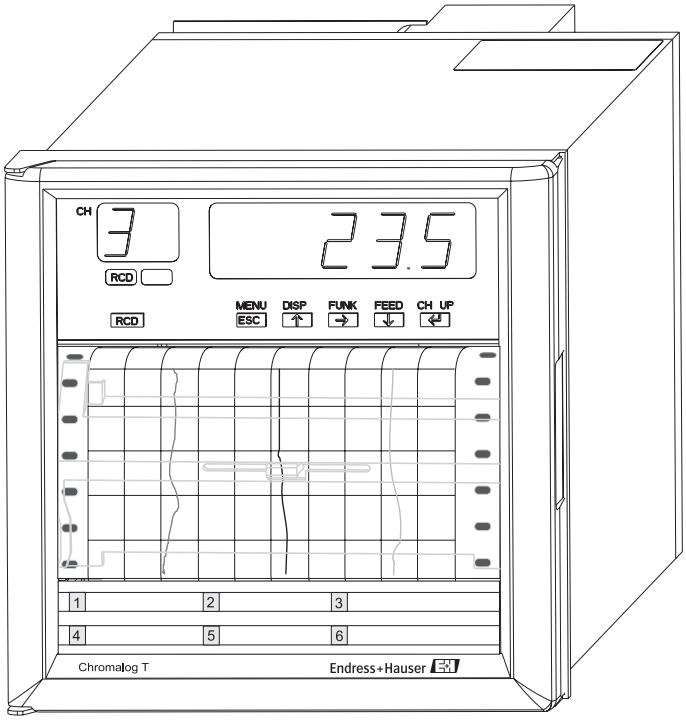
Level Pressure Flow Temperature Liquid Analysis Registration Systems Components Services Solutions

Operating Instructions

Chromalog T

Strip chart recorder



BA232R/09/en/12.08
Nr. 71028288

Endress+Hauser

People for Process Automation

Brief overview

For quick and easy commissioning:

Safety instructions	→ page 4
▼	
Installation	→ page 9
▼	
Wiring	→ page 12
▼	
Display and operating elements	→ page 17
▼	
Commissioning	→ page 20
■ Instrument configuration ■ Parameter configuration ■ Setting the basic function ■ Recording/displaying data	

Notes

- The contents of this manual are subject to change without prior notice as a result of continuing improvements to the instrument's performance and functions.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors, please contact your nearest dealer.
- Copying or reproducing all or any part of the contents of this manual without the permission of us is strictly prohibited.

Table of contents

1 Safety instructions

The general safety precautions described here must be observed during all phases of operation.

Safety standards and EMC standards
This recorder conforms to IEC safety class I (provided with terminal for protective grounding), Installation category II, Measurement category II (CAT II), and EN61326-1 (EMC standard), class A (use in a commercial, industrial, or business environment). This recorder is designed for indoor use.

1.1 Designated use

- This product is not designed or manufactured to be used in critical applications that directly affect or threaten human lives.
- Such applications include nuclear power equipment, devices using radioactivity, railway facilities, aviation equipment, air navigation facilities, aviation facilities, and medical equipment. If so used, it is the user's responsibility to include in the system additional equipment and devices that ensure personnel safety.

1.2 Installation, commissioning and operation

About this manual
- This manual should be read by the end user.
- Read this manual thoroughly and have a clear understanding of the product before operation.
- This manual explains the functions of the product. We do not guarantee that the product will suit a particular purpose of the user.
- Under absolutely no circumstances may the contents of this manual be transcribed or copied, in part or in whole, without permission.
- The contents of this manual are subject to change without prior notice.
- Every effort has been made in the preparation of this manual to ensure the accuracy of its contents. However, should you have any questions or find any errors or omissions, please contact your nearest dealer.

Precautions related to the protection, safety, and alteration of the product
- For the protection and safe use of the product and the system controlled by it, be sure to follow the instructions and precautions on safety that are stated in this manual whenever you handle the product. Take special note that if you handle the product in a manner that violate these instructions, the protection functionality of the product may be damaged or impaired. In such cases, we do not guarantee the quality, performance, function, and safety of the product.
- When installing protection and/or safety circuits such as lightning protection devices and equipment for the product and control system or designing or installing separate protection and/or safety circuits for fool-proof design and fail-safe design of the processes and lines that use the product and the control system, the user should implement these using additional devices and equipment.
- If you are replacing parts or consumable items of the product, make sure to use parts specified by us.
- Do not modify this product.

Warning!

Power supply
Ensure that the source voltage matches the voltage of the power supply before turning ON the power.

Protective grounding
Make sure to connect the protective grounding to prevent electric shock before turning ON the power.

Necessity of protective grounding
Never cut off the internal or external protective earth wire or disconnect the wiring of the protective earth terminal. Doing so invalidates the protective functions of the instrument and poses a potential shock hazard.

Defect of protective grounding
Do not operate the instrument if the protective earth or fuse might be defective. Make sure to check them before operation.

Do not operate in an explosive atmosphere
Do not operate the instrument in the presence of flammable liquids or vapors. Operation in such environments constitutes a safety hazard.

Do not remove covers
The cover should be removed by our qualified personnel only. Opening the cover is dangerous, because some areas inside the instrument have high voltages.

External connection
Connect the protective grounding before connecting to the item under measurement or to an external control unit.

Damage to the protective structure
Operating the recorder in a manner not described in this manual may damage its protective structure.

1.3 Operational safety

Exemption from responsibility
- We assume no liability to any party for any loss or damage, direct or indirect, caused by the user or any unpredictable defect of the product.

Handling precautions
- Use care when cleaning the recorder, especially any plastic parts. When cleaning, wipe using a dry soft cloth. Do not use chemicals such as benzene or thinner, since these may cause discoloring and deformation.
- Keep electrically charged objects away from the signal terminals. This may damage the recorder. Do not apply volatile chemicals to the door glass, display, panel keys, etc. Do not allow rubber and vinyl products to remain in contact with the recorder for long periods of time. This may damage the recorder.
- When not in use, make sure to turn OFF the power supply source.
- If there are any symptoms of trouble such as strange odors or smoke coming from the recorder, immediately turn OFF the power supply source. Then contact your nearest dealer.

Technical improvement
The manufacturer reserves the right to adapt technical data to the most up-to-date technical developments without any special announcement. Ask your supplier for information about activities and possible extensions to these operating instructions.

1.4 Return

The following measures must be taken before you return a measuring unit, e.g. for repair or calibration:
- The unit must be packed in protective packaging. The original packaging offers the best protection.

1.5 Notes on safety conventions and icons

How to use this manual
The following markings are used in this manual.

Warning!
Calls attention to actions or conditions that could cause serious or fatal injury to the user, and precautions that can be taken to prevent such occurrences.

Improper handling or use can lead to injury to the user or damage to the instrument. This symbol appears on the instrument to indicate that the user must refer to the user's manual for special instructions. The same symbol appears in the corresponding place in the user's manual to identify those instructions. In the manual, the symbol is used in conjunction with the word "WARNING" or "CAUTION."

Caution!
Calls attentions to actions or conditions that could cause light injury to the user or damage to the instrument or user's data, and precautions that can be taken to prevent such occurrences.

Note!
Calls attention to information that is important for proper operation of the instrument.

Precautions related to the protection, safety, and alteration of the product
The following safety symbols are used on the product and in this manual.

Warning!
"Handle with care." To avoid injury and damage to the instrument, the operator must refer to the explanation in the manual.

Protective ground terminal

~ AC

High temperature!
To avoid injury caused by hot surface, do not touch locations where this symbol appears.

2 Identification

2.1 Device designation

2.1.1 Nameplate

A name plate (→ Fig. 1, Pos. 1) is affixed to the case. Check that the model name and suffix code given on the name plate on the upper panel match those on your order.

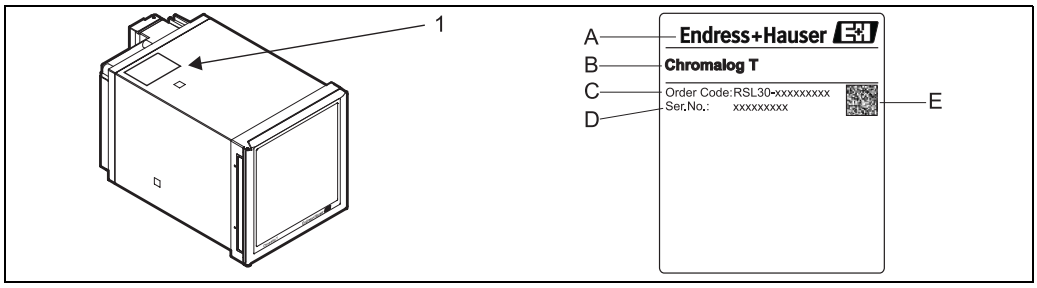


fig. 1: Name plate position on the recorder

1: Nameplate
A: Manufacturer
B: Type
C: Order code
D: Serial No.
E: 2D code

2.1.2 Product structure

Chromalog T Paper recorder z-fold paper 16 m; Universal input U, I, TC, RTD; Channel display + status display; Measurement value recording, analog; Input galvanically insulated; Approval: CSA

	Version:						
	1	1-channel strip chart recorder; Recording speed adjustable: 10...3600 mm/h (0.39...141.7 inch/h)					
	3	3-channel strip chart recorder; Recording speed adjustable: 10...3600 mm/h (0.39...141.7 inch/h)					
	6	6-channel dotting recorder; Recording speed adjustable: 10...1200 mm/h (0.39...47.2 inch/h)					
		Power supply:					
		1	115/230 V AC, 50/60 Hz				
			Display:				
			A	LED, 5-digit			
				Housing:			
				A	Panel 144 x 144 mm (5.67 x 5.67 inch), depth 220 mm (8.66 inch)		
					Operation manual:		
					A	German	
					B	English	
RSL30-		**1**	**A**	**A**		⇒ **Order code**	

2.2 Scope of delivery

Unpack the box and check the contents before operating the instrument. If some of the contents are not correct or missing or if there is physical damage, contact the dealer from which you purchased them.

Standard accessories

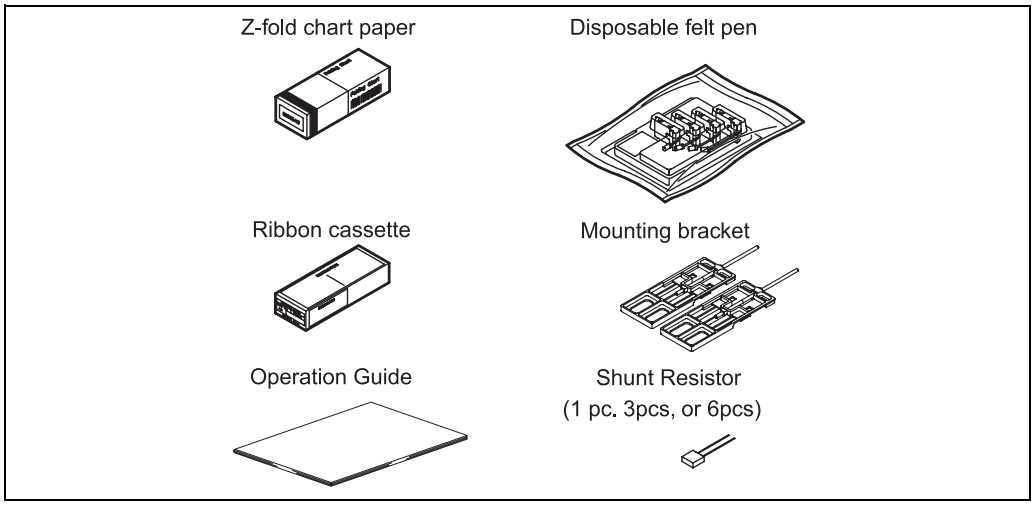


fig. 2: Standard accessories

Optional accessories (sold separately)

The optional accessories are available for purchase separately, → Chapter 8. If you make an order, make sure that all contents are present and undamaged. For information about ordering accessories, contact the dealer from which you purchased the recorder.

Removing the packing materials

Open the door, put your finger on the tab at the lower left of the display and key panel section, and open the display and key panel section.

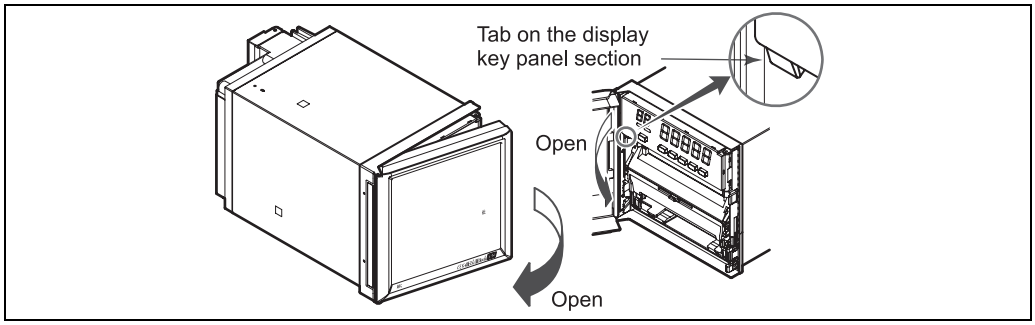


fig. 3: Remove all packing materials.

Caution!
To protect the hinges, do not apply vertical force on the display and key panel section.

