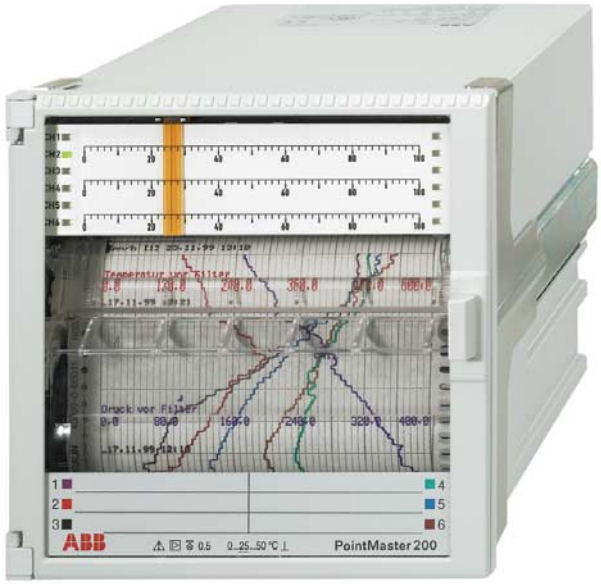
PointMaster 200

6-channel Multipoint recorder
Version with scales

Parameter setting instructions 42/41-24 EN Rev. 00



Contents

Important instructions! Please read and observe!

Correct and safe operation of the apparatus calls for appropriate transportation and storage, expert installation and commissioning as well as correct operation and meticulous maintenance.

Only those persons conversant with the installation, commissioning, operation and maintenance of similar apparatuses and who possess the necessary qualifications are allowed to work on the apparatus.

Please take note of the contents of this Operating Manual and the safety regulations affixed to the apparatus.

The directives, norms and guidelines mentioned in this Operating Manual are applicable in the Federal Republic of Germany. When using the apparatus in other countries, please observe the national regulations prevailing in the respective country.

This apparatus has been designed and tested in accordance with EN 61010-1 "Safety requirements for electrical measurement, control and laboratory instruments" and has been supplied in a safe condition. In order to retain this condition and to ensure safe operation, the safety instructions in this Operating Manual bearing the headline "Caution" must be observed. Otherwise persons can be endangered and the apparatus itself as well as other equipment and facilities can be damaged.

If the information in this Operation Manual should prove to be insufficient in any point, the Service Department will be delighted to give you more information.

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Notes

The following conventions will be used for identification purposes:
key entries with < > brackets,
indications on display with { } brackets,
text printouts with [ ] brackets.

The maximum equipment is descibed in this manual. The number of parameters which the recorder provides for modification depends on the recorder version selected.

The recorder recognizes its hardware configuration.

Short description

The PointMaster 200 is a microcontroller-controlled multipoint recorder.

It is supplied in 3 different versions:
- Scale version with 1 to 6 scale graduations,
- LED display version and
- LC display version.

This manual describes the parameterisation of the scale version.

Introduction

The recorder is parameterised using either the keys of the display and operator control unit or a PC via the RS-485 interface.

Parameterisation via the RS-485 interface can be performed with the arameterisation program.

Parameterisation

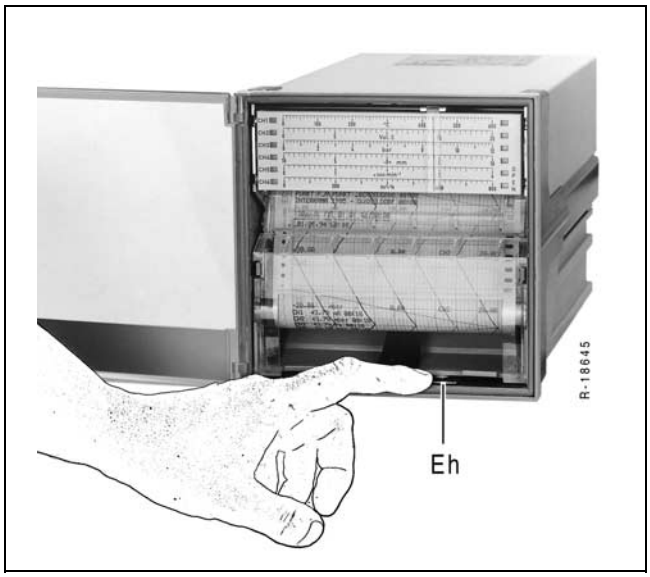


Fig. 1 Remove the chart unit
R-18645

Start

1. Press down pull-to-unlock lever *Eh* (see fig. 1). The chart unit swings out.
2. Remove the chart unit. The operator control unit is accessible.

Display and operator control unit

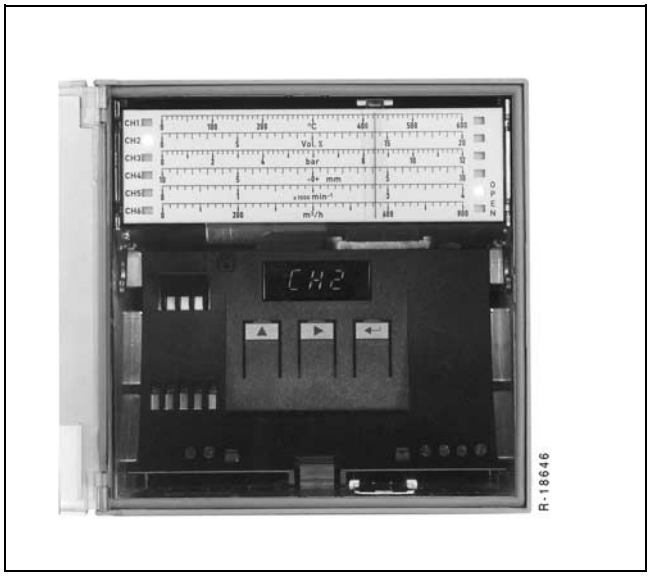


Fig. 2 Display and operator control unit
R-18646

The display and operator control unit (see Fig. 2) is equipped with 3 keys and a 5-digit display for presenting the parameters and parameter values.

Explanation of the keys

<▲> Scroll up key
selects the next digit when setting numerical values or returns to main menu

<▶> Scroll right key
selects next main menu item, next parameter, next parameter value, next digit position

<↵> Enter key
addresses or exits parameters or parameter values

Start parametrisation

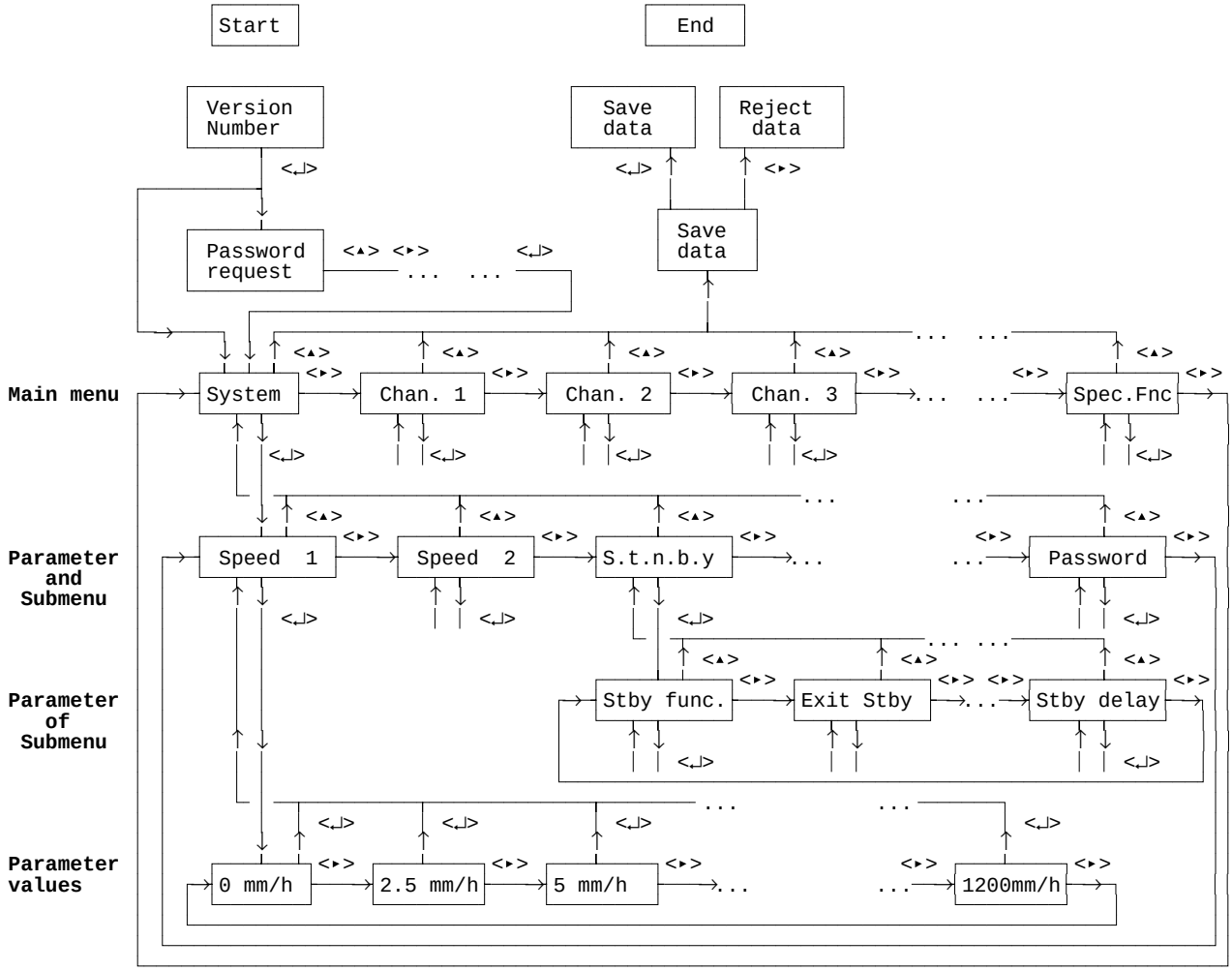
Error messages - insofar as available - are displayed after the chart unit has been removed. These must be acknowledged with <↵>. If no error message exists, the software version of the recorder will be displayed instead. Then the measuring system is active. The current measured values are displayed.

Press <↵> to switch on recorder parameterisation mode.

The print head moves to the park position at the scale start.

If a password has been assigned, the program will ask for it (see section “Preparations for parameterisation”). If no password has been assigned, main menu item **{S Y S}** will be displayed.

