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Depiction of reference symbols in the text

<Key> Inscription of the keys on the display and operator control unit.

The indications "right", "left", "top" or "bottom" imply that the viewer is looking at the front panel of the instrument unless stated otherwise.

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 microprocessor-controlled continuous-line recorder with 1 to 4 line channels.

The recorder is connected to the transmitter and is to be used for measuring process signals. The measuring channels are electrically separated from each other and unearthed.

Installation and Commissioning

Scope of delivery

The recorder is supplied with the following:

- 1 operating manual
- 2 mounting brackets *Be*
- 1 fibre pen *Fe* for each measuring channel
- 1 pack of fanfold chart *Fp* or 1 roll chart *Sr*
- depending on the order the corresponding number of screw-plug terminals *Sk* and ruler(s).

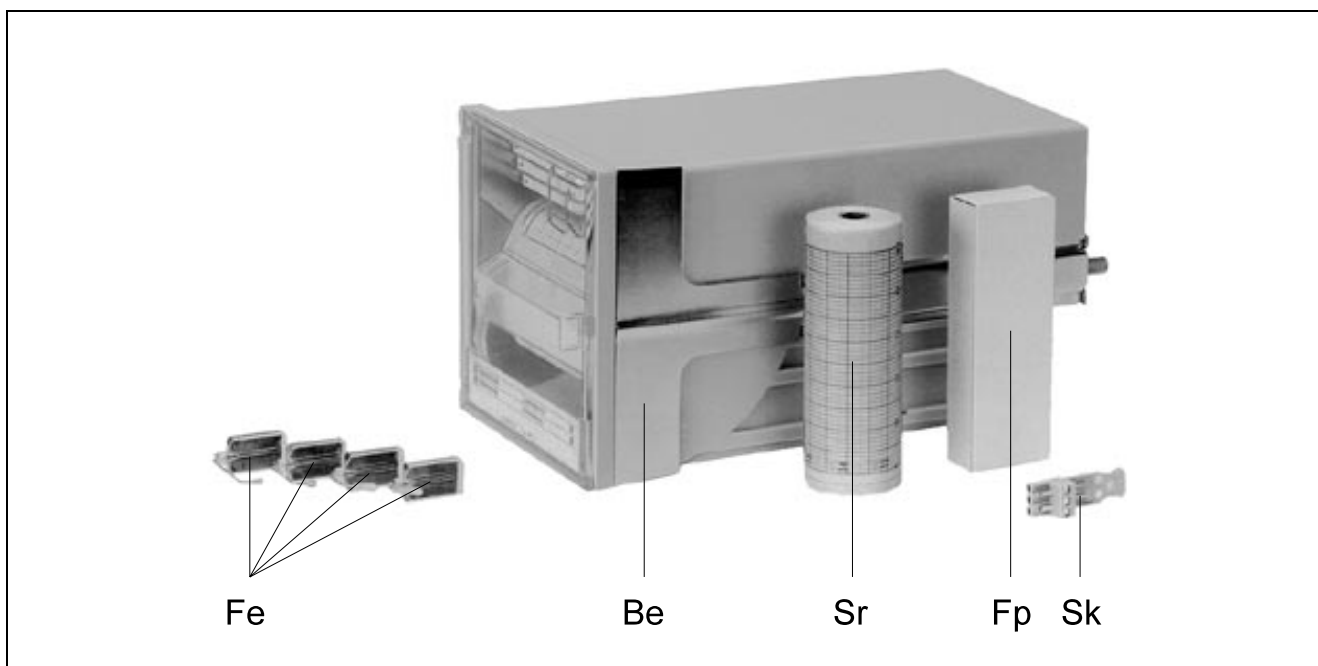


Fig. 1 Scope of delivery
Z-18035
Be Mounting brackets
Fe Fibre pens
Fp Fanfold chart
Sk Screw-plug terminals
Sr Roll chart

1. Mounting location

Mounting orientation

Lateral -30° ... 0° ... $+30^{\circ}$

Inclination backwards 20° , forwards 20°

Ambient temperature

0° ... 50° °C

Relative humidity

$\leq 75\%$ annual average, max. relative humidity $\leq 85\%$ during operation. Avoid condensation!