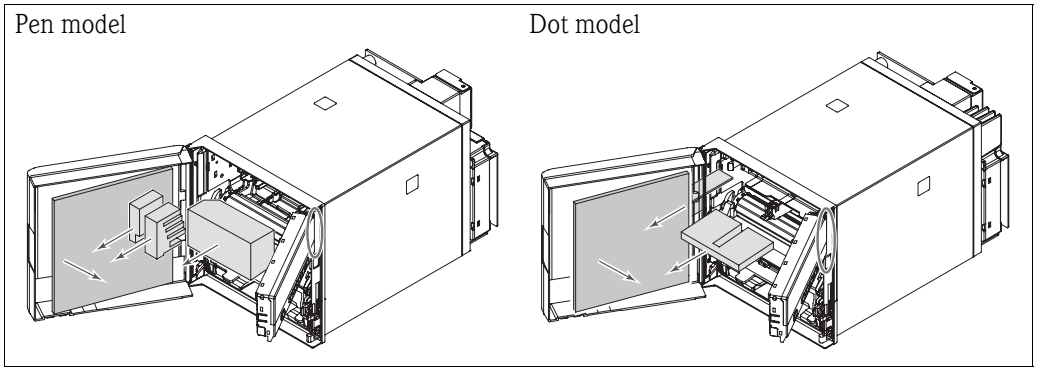


fig. 4: Remove the transportation lock.

2.3 Trademarks

- Adobe, Acrobat, and PostScript are trademarks of Adobe Systems Incorporated.
- For purposes of this manual, the TM and ® symbols do not accompany their respective trademark names or registered trademark names.
- Company and product names that appear in this manual are trademarks or registered trademarks of their respective holders.

2.4 Certificates and approvals

An overview of all certificates and approvals can be found in → Chapter 10 'Technical data'.

3 Installation

3.1 Installation conditions

3.1.1 Dimensions

The dimensions of the device can be found in → Chapter 10 'Technical data'.

3.1.2 Installation location

Install the recorder indoors in a location that meets the following conditions:

- Instrument panel
  The recorder is designed for panel mounting.
- Well-ventilated location
  To prevent overheating, install the recorder in a well-ventilated location. For the panel cut dimensions when arranging multiple recorders, see the next page. Follow the panel cut dimensions providing adequate space between instruments when other instruments are arranged on the panel.
- Minimum mechanical vibrations
  Choose an installation location with the minimum mechanical vibration. Installing the recorder in a location with large mechanical vibration not only causes adverse effects on the mechanism but also may hinder normal recording.
- Horizontal
  Install the recorder horizontally (however, the recorder can be inclined up to 30 ° backwards for panel mounting, see Fig. 5).

Note!
- Condensation may occur if the recorder is moved to another place where both the ambient temperature and humidity are higher, or if the temperature changes rapidly. In addition, measurement errors will result when using thermocouples. In this case, let the recorder adjust to the new environment for at least one hour before using it.
- The chart paper may be adversely affected by a rapid change in the ambient temperature and humidity.

Do not install the recorder in the following places:

- Outdoors
- In direct sunlight or near heat sources.
  Install the recorder in a place with small temperature fluctuations near room temperature at approx. 23 °C (73.4 °F). Placing the recorder in direct sunlight or near heat appliances can cause adverse effects on the internal circuitry.
- Where an excessive amount of soot, steam, moisture, dust, or corrosive gases are present.

Soot, steam, moisture, dust, and corrosive gases will adversely affect the recorder. Avoid such locations.

- Near strong magnetic field sources.
  Do not bring magnets or instruments that produce electromagnetic fields close to the recorder. Operating the recorder in strong magnetic fields can cause errors in the measurements.

3.2 Installation

The recorder should be mounted on a steel panel of thickness 2 mm to 26 mm (0.08 to 1.02 inch).

1. Insert the recorder from the front side of the panel (→ Fig. 5).
2. Mount the recorder to the panel using the mounting brackets that come with the package.
   – Use two brackets to support the top and bottom or the left and right sides of the case (remove the seal that is covering the holes for the mounting brackets beforehand).
   – The proper torque for tightening the mounting screws is 0.7 to 0.9 Nm.
   – Mount the recorder to the panel according to the procedure below.
   First, attach the two mounting brackets and temporarily fasten the attachment screws. Next, fix the recorder in place by tightening the attachment screws with the appropriate torque. When the recorder is approximately perpendicular to the panel as you fasten the screws, press the mounting bracket against the case so that they are in contact with each other.

3.2.1 Panel cutout

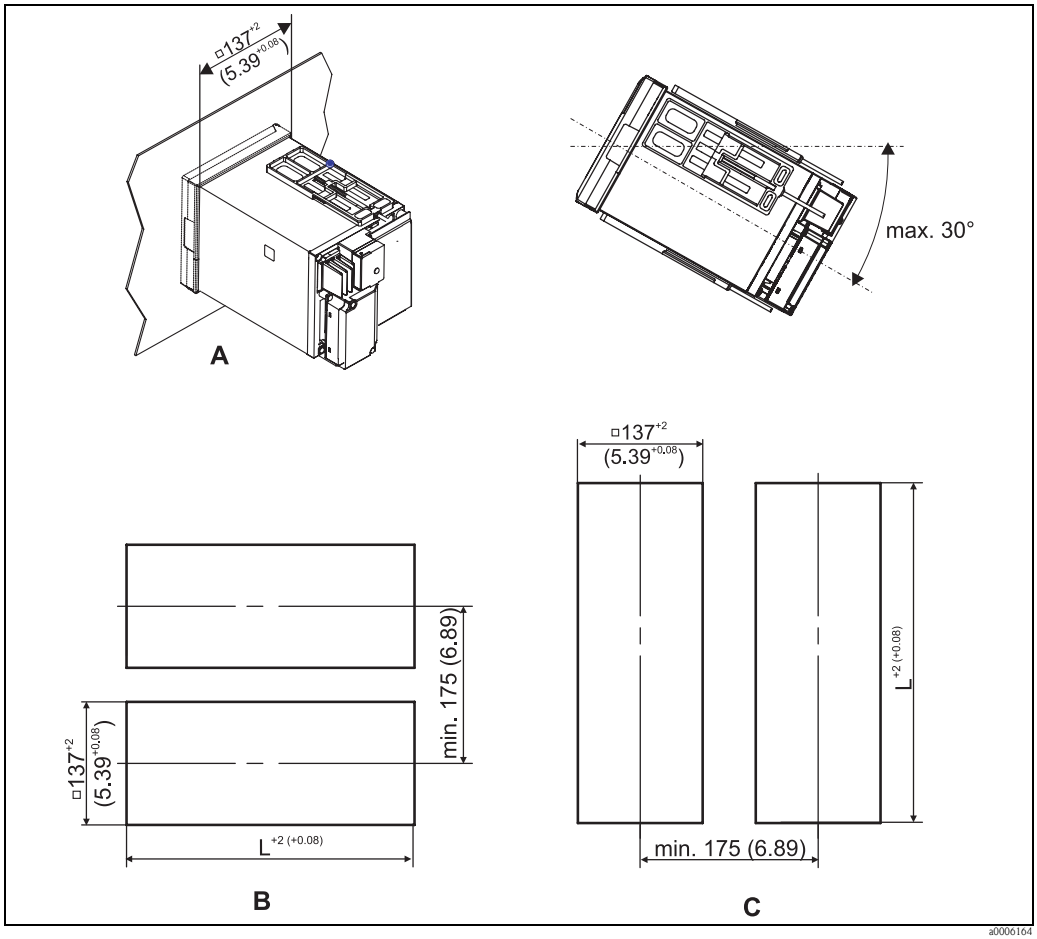


fig. 5: Panel cutout - dimensions in mm (inch)

- Pos. A: Single unit mounting
- Pos. B: Side-by-side mounting (horizontally)
- Pos. C: Side-by-side mounting (vertically)
- L = Length panel cutout

Units	2	3	4	5	6	7	8	9	10	n
L in mm (inch)	282 (11.1)	426 (16.8)	570 (22.4)	714 (28.1)	858 (33.8)	1002 (39.5)	1146 (45.1)	1290 (50.8)	1434 (56.5)	(144 x n) - 6 (5.67 x n) - 0.24

Note!
Side-by-side mounting vertically is possible for max. 3 units.

Note!
Attach the mounting brackets to the top and bottom when mounting the recorders side-by-side horizontally or right and left when mounting the recorders side-by-side vertically.

3.2.2 Panel mounting diagram

Caution!
- Tightening the screws too much can deform the case or damage the bracket.
- Be careful not to insert foreign objects or tools through the holes for the mounting brackets in the case.

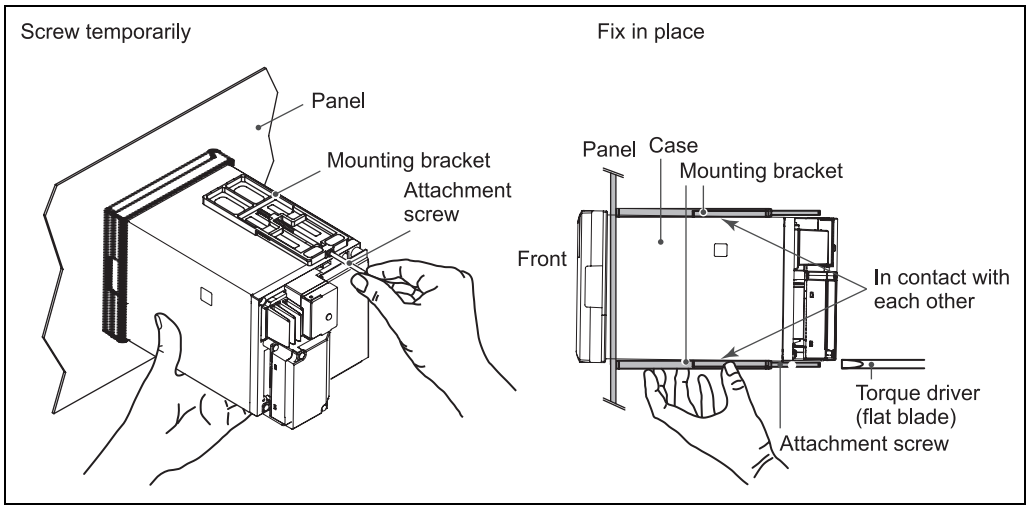


fig. 6: Panel mounting - It shows the case when the mounting brackets are used on the top and bottom of the case.

4 Wiring

4.1 Wiring diagram

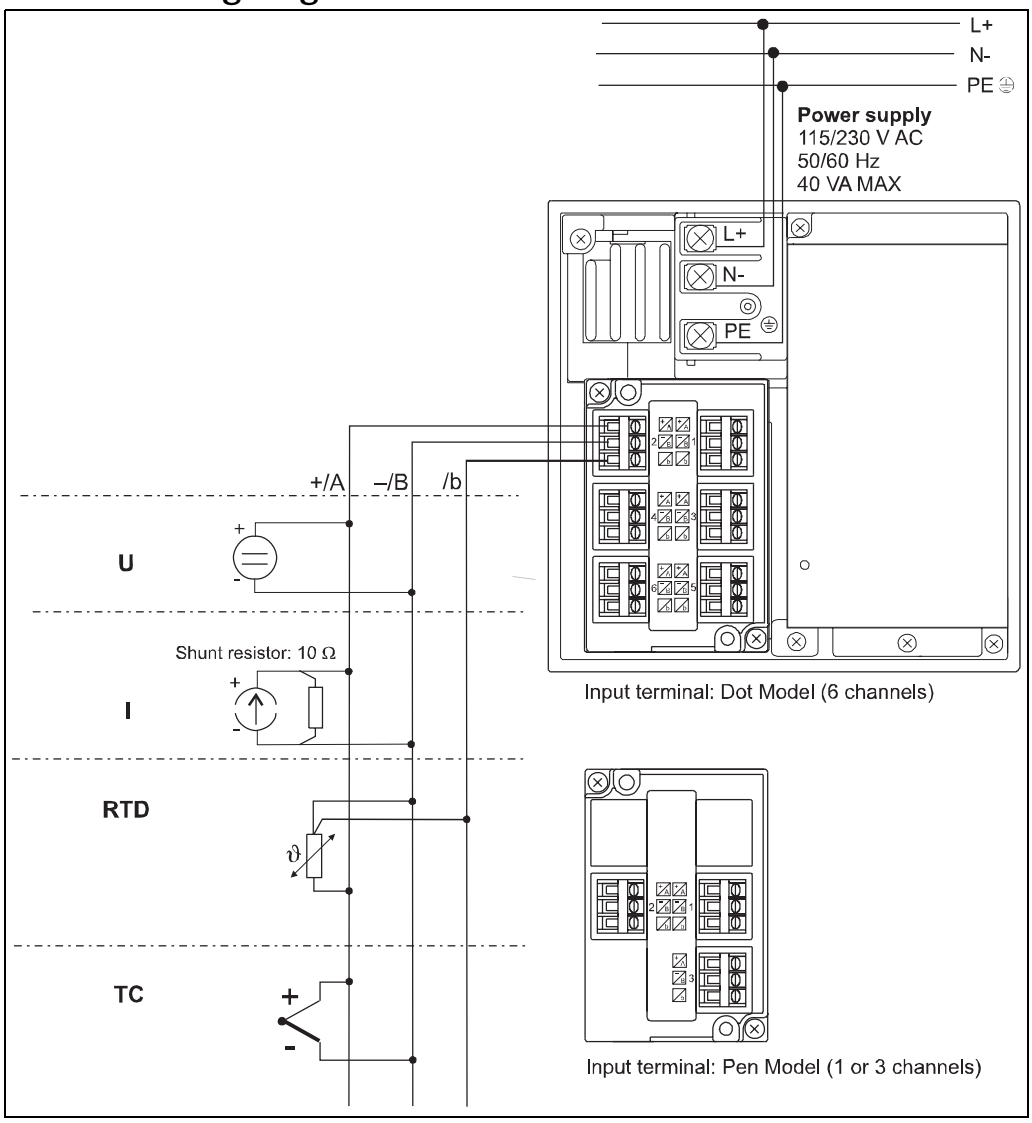


fig. 7: Wiring overview

4.2 Connecting the sensor – input signal wiring

Warning!
To prevent electric shock while wiring, ensure that the power supply source is turned OFF.