Principle of parameterisation



Main menu

- Pressing <▸> displays the following main menu items in succession:

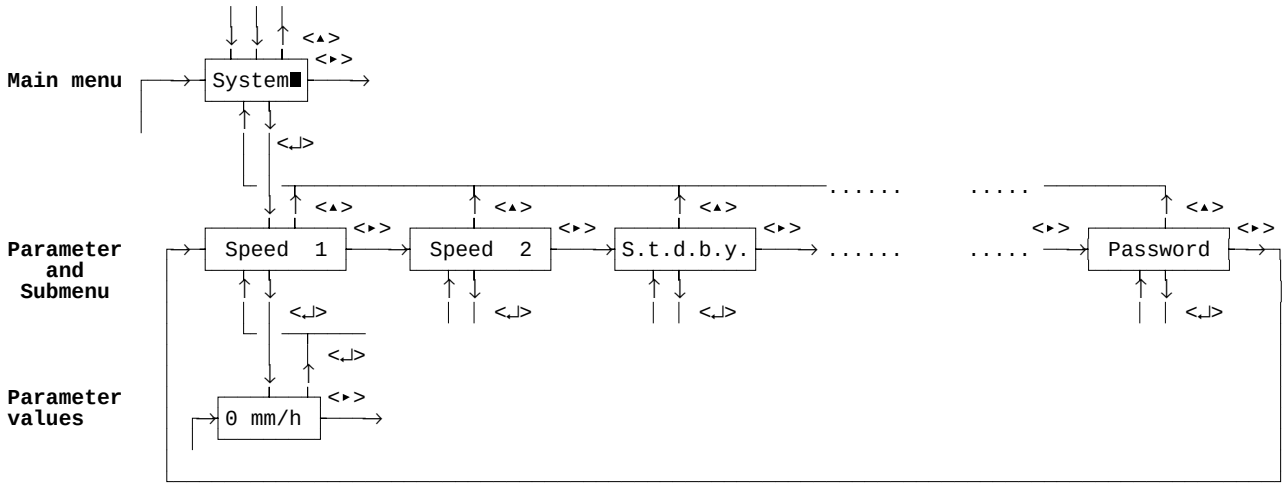
{S Y S}	Definition of drive/display parameters
{C H 1}	Parameters of channel 1 (violet)
{C H 2}	Parameters of channel 2 (red)
{C H 3}	Parameters of channel 3 (black)
{C H 4}	Parameters of channel 4 (green)
{C H 5}	Parameters of channel 5 (blue)
{C H 6}	Parameters of channel 5 (brown)
{Prt.Co}	Colours of chart curves and text lines
{Prt.iv}	Time-interval-controlled text print function
{Prt.SY}	Time-controlled text print functions
{ASS.di}	Assignment of binary inputs to functions
{SP.FnC}	Tests and adjustment
{S Y S}	...

...

Main menu item “Assigning binary inputs to functions” is only displayed if the recorder is equipped with the “Threshold monitoring and binary inputs” option.

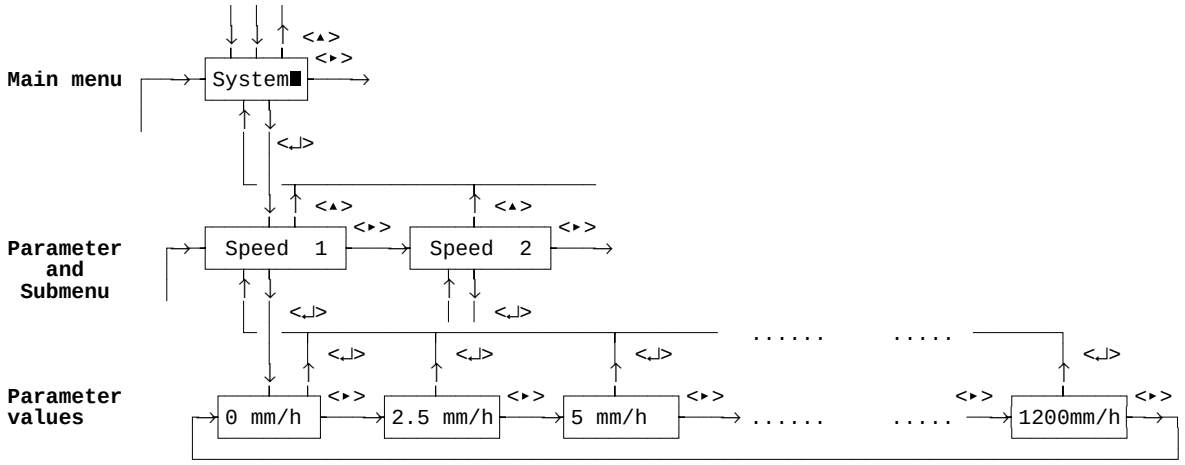
The submenu items are identified by a dot after each letter: **{P.r.F.n.C.}** means “Submenu item Print functions”.

Parameter selection



- Pressing <↵> confirms the selected main menu item. The first parameter of this main menu item is displayed.
- Pressing <▸> displays the parameters of the main menu item in succession.
- Pressing <▴> returns to the main menu item.

Defining parameter values



- Confirm the selected parameter with <↵>, the preset parameter value of the confirmed parameter flashes.

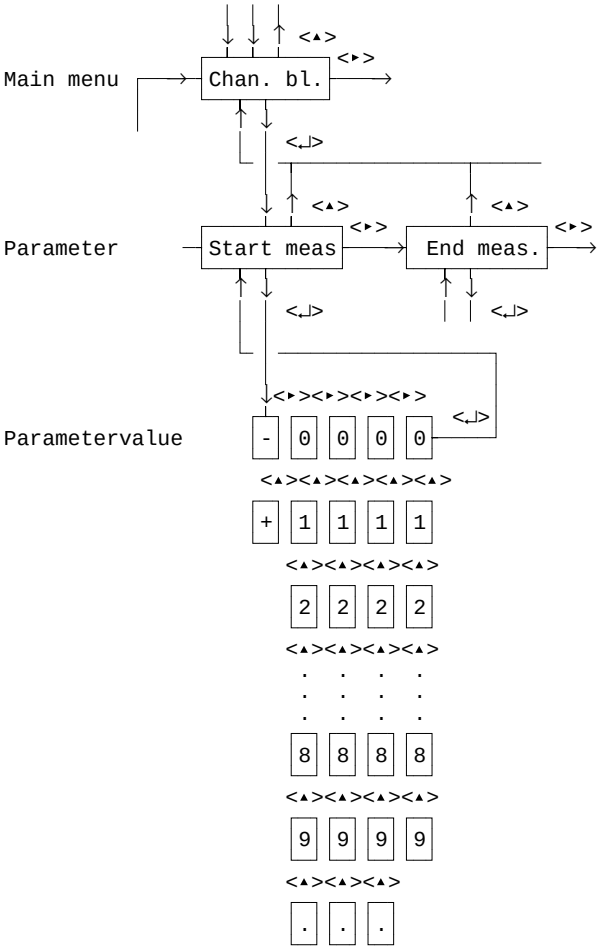
There are two ways of defining parameter values:

- **Selecting** a value from n predefined values.
  Example: selection of a speed from the series 0 / 2.5 / 5 / 20 / ... mm/h.
- **Entering** any desired values between an upper and lower limit.
  Example: entering the lower range and upper range values of the measuring range

Selection

- Display the values of the selected parameter in succession by pressing <▸>.
- Confirm the selected parameter value with <↵>. The parameter is displayed.

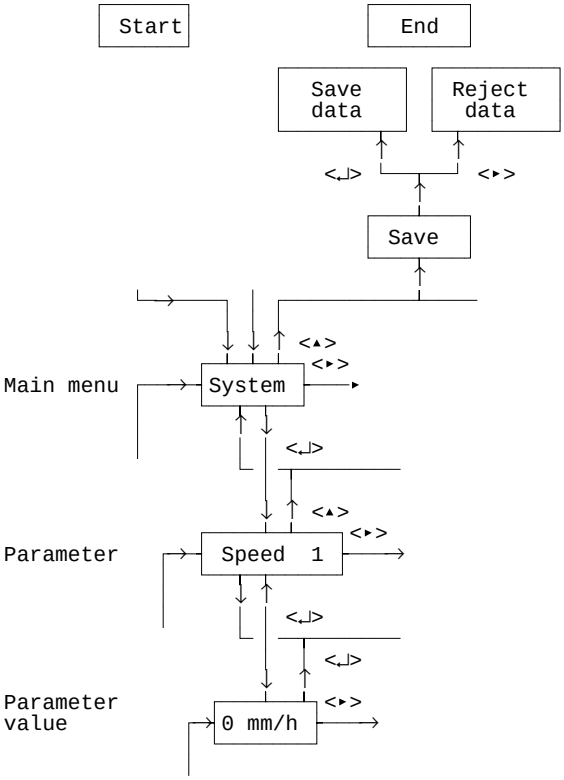
Entry



- Select character positions 1...5 of the parameter value in succession by pressing <▸>, the selected position flashes.
- Press <▲> to display the characters
  − / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / . (. = decimal point)
  in succession.
- Press <↵> to confirm the generated 4-digit number (with sign); the parameter is displayed.
- Press <▲> to return to the main menu item.

The characters “−” and “.” can only be selected when entering real numbers, when entering integer numbers (e.g. password), these characters are not available.

End of parameterisation



Pressing <▲> displays
{SAVE?}.

You can exit the parameterisation mode in two ways:

- Pressing <↵> saves the changed parameter data in the EEPROM.
- Pressing <▸> rejects the changed parameter data.

If the chart unit is used during parameterisation, parameterisation mode is exited. Any data which have already been entered are rejected and the old parameter data remain valid.

Notes on parameterisation

Changing the values of the channel parameters

The procedure when selecting a new type of measurement, a new nominal measuring range, the measuring range or the physical unit is as follows:

Type of measurement and / or nominal measuring range is changed

Lower range value and upper range value of measuring range are set to the limits of the nominal measuring range.

The display range is set to the limits of the nominal measuring range.

The thresholds are set to the lower value (in the case of min. function) or upper value (in the case of max. function) of the display range.

The limits that can be entered for the measuring range are the same as the nominal measuring range.

The limits that can be entered for the display range are −1000... +9999.

The unit of measurement is set to the unit of the type of measurement (e.g. type = 0...10 V: unit = “V”).

If a thermocouple or Pt100 has been selected as the type of measurement, menu items
− user linearisation,
− square root extraction and
− direction are reset.

The temperature unit is switched to °C.

Lower range value or upper range value of measuring range is changed

If a thermocouple or Pt 100 has been selected as the type of measurement, the scale range is adjusted automatically.

The thresholds are checked for compliance with the new measuring range and, in case they lie above or below such, are set to the limits of the measuring range.

If current or voltage has been selected as the type of measurement, the scale range and thresholds remain unchanged.

The thresholds are always referred to the scale range.

Scale range is changed

The thresholds are checked for compliance with the new scale range and, in case they lie above or below such, are set to the limits of the new scale range.