2. Mounting

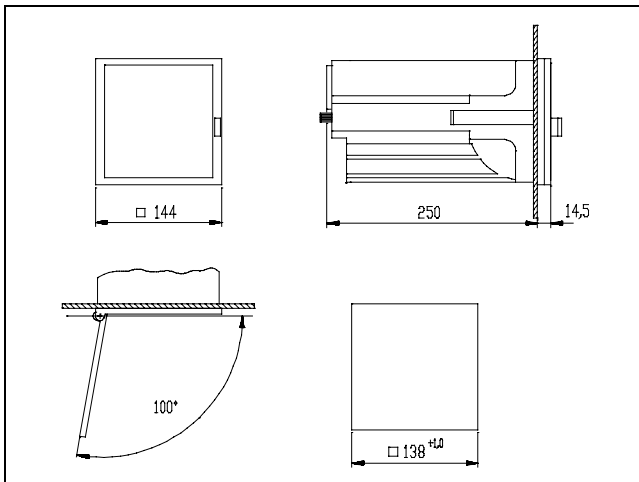


Fig. 2 Dimensional drawing (dimensions in mm)
Z-17464 left bottom: panel cutout

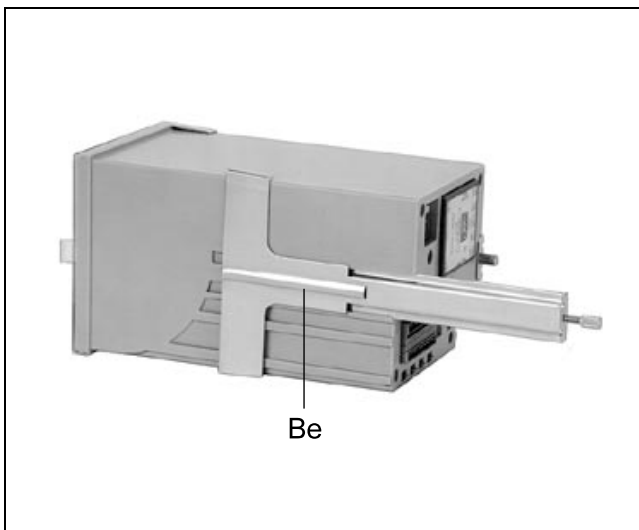


Fig. 3 Mounting the brackets
Z-17539 *Be* Mounting bracket

Mounting in panels

1. Fit the instrument into the panel from the front.
2. Fit mounting brackets *Be* laterally into the fitting notches on the case (see fig. 3).

Note

The mounting brackets *Be* are designed for close-packed horizontal and vertical mounting.

3. Align the mounting brackets *Be* vertically and tighten them equally.

Mounting in rack

1. Fasten 4 centering brackets.
2. Fit mounting brackets *Be* laterally into the fitting notches on the case (see fig. 3).
3. Align the mounting brackets *Be* vertically and tighten them equally.

3. Connecting the instrument

⚠ Caution

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

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

The unit may only be operated when properly installed.

Install a mains switch, with adequate switching capacity, within the reach of the mounting site so that the unit can be disconnected at all poles from the mains. The protective action of the protective conductor must not be negated.

- The current signals are connected at terminals 0.1 (-) and 0.2 (+).
- The voltage signals are connected at terminals 0.1 (-) and 0.3 (+).

