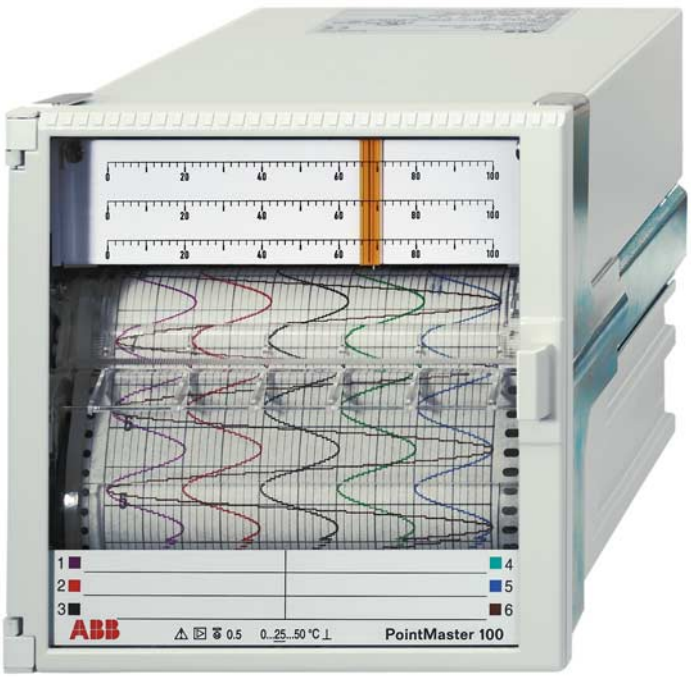
PointMaster 100

6-channel multipoint recorder

Operating manual

42/41-26 EN

Rev. 1.0



ABB

Contents

Remarks on display

<Key> describes the keys
{Display} text in the display

The statement “right”, “left” or “up”, “down” − if not stated otherwise - should be understood to mean when viewed from the front.

Important Instructions for your Safety! 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 DIN EN 61010-1„Safety requirements for electronic, process measuring 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 „Attention“ 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 Operating Manual should prove to be insufficient in any point, the Service Department will be delighted to give you more information.

Short description

The recorder is a micro-controlled multipoint recorder.

The recorder records process signals of 0/4...20 mA and 0...1 V. Further current and voltage signals can be measured with the help of plug-on shunts or voltage dividers.

The measuring channels are electrically isolated from each other and ungrounded.

The recorder or its software is matched to the task with the keys of the display and operating unit of a PC and a parameter-definition program (via RS-485 interface).

Alarm contact outputs, external chart speed changeover and the standby function are available as options. The number of contact outputs can be extended with an I/O converter connected to the laterale interface of the recorder.

Installation and commissioning

Scope of supply and delivery

Supplied together with the recorder are:
- 1 Operating Manual
- 2 fasteners *2*
- 1 ink head *1*
- 1 packet of folded paper *5* or 1 roll chart *1*
- Depending on the order the corresponding quantity of screw-on terminals *3* and ruler(s).

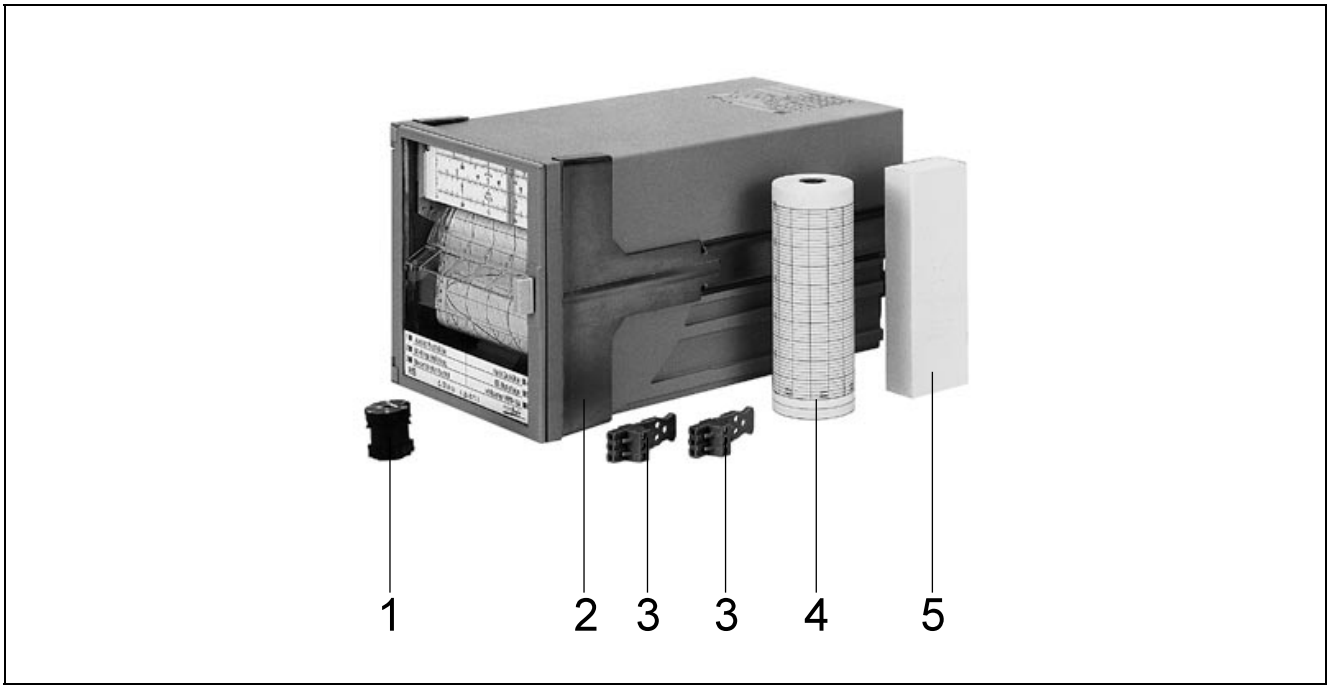


Fig. 1 Scope of supply
R-18755
1 Ink head
2 Fasteners
3 Screw-on terminals
4 Roll chart
5 Folded paper

1. Selecting the installation site

Mounting orientation
Lateral inclination −30°...0...+30°
Inclination to the back 20°, to the front 20°

Ambient temperature
0...50 °C

Relative humidity
≤ 75 % annual average,
max. 85 %
avoid condensation!

2. Mounting

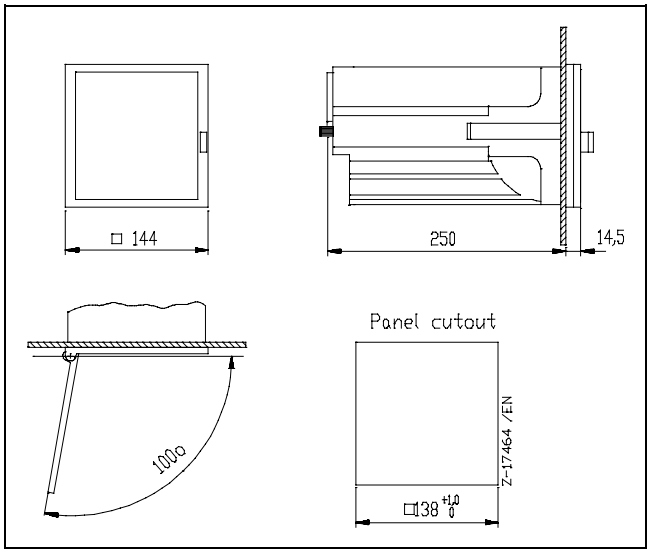


Fig. 2 Dimensional diagram (in mm)
Z-17464

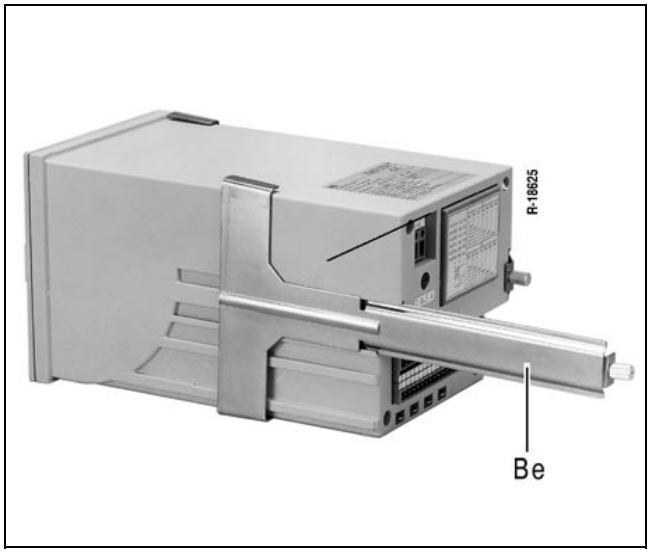


Fig. 3 Inserting fastener
R-18625 *Be* Fastener

Installation in panels

1. Insert unit into panel from the front.
2. Insert fasteners *Be* into the grooves on the lateral side of unit (see Fig. 3).

   Notice
   The fasteners *Be* are suitable for close-density mounting in horizontal or vertical position.
3. In perpendicular position, evenly and firmly tighten fasteners *Be*.

Installation in mosaic panel grid

1. Fix 4 centering brackets (Suppl. No. 92204-4-0457301) onto the mosaic panel grid.
2. Insert fasteners *Be* into the grooves on the lateral side of unit (see Fig. 3).
3. In perpendicular position, evenly and firmly tighten fasteners *Be*.

3. Connection

⚠ Attention

Before all other connections are made, the protective ground terminal must be connected to a protective conductor.

The apparatus can be dangerous if the protective conductor is interrupted inside or outside the apparatus or if the protective ground terminal is disconnected.

The apparatus may only be operated when fully installed.

Provide an on/off switch within reach powerful enough to disconnect the apparatus completely from the power supply. This should not nullify the protective function of the grounding conductor.

The rated input current of the overcurrent protective device may not exceed 16 A on the installation side.

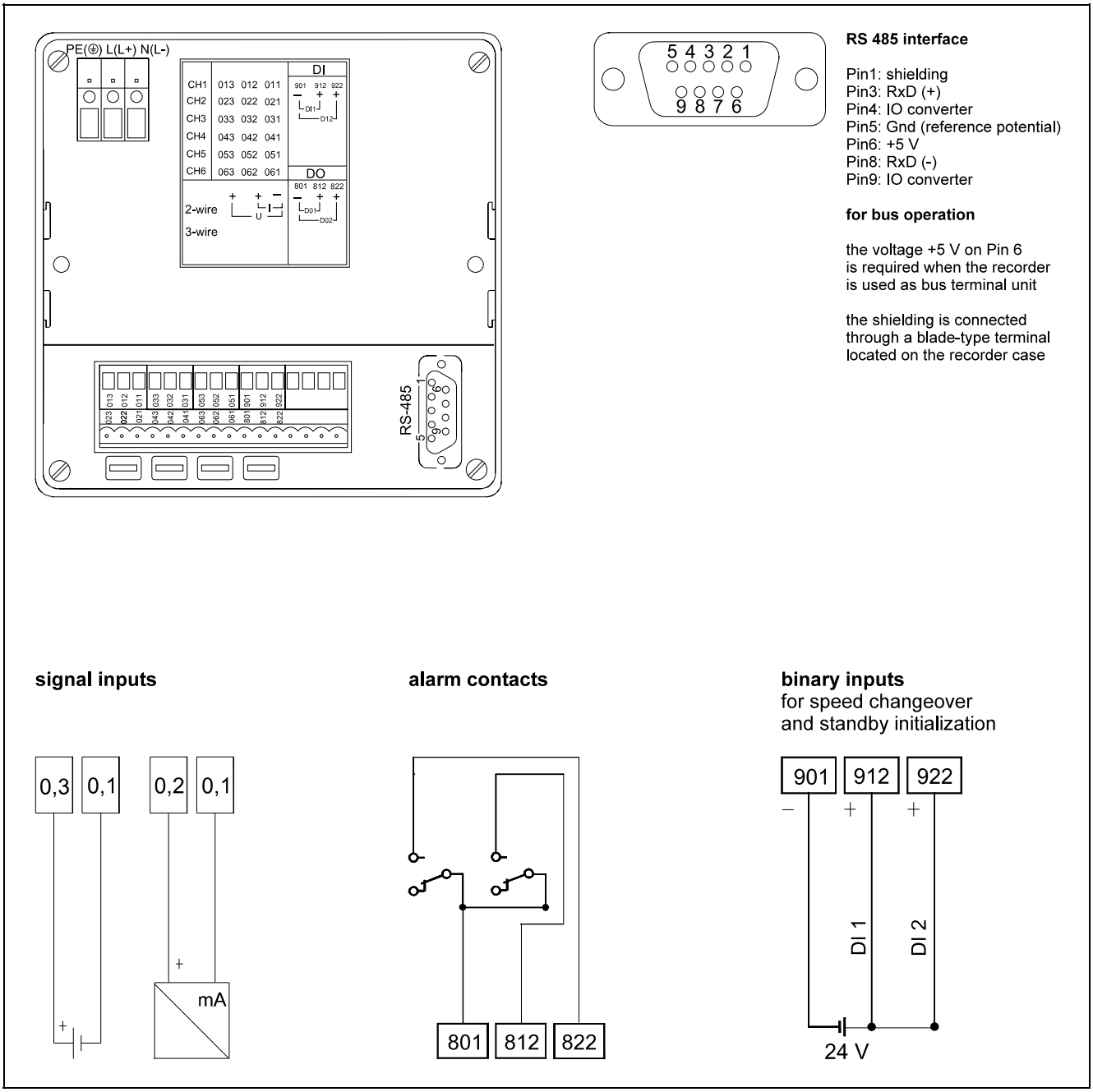


Fig. 4 Rear panel and terminal diagrams
Z-18064a, Z-16529, Z-16784a, Z-18065a, Z-18066a

