PointMaster 200

6-channel Multipoint recorder
Version with LC display
Version with LED

Parameter setting instructions

42/41-23 EN

Rev. 01

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 ABB Service Department will be delighted to give you more information.

Notice on displays

Displayed are
Key inputs with **<** **>** brackets,
Displays with { } brackets,
Text printouts with **[** **]** brackets

Illustrated are maximum displays. The number of parameters offered for modification by the recorder depends on the type of recorder selected.

The recorder can recognize its hardware complement.

Short description

The PointMaster 200 is a micro-controller driven multipoint recorder in 3 versions:
- Scale version with 1 to 6 scale divisions,
- LED display version and
- LC display version.

The present parameter configuration instructions refer to the display versions of the multipoint recorder.

Introduction

The recorder is configured using the keys of the operator control unit or with the help of a PC via the RS-485 interface.

The parameter definition program PARAPOINT 200 (Cat. No. 41495-5-3100456) has been provided to enable configuration via the RS-485 interface.

LC Display Version

(LED Display version as of page 11)

Start

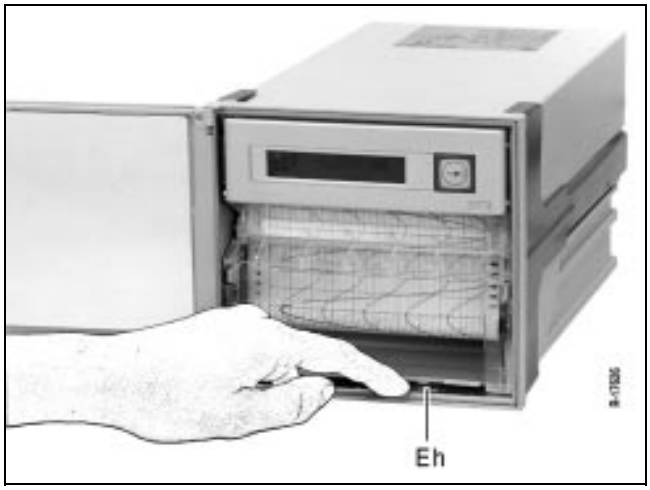


Fig. 1 How to pull out chart unit

1. Press down the release lever *Eh* (see figure 1). The chart unit swings off.
2. Pull out the chart unit. The operator control unit is now accessible.

Operator control unit und display

Fig. 2 Display and operator control unit

The operator control unit (see Fig. 2) has 3 keys. Parameter and parameter values are displayed in clear text on the 16-digit LC display.

Key legend

<▲> Scroll-up key
selects the next digit during the setting of numerical values or springs back to the main menu.

<▸> Scroll right key
selects the next main menu item, the next parameters, the next parameter values, the next reading position.

<↵> Enter key
prompts the parameter or parameter value or abandons it.

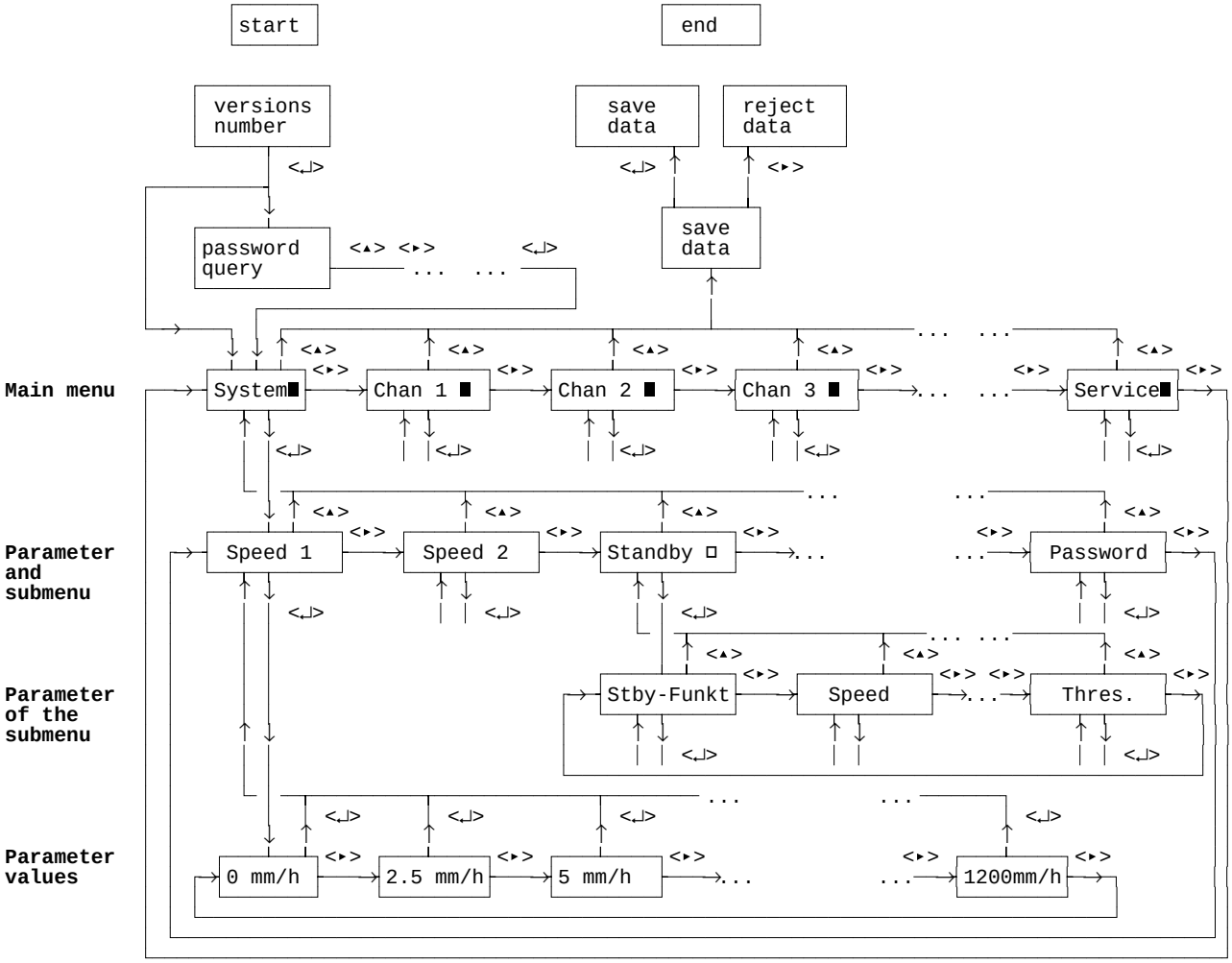
Beginning the parameter definition

Notice
Measured value processing and alarm monitoring functions are active in the parameter definition mode.

1. Switch on the parameter definition mode of recorder with key <↵>. The printer head moves into the park position.

If a password was defined, its input will be queried (see Section on “Preparing twoards parameter definiton”). If no password was defined, the main menu item **{System data}** will be displayed.

The principle of parameter definition



Main menu

- On pressing key <▸> the following main menus will be displayed one after the other:

{System data ■}	Definition of drive display parameters
{Channel 1 ■}	Parameters of channel 1 (violet)
{Channel 2 ■}	Parameters of channel 2 (red)
{Channel 3 ■}	Parameters of channel 3 (black)
{Channel 4 ■}	Parameters of channel 4 (green)
{Channel 5 ■}	Parameters of channel 5 (blue)
{Channel 6 ■}	Parameters of channel 6 (brown)
{Text lines ■}	Input of text lines
{Print inter. ■}	Time interval-driven print functions
{Sync.times ■}	Time-driven print functions
{Print colours ■}	Colours of recorder curves and text lines
{DI assingment■}	Assignment of inputs to functions
{Service ■}	Tests und calibrations
{System data ■}	

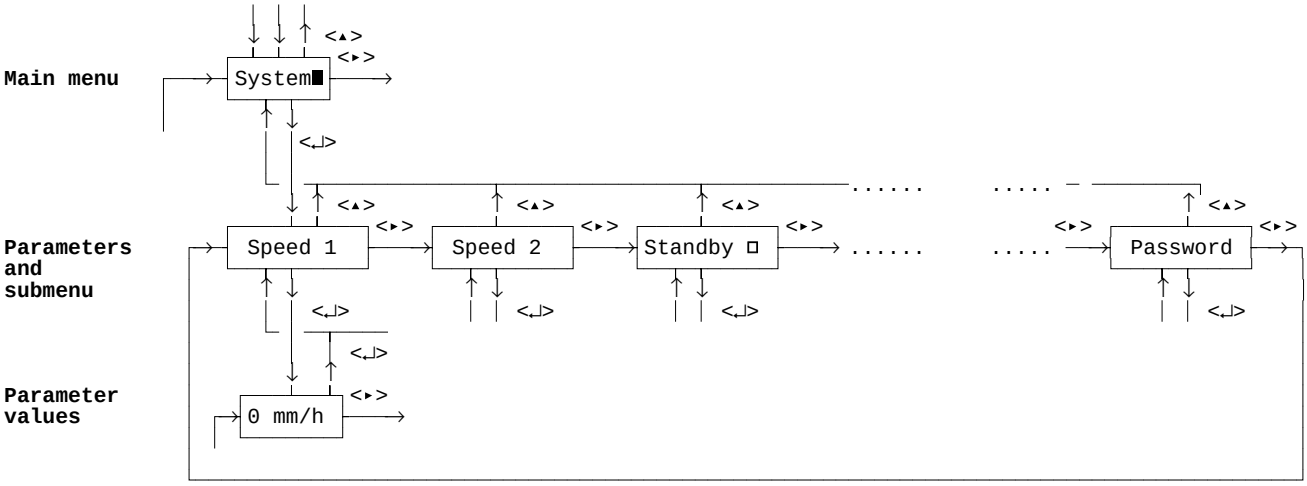
..

The main menu item “Assignment of binary inputs to functions” is only displayed if the recorder is equipped with the option “Alarm value monitoring and binary inputs”.

The block character (“■”) at the end of the line identifies the main menu items.

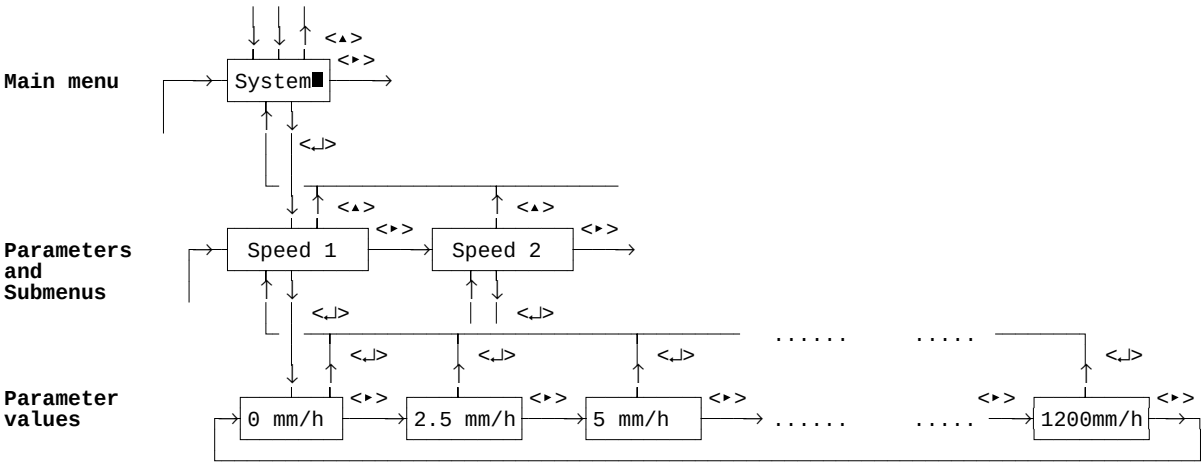
The character (“□”) at the end of the line identifies the submenu items.

Parameter selection



- Acknowledge the main menu item with <↵>; the first parameter of this main menu item is displayed.
- Display the parameters of the main menu item one after the other with <▸>.
- Return to the main menu item with <▲>.

Configuring the parameter values



- Acknowledge the selected parameters with <↵>; the set parameter value of the acknowldeged parameter flashes.

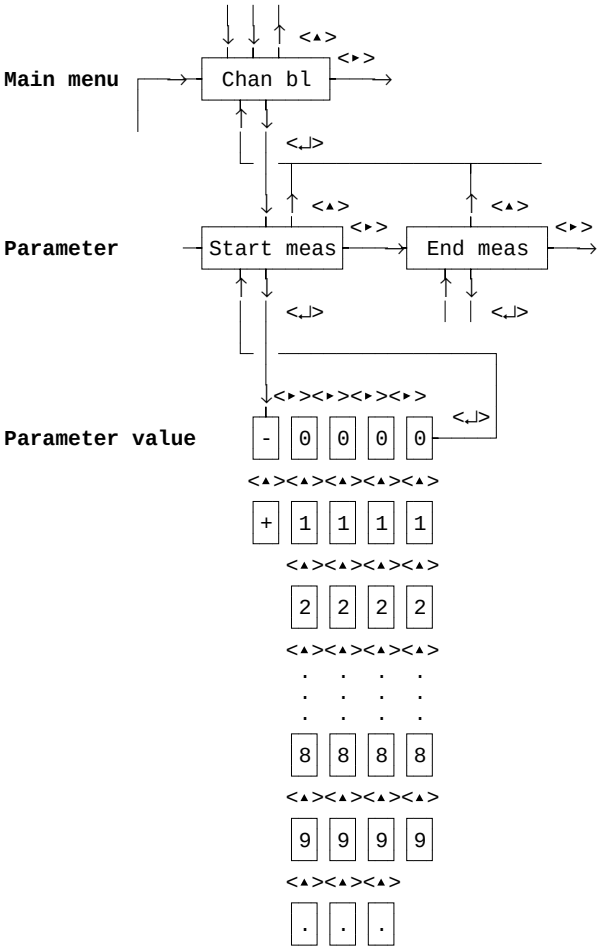
The parameter value can be determined in two ways:

- **By selecting** a value from n predefined values.
  Example: By selecting a speed from the 0 / 2.5 / 5 / 20 / ... mm/h) column.
- By **inputting** any values within a lower or upper cabinet.
  Example: input of the initial and final value of the measuring range.