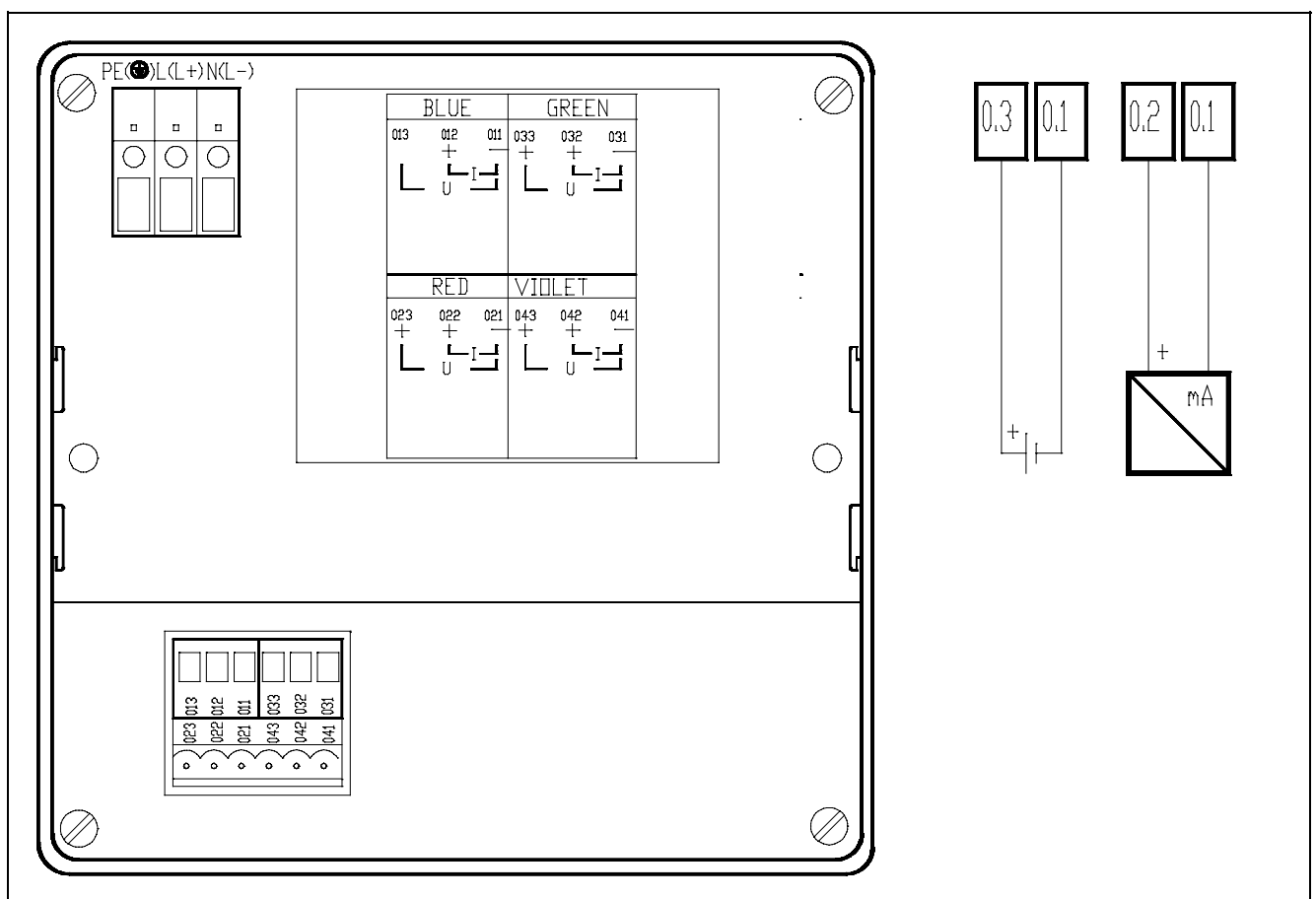


Fig. 4 Back panel and (on the right) screw-plug terminals
 Z-17962 “.” = 1 for channel blue, “.” = 3 for channel green,
 Z-17963 “.” = 2 for channel red, “.” = 4 for channel violet

Connecting the input signal

- Fasten signal lines (max. cross section $2 \times 1 \text{ mm}^2$) at the screw-plug terminals.

Connecting the power supply

- Fasten power supply lines (max. cross section $1 \times 4 \text{ mm}^2$ or $2 \times 1.5 \text{ mm}^2$) at the screw-plug terminals. The cross section of the protective conductor must at least be equal to the cross section of the power supply line.

4. Fitting the chart

Chart unit for roll chart

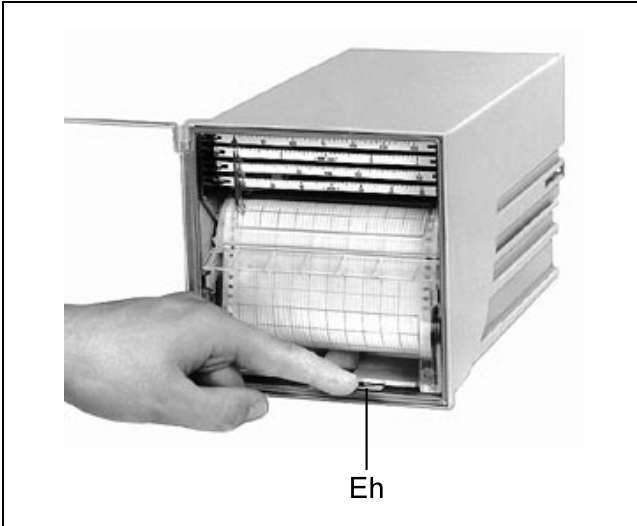


Fig. 5 Unlocking the chart unit
Z-17540 Eh Unlocking lever

1. Unlock chart unit: Press unlocking lever *Eh* (see fig 5). Chart unit swings forwards. Remove chart unit in the direction of the arrow.
2. Open out pressure plate flap *Pa*.
3. Insert roll chart into the chart storage recess *Pm*.
4. Pull the chart beginning forwards to the sprocket wheel and engage the perforation with the sprocket wheel, making sure that the chart is parallel to the sprocket wheel.
5. Close the pressure plate flap *Pa*.
6. Open out the chart guide flap *Pf*.
7. Fit take-up roll *Ar* if necessary.
8. Close the chart guide flap *Pf*.

Note

Having installed the chart unit in the recorder, the chart unit winds itself automatically onto the take-up roll.

