups of Channel 1.

TDD

Transmit Device Data
Save amplifier set-ups and comments

Syntax: TDD p1(x)

Parameters:

p1	Amplifier set-ups		
0	ROM	→	RAM (Setup Factory Data)
1	EEPROM	→	RAM (Recall Data)
2	RAM	→	EEPROM (Save Data)
3	External EEPROM	→	RAM (Recall Data)
4	RAM	→	External EEPROM (Save Data)

p1	Comments		
5	EEPROM	→	RAM (Recall Comment)
6	RAM	→	EEPROM (Save Comment)
7	External EEPROM	→	RAM (Recall Comment)
8	RAM	→	External EEPROM (Save Comment)

Effect: Cold/Warm start and data security to EEPROM

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: TDD2(x)
0(y)
Store amplifier set-ups in internal EEPROM.
Saving to an external EEPROM takes about 3 secs.

TDD?

Transmit Device Data Query
Query, where amplifier set-up originates from

Syntax: TDD? p1(x)

Parameters:

p1	
0	Source of amplifier set-up
3	Queries whether external EEPROM is connected

Effect: Queries the source of the currently active amplifier setting.

Response: q2(y)

q2	when p1=0
0	Setup
1	Internal EEPROM
2	User entry
3	External EEPROM (transducer EEPROM)
?	Error

q2	when p1 = 3
–1	External EEPROM not present.
0	External EEPROM present.

Example 1:	TDD?0(x) *1(y)* Amplifier set-up comes from internal EEPROM.
Example 2:	TDD?3(x) *-1(y)* External EEPROM not present.

UCC

User Channel Comment
Input comment

Syntax: UCC p1(x)

Parameters: p1

any string ”_ _ _ _ _”, (45 characters)

Effect: With this command any comments can be stored in the amplifier.

Response:

Acknowledg-ment	Meaning
0	Command has been executed
?	Error

Example: UCC”Displacement transducer to right-hand tunnel wall” (x)
0(y)

UCC?

User Channel Comment Query
Output comments

Syntax:	UCC?(x)
Parameters:	none
Effect:	With this command, a comment stored in the amplifier can be read off.
Response:	”_ _ (String)_ _”(y)
Example:	UCC?(x) ”Pressure transducer at load machine”(y)

3.9 Remote control

LOR

Local/Remote
Local/Remote switching

Syntax: LOR p1(x)

Parameters:

p1	Status
1	local
0	remote

Effect: Switch to remote control of certain amplifier functions (see RFP command) via remote control inputs of the AP42 connection board (Pin 2 – 9).

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: LOR0(x)
0(y)
Remote control is switched on, i.e. all set-up functions for amplifier parameters are activated via the remote control lines (Bu2, Pin 2 – 9).

LOR?

Local/Remote Query
Query Local/Remote status

Syntax: LOR?(x)

Parameters: none

Effect: Local/Remote control status is output

Response: q1(y)

q1	Status
1	local
0	remote

Example: LOR?(x)
1(y)
Local control is switched on, i.e. all set-up functions for amplifier parameters via the remote control lines (Bu2, Pin2 – 9) are blocked.

RFP

Remote Function Programming
Assignment of remote functions

Syntax: RFP ” . . . .”(x)

Pin9 — Bu2 of connection boards
Pin2

Parameters:

Code number	Function	
0	Autocalibration Off/On	ACAL
1	Initiate taring	TARE
2	Switch Range 2/1	RNGE
3	Switch Filter 2/1	FREQ
4	Current value/Min/Max 1	CPV1
5	Min/Max 1 (HOLD)	HLD1
6	Current value/Min/Max 2	CPV2
7	Min/Max 2 (HOLD)	HLD2
8	Amplifier zero values	ZERO
9	REMOTE-/LOCAL-Switching	REMT
A	Shunt Off/On	SHNT
B	Print Off/On	PRNT
C	Switch on calibration signal	CAL
D	Switch on zero signal	ZERO

The function code numbers 0 – 7 correspond to the default assignment of Pins 2 – 9 after a device "SET UP".

Effect: A string (8 characters) is sent for the assignment of Pins 2 – 9 of the AP42 socket on the amplifier connection boards. In this way, the effect of the remotes on the selected amplifier functions is defined.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: RFP "01894567"(x)
0(y)

Pins 4 and 5 are assigned with ZERO or REMT (different from the default assignment).