Caution!
- If a strong tension is applied to the cable wired to the recorder, the terminals of the recorder and/or the cable can be damaged. In order to prevent tension from being applied directly on the terminals, fasten all wiring cables to the rear of the mounting panel.
- Do not apply a voltage exceeding the following value to the input terminals as this may damage the recorder.
  – Maximum input voltage: Voltage range less than or equal to 200 mVDC, TC and RTD: ±10 VDC. Ranges other than those listed above: ±60 VDC
  – Maximum common-mode voltage: ±60 VDC (under measurement category II conditions)
- The recorder is an INSTALLATION CATEGORY II product.

4.2.1 Precautions to be taken while wiring

Take the following precautions when wring the input signal cables.

Take measures to prevent noise from entering the measurement circuit.

- Move the measurement circuit away from the power cable (power circuit) and ground circuit.
- It is desirable that the object being measured does not generate noise. However, if this is unavoidable, isolate the measurement circuit from the object. Also, ground the object being measured.
- Shielded wires should be used to minimize noise caused by electrostatic induction. Connect the shield to the ground terminal of the recorder as necessary (make sure you are not grounding at two points).
- To minimize noise caused by electromagnetic induction, twist the measurement circuit wires at short, equal intervals.
- Make sure to earth ground the protective ground terminal through minimum resistance (less than 100 Ω).

When using internal reference junction compensation on the thermocouple input, take measures to stabilize the temperature at the input terminal.

- Always use the terminal cover.
- Do not use thick wires which may cause large heat dissipation. Cross sectional area of 0.5 mm^2 (20 AWG) or less recommended.
- Make sure that the ambient temperature remains reasonably stable. Large temperature fluctuations can occur if a nearby fan turns ON or OFF.

Connecting the input wires in parallel with other devices can cause signal degradation, affecting all connected devices.
If you need to make a parallel connection, then:

- Turn the burnout detection function OFF.
- Ground the instruments to the same point.
- Do not turn ON or OFF another instrument during operation. This can have adverse effects on the other instruments.
- RTDs cannot be wired in parallel.

4.2.2 Wiring procedure

A terminal cover is screwed in place on the measuring input terminal block on the rear panel. A label indicating the terminal arrangement is affixed to the cover.

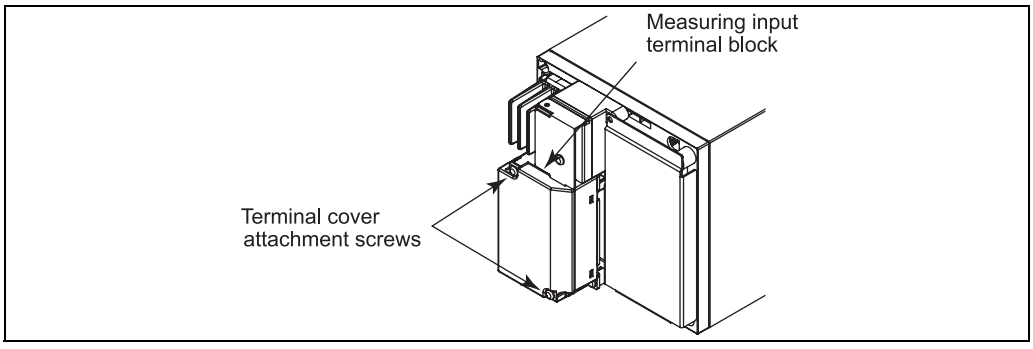


fig. 8: Removing the terminal cover.

1. Turn OFF the recorder and remove the terminal cover.
2. Connect the signal wires to the terminals (→ Fig. 7).
3. Replace the terminal cover and fasten it with screws. The proper torque for tightening the screws is 0.6 Nm.

✎ Note!
RTD input terminals A and B on the dot model are isolated on each channel. Terminal b is shorted internally across all channels.

4.3 Connecting the measuring unit - power supply wiring

Warning!
- To prevent electric shock when wiring, ensure the main power supply is turned OFF.
- To prevent the possibility of fire, use 600 V PVC insulated wire (AWG 20 to 16) or an equivalent wire for power wiring.
- Make sure to earth ground the protective earth terminal through a grounding resistance less than 100 Ω before turning ON the power.
- Use crimp-on lugs (designed for 4 mm screws) for power and ground wiring termination.
- To prevent electric shock, make sure to close the transparent cover for the power supply wires.
- Make sure to provide a power switch (double-pole type) on the power supply line in order to separate the recorder from the main power supply. Put an indication on this switch as the breaker on the power supply line for the recorder and indications of ON and OFF.
  – Switch specifications:
  Rated power current: 1 A or more
  Rated rush current: 60 A or more
  Complies with IEC 60947-1, 3.

- Connect a fuse in the power supply line.
  – Between 2 A and 15 A
  – Use a fuse approved by CSA (for the use in North America) or VDE (for the use in Europe).
- Do not add a switch or fuse to the ground line.

Use a power supply that meets the following specifications:

Item	Specifications
Rated supply voltage	100 to 240 VAC
Allowable power supply voltage range	90 to 132/180 to 264 VAC
Rated power supply frequency	50/60 Hz
Allowable power supply frequency range	50/60 Hz ± 2%
Maximum power consumption	40 VA

Note!
Do not use a supply voltage in the range 132 to 180 VAC, as this may have adverse effects on the measurement accuracy.

4.3.1 Wiring procedure

1. The power supply terminals and protective ground terminals are located on the rear panel.
2. Turn OFF the power and open the power terminal cover.
3. Wire the power cord and the protective ground cord to the power supply terminals. Use ring-tongue crimp-on lugs (designed for 4 mm screws).
4. Close the power supply terminal cover and secure it with the screw. The proper torque for tightening the screws is 0.6 Nm.

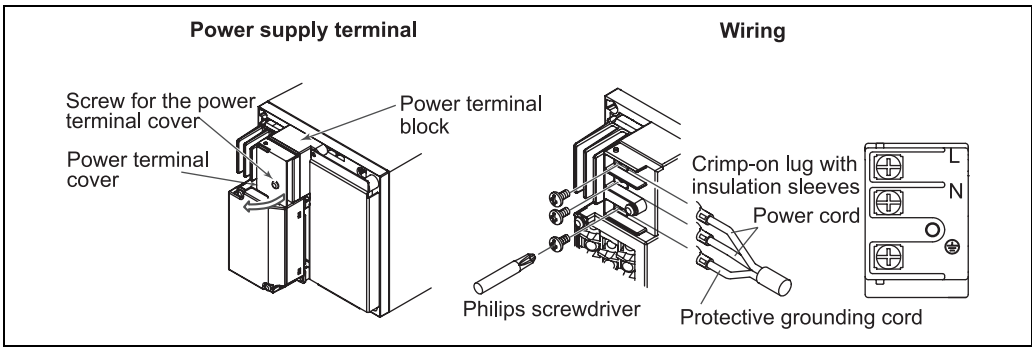


fig. 9: Wiring the power supply

Turning ON/OFF the power
The recorder has no power switch. Use an external switch to turn ON and OFF.

4.4 Terminal assignment

Caution!
If high-energy transients occur when using long signal cables, we recommend connecting a suitable overvoltage protection (e.g. E+H HAW560/562).

4.5 Degree of protection

At the front, the unit meets all the requirements of ingress protection IP54, only when the door is closed.

4.6 Post-connection check

After completing the unit's electrical connections, carry out the following checks:

Unit status and specifications notes	**Notes**
Is the unit or cable damaged (visual inspection)?	-
Electrical connection	**Notes**
Does the supply voltage match the information on the nameplate?	Compare nameplate on the unit
Are the mounted cables relieved of tension?	-
Are all the terminals firmly seated at the contacts?	-

5 Operation

5.1 Quick operation guide

Operation sequence
This section explains the operations when using the recorder for the first time.
- Instrument configuration (for the operating procedure, → page 20).
  Load the chart paper and pens (pen model) or ribbon cassette (dot model).
- Setting the channel input range and other parameters (for the operating procedure, → Page 25 ff.)
  Set the measurement conditions suitable for the object being measured.
- Recording/displaying data (for the operating procedure, → page 35).
  Start/Stop the recording. Also, switch the displayed channel.
- Adjusting the pen or dot printing position (for the operating procedure, → Page 37 ff.)
  Start/Stop the recording. Also, switch the displayed channel.

✎ Note!
Because the chart paper may expand or contract depending on the environment in which the recorder is used, it is recommended that the position be readjusted before use.

Execution modes
The recorder has three execution modes.
- Operation mode (→ Fig. 10, Pos. A):
  This mode is used for normal recording operation. The recorder enters this mode when the power is turned ON.
- Setting mode (→ Fig. 10, Pos. B):
  This mode is used to set the input, limit conditions, chart speed, and other parameters. These settings excluding input settings, can be changed while recording is in progress.
- Basic setting mode (→ Fig. 10, Pos. C):
  This mode is used to set the basic functions of the recorder such as the thermocouple burnout detection function. This mode cannot be entered while recording is in progress. Measurement, recording, and limit detection cannot be carried out in this mode.

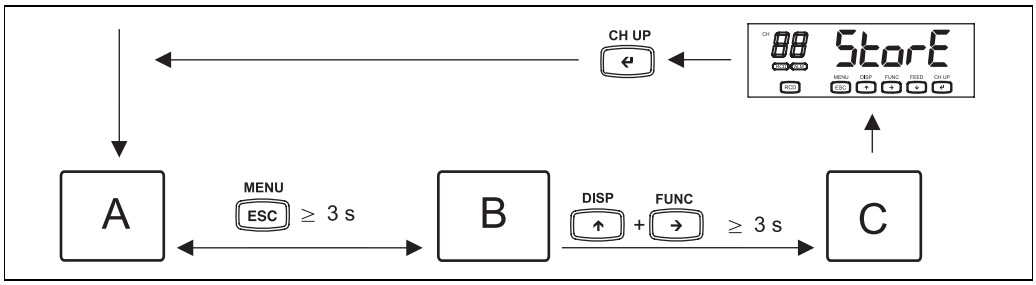


fig. 10: Execution modes

Functions marked on the key top are enabled in the setting mode and basic setting mode.

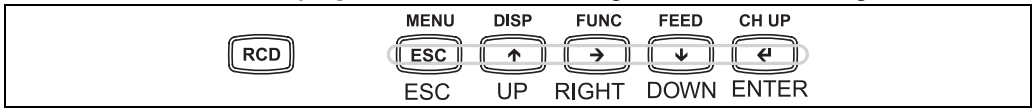
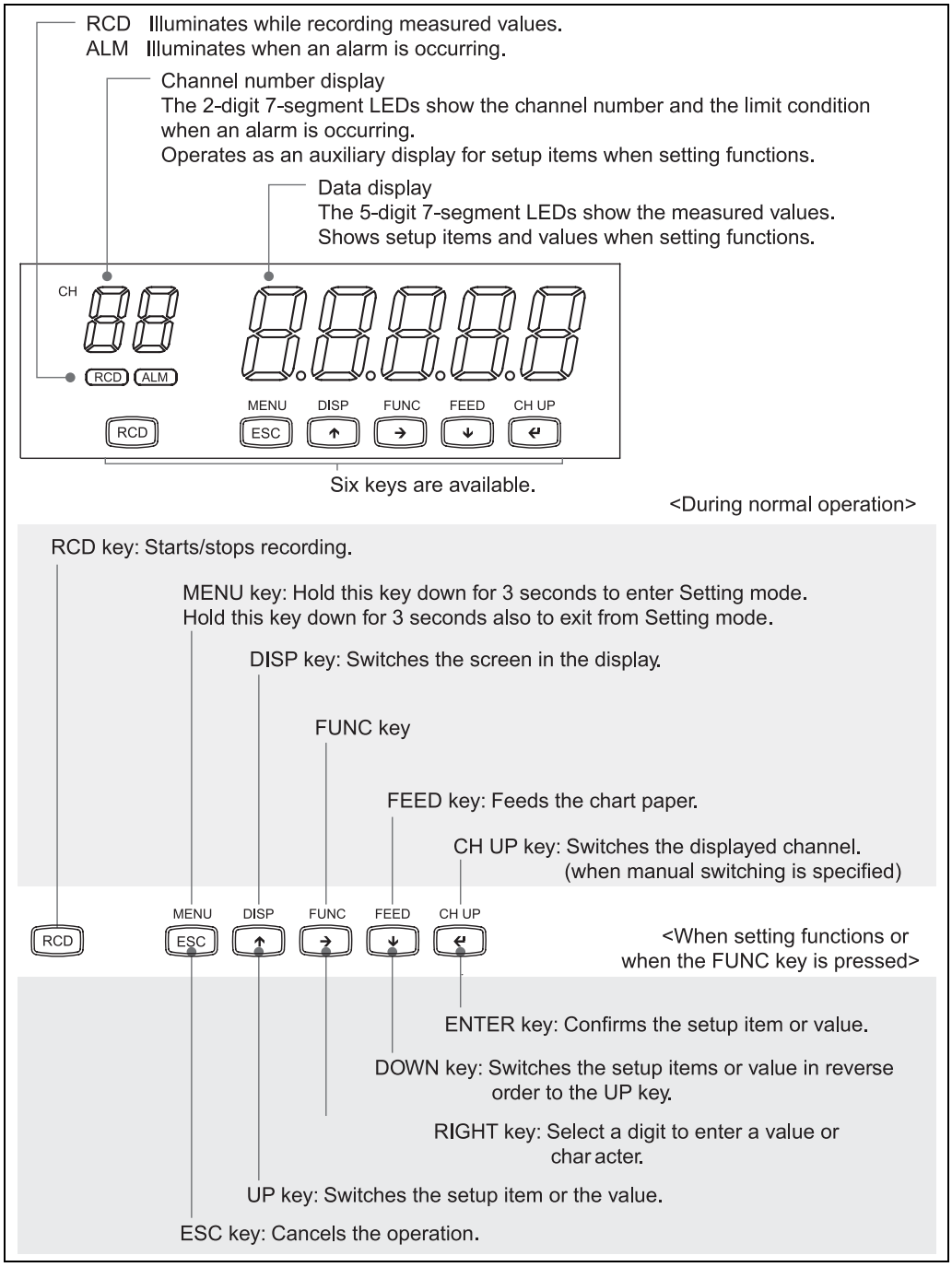