Selection

- Display the parameter value of the selected parameter one after the other with <▸>.
- Acknowledge the selected parameter value with <↵>; the parameter is displayed.

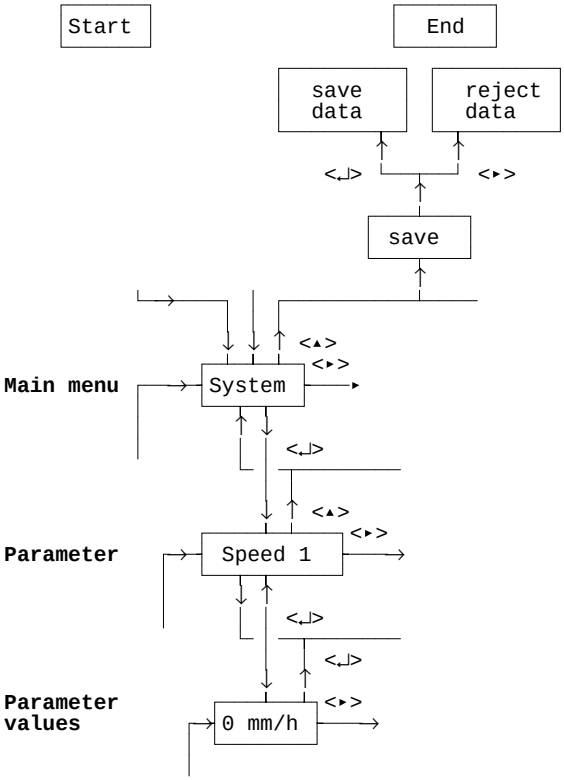
Input



- Select the character positions 1...5 one after the other with <▸>; the selected item flashes.
- With <▲> display the characters − / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / . (. = decimal point) one after the other.
- With <↵> acknowledge the calculated 4-digit figure (with sign); the parameter is displayed.
- With <▲> return to the main menu item.

The characters "–" and "." are only available for selection when inputting real figures; these characters are not available for inputting integer figures (e.g. password).

End of parameter definition



On repressing key <▲> **{Save data ?}** will be displayed.

The parameter definition mode can be escaped in 2 ways:

- The modified parameter data are stored on the EEPROM with <↵>.
- The modified parameter data are rejected with <▸>.

If the chart unit is used during parameter definition, the parameter definition mode will be escaped. The data hitherto input is then rejected. The old parameter data retain their validity.

LED Display Version

Operator control unit and display

Fig. 3 Display and operator control unit

After opening the case door, the six keys of the operator keyboard become accessible. In the operation mode the inscriptions on the keys are valid, in the parameter definition mode the inscriptions over the keys are valid. During the active parameter definition mode, the red LED left of the <Para> key flashes.

Key legend

Operation mode	**Parameter definition modes**
<Para> Call-up Parameter definition	<Esc> End the parameter definition or return to the higher level menu
<Print> Printout of the measured value of active channels	<▲> Select menu item Select parameter Select parameter value
<→| > Channel step enabling for measured value display	<▼> Select menu item Select parameter Select parameter value
<Fnc> Enable service mode Enable standby Initiate accounting printout	<◄> Editing function: Left cursor
<⏲> Display date and time	<►> Editing function: Right cursor
<| =⊗> Acknowledge alarm value infringements and error messages	<↵> Select menu item Select parameter Take over parameter value

Parameters and parameter values are displayed in clear text on the 16-digit LED display.

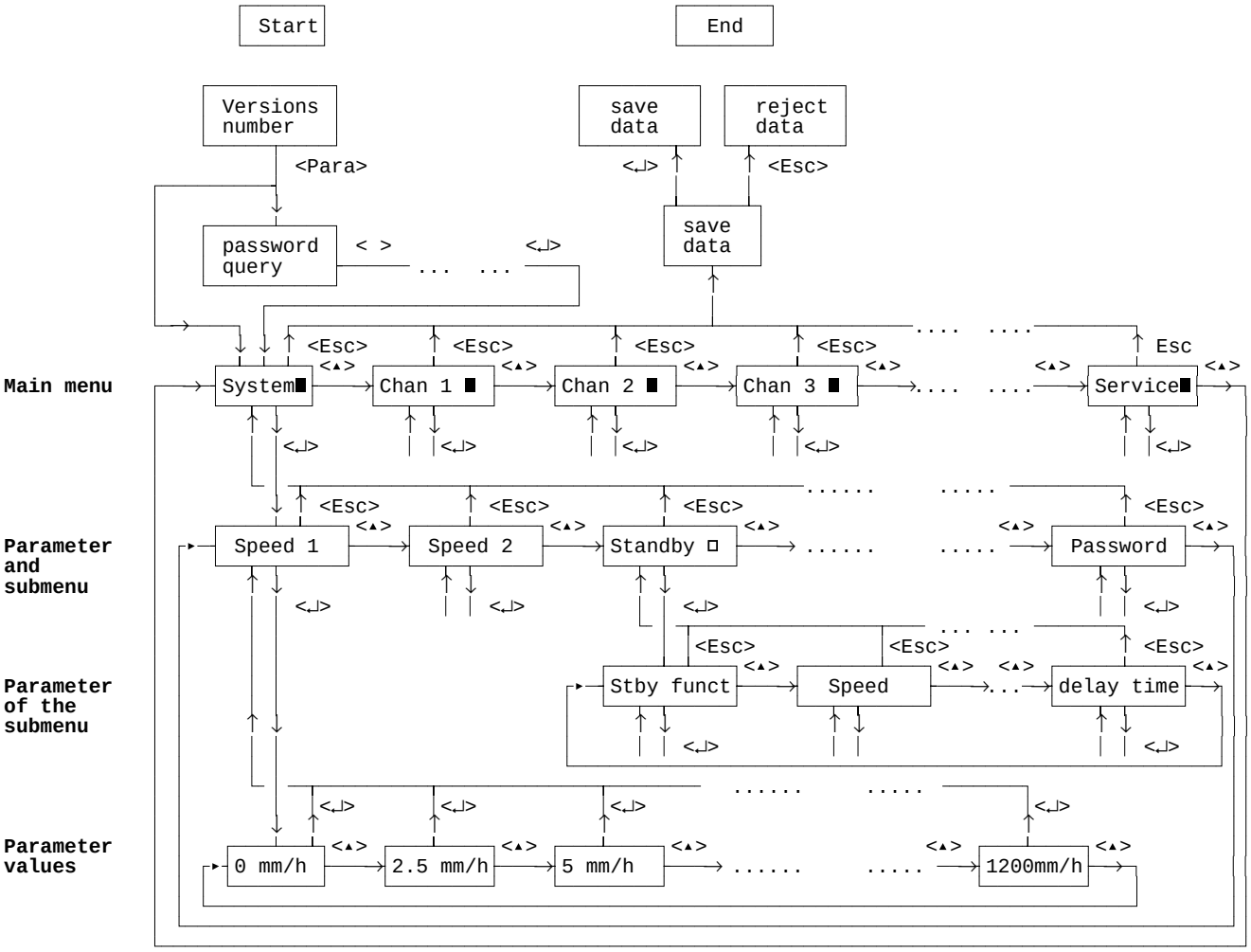
Starting the parameter definition

1. Switch on the parameter definition mode of recorder with the key <Para>. The software version number is displayed for 2 s. The printer head moves into the park position (at scale start).

Notice
Measured value processing and alarm monitoring functions are active in the parameter definition modes.

If a password was input, this will be demanded (see Section on “Preparing towards parameter definition”). If no password was defined, the main menu item **{System data}** will be displayed.

The principle of parameter definition



Main menu

- On pressing key <▸> the following main menus are displayed one after the other:

{System data ■}	Definition OF drive display parameters
{Channel 1 ■}	Parameters of channel 1 (violet)
{Channel 2 ■}	Parameters of channel 2 (red)
{Channel 3 ■}	Parameters of channel 3 (black)
{Channel 4 ■}	Parameters of channel 4 (green)
{Channel 5 ■}	Parameters of channel 5 (blue)
{Channel 6 ■}	Parameters of channel 6 (brown)
{Text lines ■}	Input of text lines
{Print inter. ■}	Time interval-driven print functions
{Sync.times ■}	Time-driven print functions
{Print colours ■}	Colours of recorder curves and text lines
{DI assignment ■}	Assignment of inputs to functions
{Service ■}	Tests und calibrations
{System data ■}	

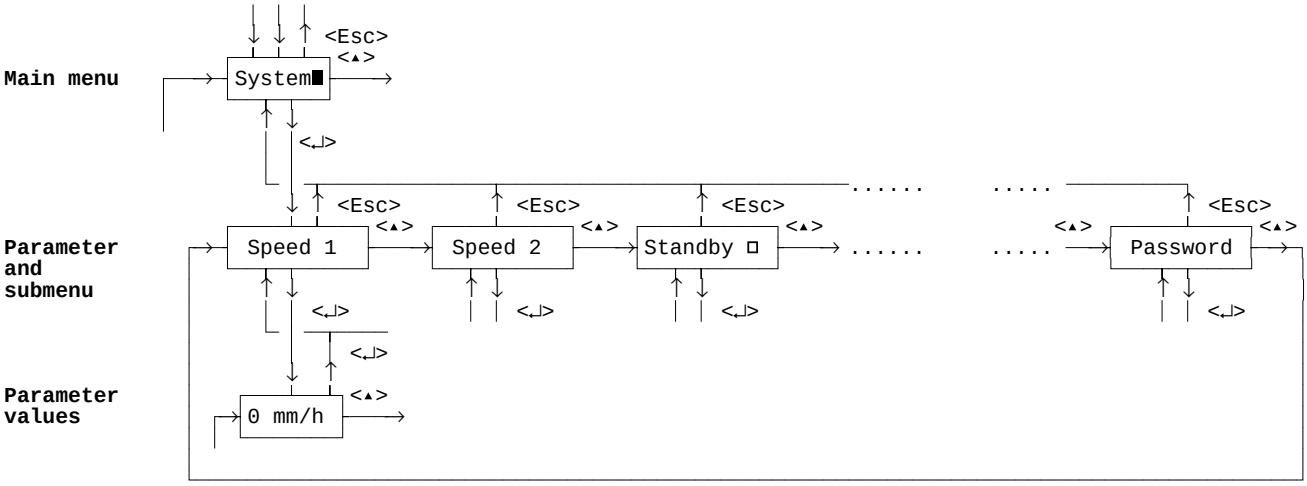
..

The main menu item “Assignment of binary inputs for functions” is only displayed when the recorder is equipped with the option “Alarm monitoring and binary inputs”.

The block character (“■”) at the end of the line identifies the main menu item.

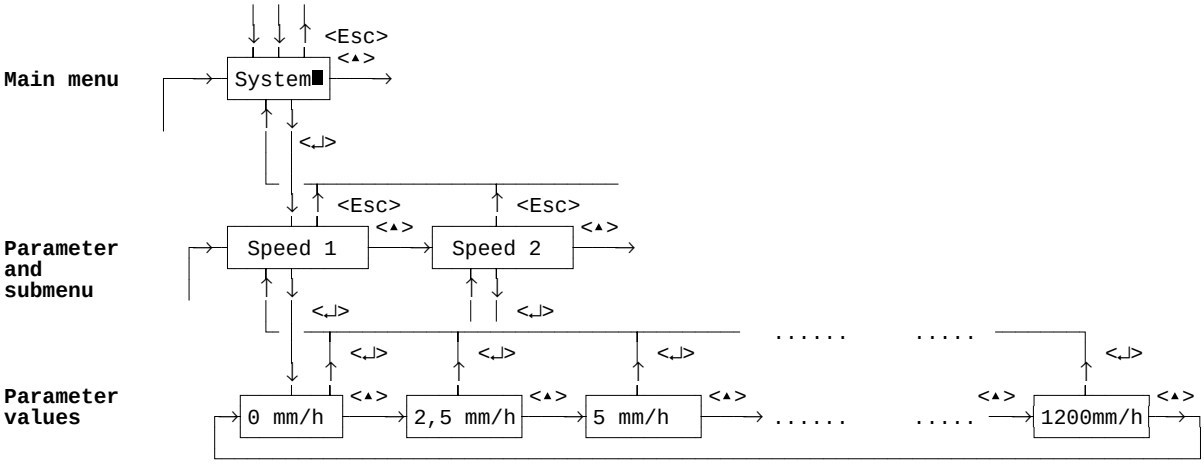
The character (“□”) at the end of the line identifies the submenu points.