9. Fit chart unit in the chassis until it engages.

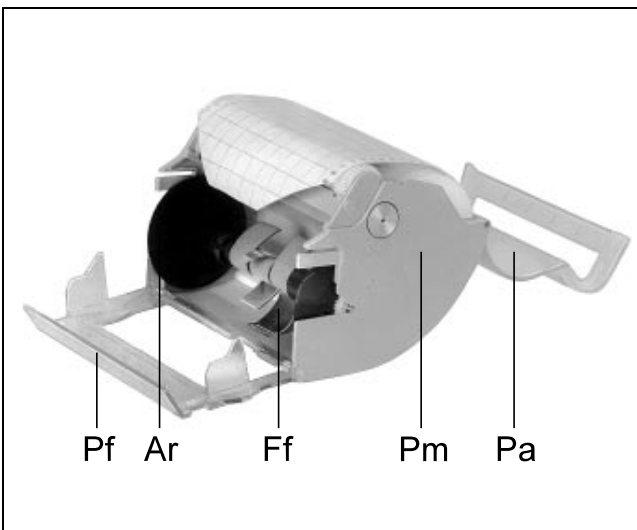


Fig. 6 Chart unit for roll chart
Z-17668 Ar Take-up roll
Ff Guide spring
Pa Pressure plate flap
Pf Chart guide flap
Pm Chart storage recess

Chart unit for fanfold chart

(see fig.s 5 and 7)

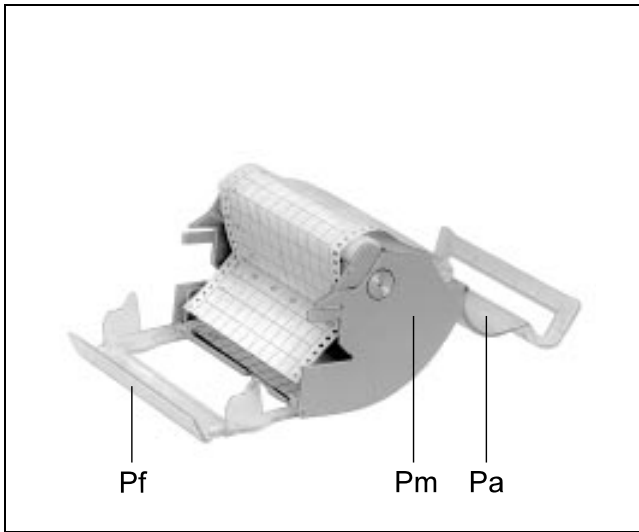


Fig. 7 Chart unit for fanfold chart
Z-17669 *Pa* Pressure plate flap
Pf Chart guide flap
Pm Chart storage recess

Remove the guide spring *Ff* and Take-up roll *Ar* when converting the roll chart unit to the fanfold chart (see fig. 6).

1. Unlock chart unit: Press unlocking lever *Eh* (see fig 5). Chart unit swings forwards. Remove chart unit in the direction of the arrow.
2. Open out pressure plate flap *Pa*.
3. Insert roll chart into the chart storage recess *Pm*.
4. Open out the chart guide flap *Pf*.
5. Pull the chart beginning forwards to the sprocket wheel and engage the perforation with the sprocket wheel. Two fanfold sheets must rest in the tray. Make sure that the chart is parallel to the sprocket wheel.
6. Close the pressure plate flap *Pa*.
7. Close the chart guide flap *Pf*.
8. Fit chart unit in the chassis until it engages.

5. Fitting the fibre pen

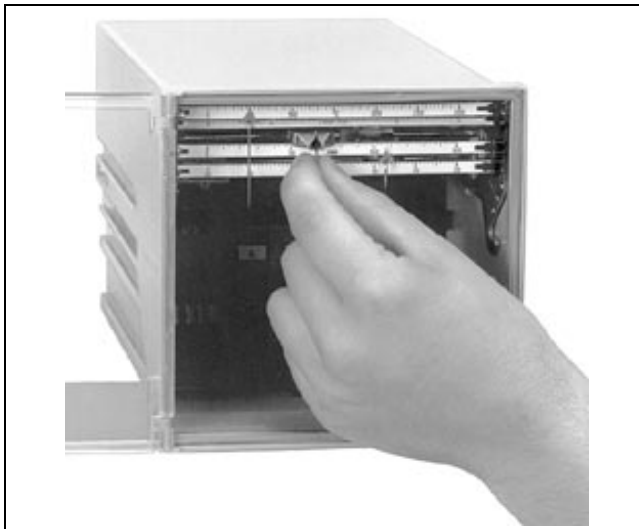


Fig. 8 Fitting the fibre pen
R-17670

1. Push scales upwards.
2. Fit fibre pen according to fig. 8.

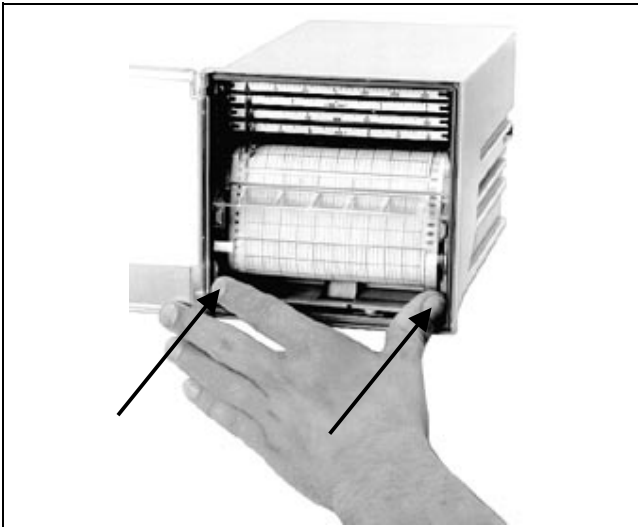
6. Switching on the unit

⚠ Caution

Before switching on, make sure that the operating voltage of the unit (see rating plate) corresponds to the voltage of the power supply.