Note: Switching between Remote and Local remains possible even when the instrument is in LOCAL status.

RFP?

Remote Function Programming Query
Query re: assignment of the remote functions

Syntax: RFP? p1(x)

Parameters:

p1	
0	Output assignment of remote functions
1	Output table of available functions

Effect: Output of assignment of remote functions of Pins 2 – 9 of the AP42 on the amplifier connection boards.

Response: ” . . . . ”(y)

Example 1: RFP?0(x)
”01234567”(y)

Pins 2 – 9 are assigned as per the default setting (see RFP command).

Example 2: RFP?1(x)
”ACALTARARNGEFREQCPV1HLD1CPV2HLD2ZEROREMTSHNTPR NTCAL␣NULL”(y)

Output table of available remote functions. Abbreviations (4 characters), see RFP command.

4 Amplifier functions

4.1 Calibration

ACL

AutoCal
Switching autocalibration on and off

Syntax: ACL p1(x)

Parameters:

p1	Automatic calibration
0	Switch off
1	Switch on

Effect: Switching autocalibration status on and off (see also CAL).

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: ACL1(x)
0(y)

A calibration is triggered and cyclic autocalibration is switched on.

This interrupts the measurement process approximately every 5 minutes and calibrates the amplifier. If such interruption during a measurement process would be a problem, automatic calibration must remain switched off.

ACL?

AutoCal Query
Output of autocalibration status

Syntax: ACL?(x)

Parameters: none

Effect: Status of autocalibration is output.

Response: q1(y)

q1	Status
0	Autocalibration is off
1	Autocalibration is on

Example: ACL?(x)
1(y)

Autocalibration has been switched on.

CAL

Calibrate
Calibration

Syntax: CAL(x)

Parameters: none

Effect: A single calibration is triggered.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: CAL(x)
0(y)

Calibration is performed.

Note: see also ACL command

4.2 Output format, measurement output

COF

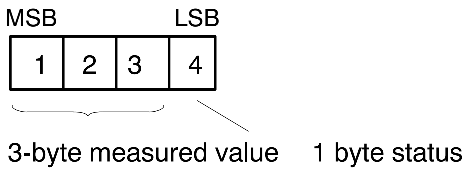
Change Output Format
Change format of measurement output

Syntax: COF p1(x)

Parameters:

p1	Measurement output format
0	Measured value, channel, status (ASCII format)
1	Measured value (ASCII format)
2	Binary measurement output 4 bytes (MSB XX XX LSB)
3	Binary measurement output 4 bytes (LSB XX XX MSB)
4	Binary measurement output 2 bytes (MSB LSB)
5	Binary measurement output 2 bytes (LSB MSB)

4-byte output:



7 680 000 = final value of measuring range (unit)
With thermocouples and units °C,°F, K corresponds to the output value multiplied by 1 / 2560 of the measured value in degrees.

Status byte

Bit	Value	Meaning
0	1	Limit value1 On
1	2	Limit value 2 on
2	4	Limit value 3 On
3	8	Limit value 4 on
4	16	S1 Overflow
5	32	S2 Overflow
6	64	Calibration error
7	128	Alteration of setting (e.g. via remote control signals), Value not available

2-byte output:

MSB	LSB
1	2

2-byte measured value
30 000 = final value of measuring range (unit)
With thermocouples and units °C,°F, K corresponds to the output value multiplied by 1 / 10 of the measured value in degrees.

Effect: With the following MSV commands, measured values are output in the preferred form.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: COF0(x)

0(y)

Output measured values with channel no. and status in ASCII format.

Note: This command always applies to all the channels of a device.

Note: With ASCII format, measured values are output scaled, with binary format in ADU units.

COF?

Change Output Format Query
Query format of measurement output

Syntax:	COF?(x)
Parameters:	none
Effect:	Output the output format code number of measured values.
Response:	q1(y) Output format code number (see COF command).
Example:	COF?(x) *0(y)*

Measured values, channel no. and status are output in ASCII format.

ISR

Input Sampling Rate
Define value transfer rate

Syntax: ISR p1(x)

Parameters: p1
Divider value for measurement output data transfer rate via an interface.

