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Important instructions! Please read and observe!

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

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

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

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

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

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

Comments on displays within text

Text inputs are illustrated by < >, displays by { } and text printouts by [].

The statements "right", "left" or "up", "down" – if not stated otherwise, mean when viewed from the front.

Supplementary technical literature

Parameter-definition instructions, Description of interfac

Application and short description

The recorder is a microcontroller-controlled Multiline Recorder with 1...4 line channels or 1...3 line channels and 1 printer channel.

The recorder is connected to a transmitter and detecting elements such as thermocouples. Standard temperature sensor curves are stored in the firmware of the recorder and linearised with a high accuracy rate.

The recorder is adapted to the measuring task per software using an internal operator keyboard or adapted through the interfaces RS 232C and RS 485.

Installation and commissioning

Scope of supply and delivery

Supplied with the recorder are the following spare parts:

- 2 Fasteners *B*
- 1 Fibre-pen insert *F* per line channel
- 1 Print insert *D* (for versions with printer channel)
- 1 Roll chart *S*

Depending on the order, the corresponding number of screw terminals *K*; one Zener-diode combination for each measuring element and rulers.

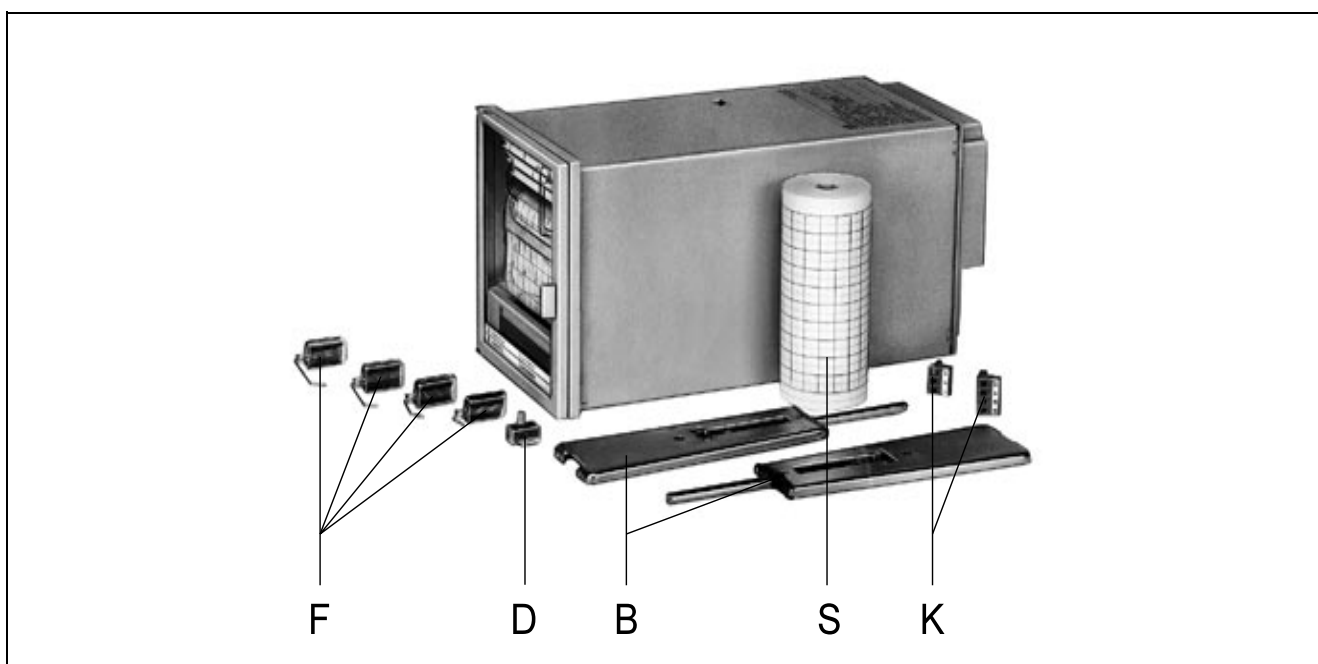


Fig. 1 With accessories
Z-17070 B fasteners
D print insert
F fibre-pen inserts
K screw terminals
S roll chart

1. Installation site

Mounting position

with lateral inclination $-30^{\circ} \dots 0 \dots +30^{\circ}$

inclination to the back 20°

inclination to the front 20°

Ambient temperature

$0 \dots 50^{\circ}\text{C}$

Relative humidity

$\leq 75\%$ annual average

maximum relative humidity $\leq 85\%$

Avoid condensation!

2. Mounting

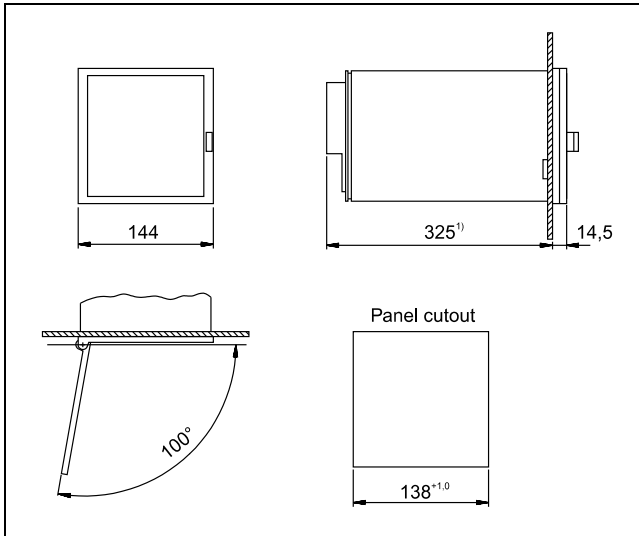


Fig. 2 Dimensional diagram (in mm)
Z-18749 1) version without flat-ribbon cable: 294 mm

The recorder is suitable for mounting in panels and mosaic panel fields.

Mounting in panels

1. Insert unit into the panel from the front.
2. Attach by hanging fasteners onto the cutouts on case.

In case of close-density mounting in horizontal direction, hang the fasteners onto the cutouts in the upper and lower sides of panel.

3. Clamp and tighten the fasteners uniformly in vertical direction.

Mounting in a mosaic grid framework

1. Attach 4 centering brackets to the grid framework.
2. Attach by hanging fasteners onto the cutouts on case.
3. Clamp and tighten the fasteners uniformly in vertical direction.

3. Connection

(see fig. 3)

⚠ 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.

Signal connection

- Attach wire (maximum cross-section $2 \times 1 \text{ mm}^2$) onto the screw terminal.

⚠ Attention

In the version “without flat-ribbon cable” install a zener diode combination for each current circuit at the terminals of the current measuring points in order to prevent internal circuit interruptions. The zener diode combination (for catalog no. see data sheet) is part of the recorder accessories supplied on first delivery.

No zener diode combination should be installed for such input variables like voltage or resistance.

Power supply connection

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.

- Attach wire (maximum cross-section $2 \times 1 \text{ mm}^2$) to the screw terminals. The cross-section of the protective conductor must correspond at least to the cross-section of the power supply cable.