fig. 11: Marked functions

5.2 Display and operating elements



Displayed characters

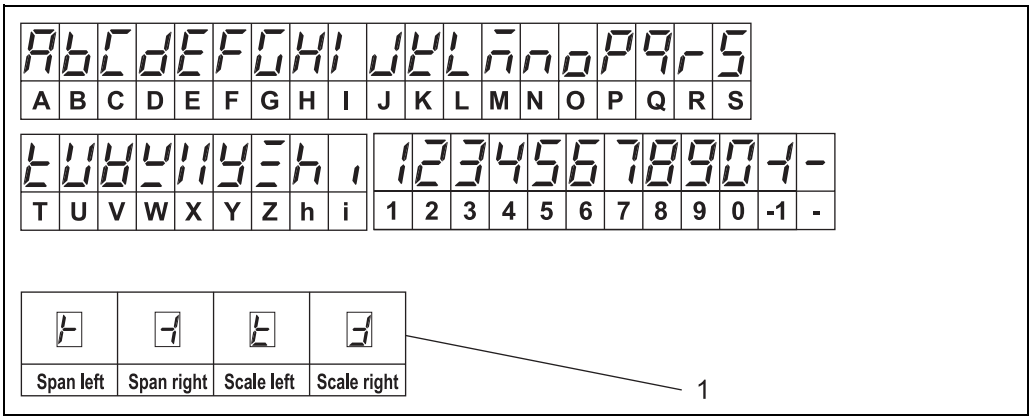


fig. 12: Displayed characters

Pos. 1: Symbols used on channel number display

5.3 Using the function matrix

Menu structure of setting mode

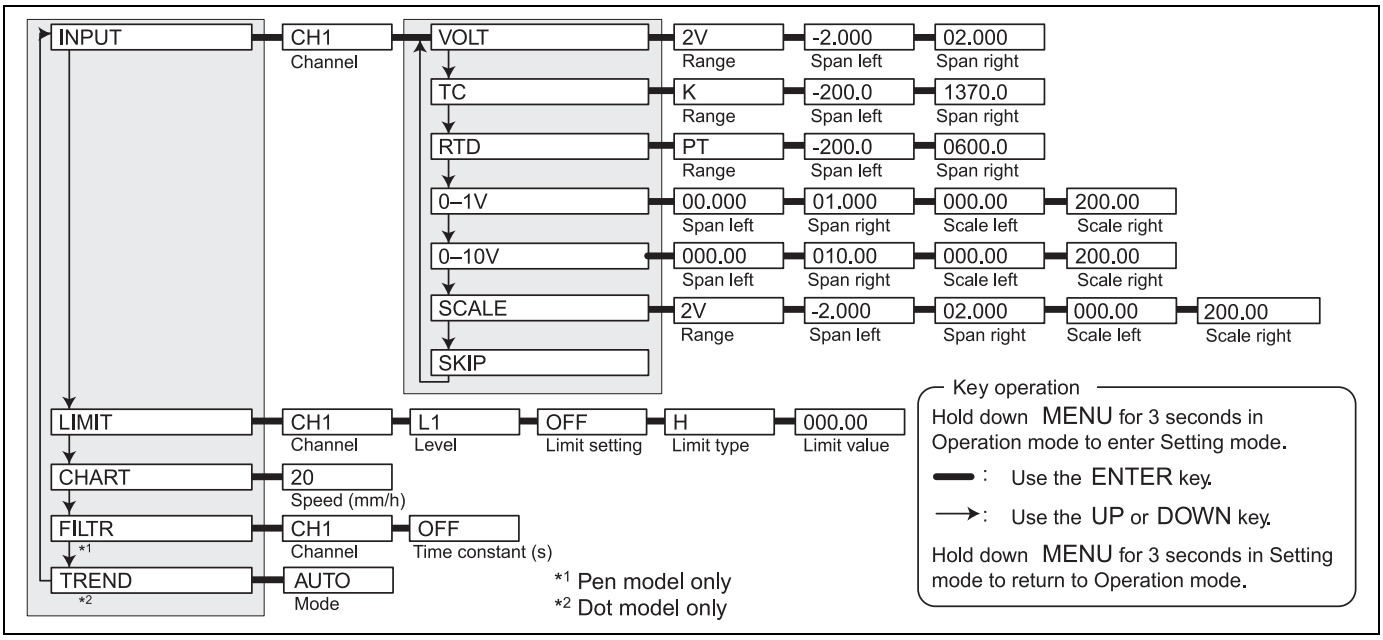


fig. 13: Menu structure, setting mode

Setup items in setting mode and their default values

Setup item		Pen/Dot	Selectable range or settings	Default value
INPUT (select channel first)		-	VOLT/TC/RTD/01V/0-10V/SCALE/SKIP	VOLT
	→ VOLT → Range	-	20 mV / 60 mV / 200mV / 2V / 6V / 20V / 50V	2V
	→ SCALE → Type → Range	-	20 mV / 60 mV / 200mV / 2V / 6V / 20V / 50V	2V
	→ TC → RANGE	-	R/S/B/K/E/J/T/N/L/U	R
	→ RTD → Range	-	Pt	Pt
	→ 0-1V	-	0-1V	0-1V
	→ 0-10V	-	0-10V	0-10V
LIMIT	→ Level	-	L1 (level 1)/L2 (level 2)	L1
	→ Limit type	-	H (high limit)/L (low limit)	H
	→ Limit value	-	Depends on the limit type	000.00

Setup item		Pen/Dot	Selectable range or settings	Default value
CHART		Pen model	10/20/60/120/300/600/1200/3600 mm/h (0.4/0.8/2.4/4.7/11.8/23.6/47.2/141.7 inch/h)	20 (0.8)
		Dot model	10/20/60/120/300/600/1200 mm/h (0.4/0.8/2.4/4.7/11.8/23.6/47.2 inch/h)	20 (0.8)
FILTR	→ Time constant	Pen model	OFF/1s/2s/3s/4s/5s/6s/7s/8s/9s/10s	OFF
TREND	→ Mode	Dot model	AUTO/FIX (fastest)	AUTO

Menu structure of basic setting mode

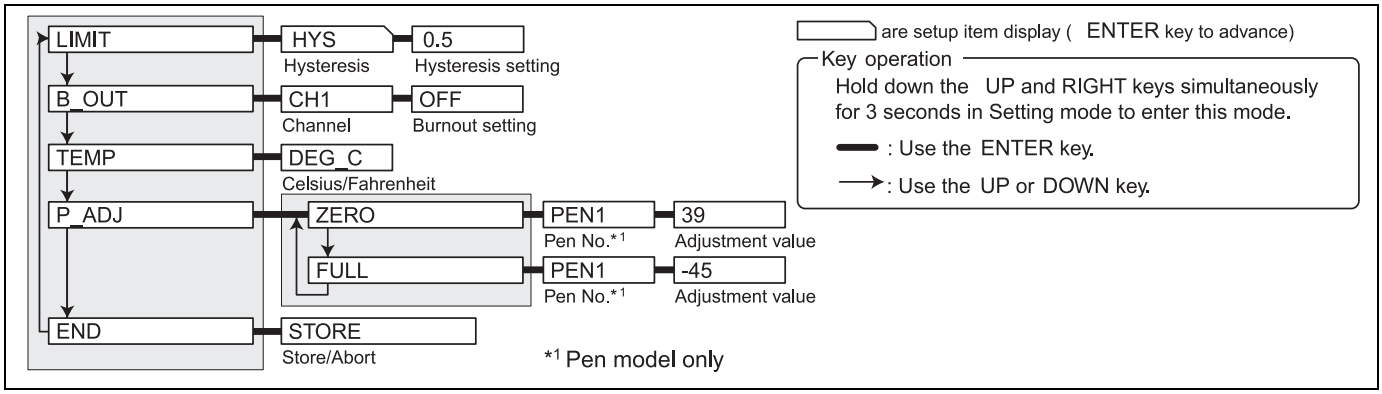


fig. 14: Menu structure, basic setting mode

Setup items in basic setting mode and their default values:

Setup item		Pen/Dot	Selectable range or settings	Default value
LIMIT	→ Hysteresis setting	-	0.1% to 1.0%	0.5
B_OUT	→ Burnout setting	-	OFF/UP/DOWN	OFF
TEMP	→ Celsius/Fahrenheit	-	DEG_C (Celsius)/ DEG_F (Fahrenheit)	DEG_C
P_ADJ	→ ZERO → Adjustment value	Pen model Dot model	00 to 70 00 to 15	39 07
	→ FULL → Adjustment value	Pen model Dot model	-45 to 15 -30 to 30	000 000

6 Commissioning

6.1 Instrument configuration

6.1.1 Loading or replacing the chart paper

Caution!
- Do not install or remove the chart cassette with the chart paper guide open. This may damage the stopper.
- Continuing to record or print without the chart paper on the dot model can cause damage to the chart cassette platen (the cylindrical section that holds the paper during the recording operation). Be sure to replace the chart paper ahead of time.

Loading the chart paper

1. Open the door.
   If recording is in progress, press the RCD key to stop the recording.
2. Remove the chart cassette.
   Gently pressing the left and right stoppers inward. The bottom section of the chart cassette comes out. Gently lift the chart cassette and pull it out from the recorder case.
3. Open the chart holder and the chart paper guide.

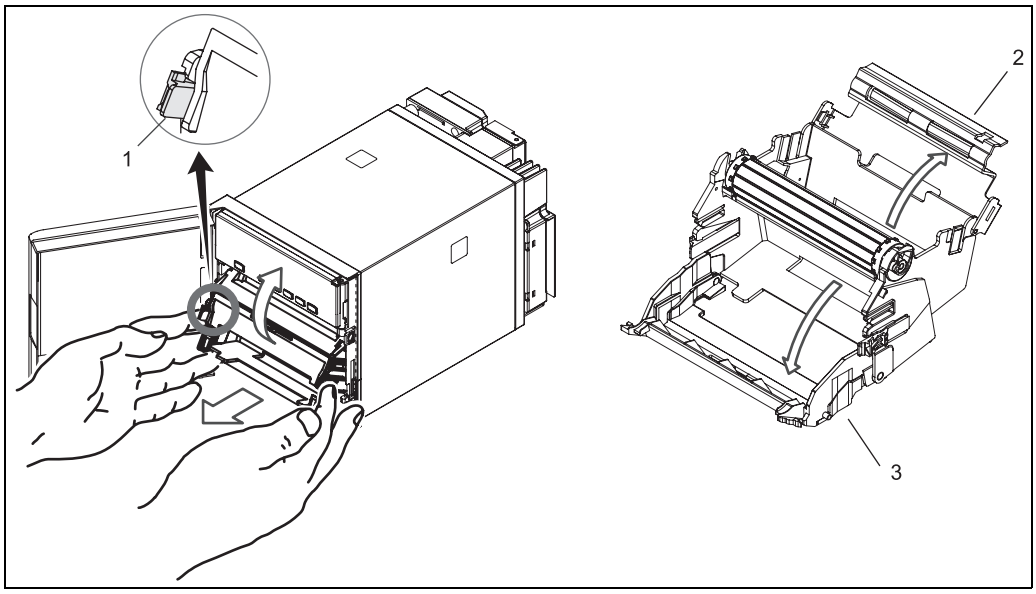


fig. 15: Chart holder and shart paper guide

Pos. 1: Stopper
Pos. 2: Chart holder
Pos. 3: Chart paper guide

4. Load the chart paper.
   Riffle the chart thoroughly before loading. Make sure that the sprocket teeth of the chart drives are properly engaged in the chart paper perforations. Make sure not to load the chart paper backwards.