The temperature unit is changed

The measuring range and display range are reset to the nominal measuring range. The entry limits are prespecified in accordance with the nominal measuring range. If the temperature unit is switched to degrees F, the entry limits for the measuring range are converted to °F (°F = 9/5 × °C + 32).

Split Range

When entering the measuring ranges, a check is performed to determine whether the span falls below the minimum span of 20 %. If the span is too small, the error message
{E-rng}
will be output.

Parameter description

Preparations for parameterisation

Password

The parameterisation mode is called up with <↵> if
- the password is 0000 or
- link XB 1 on the CPU card is in position.

Processing of measured values and monitoring of thresholds remains unaffected.

If none of these prerequisites is satisfied, the password is requested:
{PASS?}
{0000?} (last digit flashes)

Enter the password with <▲>, <▸> and acknowledge with <↵>.

If the password is wrong, the message
{E9000}
flashes in the display. Since this is an error message, it must be acknowledged with <↵>. The recorder switches back to operating mode.

If 9999 has been selected for the password, the recorder parameters can only be viewed and not changed. The main menu item “SP.FnC” and the password are not displayed.

If the selected password lies between 0001 and 9998, the parameterisation can be changed if the entered password agrees.

System data

The following parameters can be called up in main menu item “System data”:

Key	Display	Parameter
	{S Y S}	System data (Main menu item)
<↵>	**{SPd.1}**	Speed 1 (standard speed)
<▸>	**{SPd.2}**	Speed 2 (option “Threshold monitoring and binary inputs” required)
<▸>	**{S.t.b.Y.}**	Sub menu standby function
<▸>	**{Pr.FnC}**	Operating mode
<▸>	**{CY.tin}**	Time between 2 charting cycles
<▸>	**{E.dEL}**	Delayed start of measured value printout in operating mode B
<▸>	**{Ev.Cnt}**	Number of event markers in operating mode D
<▸>	**{bAUd.}**	Data transfer rate
<▸>	**{Addr.}**	Bus subscriber address
<▸>	**{AL.CtL}**	Alarm acknowledgment type
<▸>	**{rEL.St}**	Switching of threshold relays
<▸>	**{IO-CO}**	Extension unit for binary inputs and alarm relays
<▸>	**{AL.oUt}**	Collective alarm output
<▸>	**{PA.oUt}**	End-of-paper alarm output
<▸>	**{LEd.Ct}**	LEDs for signalling the displayed channel and the assigned scale graduation
<▸>	**{dFor.}**	Time and date format
<▸>	**{CLoC.}**	Time
<▸>	**{dAtE}**	Date and month
<▸>	**{YEAr}**	Year
<▸>	**{SY.tin}**	External clock synchronisation
<▸>	**{P.r.F.n.C.}**	Submenu for printing functions
<▸>	**{PASS.}**	Password

Speed 1

Speed 1 is the default recorder speed. It is used by the recorder if none of the speed selection functions are active. The default value is 20 mm/h.

Parameter
{SPd.1}

Parameter values mm/h
0 / 2.5 / 5 / 10 / 20 / 30 / 40 / 60 / 120 / 240 / 300 / 600 / 1200

Speed 2

Note
The “Threshold monitoring and binary inputs” option is required.

Speed 2 can have the same values as speed 1. The default value is 120 mm/h. Speed switching is activated by assigning a digital input to the “Speed selection” parameter in the “DI assignment” main menu item. Speed 2 is activated by applying a voltage of 24 V DC between terminals 901 (−) and the terminal (+) assigned to the selected binary input.

Parameter
{SPd.2}

Paramater value mm/h
0 / 2.5 / 5 / 10 / 20 / 30 / 40 / 60 / 120 / 240 / 300 / 600 / 1200

Standby function

Note
The “Threshold monitoring and binary inputs” option is required.

Processing of measured values and threshold monitoring are active in standby.

The following parameters can be called up:

Key	Display	Parameter
	{S.t.b.Y.1}	
<↵>	**{StbY.F}**	Activation of standby
<▸>	**{StbY.L}**	Criterion for exiting standby
<▸>	**{StbY.t}**	Time for delayed switch-on of standby

Standby control

This parameter defines the type of standby control. There are two types of standby control.

1. The recorder is in chart mode when the power supply is switched on. Standby is activated by assigning a digital input to the “Standby” parameter in the “DI assignment” main menu item. The recorder switches to standby when the input is closed.
2. The recorder is in standby when the power supply is switched on.

Standby is exited
− by infringing selected thresholds
− by pressing the multi-function key *FT* and
called again
− by pressing again the multi-function key *FT*.

Parameter
{StbY.F}

Paramater value
0 no standby function
1 standby, activated via binary input and cancelled via threshold infringements
2 standby, activated via binary input and cancelled by pressing *FT*
3 standby activated by switching on the recorder’s power supply and cancelled via threshold infringements
4 standby, activated by switching on the recorder’s power supply and cancelled by pressing *FT*

Exiting standby

This parameter is used to select the thresholds which, when infringed, cause standby to be exited.

Parameter
{StbY.L}

Paramater value
0...4095

The code number of the required threshold which is to cancel standby is to be used as the parameter value. If standby is to be cancelled by several thresholds, the sum of the code numbers must be formed in accordance with the following table and entered as a parameter value.

Code	Channel	Threshold
1	Channel 1	Threshold 1
2	Channel 1	Threshold 2
4	Channel 2	Threshold 1
8	Channel 2	Threshold 2
16	Channel 3	Threshold 1
32	Channel 3	Threshold 2
64	Channel 4	Threshold 1
128	Channel 4	Threshold 2
256	Channel 5	Threshold 1
512	Channel 5	Threshold 2
1024	Channel 6	Threshold 1
2048	Channel 6	Threshold 2

Example

Standby is to be switched off by thresholds 1 and 2 of channels 1 and 2 and by threshold 1 of channels 3, 4 and 5:

The parameter value to be entered is:

1	Channel 1 Threshold 1
2	Channel 1 Threshold 2
4	Channel 2 Threshold 1
8	Channel 2 Threshold 2
16	Channel 3 Threshold 1
64	Channel 4 Threshold 1
256	Channel 5 Threshold 1

Σ **351**

Switching on standby with delay

This parameter can be used to select a time by which switch-on of standby is to be delayed. If text information is to be written when the standby switch-on criterion is satisfied, chart feed must not be switched off immediately. The chart paper must be transported further by the height of the text line (2.8 mm).

Note
This parameter has no effect when standby is controlled by key *FT*.

Parameter
{StbY.t}

Paramater value
0....200 min

Operating mode

The recorder distinguishes between 4 different operating modes:

A **Cyclical mode**: process all active channels

B **External control**
recording of one or more channels, control via the recorder's binary inputs 1...6

C **Cyclical mode**: process one channel
The displayed channel is updated during the cycle time. DI 1...DI 6 signal the through-connected channel by a normally open contact.

D **Event recorder for 10 events**

Operating modes **A** and **C** require a cycle time to be specified which controls printout of the measured values on the paper. The cycle time (3...360 s) is defined by parameter. After the cycle time has expired, the measured values are printed out on the chart. If the chart is moved by the feed by more than 0.4 mm before the cycle time has elapsed, a line of dots is also printed out.

Operating modes **B** and **C** require a delay time to be specified during which no measured values are printed. Specifying a delay time in this way prevents the recorder from recording transient effects from the upstream transmitter. The delay can be 0...30 s. The feed is not halted until the delay has expired.

In operating mode **A** the recorder operates in the following cycle:

1. Print head traces up the measured value from CH 1.
2. After the cycle time has expired, the measured values of all active channels are printed out.
3. After the printout, the print head traces up the measured value from CH 2.
4. After the cycle time has expired, the next channel is selected for display.

The display can be set permanently to a single channel using the key *FT*.

Operating mode **B** establishes a fixed assignment between digital inputs 1...6 and measuring channels 1...6. Only those channels are recorded whose associated DI is closed. In operating mode B, the recorder works in the following cycle:

1. DI x is closed. The measured value of CH x is displayed. The print head traces up the measured value from CH x.
2. DI x is opened. DI y is closed. The measured value of CH y is displayed. The print head traces up the measured value from CH y.
3. DI y is opened. DI z is closed. The measured value of CH z is displayed. The print head traces up the measured value from CH z etc.

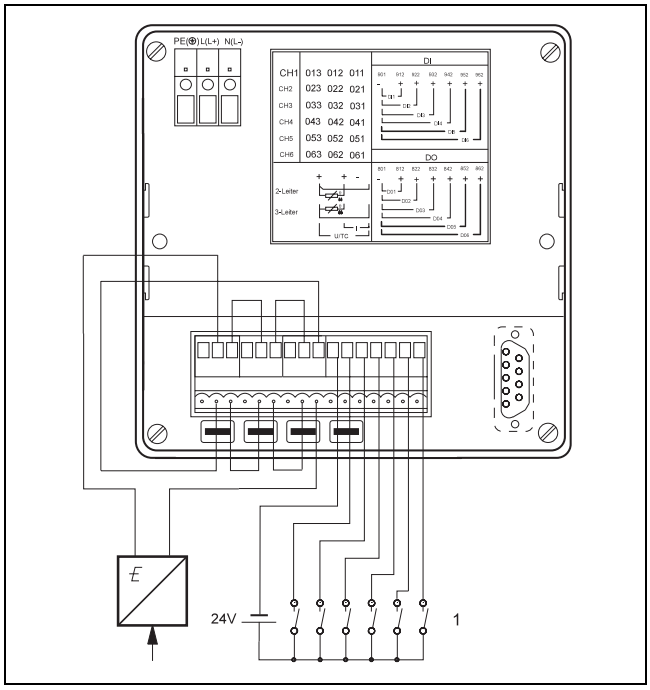


Fig 3 Connection in operating mode B
Z-18069 *1* Channel selector

In operating mode **C** the recorder works in the following cycle:

1. Measured value CH 1 is displayed. The print head traces up the measured value from CH 1. DO 1 is closed. Measured value CH 1 is recorded.
2. After the cycle time has expired, the next channel is selected.
3. Measured value CH 2 is displayed. The print head traces up the measured value from CH 2. DO2 is closed. Measured value CH 2 is recorded.
4. After the cycle time has expired, the next channel is selected, etc.

When a delay time is prespecified, the measured value is displayed immediately. However, no recording is made on the chart.

Operating mode **D** allows the user to record up to 10 time markers on the chart. A parameter is used to specify how many markers are to be recorded. The number can be 1...10. A permanent assignment exists between the time markers and the digital inputs and also with the colour used for plotting the time marker.