Parameter selection



- Acknowledge the selected main menu item with <↵>; the first parameter of this main menu item is displayed.
- The parameters of the main menu item are displayed one after the other with <▲>.
- Return to the main menu item with <Esc>

Configuration of parameter values



- Acknowledge the selected parameters with <↵>; the set parameter value of the acknowledged parameter flashes.

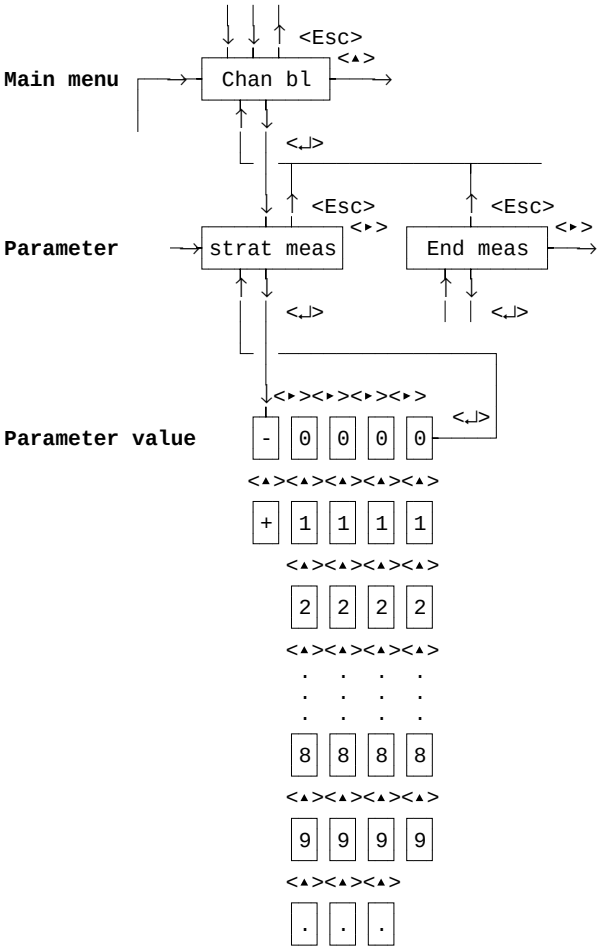
There are two ways of determining the parameter value:

- The **selection** of a value from n predefined values.
  Example: Selection of one speed from the 0 / 2.5 / 5 / 20 / ... mm/h) series.
- The **input** of any value within a lower and upper cabinet.
  Example: input of the initial and final values of the measuring range.

Selection

- Display the selected parameter values one after the other with <▲>.
- Acknowledge the selected parameter value with <↵>; the parameter is displayed.

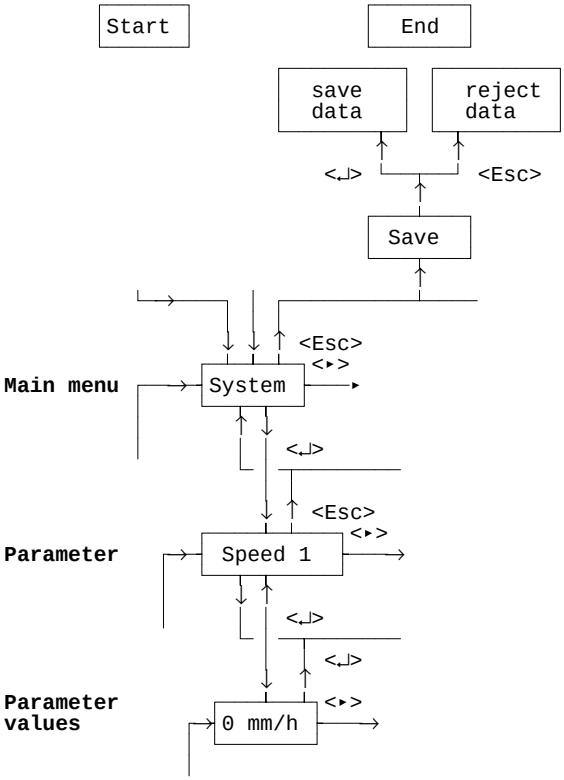
Input



- Select digits 1...5 of the parameter values one after the other with <▸>; the selected item flashes.
- Display digits − / 0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / . (. = decimal point) one after other with <▲>.
- Acknowledge the created 4-digit figure (with sign) with <↵>; the parameter is displayed.
- Return to the main menu item with <Esc>.

The characters "–" und "." are provided for selection only during the input of real figures; these characters are not provided when inputting integers (e.g. password).

End of parameter definition



On reactuation of the key <Esc>, **{Save data ?}** is dispayed.

The parameter definition mode can be escaped in two ways:

- The changed parameter data are stored on the EEPROM with <↵>.
- The modified parameter data are rejected with <Esc>.

If the chart unit is used during the parameter definition, the parameter definition mode is escaped. The data input hitherto will be rejected. The old parameter data remain vlaid.

Parameter definition instructions

Changing the channel parameter value

The following illustrates what happens on selecting a new type of measurement, a new nominal range, measuring range or physical unit:

Modification of type of measurement and/or nominal range

The measuring range initial and end values are set to the limit values of the nominal range.

The display range is set to the limit values of the nominal range.

The alarm values are set to the initial (for min. function) or final value (for max. function) of the display range.

The input limits of the measuring range are equivalent to those of the nominal measuring range.

The input limits for the display range are −1000 ... +9999.

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

If a thermocouple or Pt 100 is selected as the type of measurement, the menu items
- user linearisation,
- square rooting and
- direction

are reset.
The temperature unit is switched to °C.

Modification of initial or final measuring range values

For measurements with thermocouple or Pt 100 the display range is automatically included.

The alarm values are checked for their adherence to the new display range and set to the limit valaues of the measuring range in case of under or overshooting.

For measurements with current or voltage the display range and alarm values remain unchanged.

The alarm values are always related to the display range.

Modification of display range

The alarm values are checked for their adherence to the new display range and set to the limit values of the measuring range in case of under or overshooting.

Modification of the temperature unit

The measuring und display ranges are reset to the rated measuring range. The input limits are preset in accordance with the rated measuring range. If the temperature unit is set to °F, the input limits of the measuring range will be converted to °F (°F = 9/5 * °C + 32).

Split Range

The minimum span of 20 % is checked for undershooting during the measuring range input. In case of low span, the error message
{Span < 20%}
shall be displayed.

Parameter description

Notice

The remaining sections of this Instruction Manual refer to both the LC display and the LED display versions.

The parameter definition of both versions only differs in operation, due to the different keys.

For the sake of simplicity, the two versions are identified as

LC (LC display version)

and

LED (LED display version).

Preparing towards parameter definition

Selecting the password

The parameter definition mode is obtained with <↵> (LC) or <Para> (LED), if
- the password is 0000 or if
- the bridge XB 1 on the CPU card

has been established (see the service instructions).

If none of these conditions are fulfilled, a password query will follow:
{*Password ? 0000*} (last position flashes)

Input the password with <▲>, <▸> (LC and LED) and acknowledge with <↵>.

If the password is incorrect, the message
{*password wrong !*}
will be flashed in the display. Since this involves an error message, it must be acknowledged with <↵>. The recorder switches back to the operation mode.

If the value 9999 was selected as password, the parameter configuration of the recorder can only be read but not corrected. The main menu item “Service” and the password are not displayed.

If a value from 0001 to 9998 was selected as password, the parameter configuration can be modified in accordance with the defined password.

System data

The following parameters can be called up from the main menu “System data”:

Key (LC)	Key (LED)	Display	Parameters
		{System data ■}	System data (main menu)
<↵>	<↵>	**{Language D}**	Language of the menu prompting
<▸>	<▴>	**{Speed 1 20}**	Standard speed with information on the set speed in mm/h
<▸>	<▴>	**{Speed 2 300}**	2nd speed with information on the set speed required in mm/h
<▸>	<▴>	**{Stdby.Funct. }**	Submenu standby function
<▸>	<▴>	**{Oper.mode A}**	Select the type of operation
<▸>	<▴>	**{Cycle time 03}**	Time (in s) between recording cycles
<▸>	<▴>	**{Delay time 10}**	Delayed start of the measured range pressure for type of operation B.
<▸>	<▴>	**{Ev. markers 10}**	Number of event marks for type of operation D.
<▸>	<▴>	**{Baud rate 9600}**	Data baud rate
<▸>	<▴>	**{Adress 01}**	Bus subscriber address
<▸>	<▴>	**{Alarm mode aus}**	Start of alarm acknowledgement
<▸>	<▴>	**{Relay inv. aus}**	Switch-on of the alarm value relay
<▸>	<▴>	**{IO convert. aus}**	Extension unit for binary inputs and alarm relay
<▸>	<▴>	**{Coll. alarm DO1}**	Output of the collective alarm
<▸>	<▴>	**{Paper end DO 2}**	Output of the end-of-paper alarm
<▸>		**{LCD Light. on}**	Background illumination of the display (only LC display version)
	<▴>	**{Brightness 3}**	Brightness of the LED display (only LED display version)
<▸>		**{Bar graph on}**	Additional bargraph display of the measured value (only LC display version)
<▸>	<▴>	**{Dat.format EURO}**	Time and data format
<▸>	<▴>	**{Time 15:16}**	Input the time
<▸>	<▴>	**{Date 23.01}**	Input dag and month
<▸>	<▴>	**{Year 97}**	Input year
<▸>	<▴>	**{Clock.sync. DI 1}**	External clock synchronization
<▸>	<▴>	**{Print funct. }**	Submenu for print functions
<▸>	<▴>	**{Password 0000}**	Input the password

Speed 1

Speed 1 is the standard recorder speed. This speed is used when none of the speed changeover functions is active. The standard value is 20 mm/h.

Parameters
{Speed 1 20}

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

Speed 2

Notice
This submenu can only be called up if the recorder is equipped with the option “Limit alarm monitoring and binary inputs”.

Speed 2 can deal with the same values as Speed 1. The standard value is 120 mm/h. The speed changeover is activated by assigning a digital output to the parameters “Speed changeover” in the main menu item “Assignment DI”. Speed 2 is activated by applying a voltage of 24 V DC between terminal 901 (−) and the terminal assigned to the selected binary input (+).

Parameter
{Speed 2 120}

Parameter value
0 / 2,5 / 5 / 10 / 20 / 30 / 40 / 60 / 120 / 240 / 300 / 600 / 1200 mm/h

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Standby function

Notice
This submenu can only be called up if the recorder is equipped with the option “Alarm value monitoring and binary inputs”.

In the standby mode the measured value processing and the alarm value monitoring functions are active.

The following parameters can be called up:

Key (LC)	Key (LED)	Display	parameter
		{Standby }	
<↵>	<↵>	**{Stby funct. off}**	activate the standby
<▸>	<▲>	**{Speed 5}**	Paper speed during standby
<▸>	<▲>	**{Threshold 1023}**	Criterium for quitting standby
<▸>	<▲>	**{Delay time 300}**	time for delayed switching on of standby

Standby control

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

1. Upon switching on the power supply, the recorder is set to the operation mode. Standby is activated by assigning a digital output to the parameters “Standby” in the main menu item “Assignment DI”. The recorder switches to standby upon closing the input.
2. Upon switching on the power supply, the recorder is set to the standby mode.

Standby is escaped by
− infringing on the selected alarm values or
− <→| > (LC) or <Fnc> (LED) and
re-invoked with
− <→| > (LC) or <Fnc> (LED).

Parameter
{Stby funct. 0}

Parameter value
0 No standby function
1 Standby; is activated with the binary input and cancelled in case of alarm value infringement.
2 Standby; is activated with the binary input and cancelled by pressing key (<→| >).
3 Standby; is activated by switching on the recorder power supply, and cancelled in case of alarm value infringement.
4 Standby; is activated by switching on the recorder power supply, and cancelled by pressing key (<→|>).

Standby speed

The parameter defines the speed which is active during standby.

Parameter
{Speed 1 20}

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

Escape standby

With this parameter, the alarm values are selected, the infringement of which cause the standby mode to be escaped.

Parameter
{Alarm value 0003}

Parameter value
0...4095

The desired code of the alarm value should be defined as the parameter value for cancelling the standby mode. Should the standby mode be cancelled due to several alarm values, the sum of all code figures shall be totalled according to the table below and configured as parameter value:

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

Example

The standby mode is to be cancelled by the alarm values 1 and 2 of channels 1 and 2 and by the alarm value 1 of channels 3, 4 and 5:

The parameter value to be input is

1	Channel 1	Alarm value 1
2	Channel 1	Alarm value 2
4	Channel 2	Alarm value 1
8	Channel 2	Alarm value 2
16	Channel 3	Alarm value 1
64	Channel 4	Alarm value 1
256	Channel 5	Alarm value 1

Σ **351**

Standby delays switch-on

With this parameter a time unit can be selected for switching on the delayed standby mode. If on fulfilling the standby criterium a text information must be written, the paper speed may not be switched off immediately. The recording paper must be further transported to the level of the text line (2.8 mm).