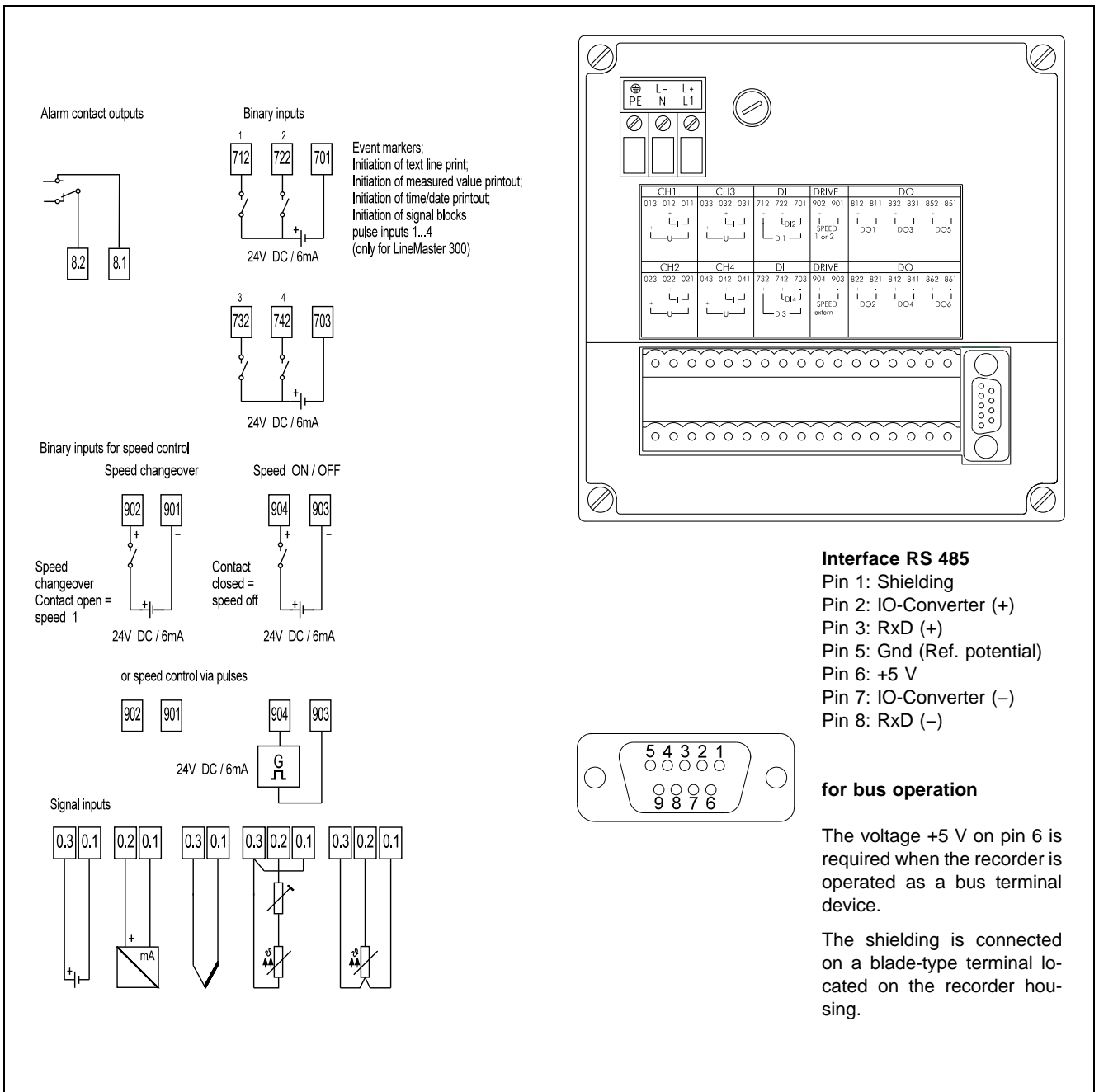


Fig. 3 Connections

Z-16784

Z-18750

Z-16529

4. Opening the case door

1. Press the handle a bit to the right.
2. Pull case door open.

5. Inserting the roll chart

1. Unlocking the slide-in unit.

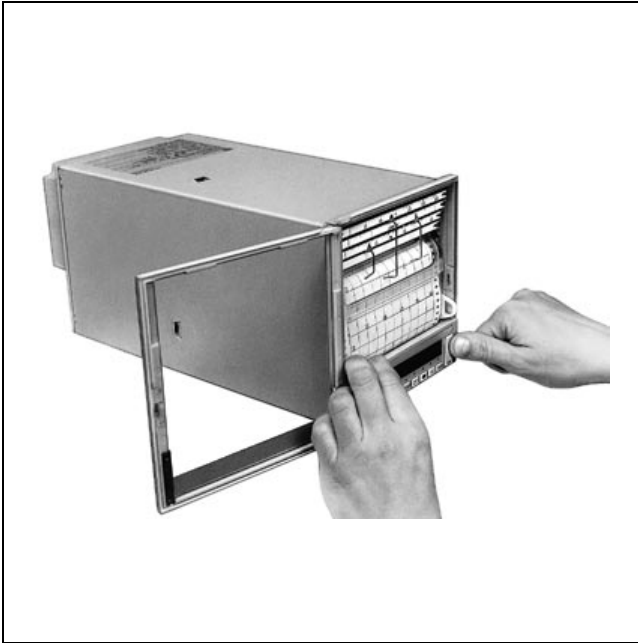


Fig. 4 Unlocking the slide-in unit
R-17072

2. Pulling forward the slide-in unit.



Fig. 5 Pulling forward the slide-in unit
R-17073

3. Unlocking the measuring element carrier.

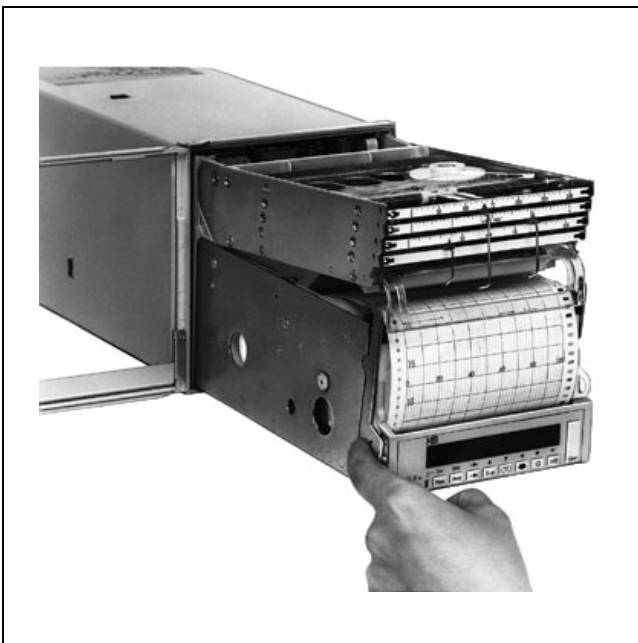


Fig. 6 Unlocking the measuring element carrier
R-17074

4. Open the measuring element carrier to the limit.



Fig. 7 Open the measuring element carrier to the limit
R-17075

5. Inserting the roll chart from the side.



Fig. 8 Inserting the roll chart from the side
R-17076

6. Pull the start of paper up to the sprocket wheel and position the perforations on the sprockets.
7. Push the measuring element carrier downwards.
8. Push the slide-in unit into the case.

6. Switching on the unit

Switch on unit with external on/off switch.