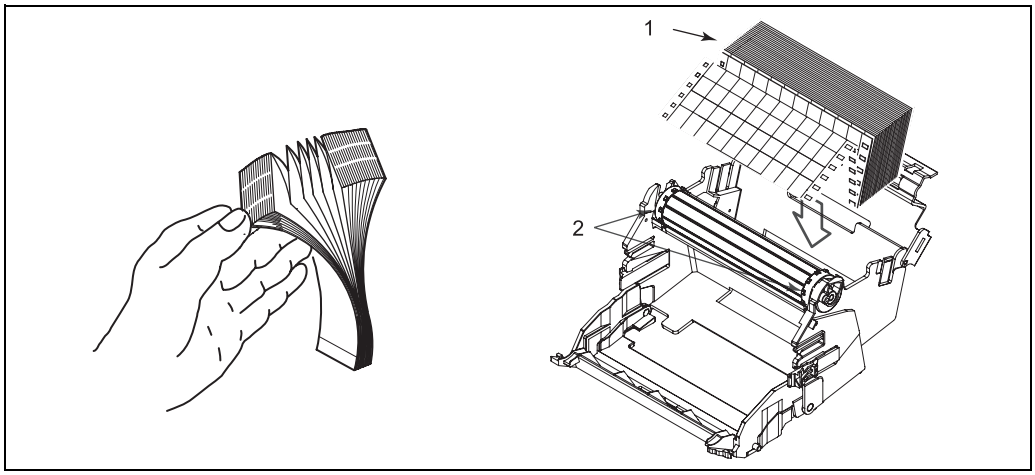


fig. 16: Load the chart paper

Pos. 1: Z-fold chart paper
Pos. 2: Sprocket teeth

5. Close the chart holder and close the chart paper guide.

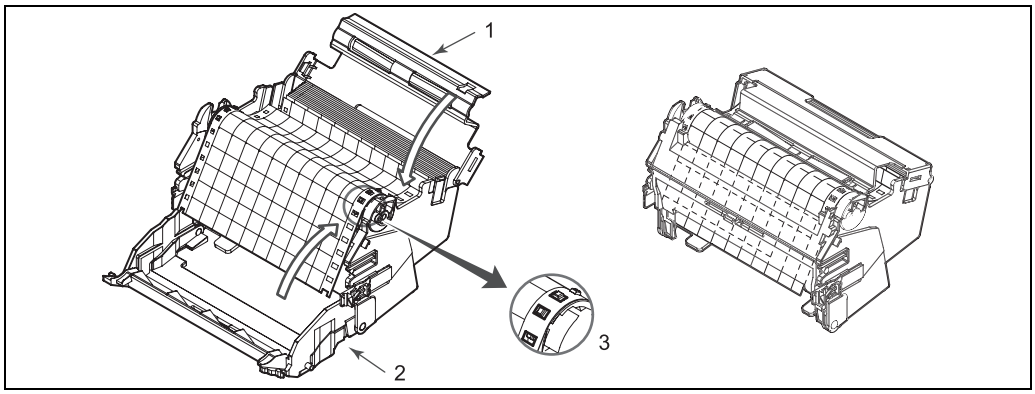


fig. 17: Close the chart holder

Pos. 1: Chart holder
Pos. 2: Chart paper guide
Pos. 3: The side with the long rectangular holes is the right side

6. Replace the chart cassette back into the recorder.
Align the left and right projections with the guide grooves of the recorder and press the entire chart cassette into the recorder case. The chart cassette is fixed in place with the stoppers.

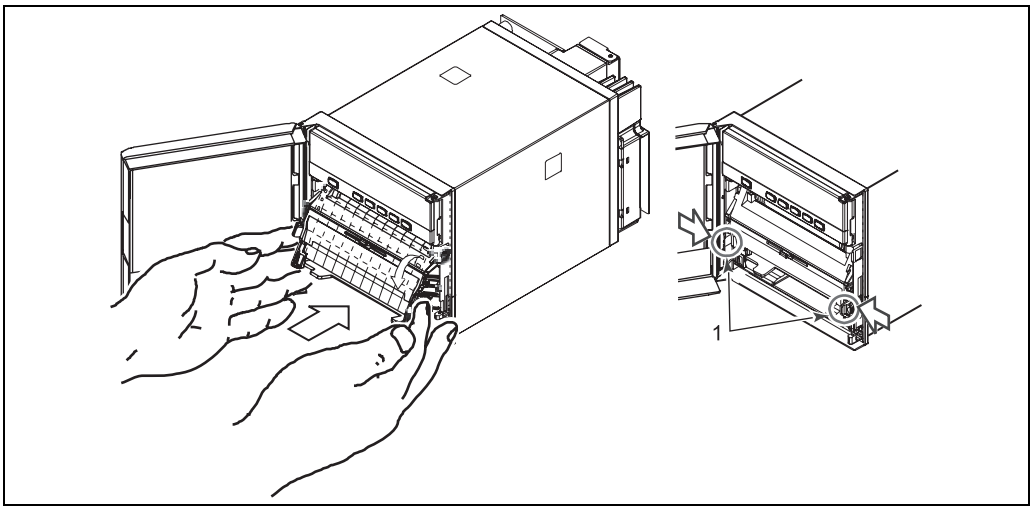


fig. 18: Place the chart cassette back

Pos. 1: Stopper

Feeding the chart paper
Press the FEED key to assure that the chart moves two or more folds smoothly into the chart receiver. If it moves unsteadily, do the installing procedure again.

6.1.2 Installing/replacing felt pens (pen model)

Caution!
- Do not press or pinch the felt tip to prevent deformation.
- Do not move the penholder left or right by force to protect the driving mechanism.
- Make sure to remove the pen cap before installation.
- Use pen caps of the same ink color. If a pen cap of a different ink color is used on the pen, the remaining ink in the cap may be absorbed through the pen tip, and the ink may change its color.

1. Open the door.
   If recording is in progress, press the RCD key to stop the recording.
2. Open the display and key panel section.
   You can open the display and key panel section by holding the tab at the lower left and pulling it toward you.
3. Hold the felt pen cartridge and pull it out from the pen holder.
   If the pen (pen holder) is at a position that is not easily accessible, see "When the pen (pen holder) is at a position that is not easily accessible" below.
4. Remove the cap from the new felt pen and insert the pen firmly into the pen holder.

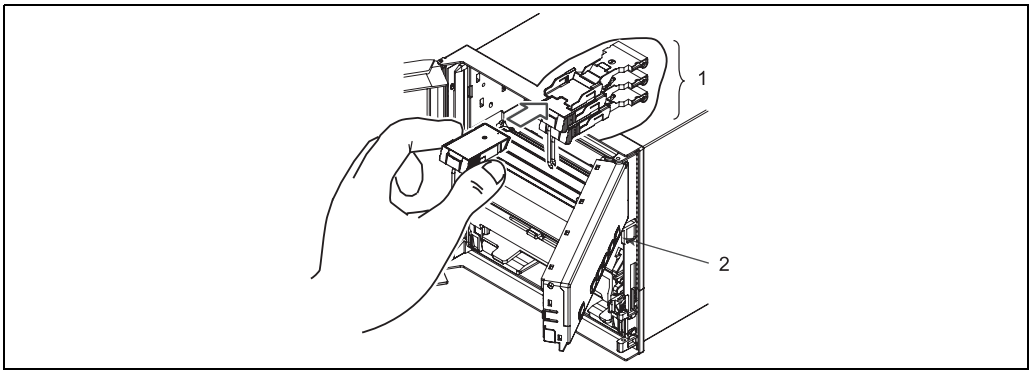


fig. 19: Placing the felt pens (pen model)

Pos. 1: From the top: pen 1 (red), pen 2 (green), pen 3 (blue)
Pos. 2: Display and key panel

5. Return the display and key panel section to its original position.

When the pen (pen holder) is at a position that is not easily accessible
If the pen (pen holder) is at a position that is not easily accessible, carry out the procedure below to move it near the center position.

1. Press the FUNC key.
2. PEN is displayed.

3. Press the ENTER key.
   The pen (pen holder) moves near the center position, and END appears.

Note!
When the pen moves, a line is drawn on the chart paper.

4. Replace the pen.
5. Return the display and key panel section to its original position, and press the ENTER key.
   The screen returns to the operation mode.

6.1.3 Installing/replacing the ribbon cassette (dot model)

Caution!
- Improper cassette insertion may cause the color to change or damage the ribbon.
- Do not apply upward force to the printer carriage. If you do, the carriage position may be offset, and the recorder may not print correctly.

1. Open the door.
   If recording is in progress, press the RCD key to stop the recording.
2. Press the FUNC key.
3. RIBON is displayed.

4. Press the ENTER key.
   The printer carriage moves near the center position, and END is displayed.
5. Open the display and key panel section.
   You can open the display and key panel section by holding the tab at the lower left and pulling it toward you.

Note!
If the recorder is OFF, hold the printer carrige and move it near the center position.

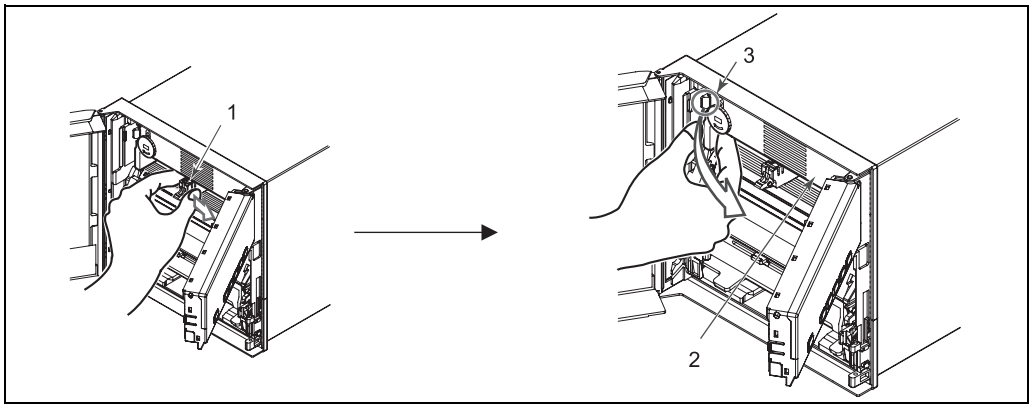


fig. 20: Remove the ribbon cassette (dot model)

Pos. 1: Printer carriage
Pos. 2: Ribbon cassette
Pos. 3: Holder tab

6. Remove the ribbon cassette.
   Push the cassette holder tab on the left-hand side of the ribbon cassette to the left to disengage the ribbon cassette. Pull the ribbon cassette on the left-hand side out from the recorder case.
7. Install a new ribbon cassette.
   – First, insert the right-hand part and then the left-hand part into the cassette holder.
   – Check that the cassette is properly engaged with the cassette holder tab.
   – If inserting the ribbon cassette is difficult, turn the ribbon feeding knob in the direction of the arrow to align the ribbon feeding shaft of the cassette with the ribbon feeding shaft of the holder.

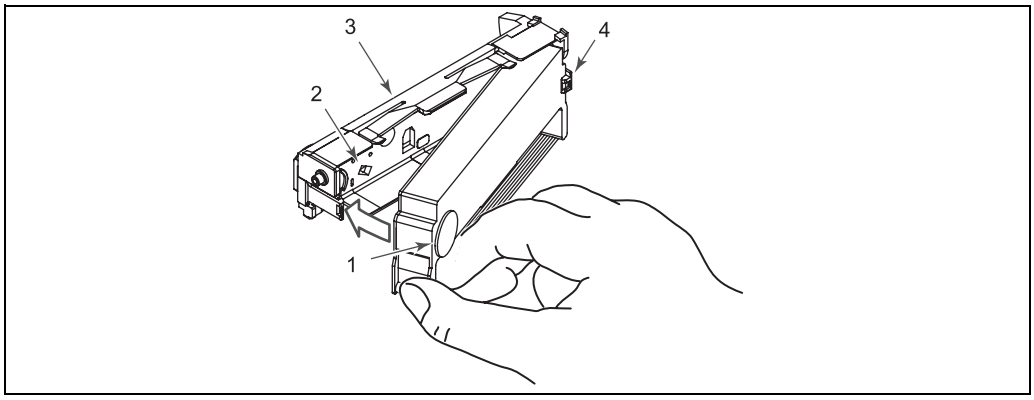


fig. 21: Install a new ribbon cassette

Pos. 1: Ribbon feeding knob
Pos. 2: Hole for the ribbon feed shaft
Pos. 3: Cassette holder
Pos. 4: Holder tab

8. Turn the ribbon feeding knob in the direction of the arrow a half turn or more to check that the ribbon is feeding properly. If the ribbon is loose, turn the knob in the direction of the arrow to tighten it.
9. Return the display and key panel section to its original position, and press the ENTER key: The screen returns to operation mode.

6.2 Configuration

6.2.1 Setting the input range

Setup example (1) of current input
Set channel 01 to voltage and a measured range (span) from 40 to 200 mV. The measurable range for current is now 4 to 20 mA (via 10 ohm shunt). This range is called "span", and the leftmost and rightmost values of the span are called span left and span right, respectively.
Then set the scale from 0 to 14 (0=scale left, 14=scale right; e.g. for "ph"). Now the measured values are recorded in a width of 100 mm on the chart paper, and the measured value is shown at the display.

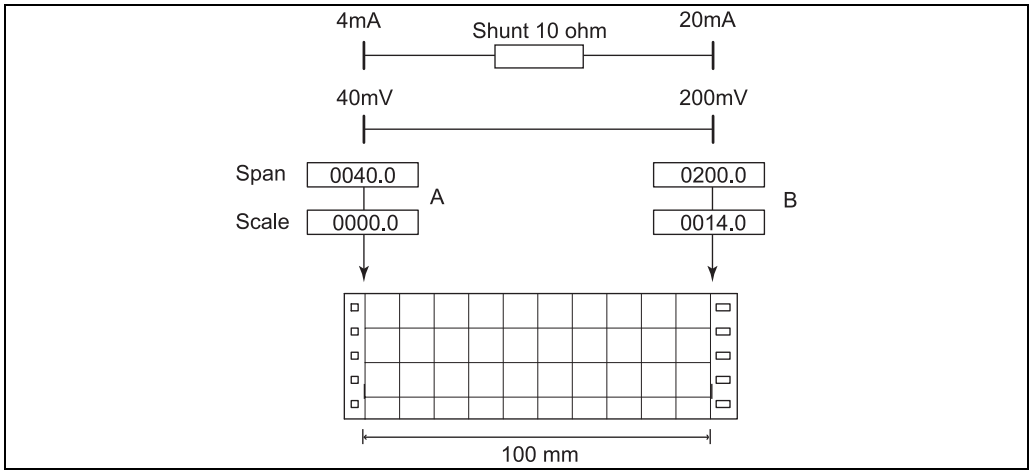


fig. 22: Measurable range of current

Pos. A: Span/scale left
Pos. B: Span/scale right

1. Hold down the MENU key for 3 seconds to enter setting mode.
2. Press the ENTER key with INPUT shown.

Selecting the channel
3. Press the UP key to select CH1, and press the ENTER key.