Connecting the measuring signals
(see Figs. 4 and 5)

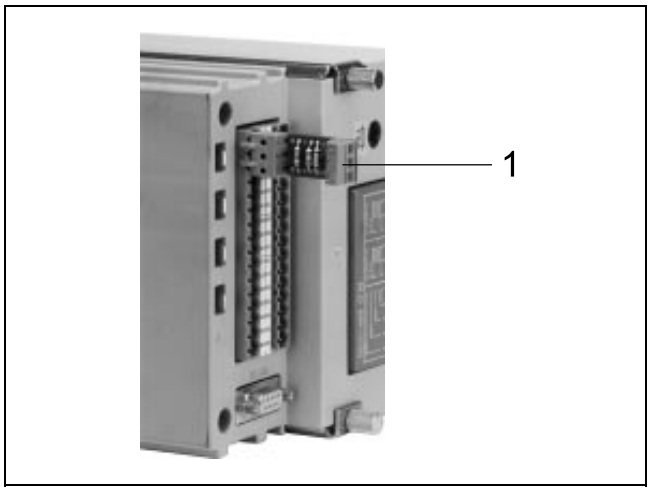


Fig. 5 Connecting measuring signals via an adapter
Z-18671 *1* Adapter

Measuring range:
0...20 mA, 4...20 mA
0...1 V

- Fix the signal leads with max. cross-section of 2 x 1 mm^2 into the screw terminals

Measuring ranges:
0...0.5 / 2,5 / 5 / 100 / 500 mA
0...5 / 25 / 50 V

These measuring ranges are achieved using an adapter (shunt, voltage divider).

- Fix the signal leads with a max. cross-section of 2 x 1 mm^2 into the adapter and insert the adapter onto the corresponding channel (see Fig. 5).

Connecting the power supply

- Fix the power supply lines with a max. cross-section of 1 x 4 mm^2 or 2 x 1.5 mm^2 into the screw terminals. The cross-section of the protective conductor must at least correspond to the cross-section of the mains supply line.

4. Inserting recording paper

Chart unit for roll chart

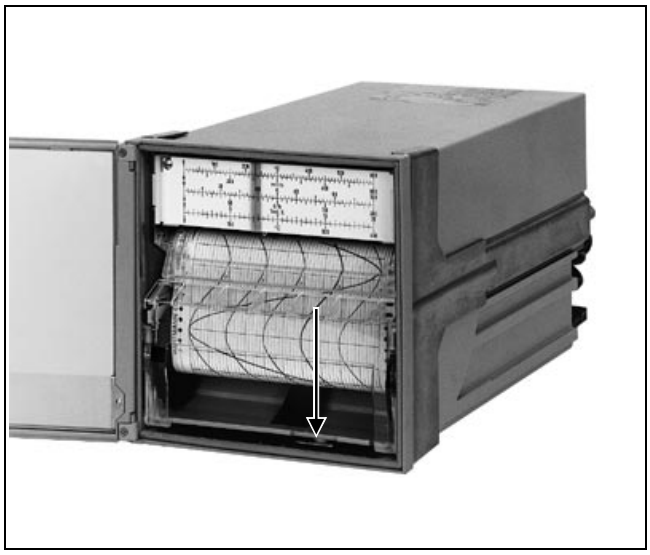


Fig. 6 Unlock the chart unit
Z-18756

1. Unlock the chart unit: push the pull-to-unlock lever downwards (see Fig. 6). The chart unit swings forward and can then be pulled out.

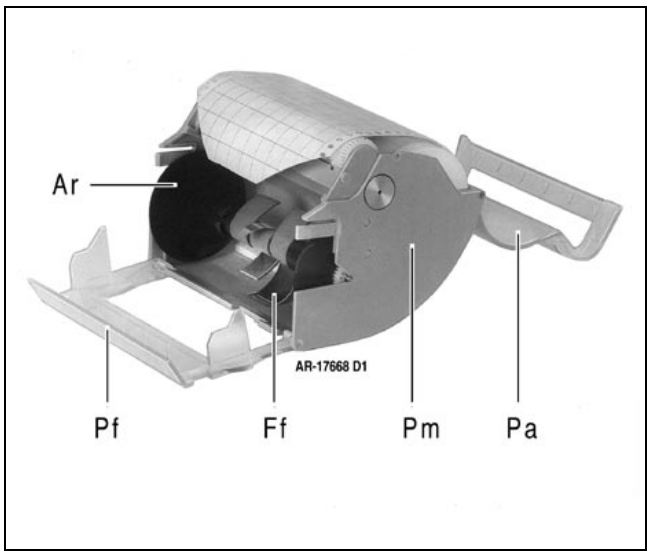


Fig. 7 Chart unit for roll chart
R-17668
Ar Take-up reel
Ff Guiding spring
Pa Paper contact valve
Pf Paper guidance flap
Pm Paper supply recess

2. Swing open the paper contact valve *Pa*.
3. Insert the roll chart into the paper supply recess *Pm*.
4. Pull paper up to the spiked roller and insert spikes into perforation. Ensure insertions on both sides are equal!
5. Close the paper contact valve *Pa*.
6. Open the paper guidance flap *Pf*.
7. Insert the take-up reel *Ar*.
8. Close the paper guidance flap *Pf*.

Notice
After inserting the chart unit into the apparatus, the paper is automatically wound onto the take-up reel.

9. Swing back the chart unit into the chassis until it snaps in.

Chart unit for folded paper

(see Figs. 6, 7 und 8)

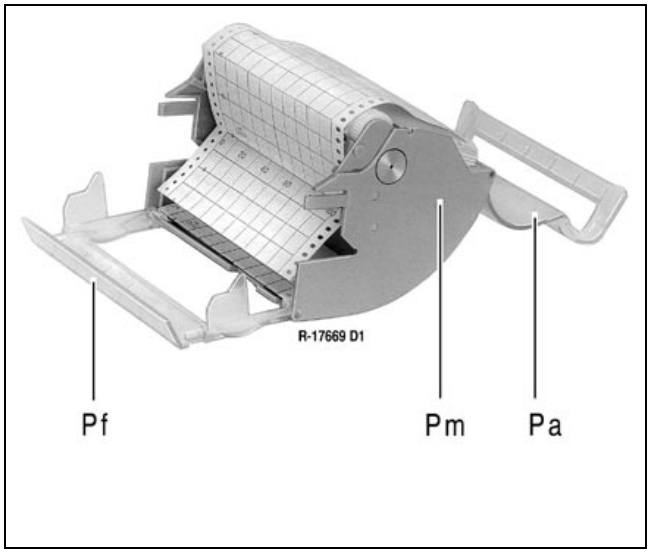


Fig. 8 Chart unit for folded paper
R-17669
Pa Paper contact valve
Pf Paper guiding valve
Pm Paper supply recess

When changing over the chart unit from roll chart to folded chart, remove guiding spring *Ff* and the take-up reel *Ar* (see Fig. 7).

1. Unlock the chart unit: press the pull-to-unlock lever downwards (see Fig. 6). The chart unit swings to the front.
2. Remove the chart unit.
3. Open the paper contact valve *Pa*.
4. Insert the folded packet into the paper supply recess *Pm*.
5. Pull paper up to the spiked roller and insert spikes into perforation. Two folded layers must be on the floor of the tray. Ensure insertions on both sides are equal!
6. Shut the paper contact valve *Pa*.
7. Swing open the paper guiding valve *Pf*.
8. Move paper so far to the front by turning it on the sprocket wheel in such manner that 2 folded layers are in the stray.
9. Shut the paper guiding valve *Pf*.
10. Swing the chart unit into the chassis until it snaps in.

5. Exchanging the ink head

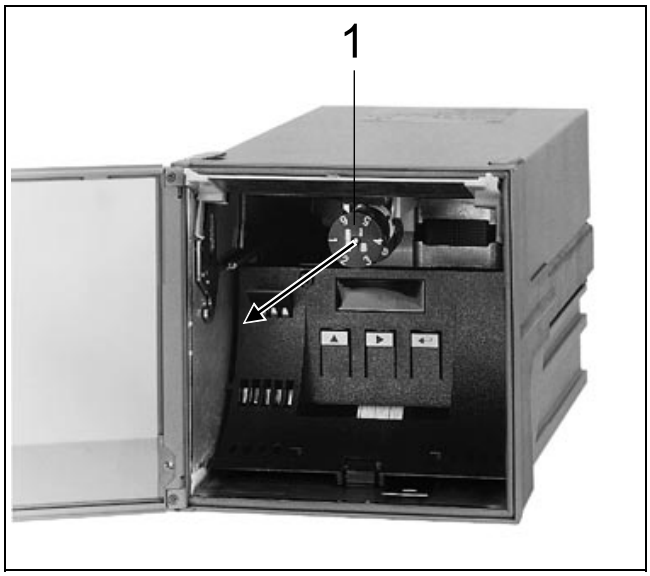


Fig. 9 Exchanging the ink head *1*
Z-18757

1. Unlock the chart unit: Push the pull-to-unlock lever downwards (see Fig. 6). The chart unit swings forwards.
2. Pull out the chart unit.
3. Press key <▲>.

The ink head moves into the parking position.

4. Swing the pointer upwards.
5. Open the scale.
6. Insert ink head *1* as shown in Fig. 9.
8. Close the scale.
9. Swing the pointer down.
10. Swing back the chart unit into chassis until it snaps in.

6. Switching on the apparatus

⚠ Attention

Before switching on the apparatus make sure that its operating voltage (see the rating plate) is set to the voltage of the power supply.

Provide an on/off switch within reach powerful enough to disconnect the apparatus completely from the power supply. This should not nullify the protective function of the grounding conductor.

7. Positioning the recording paper

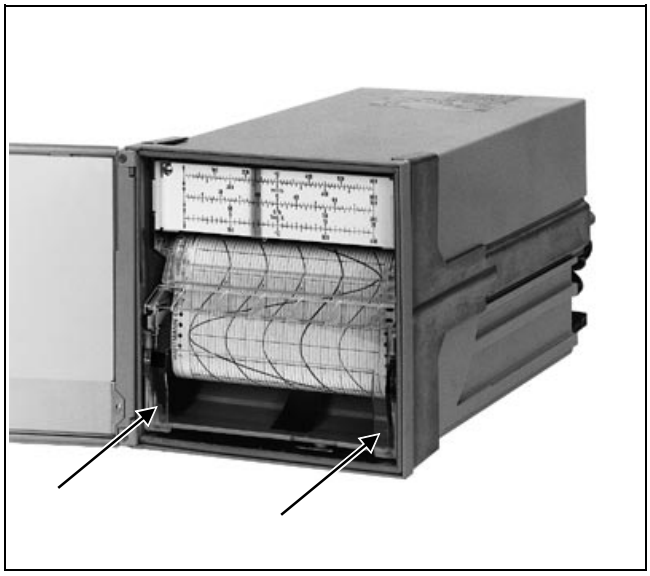


Fig. 10 Positioning the recording paper
Z-18756

The print head records at a 11.5 mm margin from the leading edge of the paper contact valve.

1. Press the lower recorder handle strips to the back. The chart paper is transported in accelerated fashion in the run direction.
2. Release the handle strips, when the required time base agrees to the leading edge.