Effect: In the case of binary measurement output, this command takes care of an output in a fixed time raster for the commands MSV?13; MSV?14 or MSV?15.

The display of measured values on the Act.screen must be switched off.

The relationship between the parameter p1 and the output rate comes from the calculation below.

In order to define the input value for p1, the following calculation applies:

$$p1 = \frac{\text{Internal cycle frequency (=75 Hz)}}{\text{Measured value transfer rate}} = 1...75$$

The following commands start an output in the 15 measured values / seconds time raster:

Command	Function
ISR5(x)	Value transfer rate 15 per second
COF2(x)	Output format 4 bytes binary
MSV?13,0(x)	Continuous measurement output Gross signal
STP(x)	Stop measurement output

MSV?

Measuring Signal Value Query
Measured value output

Syntax: MSV? p1,p2,p3(x)

Parameter: p1

Selection of amplifier signal

p1	Signal	
1	S1	Gross
2	S2	Net
3	S3	Peak value1
4	S4	Peak value2
5	LVS1	Closer
6	LVS1	Opener
7	LVS2	Closer
8	LVS2	Opener
9	LVS3	Closer
10	LVS3	Opener
11	LVS4	Closer
12	LVS4	Opener
13	S1	Dynamic, gross
14	S2	Dynamic, net
15	S0	Dynamic, absolute
16	S0	Absolute
32		Absolute mV/V
33		Gross mV/V
34		Net mV/V
35	Peak value1 absolute mV/V	
36	Peak value1 gross mV/V	

Synchronized, see ASF for measurement rate

Selection of amplifier signal

p1	Signal
37	Peak value1 net mV/V
38	Peak value2 absolute mV/V
39	Peak value2 gross mV/V
40	Peak value2 net mV/V
41	Absolute Unit2
42	Gross Unit2
43	Net Unit2
44	Peak value1 absolute Unit2
45	Peak value1 gross Unit2
46	Peak value1 net Unit2
47	Peak value2 absolute Unit2
48	Peak value2 gross Unit2
49	Peak value2 Net Unit2

p2	Number of measured values
0	Send continuously
1 ... 65 535	Default = 1

Parameter:	p3 Sequence in seconds 0.1 s to 60.0 s. Output time in seconds between measured values (only for binary measurement output).
Effect:	The measured value from the required signal p1 is output. The output format depends on the last COF and TEX command. The command CMS is used to define from which channel values are output.
Response:	Measured value (output format: see COF command).

MSV?: all values are reversed, if programmed so; exception: peak-peak values (signal no. 3,4,35..40,44..49) and limit values (signal no. 5..12).

See also remote SGN.

Example 1: **Output in full ASCII format**

TEX44,59(x)	Separators ’,’ and ’;’
0(y)	
COF0(x)	Full ASCII format (value, channel, status)
0(y)	

Retrieve one measured value from S1.
MSV?1(x)
9.998,3,0(y)

Status byte
Channel
Measured value (e.g. 9.998kg)

Example 2: **Output in stripped ASCII format**

Stripped ASCII format (value only).
One measured value from S1.

COF1(x)
0(y)
MSV?1(x)
9.998(y)

Example 3: **Output in 4-byte binary format**

Binary 4-byte format
One value from S1

COF2(x)
0(y)
MSV?1(x)

#14ffeedd00(y)

1-byte status
3 bytes measured value
Binary format

y
x
z
ASCII format

z: Identification character for binary output

x: gives the number of decimal places from y (x=0 with continuous output)

y: gives the number of binary bytes which follow (not used for continuous output)

e.g.:	x = 1	y = 8	(8 binary bytes are output)
	x = 2	y =16	(16 binary bytes are output)

MEV

Measuring Extended Values Query
Output of additional measured values

Syntax: MEV? p1 (x)

Parameter: p1
Selection of amplifier signal

p1	Signal
1	External voltage in volts (xx.xxx)
2	External resistance in Ω (xxxx.x)
3	External temperature in °C (–xxx.xx)
4	Transducer current in mA (xxx.x)
5	Transducer resistance in Ω (xxx.x)

The measuring rate for all MEV signals is slow (1...2 Hz). The output is not synchronized; in the event of more rapid querying, the same value is output several times.

p1 The external voltage with a maximum of three decimal places is zero with an open input.

p2/3 The external resistance input is dispensed with from 10 to 1400 ohms and is designed for Pt100, Pt500 or Pt1000. Switching between ranges is automatic. Open inputs are displayed as 9999.99 Ω or 200 °C. With input resistances under 80 Ω, –100 °C is output.

p4 The maximum transducer current is about 250 mA. If the final stage of transducer excitation is limited, 999.9 mA is displayed.

p5 The transducer resistance is the quotient of the current excitation voltage and the transducer current. If the final stage is limited, 0 is output. With very low currents, the information on resistance is very approximate and if the current is too low, it is limited to 9999.9 Ω.