Selecting the input type
4. Press the UP key to select SCALE, and press the ENTER key

Selecting the input value
5. Press the UP key to select 200mV, and press the ENTER key

Setting span left

6. Set span left to 0040.0, and press the ENTER key. Press the RIGHT key to select the desired digit. Press the UP key to change the value.

Setting span right

7. Likewise, set span right to 0200.0, and press the ENTER key.

Setting scale left

8. Move the decimal point so that the number of digits to the right of the decimal is 1. Press the RIGHT key to select E. Press the UP key to move the decimal point.

9. Set scale left to 0000.0, and press the ENTER key.
   Press the RIGHT key to select the desired digit. Press the UP key to change the value.

Setting scale right

10. Likewise, set scale right to 0014.0, and press the ENTER key.

When OK is displayed, the settings entered up to then are applied.

Finishing the settings

11. Press the ENTER key to set other channels.
    To finish setting the input, press the ESC key.
12. Hold down the MENU key for 3 seconds to return to operation mode.

Setup example (2) of thermocouple input

Set channel 02 to thermocouple type K and measure temperatures in the range -50.0 to 450.0 °C (-58 to 842 °F). The measurable range for thermocouple type K is -200.0 to 1370.0 °C (-328 to 2498 °F).

The measured values in the range of -50.0 to 450.0°C (-58 to 842 °F) are recorded in a width of 100 mm on the chart paper. This recording range is called a recording span, and the leftmost and rightmost values of the recording span are called span left and span right, respectively.

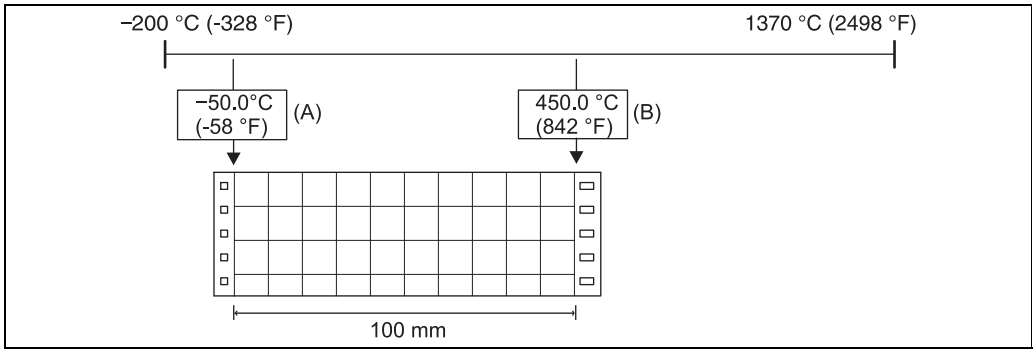


fig. 23: Measurable range of thermocouple type K

Pos. A: Span left
Pos. B: Span right

1. Hold down the MENU key for 3 seconds to enter setting mode.
2. Press the ENTER key with INPUT shown.

Selecting the channel

3. Press the UP key to select CH2, and press the ENTER key.

Selecting the input type

4. Press the UP key to select TC, and press the ENTER key.

5. Press the UP key to select K, and press the ENTER key.

Setting span left

6. Set span left to -050.0, and press the ENTER key.
   Press the RIGHT key to select the desired digit. Press the UP key to change the value.

↑ '-' can be set to this digit only.

Setting span right

7. Likewise, set span right to 0450.0, and press the ENTER key.

8. When OK is displayed, the settings entered up to then are applied.

Finishing the Settings

9. Press the ENTER key to set other channels.
   To finish setting the input, press the ESC key.
10. Hold down the MENU key for 3 seconds to return to operation mode.

Setup example (3) of 0-1V input

Set channel 03 to 0 to 1V input and 0.0 to 500.0 scale. The measured values in the range of 0.0 to 500.0 are recorded in a width of 100 mm on the chart paper.

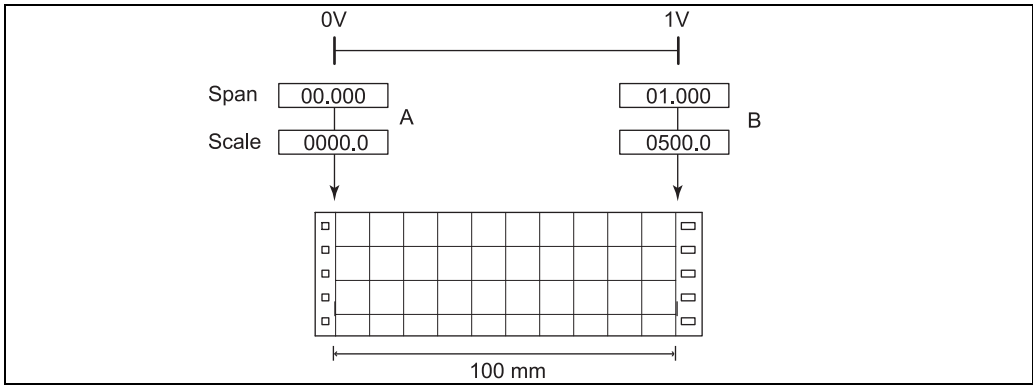


fig. 24: 0-1 V standard signal

Pos. A: Span/scale left
Pos. B: Span/scale right

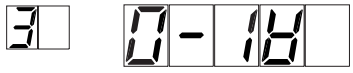
1. Hold down the MENU key for 3 seconds to enter setting mode.
2. Press the ENTER key with INPUT shown on the screen.

Selecting the channel

3. Press the UP key to select CH3, and press the ENTER key.

Selecting the input type

4. Press the UP key to select 0-1V, and press the ENTER key.



Setting span left

5. Set span left to 00.000, and press the ENTER key.
   Press the RIGHT key to select the desired digit. Press the UP key to change the value.

Setting span right

6. Likewise, set span right to 01.000, and press the ENTER key.

Setting scale left

7. Move the decimal point so that the number of digits to the right of the decimal is 1.
   Press the RIGHT key to select . Press the UP key to move the decimal point.

8. Set scale left to 0000.0, and press the ENTER key.
   Press the RIGHT key to select the desired digit. Press the UP key to change the value.

Setting scale right

9. Likewise, set scale right to 0500.0, and press the ENTER key.

10. When OK is displayed, the settings entered up to then are applied.

Finishing the range settings

11. Press the ENTER key to set other channels. To finish setting the input, press the ESC key.
12. Hold down the MENU key for 3 seconds to return to operation mode.

✎ Note!
If the range is changed after setting the limits, the limit setting becomes invalid. When you change the range, check the limit setting.

6.2.2 Setting the alarm

Setup example

Set limit conditions on each channel.

1. Hold down the MENU key for 3 seconds to enter the setting mode.
2. Press the UP key to select LIMIT, and press the ENTER key.

Selecting the channel

3. Press the UP key to select CH2, and press the ENTER key.

Setting the limit condition

4. Press the UP key to select L1, and press the ENTER key.
   Up to two alarms , L1 and L2, can be set on a single channel.

5. Press the UP key to select ON, and press the ENTER key.
   ON: Enables the alarm.

6. Press the UP key to select H, and press the ENTER key. The letter "H" represents the high limit alarm.

Selections	Description
H	High limit: Indicates alarm when measured value is more than or equal to set value.
L	Low limit: Indicates alarm when measured value is less than or equal to set value.

7. Set the limit value by carrying out the key operations below. Press the RIGHT key to select the desired digit. Press the UP key to change the value. When all digits have been set, press the ENTER key.

↑ '-' can be set to this digit only.

Input selections	Limit value
VOLT, TC, RTD	Values within the measurable range.
0-1V, 0-10V, SCALE	A value within -5 to 105% of the scaling span except within the range of -19999 to 30000 (excluding the decimal point).

8. When OK is displayed, the settings entered up to then are applied.

Finishing the settings

9. Press the ENTER key to set other limit conditions. To finish setting the limit, press the ESC key.
10. Hold down the MENU key for 3 seconds to return to operation mode.

6.2.3 Setting the filter (pen models)

Set the filter for each channel on pen models.

1. Hold down the MENU key for 3 seconds to enter the Setting mode.
2. Press the UP key to select FILTR, and press the ENTER key.

Selecting the channel

3. Press the UP key to select a channel, and press the ENTER key.

Setting the time constant

4. Press the UP key to select a time constant and press the ENTER key.

Selections	Description
OFF	Do not use a filter.
1 to 10	Time constant 1 s to 10 s (1 s step)

5. When OK is displayed, the settings entered up to then are applied.

Finishing the settings

6. Press the ENTER key to set other channel. To finish setting the filter, press the ESC key.
7. Hold down the MENU key for 3 seconds to return to operation mode.

6.2.4 Setting the dot printing interval (dot models)

Set the dot printing interval on dot models.

1. Hold down the MENU key for 3 seconds to enter the setting mode.
2. Press the UP key to select TREND, and press the ENTER key.

Selecting the channel

3. Press the UP key to select the dot printing interval, and press the ENTER key.

Selections	Description
AUTO	The dot printing interval is set according to the chart speed so that the dots do not overlap.
FIX	The dot printing interval is fixed to the maximum speed (10 s/6 dots).

4. When OK is displayed, the settings entered up to then are applied.

Finishing the settings
5. Press the ESC key.
6. Hold down the MENU key for 3 seconds to return to operation mode.

6.2.5 Changing the chart speed

1. Hold down the MENU key for 3 seconds to enter setting mode.
2. Press the UP key to display CHART, and press the ENTER key.

3. Press the UP key to select the chart speed and press the ENTER key.

See the table below for the chart speeds. The selectable chart speeds vary between the pen model and the dot model.

Chart speed in mm/h (inch/h)
10 (0.4), 20 (0.8), 60 (2.4), 120 (4.7), 300 (11.8), 600 (23.6), 1200 (47.2), 3600 (141.7)[a]

a. to the pen models only

When OK is displayed, the settings entered up to then are applied.

4. Press the ESC key.
5. Hold down the MENU key for 3 seconds to return to operation mode.

6.3 Setting the basic functions

Set the following items
- Difference of values for alarm occurrence and release (hysteresis)
- Thermocouple burnout detection
- Temperature unit for the thermocouple and RTD input

Entering the basic setting mode

1. Press the RCD key to stop recording. The 'RCD' indicator (green lit) turns off to signalize that recording function has stopped.
2. Hold down the MENU key for 3 seconds to enter setting mode.
3. Next, hold down both the UP key and the RIGHT key for 3 seconds to enter basic setting mode. The channel number display shows BS. The setup item is displayed blinking.

Setting the difference of values for alarm occurrence and release (hysteresis)

1. Press the ENTER key with LIMIT shown.

HYS is displayed.

2. Press the ENTER key.
3. Press the UP key to select the hysteresis value, and press the ENTER key.

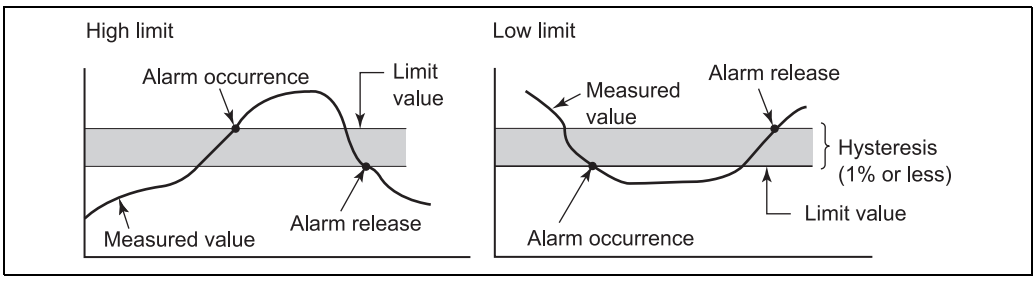


fig. 25: Hysteresis settings

Hysteresis (unit: % to the recording span)										
0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0

When OK is displayed, the settings entered up to then are applied.

4. Press the ESC key.

Setting the thermocouple burnout detection

1. Press the UP key to select b_oUt, and press the ENTER key.

2. Press UP key to select a channel and press the ENTER key.

3. Press the UP key to select the action when a burnout is detected, and press the ENTER key.

Selections	Description
OFF	Do not use this
UP	Records off the scale on the 100% side
DOWN	Records off the scale on the 0% side

When OK is displayed, the settings entered up to then are applied.

4. Press the ESC key.

Setting the temperature unit for the thermocouple and RTD input

✎ Note!
When the temperature unit is changed, the setup items in the setting mode (INPUT, LIMIT, CHART, FILTER and TREND) are initialized to default values.

1. Press the UP key to select TEMP, and press the ENTER key.

2. Press the UP key to select the temperature unit, and press the ENTER key.

Selections	Description
DEG_C	Celsius
DEG_F	Fahrenheit

When OK is displayed, the settings entered up to then are applied.