Operation

Removing the chart paper

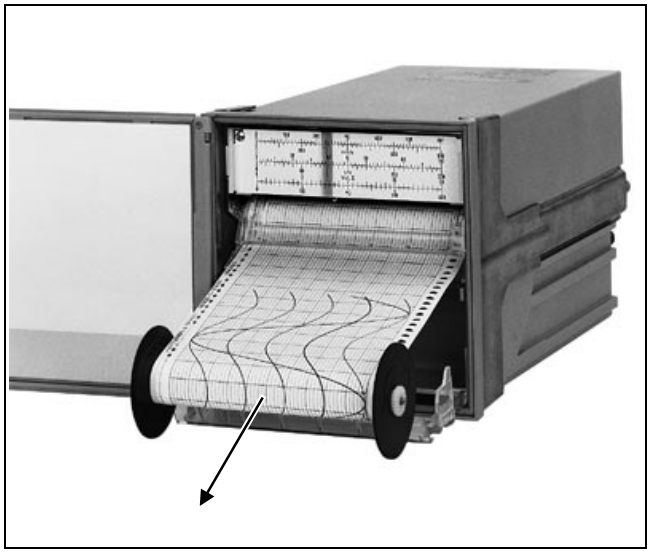


Fig. 11 Removing the chart paper
Z-18758

The chart unit can remain in the unit when removing the chart paper.

Chart unit for roll chart

1. Swing down the paper guiding valve.
2. Remove the take-up roll.
3. Eventually tear off paper at the tear-off edge.

Chart unit for folded paper

1. Press down the paper guiding valve.
2. Remove the recording paper.
3. Eventually tear off paper at the folding point.

Notice
Two folded layers of paper must be in the tray.

Removing chart paper from the take-up reel

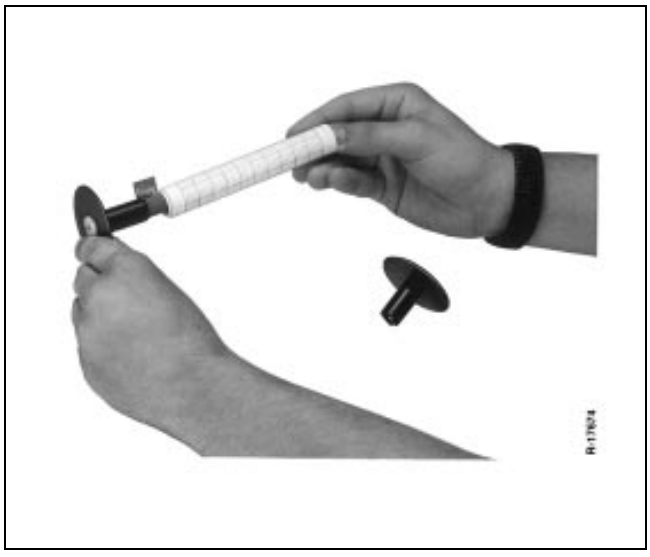


Fig. 12 Removing chart paper from the take-up reel
R-17674

1. Turn flange without pinion drive by 45° and remove from the take-up reel.
2. Grip paper as shown in Fig. 12 and remove from the axle.
3. Replace the right flange on the take-up reel and secure by turning it 45°.
4. Insert take-up reel into chart unit. The driving pinion must be on the right side.
5. Shut the paper guiding valve.

Changing over the paper speed

If the recorder is designed with the option “Alarm value monitoring and binary inputs”, it can be externally switched between chart speed 1 and chart speed 2. The required values for chart speed 1 and chart speed 2 are selected in the parameter-definition mode.

Chart speed 1 is active after switching on the recorder. By applying a voltage of 24 V DC between terminals 901 (−) and 922 (+) chart speed 2 becomes active.

Standby function

If the recorder is desinged with the option “Alarm value monitoring and binary inputs”, it can be switched to the standby mode. To switch to the standby function, apply a voltage of 24 V DC between terminals 901 (−) and 912 (+).

Two types of parameter definition modes can be selected as type of operation:

- the standby is switched active/inactive via the binary input. The measured value processing mode is active.
- The standby is activated via the binary input. The measured value processing mode is active during standby. The standby is cancelled by alarm value infringements. The recorder takes over the recording function.

Measured value display

The tag number on the ink head shows the channel with a through connection to the measuring element. During the measuring point connection period, the measuring element follows the measured value. Recording only takes place if the equidistant precondition is met.

For appropriate scale division, the channel with a through connection is assigned to the scale start by means of colour identification.

A selected tag is continuously displayed when undertaking the followng steps:

1. Pull out the chart unit
2. Press <▸>. Lock function (= tag selection) is switched to active.
3. <▴> and select required channel.
4. Press <↵>. The selected channel is displayed and recorded.

Notice
In case of active lock function, all active channels for which alarm values are parametered are monitored for alarm value infringements.

Ending the lock function

1. Press <▸> key.

The recorder returns to cyclical operation.

Parameter definition

The recorder is defined with the keys of the display and operating unit or with the help of a PC via the RS 485 interface. A parameter-defintion program is provided for defining the recorder by way of the interface.

A maximum display is depicted. The number of parameters presented by recorder for modification depends on the version selected.

The recorder recognises its hardware.

Key inputs are identified with “< >”, displays with “{ }”.

Contents

Operator keys and display

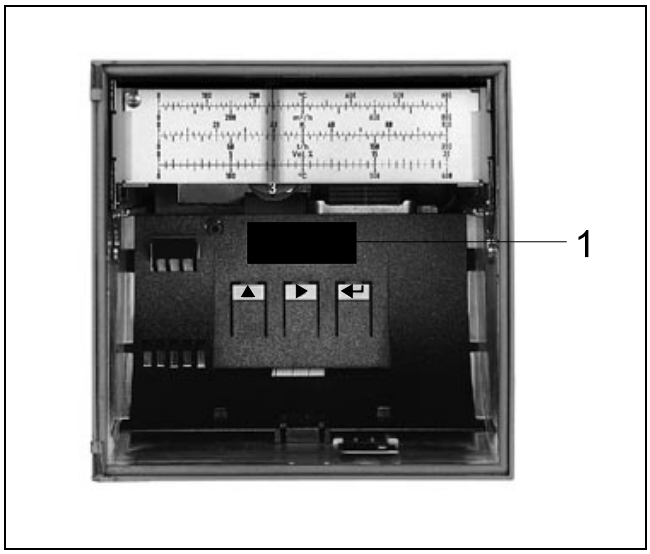


Fig. 13 Operator keys and display *1*
Z-18759/2

The three operator keys and the 5-digit LED display *1* (for parameter and parameter values) are located behind the chart unit.

To define parameters, remove the chart unit: Press the unlocking lever down (see Fig. 6). The chart unit swings forward and can be pulled out.

The three keys have the following functions

<▲> Scroll up key
selects the next numeral if set to numerical values or jumps back to the main menu.

<▸> Scroll-right key
selects the next main menu item, the next parameter, the next parameter value, the next digital position.

<↵> Enter key
responds to parameters or parameter valaues or quits them.

Sequence

Starting the parameter definition

After removing the chart unit, error messages are displayed, if avaialble.

1. Acknowledge existing error messages:
   <↵>, <↵>, ...

If no error message exists, the software version of the recorder is displayed.

2. Call up the parameter-definition mode:
   <↵>

Notice
The alarm monitoring function remains unchanged.

If no password was allocated (password = 0000), or if jumper BR 1 exists on the CPU card, (see Fig. 23), no password shall be required, the parameter definition is enabled.

If no password was allocated (Password not 0000), or if jumper BR 1 does not exist on the CPU card (see Fig. 23), the password shall be requested: **{PASS ?}**, **{0000 ?}** (the last position flashes).

3. State the password:
   Select the respective positions with <▸>, select the figure for this with <▲>, state the password with <↵>.

If the password is wrong, the signal **{E9000}** will flash on the display. Being an error signal, this must be acknowleged with <↵>. The recorder returns to the operation mode.

If “9999” is stated as password, the parameter-defintion of the unit can be viewed but not altered. The main menu item **{SP. FnC}** and the password are not displayed.

After correctly stating the password, (or when there is no password allocation), the main menu item **{SYS}** is displayed.

The principle of parameter-definition

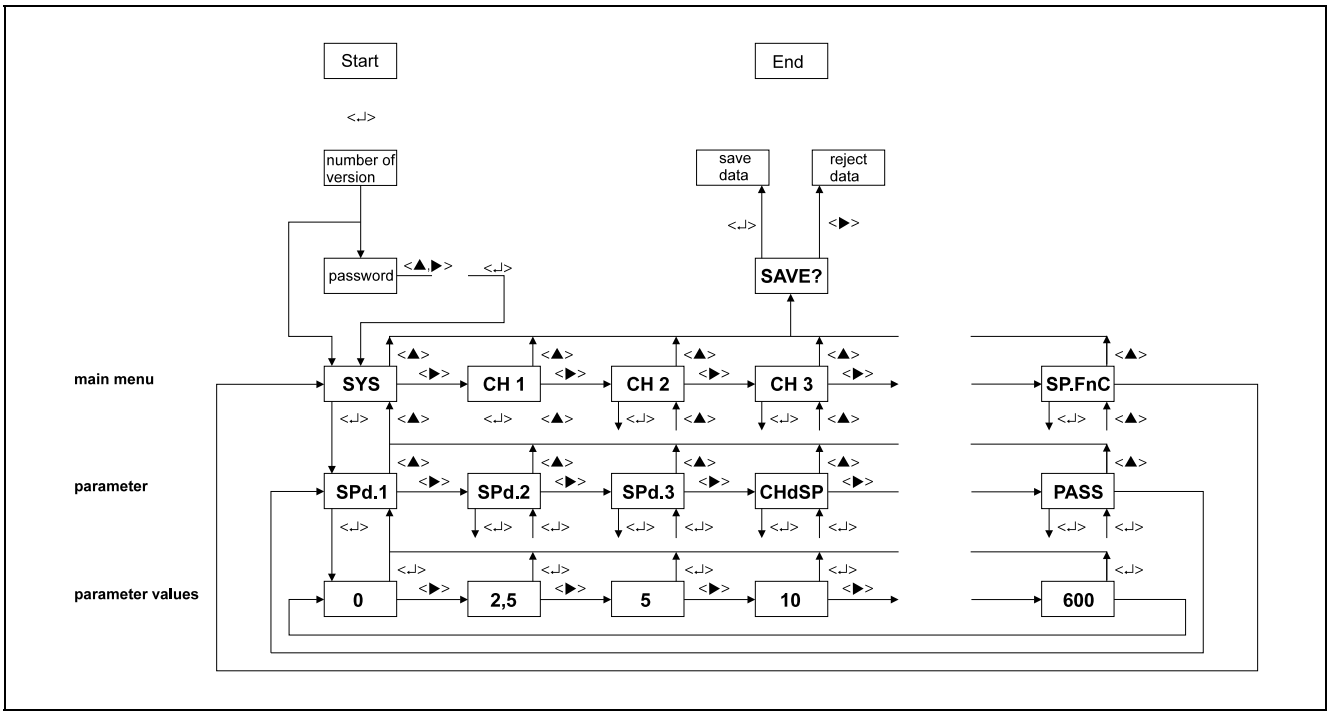


Fig. 14 The principle of parameter definition
Z-18811

Main menu

The following main menu items are displayed after each other with <▸>:

{SYS}	Drive and display parameters
{CH 1}	Parameter of channel 1
{CH 2}	Parameter of channel 2
{CH 3}	Parameter of channel 3
{CH 4}	Parameter of channel 4
{CH 5}	Parameter of channel 5
{CH 6}	Parameter of channel 6
{SP.FNC}	Tests and balancing
{SYS}	

Selecting parameters

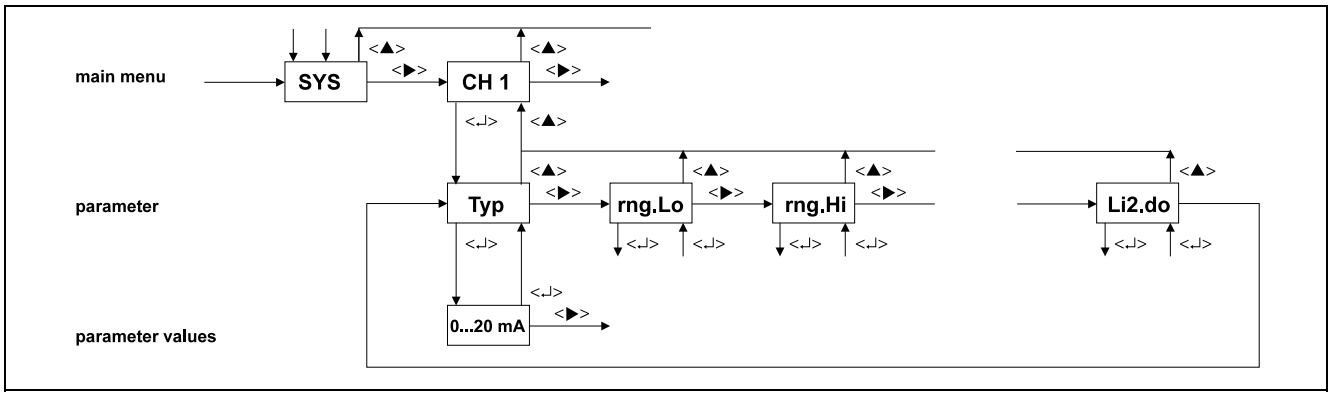


Fig. 15 Select parameters
Z-18812

- Acknowledge the selected main menu item with <↵>, the first parameter of this main menu item is displayed.
- Display the parameter of the main menu item consecutively with <▸>.
- Return to the main menu item with <▴>.