Event marker	Color	Recording position	DI
1	violet	5 %	1
2	red	15 %	2
3	black	25 %	3
4	green	35 %	4
5	blue	45 %	5
6	brown	55 %	6
7	violet	65 %	7
8	red	75 %	8
9	black	85 %	9
10	green	95 %	10

Tab. 1

The time markers are shown as a line on the chart. A cross-bar of length approximately 4 mm appears at the start and end of the line.

Parameter
{Pr.FnC}

Paramater value
A process all measuring points cyclically
B external control
C process one measuring point cyclically
D record event

Cycle time

This parameter defines the span of time between two recording cycles. When the cycle time has expired, the measured values of all active channels are printed out. The next printing process is performed after the cycle time has expired again.

Parameter
{CY.tin}

Paramater value:
3...360 s

Delay time for operating modes B and C

This parameter defines the span of time between the activation of a measuring channel and the start of the recording for the measuring channel.

Parameter
{E.dEL}

Paramater value
0...30 s

Number of event markers

This parameter defines how many event markers the recorder is to output on the chart. The parameter is only processed if the recorder is in operating mode D (event recorder).

Parameter
{Ev.Cnt}

Paramater value
1...10

Baud rate

This parameter defines the transmission speed for the RS-485 interface. Standard transmission speeds are used.

Parameter
{bAUd.}

Paramater value
600
1200
2400
4800
9600
19200

Bus subscriber address

This parameter defines the bus subscriber address of the recorder for communication purposes.

Parameter
{Addr.}

Paramater value
0....127 (= subscriber addresses)

Note
Address 133 is the broadcast address of the multipoint recorder.

Alarm acknowledgment

This parameter defines how to handle the display for threshold alarms. The parameter can have the values “off”, “auto” and “man”.

In the case of “off”, no threshold alarms are output on the display.

With “auto” the alarm message is displayed while the threshold is active. Manual acknowledgement is possible. The alarm message is automatically deleted if the threshold infringement no longer applies.

With “man”, a manual acknowledgment is required for every alarm.

These settings are not effective for self-test messages. Self-test messages are always displayed and must be acknowledged.

Parameter
{AL.CtL}

Paramater value
{oFF}
{nAn}
{AUto}

Relay status

This parameter defines whether the output relays will work using the NO or NC current principle. This also defines the contact position in the event of an alarm.

Operating current	NO contact = off
Quiescent current	NC contact = on

This parameter can have the value “off” or “on”. The default setting for the parameter is “off”. The parameter does not apply to relay outputs DO1...DO6 if the recorder is in operating mode C.

Parameter
{rEL.St}

Paramater value
{oFF}
{on}

IO converter

If the recorder is equipped with option “Threshold monitoring and binary inputs”, 6 binary inputs and 6 contact outputs are available. The roots of the contact outputs are interlinked.

The IO converter extends the binary inputs which are directly available on the recorder by a further 8 and extends the contact outputs by a further 14. The contact outputs are electrically isolated.

This parameter can have the values “off” and “on”. In the case of “on”, the IO converter can be connected to a recorder which is not equipped with option “Threshold monitoring and binary inputs”.

Parameter
{IO-CO}

Paramater value
{oFF}
{on}

Collective alarm

This parameter defines which relay output is activated in the event of a self-test error or other alarms. The collective alarm relay is always operated using the NC contact principle. The output is closed if no alarm is present.

Parameter
{AL.oUt}

Paramater value

{oFF}	collective alarm relay off
{doO1}	binary output 1
{doO2}	binary output 2
..	..
{do24}	binary output 24

End-of-paper signal

This parameter defines which relay output is activated when the paper reaches the end.

Parameter
{PA.oUt}

Paramater value

{oFF}	no alarm
{doO1}	binary output 1
{doO2}	binary output 2
..	..
{do24}	binary output 24

Channel and scale LEDs

This parameter defines whether the channel and scale LEDs are activated or switched off.

Parameter
{LEd.Ct}

Paramater value

0	Channel and scale LEDs off
1	Channel LEDs on
2	Channel and scale LEDs on

Date format

This parameter is used to select the format of date and time outputs. The format defined applies for all inputs and outputs of times and dates on the print head.

Parameter
{dFor.}

Paramater value
{EUro}
{US}

Time

This parameter is used for entering the time. The value entered is written immediately to the clock module.

Parameter
{CLoC.}

Paramater value
00:00 to 23:59

The factory setting for the date and time is:
01.01.96 00:00 h.

Date

This parameter is used for entering the date. The value entered is written immediately to the clock module.

Parameter
{dAtE}

Paramater value
01.01 to 31.12

The factory setting for the date and time is:
01.01.96 00:00 h.

Year

This parameter is used for entering the year. The value entered is written immediately to the clock module.

Parameter
{YEAr}

Paramater value
0...99

The factory setting for the date and time is:
01.01.96 00:00 h.

Time for external clock synchronisation

The time to which the clock module is set when the associated input is closed is prespecified.

Parameter
{SY.tin}

Paramater value
00:00 to 23:59

Print functions

Key	Display	Parameter
	{P.r.F.n.C.}	
<↵>	**{Pr.nUn}**	write channel code on chart curve
<▸>	**{Pr.Lin}**	Output of text lines with addition of measured value for alarm value infringement
<▸>	**{SCA.di}**	Spacing in mm between 2 line pairs
<▸>	**{PSPd.}**	Printout of speed, date and time after switching
<▸>	**{Cnt.Hi}**	Counter status of the 4 most significant digits
<▸>	**{Cnt.Lo}**	Counter status for the 4 least significant digits
<▸>	**{Cn.inC}**	Counter ranking/pulse
<▸>	**{Cn.dir}**	Direction of counting
<▸>	**{Cnt.tE}**	Number of text line with counter
<▸>	**{Pr.bL.1}**	Printout of message block 1
<▸>	**{Pr.bL.2}**	Printout of message block 2
<▸>	**{Pr.bL.3}**	Printout of message block 3
<▸>	**{Pr.bL.4}**	Printout of message block 4

Channel number on chart curve

This parameter defines whether a code ("_CH1" .. "_CH6") is to be printed on the measured value curves on the chart. The codes are printed cyclically on the curves at distances of 6 cm. Printout is suppressed if the printer queue is not empty. In the case of measured values below the chart's 50 % line, the channel code is printed to the right of the chart curve. With measured values over the chart's 50 % line it is printed to the left of the curve.

Parameter
{Pr.nUn}

Paramater value
{oFF}
{on}

Text line printout for threshold infringement

Thresholds can be assigned to text lines. When thresholds are infringed, these lines are displayed and printed out complete with the time. This parameter can be used to augment the text line output by the current measured value. In order for the threshold to be added, no more than 16 characters of the text line may be occupied.

If the parameter value is set to "on", the line will look as follows (for example):

[Text line > -23.00mV 9:45]

Parameter
{Pr.Lin}

Paramater value
{oFF}
{on}

Line pair spacing

This parameter defines the spacing between the line pairs (scale and text lines) of the channels.

Parameter
{SCA.di}

Paramater value
40...500 (in mm increments)

Printout of chart speed

If the recorder is switched on or the speed is changed, a line of text is output consisting of the time, date and current speed. This parameter activates printout of this line.

Parameter
{PSPd.}

Paramater value
{oFF}
{on}

Batch counter

The following parameters are used for generating an 8-digit counter for identifying batches.

Counter ↑

This parameter is used to enter the counter's highest 4 digits.

Parameter
{Cnt.Lo}

Paramater value
0...9999

Counter ↓

This parameter is used to enter the counter's lowest 4 digits.

Parameter
{Cnt.Hi}

Paramater value
0...9999

Counter ranking

This parameter specifies the amount by which the counter contents are changed with every activation.

Parameter
{Cn.inC}

Paramater value
0...1000

Counter function

This parameter specifies whether the change in the counter is added to or deducted from the contents of the counter.

Parameter
{Cn.dir}

Paramater value
{Add}
{Sub}

Text line with counter

This parameter defines the text line to be printed out with the counter status. The date and time are no longer added to the selected text line.

Parameter
{Cnt.tE}

Paramater value

0	no output
1...10	text line 1...10

Printout of message blocks

The individual text lines, the measured value lines and the date/ time line can be combined into text blocks. A maximum of four text blocks can be created. The text blocks are triggered via binary inputs DI 1...DI 4.

Each text line is assigned a code number. The sum of the code numbers of the text lines combined to a text block must be entered as a parameter value.

Code number

0	no block generated
1	measured value, channel 1
2	measured value, channel 2
4	measured value, channel 3
8	measured value, channel 4
16	measured value, channel 5
32	measured value, channel 6
64	Text line 1
128	Text line 2
256	Text line 3
512	Text line 4
1024	Text line 5
2048	Text line 6
4096	Text line 7
8192	Text line 8
16384	Text line 9
32768	Text line 10

Parameter
{Pr.bL.1}
{Pr.bL.2}
{Pr.bL.3}
{Pr.bL.4}

Paramater value
0...65535

Password

This parameter defines the combination of digits that can be used to access the parameterisation data. The parameter can have values of 0000...9998. If the password is set to 0000, no password will be requested. If it is set to 9999, all parameters (not the password) can be viewed. The parameters cannot be changed in this scenario.

Parameter
{PASS.}

Paramater value
0001....9998

Channel parameters

The channel parameters can be set separately and independently for each channel.

The following parameters can be called up in main menu item “Channel parameters”:

Key	Display	Parameter
	{CH1}	
<↵>	**{tYPE}**	Type of measurement in nominal measuring range
<▸>	**{r.A.n.g.E}**	Submenu for ranges
<▸>	**{t.Unit}**	Temperature unit for Pt100 and TC connection
<▸>	**{Unit}**	Unit of measurement
<▸>	**{bUrn.S}**	Activation of sensor break monitoring
<▸>	**{bUrn.P}**	Specification of print head position in event of sensor break
<▸>	**{CdJC.}**	Reference junction temperature for TC
<▸>	**{PtCon}**	Connection type for Pt100
<▸>	**{LEAdr}**	Line resistance for Pt100 2-wire circuit
<▸>	**{rL.CAL}**	Measurement of line resistance for Pt100 2-wire circuit
<▸>	**{rL.vAL}**	Input of measured line resistance
<▸>	**{rESPt}**	Filter time constant
<▸>	**{SCA.Fo}**	Format of scale line
<▸>	**{CH.dSP}**	Enabling of measured value display
<▸>	**{SC.LED}**	LED for signalling the valid scale graduation
<▸>	**{Lin.En}**	Enabling the user linearisation
<▸>	**{L.i.t.A.b}**	Submenu for user linearisation tie points
<▸>	**{C.A.L.C.U}**	Submenu for mathamatical functions
<▸>	**{A.C.C.n.t}**	Submenu for accounting
<▸>	**{L.i.n.i.t}**	Submenu for threshold settings

Signal type (type of measurement / nominal measuring range)

This parameter can be used to select the type of measurement and the nominal measuring range for the channel concerned. Signal type “SER” switches the channel from processing of measured values to reception of measured values via the serial interface. The last value received from the interface is recorded until a new value is received. Here, too, recording is performed within the specified cycle time. The measured value received via the interface must be a standardised value in the range 0..1000. The scale for signal type “SER” must lie in maximum entry limits −999.0..9999.0.