Install a mains switch, with adequate switching capacity, within the reach of the mounting site so that the unit can be disconnected at all poles from the mains. The protective action of the protective conductor must not be negated.

7. Positioning the chart



1. Press the lower handle strips of chart unit towards the back. The chart is transported faster downwards.
2. Let go the handle strips once the green baseline has been reached.

Fig. 9 Positioning the chart
Z-17672

Operation

Removing the chart



Fig. 10 Removing the chart
R-17673

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

Chart unit for chart

1. Open the chart guide flap downwards.
2. Remove take-up roll.
3. If necessary, tear off the chart at the perforation.

Chart unit for fanfold chart

1. Open the chart guide flap downwards.
2. Remove the fanfold pack.
3. If necessary, tear off the chart at the fold.

Note

Two fanfold sheets must rest in the tray.

Withdrawing chart paper from take-up roll



Fig. 11 Withdrawing chart from take-up roll
R-17674

1. Rotate flange without drive pinion by 45° and pull from take-up roll.
2. Hold chart as shown in Fig. 11 and remove from axis.
3. Replace right flange and secure by rotating by 45°.
4. Fit take-up roll into chart unit. The drive pinion must be on the right hand side.
5. Close chart guide flap.

Changing the chart speed

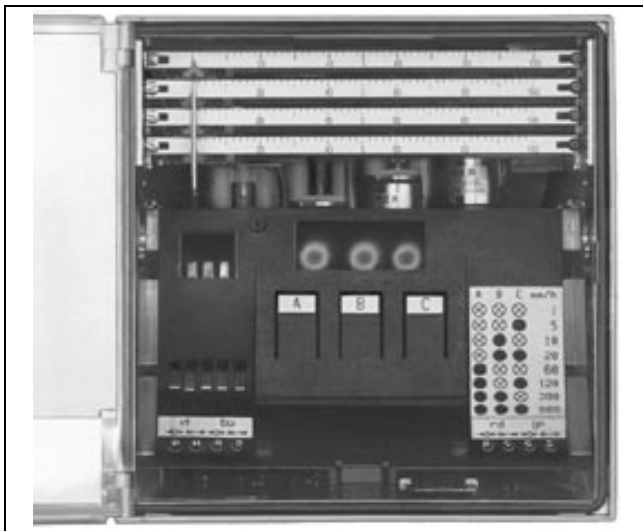


Fig. 12 Changing the chart speed

R-18036

The chart speed can be changed with keys <A>, and <C> of the display and operator control unit. The assigned LEDs are switched on and off with these keys. The combination of LED - states indicate that the chart speed is active (see plate).

1. Unlock the chart unit: Press unlocking lever *Eh* downwards (see fig. 5). Chart unit swings forwards.
2. Remove the chart unit.
3. Select chart speeds with keys <A>, and <C>.

Note

The basic setting for the chart speed is 20 mm/h.

4. Replace chart unit.

Selecting the response time

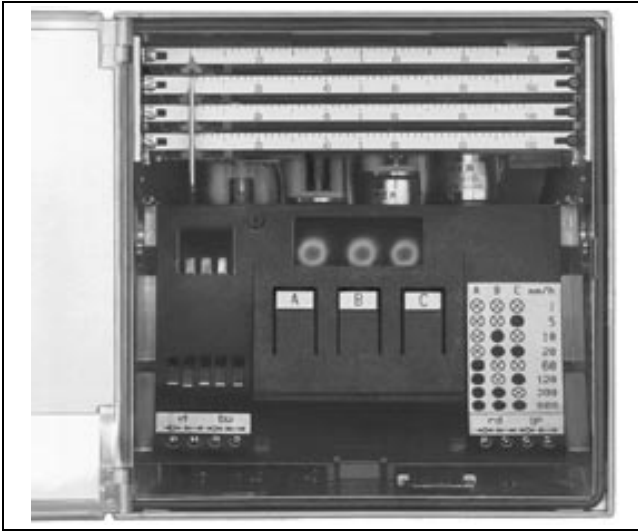


Fig. 13 Selecting the response time
R-18036

The response time of the measuring elements can be selected for each channel. The response time is defined as the time which the measuring system requires to travel from 10 % to 90 % of scale length in case of step-shaped change of the measured signal from 0 % to 100 %.

The adjusting action of recorder is linear. On selecting the response time the rotational speed of the system motor changes.

1. Unlock the chart unit: Push the unlocking lever *Eh* downwards (see fig. 5). Chart unit springs forward.
2. Remove chart unit.
3. Press keys <A> and <C> of the display and operator control unit simultaneously: LED above key <A> flashes slowly.