3. Press the ESC key.

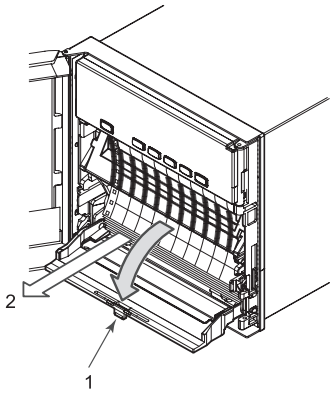
Exiting from basic setting mode (returning to operation mode)

1. Press the UP key to select END and then press the ENTER key.

2. Press the UP key to select STORE and then press the ENTER key. The setting is applied, and the screen returns to operation mode.
   If you select ABORT and press the ENTER key, the setting is discarded, and the screen returns to operation mode.

3. Press the 'RCD' key to start recording. Recording mode is signalized by green lit LED.

6.4 Recording/displaying data

Action	Procedure
Starting the recording	Press the RCD key to start recording. The "RCD" indicator turns ON (Lit green).
Stopping the recording	While recording is in progress, press the RCD key to stop recording. The "RCD" indicator turns OFF.
Feeding the chart paper	The chart paper is fed while the FEED key is held down.
Viewing the recorded results	Pull the front cover tab of the chart cassette to open the front cover. The recorded chart paper can be pulled out for viewing.  *fig. 26: Pulling out the recorded chart paper* *Pos. 1: Front cover tab* *Pos. 2: Recorded chart paper can be pulled out*
Switching the display screen	The screen switches in two display status each time the DISP key is pressed. Display example (channel number, left – measured value, right)  ■ Displayed channel auto switching. The displayed channel is automatically switched in ascending order. The switching interval is 2 s. ■ Displayed channel fixed. The channel switches each time the CH UP key is pressed in ascending order.
Recording color	■ Pen strip chart recorder: Channel 1: red Channel 2: green Channel 3: blue ■ Dot strip chart recorder: Channel 1: purple Channel 2: red Channel 3: green Channel 4: blue Channel 5: brown Channel 6: black

7 Maintenance

7.1 Periodic inspection

Check the operation periodically to keep the recorder in good working order. Perform the following checks and replace worn parts as needed.

- Is the indication and recording functioning properly?
- Are recorded lines or printed characters clear (not blurred)?
- Is the chart paper feeding properly (no paper jams)?
- Is there enough chart paper remaining? Remaining chart length (→ Fig. 27, Pos. 1) is printed on the left margin of the chart at intervals of 20 cm (7.9 inch).

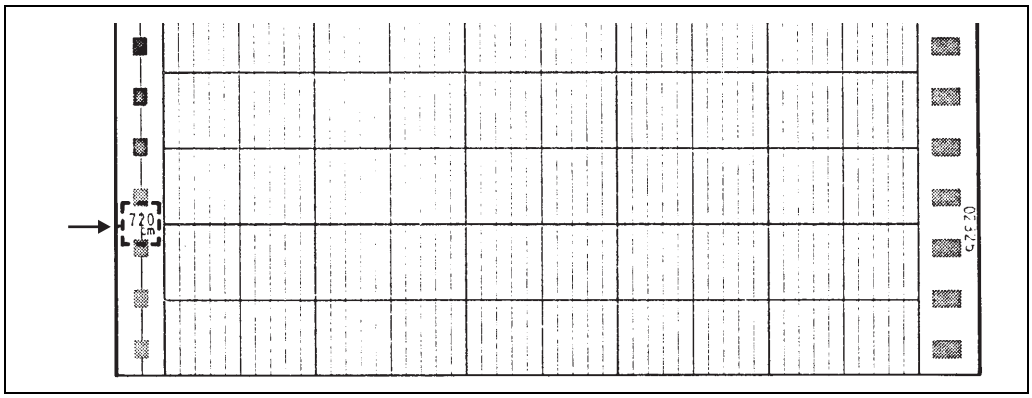


fig. 27: Remaining chart length

7.2 Cleaning the recorder

Caution!
Do not apply lubricating oil to the shaft.

Pen model
There is no specific component to be cleaned periodically.

Dot model
To maintain smooth operation, wipe the dust off the two shafts of the printer carriage using a soft lint-free cloth or paper. It is recommended that these shafts be cleaned once a year.

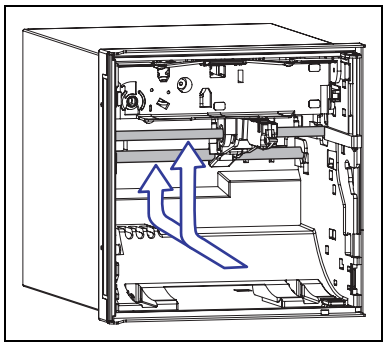


Abb. 28: Two shafts of the printer carriage

7.3 Adjusting the pen position (pen model)

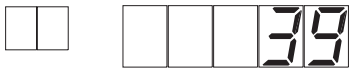
Adjust the pen position on the chart paper. It is recommended that the pen be adjusted once a year to assure its recording accuracy.

1. Warm up the recorder for at least 30 minutes.
2. Check that the operating environment such as ambient temperature and humidity is within the normal operating conditions (→ Chapter 10, 'Technical data').
3. Press the RCD key to stop recording.
4. Hold down the MENU key for 3 seconds to enter setting mode.
5. Hold down the UP and RIGHT keys simultaneously for 3 seconds to enter basic setting mode.
6. Press the UP key to select P_Adj and then press the ENTER key.

7. Press the UP key to select ZERO (left edge of the chart paper) or FULL (right edge of the chart paper) and then press the ENTER key.
   Adjust ZERO first and then FULL.

8. Press the UP key to select the channel (pen) number and then press the ENTER key.

The adjustment value is displayed.



9. Increase or decrease the setting to align the pen position with the scale line on the chart paper. Then, press the ENTER key. To change the setting, press the RIGHT key to move the cursor and UP key to change the value.
   A value change of 1 corresponds to 0.033 mm (0.0013 inch) change in the pen position. Decreasing the value moves the pen to the left and increasing the value moves the pen to the right.

Position	Value
ZERO	00 to 70
FULL	-45 to 15

OK is displayed.

10. Press the ENTER key to carry out subsequent adjustments. Press the ESC key to finish the adjustment. The screen returns to the P_Adj screen.
11. To return to the operation mode:
    1. Press the UP key to select END and then press the ENTER key.
    2. Press the UP key to select STORE (save the settings) or ABORT (discard the settings) and then press the ENTER key.
12. Press the 'RCD' key to start recording. Recording mode is signalized by green lit LED.

7.4 Adjusting the dot printing position (dot model)

Adjust the dot printing position on the chart paper. It is recommended that the position be adjusted once a year to assure its recording accuracy.

1. Warm up the recorder for at least 30 minutes.
2. Check that the operating environment such as ambient temperature and humidity is within the normal operating conditions (→ Chapter 10, 'Technical data').
3. Press the RCD key to stop recording.
4. Hold down the MENU key for 3 seconds to enter setting mode.
5. Hold down the UP and RIGHT keys simultaneously for 3 seconds to enter basic setting mode.
6. Press the UP key to select P_Adj and then press the ENTER key.

7. Press the UP key to select ZERO (left edge of the chart paper) or FULL (right edge of the chart paper) and then press the ENTER key.
   Adjust ZERO first and then FULL.

The adjustment value is displayed

8. Increase or decrease the setting to align the dot printing position with the scale line on the chart paper. Then, press the ENTER key. To change the setting, press the RIGHT key to move the cursor and UP key to change the value.
   A value change of 1 corresponds to 0.1 mm (0.004 inch) change in the dot printing position. Decreasing the value moves the line to the left and increasing the value moves the line to the right.

Position	Value
ZERO	00 to 15
FULL	-30 to 30

OK is displayed.

9. Press the ENTER key to carry out subsequent adjustments. Press the ESC key to finish the adjustment. The screen returns to the P_Adj screen.
10. To return to the operation mode:
    1. Press the UP key to select END and then press the ENTER key.
    2. Press the UP key to select STORE (save the settings) or ABORT (discard the settings) and then press the ENTER key.
11. Press the 'RCD' key to start recording. Recording mode is signalized by green lit LED.

7.5 Confirming the version number of the recorder

Confirm the version number of the recorder.

1. Press the FUNC key.
2. Press the UP key to select VER and then press the ENTER key.

The version number of the recorder is displayed.

3. Press the FUNC key to return to the measured value display.

8 Accessories

The following accessories are available:

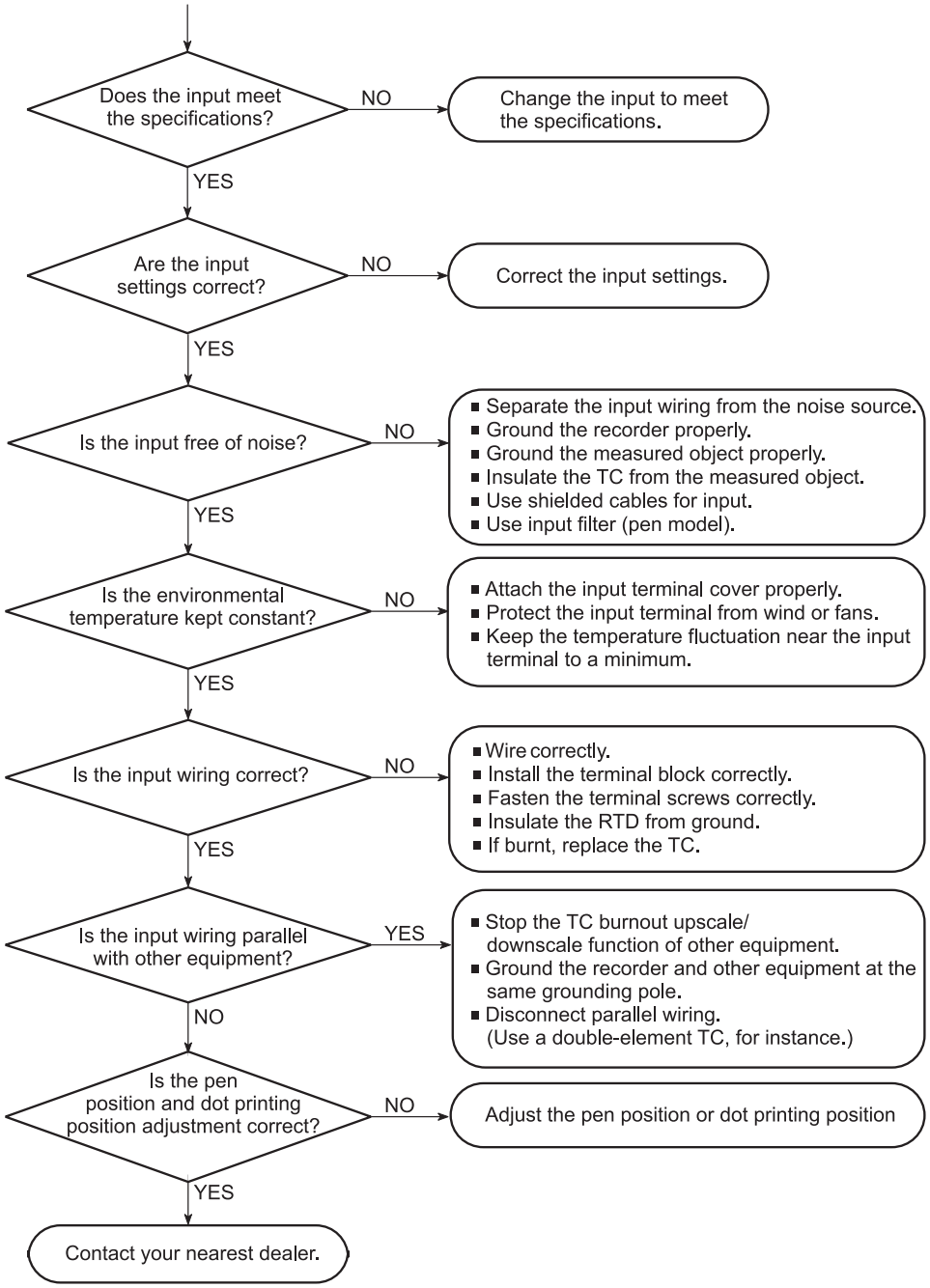
Order-Code	Accessory part
71022956	3x felt pen channel 1 red
71022957	3x felt pen channel 2 green
71022958	3x felt pen channel 3 blue
71022955	Ribbon cassette (6-color)
71022960	5 x Z-fold chart paper, neutral (Art.-Nr.: B956ACL) Partition 0-100 % linear; length 16 m (52.5 ft)
71028635	5 x Z-fold chart paper, 20 mm/h (Art.-Nr.: B956ACL-T) Partition 0-100 % linear; length 16 m (52.5 ft)

✎ Note!
Please use only original Z-fold chart paper from Endress+Hauser to guarantee reliable operation.

9 Trouble-shooting

9.1 Trouble shooting instructions

Trouble shooting flow charts

Problem	Cause	Remedy
Nothing works	No power supply	■ Is the power source turned ON? ■ Is the power supply connected properly? ■ Is the power supplied properly?
■ The reading error is large. ■ The indication is unstable. ■ The pen is off the scale on either the 0% or 100% side.		

9.2 System error messages

The error codes displayed on the recorder and their description are listed below.