Example: Measurement of transducer temperature with Pt100

MEV?3(x)
24.44
or

MEV?3(x)
30(y)

STP

Stop
End of measurement output

Syntax:	STP(x)
Parameters:	none
Effect:	The measurement output initiated with MSV? is stopped.
Response:	none
Example:	STP(x)

TEX

Define Terminator
Define value separators

Syntax: TEX p1,p2(x)

Parameters:

p1	Parameter separators
	1 - 126 Default: 44, ASCII ”,”

p2	Block separators
	1 - 126 Default: 13, ASCII ”CR”

Effect: ASCII characters input with p1 and p2 are effective as separators for ASCII value output (MSV? command). ASCII characters input with p1 are output as parameter separators and those input with p2 are output as block separators between repeated values.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: TEX59,13(x)
0(y)

59 → ASCII ”;”
13 → ASCII ”CR”

TEX?

Define Terminator Query
Output value separator

Syntax: TEX?(x)

Parameters: none

Effect: Output value separator (see TEX).

Response: q1,q2(y)
Parameter and block separators

Example: TEX?(x)
44,13(y)

44 → ASCII ”,”
13 → ASCII ”CR”

4.3 Display functions

Note: The commands in this Chapter, ”Display functions” have an effect on the display of measured values on the Act.screen.

ENU

Engineering Unit
Input of the unit of measurement

Syntax: ENU p1,p2(x)

Parameters:

p1	Measuring range, to which the unit applies
	1 = Measuring range 1; 2 = Measuring range 2

p2	The preferred unit as string
	4 characters

Effect: Unit is set to p2.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: ENU 2,”KG_ _”(x)
0(y)

ENU?

Engineering Unit Query
Output of the unit of measurement

Syntax: ENU? p1(x)

Parameters:

p1	
0	Unit of measurement of measuring range currently set
1	Unit – Measuring range 1
2	Unit – Measuring range 1
3	Table of available units

Effect: The set unit is output.

Response: q1,q2(y)

q1 No. of measuring range (Range1/2)

q2 A string consisting of a maximum of 4 characters. You can take the characters for the string from the table on the following page.

Possible unit for Measuring range 1:

”MV/V”

Possible units for Measuring range 2:

”V__G___KG__T___KT--TONSLBS-N---KN--BAR-mBARPA__PAS_HPASKPASPSI_uM__MM__CM__M___INCHNM__FTLBINLBUM/MM/S_M/SSp/o_p/ooPPM”

These mean:

MV/V	=	mV/V	PSI	=	PSI
V	=	V	uM	=	µm
G	=	g	MM	=	mm
KG	=	kg	CM	=	cm
T	=	t	M	=	m
KT	=	kt	INCH	=	inch
TONS	=	tons	NM	=	Nm
LBS	=	lbs	FTLB	=	ftlb
N	=	N	INLB	=	inlb
KN	=	kN	uM/M	=	µm/m
BAR	=	bar	M/S	=	m/s
mBAR	=	mbar	M/SS	=	m/s^2
PA	=	PA	p/o	=	%
PAS	=	PAS	p/oo	=	%o
HPAS	=	HPAS	PPM	=	ppm
KPAS	=	KPAS			

Example 1: ENU?(x)

1,"MV/V"(y)
Unit of measurement of current measuring range set

Example 2: ENU?3(x)

*"MV/VV_ _ _G_ _ _KG_ _T_ _ _KT_ _TONSLBS_N_ _ _KN_ _BAR_mBARPA_*
PAS_HPASKPASPSI_UM_ _MM_ _CM_ _M_ _ _INCHNM_ _FTLBINLB
UM/MM/S_M/SSp/o_p/00PPM_"(y)
Output table of possible units.