7. Inserting the fibre-pen insert

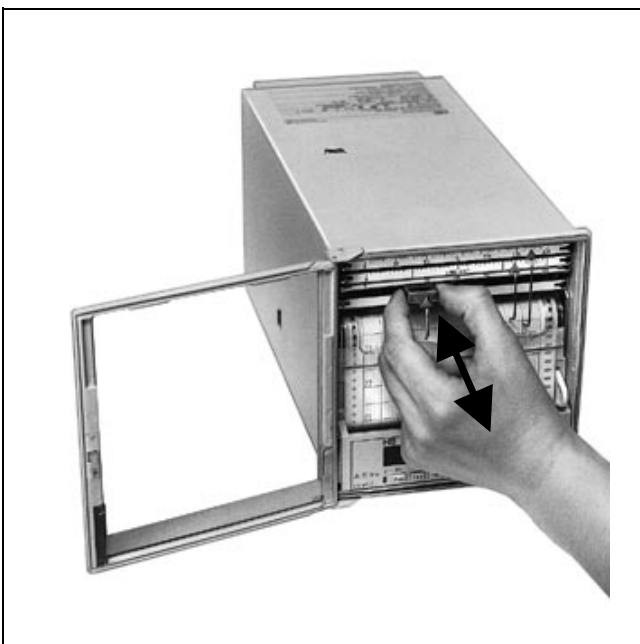


Fig. 9 Inserting the fibre-pen insert
Z-17077 ↑ insert, ↓ remove

1. Press and hold <Stop> for more than 2 s.

The measuring elements move into the parking position (only when the stop key function is enabled).

2. Swing up the scales.
3. Install the fibre-tip insert into the chart carriage.

8. Inserting the print unit



Fig. 10 Inserting the print unit
Z-17078
↑ insert
↓ remove

1. Press and hold <Stop> for more than 2 s.

The measuring elements move into the parking position (only when the stop key function is enabled).

2. Swing up the scales.
3. Install the print insert into the chart carriage.

9. Adjusting the starting point of recording

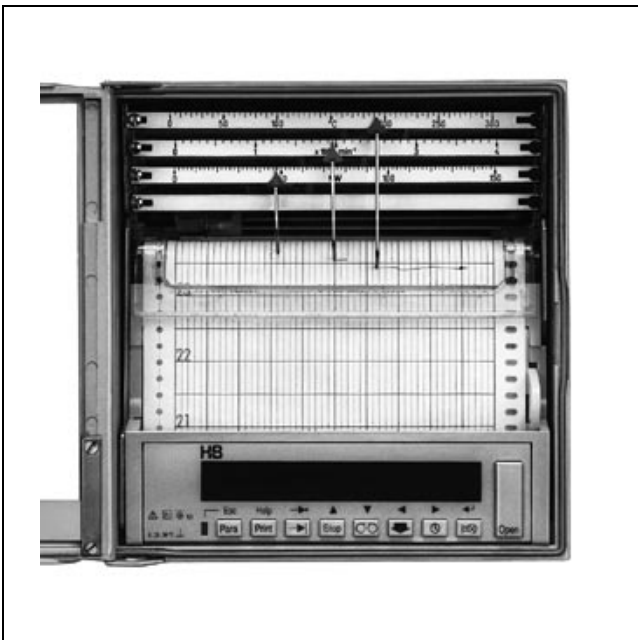


Fig. 11 Adjusting the starting point of recording
R-17079

Press <↓> and release when the right baseline has been adjusted under the fibre-pen insert or print unit.

Notice

If the time imprint or date/time baseline is enabled, the handle strips upon releasing it, will transport the chart paper so far that the next time or date will be imprinted at the correct position.

Operation

Operator front panel



Fig. 12 Operator front panel
R-17079*

After opening the case door, the eight keys of the operator keyboard will become accessible. In the operating mode, the characters on the keyboard are valid; in the parameter-definition mode, the characters over the keys are valid.

Key legend

Operating mode

<Para>
Call up the parameter definition mode

<Print>
Print channel name, measured value, time, ...

<→>
Switch the measured value to a further channel

<Stop>
Stop the recording or Standby (can be activated or deactivated in the parameter-definition mode)

<↺>
Stop der unwind function

<↻>
Adjust the baseline (quicker chart speed)

<🕒>
Display date and time

<|=⊗>
Acknowledge error message

Parameter-definition mode

<Esc>
End parameter-definition or return to the higher-level menu

<Help>
Context-related help texts on the parameters

<◀▶>
Shift the decimal point to one further place on the right

<▲>
Select the menu item Adjust the figure

<▼>
Select the menu item Adjust the figure

<←>
Edit function: left cursor

<→>
Edit function: right cursor

<↵>
Select menu item Select parameter Accept parameter value

Display

The display is a green 16-digit dot matrix.

The parameter-definition mode and the validity of the second key assignment is signalled by a red LED positioned on the left beside the <Para> key.

Display in the operating mode

In the operation mode the measured values of the enabled channels are displayed cyclically, e.g.:

```
{c1 253.5 °C      }  
{c2 22.34 l/min   }  
{m1 19.02 mA     }  
{i1 521 MWh      }  
{s1 250 MWh      }  
{bl 225 V        }  
{rd 75 mm        }  
{gn 76.02 bar    }
```

This means:

c1...c4	Channel 1...4
m1...m4	Mathematic channel 1...4
i1...i4	Pulse channel 1...4
s1...s4	Accounting channel 1...4
bl, rd, gr, vt	Output channels blue, red, green, violet
pr	Printer channel

On overshooting the measuring range, e.g. **{bl↑}** is displayed in flashing mode.

On undershooting the measuring range, e.g. **{bl↓}** is displayed in flashing mode.

In case of sensor break, e.g. **{bl*}** is displayed in flashing mode.

The channel code is displayed in lowercase characters in case of cyclical display of the measured values, e.g. **{c1 253.5 °C}**

The channel code is displayed in uppercase characters in case of static display of the measured values, e.g. **{C1 253.5 °C}**.

Time delay compensation

If the time delay compensation is switched on active, the measured values are output on the measured element (**not on display**) with a time delay. The time-delayed measured values are displayed for instance like **{bl τ 253.5 °C}**.

Special character formats

For display sections whose readout range exceeds 9999, the exponential display mode (semi-logarithmic) can be selected (see parameter-definition instructions):

Example:

{7.452E6} = 7452000

The exponential display mode can also be selected for a logarithmic readout range (see parameter-definition instructions):

Example:

{7.452₁₀6} = 7452000

Special display operating states when using the history function

Standby with memory:

{Standby: MEM/MAN}

Standby is switched on; is activated with <Stop>.

{Standby: MEM/DI}

Standby is switched on; is activated through the binary input.

{Standby: MEM/AUTO}

Standby is switched on; is activated upon switching on the unit.

{Standby: PRT/DI}

Standby is switched off; the activation criteria are printed out.

{Standby: OUT/DI}

Standby is switched off; the buffer is printed out till empty.

Standby without memory:

{Standby: MAN}

Standby is switched on; is activated with <Stop>.

{Standby: DI}

Standby is switched on; is activated through the binary input.

{Standby: AUTO}

Standby is switched on; is activated upon switching on the unit.

Key functions in the operating mode

The <Print> key

If a printer channel exists, the active and enabled channels will be printed out in ascending order:

```
<Print>
{C1 253.5 °C      11:33}
{C2 2.34 l/min    11:33}
{M1 19.02 mA     11:33}
{l1 521 MWh      11:34}
{BL 225 V        11:34}
{RD 75 mm        11:34}
{GN 76.02 bar    11:34}
```

For about 2 s the message **{printout active}** will be displayed.

If no printer channel exists, the message **{no print system}** will be displayed for about 1 s.

On completion, the display reverts to normal operation.

Die Taste <→|>

The active channels for display are enabled with the <→|> key.

{BL 253.5 °C}

Press <→|>

{RD 22.34 l/min}

If <→|> is pressed so long until the channel code changes from uppercase to lower case letters, the cyclical channel enabling function (with the default cycle time) will be activated.

In the standby mode,

{Standby: ...}

is displayed. If <→|> is pressed, the current measured value of channel C1 is displayed. If <→|> is pressed again, the current measured value of channel C2 is displayed etc. If <→|> 5 s is not pressed for a long time, the display reverts to **{Standby: ...}**.