Pressing <↵> accepts the selected signal type and thus the associated nominal measuring range. With current and voltage measurements, the display range is not governed by the measuring range.

If the physical unit is set to °F for temperature measurements using Pt100 or thermocouple, the permissible range limits are changed automatically. The conversion is performed on the basis: °F = (9/5) × °C + 32.

Parameter
{tYPE}

Paramater value

{oFF}	aus	
{0..20}	0...20 mA	
{4..20}	4...20 mA	
{i-2.5b}	±2.5 mA	
{i-5b}	±5 mA	
{i-20b}	±20 mA	
{U-25}	0...25 mV	
{U-25b}	±25 mV	
{U-100}	0...100 mV	
{U-100b}	±100 mV	
{U-500}	0...500 mV	
{U-2.5}	0...2.5 V	
{U-2.5b}	±2.5 V	
{U-5}	0...5 V	
{U-5b}	±5 V	
{U-10b}	±10 V	
{U-20b}	±20 V	
{Pt-1}	PT100-I	−50....150 °C
{Pt-2}	PT100-II	−50....500 °C
{Pt-3}	PT100-III	−200...850 °C
{tC-b}	THERMO-B	0...1820 °C
{tC-E}	THERMO-E	−270...1000 °C
{tC-J}	THERMO-J	−210...1200 °C
{tC-K}	THERMO-K	−270...1372 °C
{tC-L}	THERMO-L	−200...900 °C
{tC-n}	THERMO-N	−270...1300 °C
{tC-r}	THERMO-R	−50...1769 °C
{tC-S}	THERMO-S	−50...1769 °C
{tC-t}	THERMO-T	−270...400 °C
{tC-U}	THERMO-U	−200...600 °C
{SER}	SER	measured value received via RS-485 interface
{USEr}	USER	special measuring ranges (see “Special measuring range parameterisation”)

Range settings

The range settings specify which part of a nominal measuring range is to be used, how this range is scaled and how it is be recorded.

The following parameters can be called up in submenu item “Range settings”:

Key	Display	Parameter
	{r.A.n.g.E}	
<↵>	**{rng.Lo}**	lower value of measuring range
<▸>	**{rng.Hi}**	upper value of measuring range
<▸>	**{root}**	Square root extraction of the measured value
<▸>	**{digit}**	Number of positions behind the decimal point
<▸>	**{SCA.Lo}**	lower value of scale range
<▸>	**{SCA.Hi}**	upper value of scale range
<▸>	**{rEC.Lo}**	lower value of recording range
<▸>	**{rEC.Hi}**	upper value of recording range
<▸>	**{dirEC}**	effective direction of recording system
<▸>	**{0FFSt}**	measured value offset

Measuring range (Zooming)

Parameters “Lower value of measuring range” / “Upper value of measuring range” define the span of the nominal measuring range used for measurement. The span must be at least 20 % of the nominal measuring range. The entry limits for these values are set to the lower and upper range values of the selected nominal measuring range. The lower range value may lie between 0 and 80 % of the nominal measuring range and the upper range value between 20 and 100 %.

Parameter

{rng.Lo} lower value of measuring range
{rng.Hi} upper value of measuring range

Paramater value

Start of nominal measuring range to
end of nominal measuring range
Entry is made in unit of measurement of the measuring range.

Example:
with
{tYPE}
{0..20}
nominal range 0...20 mA and setting
{rng.Lo}
{4.500}
{rng.Hi}
{19.000}
the measuring range is 4.5...19 mA (with accuracy restricted accordingly)

Square root extraction

This parameter defines whether the input signal is to undergo square root extraction.

Parameter

{root}

Paramater value

{oFF}
{on}

Decimal places

This parameter defines the number of decimal places for the display and measured value output. It can have the values “0, 1, 2, 3, auto”. With “auto”, the number of places is determined by the recorder. The scale range parameter is used to determine the number of decimal places.

Parameter
{digit}

Paramater valuee:
{AUto}
{0}
{1}
{2}
{3}

Scale range

The “Lower value of scale range” / “Upper value of scale range” parameters define the physical range (numerical range) for depicting the selected measuring range (e.g. 0...20 mA → 3... 9 bar).

Parameter
{SC.Lo}
{SC.Hi}

Paramater value
−999....+9999

Recording range (Zoning)

The “Lower value of recording range” / “Upper value of recording range” parameters define the range of the chart for recording the channel. The lower value is 0 %...90 %, the upper value 10 %... 100 %. Entry is made in 1 % increments. No check is made for incorrect inputs (lower value > upper value).

Parameter
{rEC.Lo} lower value of recording range
{rEC.Hi} upper value of recording range

Paramater value
00...90 for lower value
10...100 for upper value

Recording direction

This parameter defines whether, with increasing measured values, the input signal is recorded from left to right (default) or right to left.

Parameter
{dirEC}

Paramater value
{0─100}
{100─0}

If the parameter setting is entered as 100─0, the pointer moves from right to left as the measured value increases (normal = left to right).

Offset

This parameter is used to offset the measured value by a constant amount. It is used e.g. to compensate imbalances in Pt100 supply lines.

Parameter
{0FFSt}

Paramater value
<▲> key increments the measured value
<►> key decrements the measured value

Unit of measurement

A unit of measurement can be selected for each individual channel. The recorder distinguishes between:
- Temperature unit,
- Standard unit or
- free unit (can only be entered via interface using the parameterisation program).

Temperature unit

The temperature unit is prespecified by the user if the measuring input is working with a thermocouple or a Pt100. It is possible to select degrees °C or °F.

Parameter
{t.Unit}

Paramater value
{°C}
{°F}

Standard unit

The standard unit is selected by the user from a list of units. The user can access the menu item for standard signals (current, voltage).

Parameter
{Unit}

Paramater value

00	-TEXT-	10	°F
01	mA	11	K
02	A	12	l/sec
03	mV	13	l/min
04	V	14	%
05	mbar	15	‰
06	bar	16	kW
07	Pa	17	MW
08	kPa	18	1/min
09	°C	19	m^3/h

Sensor break monitoring

This parameter switches sensor break monitoring on or off for a thermocouple or Pt100 connection. If sensor break monitoring is switched off, the recorder cannot influence devices that are connected in parallel with it.

Parameter
{bUrn.S}

Paramater value
{oFF}
{on}

Procedure with sensor breaks

This menu item is used to define the direction in which the measuring system is to move for sensor breaks with Pt100 and thermocouples.

Parameter
{bUrn.P}

Paramater value

{At0}	Pointer moves to the zero point
{At100}	Pointer moves to the end of the scale

Reference junction correction

This parameter defines the temperature that can be expected for the reference junction when thermocouples are connected.

If the parameter is set to “int”, the value of the terminal temperature measured by the recorder is used for correction purposes.

If “CH 6” is selected, channel 6 functions as the reference channel for channels 1...5. This feature is used if, when several thermocouples are connected, the transition from extension lead wire to copper takes place in a “zone of identical but unknown temperature”. The reference channel measures the temperature of the “zone of identical temperature”. A thermocouple or Pt100 sensor can be used as the reference element. If a thermocouple is used as the reference element, wiring is performed right up to the recorder using extension lead wire. Internal reference junction correction must be selected for reference channel “Channel 6”:

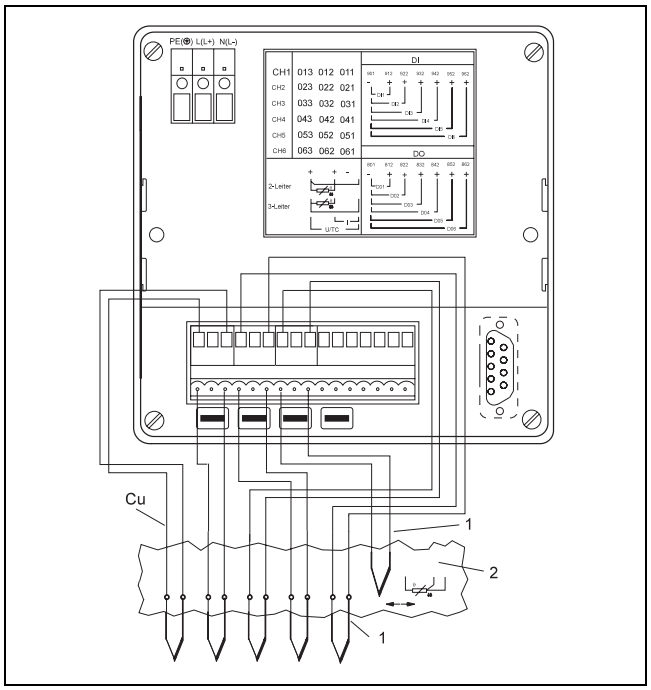


Fig. 4 Correction of channels 1...5 with reference channel 6
Z-18070 *1* Extension lead
2 Zone of identical temperature

Parameter
{CdJC.}

Parameter value

0°C	external compensation
20°C	external compensation
50°C	external compensation
60°C	external compensation
70°C	external compensation
int.	use of internal terminal temperature measuring point
CH 6	measuring channel 6 = reference channel

Selection of Pt100 2/3-wire circuit

This parameter defines whether a Pt100 sensor in a 2-wire or 3-wire circuit is to be connected to the recorder.

Parameter
{PtCon}

Parameter value

{3L}	3-wire circuit
{2L}	2-wire circuit

Specifying the line resistance

This parameter defines the line resistance for cirrection of the measured value in case a Pt100 is used.

If the parameter „vAL“ is used, a user defined resistance value (max. 40 Ω) is subtracted from the measured value.

If the parameter „Et.“ is used, the recorder will measure the line resistance. See next section for details.

Parameter
{LEAdr}

Parameter value

{vAL.}	Entering the line resistance (Ω)
{Et.}	Measuring the line resistance (Ω)

Measuring the line resistance

This parameter is required for measuring the line resistance. In the case of parameter **{LEAd.r}**, the parameter value **{Et.}** must be selected. The Pt100 sensor must be shorted at its connection point. If the menu item is called up, the resistance measured for the Pt100 supply lines is output on the display. Pressing <↵> adopts the measured value and saves it in the channel card EEPROM. The value determined here is then used for the measured value correction.

Parameter
{rL.CAL}

The measured value is displayed when <↵> is pressed.

Parameter value
{22.15}

Pressing <↵> again adopts the measured value.