Notice
This parameter is not effective if the standby is controlled with key <⇥> (LC) or <Fnc> (LED).

Parameter
{Delay time 200}

Parameter value
0....200 minutes

Type of operation

Der recorder differentiates between four types of operation

A **Cyclical operation:** edit all active channels

B **External control**
Display of one or several channels, control via the binary inputs 1...6 of the recorder.

C **Cyclical operation: Edit one channel**
The displayed channel is updated during the cycle time. DI 1...DI 6 signalize the channels connected by means of NO contact.

D **Event recorder for 10 events**

Operations **A** and **C** require the presetting of a cycle time to control the printout of the measured value on paper. The cycle time (3...360 s) is configured in the parameter definition. After expiry of the cycle time, the measured value is imprinted on the chart. If the chart is moved by more than 0.4 mm prior to expiry of the cycle time, a dotted line will also be printed.

Operations **B** and **C** require the presetting of a delay time, during which no measured value can be printed. By presetting the delay time, the recording of transmitter transient effects is no possible. The delay time may be 0...30 s. The speed cannot be maintained when delay time is active.

In the type of operation **A** the recorder operates according to the following cycle:

1. The display shows the measured value CH 1, printer head moves to the measured value CH 1.
2. After expiry of the cycle time, the measured values of all active channels are printed out.
3. After printout the printer head moves to the measured value CH 2.
4. After expiry of the cycle time a further switchover to the next channel etc. takes place.

The display can be fixed permanently to a specific channel with key <⇥>.

Operation **B** creates a permanent link between the digital inputs 1...6 and channels 1...6. Only channels with their assigned DI closed will be recorded. With operation **B** the recorder operates according to the following cycle:

1. DI x is closed. The measured value of CH x is displayed. The printer head moves to the measured value CH x.
2. DI x is open. DI y is closed. The measured value of CH y is displayed. The printer head moves to measured value CH y.
3. DI y is open. DI z is closed. The measured value of CH z is displayed. The printer head moves to measured value CH z etc.

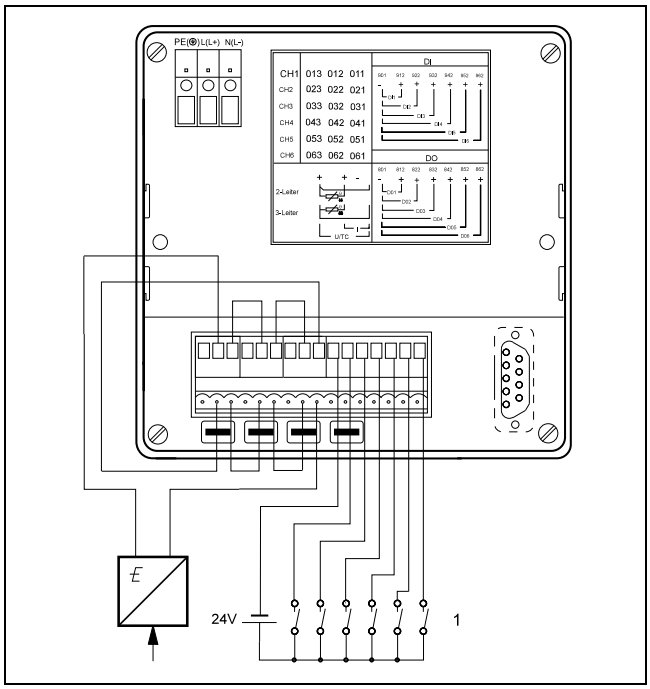


Fig. 4 Connection for operation B
Z-18069 *1* Channel selector

In operation **C** the recorder operates according to the following cycle:

1. The measured value CH 1 is displayed. Printer head follows measured value CH 1. DO 1 is closed. CH 1 is recorded.
2. After expiry of the cycle time, the next channel is enabled.
3. The measured value of CH 2 is displayed. Printer head moves to the measured value of CH 2. DO 2 is closed. CH 2 is recorded.
4. After expiry of the cycle time, the next channel is enabled etc.

If a delay time has been predefined, the measured value will be displayed immediately. However, no recording will take place on the chart.

The type of operation **D** permits the recording of up to 10 time markings on the chart. In one parameter the user defines how many markings are to be recorded. Thee is a permanent link between the time marking, the digital inputs and the colour with which the time marking should be recorded:

Event mark	Colour	Recording position	DI input
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

The event markers are illustrated on the charts as lines (1 dot in size). An approx. 4 mm long dash is printed at the start and end of the line.

Parameter
{Operating mode A}

Parameter values
A Edit all measuring points cyclically
B External control
C Edit one measuring point cyclically
D Event recording

Cycle time

This parameter defines the time span between two recording cycles. After expiry of the cycle time, the measured values of all active channels are printed out. The next printout then follows after the cycle time has expired again.

Parameter
{Cycle time 03}

Parameter value:
3...360 s

Delay time for operations B and C

This parameter defines the time span between the activation of a channel and the begin of channel recording.

Parameter
{Delay time 00}

Parameter value
0...30 s

Number of event marks

This parameter defines the number of event markers the recorder should print on the chart. The parameter shall only be processed if the recorder is switched to operation D (event recorder).

Parameter
{Event markers 10}

Parameter value
1...10

Baud rate

The parameter defines the baud rate for the RS-485 interface. Standard baud rates are used.

Parameter
{Baud rate 9600}

Parameter value
600
1200
2400
4800
9600
19200

Bus subscriber addresses

This parameter defines the subscriber address of the recorder to enable communication.

Parameter
{Adress 01}

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

Notice
Address 133 is the broadcast address of the recorder.

Language

This parameter defines the type of language used. The following settings are possible: **D** for German, **GB** for English and **F** for French. On selecting the appropriate language, the menu dialog is also set to the respective language.

Parameter
{Language D}

Parameter value
D
GB
F

Alarm acknowledgement

This parameter determines how to handle the alarm value display. The parameter can accept the values “off”, “auto” or “man”.

In the case of “off” no alarm values are displayed.

In the case of “auto” the alarm message is displayed as long as the alarm value is active. Manual acknowledgement is possbile. The alarm message is automaticaly cancelled when there is more alarm value infringement.

For “man” a manual acknowledgement for each alarm is required.

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

Parameter
{Alarm ackn. auto}

Parameter value
off
auto
man

Relay status

This parameter defines whether the output relay operates according to the active or quiescent current principle. The contact position is therefore predetermined in case of alarm.

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

The parameter can accept the values “off” or “on”. The default setting of the parameter is “off”. The parameter does not influence the relay outputs DO1...DO6, if the recorder is switched to operation **C**.

Parameter
{Relay inv. aus}

Parameter value
off
on

I/O Converter

If the recorder is equipped with the option “Alarm value monitoring and binary inputs”, 6 binary inputs and 6 contact outputs will be available. The roots of the contact outputs are linked to each other.

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

The parameter can accept “off” and “on”. For “in” the I/O converter can be connected to a recorder which is **not** equipped with the option “Alarm value monitoring and binary inputs”.

Parameter
{IO converter off}

Parameter value
off
on

Collective alarm

This parameter defines which relay output or other alarms are activated in case of self-test error. The collective alarm relay always operates according to the queiscent current principle. The output is closed if there is no alarm.

Parameter
{Coll. alarm DO 1}

Parameter value

off	collective alarm is switched off
DO 1	Binary output 1
DO 2	Binary output 2
.	.
DO 20	Binary output 20

End-of-paper signal

This parameter defines which relay output is activated in case the end of paper is reached

Parameter
{Paper end DO1}

Parameter value

off	No message
DO 1	Binary output 1
DO 2	Binary output 2
.	.
DO 20	Binary output 20

Illumination

This parameter switches on the lighting for the background of the LC display and the paper.

parameter
{LCD light. on}

Parameter value
off
on

Brightness

This parameter defines the brightness of the LED display.

Parameter
{Bightness 3}

Parameter value
0
1
2
3

Bargraph display

This parameter determines if the measured value should be displayed as bargraph, in addition to the digital display. The bargraph establishes the relationship between current measured values and the end of the measuring range. The measured value can be read off at a distance. It provides rough orientation. The bargraph display has an accuracy of about 10 %.

Parameter
{Bar graph on}

Parameter value
off
on

Date format

The parameter defines the date format and time outputs. The format configuration applies to all inputs and outputs of date and time on both the printer head and the display.

Parameter
{Dat.format EURO}

Parameter value
EURO
US

Time

The parameter states the time which is written into the clock module as soon as any change takes place.

Parameter
{Time 11:33}

Parameter value
00:00 to 23:59

The factory setting for date and time is:
01.01.96 00:00 o'clock.

Date

The parameter states the date which is written into the clock module as soon as any change takes place.

Parameter
{Date 11:33}

Parameter value
00:00 to 23:59

The factory setting for date and time is:
01.01.96 00:00 o'clock

Year

The parameter states the year which is written into the clock module as soon as any change takes place.

Parameter
{Year 96}

Parameter value
0...99

The factory setting for date and time is:
01.01.96 00:00 o'clock.

Time for external clock synchronization

The parameter defines the time set on the clock module at the time of closing the assigned input.

Parameter
{Clock synch. 00:00}

Parameter value
00:00 to 23:59

Password

The parameter defines the figure combinations with which the parameter definition data can be accessed.

If the password is "0000", it will not be queried. If the password is "9999", all parameters (except the password) can be viewed. Parameter modification is not possible in this case.

Parameter
{Password 0000}

Parameter value
0001....9998

Printout functions

The following parameters can be called up in this submenu item:

key (LC)	key (LED)	Display	Parameters
		{Print functions }	
<↵>	<↵>	**{CH code on}**	Write channel identification code on recorder curve.
<▸>	<▲>	**{Thres. text out. on}**	Printout of text lines with measured value supplement in case of alarm value infringement.
<▸>	<▲>	**{Scal. dist. 060}**	Spacing (in mm) between 2 double lines.
<▸>	<▲>	**{Speed.printout on}**	Printout of speed, date/time after changeover.
<▸>	<▲>	**{Counter ↑ 0000}**	Input of meter reading of the 4 high-order figures.
<▸>	<▲>	**{Counter ↓ 0000}**	Input of meter reading of the 4 low-order figures.
<▸>	<▲>	**{Ranking 100}**	Input of the meter value ranking/pulse.
<▸>	<▲>	**{Counter funct. +}**	Direction of count
<▸>	<▲>	**{Count. text line 10}**	Number of text lines with counter
<▸>	<▲>	**{Mess. blc. 1 0049}**	Printout of signal block 1.
<▸>	<▲>	**{Mess. blc. 2 0082}**	Printout of signal block 2.
<▸>	<▲>	**{Mess. blc. 3 0148}**	Printout of signal block 3.
<▸>	<▲>	**{Mess. blc. 4 0280}**	Printout of signal block 4.

Channel number on recording curve

This parameter determines if a code ("_CH1" .. "_CH6") should be imprinted on the measured value curve of the chart. The codes are printed cyclically on the curve at a spacing of 6 cm. The printout is suppressed if the printout queue is not empty. For measured values below 50 % of the chart line, the channel code is imprinted on the right side of the measured value curve. For measured values above 50 % the channel code is imprinted on the left side of the curve.

Parameter
{CH code on}

Parameter value
off
on

Text line printout for alarm value infringements

Alarm values can be assigned to text lines. In case of alarm infringements, these lines shall be displayed with a time supplement and printed out. In this parameter the text line printout can also be supplemented with the current measured value. Condition for supplementing the alarm value is, the text line should not be filled with more than 16 characters.

If the parameter value is set to "on", the line could have the following appearance:

[Text lines > -23.00mV 9:45]

Parameter
{Thres.text out. ein}

Parameter value
off
on

Spacing between double lines

This parameter defines the spacing between the double lines (scaling and text lines) of the channel.

Parameter
{Scal.dist. 60}

Parameter value
40...500 (in mm steps)

Printout of paper speed

When the recorder is switched on or the speed is adjusted, a text line containing time, date and current speed shall be imprinted. The parameter activates the printout of these lines.

Parameter
{Speed printout ein}

Parameter value
off
on

Load counter

The following parameters are used for creating an 8-digit counter for the identification of loads.

Counter ↑

This parameter is used to input the 4 higher order digits of the counter.

Parameter
{Counter ↑ 0000}

Parameter value
0...9999

Counter ↓

This parameter is used to input the 4 lower order digits of the counter.

Parameter
{Counter ↓ 0000}

Parameter value
0...9999

Counter significance

The parameter defines the total of counter values to be changed each time the counter is activated.

Parameter
{Ranking 100}

Parameter value
0...1000

Counter function

The parameter determines if any counter change should be added or subtracted from the counter value.

Parameter
{Counter funct. +}

Parameter value
+
–

Text line with counter

The parameter determines which text line is printed out together with the count. Date and time are no longer added to the selected text line.

Parameter
{Counter text line 10}

Parameter value
1...10 (= Text line 1...10)

Printout of message blocks

The respective text lines, the measured value lines and the date / time lines can be grouped together into text blocks. It is possible to create a maximum of four text blocks. The text blocks are actuated via the binary inputs DI 1...DI 4.

Every text line is assigned to a code. The sum of the text line codes to be grouped together into a text block must be stated as a parameter.