The <Stop> key

If the <Stop> key is pressed 2 s long, the recorder shifts to the "stop recording" mode (if this function was enabled during parameter-definition). As a result, the take-up and chart speed motor stops and the servomechanisms revert to the parking position:

```
System up           to 100 %
System middle up    to 80 %
System middle down  to 0 %
System down         to 20 %
```

```
Printer channel     to 50 %
```

The active print mode is terminated when the on-going dot sequence has been completed.

{Registrier-Stop}

is displayed. Upon pressing <Stop> again, the unit returns to the normal operation mode.

If this function is inhibited,

{Taste gesperrt}

is displayed.

As an alternative to the stop function, the <Stop> key can also be assigned with the standby function. Precondition is that the **{Systemdaten}/{History}/{Taste}** is adjusted to "on". The standby can be switched on and off with <Stop>.

{Standby: MEM/MAN} (for standby with memory time)

or

{Standby: MAN} (for standby without memory time)

is displayed.

The <⏏> key

On pressing the <⏏> key, the take-up motor stops.

The display shows

{Aufwickel Stop}.

It is then that the unrolled paper can be manually handled and viewed.

If <⏏> is pressed again, the paper is rewound at an approximate speed of 20000 mm/h.

The <↓> key

Pressing <↓> positions the paper. If the key is kept pressed, the chart speed increases in approx. 5 s from 2.5 to about 5000 mm/h. On releasing and repressing the key, the chart speed starts again with 2.5 mm/h.

Notice

If the time imprint or date/time baseline is enabled, the handle strips upon releasing it, will transport the chart paper so far that the next time or date will be imprinted at the correct position.

The <⌚> key

On pressing <⌚>, date and time will be displayed in European format

{08.09.1997 13:38}

or in American format

{09/08/1997 1:38pm}.

The <|=⊗> key

In case of an error or alarm signal, acknowledge this with <|=⊗>. If there are several signals, all of them must be acknowledged before other inputs can be made with the keyboard.

Action in case of measuring range under or overshooting

Display and recording are within the -0,25 % to 100.25 % range, as a proportional function of the selected measuring range. Over or undershooting of the measured value of the stated proportional range is signalled as follows:

Illustrated displays

Should the measured value be short of or exceed the selected measuring range by more than 0.25 %, the channel in question will display after approx. 2 s e.g.

{BL↑} for measuring range overshooting

{BL↓} for measuring range undershooting

in the flashing mode. Upon returning to the permissible range, the measured value is redisplayed after approx. 2 s.

Display on paper

If the measured value under or overshoots the selected measuring range by more than 0.25 %, the measuring element will be controlled in steps with a delay of approx. 2 s to approximately -1 % or +101 % of the recording width.

Changing the chart speed

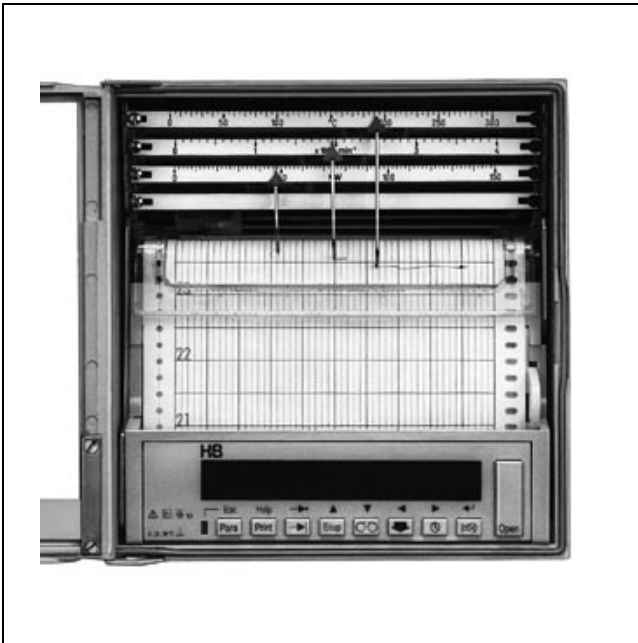


Fig. 13 Changing the chart speed
R-17079

The chart speed is set to a standard of 20 mm/h. The chart speed can be modified in the parameter-definition mode:

1. Press <Para>.

{**Systemdaten**} is displayed, if no password has been allocated.

Notice

In the parameter-definition mode the red LED lights up beside <Para>.

2. Press <↵>.

{**Vorschübe ■**} is displayed.

3. Press <↵>.

{**Vorschub 1**} is displayed.

4. Press <↵>.

The chart speed value 0000 flashes.

5. Press <▲> or <▼>. Select the required chart speed 1.

Adjustable speeds in mm/h:

0 / 1 / 2,5 / 5 / 10 / 20 / 30 / 40 / 60 / 120 / 240 / 300 / 600 / 1200 / 1800 / 3600 / 7200

6. Acknowledge selected chart speed 1 with <↵>.

7. Press <Esc>.

{**Vorschübe ■**} is displayed.

8. Press <Esc>.

{**Systemdaten**} is displayed.

9. Press <Esc>.

{**Param. Ende ?**} is displayed.

10. Press <↵>.

{**Daten Sichern ?**} is displayed.

11. Press <↵>.

The selected chart speed is stored in the EEPROM and is active.

Chart speed changeover

If the recorder features the option "Alarm value monitoring and binary inputs", it can be externally switched between chart speed 1 and chart speed 2. The desired values for chart speed 1 and chart speed 2 are selected in the parameter-definition mode.

Chart speed 1 becomes active after switching on the recorder. On applying a voltage of 24 V DC between terminals 901 (-) and 902 (+) the chart speed 2 becomes active. On applying a voltage of 24 V DC between terminals 903 (-) and 904 (+) the chart speed is switched off.

Standby

If the recorder features the option "Alarm value monitoring and binary inputs", it can be switched to the standby mode. In the parameter-definition mode, select a binary input for switching on the standby function. In order to switch on the standby function, apply a voltage of 24 V DC between terminals 701/703 (-) and the terminals (+) assigned to the selected binary input.

In the standby, standby chart speed, measured value processing and alarm value monitoring modes are active.

The measuring elements are at the start of scale or are located at the last position prior to the triggering of the standby mode.

The standby mode is cancelled by alarm value infringements or by switching the applied voltage to the binary input. The recorder begins recording.

If the <Stop> key for the standby control is switched on, the it can also be used to switch the standby function on and off.

If the recorder is so defined, that the recorder switches to standby when the power supply is applied, the standby operation can be switched on and off with the <Stop> key.

Making history become visible

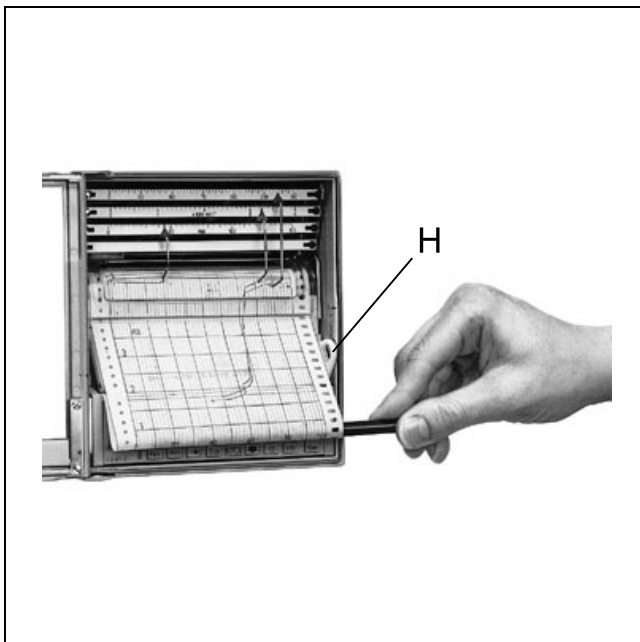


Fig. 14 Making history become visible
Z-17080

1. Press <O-O>.

{Aufwickel-Stop} is displayed.