Entering the line resistance

This parameter is used to enter a line resistance determined by the user. The resistance is used by the recorder for measured value correction.

Parameter
{rL.vAL}

Parameter value
00.00....40.00 Ω

Damping

This parameter defines the time constant of the digital filter for damping the input signal. The filter functions like a first-order low-pass filter.

Parameter
{rESPt}

Parameter value
0...60 s (in increments of 1 s)

Printout of line pairs

A line pair can be written which is assigned to each measuring channel. The first line of the line pair is a scale line. The second line is a text line which can contain data specific to measuring points, e.g. file reference number etc. If thresholds have been parameterised for a channel, a line with markings (triangles) for the thresholds is printed as a third scale line. A threshold is considered parameterised if a text line and/or an output relay is assigned to it. In the case of thresholds which have been assigned a parameter close to 0 % or 100 %, the triangle is replaced by a broken perpendicular line.

When the scale line has 2 graduations, the physical unit is printed between the 0 % and 50 % values. The channel code is printed between the 50 % and 100 % values.

Where the scale line has 3 graduations, the physical unit is printed between the 33 % and 66 % values. The channel code is printed between the 66 % and 100 % values.

Where the scale line has 5 graduations, no unit and no channel code are printed in the scale line.

In the case of a “free entry”, the scale is selected at will by the user.

Examples of scale lines:

```
0.00       mA           50.00           CH1      100.0

0.00         33.33 V    66.66           CH4      100.0

0.00     20.00     40.00     60.00     80.00     100.0
```

Format of the scale line

This parameter is used to select the format of the scale line.

Parameter
{SCA.Fo}

Parameter value
0 Scale and text line print off
1 Scale with 2 graduations
2 Scale with 3 graduations
3 Scale with 5 graduations
4 Scale line is used as text line

Enabling the measured value display

The parameter defines whether the measured value of the measuring channel is displayed. The default value is “on”.

Parameter
{CH.dSP}

Parameter value
{oFF}
{on}

LED for signalling the valid scale graduation

This parameter defines which of the scale LEDs is switched on for the channel display. If the parameter has the value “0”, no LED is switched on. If the value is 1...6, the associated LED (1 = top, 6 = bottom) in the scale is switched on. It is not possible for more than one LED to be switched on at the same time.

Parameter
{SC.LED}

Parameter value
0...6

Enabling the user linearisation

This parameter defines whether the measuring input is to be processed using the user linearisation tie points. Thermocouples and Pt100 are always processed with recorder-internal linearisation.

Parameter
{Lin.En}

Parameter value
{oFF}
{on}

User linearisation tie points

The user can specify 16 tie points for special linearisations. The values can be entered in ‰. The tie points must increase on a uniform basis. After the values have been entered, the recorder sorts the tie points. This obviates any need to readjust the table manually when the values are augmented. The tie points at 0 % and 100 % are added automatically by the recorder.

Key	Display	Parameter
	{L.i.t.A.b}	
<↵>	**{in.1}**	1st tie point input value in ‰
<▸>	**{oUt.1}**	1st tie point output value in ‰
..		
<▸>	**{in.16}**	16th tie point input value in ‰
<▸>	**{oUt.16}**	16th tie point output value in ‰

Parameter value
0...1000 ‰

Mathematical functions

Each channel can serve as a results channel (output channel) of a mathematical logical operation. The results channel can also serve as a logic channel (input channel). It is possible to create the sum of, or difference between, two channels.

The submenu “Mathematical functions” includes the following parameters:

Key	Display	Parameter
	{C.A.L.C.U}	
<↵>	**{FnC}**	Calculation specification
<▸>	**{nF.CH1}**	Logic channel 1
<▸>	**{nF.CH2}**	Logic channel 2
<▸>	**{rES.Lo}**	lower value of results range
<▸>	**{rES.Hi}**	upper value of results range

Calculation specification

This parameter defines the type of logical operation. In the calcuculation, the value of logic channel 2 is subtracted from or added to that of logic channel 1. The result of the calculation serves as the measured value of the current channel.

Parameter
{FnC}

Parameter value
{+}
{-}

Logic channels

The following two parameters specify the channels that are to be mathematically linked.

Parameter
{nF.CH1}
{nF.CH1}

Parameter value
1...6

Results range

The “Lower value of results range” / “Upper value of results range” parameters represent the values between which the results of the calculation lie.

The user can specify that the measurement starts at a value between 0...80 % of the results range span and that it ends at a value that lies between 20...100 % of the results range span. If one of the two logic channels overflows or underflows, the results of the calculation are also set to overflow or underflow.

Example:

Channel 1 is a 0...20 mA input which measures a temperature in the range −50...+50 °C. Channel 2 is a 0...20 mA input which measures a temperature in the range +100...+200 °C. Channel 2 is used as the results channel. If the function is set to “+” when parameterising channel 2, the limits of the results range are as follows:

Lower value −50 + (+100) = + 50 °C
Upper value +50 + (+200) = +250 °C
Span of results range 200

The smallest measuring span is 20 % of 200: 40.

The lower value can be selected between 50...210 °C.

The upper value can be selected between 90...250 °C

If the function is set to “−”, the limits of the results range are:

Lower value −50 − (+200) = −250 K
Upper value +50 − (+100) = −50 K
Span of results range 200

The smallest measuring span is 20 % of 200: 40.

The lower value can be selected between −250...−90 °C.

The upper value can be selected between −210...−50 °C.

Parameter
{rES.Lo}
{rES.Hi}

Parameter value
lower value of results range to upper value of results range

Accounting

The accounting can be parameterised separately for each channel. The accounting function is disabled if standby mode is enabled for the recorder. The accounting function allows the user to print out the following table at selectable intervals:

1. Channel code with comments
2. Sum of power failure times (if present)
3. Time/date interval start and
   time/date interval end
4. smallest measured value during the interval with time and date
5. largest measured value during the interval with time and date
6. Mean value over interval
7. Summation value over interval

Example:

1. **[Bl: Text line]**
3. **[15.07.94 15:00 - 15.07.94 15:15]**
4. **[Min: +36.7 MW - 15.07.94 15:12]**
5. **[Max: +150 MW - 15.07.94 15:03]**
6. **[$\bar{x}$: +115.2MW]**
7. **[Σx: 2.881E1 MWh]**

Note
Parameter “Print format” can be used to select the number of lines to be printed.

The table with 7 lines is approx. 23 mm long (approx. 20 mm with 6 lines). The minimum chart speed for accounting with one measuring channel is to be calculated in accordance with the following inequation:

P_v [mm/h] > 23 (20) [mm] / interval time [h]
or
P_v [mm/h] > 23 (20) [mm] $\times$ 60 / interval time [min]

If accounting is performed with several channels, the result calculated for one channel must be multiplied by the number of channels used for accounting. The max. possible chart speed for text printing is 240 mm/h.

The following parameters can be called up in submenu item “Accounting”:

Key	Display	Parameter
	{A.C.C.n.t}	
<↵>	**{tYPE}**	Operating mode
<▸>	**{inPUt}**	Interval control via binary inputs
<▸>	**{int.vL}**	Interval time
<▸>	**{tinE}**	Orientation time for interval
<▸>	**{dAY}**	Orientation day for interval
<▸>	**{tEt}**	Message text line
<▸>	**{Linit}**	Threshold monitoring of sum
<▸>	**{AL.oUt}**	Relay output for threshold
<▸>	**{Prt.Ct}**	Selection of accounting lines
<▸>	**{SU.Prt}**	Printout of sum for overshooting threshold
<▸>	**{SU.dSP}**	Display of sum instead of measured value

Operating mode

This parameter defines the operating mode for accounting.

Parameter
{tYPE}

Parameter value
{oFF}
{1}
{2}
{3}

See next page for details.

Operating mode 1

In this operating mode, lines 1...6 are written in the accounting table (see example). No summation is performed.

Operating mode 2

In this operating mode, summation is performed. Lines 1...7 are written in the accounting table. The following applies for the measuring ranges of the sum:

The upper value of the selected channel measuring range multiplied by the time of the accounting interval (in h) gives the max. value for the sum (unit of measurement × h). This value can be presented in any required display range with due regard to the maximum numerical value that can be depicted (= max. counter status) of 7.500E6 (7500000).

Example:

Measuring range	0...20 mA
Display range	0...300 m^3/h
Interval time	1 month = 24 h × 31 = 744 h
Upper value Σx	20 mA × 744 h = 14880 mAh

If summation recording is selected instead of instantaneous measurement recording, the pointer will be fully deflected at 14880 mAh.

max. display Σx	744 h × 300 m^3/h = 223200 m^3 = 2.232E5 m^3

Operating mode 3

In this operating mode, a sum is formed. Threshold monitoring is also possible. The set threshold is employed for absolute value monitoring of the summation value. As soon as the summation value reaches the threshold, signalling is performed for one second (contact output). At the same time, the threshold summation counter is set to 0. The threshold cycle begins again from the start. The threshold can be reached several times during an interval:

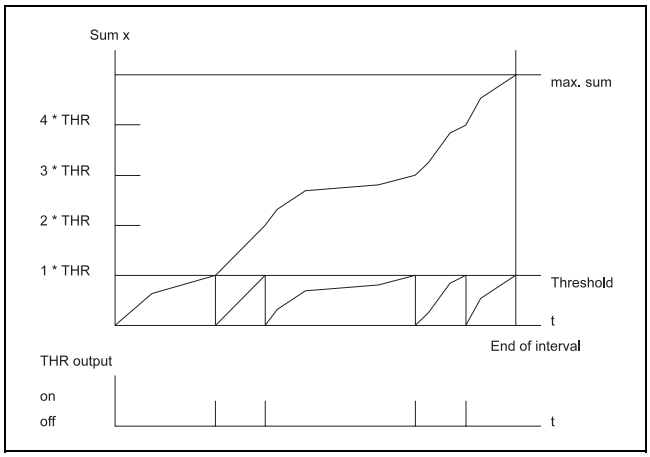


Fig. 5 Operating mode Δx

External interval control

The accounting interval can be controlled internally by the integrated real-time clock. External interval control is performed by initiating a pulse via one of the recorder's binary inputs. When the parameter is set to "off", accounting is based on the default interval.

Note
An interval must also be specified for external interval control.

Parameter
{inPUt}

Parameter value:
{oFF}
{DI 1}
{DI 2}
...
{DI 14}

Internal interval control

The parameter specifies the time during which summation or averaging is performed.

Parameter
{int.vL}

Parameter value
15 / 30 min
1 / 2 / 3 / 6 / 8 / 12 h
1 / 7 day(s)
1 month

Synchronisation time for internal interval control

The synchronisation time specifies the orientation time for internal interval control.

Parameter
{tinE}

Parameter value
00:00...23:59

Synchronisation day for internal interval control

The synchronisation day specifies the orientation time in a month for internal interval control.