Legend:

	LED off
	LED on
	LED flashes slowly
	LED flashes rapidly

Selecting channel

4. Select measuring channel with keys and <C>.

A	B	C	
			Channel violet
			Channel blue
			Channel red
			Channel green

5. Press again key <A> of the display and operator control unit: LED above key <A> flashes rapidly.
6. Select response time with keys and <C>. The following response times can be selected:

The basic setting of the response time is 2 s for all channels.

A	B	C	
			2 s
			5 s
			20 s
			60 s

7. Press key <A>: the selected response time is saved. The LED above key A flashes slowly.
8. Select the next channel. Repeat steps 4 and 5.
9. Press keys <A> and <C> simultaneously. The LEDs indicate the active chart speed.
10. Replace chart unit.

Retrofitting

⚠ Caution

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.

Changing measuring ranges

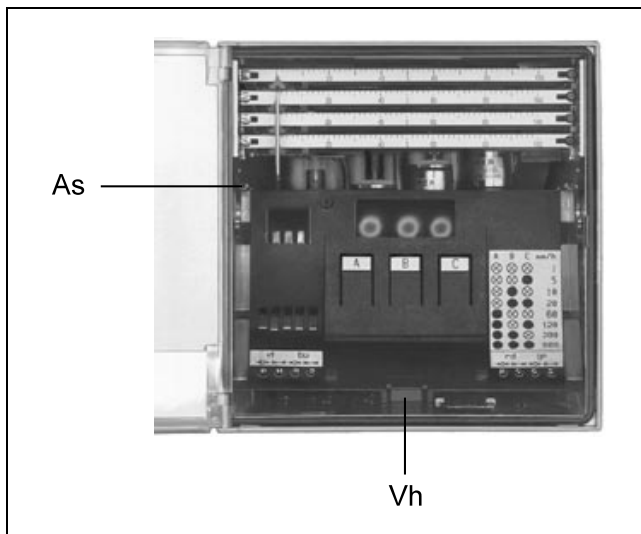


Fig. 14 As Retaining screw
Z-18036/1 Vh Locking lever

The recorder is delivered with 2 measuring range settings.

- 0...20 mA / 0...10 V for all channels
- 4...20 mA for all channels

In the case of measuring range changeover the hardware must be matched using plug-in jumpers:

1. Unlock the chart unit: press unlocking lever *Eh* downwards (see fig. 5). Chart unit swings forwards.
2. Remove chart unit.
3. Lift the locking lever *Vh* (see fig. 14) and simultaneously pull forward the module.
4. Pull out the EC unit as far as possible so that the plug-in jumpers become easily accessible (see fig. 15).
5. Plug in jumpers for measuring ranges 0...20 mA and 0...10 V. Remove jumpers for measuring range 4...20 mA.
6. Push in the EC unit.
7. Replace chart unit.

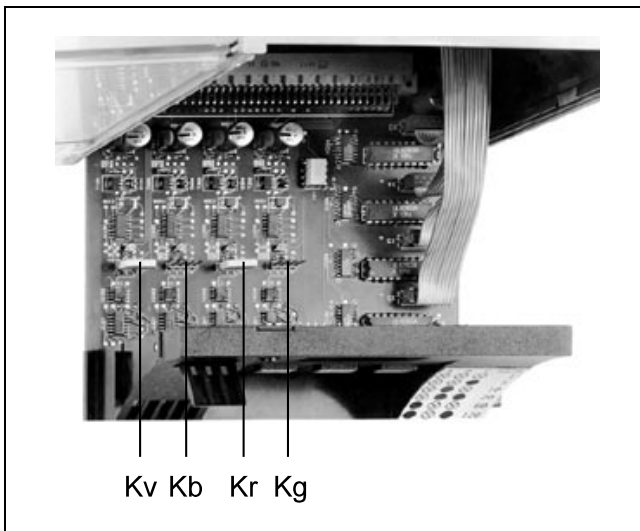


Fig. 15 Pulled out EC unit. Arrangement of plug-in jumpers and their channel assign.
Z-18037

Kg channel green
Kr channel red
Kb channel blue
Kv channel violet

Adjusting the zero and balancing the span

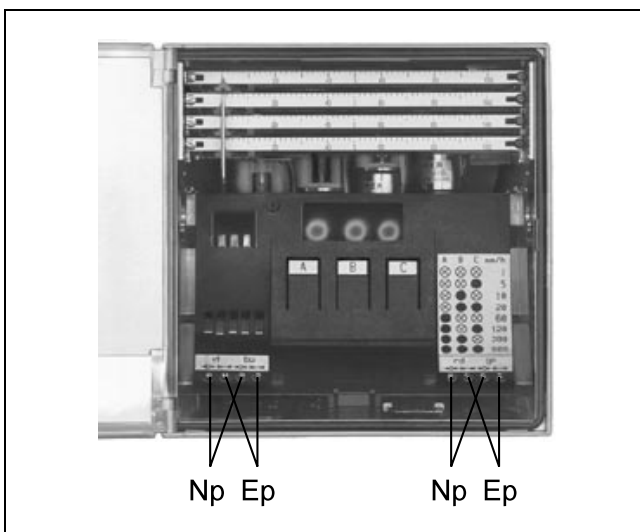


Fig. 16 Display and operator control unit with potentiometers
Z-18036/2

Two potentiometers each (below left) are accessible in the display and operator control unit for the violet and blue channels.