2. Push lever *H* on the right side of the slide-in module to the up position.

3. Pull out chart paper to the front.

4. Push lever *H* to the down position.

Notice

Lever must snap in.

5. Press <O-O> again.

Recording paper is automatically taken up.

Removing the chart paper

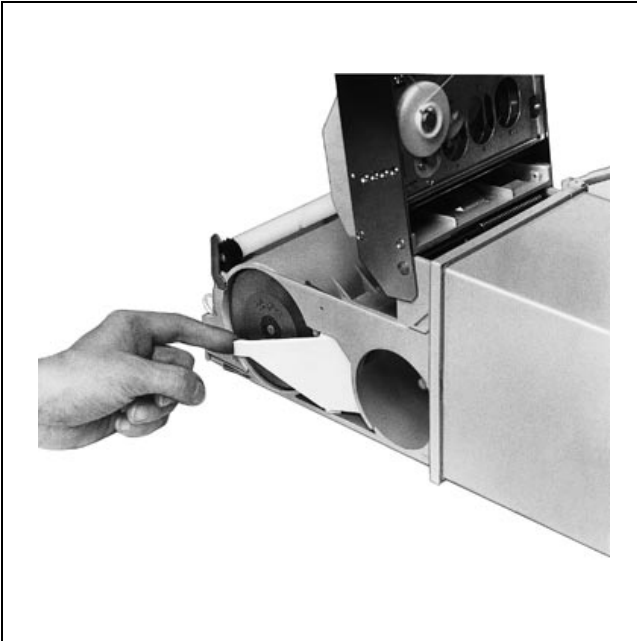


Fig. 15 Opening the chart roll holder
R-17081

1. Unlock slide-in unit and pull forward (see Figs. 4 and 5).
2. Unlock the measuring element carrier and swing open to the limit (see Figs. 6 and 7).
3. Swing open the chart roll holder to the limit (see fig. 15).
4. Remove the take-up reel with recording paper (see fig. 16).
5. Take off the flange without "handling instructions"
6. Remove the recording chart.
7. Fit back the removed flange.
8. Insert the take-up reel.
9. Close the chart roll holder.
10. Insert the new roll chart (see fig. 8).
11. Pull the start-of-paper up to the sprocket wheel and position the perforations on the sprockets.
12. Swing down the measuring element carrier
13. Push the slide-in unit into the apparatus.

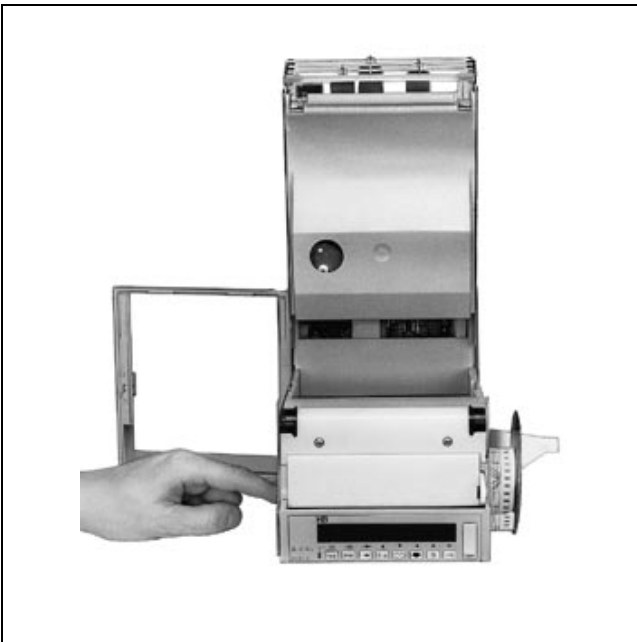


Fig. 16 Removing the take-up reel
R-17082

Paper-end signal

Insert the roll chart (see Chapter 5.) and state the length of the roll chart.

1. Press <|=⊗>.
2. Press <PARA>.

The parameter {L} is displayed. The parameter value flashes.

3. State the length of the inserted roll chart with <▶> or <◀> and <▲> or <▼> in meters. When doing this take account of the negative paper tolerance.
4. Acknowledge the value with <↵>.

The input value is stored. The recorder returns to the operating mode. The length of the remaining paper is written in an EEPROM at time intervals determined by the speed.

Displaying length of rest of paper

In the parameter mode, the end-of paper signal is assigned to the contact output in the main menu {System} under {Pap.Ende DO1}. The end-of-paper signal is output 2 hours prior to paper-end, depending on the speed.

If <|=⊗> is pressed, the rest of paper is displayed. In addition, the time remaining for paper change is also displayed in accordance with the active chart speed.

Accounting function

If during the accounting function the <Print> key is enabled, the printout of the lines defined in the parameter-definition can be initiated. The control of the accounting interval (internally cyclical or cyclically via binary inputs) is not affected by this.

Notice

The accounting and standby functions are mutually exclusive.

Parameter definitions

(see parameter-definition instructions)

The recorder is defined with the operating keys or with a parameter-definition software from a PC via the RS 485 interface.

Should access to the parametering level be blocked due to a password allocation, the parameter values can only be read.

Press <PARA>. {Passwort ?} is displayed. The parameter value "0000" flashes.

Input the password "9999" with the keys <▶> or <◀> and <▲> or <▼>.

The main menu items and parameters are selected. The parameter values are only displayed.

Conversion

Exchanging the scales

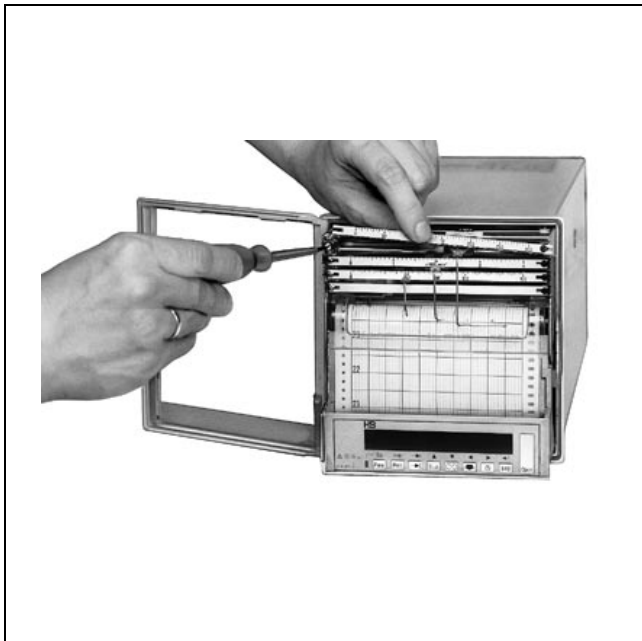


Fig. 17 Exchanging the scales
R-17083

1. Remove the fibre-tip insert from the chart carriage (fig. 9).
2. Pull forward the slide-in unit.
3. Unloosen the left scale screws.
4. Push the scales to the right and remove by untightening the scale screw.
5. Take out the scales from the left side (see fig. 17).
6. Install scales in the opposite order.
7. Adjust the measuring element to zero:
Press <Para>. **{Systemadten}** is displayed.
Press <v> **{Service}** is displayed.
Press <↓>. **{Kanal BLAU}** is displayed.
Press <▲>. Select required channel.
Press <↓>. **{Papier |← x x x x}** is displayed.
Press <↓>. Pointer moves to zero. "x x x" flashes.
Check agreement between electrical zero and paper zero. If balancing is necessary, press <▶>, until the recording pen reaches field. Press <◀> and make a zero correction.
8. Align scale to pointer.
9. Tighten scale screws.
10. Changeover to the parameter-definition mode.
<↓>
Press <Esc>. **{Kanal blau}** is displayed.
Press <Esc>. **{Service}** is displayed.
Press <Esc>. **{Param. Ende ?}** is displayed.
Press <↓>. **{Daten Sichern ?}** is displayed.
Press <↓>. Recorder is switched to the operating mode.