Fixing the parameter value

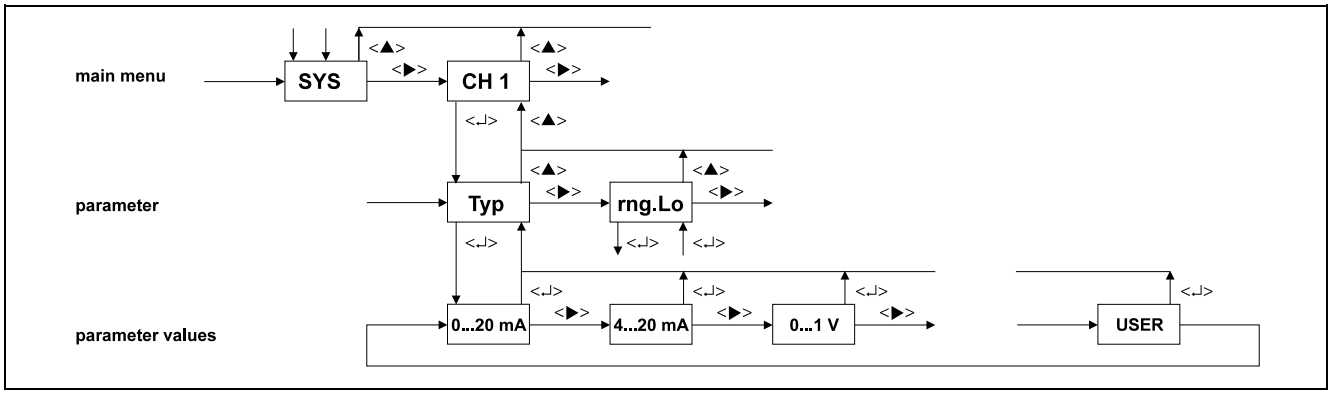


Fig. 16 Fix the parameter value
Z-18813

- Acknowledge the selected parameter with <↵>, the preselected parameter value of the acknowledged parameter flashes.

There are 2 types of parameter value definitions:

- the **selection** of a value from n predefined values.
  For example: selection of a chart speed from 0 / 2.5 / 5 / 20 / ... mm/h).
- The **input** of any values within a lower and an upper barrier.
  For example: input of the lower- and upper-end values of the measuring range

Select parameter

- Consecutively display the parameter values of the selected parameter with <▸>.
- Acknowledge the selected parameter with <↵>, the parameter is displayed.

Input parameters

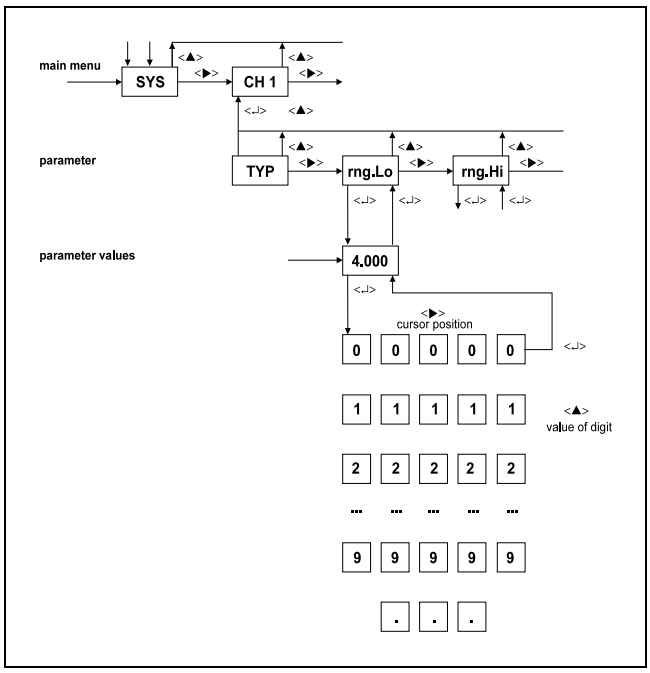


Fig. 17 Input parameters
Z-18814

- Consecutively select the character positions 1...5 of the parameter value with <▸>, the selected position flashes.
- From the characters select one with <▲>
  0 / 1 / 2 / 3 / 4 / 5 / 6 / 7 / 8 / 9 / . (“.” = decimal place).
- Acknowledge the created 4-digit figure with <↵> (with sign), the parameter is displayed.
- Return to the main menu item with <▲>.

The character “.” is only offered on stating real figures. This character is not presented, if integers are input (e.g. password).

Terminate parameter-definition

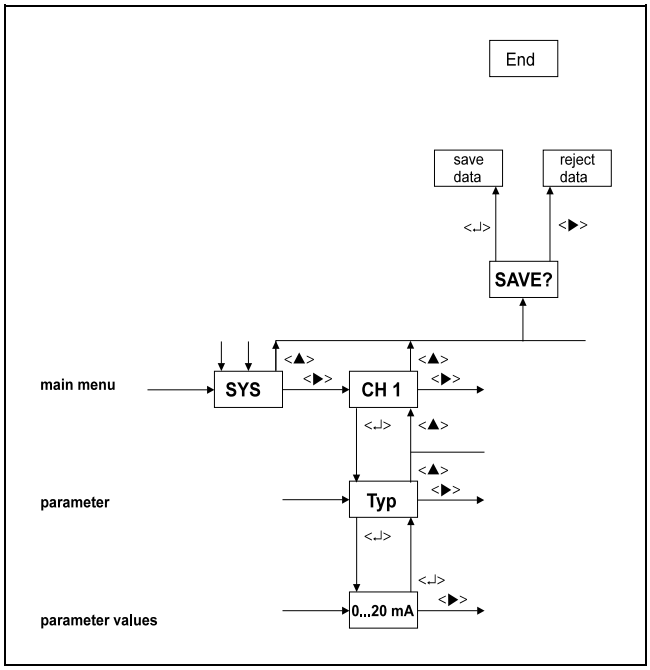


Fig. 18 Terminating the parameter definition
Z-18815

With a repeated press of the <▲> key
{SAvE ?}
is displayed.

The parameter-definition mode can be quit in two different ways:

- with <↵> the (modified) parameter data is stored in the EEPROM.
- with <▸> the modified parameter data is rejected.

Remarks on unit action

Action on changing the type of measurement

Action of the measuring range following the selection of a new measuring mode or a new nominal range:

- Measuring mode and or nominal measuring range is modified:

  the lower- and upper range values are set to the thresholds of the nominal measuring range. The alarms are set to the lower range (for minimum function) or to the final range value (for maximum function) of the nominal measuring range.

  The input thresholds for the measuring range are the same as for the nominal measuring range.

- initial or final measuring range is modified:

  The alarm values are checked to see if they have kept the new measuring range and set to the alarm thresholds in case of over or undershooting.

Split Range

During input of the measuring ranges, a check takes place to see if the minimum span of 20% is undershot. In case of inadequate span, an error message **{E-rng}** is displayed.

Action on under or overhooting the measuring range

Display and recording are proportional within range −0.25 %...+100.25 % in relation to the selected measuring range. If the measured value under or overshoots the stated proportional range, the meassuring element shall be driven to approx. −1 % or +100 % of the recording width. This transition takes place in steps with a delay of approx. 2 s.

System data

	{SYS}	
<↵>	**{SPd.1}**	chart speed 1 (standard speed)
<▸>	**{SPd.2}**	chart speed 2 (option “alarm value monitoring and binary inputs” required
<▸>	**{SPd.3}**	standby-chart speed
<▸>	**{CHdSP}**	channel connection time
<▸>	**{StbY}**	activate standby
<▸>	**{LCodE}**	alarm value selection for quitting the standby mode
<▸>	**{ALAr.}**	
<▸>	**{AL.StA}**	
<▸>	**{Addr.}**	bus subscriber address
<▸>	**{bAUd.}**	data transmission speed
<▸>	**{IoCon}**	extension unit for binary inputs and alarm relay
<▸>	**{PASS}**	input the password
<▸>	**{P.EnAb}**	enable the parameter-definition level

Chart speed 1

defines chart speed 1 (= standard speed) of the recorder. This chart speed is used by the recorder if none of the chart speed changeover functions is enabled. The standard value is 20 mm/h.

Parameter
{SPd. 1}

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

Chart speed 2

determines which chart speed is effective upon activating the chart speed changeover function. Chart speed 2 can accept the same values as for chart speed 1. the standard value is 120 mm/h. Chart speed 2 is activated if a voltage of 24 V DC is applied to terminals 922 (+) and 901 (−).

Notice
The recorder must be equipped with the option “Alarm value monitoring and binary inputs”.

Parameter
{SPd.2}

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

Standby chart speed

defines the chart speed for standby operation. Standby is active when 24 V DC is applied to the binary input DI 1. Measured value processing and alarm monitoring are enabled during the standby mode.

Notice
The recorder must be equipped with the option “Alarm value monitoring and binary inputs”.

Parameter
{SPd.3}

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

Channel connection time

defines the time during which the connected channel is recorded. After expiry of the channel connection time, changeover to the next channel takes place.

Parameter
{ChdSP}

Parameter value in s
2,5 / 5 / 10 / 20

Standby connection

defines the type of operation when the standby chart speed is activated. The parameter can accept 0 and 1.

On “0” the recorder executes the standby chart speed, the measured value processing and chart recordings do not take place. The print head reverts to the 0 % position.

On “1” the recorder executes the standby chart speed. No chart recordings take place. The print head reverts to the 0 % position. The measured values are processed further.

On infringing one of the alarm values stated in the alarm mask, the standby operation is terminated, the recorder returns to the recording mode. The data is recorded until no alarm is either under or overshot. At the end of recording, 5 mm paper is additionally transported if the standby speed is less than 120 mm/h.

Parameter
{StbY}

Parameter value
0 Standby on/off via binary input
1 Standby on via binary input
Standby off/on via alarm value infringements

Quit standby

defines the alarm values for quitting the standby mode in case of infringement.

To be input as parameter value is the code number of the required alarm value which cancels the standby mode. Should the standby be cancelled by several alarm values, the sum of code numbers should be created according to the table below and input as a parameter value.

Parameter
{LCodE}

Parameter value
0...4095

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

For example

Standby should be cancelled by the alarm values 1, 2 of channels 1, 2 and by the alarm value 1 of channels 3, 4 and 5:

The parameter value to be stated 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**		

Collective alarm

defines which relay output is activated in case of self-test error or if other alarms are enabled. The collective alarm relay is always operated in the NC contact operation mode. The output is closed if there is no alarm.

Parameter
{ALAr.}

Parameter value

Relay status

determines if the output relay should operate according to the NO contact operation or to the NC contact operation. This also fixes the position of the contact in case of alarm.

operating current - NO contact = off
quiescent current - NC contact = on

The parameter can accept “no” or “nc”. The default setting of the parameter is “no”.

Parameter
{rEL.St}

Parameter value
nc
no

Bus subscriber address

defines the subscriber address of the recorder for communication.

Notice
The broadcast address of the recorder is 135.

Parameter
{Addr.}

Parameter value
0...126

Data transmission speed

defines the data transmission speed for the RS 485 interface. Standard values are used.

Parameter
{bAUd.}

Parameter value
600 / 1200 / 2400 / 4800 / 9600 / 19200

I/O Converter

If the recorder is equipped with the option “alarm value monitoring and binary inputs”, 2 binary inputs and 2 contact outputs are available. The roots of the contact outputs are connected to each other.

The IO converter extends the contact outputs directly available on the recorder by 14. The contact outputs are electrically isolated. The parameter can accept the “off” and “on” values. In the case of the parameter value “on”, the IO converter can be connected to a recorder which is not equipped with the option “Alarm Value Monitoring and Binary Inputs”.