Code

0	No block formation
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

{Mess. blc. 1 0049}
{Mess. blc. 2 0082}
{Mess. blc. 3 0148}
{Mess. blc. 4 0000}

Parameter value

0...65535

Channel parameters

The channel parameters can be adjusted specifically for each channel.

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

Key (LC)	Key (LED)	Display	Parameter
		{Channel 1 ▮}	
<↵>	<↵>	**{Type 4..20mA}**	Type of measurement with rated measuring range.
<▸>	<▲>	**{Ranges ▮}**	Submenu for ranges
<▸>	<▲>	**{Temp. unit °C}**	Select the temperature unit
<▸>	<▲>	**{Unit of meas. bar}**	Select the dimensional unit
<▸>	<▲>	**{Text unit ?????}**	Freely configure dimensional unit.
<▸>	<▲>	**{Break monit. off}**	Switch-on of the sensor break monitoring mode.
<▸>	<▲>	**{Sensor brk. ◂—0}**	Preset the printer head position for sensor break.
<▸>	<▲>	**{Ref.temp. 0°C}**	Reference junction temperature for TC
<▸>	<▲>	**{Pt100 conn. 2w}**	Select the type of terminal for Pt 100.
<▸>	<▲>	**{Line resist. 1}**	Configure the line resistance for Pt 100 / 2-wire circuitry.
<▸>	<▲>	**{RL meas. ffff}**	Measure the line resistance for Pt100, 2-wire.
<▸>	<▲>	**{Specify RL 5,66}**	Input a measured line resistance.
<▸>	<▲>	**{Filter time 00}**	Filter time constant.
<▸>	<▲>	**{Scale format 2}**	Format of the scaling line.
<▸>	<▲>	**{Scale text TXT}**	Text line of scaling line.
<▸>	<▲>	**{Meas.val.disp. on}**	Measured value display enabled.
<▸>	<▲>	**{User linear. int}**	User linearization enabled.
<▸>	<▲>	**{Lin. table ▮}**	Submenu for tie points of user linearization.
<▸>	<▲>	**{Math funct. ▮}**	Submenu for computing functions.
<▸>	<▲>	**{Accounting ▮}**	Submenu for accounting.
<▸>	<▲>	**{Thresholds ▮}**	Submenu for alarm value settings.

Signal type (type of measurement and rated measuring range)

This parameter defines the type of measurement and the rated measuring range required for a respective channel. The signal type “SER” switches over the channel of the measured value processing to the reception of measured values via the serial interface. The last accepted value from the interface is recorded until a new value is received. Here also, recording takes place dirng the preset cycle time. The measured value received via the interface must be available as a normed value within the 0 .. 1000 range. The permitted scaling for the signal type “SER” lies within the maximum input limits of -999.0 .. 9999.0.

The preferred signal type and its associated rated measuring range are selected with <↵>. For current and voltage measurements the display range is independent of the measuring range. If during temperature measurement the physical unit is set to °F using Pt 100 or thermocouple, the permissible range limits will be changed automatically.

The conversion is: °F = (9/5) * °C + 32.

Parameter

{Type 0...20 mA}

Parameter value

off	
0...20 mA	
4...20 mA	
±2.5 mA	
±5 mA	
±20 mA	
0...25 mV	
±25 mV	
0...100 mV	
±100 mV	
0...500 mV	
0...2.5 V	
±2.5 V	
0...5 V	
±5 V	
±10 V	
±20 V	
PT100-I	−50....150 °C
PT100-II	−50....500 °C
PT100-III	−200...850 °C
THERMO-B	0...1820 °C
THERMO-E	−270...1000 °C
THERMO-J	−210...1200 °C
THERMO-K	−270...1372 °C
THERMO-L	−200...900 °C
THERMO-N	−270...1300 °C
THERMO-R	−50...1769 °C
THERMO-S	−50...1769 °C
THERMO-T	−270...400 °C
THERMO-U	−200...600 °C
SER	receive measured value via RS-485 interface
USER	special measuring ranges (see section on “Special measuring range configuration”)

Range configurations

The range configurations define which part of a rated measured value should be used, how this range has been scaled and how it is to be recorded.

The following parameters can be called up in the submenu “Range configurations”:

Key (LC)	Key (LED)	Display	Parameter
		{Ranges }	
<↵>	<↵>	**{Meas.rge↓ +4.000}**	Start of measuring range.
<▸>	<▲>	**{Meas.rge↑ +20.00}**	End of measuring range.
<▸>	<▲>	**{Sq.root extr.}**	Square rooting of the measured values.
<▸>	<▲>	**{Displ. format 0}**	Display format.
<▸>	<▲>	**{Dec. places 0}**	Number of points behind the decimal point.
<▸>	<▲>	**{Display ↓ +50.00}**	Start of display range.
<▸>	<▲>	**{Display ↑ +300.0}**	End of display.
<▸>	<▲>	**{xe 1 04}**	Measuring range value for 1st kink point.
<▸>	<▲>	**{xa 1 100}**	Display range value for 1st kink point.
<▸>	<▲>	**{xe 2 05}**	Measuring range value for 2nd kink point.
<▸>	<▲>	**{xa 2 400}**	Display range value for 2nd kink point.
<▸>	<▲>	**{Rec. range ↓ 00}**	Start of recording range.
<▸>	<▲>	**{Rec. range ↑ 100}**	End of recording range.
<▸>	<▲>	**{Direct. 0 —▸100}**	Input of the effective direction of the recorder system.
<▸>	<▲>	**{Offset +100}**	Shiftung of the measured value.

Measuring range (zooming)

The parameters Measuring range start/end define which rated measuring range should be used for conducting measurements. The span must be at least 20 % of the rated measuring range. The input limits for these values are set to the initial and final values of the selected rated measuring range. The start of measurement can be within 0 and 80 % of the rated measuring range. The end of measurement can be within 20 and 100 %.

Parameter

{Meas.rge↓ -50.00} measuring range start
{Meas.rge↑ +150.0} measuring range end

Parameter value

Start to end of rated measuring range
The input is effected in the dimensional unit of the measuring range.

Example:
for
{Type 0..20mA}
Rated measuring range 0 .. 20 mA
and setting
{Meas.rge↓ +4.500}
{Meas.rge↑ +19.00}
The measuring range amounts to 4.5...19 mA (at a corresponding restricted accuracy).

Square rooting

The parameter determines if the input signal shall be square rooted or not.

Parameter
{Sq.root extr.}

Parameter value
off
on

Display format

This parameter defines the display function for the illustration of values:

- linear characteristic of the display range
- linear characteristic of the display range with one kink point
- linear characteristic of the display range with two kink points
- logarithmic chracteristic of the display range
- hyperbolic characteristic of the display range with one discontinuous point

In case of linear division, the value to be displayed “y” is determined from the measured value “x” according to a line equation y = ax + b. For linear division it is possible to input one or two kink points.

For the logarithmic characteristic $u*10^a$ is defined as initial value and $v*10^b$ as final value.

For the hyperbolic characteristic the value to be displayed “y” is determined from the measured value “x” according to the equation $y = K_1/(x-K_2)$. K_1 is determined by the recorder, K_2 is the discontinuous point (in measuring range values).

Parameter
{Displ. format 0}

Parameter value
0 linear
1 linear with one kink point
2 linear with two kink points
3 logarithmic (10-logarithm)
4 hyperbolic

Decimal points

This parameter defines the number of decimal points for the display and for the measured value printout. The parameter can accept the values “0, 1, 2, 3 and auto”. For “auto” the recorder determines the number of decimal points. The configured display range serves as basis for determining the decimal point. For logarithmic display control, the values independent of the value of this parameter are always illustrated in exponential form.

Parameter
{Dec. places auto}

Parameter values:
auto
0
1
2
3

Display of the measured value

The parameter Display range start / end defines on which physical range (numerical range) the selected measuring range is displayed (e.g. 0..20 mA → 3..9 bar).

Parameter
{Display ↓ 0.000}
{Display ↑ 9000.}

Parameter value
−999....+9999

The logarithmic measured value curve is input in the exponential format 1.00 E -9....9.99E 9.

In the operation mode the measured value is displayed in the form 5.23 10^{-1}.

Kink points for linear display range

Linear display ranges can be configured with one or two kink points. This possibility is utilized in order to create loop ranges within the measuring range (e.g. contracting initial and final ranges). The parameter defines the coordinates of the kink points.

Parameter
{xe 1 4.000}
{xa 1 100.0}
{xe 2 12.00}
{xa 2 200.0}

Parameter value
for xe = measuring range start to measuring range end
for xa = display range start to display range end

Discontinuous point of the hyperbolic display range

During the hyperbolic trend of the display range, this parameter defines the discontinuous point (in measuring range values).

Parameter
{xe 2 4.000}

Parameter value
Measuring range start to measuring range end

Recording range (zoning)

The parameters Recording range start / end determine in which chart range recording for the channel takes place. The initial value is 0 %..90 %, the final value is 10 %..100 %. It is input in 1 % steps. Incorrect inputs are not checked (initial > final value)!

Parameter
{Rec. range ↓ 00}
{Rec. range ↑ 90}

Parameter value
00...90 for initial value
10...100 for final value

Recording direction

The parameter determines if the input signal shall be inversely recorded.

Parameter
{Direct. 0 ⟶ 100}

Parameter value
0 ⟶ 100
100 ⟵ 0

During parameter setting 100 ⟵ 0 the pointer moves from right to left when the measured value increases (normal is from left to right).

Offset

The parameter causes the measured value to be shifted at a constant magnitude. It is used for instance, to equalize unbalanced Pt 100 supply lines.

Parameter
{Offset +100}

Parameter value

LC	LED	
<▲>	<▲>	key increments the measured value
<▸>	<▼>	key decrements the measured value

Dimensional unit

The dimensional unit for each channel can be individually selected. The recorder differentiates between:
- temperature unit,
- standard unit or
- free unit.

Temperature unit

The temperature unit is supplied by the user when the measured input processes a thermocouple or a Pt 100. There is a choice between °C and °F.

Parameter
{Temp. unit °C}

Parameter value
°C
°F

Standard unit

The standard unit is selected by user from the list of units. For standard signals (current, voltage) the user is provided with a menu.

Parameter
{Unit bar}

Parameter 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

Freely configured dimensional unit

The free dimensional unit can take on 7 configurable characters input by user. The free unit is put at user's disposal for standard signals only.

Parameter
{Text unit ???????}

Parameter value
Character set from the table section "Character set table". The items marked ??????? can then be edited with the cursor (see section on "Print texts"), e.g. in **{Text unit µV/mΩ}**.

Sensor break monitoring

The parameter enables the switching on and off of the connection for thermocouple and Pt 100 monitoring of sensor break. If the sensor break monitoring is switched off, this ensures that the recorder does not influence any other devices in operation.

Parameter
{Sensor brk. on}
Parameter value
on
off

Reaction to sensor break

The parameter determines the direction of movement of the measuring system in case of sensor break.

Parameter
{Sensor brk. ◂—0}

Parameter value

◂—0	Pointer moves to 0-point in case of sensor break.
100—▸	Pointer moves to scale end in case of sensor break.

Reference junction correction

The parameter defines which temperature is to be used for the reference junction, in case a thermocouple is connected.

If the parameter value “int” is applied, the terminal temperature value measured by the recorder will be used for the correction.

If the parameter value “CH 6” is applied, channel 6 will represent the reference channel for channels 1...5. This possibility can be applied when, in case several thermocouples are connected, the transition is from a copper compensating lead to a “zone of equal but unknown temperature”. The reference channel measures the temperature of the “zone of equal temperature”. A thermocouple or Pt 100 can be used as reference element. If a thermocouple is used as a reference element, the compensation lead shall be wired up to the recorder. Select the internal reference junction correction for the reference channel, channel 6:

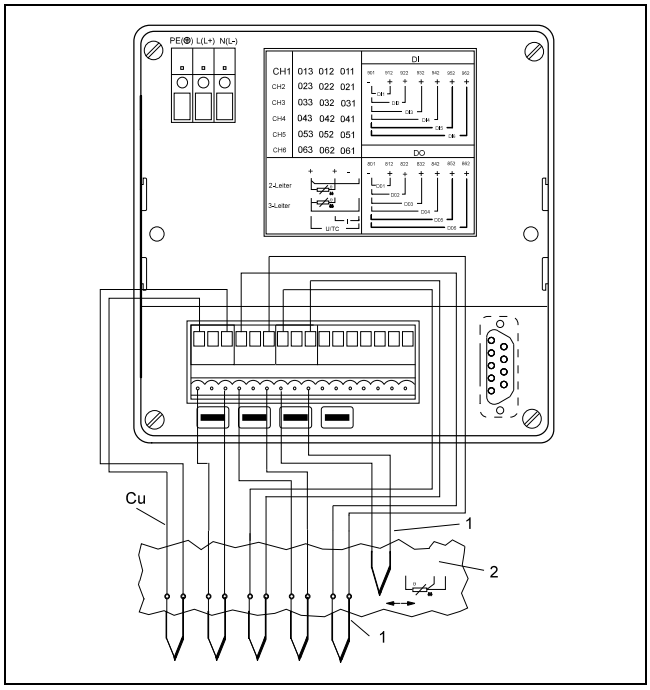


Fig. 5 Correction of channels 1...5 with reference channel 6
Z-18070 *1* Compensation lead
2 Zone of equal temperature

Parameter
{Ref. temp. 0°C}

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 the internal terminal temperature point
CH 6	Channel 6 = reference channel

Selection of Pt 100 2-/3 -wire circuitry

The parameter determines if the Pt 100 sensor should have a 2- or 3-wire connection to the recorder.