Exchanging the tag name plate

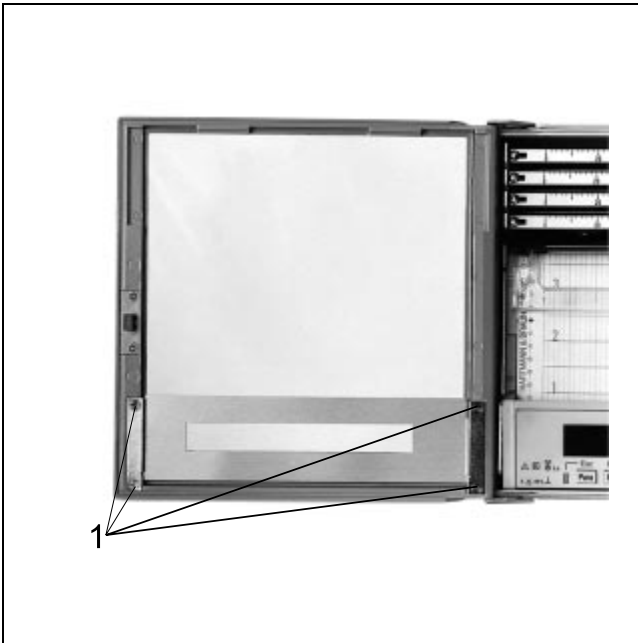


Fig. 18 Exchanging the tag name plate
Z-18806

Moulded door

Pull off the flexible tag name plate from the retainer.

Metal frame door

1. Unloosen the screws of the retainer.
2. Take out the tag name plate.
3. Shorten the new tag name plate at the rupture joints (see fig. 18) and insert into the retainer.
4. Tighten the screws of the retainer.

Exchanging door

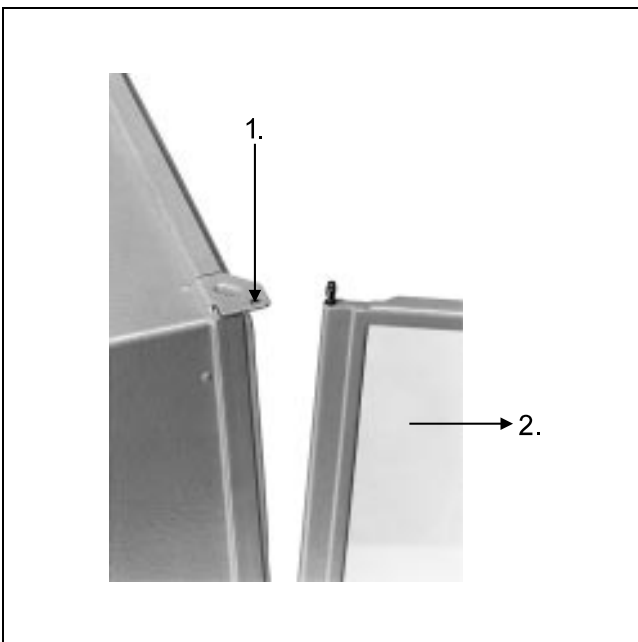


Fig. 19 Exchanging the door
Z-18810

1. Open door.
2. Unloosen the four mounting studs 1 and unhinge door.
3. Replace with new door and fasten with the four studs 1.

Firmware update

1. Unlock the slide-in unit with <Open> and pull forward to the limit (see fig. 20).



Fig. 20
R-18807

- Carefully pull up the electronic card 2 and loosen cables 3, 4, 5 and 6 (see fig. 22).

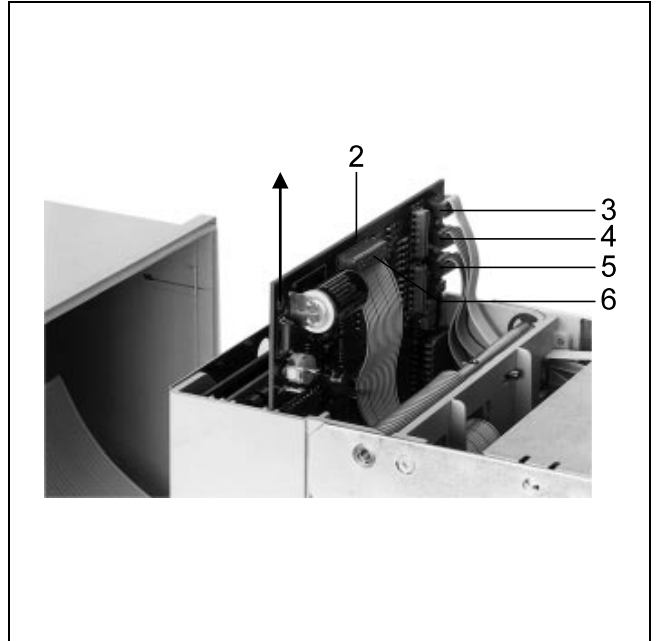


Fig. 22
Z-18805

2. Move pull-to-unlock lever 1 (accessible from underneath) in direction of arrow (1.) and remove the chart unit completely from the case (2.) (see fig. 21).