Two potentiometers each (below right) are accessible in the display and operator control unit for the red and green channels.

The left potentiometer is used to balance the zero setting, and the right potentiometer to balance the span (see fig. 16). For setting the zero, a bipolar current or voltage is required.

1. Connect power supply of recorder and switch on.
2. Connect sensor and supply the lower range value.
3. Set recording tip to zero reference line of paper using current voltage source.
4. Adjust scale pointer to the initial value.
5. Set current voltage source to lower range value.
6. Unlock chart unit: Push unlocking lever *Eh* downwards (see fig. 5). Chart unit swings forwards.
7. Remove chart unit.
8. Use zero potentiometer to set tip of indicator to the start of scale.
9. Predefine measuring range final value with current voltage source.
10. Use final value potentiometer to set end of scale.
11. Replace chart unit.

Replacing scales

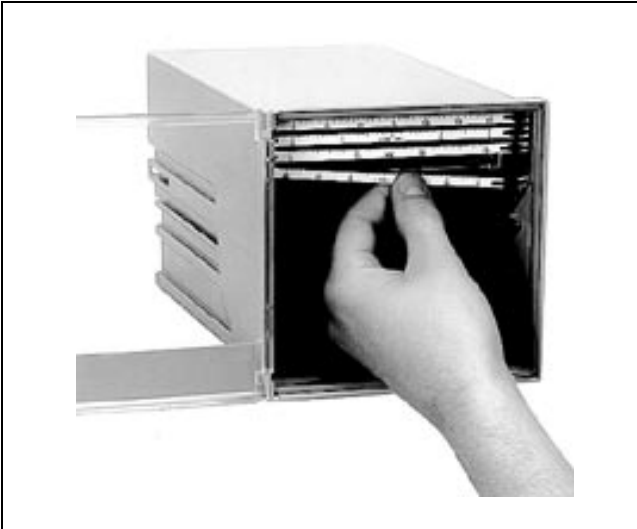


Fig. 17 Replacing scales
Z-17675

1. Remove fibre pens and print unit.
2. Undo the scale screws on the left.
3. Push scales to the right and disengage from scale screw.
4. Remove the scales by pulling them to the left.
5. Reinstall scales working in the opposite order.
6. Fit in the fibre pen.
7. Check the measuring system zero with the start of scale. See "Adjusting the zero and balancing the span".

Replacing the measuring point name plate



Fig. 18 Replacing the measuring point name plate
Z-17676

Simply pull out the flexible measuring point designation plate and fit a new one.

Maintenance

⚠ Caution

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 fuses



Fig. 19 Replacing fuse *Si*
Z-18038

⚠ Caution

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short-circuiting of fuse-holder are prohibited.

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.

1. Unscrew the fuse holder.
2. Replace fuse *Si*.
3. Screw back the fuse holder.

Fuse rating

230 V	T	0.315 L
115 V	T	0.315 L
24 V	M	1.6 E

Technical data

Measuring section

Measuring deviation
Class 0.5 according to IEC 484

Dead zone
0.25 % of span

Response time (selectable per measuring channel)
2 s, 5 s, 20 s, 60 s

Measurement variable / nominal ranges

Direct current
0...20 mA $R_i = 40 \Omega$
4...20 mA $R_i = 50 \Omega$

Direct voltage
0...10 V $R_i = 500 \text{ k}\Omega$

Effects

Influence of temperature
0.2 % / 10 K

Influence of supply voltage
0.1 % for 24 V DC $\pm 20 \%$
0.1 % for 24 V AC $+10 \%$ / -15%
0.1 % for 115 V AC $+10 \%$ / -15%
0.1 % for 230 V AC $+10 \%$ / -15%

Influence of AC parasitic voltages
 $\leq 0.5 \%$ of span

Influence of external magnetic field 1 mT
 $\leq 0.5 \%$ of span

Influence at mechanical stress
during and after the effect $\pm 0.5 \%$ of the span

Recording section

Scale
one graduation per measuring system
scale plate width 5 mm
character height 2 mm

Recording

fibre pen with ink reservoir
content approx. 1.4 ml, length of line approx. 1300 m
distance between tips of fibre-tip recording pens 2 mm

Arrangement of the measuring systems and colour assignment:



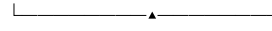

	Number of line channels			
	1	2	3	4
 green			x	x
 red			x	xx
 blue	x	x	x	x
 violet				x

Chart speed
chart speeds 1; 5; 10; 20; 60; 120; 300 and 600 mm/h
selectable in the display and operator control unit

Chart
32 m roll chart or 16 m fanfold chart

Visible diagram length
60 mm

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

Chart feed-in (with roll chart)
via automatic catch of fresh paper by take-up reel. Capacity of take-up reel 32 m.