Parameter
{IoCon}

Parameter value
on
off

Password

defines which numerical combinations can be used to access the parameter data. The parameter can accept values from 0000... 9998. If the password is “0000”, no password is demanded. If the password is set to “9999”, all parameters (except the password) can be viewed but not changed.

Parameter
{PASS}

Parameter value
0000...9999

Enabling the parameter definition

determines if the parameter-definition level is inhibited. The parameter level is enabled by applying a voltage of 24 V DC to the corresponding binary input. The parameter-enable function takes priority over the external chart speed changeover (DI 2) or the standby function (DI 1).

Parameter
{P.EnAb}

Parameter value
off
DI1
DI2

Channel parameters

The channel parameters can be individually adjusted independently for each channel.

	{CH1 }	
<↵>	**{tYPE}**	type of measurement with nominal measuring range
<▸>	**{E.tYPE}**	type of measurement with nominal measuring range via external standard adapter
<▸>	**{E.rn.Hi}**	measuring range end of external user adapter
<▸>	**{rng.Lo}**	measuring range start
<▸>	**{rng.Hi}**	measuring range end
<▸>	**{rESPt}**	filter time constant
<▸>	**{Li-1}**	alarm value 1 (in measuring range values)
<▸>	**{Li1-F}**	input the alarm value function
<▸>	**{Li1.do}**	assignment of the relay output
<▸>	**{Li-2}**	value of alarm value 2 (in measuring range values)
<▸>	**{Li2-F}**	input of the alarm value function
<▸>	**{Li2.do}**	assignment of the relay output

Signal type (type of measurement and nominal measuring range)

defines the type of measurement and nominal measuring range for the channel in question.

Parameter
{tYPE}

Parameter value

off	
0..20	0...20 mA
4..20	4...20 mA
0..1V	0...1 V
E.rES	external shunts or voltage dividers

The selected type of signal and its associated nominal range is accepted with <↵>. On selecting the parameter value **{E.rES}** the parameter **{E.tYPE}** becomes accessible.

Extension of nominal measuring ranges

defines the external, standard nominal measuring ranges which can be enabled by using pluggable shunts and voltage dividers.

Parameter
{E.tYPE}

Parameter value

i0.5	0...0.5 mA
i2.5	0...2.5 mA
i5.0	0...5 mA
i100	0...100 mA
i500	0...500 mA
u5.0	0...5 V
u25	0...25 V
u50	0...50 V
uSEr	external user adapter (shunts or voltage dividers)

On selecting the parameter value **{uSEr}** the parameter **{E.rn.Hi}** becomes accessible. The parameter value **{uSEr}** allows the use of specific user shunts or voltage dividers. Input the user-specific adapter into the following final value parameters. The initial value is always 0.

Parameter
{E.rn.Hi} final value of nominal measuring range

Parameter value

0.5...500 mA	for current measurements
1...50 V	for voltage measurements

Measuring range (zooming)

defines (with the parameters lower/upper-range value) which range of the nominal range should be used for the measurement. The span must be at least 20 % of the nominal measuring range. The input limits for these values are set to the initial and final values of the selected nominal measuring range. The lower-range value may be between 0 and 80 % of the nominal range. The upper-range may lie between 20 and 100 %.

Parameter
{rng.Lo} start of measuring range
{rng.Hi} end of measuring range

Parameter value
nominal range start to end

Input the values into the dimensional unit of the measuring range.

For example

For **{tYPE}** 0..20 (nominal range 0 .. 20 mA) and the setting **{rng.Lo}**, the start of measuring range 4.500 and **{rng.Hi}** end of measuring range 19.00 the measuring range amounts to 4.5...19 mA (at a corresponding limited accuracy).

Damping

defines the time constant of the digital filter for damping the input signal. The value range is "0...60 s". The filter functions like a first grade low-pass filter.

Parameter
{rESPt}

Parameter value in s (1 s-steps)
0...60

Alarm value input

defines the alarm value (in measured range values).

Parameter
{Li-1}
{Li-2}

Parameter value
lower-end to upper-end value of the measuring range.

Function of the alarm value

defines the effective direction of the alarm values.

Parameter
{Li1-F}
{Li2-F}

Parameter value
off
Lo Minimum contact
Hi Maximum contact

Relay output of the alarm values

defines the assignment of the alarm value to a relay output.

Parameter
{Li1.do}
{Li2.do}

Parameter value

off	Collective alarm is switched off
DO01	Binary output 1
DO02	Binary output 2
DO07	Binary output 7 via IO converter
..	
DO20	Binary output 20 via IO converter

Service

The main menu item **{Service}** contains functions which are used for testing and adjusting.

	{SP.FnC}	
<↵>	**{Si.tYP}**	statement of the various test curves. The signals are handled like analog input signals.
<▸>	**{Si.PEr}**	duration period of test curve in seconds
<▸>	**{init}**	load up the factory setting
<▸>	**{Pr.oFS.}**	balance print head 0 %
<▸>	**{Pr.rng.}**	balance print head 100 %

Simulation

During simulation test signals are generated in the recorder, without a generator having to be connected to the input terminals. These signals go through the measured value processing sequence and are output on the recording system. The paper speed should be selected to suit the duration period.

Parameter
{Si.tYP}

Parameter value

off	
rAnP	ramp
SinE	sinus
StEP	steps in 10 % steps

Selection of the duration period

Parameter
{Si.PEr}

Parameter values
400...4000 s

Initialisation

loads up the factory setting.

Parameter
{init}

Parameter value
Press <↵>.
The factory setting is loaded into the RAM memory. If on leaving the parameter definition the query **{SAvE ?}** is answered with the <↵> key, the parameter values of the factory setting are written into the EEPROM. Should the query be answered with <▲>, the parameter values of the factory setting are rejected and the recorder continues to operate with the valid parameter values.

Balancing of the print head

balances the printer head on papier to 0 % and 100 %.

Parameter
{Pr.oFS.}

Parameter value
Set the paper zero:
Acknowledge <↵>.
{CASS.} is displayed.
Install the chart unit.
The print head drives to the current zero point.
Press the handle strip of the chart unit to the back.
The current position of the zero is identified with a zero whilst the paper is transported at the same time.
If the zero point is correct, remove the chart unit from the case and exit the parameter.
If the zero point is not correct, press the handle strips of the chart unit again.
The print head drives to approx. 3 % of the paper width.
Press the handle strips of the chart unit again.
The print head ist driven to the paper zero.
5 dots are written whilst the paper is transported at the same time.
Repeat this process until the paper zero line is reached.
If the zero point is correct, remove the chart unit from the apparatus and exit the prameter.

Set the end-of-paper

Parameter
{Pr.rng.}

Parameter value
as for zero point

Error messages

Self-test Error messages

Error messages are displayed in as **{Exx}**. The two digits of the “xx” position represent the cause of error.

Display	cause of error
{E00}	check sum error EEPROM parameter data
{E01}	check sum error EEPROM calibration data
{E02}	write error EEPROM
{E03}	read error EEPROM
{E04}	system motor timeout
{E05}	dotting motor timeout
{E06}	watchdog reset
{E07}	communication error to I/O converter
{E08}	invalid DO reference
{E09}	error pulse generation CPU

Messages during parameter definition

{E-Lo}	the input value is smaller than the minimum value
{E-Hi}	the input value is greater than the maximum value
{E-rng}	the parameter-defined measuring range is smaller than 20 % of the nominal range
{E-DO}	Invalid relay number
{E9000}	Wrong password: input password does not agree with the defined password, no access to parameters
{E9001}	the displayed parameter cannot be altered (for password “9999”)
{E9002}	no access to parameters (inhibited via DI)

Interface Description

Contents

Description

Provided for communication with the continuous-line recorder is an RS 485 interface. The type of data protocol used is designed to suit DIN 19 245 Part 1 (Profibus protocol). Only a part of the directives were taken into account. Among others, the directives on the operation of a multimaster (Token-Passing-Procedures) were not taken into account, since the recorder is always a passive subscriber.

Technical data of bus connection RS 485

Bus structure
- lead without stub cables
- stub to line to subscriber < 0,3 m

Medium
- shielded, twisted 2-wire lead
- surge resistance 100...130 Ω, for f > 100 kHz
- cable capacity < 60 pF/m
- cross-section ≥ 0.22 mm^2

Lead length
- ≤ 1200 m

Number of bus subscribers
- 32 (active and passive)

Transmission rate
- 600 / 1200 / 2400 / 4800 / 9600 / 19200 Baud

Type of transmission
- symmetrical

Driver output
- open-circuit ±5 V, with load ±1,5 V
- load resistor 60 Ω

Receiver
- sensitivity 200 mV
- input resistance 12 kΩ

Grounding
- The shield shouldbe grounded on both ends to arrest high frequency fault states

Potential balancing
- The difference in potential between the reference data potentials (GND) and all bus subscribers may not exceed ±7 V

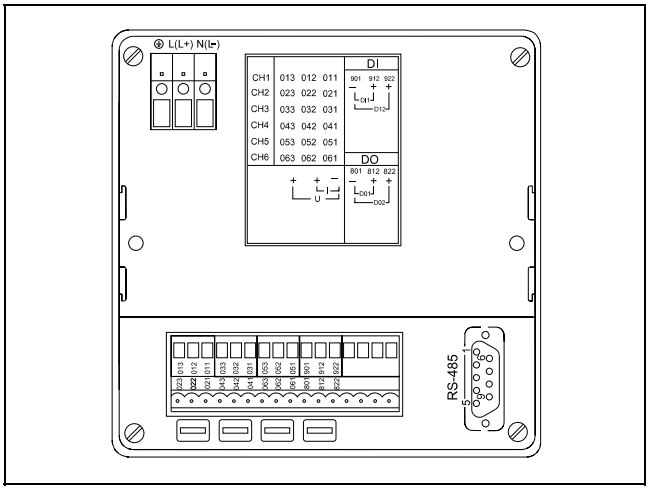


Fig. 19 Rear panel
Z-18064a

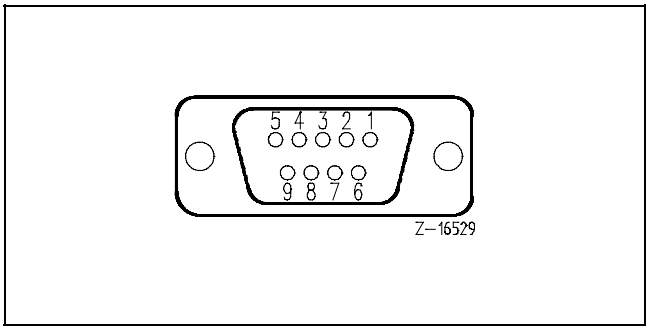


Fig. 20 Terminal assignment RS 485 interface
Z-16529 (9-pin connector SUB D)
- Pin 1 Shield
- Pin 2 I/O converter (+)
- Pin 3 RxD (+)
- Pin 5 GND (reference potential)
- Pin 6 +5 V
- Pin 7 I/O converter (−)
- Pin 8 RxD (−)

The voltage of +5 V on pin 6 is only required when the recorder is used as a bus end-unit.

The shielding is applied through a blade-type terminal on the recorder case.

The quiescent bus potential is fixed with the resistors R_d, R_t and R_u.

R_d = 390 Ω
R_t = 150 Ω
R_u = 390 Ω

Wiring should take place in accordance with fig. 21. The resistors R_d, R_t and R_u should be installed in the 9-pin bus connector in such way that the recorder can be separated from the bus with the bus remaining closed.

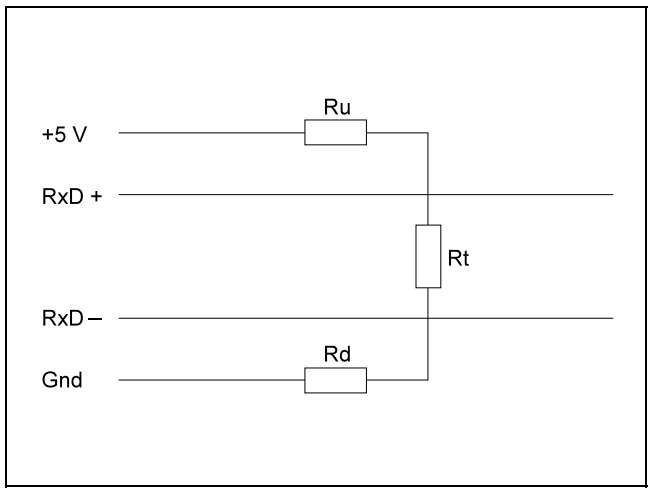


Fig. 21 Bus end wiring
Z-17340

Data formats

The data to be transmitted can be formatted in four different ways:

- Type BYTE value range 0...255
- Type CHAR value range −128...+127
- Type WORD value range 0...65535
- Type FLOAT value range ±1.175494E−38..±3.402823E+38

BYTE

The BYTE format is used to select parameters from the tables in Chapter on “Parameters”.