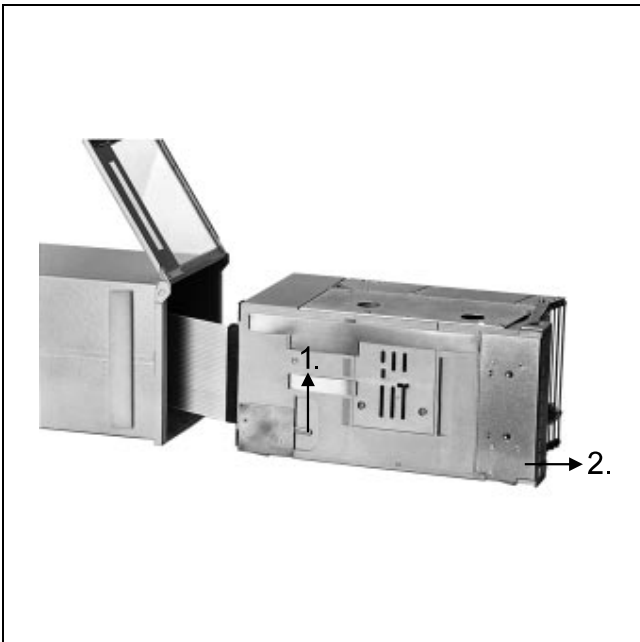


Fig. 21 View from below!
Z-18808

4. Completely pull out the electronic card 2 and exchange EEPROM 7.

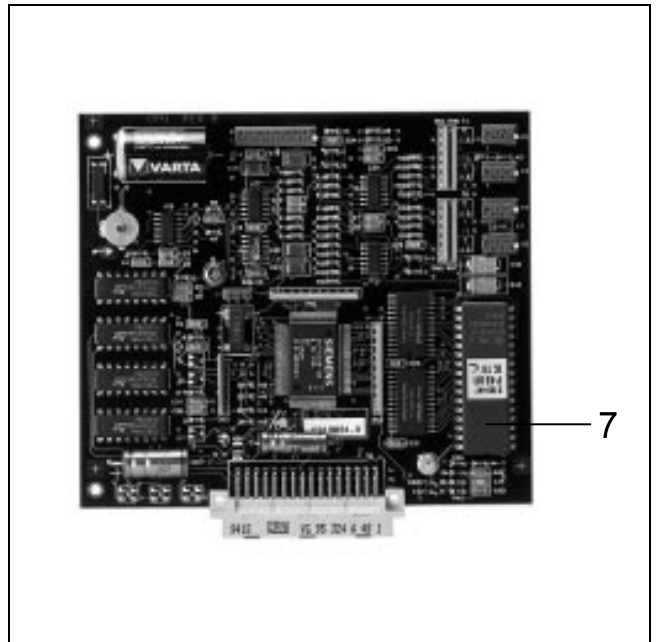


Fig. 23
Z-18804

5. Mount in the opposite order.

Maintenance

⚠ Attention

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

The apparatus shall be disconnected from all voltage sources before it is opened for any operations. Operations on the opened apparatus under voltage must only be performed by an expert who is aware of the hazard involved.

Capacitors inside the apparatus may still be charged even if the apparatus has been disconnected from all voltage sources.

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

Whenever it is likely that protection has been impaired, the apparatus shall be made inoperative and be secured against any unintended operation.

It must be assumed that the protection has been impaired when

- the apparatus has visible signs of damage,
- the apparatus no longer functions,
- the apparatus has been stored in unfavourable conditions for a long time,
- the apparatus has been subjected to adverse transport conditions.

Replacing fuse

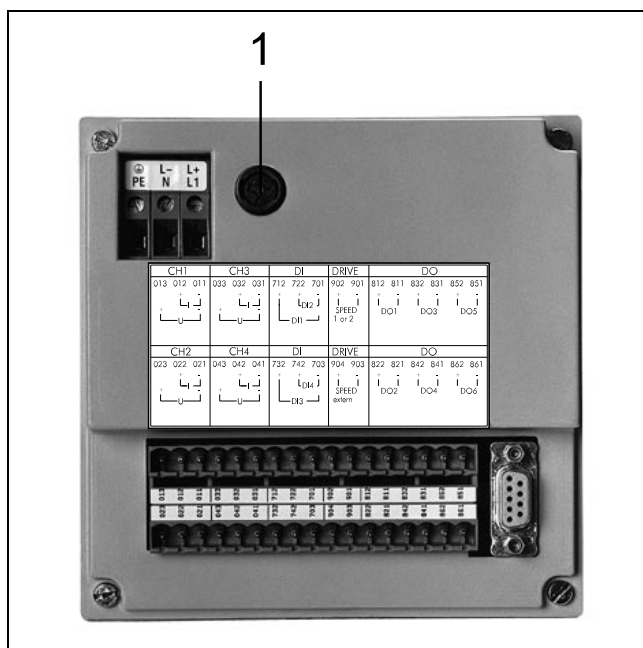


Fig. 24 Replacing fuse 1
Z-18809

⚠ Attention

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

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

1. Unscrew and take out the fuse holder.
2. Replace fuse *Si*.
3. Rescrew the fuse holder.

Fuse ratings

110...300 V T 1 A
24...60 V T 2 A

Technical Data

Measurement section

Deviation

to IEC 1143-1 as a function of the nominal range
 Class 0.5 for line channels
 Class 1 with printer channel
 in case of shift of lower-range and/or upper range, optional

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

±0.1 % of scale span during linearisation
 ±1 K during internal reference junction correction

Dead zone

0.25 % of scale span

Response time

1 s

Measured value damping

with low-pass 1st grade
 time constant 0...60 s definable per channel

Measured variables / Nominal ranges

Standard version

Direct current

0...20 mA Ri = 50 Ω
 4...20 mA Ri = 50 Ω

Direct voltage

0...10 V Ri ≥ 1 MΩ

Universal version

Direct current

0...20 mA Ri = 50 Ω
 4...20 mA Ri = 50 Ω
 ±2.5 mA Ri = 50 Ω
 ±5 mA Ri = 50 Ω
 ±20 mA Ri = 50 Ω

Direct voltage

0...25 mV Ri ≥ 2 MΩ
 ±25 mV Ri ≥ 2 MΩ
 0..100 mV Ri ≥ 2 MΩ
 ±100 mV Ri ≥ 2 MΩ
 0...2.5 V Ri ≥ 200 kΩ
 ±2.5 V Ri ≥ 200 kΩ
 0...5 V Ri ≥ 200 kΩ
 ±5 V Ri ≥ 200 kΩ
 ±10 V Ri ≥ 200 kΩ
 ±20 V Ri ≥ 200 kΩ

Thermocouples Ri ≥ 2 MΩ

Type B 100...+1820 °C
 Type E -270...+1000 °C
 Type J -210...+1200 °C
 Type K -270...+1372 °C
 Type L -200...+ 900 °C
 Type N -270...+1300 °C
 Type R - 50...+1769 °C
 Type S - 50...+1769 °C
 Type T -270...+400 °C
 Type U -200...+600 °C

Internal or external reference junction
 Sensor break monitoring can be defined

Resistance thermometer

Pt 100 in 2- or 3-wire circuitry
 -50...+150 °C; -200...+850 °C;

Line resistance for

2-wire circuitry max. 40 Ω
 3-wire circuitry max. 80 Ω

Measuring ranges

Start of measuring range

0...80 % of the respective nominal range, definable

End of measuring range

20...100 % of the respective nominal range, definable,

Start of measuring range

≥20 % of the respective nominal range

Square-rooting function

nominal ranges for direct current and direct voltage definable

Linearisation of user-specific curves

nominal ranges for direct current and direct voltage definable

Mathematic channels

Number

4, freely assignable to the recording systems

Purpose

interconnection of input channels

Term length

maximum 32 characters

Arithmetic

+, -, ×, /

Functions

x^a; a^x; log; cos; sgn; int

Pulse inputs

Number
4

Pulse frequency
maximum 10 Hz

Control voltage
24 V DC / 6 mA external

Option "Binary inputs/outputs" required

Effects

Temperature

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

Reference temperature
25 °C

Supply voltage

- ≤0.1 % for 24 V DC ±20 %
- ≤0.1 % for 24 V AC +10/-15 %
- ≤0.1 % for 230 V AC +10/-15 %
- ≤0.2 % for other voltages

Interfering parasitic voltages

≤0.5 % of the measuring span

External magnetic field 1 mT

≤0.5 % of the measuring span

Mechanical stress

during and after activation ±0.5 % of the measuring span

Recording section / Measured value display

Scales

one graduation per measuring element

Type	Scale plate width	Character size
1	5 mm	2 mm
2	7.5 mm	3 mm
3	13.4 mm	5 mm

Operator and display panel

Display

16-digit point-matrix-display

Character size

3 mm × 5 mm

Operation

8 keys, double assignment

First level: operation

Second level: parameter-definition

Recording

Arrangement of the measuring elements and colour assignments

Version with 1..4 line channels

Type	1			2			3			Number of Line Channels				
	1	2	3	1	2	3	1	2	3	4				
green											x	x		
red											x	x	x	
blue											x	x	x	x
violet													x	

Version with 1..3 line channels and printer channel

Type	1			2			3			Number of Line Channels				
	1	2	3	1	2	3	1	2	3					
green													x	
red												x	x	
blue												x	x	x
violet														Printer Channel

Trend recording with line channels

Fibre-pen with ink reservoir, containing approximately 1.4 ml, trace length approx. 1300 m, spacing between the tips of the fibre-pens 2 mm.