Power supply

UC power supply unit

24 V AC/DC $\pm 20 \%$

Power consumption
at max. complement approx. 15 W / 20 VA

AC power supply unit

24 AC / 115 AC / 230 V AC, $+10 \%$ / -15%

Frequency range
47.5...63 Hz

Power consumption
at max. complement approx. 20 W / 25 VA

General and Safety Data

Environmental capabilities

Climate class
3K3 according to DIN IEC 721-3-3

Ambient temperature
0...25...50 °C

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

Relative humidity
75 % annual average, max. relative humidity $\leq 85 \%$ during operation. Avoid condensation!

Note effect of atmospheric humidity on the chart paper according to DIN 16 234.

Mechanical features

Tested

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

Transport

Impact 30g / 18 ms
Vibration 2g / 5...150 Hz

In function

Vibration 0.5g / ±0.04 mm / 5...150 Hz / 3 × 2 cycles

Electromagnetic compatibility

The protection targets of the EMC directive 89/336/EEC with regard to radio interference suppression to EN 55 011 and to interference resistance acc. to EN 50 082-2 are met.

Radio interference suppression

limit class B according to EN 55011 or Post Office Ordinance 243/92

Immunity to interference

tested according to IEC 801

Type of test	Test severity	Effect	Severity degree
Burst (5/50 ns) on main line measuring lead	2 kV 2 kV	≤1% ≤1%	3 3
Surge (1,2/50 s) on mains lead common mains lead differential	2 kV 1 kV	≤1% ≤1%	3 2
HF field radiated 80 MHz...1 GHz lead routing 0,15... 80 MHz	10 V/m 10 V	≤1% ≤1%	3 3
1 MHz puls on mains lead common mains lead differential	2 kV 1 kV	≤1% ≤1%	3 3
ESD (1/30 ns)	6 kV	≤1%	3

The NAMUR industrial standard EMC is fulfilled.

Permitted interference voltages

	Permissible interference parasitic voltage
Serial interference peak-to-peak	≤0.3 × span max. 3 V
Normal-mode rejection	35 dB
Common-mode parasitic voltage	60 V DC / 250 V AC
Common-mode rejection	83 dB for DC 96 dB for AC

Electrical safety

Tested

according to DIN EN 61 010-1 (Classification VDE 0411) or IEC 1010-1

Class of protection

I

Overvoltage category

III at mains input
II for inputs

Degree of contamination

2 in unit and at the input terminals

Test voltage

3.75 kV measuring channels to power supply
2.2 kV protective conductor to power supply

Connection, case and mounting

Electrical connections

Degree of protection IP 20
Threaded-head terminals for control inputs
Max. wire cross-section 2 × 1 mm²
Screw-plug terminals for mains connection
Max. wire cross-section 1 × 4 mm² or 2 × 1.5 mm²

Case

Moulded plastic for panel or rack (dimensions see fig. 2)

Degree of case protection according to IEC 529

Front IP 54
Reserve IP 20

Colour of case

pebble grey according to RAL 7032

Case door

Moulded material
Option: Metal frame door with glass pane nonreflecting

Mounting of case
with 2 mounting brackets (optionally for panel or rack), for rack mounting centering brackets required. Max. width of grid rod = 40 mm.

Mounting orientation
Lateral -30° ... 0° ... $+30^{\circ}$
Inclination backwards 20°
Inclination forwards 20°

Mounting distance
horizontally or vertically 0 mm, case door must open at a 100° angle.

Mass
approx. 3 kg

Fulfilled standards or norms

International Standards

IEC 484	DIN 43 782	potentiometric recorders
IEC 1010-1	DIN EN 61 010-1	electrical safety (test voltages)
IEC 664	VDE 0110	overvoltage category degree of contamination
IEC 68-2-6	DIN IEC 68-2-6	mechanical features (vibrations)
IEC 68-2-27	DIN IEC 68-2-27	mechanical features (shock)
IEC 529	DIN 40 050	degree of case protection
IEC 801 EN 60 801	DIN VDE 0843	immunity to electromagnetic interference
IEC 721-3-3	DIN IEC 721-3-3	ambient climatic conditions
IEC 742	DIN EN 60 742	classification VDE 0551 safety transformer

German norms

DIN 43 802	Scales
DIN 16 234	Chart paper
DIN 43 831	Case

Packaging for transport or for return to manufacturer

Remove the fibre-tip inserts when transporting.

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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