Parameter
{Pt100 conn. 2w}

Parameter value
3L 3-wire
2L 2-wire

Line resistance Pt 100 2-wire

This parameter defines which line resistance is to be used when applying the Pt 100 for measured value corrections.

If the parameter “int” is applied, a prestated resistance value is subtracted from the measured value. The value may not exceed 40 Ω.

If the parameter “ext” is applied, the recorder will conduct a resistance measurement.

For a description of the process see “Line resistance measurement”.

Parameter
{Line resist. int.}

Parameter value
int.
ext.

Line resistance measurement

This parameter is required for effecting line resistance measurements. For the parameter “Line resistance” the parameter value “external” must be selected. The sensor of Pt 100 must be short-circuited at its interface. On calling up the menu, the measured resistance of the Pt 100 supply lines is displayed. Use <↵> to accept the measured value and store in the EEPROM of the channel card. The value obtained here can then used for correcting the measured value.

Parameter
{RL meas. 03d2}

After actuating <↵> the measured value is displayed.

Parameter value [Ω]
{RL = 1.15}

On actuating <↵> again the measured value is accepted.

Presetting the line resistor

This parameter is used to input the line resistance determined by user. The recorder uses the resistance to make measured value corrections.

Parameter [Ω]
{Specify RL 5,66}

Parameter value
00.00....40.00 Ω

Damping

The parameter defines the time constant of the digital filter for damping the input signal. The filter operates as a first order low-pass filter. The value range is “0.. 60 s”.

Parameter
{Filter time 00}

Parameter value
0...60 s (in seconds steps)

Printout of double lines

A double line can be assigned to every channel. The first line is defined as scaling line. The second line is a text line which can contain specific measuring point information, e.g. AKZ-No. etc. If an alarm value is configured for one channel, a line with alarm value markings (triangles) will be printed out as a third scaling line. An alarm value is considered as being configured if a text line and/or an output relay has been assigned to it. For alarm values configured close to 0 % or 100 %, the triangle shall be replaced by a broken vertical line.

2 graduations for the scaling line:
The physical unit between 0 % and 50 % is printed. The channel code between 50 % and 100 % is printed.

3 graduations for the scaling line:
The physical unit between 33 % and 66 % is printed. The channel code between 66 % and 100 % is printed.

No unit and no channel code will be printed within the scaling line in case of 5 graduations.

User should freely create the scaling in case of free input.

If the recorder is set on the logarithmic display format, the scaling line is always printed with 2 graduations. Other default values in the parameter definition are ignored. The physical unit is printed between 0 % and 50 %. The channel code is printed between 50 % and 100 %.

Examples of scaling 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 scaling lines

The parameter defines the format of the scaling line.

Parameter
{Scale}

Parameter value
0 Scaling line and text line “off”
1 Scaling with module 2
2 Scaling with module 3
3 Scaling with module 5
4 Scaling line is used as text line.

Text line to scaling line

The scaling text line is printed as second line for the scaling, if the scaling line printout is enabled. The printout of the line is suppressed if 20H (= “blank”) is the first line character. The scaling text line can contain 54 characters. Manual scaling can only be effected in the text line of the double line. To do this, select the parameter vlaue “4” from “Skal.Format”.

Select the spacing between the double lines in the main menu item “System” and there in the submenu “Print functions”.

Parameter
{Scale text xxxxxx}

The items marked xxxxx... can be edited with the cursor (see section in the main menu item “Freely configurable texts”).

Parameter value
Character set from table

Release of measured value display

The parameter determines if the channel measured value shall be displayed or not. The default value is “on”.

Parameter
{Meas.val.disp. on}

Parameter value
on
off

Assignment of user linearization

The parameter which can only be accessed for current measuring ranges, voltage measuring ranges and the type of measurement “USER”, defines the linearization table for
1. rated measuring range or
2. measuring range.

On completion of the assignment, linearization becomes active. Thermocouples (according to table “Signal type”) and Pt100 are always processed with the internal linearization feature of the recorder.

Parameter
{User linear. 0}

Parameter value
0 Linearization off
1 Rated measuring range is linearized
2 Measuring range is linearized

Checkpoints of the user linearization

The user can supply 16 checkpoints for special linearizations. The values are expressed per thousand. The checkpoints must be in monotonous direct action. After inputting the values, the recorder sorts out the checkpoints. This makes a manual conversion of the table during value extension unnecessary. The checkpoints for 0 % and 100 % are automatically supplied by the recorder.

Key (LC)	Key (LED)	Display	Parameter
		{Lin. table }	
<↵>	<↵>	**{Lin.pnt.x1 1000}**	1. Tiepoint of input value in ‰
<▸>	<▲>	**{Lin.pnt.y1 1000}**	1. Tiepoint of output value in ‰
<▸>	<▲>	.	.
<▸>	<▲>	**{Lin.pnt.x16 1000}**	16. Tiepoint of input value in ‰
<▸>	<▲>	**{Lin.pnt.y16 1000}**	16. Tiepoint of output value in ‰

Parameter value
0...1000 ‰

Logic functions

Every channel can be used as a result channel (output channel) of a logical operation. The result channel can simultaneously be an interconnection channel too. (input channel). It is possible to calculate the total or the difference of two channels.

The submenu “Logical functions” includes the following parameters:

Key (LC)	Key (LED)	Display	Parameter
		{Math. funct. }	
<↵>	<↵>	**{Function +}**	Computing regulations
<▸>	<▲>	**{Logic chan. 1 5}**	Interconnection channel 1
<▸>	<▲>	**{Logic chan. 2 3}**	Interconnection channel 2
<▸>	<▲>	**{Res.rge ↓ −100.0}**	Start of result range
<▸>	<▲>	**{Res.rge ↑ +300.0}**	End of result range

Computing regulation

This parameter defines the type of logical combination. During the calculation process, the value of interconnection channel 2 is subtracted or added to that of internconnection channel 1. The calculation result is further processed as the measured value of the current channel.

Parameter
{Function +}

Parameter value
off
+
-

Interconnection channels

The following two parameters define which channels should be logically combined with each other.

Parameter
{Logic chan. 1 5}
{Logic chan. 2 3}

Parameter value
1 / 2 / 3 / 4 / 5 / 6

Result range

The parameters “Result range start / end” represent the values among which the result is to be found.

Within the result range limits, the required start of measurement can be selected between 0...80 % of the result range volume. The end of measurement can be selected between 20...100 % of the result range volume. In case of under or overflow of one of the two interconnected channels, the result of the calculation will also be set to either over or underflow.

Example:

Channel 1 is a 0...20 mA input which measures temperature within the −50 bis +50°C range. Channel 2 is a 0...20 mA input which measures temperature in the +100...+200°C range. Channel 2 is used as the result channel. If during the parameter definition of Channel 2 the function is set to “+”, the result range limits will be as follows:

Start	−50 + (+100) = + 50 °C
End	+50 + (+200) = +250 °C
Result range volume	200

The smallest measuring span is 20 % of 200, which is 40.
The start of measurement can be selected between 50...210.
The end of measurement can be selected between 90...250.

If the function is set to “−”, the result range limits will produced the following values:

Begin	−50 − (+200) = −250 K
End	+50 − (+100) = −50 K
Result range volume	200

The smallest measuring span is 20 % of 200, which is 40.
The start of measurement can be selected between −250...−90.
The end of measurement can be selected between 210...−50.

Parameter
{Res. rge ↓ −100.0}
{Res. rge ↑ +300.0}

Parameter value
From the lower limit of the result range up to the upper limit of the result range

Accounting

Accounting can be configured independently for each channel. The accounting function is disabled when the recorder standby mode is enabled. The accounting function permits printout of the following table at selectable time intervals:

1. Channel identification with comment
2. Total of power failure times (if available)
3. Time/date interval start and
   Time/date interval end
4. Smallest measured value during the interval with time and date
5. Biggest measured value during the interval with time and date
6. Average value over interval time
7. Total value over interval time

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]**

The table with 7 lines is approx. 23 mm long (6 lines for approx. 20 mm). The minimum paper speed for accounting with one channel should be calculated according to the following unequation:

P_v [mm/h] > 23 (20) [mm] / Interval time [h]
or
P_v [mm/h] > 23 (20) [mm] * 60 / Interval time [min]

If several channels are destined for accounting, the result calculated for one channel can be multiplied with the number of channels to be accounted for. The max. possible paper speed for text printout amounts to 240 mm/h.

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

Key (LC)	Key (LED)	Display	Parameter
		{Accounting }	
<↵>	<↵>	**{Oper. mode Σx}**	Select type of operation.
<▸>	<▲>	**{Control inp. DI 1}**	Select binary input for external interval control.
<▸>	<▲>	**{Interval 1h}**	Interval time.
<▸>	<▲>	**{Sync. time 08:30}**	Orientation time for interval.
<▸>	<▲>	**{Sync. day 25}**	Orientation time for interval.
<▸>	<▲>	**{Acc.text 2}**	Comment text line.
<▸>	<▲>	**{Max.val. 4.200E2}**	Total of alarm values.
<▸>	<▲>	**{Max. DO DO 2}**	Relay output in case of alarm value infringement.
<▸>	<▲>	**{Print format 4}**	Select accounting lines.
<▸>	<▲>	**{Sum print on}**	Printout of totals during alarm value infringement.
<▸>	<▲>	**{Sum displ. on}**	Display the total instead of the measured values.

Type of operation

The type of operation for the accounting function is defined in this parameter.

Parameter
{Oper. mode Σx}

Parameter value
off
$\bar{x}$
Σx
Δx

For explanations see overleaf

Type of operation $\overline{x}$

During this type of operation lines 1...6 are written into the accounting table (see example). No summation takes place.

Type of operation Σx

It is in this type of operation that summation takes place. Lines 1...7 are written in the accounting table. The following refers to the measuring range of the sum:

The final value of the selected channel measuring range multiplied with the time of the accounting interval (in h) produces the max. value of the sum (dimensional unit * h). This value can be illustrated in any display range taking into consideration the maximum displayable numerical value (= max. count) of 7.500E6 (7 500 000).

Example:

Measuring range	0...20 mA
Display range	0...300 m^3/h
Interval time	1 month = 24 · 31 = 744 h
End value Σx	20 · 744 h = 14 880 mAh

If the summation recording is switched on instead of an instantaneous value recording, the pointer deflection is reached at 14880 mAh 100 %.

Max. display Σx 744 · 300 = 223 200 m^3 = 2.232E5 m^3

Type of operation Δx

It is within this type of operation that summation takes place. Additionally an alarm value monitoring is possible. The set alarm value is used to monitor the absolute value of the sum total. As soon as the sum total reaches the alarm value, it is signalled for one second (contact output). At the same time the sum counter of the alarm value is set to 0. The alarm value cycle starts again. The alarm value can be reached several times during an interval:

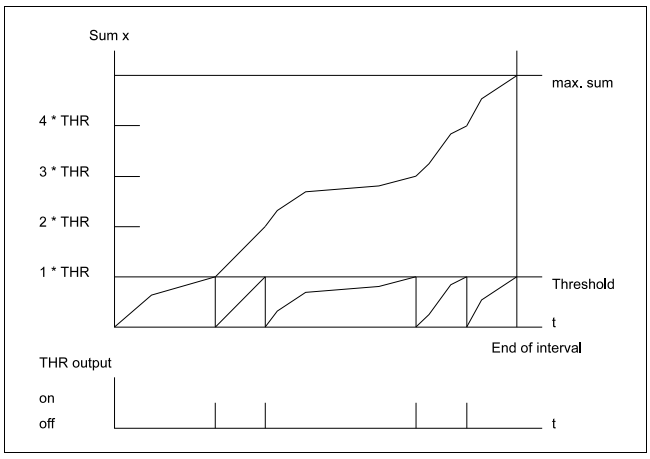


Fig. 6 Type of operation Δx

External interval control

The accounting interval can be controlled internally with the built-in real-time clock. Externally the interval is controlled via the contact of a binary input of the recorder. If the parameter value “off” is selected, the accounting function operates according to the preset interval.

Notice
An interval time must also be configured in case of external interval control.

Parameter
{Control inp. off}

Parameter value:
off
DI 1
DI 2
...
DI 14

Internal interval control

The parameter defines the duration for creating the total or average value.

Parameter
{Interval 1h}

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

Synchronized time for internal interval control

The parameter defines the orientation time for the internal interval control.

Parameter
{Sync. time 08:30}

Parameter value
00:00 .... 23:59

Synchronized day for internal interval control

The parameter supplies the monthly orientation time for the internal interval control.

Parameter
{Sync. day 25}

Parameter value
00....31

Comment line

The accounting text is added to the first line of the channel identification function during printout of the interval. One of the 10 freely configurable text lines can be used as a comment line in the accounting table.