Trend recording with printer channel

Instead of the violet line channel, a printer channel for text print-outs has been incorporated. The measured values are recorded als dotted lines with equidistant dot spacings. Ink head reservoir approx. 1.5×10^6 dots. Spacing between the blue fibre-pens and ink head 6 mm.

Text printout

only for chart speeds of ≤ 300 mm/h

Character size

approx. 1.5×2 mm

Scope of text printouts:

1. Ten text lines: optional per text line
maximum 32 characters
maximum 30 characters and time imprint
maximum 24 characters and time/date imprint
Cyclical triggering at time intervals or
event-dependent through internal (alarm value) / external
excitation (binary inputs)
2. Printout of chart speed, date and time
Triggering off upon switch-on of recorder and during chart
speed changeover
3. Printout of the current measured values
Triggering at cyclical time intervals or
event-dependent through internal/external excitation
4. Printout of double lines assigned to measuring points
First line: scaling line with channel coding and printout of the
measured unit
Second line: measuring point-related text with a maximum of
32 characters
5. Printout of the accounting table consisting of:
comment line
start and end time of the accounting interval
minimum / maximum value during the accounting interval
average and summation value through accounting interval
initiation: cyclical and external.

Chart speed

Speeds (definable)

0 / 1 / 2,5 / 5 / 10 / 20 / 30 / 40 / 60 / 120 / 240 / 300 / 600
/ 1200 / 1800 / 3600 / 7200 mm/h

Option: external chart speed changeover and switch-off
required (Option "Alarm value monitoring and binary inputs")

Charts

64 m roll chart

Visible diagram length

65 mm

Recording width

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

Chart feed-in

automatic capture of start-of-paper by the take-up reel (daily
chart tear off or complete unwinding is possible)

Power supply

Power supply unit

18...53 V UC / ...75 V DC

85...265 V UC / ...300 V DC

Holding time in case of mains interruption in the range 85...

120 V DC

≥ 2 ms

Frequency range for AC operation

47.5...63 Hz

Power intake

at maximum complement approx. 18 W, 25 VA

Interface RS 485

- for parameter definitions
- for coupling to higher-level systems for bidirectional data
transmission

Option "Alarm value monitoring and binary inputs"

External chart speed changeover

Signal voltage 24 V DC / 6 mA external

Standby

Signal voltage 24 V DC / 6 mA external

Alarm value monitoring

2 Alarm values per channel for absolute value monitoring

2 Alarm values per channel for gradient monitoring

6 internal relays can be freely assigned to the alarm values

Output: NO contact

Contact load: $U_{\max.} = 30$ V, $I_{\max.} = 100$ mA, $\cos\varphi = 1$

14 additional relays available with external I/O converters

Event marking

4 markings possible

Recording for 2 %, 5 %, 95 %, 98 % recording width

Signal voltage 24 V DC / 6 mA external

External measuring range changeover

Signal voltage 24 V DC / 6 mA external

Accounting

4 accounting channels can be used

one freely selectable binary input controls the accounting
interval

Control voltage 24 V DC / 6 mA external

End-of-paper signal

for speeds ≤ 120 mm/h, 2 hours before paper-end

for speeds > 120 mm/h, at least 8 hours before paper-end

Output: freely selectable relay contact

General and safety data

Environmental capabilities

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

Ambient temperature
0...25...50 °C

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

Relative humidity
≤ 75 % annual average
maximum relative humidity ≤ 85 %, avoid condensation
Pay attention to effect of humidity on chart paper according to DIN 16 234

Mechanical capabilities

Tested to DIN IEC 68-2-27 and 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 × 2 cycles

Electromagnetic compatibility

The protection targets of the EMC directive 89/336/EWG on radio interference suppression to EN 55011 and on interference immunity to EN 50 082-2 are met.

Radio interference suppression
Alarm value class B to EN 55 011 or Postal Ordinance 243/92

Interference immunity
Tested to IEC 801 / EN 60 801

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

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

Permissible parasitic voltages

	standard version	universal version
	≤0,3 × measuring span, max. 3 V	≤20 × measuring span max. 3 V
Normal mode rejection	35 dB	72 dB
Common-mode parasitic voltage	60 V DC / 42 V AC	60 V DC / 42 V AC
Common-mode rejection	75 dB	121 dB

Electrical safety

Tested to DIN EN 61 010-1 (classification: VDE 0411) or IEC 1001-1

Protection class
I

Overvoltage category
III at mains input
II at inputs and outputs

Pollution severity
2 in unit and on the terminals

Test voltage
3.75 kV measuring channels to power supply
2.20 kV protective conductor to power supply

Functional extra-low voltage with intrinsical isolation (PELV) to VDE 0100 Part 410 and VDE 0106 Part 101 between mains input – channels, signal leads, interface leads

Connection, Case and Mounting

Electrical connections
Type of protection IP 20
Screw terminals for signal inputs,
Control inputs and alarm value relay outputs
Maximum wire cross-section 2 × 1 mm²
Screw terminals for mains connection
Maximum wire cross-section 1 × 4 mm² or 2 × 1.5 mm²
RS 485 interface with 9-pin Sub-D connector

Case

Sheet steel for panel or rack mounting
(see dimensional diagram)

Case type of protection to DIN 40 050

Front panel including door IP 54
Rear panel IP 20

Case colour

Pebble grey to RAL 7032

Case door

Moulded material
Option: Metal frames with glass

Case fastening

with 2 fasteners (optionally for panel or rack mounting). Maximum grid rod thickness 40 mm, centering bracket is required for installation in rack

Mounting orientation

side inclination -30° ... 0 ... $+30^{\circ}$
back inclination 20°
front inclination 20°

Mounting spacing

horizontal or vertical 0 mm, case door must be opened to 100°

Mass

approx. 5 kg

Default settings

Scales with graduation 0...100 per measuring element

will be supplied if no scale is defined when ordering.

Basic parameter-definition

If no specific parameter-definition is stated when ordering, the recorder will be supplied with the following parameter-definition:

All channels with measuring range 0...20 mA

Chart speed 1 20 mm/h

Chart speed 2 120 mm/h

Alarm values are set to the end positions (0 and 20 mA)

Measured value damping, zoom-, printer- and alarm-value functions are switched off

No password allocation

These parameter presettings can be initialised at any time in the service mode of the recorder.

Basic Standards

International Norms

IEC 68-2-6	Mechanical capabilities (vibrations)
IEC 68-2-27	Mechanical capabilities (shock)
IEC 225-4	1 MHz pulse on mains leads
IEC 529	IP types of protection
IEC 721-3-3	Environmental capabilities
IEC 742	Safety transmitters
IEC 880	Software development
IEC 1000-4	Electromagnetic immunity (measuring method)
IEC 1010-1	Safety of 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 industrial areas
EN 50 082-1	Electromagnetic parasitic immunity in living areas
EN 50 082-2	Electromagnetic parasitic immunity in industrial areas
EN 50 011	Radio interference suppression for ISM units
EN 60 873	Process recorders
EN 132 400	Solid capacitors (Y-capacitors)

German norms

DIN 16 230	Recording paper
DIN 24 420	Spare parts list for mounting
DIN 43 802	Scales
DIN 46 834	Unit fastening
DIN VDE 0100-410	Protection against shock currents
DIN VDE 0106-101	Basic requirements for intrinsic isolation

Packaging for transport or for return to manufacturer

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 (foamed material or similar) for the transportation. The amount of cushioning must be adapted to the weight of the unit 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 desiccant (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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