WORD

The WORD format consists of 2 bytes and is used when integers are to be transmitted without preceding signs (integer values). During transmission, high bytes precede low bytes.

For example: the value 820 is to be transmitted.

820 dec = 03 34 hex

FLOAT

The FLOAT format consists of 4 bytes and is used when floating decimal values are to be transmitted. The IEEE 754 format should be used. The numerical range accepted by the recorder lies within −9.990E9 and +9.990E9.

For example: the value −12.5 is to be transmitted.

−12.5 dec = C1 48 00 00 hex

Determining the hex figure

The general form of the floating decimal point is: (sign) * $2^{Exp-127}$ * (Rest).

The binary display of −12.5 is

```
11000001 01001000 00000000 00000000
||          |                      |
||  Exp     |          Rest        |
||  (8 Bit) |          (23 Bit)    |
|
negative sign
```

1. Calculate the sign:
   the bit is set in case of a negative sign.

2. Calculate the exponent:
   the highest exponent is calculated:

   EXP = INT [lg“$Figure_{dec}$”/lg2] + 127

   in the example:
   INT [lg12.5/lg2] + 127 = 130 dec = 82 hex = 10000010 binary

3. Calculate rest:

   Rest = “$Figure_{dec}$”/2^{Exp}

   Example:
   $12.5/2^3$ = 1.562

4. Convert into binary code:

   Rank : $2^0 + 2^{-1} + 2^{-2} + 2^{-3} + 2^{-4} + ... + 2^{-23}$
   Example : 1 1 0 0 1

   The value of 2^0 is always 1 and is therefore not converted.

Data Transmission

General

A combination of telegram characters is grouped together for the transmission of data. The telegrams accept the “Handshake function”, i.e. each telegram from the computer to the recorder must be first confirmed before being sent.

Notice
Prior to data transfer the interface address and the band rate must be defined.

Telegram characters

(UART character without frame)

Each character (frame) has 11 bits, a start bit (ST) with “logical 0” signal, 8 information bits with “logical 0” or “1” signal, an optional parity bit (P) with “logical 0” or “1” signal and a stop bit (SP) with logical “1” signal.

0	b1	b2	b3	b4	b5	b6	b7	b8	(P)	1
ST	2^0	2^1	2^2	2^3	2^4	2^5	2^6	2^7	(P)	SP

Permissible Addresses

The recorder only answers queries which use the address set in the unit as target address. Permissible are values between 0 and 126 (= 7E H). These can be allocated in any manner desired. However, no double addresses may be allocated. The recorder does not reply to faulty messages (check sum, wrong address, other faulty reception). Also, faulty messages are not acknowledged.

Some data ranges are identified as “read only” fields. Attempts to write into such fields will be ignored by recorder.

Broadcast address

Messages to the broadcast address (133 dec) are processed by all recorders, no response is however given to a broadcast message.

Telegram formats, framework specifications

The recorder accepts the following telegrams:

SD1 Telegram

Telegram with fixed information field length without data field

SD1/DA/SA/FC/FCS/ED
|<-- L -->|

is used for sending a query to the recorder and for sending acknowledgement by recorder.

Meaning:

SD1 = 10H	Start delimiter, node: 10H
DA	Destination address
SA	Source address
FC	Frame control
FCS	Test byte (Frame check sequence) Sum of the hex values of L frames without conversion for FFH
ED	End delimiter, dode: 16H
L	Number of bytes in FCS = 3

In reply to a query with FC = 01H (ident-interrogration) the recorder will also respond in the SD1 format. If the unit has no self-test function, the response is in FC = 10H, otherwise it is FC = 11H.

The ident recognition of the recoder is conducted with the function code 4EH in accordance with internal standard.

In reply to a query with FC = 4EH the recorder replies with a message in SD2 format.

The “data field” of the recognition message is assigned as follows:

LE_VN/LE_CT/LE_HR/LE_SR/VN/CT/HR/SR

LE_VN	= 03H
LE_CT	= 11H
LE_HR	= 05H
LE_SR	= 05H
VN	= “xxx” Manufacturer’s code
CT	= “xxx; xxx” Catalog number and apparatus
HR	= “CPU:A”” Index of the recorder CPU card
SR	= “00.00.16” Example for the software release

SD2 Telegrams

Telegram with variable information field length

SD2/LE/LEr/SD2/DA/SA/FC/aa/oo/oo/cc/data field/FCS/ED
|<-- L -->|

is used for sending data to the recorder and for responding to data from the recorder.

Meaning:

SD2 = 68H
start byte
LE number of data bytes + 7
LEr repetition of LE
SD2 = 68H
repetition of start byte
DA destination address (bus subscriber address)
SA source address
FC frame control:
16H = send data to the recorder
15H = copy data from the recorder
aa basic address of the parameter field
oo oo 2 byte parameter address (= Offset)
cc number of data bytes
Daten-
feld data for transfer
FCS test byte (Frame Check Sequence)
sum of hex variables of the L frame without conversion for FFH
ED = 16H
end code
L number of bytes in FCS

Upon receiving a data message in SD2 format, the recorder responds with a message in SD1 format. FC = 10H, if all data is accepted by the recorder, otherwise FC = 11H.

The altered data is written into the non-volatile memory one minute after receiving the last data signal.

The function code 16H is used to send data to the recorder. The recorder uses the function code 15H to send reply telegrams in SD2 format.

SD3 Telegram

Telegram with fixed information field length

SD3/DA/SA/FC/aa/oo/oo/cc/xx/xx/xx/xx/FCS/ED
|<-- L -->|

is used for sending a request to the recorder.

Meaning:

SD3 = A2H
start byte
DA target address (bus subscriber address)SA source address
FC = 15H
function code
aa basic address of the parameter field
oo oo 2 bytes parameter address (offset)
cc number of data bytes
xx xx
xx xx 4 of any bytes
FCS test (Frame Check Sequence)
sum of the hex variables of the L frames without conversion for FFH
ED = 16H
end of coding
L number of bytes in FCS

Transmission rules

The idle state of the line corresponds to the logical “1” signal. Before data transmission starts − from the PC − a minimum time of 33 bits (syn-time) as idle state is required for synchronisation.

Pauses of the length ≥ 3 frames shall be interpreted as telegram end.

The recorder inserts a pause of ≤ 300 ms each between the reception of the last stop bit and the first start bit.

Pause between two telegrams:

telegram	break ≤ 300 ms	answer telegram

Space between two frames:

Frame	≤ 0,2 ms	Frame

The receiver checks
- for each frame start, stop and parity bit and
- for each telegram start, DA, SA, FCS and end byte.

Should the test result be negative, the whole telegram should be rejected as incorrect.

In the reply, the recorder takes over the source address of the transmitted telegram as target address and inserts its own address as source address.

Parameter

Addressable Parameters

The following parameters can be changed and/or read with telegrams SD1, SD2 and SD3. To do this, a parameter field address (see table on the right), a parameter address (offset) and the code of the parameter value must be stated.

Example

The following information is required for the first chart speed:

Parameter field address	10H
Parameter address (offset)	0000H
Coding of the chart speed 20 mm/h	04H

Parameter field addresses

Function group	Parameter field address
System parameter definition	10H
Parameter measuring channel 1	11H
Parameter measuring channel 2	12H
Parameter measuring channel 3	13H
Parameter measuring channel 4	14H
Parameter measuring channel 5	15H
Parameter measuring channel 6	16H
read calibration data	1DH
read status	1EH
write status	21H

The above-named addresses are input into the appropriate fields of a message during communication. From the address, the recorder determines the data range to be transmitted. The data transmission takes place with messages in the SD2 and SD3 formats. To read a data field, FC = 15H must always be used, FC = 16H must be used to write a data field. If invalid parameter values are contained in a message, the negative acknowledgement (SD1, FC = 11H) is transmitted by the recorder in reply.

System parameters 10H

Parameter address (offset)	Data type	Function	Value range and coding
0001H	Byte	Chart speed 1	00H = off 01H = 2.5 mm/h 02H = 5 mm/h 03H = 10 mm/h 04H = 20 mm/h 05H = 30 mm/h 06H = 40 mm/h 07H = 60 mm/h 08H = 120 mm/h 09H = 240 mm/h 0AH = 300 mm/h 0BH = 600 mm/h
0001H	Byte	Chart speed 2	like chart speed 1
0002H	Byte	Chart speed 3	like chart speed 1
0003H	Byte	Channel switch-on time	00H = 2.5 s 01H = 5 s 02H = 10 s 03H = 20 s
0004H	Byte	Collective alarm relay output	00H = off 01H = DO 1 02H = DO 2 03H = DO 7 I/O converter .. 0FH = DO 19 I/O converter 10H = Do 20 I/O converter
0005H	Byte	Alarm status	00H = normally open (NO) 01H = normally closed (NC)
0006H	Byte	Unit address	0...126 = 00..7EH
0007H	Byte	Baud rate	00H = 600 01H = 1200 00H = 2400 01H = 4800 00H = 9600 01H = 19200
0008H	Byte	Standby mode	00H = without alarm value monitoring 01H = with alarm value monitoring
0009H	Byte	Type of simulation	00H = no simulation 01H = sinus 02H = ramp 03H = step (10 %)
000AH	Word	Period of simulation	0190H...0FA0H (= 400...4000 s)
000BH	Byte	I/O converter connection	00H = no 01H = yes

Parameter address (offset)	Data type	Function	Value range and coding
000CH	Word	Alarm value mask for ending the standy operation	00H = no termination 01H = channel 1 02H = channel 1 04H = channel 2 08H = channel 2 10H = channel 3 20H = channel 3 40H = channel 4 80H = channel 4 100H = channel 5 200H = channel 5 400H = channel 6 800H = channel 6
000DH	Byte	Parameter enable	00H = inactive 01H = DI 1 02H = DI 2

Channel parameters 11H ... 16H

Parameter address (offset)	Data type	Function	Value range and coding
0000H	Byte	Input type	00H = off 01H = 0...20 mA 02H = 4...20 mA 03H = 0...1 V 04H = 0...1 V with external shunt or voltage divider
0001H	Byte	Extension of input type via shunts or voltage dividers	00H = 0...0.5 mA 01H = 0...2.5 mA 02H = 0...5 mA 03H = 0...100 mA 04H = 0...500 mA 05H = 0...5 V 06H = 0...25 V 07H = 0...50 V 08H = USER
0002H	Float	Nominal range start for USER	0...9999
0006H	Float	Nominal range end for USER	0...9999
000AH	Float	Start of measuring range	within nominal range of input type
000EH	Float	End of measuring range	within nominal range of input type
0012H	Byte	Filter time	00...3CH = 0...60 s
0013H	Float	Value input for alarm value 1	within the measuring range
0017H	Byte	Effective direction of 1	00H = off 01H = minimum 02H = maximum
0018H	Byte	Relay outp. for alarm value 1	00H = off 01H = DO 1 02H = DO 2 03H = DO 7 I/O converter .. 0FH = DO 19 I/O converter 10H = Do 20 I/O converter

Parameter address (offset)	Data type	Function	Value range and coding
0019H	Float	Value input for alarm value 2	within the measuring range
001DH	Byte	Effective direction of alarm value 2	00H = off 01H = minimum 02H = maximum
001EH	Byte	Relay outp. of alarm value 2	00H = off 01H = DO 1 02H = DO 2 03H = DO 7 I/O converter .. 0FH = DO 19 I/O converter 10H = Do 20 I/O converter

Read calibration data 1DH

Parameter address (offset)	Data type	Function	Coding
0000H	Word	Channel 1 Calibration start value	0000H...FFFFH
0002H	Word	Channel 1 Calibration final value	0000H...FFFFH
0004H	Word	Channel 2 Calibration start value	0000H...FFFFH
0006H	Word	Channel 2 Calibration final value	0000H...FFFFH
0008H	Word	Channel 3 Calibration start value	0000H...FFFFH
000AH	Word	Channel 3 Calibration final value	0000H...FFFFH
000CH	Word	Channel 4 Calibration final value	0000H...FFFFH
000EH	Word	Channel 4 Calibration final value	0000H...FFFFH
0010H	Word	Channel 5 Calibration final value	0000H...FFFFH
0012H	Word	Channel 5 Calibration final value	0000H...FFFFH
0014H	Word	Channel 6 Calibration final value	0000H...FFFFH
0016H	Word	Channel 6 Calibration final value	0000H...FFFFH
001CH	Word	Zero correction value input stage	0000H...FFFFH
001EH	Word	Gain correction value input stage	0000H...FFFFH