Parameter
{Acc. text. 2}

Parameter value
00 none
01 Text line 1
02 Text line 2
: :
: :
10 Text line 10

Statistical alarm value

The parameter defines the sum total value at which a relay output is switched on for a duration of 1 s. The value can be preset in the range 1.0 to 7.5E6. The value input is made in the units of the display range multiplied by the time.

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

In order to input bigger figures, the exponential format is chossen as numeral format.

Example:
The figure 1 230 400 is displayed as

$1.23 * 10^{+6}$

Exponent
Mantissa

Parameter
{Max. val. 5.000 E 2}

Parameter value
0...7.500E6

Alarm output

The parameter defines the number of the relay output, which will be switched on for 1 s in case of any alarm value infringement.

Parameter
{Max. DO DO 2}

Parameter value
off
DO 1
DO 2
...
DO 24

Printer format

The parameter defines which lines are printed during printout of the accounting values.

Add the codes for the lines to be printed out and state as parameter value.

Prameter
{Print format 45}

Parameter values
01 Channel & comment line
02 Interval start / Interval end
04 Minimum during interval
08 Maximum during interval
10 Average value
20 Total value

Print total

The parameter determines if the accounting total should be imprinted on the chart, should the static alarm value is overshot.

Parameter
{Sum print on}

Parameter value
off
on

Display total

The parameter determines, if the total value should be displayed and recorded instead of the measured value.

Parameters
{Sum displ. on}

Parameter values
off
on

Alarm values

The parameters for monitoring 2 static alarm values are grouped together under one submenu.

The text lines assigned to the alarm values are printed out in the colour assigned to the measuring channel. The question if the text line should be supplemented with an alarm value input is defined in the system menu.

The text line assigned to the alarm value line is displayed in flashing mode in case of alarm value infringement (only the first 16 characters).

The hysteresis of the alarm value is permanently set to 2 %.

The following parameters can be called up in the submenu:

Key (LC)	Key (LED)	Display	Parameter
		{Thresholds }	
			State alarm value 1.
<↵>	<↵>	**{THR1 +4.000}**	Input of the display range in dimensional unit.
<▸>	<▲>	**{THR1 funct. min}**	Input of the alarm value function.
<▸>	<▲>	**{THR1 DO No. DO3}**	Assignment of the relay output.
<▸>	<▲>	**{THR1 text No. 0}**	Assignment of a text line.
			State alarm value 2.
<▸>	<▲>	**{THR2 +4.000}**	Input of the display range in dimensional unit.
<▸>	<▲>	**{THR2 funct. min}**	Input of the alarm value function.
<▸>	<▲>	**{THR2 DO No. DO3}**	Assignment of the relay output.
<▸>	<▲>	**{THR2 text No. 0}**	Assignment of a text line.

Statement of alarm value

The value is input in the display range of the dimensional unit.

Parameter
{THR1 +4.000}
{THR2 +6.000}

Parameter value
Lower to upper value of the display range

Function of the alarm value

The parameter defines the effective direction of the alarm value.

Parameter
{THR1 funct. min}
{THR2 funct. max}

Parameter value
min.
max.

Relay output of the alarm value

The parameter defines the assignment of the alarm value to an output relay.

Parameter
{THR1 DO No. DO3}
{THR2 DO No. DO5}

Parameter value
off
DO 1
DO 2
...
DO 24

Text lines for alarm values

The parameter defines the assignment of a text line to an alarm value. The text line is printed out in case of alarm value infringement.

If the parameter “Alarm value text output.” in the submenu “Print functions” (Main menu “System data”) is set to “on”, the numerical value of the alarm is added to the text (see section on “System data”).

If the parameter value “man” or “auto” is selected in the menu “Acknowl. alarm”, the text line will be displayed in flashing mode (only the first 16 digits).

No text is printed out for the parameter value 0.

Parameter
{THR1 text No. 0}
{THR2 text No. 1}

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

Print texts

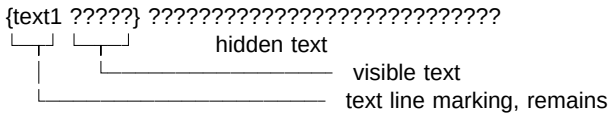
For text printouts user can define 10 different text lines with a maximum length of 32 characters. Characters not used at the end of a text line must be filled with blanks (20H). Each text line is supplemented with a time imprint.

Parameter

{Print texts ■}

<↵>, <↵>**{Text 1}**
<▸>, <▴> **{Text 2}**
: : :
<▸>, <▴> **{Text 10}**

Display structure:



permanently in the display

The entire text with a length of 32 characters can be pushed into the display with the help of the cursor.

Parameter value

With <▴> each character in the character set table can be adjusted.

Printer data

The text printout functions are defined in the main menus “Print intervals”, “Synchronized times” and “Assignment DI”.

The cyclical printout of the time to DIN for the speeds 20 mm/h, 60 mm/h and 120 mm/h is enabled on selecting the appropriate printer interval.

The format of the time imprint is: “_12:00”. The underline represents the reference line for time input.

The colour for the cyclical time print changes daily at 0:00 o’clock. After switching on the recorder, the time is imprinted with the colour defined in “Print colours”.

The cyclical imprint of time takes place only when the printer queue is empty. Otherwise printing be suppressed, since the printout time on paper no longer corresponds to the actual time.

If the current speed is set to ”0 mm/h“, the time imprint is suppressed.

At the disposal of user are a total of 10 text lines with a length of 32 characters. During printout and depending on the number of configured characters, these text lines can be extended with time or date und. If less than 24 characters of the text line are filled, the line will be supplemented with date and time.

Up to a length of 30 characters the text line can be extended by time. For bigger lengths time and date are left out.

Assignment of print colours

The colours for printing out texts and for the measured value are defined in this main menu item. Each text can be assigned one of the 6 colours. The parameters accept the values ”violet, red, black, green, blue, brown“. The default setting for the channel colours corresponds to the DIN sequence. The default setting for all other text elements is black.

Parameters

Key (LC)	Key (LED)	Display	Parameter
		{Print colours ■}	
<↵>	<↵>	**{Channel 1 violet}**	Colour of channel 1.
<▸>	<▲>	**{Channel 2 red}**	Colour of channel 2.
<▸>	<▲>	:	:
<▸>	<▲>	**{Channel 6 brown}**	Colour of channel 6.
<▸>	<▲>	**{Text 1 black}**	Colour of text line 1.
<▸>	<▲>	**{Text 2 black}**	Colour of text line 2.
<▸>	<▲>	:	:
<▸>	<▲>	**{Text 10 black}**	Colour of text line 10.
<▸>	<▲>	**{Meas.val. black}**	Colour of the measured value table.
<▸>	<▲>	**{Date/time black}**	Colour of date/time line.
<▸>	<▲>	**{Time black}**	Colour of the time imprint.

Parameter values

violet
red
black
green
blue
brown

Printer intervals

The print interval controller permits the cyclical printout of:

- text lines 1...10,
- measured values of the active channels,
- time and date and
- time.

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

Parameters

Key (LC)	Key (LED)	Display	Parameter
		{Print intervals ■}	
<↵>	<↵>	**{Text 1 10 min}**	Printout of text line 1.
<▸>	<▲>	**{Text 2 20 min}**	Printout of text line 2.
<▸>	<▲>	:	:
<▸>	<▲>	**{Text 10 6 h}**	Printout of text line 10.
<▸>	<▲>	**{Meas.val. 12 h}**	Printout of the measured values of active channels.
<▸>	<▲>	**{Date/time 24 h}**	Printout of date and time.
<▸>	<▲>	**{Time 20 min}**	Printout of time.

Parameter value

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

These values are configurable for each print function. Printing takes place cyclically at the preset intervals. These intervals are synchronized to the time stated in the main menu item ”Sync. times“ (Default setting 0:00 o’clock).

Synchronized times

The print interval (and with it the printout) can be synchronized to any specific time in this main menu item.

Parameter

Key (LC)	Key (LED)	Display	Parameter
		{Sync. times ■}	
<↵>	<↵>	**{Text 1 00:00}**	Printout of text line 1.
<▸>	<▲>	**{Text 2 00:00}**	Printout of text line 2
<▸>	<▲>	:	:
<▸>	<▲>	**{Text 10 00:00}**	Printout of text line 10.
<▸>	<▲>	**{Meas.val. 00:00}**	Printout of the measured values of active channels.
<▸>	<▲>	**{Date/time 00:00}**	Printout of date and time.
<▸>	<▲>	**{Time 00:00}**	Printout of time.

Parameter value

00:00 ..... 23:59

DI assignment

14 binary inputs in the recorder can be used for functions with external actuation. Assignment of functions to the binary inputs take place in this main menu. The respective function is actuated on switching on the input.

Parameters

Key (LC)	Key (LED)	Display	Parameter
		{DI assignment ■}	
<↵>	<↵>	**{Ev.marker 1 DI 2}**	Excite event marking 1.
<▸>	<▲>	**{Ev.marker 2 off}**	Excite event marking 2.
<▸>	<▲>	**{Ev.marker 3 off}**	Excite event marking 3.
<▸>	<▲>	**{Ev.marker 4 off}**	Excite event marking 4.
<▸>	<▲>	**{Text 1 DI 1}**	Excite text line 1.
<▸>	<▲>	**{Text 2 off}**	Excite text line 2.
<▸>	<▲>	:	:
<▸>	<▲>	**{Text 10 off}**	Excite text line 10.
<▸>	<▲>	**{Meas.val. DI 3}**	Excite measured value table.
<▸>	<▲>	**{Date/time DI 4}**	Excite date-time-lines.
<▸>	<▲>	**{Para. enable DI 1}**	Release parameter definition.
<▸>	<▲>	**{Sel. speed DI 3}**	Change over external speed.
<▸>	<▲>	**{Clock sync. DI 4}**	Synchronize the recorder clock to external master clock.
<▸>	<▲>	**{Queue empty DI 1}**	Empty printer queue.
<▸>	<▲>	**{Standby on DI 1}**	Activate standby.

Parameter values

off
DI 1
DI 2
...
DI 24

Notice

Upon activation of the standby operation, speed and printout are stopped. No texts are accepted in the printer queue. The display shows that the recorder is in the standby mode.

Service

The main menu item ”Service“ contains functions which are used for tests and adjustments.

Parameters

Key (LC)	Key (LED)	Display	Parameter
		{Service ■}	Tests and balances
<↵>	<↵>	**{Sim.type off}**	Output various test curves. The signals are treated like analog input signals.
<▸>	<▲>	**{Sim.period 0200}**	Test curve of the duration period in seconds.
<▸>	<▲>	**{Initialisation}**	Load the factory setting.
<▸>	<▲>	**{Display test}**	Output the test characters on the display.
<▸>	<▲>	**{Listing}**	Printout the device parameter definition.
<▸>	<▲>	**{Printhead ◂ 002F}**	Balance printer head 0 %.
<▸>	<▲>	**{Printhead ▸ 002F}**	Balance printer head 100 %.
	<▲>	**{Scale zero}**	Balance the scale 0 % (only for LED version)
<▸>	<▲>	**{Ref. temp.}**	Display of the internal reference junction temperature.
<▸>	<▲>	**{Pap. length 3200}**	Input paper length.

Simulation

During simulation test signals are generated in the recorder without having to connect a generator to the input terminals. These signals go through measured value processing and are output on displays and recording systems. Select the paper speed according to the adjusted time duration.

Parameters
{SIM. type off}

parameter values
off
Ramp
Sinus
Step (in 10 % steps)

Selecting the period duration

Parameter
{Sim. period 1300}

Parameter values
20...2000 s

Initialization

The factory setting is loaded in this menu item.

Parameter
{Initialisation}

Parameter value
Actuate key <↵>.

The factory setting is loaded into the RAM memory.

If on escaping the parameter definition the query ”Save data“ is anwered with <↵>, the parameter values of the factory setting will be stored in the EEPROM.

If on escaping the parameter definition the query ”Save data“ is answered with <▲> (LC) or <Esc> (LED), the parameter values of the factory setting will be rejected. The recorder then continues to operate with the existing valid parameter values.

Display test

The display test checks if all points of the dot-matrix display are available.

Parameter
{Display test}

Parameter values
<↵> the display test is started.
<↵> the display test is aborted.

Listing

The printout of all parameter values is triggered off with this parameter.

Notice
Printing can last up to an hour.

If the parameter value ”on“ is selected, and if on escaping parameter definition the query ”Save data“ is answered with <↵>, **{Cassette}** (only LC display version) will be displayed. After putting the chart unit into place, printout of the listing begins. The listing printout is aborted by pulling out the chart unit.

Parameter
{Listing off}

parameter value
off
on

Reference junction temperature display

The internal reference junction temperature is displayed in this parameter.

Parameter
{Ref.temp.displ.}

Parameter value
actuate <↵>.
{Temp: +35 °C}

Balancing the printer head

In the next two parameters the printer head is adjusted to pa-per 0 % and 100 %.

Parameter
{Printhead ◂ 002F}
{Printhead ▸ 03DF}

Paper-zero-setting (0 %) LED display version

1. Actuate key <↵>.

For checking purposes, the printer head is driven to the set zero point. A dotted line is printed out (5 dots, the line can be extended by pressing the two handle strips of the chart unit).

2. Zero point setting is correct:
   Escape the paper-zero setting with key <Esc>
   or
   Zero point setting not yet correct:
   Actuate key <↵>.