Parameter
{dAY}

Parameter value
00....31

Message line

When the interval is printed out, the accounting text is appended to the channel code which is located in the first line. One of the 10 freely definable text lines can serve as a message line in the accounting table.

Parameter
{tEt}

Parameter value
00 no text line
01 Text line 1
02 Text line 2
...
10 Text line 10

Static threshold

The static threshold indicates the summation value at which a relay output is switched on for a period of 1 second. The value can lie in the range 1.0 to 7.5E6. The value is entered in the units of the display range multiplied by the time.

Examples:
kW $\rightarrow$ kWh, $m^3/h \rightarrow m^3$.

The exponential format is selected as the numerical format in order to enter large values.

Example:
123 0400 is represented as

$1.23 \times 10^{+6}$

Exponent
Mantissa

Parameter
{Linit}

Parameter value
0...7.500E6

Alarm output

The alarm output specifies the number of the relay output which is switched on if the threshold is exceeded for 1 second.

Parameter
{AL.oUt}

Parameter value
{oFF}
{DO 1}
...
{DO 24}

Printing format

The print format defines which lines are output when the accounting values are printed out.

Each line is assigned a code number. The code number must be entered as a parameter value.

Parameter
{Prt.Ct}

Parameter value
01 Channel & message line
02 Start / end of interval
04 Minimum during the interval
08 Maximum during the interval
10 Average
20 Summation value

Printing the sum

This parameter defines if in case of overshooting the static threshold the sum is printed out on the chart.

Parameter
{SU.Prt}

Parameter value
{oFF}
{on}

Display sum

This parameter defines whether instead of the measuring value the sum is displayed and registered.

Parameter
{SU.dSP}

Parameter value
{oFF}
{on}

Thresholds

The parameters for monitoring 2 static thresholds are grouped together in a submenu.

The text lines assigned to the thresholds are printed in the color assigned to the measuring channel. The system menu is used to define whether the text line is to be augmented by specification of the threshold.

The hysteresis of the thresholds is permanently set to 2 %.

The following parameters can be called up from the submenu:

Key	Display	Parameter
	{L.i.n.i.t}	
<↵>	**{Li-1}**	Value of threshold 1: entry in unit of measurement of scale range
<▸>	**{Li1-F}**	Entry of threshold function
<▸>	**{Li1.tE}**	Assignment of the relay output
<▸>	**{Li1.do}**	Assignment of a text line
<▸>	**{Li-2}**	Value of threshold 2: entry in unit of measurement of scale range
<▸>	**{Li2-F}**	Entry of threshold function
<▸>	**{Li2.tE}**	Assignment of the relay output
<▸>	**{Li2.do}**	Assignment of a text line

Entering the thresholds

The values are entered in the unit of measurement of the scale range.

Parameter
{Li-1}
{Li-2}

Parameter value
lower value to upper value of scale range

Function of thresholds

This parameter selects the effective direction of the thresholds.

Parameter
{Li1-F}
{Li2-F}

Parameter value
{Lo} min. contact
{Hi} max. contact

Assignment of the relay output

This parameter defines the assignment of a threshold to an output relay.

Parameter
{Li1.do}
{Li2.do}

Parameter value
{oFF}
{DO 1}
...
{DO 24}

Text lines for thresholds

This parameter can be used to assign a text line to the threshold. The text line is printed if the threshold is infringed.

If the parameter “Threshold text output” in submenu item “Print functions” (main menu “System data”) is set to “on”, the numerical value of the threshold is added to the text (see “System data”).

No text is output if the parameter value is 0.

Parameter
{Li1.tE}
{Li2.tE}

Parameter value
0 / 1 / 2 / ... / 10

Printer data

The functions for printing out texts are set out in the main menu items “Print intervals”, “Synchronisation times” and “DI assignment”.

Cyclical printout of the time to DIN for the speeds 20 mm/h, 60 mm/h and 120 mm/h is initiated by selecting the appropriate print intervals.

The format for time printing is: “_12:00”. The underscore is a reference line for specification of the time.

The ink colour used for cyclical time printing changes daily at 0:00 h. After the recorder has been switched on, the time is printed in the colour selected in the “Print colours” menu.

Cyclical time printout is only performed if the printer queue is empty. Otherwise, printout is suppressed since the printout time on the paper no longer agrees with the actual time.

If the current speed is “0 mm/h”, time output is suppressed.

The user can use a total of 10 text lines, each 32 characters long. These text lines are augmented by the time or the date and time depending on the number of parameterised characters.

If less than 24 characters of the text line are assigned, the line is augmented by the date and time.

For line lengths up to 30 characters, the text line is augmented by the time.

The time and date are suppressed for longer line lengths.

Assigning the print colours

This main menu item is used to specify the output colours for the texts and measured values. Every text can be assigned one of the 6 colours. The parameters can be “violet”, “red”, “black”, “green”, “blue”, “brown”. The default setting for the channel colours is in accordance with the DIN sequence. The default setting for all other text elements is black.

Parameter

Key	Display	Parameter
	{Prt.Co}	
<↵>	**{Co.CH1}**	Colour of measuring channel 1
<▸>	**{Co.CH2}**	Colour of measuring channel 2
...		
<▸>	**{Co.CH6}**	Colour of measuring channel 6
<▸>	**{ALPH.1}**	Colour of text line 1
<▸>	**{ALPH.2}**	Colour of text line 2
..		
<▸>	**{ALP.10}**	Colour of text line 10
<▸>	**{vALUE}**	Colour of measured value table
<▸>	**{dAtE}**	Colour of date/time line
<▸>	**{CLoC}**	Colour of time printout

Parameter value

{oFF}	no colour
{vt}	violet
{rd}	red
{bL}	black
{gn}	green
{bU}	blue
{bn}	brown

Print intervals

The print interval control permits cyclical output of:
- Text lines 1...10,
- measured values of active channels,
- time and date and
- date.

The following parameters can be called up in main menu item “Print intervals”:

Parameter

Key	Display	Parameter
	{Prt.iv}	
<↵>	**{ALPH.1}**	Printout of text line 1
<▸>	**{ALPH.2}**	Printout of text line 2
..		
<▸>	**{ALP.10}**	Printout of text line 10
<▸>	**{vALUE}**	Printout of measured values of active channels
<▸>	**{dAtE}**	Printout of date/time line
<▸>	**{CLoC}**	Printout of time

Parameter value:

off
10 / 20 min
1 / 2 / 3 / 4 / 6 / 8 / 12 / 24 h

These values can be parameterised for each individual text element separately. The print function is printed out cyclically at the selected time interval. These intervals are synchronised to the point in time specified in main menu item “Synchronisation times” (default setting 0:00 h).

Synchronisation times

This main menu item can be used to synchronise the print interval (and thus the printout) to any desired point in time.

Parameter

Key	Display	Parameter
	{Prt.SY}	
<↵>	**{ALPH.1}**	Printout of text line 1
<▸>	**{ALPH.2}**	Printout of text line 2
..		
<▸>	**{ALP.10}**	Printout of text line 10
<▸>	**{vALUE}**	Printout of measured values of active channels
<▸>	**{dAtE}**	Printout of date/time line
<▸>	**{CLoC}**	Printout of time

Parameter value

00:00 ..... 23:59

DI assignment

Six binary inputs can be used in the recorder for functions triggered externally (plus 8 binary inputs when using the IO converter). This main menu item is used to assign the functions to the binary inputs. The relevant function is activated when the input is switched on.

Parameter

Key	Display	Parameter
	{ASS.di}	
<↵>	**{Evt.1}**	excite event marking 1
<▸>	**{Evt.2}**	excite event marking 2
<▸>	**{Evt.3}**	excite event marking 3
<▸>	**{Evt.4}**	excite event marking 4
<▸>	**{ALPH.1}**	excite text line 1
<▸>	**{ALPH.2}**	excite text line 2
..		
<▸>	**{ALP.10}**	excite text line 10
<▸>	**{vALUE}**	excite measured value table
<▸>	**{dAtE}**	excite date/time line
<▸>	**{P.EnAb}**	enable parameter definition
<▸>	**{SP.SEL}**	external speed changeover
<▸>	**{t.SYnC}**	synchronize the recorder clock to external master clock
<▸>	**{Prt.FL}**	empty printer queue
<▸>	**{StdbY}**	Activation of standby

Parameter value

{oFF}
{DI 1}
...
{DI 24}

Note

When standby mode is activated, the feed and printout are halted. No texts are transferred to the printer queue. Simultaneous lighting of channel LEDs 1, 2 and 3 signals that the recorder is in standby.

Service

Main menu item “Service” contains all the functions for testing and setting purposes.

Parameter

Key	Display	Parameter
	{SP.FnC}	
<↵>	**{Si.tYP}**	Output of various test curves. The signals are treated like analog input signals.
<▸>	**{Si.PEr}**	Duration period of the test curve in seconds
<▸>	**{init}**	Load factory setting
<▸>	**{tESt}**	LED test
<▸>	**{LiSt}**	Printout of the parameter definitions
<▸>	**{Pr.oFS.}**	adjust print head 0 %
<▸>	**{Pr.rng.}**	adjust print head 100 %
<▸>	**{SC.oFS.}**	adjust scale 0 %
<▸>	**{TEnP.}**	Display of the internal reference junction temperature
<▸>	**{PA.LEn}**	Input paper length
<▸>	**{PA.rSt}**	Display length of remaining paper

Simulation

During simulation, test signals are generated in the recorder without having to connect a generator to the input terminals. These signals pass through the measured value processing section and are output at the recording system. The chart speed must be selected in accordance with the time period selected.

Parameter
{Si.tYP}

Parameter valuee
{oFF}
{rAnP}
{SinE}
{StEP} (in 10 % increments)

Selection of the time period

Parameter
{Si.PEr}

Parameter valuee
20...2000 s

Initialisation

This menu item loads the factory setting.

Parameter
{init}

Parameter value
Press <↵>.

The factory setting is loaded into the RAM

If upon exiting parameterisation <↵> is pressed in response to the query “SavE”, the factory setting parameter values are written into the EEPROM.

If upon exiting parameterisation <▲> is pressed in response to the query “SAvE”, the factory setting parameter values are rejected. The recorder continues to use the parameter values which have been valid hitherto.

Display test

The display test checks whether all segments of the 5-digit display are present.

Parameter
{tESt}

Parameter value
<↵> starts the display test
<↵> aborts the display test

Listing

This parameter triggers output of all parameter values.

Note
The printing process can take up to one hour.

Parameter
{LiSt}

Parameter value
{oFF}
{on}

If parameter value “on” is selected and, upon exiting parameterisation, <↵> is pressed in response to the query “SAvE”, **{CASS}** appears on the display. After the chart unit has been fitted, the listing is printed out. Printout of the listing is aborted if the chart unit is removed.