Unit status write

Parameter address (offset)	Data type	Function	Coding
0000H	Byte	Store parameter-definition in EEPROM	00H = no action 01H = save
0001H	Byte	Zoom factor for measuring range zoom	00H = 20 % 01H = 10 %

Unit status read 34H

Parameter address (offset)	Data type	Function	Coding
0000H	Word	Measured value Channel 1	0000H...03E8H = 0...1000
0002H	Word	Measured value Channel 2	0000H...03E8H = 0...1000
0004H	Word	Measured value 3	0000H...03E8H = 0...1000
0006H	Word	Measured value Channel 4	0000H...03E8H = 0...1000
0008H	Word	Measured value Channel 5	0000H...03E8H = 0...1000
000AH	Word	Measured value Channel 6	0000H...03E8H = 0...1000
000CH	Byte	Overflow code Channel 1	00H = overflow 01H = overflow
000DH	Byte	Overflow code Channel 2	00H = overflow 01H = overflow
000EH	Byte	Overflow code Channel 3	00H = overflow 01H = overflow
000FH	Byte	Overflow code Channel 4	00H = overflow 01H = overflow
0010H	Byte	Overflow code Channel 5	00H = overflow 01H = overflow
0011H	Byte	Overflow code Channel 6	00H = overflow 01H = overflow
0012H	Byte	Status chart speed control	00H = chart speed 2 ist active 01H = standby chart speed is active
0013H	Word	Alarm status	Bit 0 = channel 1 GW 1 active 1 = channel 1 GW 2 active 2 = channel 2 GW 1 active 3 = channel 2 GW 2 active 4 = channel 3 GW 1 active 5 = channel 3 GW 2 active 6 = channel 4 GW 1 active 7 = channel 4 GW 2 active 8 = channel 5 GW 1 active 9 = channel 5 GW 2 active 10 = channel 6 GW 1 active 11 = channel 6 GW 2 active Bits 12...15 = xx

Parameter address (offset)	Data type	Function	Coding
0015H	Word	Alarm status	Bit 0 = check sum error parameter definition 1 = checksum error calibration 2 = write error EEPROM 3 = read error EEPROM 4 = timeout system motor 5 = timeout print head driver 6 = watchdog reset 7 = invalid DO reference 8 = faulty function of CPU pulse generator Bits 9...15 = xx
0017H	Word	Alarm acknowledge status	as for alarm status
0019H	Byte	DI- und DO-status in recorder	00H = no binary inputs/outputs 01H = with binary inputs/outputs
0017H	Byte	Zoom factor for measuring range zoom	00h = 20 % 01H = 10 %

Conversion

Firmware update

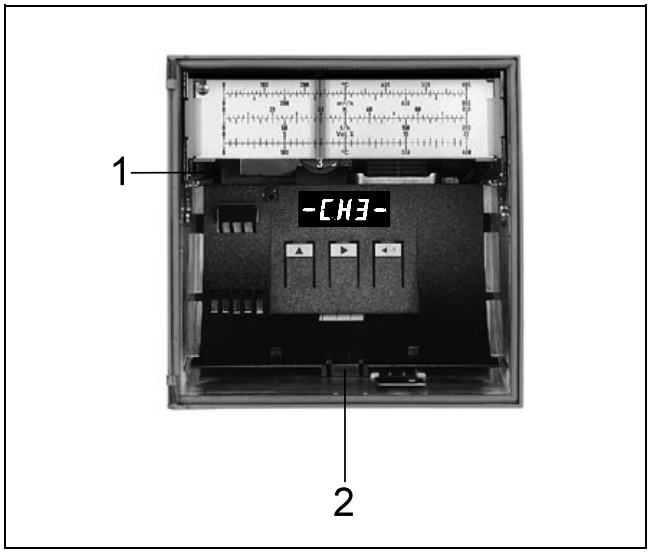


Fig. 22 Z-18759
1 Retaining screw
2 Locking lever

1. Unloosen retaining screw *1* (see Fig. 22) and pull the measuring element carrier approx. 2 cm forward.
2. Lift the unlocking level *2* (see Fig. 22) and pull the module forward simultaneously.
3. Pull out the measuring element plug.
4. Remove the electronic unit from the case (see Fig. 23).
5. Exchange EPROM *5*.
6. Reinstall in the opposite sequence.

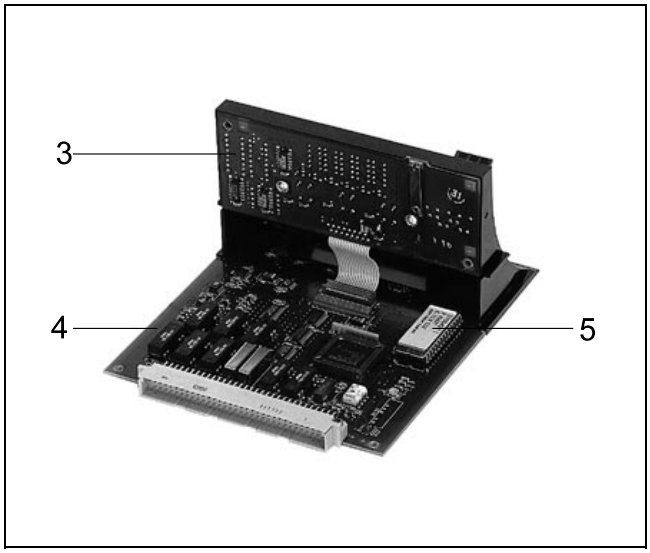


Fig. 23 Dismantled electronic unit (viewed from the rear)
Z-18760
3 Display card
4 CPU card
5 EPROM

Exchanging scales

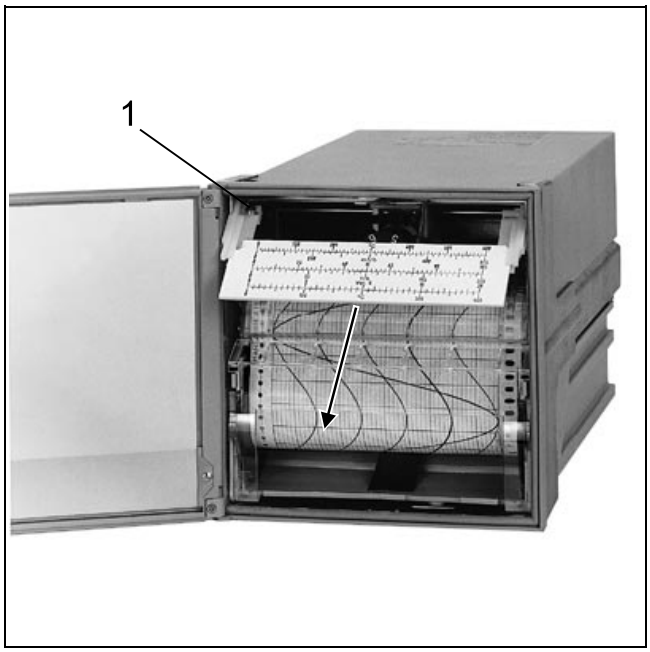
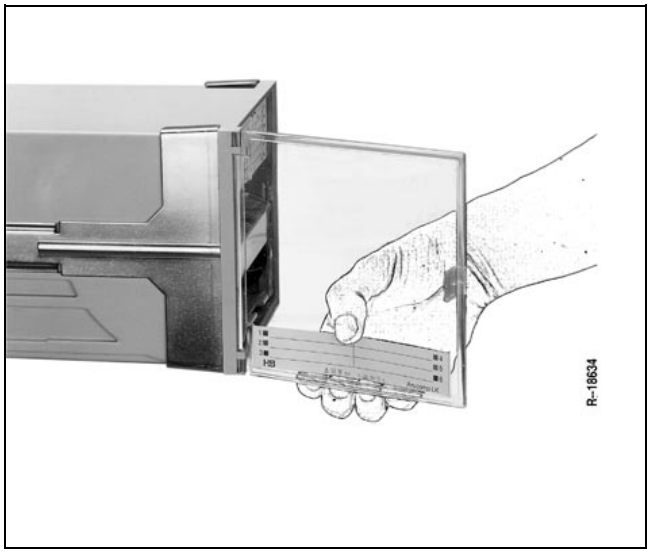


Fig. 24 Exchanging scales
Z-18761 *1* Retaining screw

1. Lift the pointer.
2. Lift the scale.
3. Unloosen the retaining screw.
4. On the front panel, remove scale from below.
5. Insert new scale in the inverse order.
6. Press down scale and pointer.
7. Check the system zero against the scale start.
   a. Remove the chart unit.
   b. Enable the lock function and select a channel with a lower-range value of 0 mA or 0 V.
   c. Short-circuit the input of the selected channel.
   d. Adjust scale start value to suit pointer
   e. Tighten the retaining screw
   f. Reinstall the chart unit.

Exchanging the tag name plate

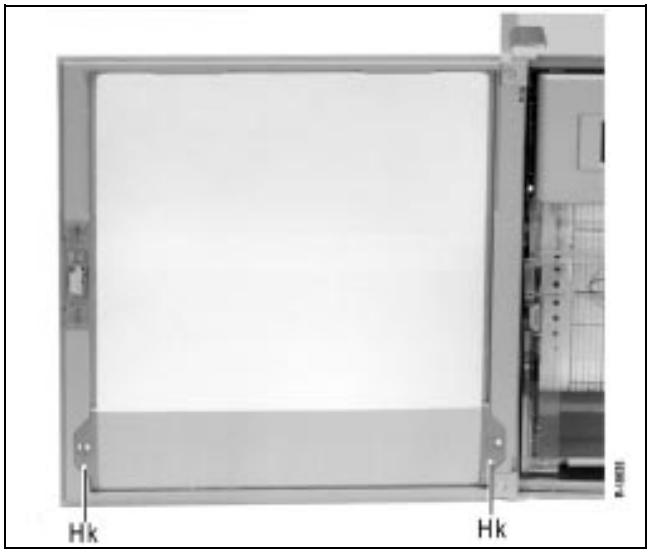
Type with moulded door



1. Pull out the flexible tag name plate from the holder.
2. Replace with new tag name plate.

Fig. 25 Exchanging tag name plate of moulded door
Z-18634

Version with metal-framed door



1. Unscrew the retaining brackets *Hk*.
2. Remove the tag name plate.
3. Replace with new tag name plate.
4. Tighten the retaining brackets *Hk*.

Fig. 26 Replacing tag name plate of metal-framed door
Z-18635

Exchanging the case door

Door made of moulded material

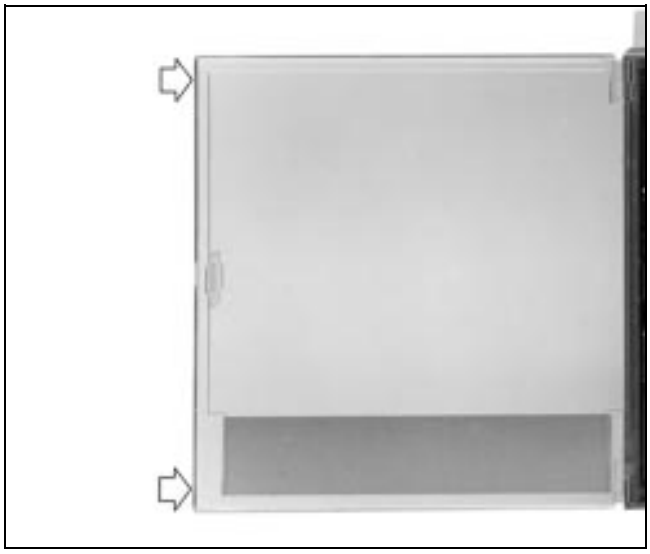


Fig. 27 Exchanging the moulded door
Z-18641

1. Open the case door by 180°.
2. Press against the narrow edge of door, first from below and then from top (see Fig. 27), until the door hinge gives.
3. Hinge up the new door (at an opening angle of 180°).
4. On the front side, press the bottom and top of door hinge.