The printer head moves to approx. 3 % paper width.

3. Actuate key <◂>.

The printer head prints a dotted line and thereby moves to the left. As soon as the zero line is reached,

4. Actuate key <↵>.

(The printer head moves to the right after actuation of the key <▸>.)

The zero point setting adjustment is stored.

The end-of-paper adjustment (100 %) runs in similar manner.

Paper-zero-setting (0 %) LC display version

1. Actuate key <↵>.

{Cassette} is displayed.

2. Operate the chart unit.

For checking purposes, the printer is driven to the set zero point. A dotted line is printed (5 dots, the line can be extended by pressing on both handle strips of the chart unit).

3. Zero point setting is correct:
   Pull out the chart unit and escape the paper-zero setting with key <▴>
   or
   Zero point setting not yet correct:
   Pull out the chart unit and actuate key <↵>.

The printer head moves to approx. 3 % paper width.

4. Actuate key <→| >.

The printer head prints a dotted line and moves to the left while doing it. As soon as the zero line is reached,

5. pull out the chart unit and actuate key <↵>.

The zero point setting is stored.

The paper-end setting (100 %) takes place accordingly.

Balancing the scale zero (only for LED display version)

1. Actuate key <↵>.

For checking purposes, the printer head is directed to the zero point of the set scale.

2. Zero point setting is correct:
   Escape paper-zero setting with key <Esc>.

   or

   Zero point setting is not yet correct:
   Actuate <↵>.

The printer head (pointer) moves to approx. 3 % below the first scale line.

3. Actuate key <▸>.

The printer head (pointer) moves to the right. As soon as the start of scale is reached,

4. Actuate key <↵>.

(The printer head moves to the left after actuation of the key <◂>.)

The adjustment is stored.

Special measuring range configuration

If ”USER“ is selected, the recorder can be used to configure special measuring ranges. This involves a complicated process which should therefore be applied only in exceptional cases - when there is absolutely no possibility of configuring standard parameters.

Examples for it are:

1. Thermoelectrical voltage measurements for internal correction of elements not included in the list supplied on page 30.
2. Resistance measurement of teletransmitters.
3. Temperature measurement using the resistance thermometers Ni.., Pt.., Cu.. etc.

The following measurements can be conducted:

Type of measurement	Code
Voltage measurement < 500 mV	0
Curent measurement	8
Voltage measurement > 500 mV	16
Resistance measurement, 2-wire	32
Thermocouple measurement	64
Resistance measurement, 3-wire	160

Tab. 1

The required gain is calculated. The gain code is added to the type of measurement code.

The following gains can be selected:

Gain factor	Code
1	0
2	1
4	2
8	3
16	4
32	5

Tab. 2

The required gain depends on the type of measurement, which should be calculated from the following unequations:

Type	Range	Calculation	lower threshold
Voltage measuring ranges < 500 mV	$257 / U_{max} < G < 512 / U_{max}$	$G \leq 512 / U_{max}$	$257 \leq G \times U_{max}$
Curent 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, 2- and 3-wire	$1222 / R_{max} < G < 2442 / R_{max}$	$G \leq 2442 / R_{max}$	$1222 \leq G \times R_{max}$
Thermocouple measurement	$257 / U_{max} < G < 512 / U_{max}$	$G \leq 512 / U_{max}$	$257 \leq G \times U_{max}$

Tab. 3 G = Gain
I_{max} = $|I_{max}|$ = biggest absolute value; I in mA
R_{max} = $|R_{max}|$ = biggest absolute value; R in Ω
U_{max} = $|U_{max}|$ = biggest absolute value; U in mV

The value obtained by calculating the gain factor should be rounded off to the next smaller value on Table 2.
The value obtained by calculating the gain factor may not violate the lower threshold value.

Add the code figures calculated from Table 1 and Table 2 together.

Input the total code figures into the parameter ADC-control (**A**nalog **D**igital **C**onverter) as parameter value.

Parameter
{ADC control 0000}

Parameter value
0...165

Thermoelectric voltage measurement with internal reference junction (constant 1)

Constant K1 is required to enable operation with the recorder's internal reference junction correction feature when dealing with thermocouples not included in the parameter "Type" (see page 16).

The value of constant K1 is calculated as follows: The trend of the thermocouple should be approximated linearly at 0...70 °C. The zero point is permanent. Input the pitch of the straight line in µV / 10 K as parameter value in the parameter "Const. 1".

Parameter
{Const. 1 1234}

parameter value
0000 without correction
0001....9999

Constant K2

Constant K2 is required during resistance and thermoelectrical measurements.

Resistance measurement:

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

Thermoelectrical voltage measurement:

input | U_{max} | [µV]

Parameter
{Const. 2 1234}

Parameter value
0000...9999

Calibration of the measuring range

Connect a current, voltage or resistance transmitter to the appropriate channel terminal for which a special measuring range is to be created. The transmitter should be in the Class 0.1 category or better.

Calibration of the measuring range initial value

Set the measured value for the measuring range initial value on the primary element.

On the recorder adjust:

Parameter
{Chan.low.val. 0000}

Parameter value
<◂┘ > actuate key. The initial value is measured.

Reactuating the key <◂┘ > causes the initial value to be stored on the EEPROM of the channel card.

Calibration des measuring range final value

Set the measured value for the measuring range final value on the transmitter.
On the recorder adjust as follows:

Parameter:
{Chan.upp.val. FFFF}

Parameter value:
Actuate key <◂┘ >. The final value is measured.

Reactuating the key <◂┘ > causes the final value to be stored on the EEPROM of the channel card.

In the submenu "Ranges" the parameter "Measuring range ↓" is set to 0 % and the parameter "Measuring range ↑" is set to 100 %. The calibrated measuring range can be handled like a standard range. This means that start of measurement can be selected in the parameter "Measuring range ↓" between 0...80 % (in relation to the calibrated measuring range). End of measurement can be selected in the parameter "Measuring range ↑" between 20...100 % (in relation to the calibrated measuring range).

Further parameter definitions can be conducted in the same manner as for standard measuring ranges.

Examples of special measuring ranges

Current measurement

Required measuring range	−1..+1 mA		Checking the lower threshold value
Selected type of measurement from Tab. 1	Code	8	$11 \leq G \times I_{max}$ $11 \leq 16 \times 1$
$\lvert I_{max} \rvert = 1$ mA			The required range can be achieved. The parameter value ”0012“ can be input into the parameter ”ADC control“. Calibration should be conducted according to the method already described.
$G \leq 20 / I_{max}$			
$G \leq 20 / 1 = 20$			
Selected gain from Tab. 2	16 amounts to code	4	
Total number of codes		12	

Voltage measurement

Required range	−3...+11 V		Checking the lower threshold value
Selected type of measurement from Tab. 1	Code	16	$10345 \leq G \times U_{max}$ $10345 \leq 1 \times 11\,000$
$\lvert U_{max} \rvert = 11$ V			The required range can be achieved.
$G \leq 20689 / U_{max}$			
$G \leq 20689 / 11\,000 = 1{,}88$			
Selected gain from Tab. 2	1 amounts to code	0	
Total number of codes		12	

Voltage measurement

Required range	−123...+46 mV		Check the lower threshold value
Selected type of measurement from Tab. 1	Code	0	$257 \leq G \times U_{max}$ $257 \leq 4 \times 123 = 492$
$\lvert U_{max} \rvert = 123$ mV			The required range can be achieved.
$G \leq 512 / U_{max}$			
$G \leq 512 / 123 = 4.16$			
Selected gain from Tab. 2	4 amounts to code	2	
Total number of codes		2	

Resistance measurement, 3-wire circuits

Required range	10...1000 Ω		Check the lower threshold value
Selected type of measurement from Tab. 1	Code	160	$1222 \leq G \times R_{max}$ $1222 \leq 2 \times 1000 = 2000$
$\lvert R_{max} \rvert = 1000\ \Omega$			The required range can be achieved.
$G \leq 2442 / R_{max}$			
$G \leq 2442 / 1000 = 2{,}442$			**Calculate constant K 2**
Selected gain from Tab. 2	2 amounts to code	1	K 2 = (1000 - 10) x 10 = 9900
Total codes		161	

Thermoelectric voltage measurement

Required range	0...200 °C Pallaplat with internal reference junction correction mV range 0...6.50 mV		Check the lower threshold value $257 \leq G \times U_{max}$ $257 \leq 32 \times 6.5 = 208!$ The required range **cannot** be achieved. Select a new measuring range: 0...250 °C. The mV range is 0...8.54 mV.
Selected type of measurement from Tab. 1	Code	64	
$\lvert U_{max} \rvert = 6.5$ mV			$G \leq 512 / 8.54 = 60$
$G \leq 512 / U_{max}$			Check the lower threshold value
$G \leq 512 / 6.5 = 78.8$			$257 \leq G \times U_{max}$ $257 \leq 32 \times 8.54 = 273{,}28$
Selected gain from Tab. 2	32 amounts to code	5	The new range can be achieved with the gain factor 32.
Total of codes		69	
			Calculate the constant K 1
			The µV volume 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
			Calculate constant K 2
			K 2 = $\lvert U_{max} \rvert$ [µV] = 8540 µV

Error messages

Self-test-error messages

The following error messages are displayed.

Display	Error classification
F: CPU	Error on CPU card.
F: RAM internal	Error in internal RAM of µC.
F: RAM external	Error in external RAM.
F: Clock module	No reply from time module
F: Time exceeded	Time overshot in the measured value recorder
F: Chks.EEPROM	Checksum of parameter data incorrect.
F: Read EEPROM	CPU card does not react to read command.
F: Write EEPROM	CPU card cannot be overwritten.
F: Chks.calibr.	Checksum of the calibration data incorrect.
F: Read EEPROM	EEPROM on channel card does not react to read command
F: Writer EEPROM	EEPROM on channel card cannot be overwritten
F: Watchdog	Watchdog initializes a device reset.
F: Buffer full	Printer queue is full.
F: Print head	Printer head does not move.
F: CPU clock	Voltage interruption for clock module discovered
F: Speed Print	Paper speed too high for text printout.
F: Time	Clock module has lost time.
F: IO conv.comm.	Interface error to I/O converter.
F: Chks. F-RAM	Checksum of F-RAM faulty.
F: Read F-RAM	F-RAM does not react to read command.
F: Write F-RAM	F-RAM cannot be overwritten.
F: CJC	Error in the reference junction correction unit.

Parameter definition messages

The following error messages are displayed.

Display	Error classification
Password wrong	The stated password does not correspond to the configured password, therefore no access to parameter definition.
Value < xxxx	The stated value is smaller than the minimum value.
Value > xxxx	The stated value is bigger than the maximum value.
Span <20 %	The configured measuring range is smaller than 20 % of the rated measuring range.
Wrong input	The stated value is not permitted (for date / time).
Key disabled	The displayed parameter cannot (for password 9999) be changed.
No access	No access to parameter definition (inhibited via DI).

Character set table

Character	Code [dec]	[Hexdec]
²	01	01
³	02	02
‰	03	03
↑	04	04
↓	05	05
▲	06	06
¹⁰	07	07
	32	20
!	33	21
"	34	22
#	35	23
$	36	24
%	37	25
&	38	26
’	39	27
(	40	28
)	41	29
*	42	2A
+	43	2B
,	44	2C
-	45	2D
.	46	2E
/	47	2F
0	48	30
1	49	31
2	50	32
3	51	33
4	52	34
5	53	35
6	54	36
7	55	37
8	56	38
9	57	39
:	58	3A
;	59	3B
<	60	3C
=	61	3D
>	62	3E
?	63	3F
@	64	40

Character	Code [dec]	[Hexdec]
A	65	41
B	66	42
C	67	43
D	68	44
E	69	45
F	70	46
G	71	47
H	72	48
I	73	49
J	74	4A
K	75	4B
L	76	4C
M	77	4D
N	78	4E
O	79	4F
P	80	50
Q	81	51
R	82	52
S	83	53
T	84	54
U	85	55
V	86	56
W	87	57
X	88	58
Y	89	59
Z	90	5A
[	91	5B
\	92	5C
]	93	5D
^	94	5E
_	95	5F
‘	96	60
a	97	61
b	98	62
c	99	63
d	100	64
e	101	65
f	102	66
g	103	67
h	104	68
i	105	69

Character	Code [dec]	[Hexdec]
j	106	6A
k	107	6B
l	108	6C
m	109	6D
n	110	6E
o	111	6F
p	112	70
q	113	71
r	114	72
s	115	73
t	116	74
u	117	75
v	118	76
w	119	77
x	120	78
y	121	79
z	122	7A
{	123	7B
|	124	7C
}	125	7D
→	126	7E
←	127	7F
~	222	DE
°	223	DF
α	224	E0

Character	Code [dec]	[Hexdec]
ä	225	E1
β	226	E2
ε	227	E3
µ	228	E4
σ	229	E5
ς	230	E6
g with Unterl.	231	E7
√	232	E8
⁻¹	233	E9
j	234	EA
▌	235	EB
ϕ	236	EC
£	237	ED
ñ	238	EE
ö	239	EF
p	240	F0
q	241	F1
Θ	242	F2
∞	243	F3
Ω	244	F4
ü	245	F5
Σ	246	F6
π	247	F7
$\overline{X}$	248	F8

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