In this string you will find the table of units available for this amplifier
Each element in the table is 4 characters long.

IAD

Indication Adaptation
Input, end value, decimal point, step

Syntax: IAD p1,p2,p3,p4(x)

Parameters:

p1	Range 1 or 2
p2	End value without decimal point
p3	Decimal point (number of decimal places)
p4	Step (= minimum step) (digit)

Step p4 can have the following values:

p4	Step
1	1
2	2
3	5
4	10
5	20
6	50
7	100
8	200
9	500
10	1000

Effect: With the aid of this command, display adaptation values are input.

Response:

Acknowledgment	Meaning
0	Command has been executed
?	Error

Example: IAD2,10000,3,4(x)
0(y)

Set display adaptation for Measuring range 2

End value 10,000 with step width 0.010

Note: In Measuring range 1, only the range currently selected with ASA can be input; the decimal places can vary from 3 to 6.

For example, the following are permissible:
IAD1,250000,6,2
IAD1,50000,4,1

If necessary, step p4 is increased internally so that the display resolution does not exceed 2500000. This internal increase is effected without an error message.

The command IAD2,6000000,0,1 has the same effect as
IAD2,6000000,0,3 namely step 5.

IAD?

Indication Adaptation Query
Output end value, decimal point, step

Syntax: IAD? p1(x)

Parameters:

p1	Status
1	of Measuring range 1
2	of Measuring range 1

Effect: Output of end value, decimal point, step.

Response: q1,q2,q3,q4(y)
Parameters: see IAD command

Example: IAD?2(x)
2,10000,3,1(y)

End value in Measuring range 2 is 10.000 with step 0.001.

LTB

Linearization Table
Linearization of transducer characteristic curve

Syntax: LTB n,x_1,y_1 .... x_n,y_n(x)

Parameter: n=2 ...11
x=Figures in mV/V (Measuring range 1)
y=Figures with current unit of measurement for Measuring range 2
(Set decimal places using the command "IAD")

Effect: With this command, known transducer linearity variations can be corrected, in that up to 11 points of the characteristic curve are defined.

Note: Certain unorthodox entries will not be accepted by the DMP unit. These can be: jumps in slope, change of slope prefix, x-values placed too closely together.

LTB?

Linearization Table Query
Output current linearization curve

Syntax: LTB?(x)

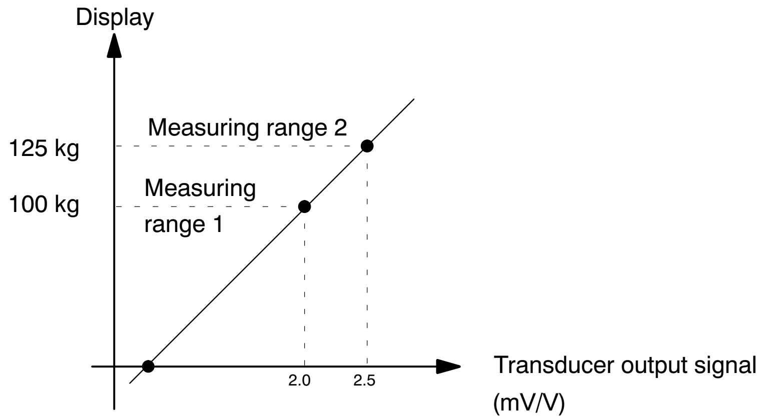
Parameters: none

Effect: The current characteristic curve points are output.

Note: After inputting the characteristic curve points, the display adaptation ("IAD" command) of Measuring range 2 is automatically adjusted. As the linearization table is input in mV/V, no correction is necessary after a change of measuring range.

Likewise, values which lie outside the measuring range currently selected can also be input.

Example:



SGN

Sign Reversal

Syntax: SGN p1(x)

Parameters: p1

p1	Display
0	normal display of values
1	reversed display of values
2	toggle normal / reversed

SGN?

Sign Reversal Query

Syntax: SGN?(x)

Parameters: no

Response: q1(y)

q1	
0	normal display of values
1	reversed display of values

Appendix I   Program versions

Some commands are executed in the amplifiers, others in the CP12.

Should individual components (CP12 or amplifier) of your DMP amplifier be fitted with older firmware versions, the table below will tell you which commands are affected by this.