Metal-framed door

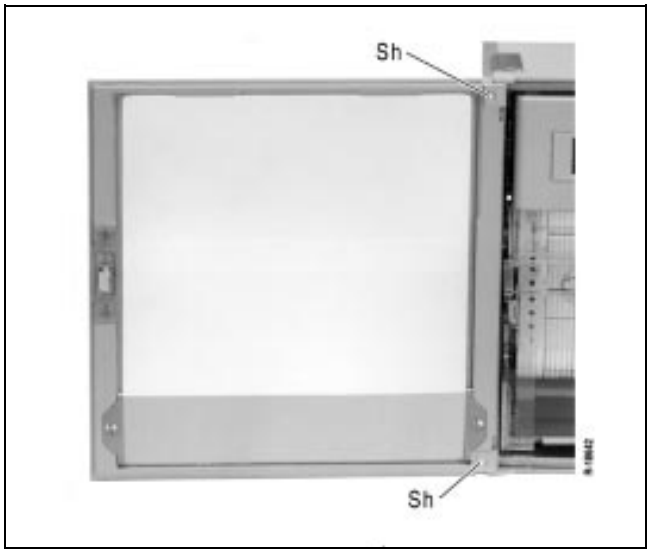


Fig. 28 Exchanging the metal-framed door
Z-18642

1. Unloosen and remove screws *Sh* at the upper and lower ends of hinge.
2. Remove door.
3. Replace with new door.
4. Replace and tighten screws *Sh* at upper and lower ends of hinge.

Maintenance

Fuse renewal

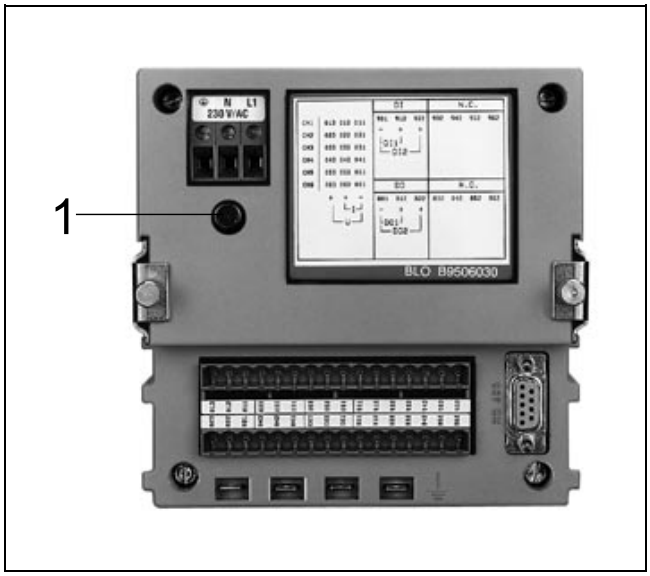


Fig. 29 Fuse renewal *1*
Z-18762

⚠ Attention

Only fuses with the specified type and rated current may be used as replacements. Makeshift fuses may not be used. The fuse holder may not be short-circuited.

When the apparatus is connected to its supply, terminals may be live, and the opening of covers or the removal of parts except those to which access can be gained by hand is likely to expose live parts. Connected parts may also be live.

1. Screw off the fuse-holder.
2. Renew fuse *1*.
3. Screw on fuse-holder again.

Fuse rating

230 V	T	0.5 L
115 V	T	0.5 L
24 V	M	1.6 E

Technical Data

Measuring section

Deviation
Class 0.5 to IEC 1143-1 as a function of the nominal range additionally in case of shift of lower-range value and/or upper range value:

$$\pm\left(0{,}1\,\% \frac{\text{nominalmeasuringrange}}{\text{measuringrange}} - 0{,}1\right)$$

Dead zone
0.25 % of scale span

Measuring point switch-on time for all channels
2.5...20 s selectable

Measured value damping
with low-pass 1. order, time constant 0...60 s per channel, configurable

Measured variables / Nominal measuring ranges

Direct current
0...20 mA, 4...20 mA, Ri = 50 Ω
via plug-on shunt 0...0.5 mA to 0...500 mA
(voltage drop 1 V)

Direct voltage
0...1 V
via plug-on voltage dividers >0...1 V to ≤0...50 V

Measuring ranges

Start of measuring range
can be parameter-defined from 0...80 % of the respective nominal range

End of measuring range
can be parameter-defined from 20...100 % of the respective nominal range

Effects

Temperature

$$\pm\left(0{,}2 + (0{,}05 \frac{\text{nominalmeasuringrange}}{\text{measuringrange}} - 0{,}05)\right)\% / 10K$$

Reference temperature
25 °C

Supply voltage
0.1 % for 24 V DC ±20 %
0.1 % for 24 V AC +10 % / −15 %
0.1 % for 115 V AC +10 % / −15 %
0.1 % for 230 V AC +10 % / −15 %

Parasitic voltage
0.5 % of the measuring span

External magnetic field 1 mT
0.5 % of the measuring span

in case of mechanical stress
during and after effect of ±0.5 % of the measuring span

Recording section

Scales
1 to 6 graduations

Character size according to the number of graduations

Graduations	1	2	3	4	5	6
Size of numerals (mm)	6	5	2	2	2	2

Channel display
according to tag number on ink head

Assignment of scales to channels
through coloured stickers on the scale

Operator keyboard
behind the chart unit

Display (for parameter-definition only)
5-digit 7-segment display
Size of numerals size 4 x 7 mm

Operation
with 3 keys behind the chart unit

Recording

Colours

Colours	**Colour sequence to DIN 43 838**
violet	channel 1
red	channel 2
black	channel 3
green	channel 4
blue	channel 5
brown	channel 6

last dot visible from the front
ink reservoir ≥ 5 x 10^5 pixels per colour

Trend recording

The measured values are recorded as dotted lines at equidistances.

Tag switch-on time
2.5 / 5 / 10 / 20 s

Up-slope integration

Chart speed is configurable
0 / 2.5 / 5 / 10 / 20 / 30 / 40 / 60 / 120 / 240 / 300 / 600
for external chart speed changeover and switch-off optional "binary input/output" required

Chart length
32 m roll chart or 16 m folded paper

Visible diagram length
60 mm

Recording width
100 mm (chart width 120 mm, DIN 16 230)

Chart feed-in (roll chart)
automatic catch of start of paper by the take-up reel (daily chart tear-off or unrolling of the 32 m possible)

Power supply

UC power supply unit

Voltage
24 V AC/DC ± 20 %

Power consumption
max. complement approx. 15 W / 21 VA

AC power supply

Voltage
24 V AC / 110 V AC / 230 V AC, +10 % / −15 %

Frequency range
47.5...63 Hz

Power consumption
max. complement approx. 15 W / 21 VA

RS-485 Interface

- for defining parameters

Optional “binary inputs/outputs” required

External chart speed changeover
Control voltage: 24 V DC / 6 mA external

Standby function
Control voltage: 24 V DC / 6 mA external

Alarm monitoring

2 alarm values per channel for monitoring the absolute value
2 internal relays can be freely assigned to the alarm values

Output:
NO contact, roots of contact are connected to each other, contact load max. 30 V / 100 mA
14 additional relays available via external IO converters

General and safety data

Environmental capabilities

Climate category
3K3 to DIN IEC 721-3-3

Ambient temperature
0...25...50 °C

Transportation and storage temperature
−40...+70 °C

Relative humidity (unit in operation)
≤ 75 % annual average, max. 85 %
Avoid condensation!
Pay attention to effect of humidity on recording chart to DIN 16 234

Mechanical capabilities

Test
to DIN IEC 68-2-27 and to DIN IEC 68-2-6

During transportation
Shock 30g / 18 ms
Vibrations 2g / 5...150 Hz

In function
Vibrations 0.5g / ± 0.04 mm / 5...150 Hz / 3 x 2 cycles

Electromagnetic compatibility

The EMC directive 89/336/EWG on interference suppression to EN 55 011 and on interference immunity to EN 50 082-2 are fulfilled.

Interference suppression to EN 55 011
Parasitic voltages on mains leads: 0.15...30 MHz Class B
Intensity of stray field: 30 MHz...1 GHz class B

Interference immunity
Tested to EN 61 000-4

Type of test	Test severity	Effect	Severity degree
Burst (5/50 ns) on			
main lead	2 kV	≤ 1 %	3
measuring lead	2 kV	≤ 1 %	3
Surge (1.2/50 µs) on			
main lead common	2 kV	≤ 1 %	3
main lead differential	1 kV	≤ 1 %	2
HF field			
radiated 80 MHz...1 GHz	10 V/m	≤ 1 %	3
lead routing 0.15 ...80 MHz	10 V	≤ 1 %	3
1-MHz pulse on			
main lead common	2 kV	≤ 1 %	3
main lead differential	1 kV	≤ 1 %	3
ESD (1/30 ns)	6 kV	≤ 1 %	3

The NAMUR industrial standard EMC is met (interface leads shielded)

Permissible parasitic voltages

Serial interference peak to peak	≤ 0,3 x span max. 3 V
Normal mode rejection	75 dB
Common-mode parasitic voltage	60 V DC 42 V AC
Common-mode rejection	83 dB for DC 96 dB for AC

Electrical Safety

Tested to DIN EN 61 010-1 or IEC 1010-1

Protection class
I

Overvoltage category
III at mains input
II at the inputs and outputs

Degree of pollution
2 within unit and on the terminals

Test voltage (type test)
3.75 kV AC channel to power supply unit
2.2 kV AC protective conductor to power supply unit

Test voltage (individual test)
3.1 kV DC measuring channel/protective conductor

Power supply

Functional extra-low voltage with safe intrinsic isolation (PELV)
between main input and channels/control inputs, interface leads to VDE 0100 Part 410 and VDE 0106 Part 101

Connection, Case and Mounting

Electrical connections

Type of protection
IP 20

Screw-type plug-in terminals for measuring inputs, control inputs and alarm relay outputs
max. wire cross-sction 2 x 1 mm^2

Fasteners for mains connection
max. wire cross-section 1 x 4 mm^2 or 2 x 1.5 mm^2

RS-485 interface
via 9-pin Sub-D connector

Housing

Case (for dimensions see Fig. 2)
Moulded door for installation in panels or mosaic grid frameworks

Type of case protection to IEC 529
Front panel (including door) IP 54
Rear panel IP 20

Case colour
pebble grey to RAL 7032

Case door
Moulded material
Option: Metal-framed door with glass

Case fastening
mit 2 fasteners (optionally for panels or mosaic panel field mounting), max. grid rod width = 40 mm, a centering bracket is required for mounting in mosaic grid framework

Mounting orientation
Lateral inclination −30°...0...+30°
Inclination to the back 20°, to the front 20°

Mounting distance
horizontal or vertical 0 mm, case door must open to about 100°

Weight
approx. 3.5 kg

Factory settings

Scale with a graduation of 0...100
will be supplied, if no specification is given on ordering the scale unit.

Basic parameters

If no particular parameters are specified when ordering, the recorder will be supplied with the following parameter presettings:

- Measuring range (all measuring channels): 0...20 mA.
- Chart speed 1: 20 mm/h.
- Chart speed 2: 120 mm/h.
- Measured value damping, zoom function: switched off.
- No password allocation.

These parameter presttings can be initialised in the service mode at any time.

Basic standards

International standards

IEC 68-2-6	mechanical capabilities (vibrations)
IEC 68-2-27	mechanical capabilities (Shocks)
IEC 225-4	1 MHz pulse on mains lead
IEC 529	IP types of protection
IEC 721-3-3	Environmental capabilities
IEC 742	Safety transformers
IEC 880	Software development
IEC 1000-4	Electromagnetic compatibility (measurements)
IEC 1010-1	Safety, process instruments
IEC 1143-1	Class accuracy
EN 50 081-1	Electromagnetic parasitic emissions in living areas
EN 50 081-2	Electromagnetic parasitic emissions in industral areas
EN 50 082-1	Electromagnetic compatibility in living areas
EN 50 082-2	Electromagnetic compatibility in industrial areas
EN 50 011	Radio suppression for ISM devices
EN 60 873	Process recorders
EN 132 400	Solid capacitors (Y-capacitors)

German Norms

DIN 16 230	Chart recording paper
DIN 24 420	Spare parts list for installation
DIN 43 802	Scales
DIN 46 834	Unit fastening
DIN VDE 0100-410	Protection against shock currents
DIN VDE 0106-101	Basic requirements for safe intrinsic separation

Packaging for transport or for return to manufacturer

- For the transportation, the ink head must be removed (see “5. Inserting the ink head” on page 7).
- If the original packing is no longer available, the apparatus must be wrapped in an insulating air foil or corrugated board and packed in a sufficiently large crate lined with shock absorbing material (e.g. foamed material) for the transportation. The amount of cushioning must be adapted to the weight and to the mode of transport. The crate must be labelled “Fragile”.
- For overseas shipment the unit must additionally be sealed airtight in 0.2 mm thick polyethylene together with a dessicant (e.g. silica gel). The quantity of the desiccant must correspond to the packing volume and the probable duration of transportation (at least 3 months). Furthermore, for this type of shipment the crate should be lined with a double layer of kraft paper.

Subject to technical changes.

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Subject to technical changes.
Printed in the Fed. Rep. of Germany
42/41-26 EN Rev. 1.0
Edition 02.01