Reference junction temperature display

This parameter is used to display the temperature of the internal reference junction.

Parameter
{TEnP.}

Parameter value
Press <↵>.
Display e.g. {35.4}

Adjusting the print head

The following two parameters are used to set the print head to paper 0 % and 100 %.

Parameter
{Pr.oFS.} 0 %
{Pr.rng.} 100 %

Setting the paper zero point (0 %)

1. Press <↵>.

The print head moves to approx. 3 % of the paper width.

2. Fit the chart unit.
3. Press key *FT*.
4. The print head is moved to the paper zero point while recording.
5. Remove the chart unit.
6. Press <↵>.

The value is stored.

Setting the final chart value (100 %)

For 100 % setting, proceed as for zero-point setting.

Adjusting the zero scale mark

This parameter is used to set the pointer to the scale starting point.

Parameter
{SC.oFS.}

Parameter value

1. Press <↵>.

The print head moves to the start of the scale.

2. Press <▸>.

The print head moves to the right.

3. Press <▴>.

The print head moves to the left.

4. Press <↵>.

The setting is stored.

Entering the length of the chart paper

This parameter is used to specify the length of the chart paper. When the recorder is in operator control mode, the length of the paper remaining can be read off at all times by pressing the key *FT*.

Parameter
{PA.LEn}

Parameter value
0.00...320 m

Special measuring range parameterisation

When “USER” is selected, the recorder can be used to create special measuring ranges. The procedure is involved and should only be used in exceptional cases once the possibilities offered by standard parameterisation have been exhausted to the full.

Examples include:
1. Measurement of thermoelectric voltage for internal correction of element types which are not included in the series set out on page 24.
2. Teletransmitter resistance measurement.
3. Temperature measurement using resistance thermometers Ni.., Pt..,Cu.. etc.

The following measurements can be performed:

Type of measurement	Coding
Voltage measurement < 500 mV	0
Current measurement	8
Voltage measurement > 500 mV	16
Resistance measurement for 2-wire circuit	32
Thermocouple measurement	64
Resistance measurement for 3-wire circuit	160

Tab. 2

The required gain is determined. The gain coding is added to the coding for the type of measurement.

The following gains can be selected.

Gain	Coding
1	0
2	1
4	2
8	3
16	4
32	5

Tab. 3

The required gain is to be determined in accordance with the type of measurement using the following inequations.

Type	Range	Calculation	lower limit
Voltage measuring ranges < 500 mV	$257 / U_{max} < G < 512 / U_{max}$	$G \leq 512 / U_{max}$	$257 \leq G \times U_{max}$
Current measuring ranges	$11 / I_{max} < G < 20 / I_{max}$	$G \leq 20 / I_{max}$	$11 \leq G \times I_{max}$
Voltage measuring ranges > 500 mV	$10345 / U_{max} < G < 20689 / U_{max}$	$G \leq 20689 / U_{max}$	$10345 \leq G \times U_{max}$
Resistance measurement for 2/3-wire circuits	$1222 / R_{max} < G < 2442 / R_{max}$	$G \leq 2442 / R_{max}$	$1222 \leq G \times R_{max}$
Thermocouple measurement	$257 / U_{max} < G < 512 / U_{max}$	$G \leq 512 / U_{max}$	$257 \leq G \times U_{max}$

Tab. 4 G = Gain
I_{max} = | I_{max} | = maximum absolute value; I in mA
R_{max} = | R_{max} | = maximum absolute value; R in Ω
U_{max} = | U_{max} | = maximum absolute value; U in mV

The value obtained when calculating the gain factor must be rounded down to the next smallest value in table 3. The following inequations must now be used to check whether the lower limit of the inequation is infringed.

The code numbers determined from tables 2 and 3 must be added.

The summed code number is entered as a parameter value in parameter “ADC control” (**A**nalog/**D**igital **C**onverter).

Parameter
{AdC.Ct}

Parameter value
0...165

Thermoelectric voltage measurement with internal reference junction (constant 1)

Constant K1 is required in order to use recorder-internal reference junction correction for thermocouples which are not contained in parameter **{tYPE}** (see page 24).

The value of constant K1 is determined as follows. The thermocouple’s curve profile is to be approximated linearly over the range 0...70 °C. The zero point is fixed. The straight line rise is to be entered as a parameter value in µV / 10 K in parameter **{USEr1}**.

Parameter
{USEr1}

Parameter value
0000 without correction
0001....9999

Constant K2

Constant K2 is required for resistance measurements and thermoelectric voltage measurements.

Resistance measurement:

$K2 = (R_{max} - R_{min}) \times 10$

Thermoelectric voltage measurement:

enter | U_{max} | [µV]

Parameter
{USEr2}

Parameter value
0000...9999

Calibrating the measuring range

An amperemeter, voltmeter or a resistance-type sensor is to be connected to the corresponding terminals of the measuring channel for which the special range is to be set up. The sensor should be of class 0.1 or better.

Calibrating the lower value of the measuring range

Set the measured value for the start of the measuring range on the sensor.

Select on the recorder:

Parameter
{,CAL.S}

Parameter value
Press <↵>. The upper value is measured.

Pressing <↵> again stores the upper value in the EEPROM.

Calibrating the upper value of the measuring range

Set the measured value for the end of the measuring range on the sensor.

Select on the recorder:

Parameter
{,CAL.E}

Parameterwert
Press <↵>. The upper value is measured

Pressing <↵> again stores the upper value in the EEPROM.

In submenu item “Ranges”, parameter “Measuring range ↓” is set to 0 % and parameter “Measuring range ↑” to 100 %. The calibrated measuring range can be treated as a standard range. In other words, the start of measurement can be selected in parameter “Measuring range ↓” between 0...80 % (referred to calibrated measuring range), the end of measurement can be selected in parameter “Measuring range ↑” between 20...100 % (referred to calibrated measuring range).

Additional parameterisation takes the same form as with standard nominal measuring ranges.

Examples of special measuring ranges

Current measurement

required measuring range	−1..+1 mA		Check of lower limit
selected measurement type (tab. 2)	Coding	8	$11 \leq G \times I_{max}$ $11 \leq 16 \times 1$
$\lvert I_{max} \rvert$ = 1 mA			
$G \leq 20 / I_{max}$			The required range is possible. Parameter value 0012 can be entered in the “ADC control” parameter. Calibration is to be performed in the manner described above.
$G \leq 20 / 1 = 20$			
selected gain from tab 3	16 gives Coding	4	
Sum of Codes		12	

Voltage measurement

required range	−3...+11 V		Check of lower limit
selected measurement type (tab. 2)	Coding	16	$10345 \leq G \times U_{max}$ $10345 \leq 1 \times 11\,000 = 11000$
$\lvert U_{max} \rvert$ = 11 V			
$G \leq 20689 / U_{max}$			The required range is possible.
$G \leq 20689 / 11\,000 = 1.88$			
selected gain (tab. 3)	1 gives Coding	0	
Sum of codes		16	

Voltage measurement

required range	−123...+46 mV		Check of lower limit
selected measurement type (tab. 2)	Coding	0	$257 \leq G \times U_{max}$ $257 \leq 4 \times 123 = 492$
$\lvert U_{max} \rvert$ = 123 mV			
$G \leq 512 / U_{max}$			The required range is possible.
$G \leq 512 / 123 = 4.16$			
selected gain (tab. 3)	4 gives Coding	2	
Sum of codes		2	

Resistance measurement for 3-wire circuit

required range	10...1000 Ω		Check of lower limit
selected measurement type (tab. 2)	Coding	160	$1222 \leq G \times R_{max}$ $1222 \leq 2 \times 1000 = 2000$
$\lvert R_{max} \rvert = 1000\ \Omega$			The required range is possible.
$G \leq 2442 / R_{max}$			
$G \leq 2442 / 1000 = 2.442$			**Determining constant K 2**
selected gain (tab. 3)	2 gives Coding	1	$K\ 2 = (1000 - 10) \times 10 = 9900$
Sum of codes		161	

Thermoelectric voltage measurement

required range	0...200 °C Pallaplat with internal reference junction correction mV-range 0...6.50 mV		Check of lower limit $257 \leq G \times U_{max}$ $257 \leq 32 \times 6.5 = 208!$
selected measurement type (tab. 2)	Coding	64	The required range is **not** possible. A new measuring range is selected: 0...250 °C. The mV range is 0...8.54 mV.
$\lvert U_{max} \rvert = 6.5$ mV			$G \leq 512 / 8.54 = 60$
$G \leq 512 / U_{max}$			Check of lower limit
$G \leq 512 / 6.5 = 78.8$			$257 \leq G \times U_{max}$ $257 \leq 32 \times 8.54 = 273.28$
selected gain (tab. 3)	32 gives Coding	5	The new range is possible for gain factor 32.
Sum of codes		69	**Determining constant K 1**
			The µV range between 0...70 °C is 1900 µV.
			K 1 = 1900 µV / 70 °C = 27.143 µ / °C
			K 1 = 271.43 µV / 10 °C
			selected: K1 = 271 µV
			Determining constant K 2
			$K\ 2 = \lvert U_{max} \rvert$ [µV] = 8540 µV

Error messages

Self-test error messages

The error messages are output on the display in the following form:

E xx yy

The two digits xx represent the cause of the error. The two digits yy can be chosen at random.

Display	Error classification
{E01..}	CPU error
{E02..}	Error in internal RAM
{E03..}	Error in external RAM
{E04..}	Clock module not responding
{E05..}	Time overshot in the measured value recorder
{E06..}	Parameterisation data check sum error
{E07..}	CPU card not responding to read command
{E08..}	CPU card cannot be written to
{E09..}	Calibration data check sum error
{E10..}	EEPROM on channel card not responding to read command
{E11..}	EEPROM on channel card cannot be written to
{E12..}	Watchdog triggers reset
{E13..}	Printer queue is full
{E14..}	Print head does not move
{E15..}	Voltage interruption detected for clock module
{E16..}	Chart speed too fast for text printing
{E17..}	Clock module has lost time
{E18..}	Interface error to IO converter
{E19..}	F-RAM check sum error
{E20..}	F-RAM not responding to read command
{E21..}	F-RAM cannot be written to
{E22..}	Reference junction correction error

Messages during parameterisation

The error messages are output on the display.

Display	Error classification
{E9000}	the password entered does not agree with the parameterised password, no access to parameters
{E-Lo}	the value entered is smaller than the minimum value
{E-Hi}	the value entered is larger than the maximum value
{E-rng}	the parameterised measuring range is less than 20 % of the nominal measuring range
{E9001}	the parameter displayed cannot be changed (if password 9999)
{E9002}	no access to parameters (disabled via DI)

Subject to technical changes.

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