Command	Executed in the CP12	Executed in the amplifier
ACL		x
ADR	x	
AID	x	
ASA		x
ASS		x
AFS		x
ASF		x
BDR	x	
CAL		x
CDW		x
CHS	x	
*CLS	x	
CMR		x
COF	x	
CPV		x
DCL	x	
ENU		x
*ESR?	x	
*ESE	x	
IAD		x
IBY?	x	
*IDN?	x	
IMR		x

Command	Executed in the CP12	Executed in the amplifier
ISS	x	
ISR		x
*IST?	x	
LIV		x
LOR		x
MDD		x
MSV	x	
OPS		x
PFS		x
PPM	x	
*PRE	x	
PRT	x	
PVS		x
RES	x	x
RFP		x
*RST	x	x
Sxx	x	
SRB	x	
*STB?	x	
STP	x	
*SRE	x	
TAR		x
TDD		x
TEX	x	
UCC		x

Appendix II CP12 measured-value transmission rates

The quickest transmission of measured values (IEEE interface or serial at 9600 baud) is obtained with binary output; with one or two (DMP40S2) amplifiers all values occurring at 75Hz can be transmitted (measuring rates: see command ASF).

ASCII measurement output

The values in the following table are valid only if the command MSV?x,0 has been input in ASCII measurement output (see COF command).

Number of amplifiers	**Number of value/s per channel**	
	ASCII long format	ASCII short format
1	18	20
2	9	10

Appendix III Glossary

This glossary contains words which are use in the manual ”Operation with computer or terminal”, as well as general terms used in the field of computer technology.

ASCII

ASCII is a standardized code (**A**merican **S**tandard **C**ode for **I**nformation **I**nterchange), in which specific codes are assigned to each printable character and each control character on your computer, e.g. 4F for the character O.

Baud

Baud is the unit of measurement for the speed at which data is transfered between system units via a serial interface. 1 baud corresponds to a transfer rate of one bit per second.

Bit

Bit is the abbreviation for ”binary digit”. A bit is the smallest unit of information a computer can recognize. A bit can have the value 0 or 1. 8 bits equal 1 byte.

Command

Command is the technical term for an instruction to your computer. Commands are entered into the computer using a keyboard, a mouse or some other form of input device. Commands instruct the computer to start or stop particular operations or to call up and process a program.

Byte

Byte is the amount of memory space needed to save one character. One byte consists of 8 bits, e.g. 01010001.

DIP switch

A DIP switch is a mini-switch, usually with 8 individual switches.

Firmware

Software, which is stored in the EEPROM or PROM and defines equipment functions. Firmware is integrated permanently and does not run on an external computer.

Channel coding value

A binary value is assigned to each channel. The associated decimal value is transfered.

Parallel interface

A parallel interface is a standardized interface with, for example, 25 connecting pins. Amongst other things, this interface is used for connecting a printer to the computer. Data is simultaneously sent or received by the parallel interface via a number of circuits.

Register

Standard Event Status Register

The standard event-status register (ESR) is set if errors occur in communication. Different causes of error set different bits, so that errors can be specified precisely.

Standard Event Status Enable Register

An error bit is set in the standard event status register. This only leads to the setting of the event summary bit (ESB) in the status byte register if the associated bit is set in the standard event status enable register (see also *ESR? command).
With this it can be established which error causes lead to the generation of a service request.

Status Byte Register

The status Byte register contains information on whether there is a message in the output buffer, an error has occurred or a service request has been made. In the case of a serial poll via the IEEE interface, the status byte register of the addressed device is also output.

Service Request Enable Register

If a service request enable register bit and the associated bit of the status byte register are set, this has the following effects:

* The master summary status byte (MSS) of the status byte register (STB) is set.
* A service request is carried out.

Interface

Any connection point through which data can be transfered or other devices connected.

Serial

A standardized transfer mode, enabling data to be transfered between transmitting and receiving devices bit by bit.

Syntax

A fixed sequence of characters, which must be used for inputting commands, parameters and switches, e.g. in MS-DOS.

Appendix IV Alphabetical summary of commands

This summary relates to *Chapter G "HBM Interpreter commands".*

Operation with computer or terminal

Appendix V Summary of commands by function

Operation with computer or terminal

This summary relates to *Chapter G "HBM Interpreter instruction set".*

Appendix VI Index to keywords

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