Code	Description
001	System error. Contact your nearest dealer.
005	The input numerical value exceeds the set range.
22	The upper and lower span limits are equal. This is not allowed.
23	The upper and lower scale limits are equal. This is not allowed.
24	The lower span limit is greater than the upper span limit.
25	The lower scale limit is greater than the upper scale limit.
161	This action is invalid during pen hold.
163	This action is invalid during record.
164	This action is invalid during manual printing.
165	This action is invalid during list printing.
166	This action is invalid during setup list printing.
167	This action is invalid during chart feed.
169	This action is invalid during ribbon hold.
600	Settings and measured data have been initialized.
902	RAM failure. Contact your nearest dealer.
910	A/D error. Contact your nearest dealer.
921	A/D calibration value error. Contact your nearest dealer.
922	A/D calibration is in the wrong order. Contact your nearest dealer.
930	Memory acquisition failure. Contact your nearest dealer.
940	The ethernet module is down. Contact your nearest dealer.
950	A/D number error. Contact your nearest dealer.
951	EEPROM write error. Contact your nearest dealer.
960	Ribbon error. Contact your nearest dealer.
961	Printer error. Contact your nearest dealer.
962	Plotter error. Contact your nearest dealer.
963	Pen 1 error. Contact your nearest dealer.
964	Pen 2 error. Contact your nearest dealer.
965	Pen 3 error. Contact your nearest dealer.

9.3 Checking measurement errors

Check the error in the measured value against the input. It is recommended that the recorder be checked once a year to assure its measurement accuracy.

Required instruments

An instrument with appropriate resolution is required for checking measurement errors.

Recommended instrument	Main specifications
DC voltage standard: Model 5520A by FLUKE or equivalent	■ Output accuracy: ±(0.005% + 1 μV)
Decade resistance box: Yokogawa M&C Model 2793-01 or equivalent	■ Accuracy of output range 0.1 to 500 Ω: ± (0.01% + 2 mΩ) ■ Resolution: 0.001 Ω
0 °C (32 °F) standard temperature device: ZC-114/ZA-10 by Coper Electronics or equivalent	■ Standard temperature stability accuracy: ±0.05°C (±0.09 °F)

Procedure

1. Wire the input signal cable from the instrument to the recorder's input terminal, and adequately warm up the instruments (the warm-up time of the recorder is at least 30 minutes).
2. Check that the operating environment such as ambient temperature and humidity is within the normal operating conditions (→ Chapter 10, 'Technical data').
3. Apply appropriate input signals corresponding to 0%, 50%, and 100% of the input range and calculate the errors from the readings. If the error is outside the accuracy specifications, contact your nearest dealer.

Temperature measurement when using a thermocouple

For thermocouple inputs, you must measure the temperature of the input terminal and apply a voltage taking into account the reference junction temperature. As shown in the figure, by using the 0vC standard temperature device to compensate the reference junction at 0 °C (32 °F), you can input the thermoelectromotive force of 0 °C (32 °F) reference from the DC voltage standard and perform the test.

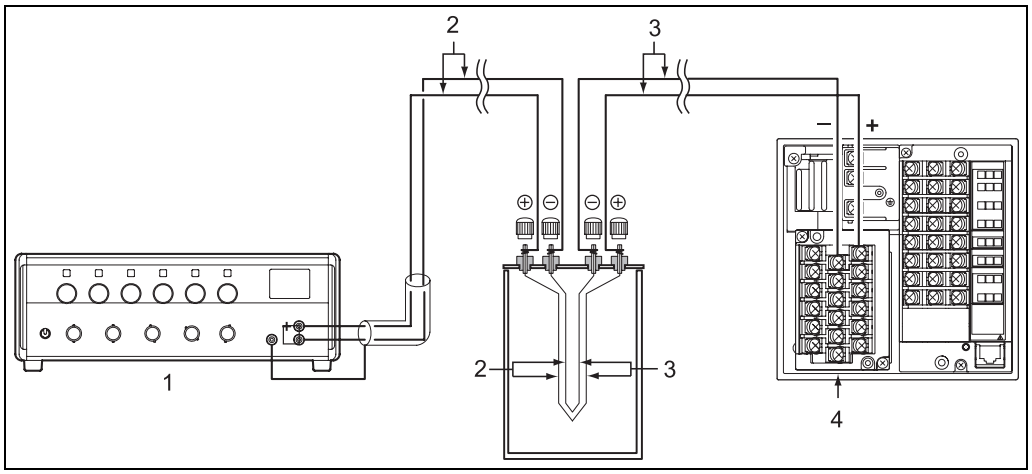


fig. 29: Checking measurement errors (using a thermocouple)

Pos. 1: DC voltage standard
Pos. 2: Copper wires
Pos. 3: Thermocouple wires resp. TC extension wires
Pos. 4: Input terminals

9.4 Return

The unit must be packed in protective packaging for later reuse or in case of repair. The original packaging offers the best protection. Repairs must only by carried out by your supplier's service organization or by skilled personnel.

✎ Note!
When sending for repair, please enclose a note with a description of the error and the application.

9.5 Disposal

Please observe local regulations.

10 Technical data

10.1 Input

10.1.1 Measured variable

Resistance thermometer (RTD) and thermocouple (TC), voltage, current (with external shunt resistance).

10.1.2 Measuring range

Measured variable	Range type	Measuring range
Resistance thermometer RTD (IEC751)	PT(Pt100)	-200 to 600 °C (-328 to 1112 °F)
Thermocouple (TC) according to IEC 584-1 (1995) and JIS C1602-1995	R S B K E J T N	0 to 1760 °C (32 to 3200 °F) 0 to 1760 °C (32 to 3200 °F) 0 to 1820 °C (32 to 3308 °F) -200 to 1370 °C (-328 to 2498 °F) -200 to 800 °C (-328 to 1472 °F) -200 to 1100 °C (-328 to 2012 °F) -200 to 400 °C (-328 to 752 °F) 0 to 1300 °C (32 to 2372 °F)
according to DIN 43710	L U	-200 to 900 °C (-328 to 1652 °F) -200 to 400 °C (-328 to 752 °F)
Voltage U	20MV (20 mV) 60MV (60 mV) 200MV (200mV) 2V 6V 20V 50V 0-1V 0-10V	-20.00 mV to 20.00 mV -60.00 mV to 60.00 mV -200.0 mV to 200.0 mV -2.000 V to 2.000 V -6.000 V to 6.000 V -20.00 V to 20.00 V -50.00 V to 50.00 V 0.000 to 1.000 V 0.00 to 10.00 V
Current I		With external shunt resistance 10 Ω (contained in the scope of delivery)

Designation	Range
Max. input voltage	±10 V DC for inputs: U ≤ 200 mV, TC and RTD ±60 V DC for inputs: U ≥ 2 V DC
Input resistance	≥ 10 MΩ for inputs: U ≤ 200 mV and TC approx. 1 MΩ for inputs: U ≥ 2 V DC

Designation	Range
Input resistance	≥ 10 MΩ for inputs: U ≤ 200 mV and TC approx. 1 MΩ for inputs: U ≥ 2 V DC
Input source resistance	Voltage U, TC: ≤ 2 kΩ RTD input: ≤ 10 Ω per wire (The resistance of all three wires must be equal)

10.1.3 Number of input channels and scan interval

- Pen model:
  1 or 3 input channels; scan interval: 125 ms
- Dot model:
  6 input channels; scan interval: 2,5 s

10.1.4 Galvanic isolation

All inputs are galvanically isolated from one another.

10.1.5 Filter (only pen model)

- Signal damping (ON/OFF) switchable for each channel.
- Time constant selectable from 1 to 10 s (1 s steps).

10.1.6 Linear scaling

Computable input type: DC Voltage
- Mantissa: -19999 to 30000
- Displayable range: -19999 to 30000

10.2 Recording characteristic quantities

10.2.1 Line recorder

Recording function

Recording pen	Disposable felt-tip pen
Response time	Approx. 1 s (as per IEC 61143 measuring method)
Number of pens	1 or 3
Recording color	Channel 1: red Channel 2: green Channel 3: blue
Trend recording	Data updating with scan rate. Continuous recording.
Paper feed	10; 20; 60; 120; 300; 600; 1200 and 3600 mm/h (0.39; 0.79; 2.36; 4.72; 11.8; 23.6; 47.2 and 141.7 inch/h)

10.2.2 Dotting recorder

Trend recording

Recording method	6-color (dot matrix printer)
Recording color	Channel 1: violet Channel 2: red Channel 3: green Channel 4: blue Channel 5: brown Channel 6: black

Paper feed	10; 20; 60; 120; 300; 600 and 1200 mm/h (0.39; 0.79; 2.36; 4.72; 11.8; 23.6 and 47.2 inch/h)
Recording ON/OFF	Recording can be switched on or off for every input channel.

10.2.3 Paper

Visible recording width	100 mm (3.94 inch)
Paper type	Z-fold chart paper, length: 16 m (52.5 ft)
Feed accuracy	± 0.1 % (for recorded material longer than 1000 mm (3.28 ft) in relation to the grid of the paper used)

10.3 Power supply

10.3.1 Electrical connection (Wiring diagram)

(Wiring diagram, see Chapter 4)

10.3.2 Supply voltage

Normal voltage power supply board: 115/230 V_{AC}, 50/60 Hz

10.3.3 Power consumption

max. 70 VA, typ. 36 VA

10.3.4 Isolation

- Insulation resistance:
  Each terminal to ground terminal: ≥ 20 MΩ (at 500 V DC)
- Dielectric strength:
  Power supply to ground terminal: 1500 V AC (50/60 Hz), 1 min.
  Measuring input terminal to ground terminal: 1000 V AC (50/60 Hz), 1 min.
  Between measuring input terminals: 1000 V AC (50/60 Hz), 1 min. (except for RTD input terminal)

10.4 Performance characteristics

10.4.1 Reference operating conditions

- Power supply: 90 to 132 or 180 to 264 V AC
- Ambient temperature: 23 °C ± 2 K (73.4 °F ± 9 °F)
- Air humidity: 55 % ± 10 % RH

10.4.2 Warm-up time

Min. 30 minutes

Input		Measurement (digital display)		Recording (analog)	
		Performance characteristics	Signal resolution	Accuracy	Resolution
Voltage U	20 mV	±(0.1% of measuring range + 2 digit)	10 µV	± (0.3% of recording range)	■ Line recorder: Dead band 0.25 % of recording range ■ Dotting recorder: 0.1 mm (3.98 mil)
	60 mV		10 µV		
	200 mV		100 µV		
	2 V[a]		1 mV		
	6 V		1 mV		
	20 V[1]		10 mV		
	50 V	±(0.1% of measuring range + 2 digit)	10 mV		
Thermocouple TC[b]	Type R, S, B	±(0.15% of measuring range + 1 °C) Barring R,S: 0 to 100 °C: ± 3.7 °C (32 to 212 °F: ± 6.7°F) 100 to 300 °C: ± 1.5 °C (212 to 572 °F: ± 2.7 °F) B: 400 to 600 °C: ± 2 °C (752 to 1112 °F: ± 3.6 °F) Accuracy for values ≤ 400 °C (752 °F) not guaranteed	0.1 °C (0.2 °F)		
	Type K	±(0.15% of measuring range +0.7 °C / 1.3 °F) Barring ±(0.15% of measuring range + 1 °C/1.8 °F) For -200 to -100 °C (-328 to -148 °F)			
	Type E	±(0.15% of measuring range +0.7 °C / 1.3 °F)			
	Type J, T, N, L, U	±(0.15% of measuring range +0.5 °C / 0.9 °F)			
Resistance thermometer RTD	Pt100	±(0.15% of measuring range +0.3 °C/0.5 °F)			

a. The accuracy of the 0-1 V (0-10 V) input corresponds to that of the 2 V (20 V) input
b. Barring accuracy of cold junction

10.4.3 Influence of ambient temperature

In the event of temperature change of 10 °C (18 °F)
- Maximum measured error: ±(0.1% of measured range + 1 digit)
- Recording: measured error (digital display) + max. ±0.2% of recording range. Barring errors in cold junction compensation

10.4.4 Compensation of terminal temperature

Over 0 °C (32 °F) with adjusted terminal temperature (60 minutes after start procedure)

- Type R, S, B: ± 1.0 °C (1.8 °F)
- Type K, J, E, T, N, L, U: ± 0.7 °C (1.3 °F)

10.4.5 Influence of supply voltage

±(0.1% of measured value + 1 digit)

10.4.6 Influence of magnetic field

AC (50/60 Hz) and DC 400 A/m fields: ±(0.5% of measured range + 10 digit)

10.4.7 Influence of orientation

For an angle of inclination (backwards) ≤ 30 °: ≤ (± 0.1% of measuring range + 1 digit)

10.4.8 Vibrations effects

For frequencies of 10 Hz to 60 Hz and an acceleration of 0.2 m/s^2 (0.66 ft/s^2):
- Measured error: max. ±(0.1% of measuring range + 1 digit)
- Recording: max. ±0.2% of recording range

10.5 Installation conditions

10.5.1 Orientation

Panel mounting horizontally, max. 30° incline backwards

10.5.2 Installation instructions

(Panel mounting and installation instructions see Chapter 3)

10.6 Environment

10.6.1 Ambient temperature range

0 to 50 °C (32 to 122 °F)

10.6.2 Storage temperature

-25 to +60 °C (-13 to 140 °F)

10.6.3 Relative air humidity

at 5 to 40 °C (41 to 104 °F), 20 to 80 % without condensation

10.6.4 Degree of protection

- front-panel IP54 (IEC 60529, Cat. 2) NEMA 3S
- rear-panel IP20

10.6.5 Electrical safety

IEC 61010-1, low voltage: overvoltage category II
Environment < 2000 m (< 6562 ft) above MSL (mean sea level)

10.6.6 Shock resistance

Environment must be shock-free

10.6.7 Vibration resistance

10 to 60 Hz, ≤ 0.2 m/s^2 (0.66 ft/s^2)

10.6.8 Magnetic field

≤ 400 A/m (DC and 50/60 Hz)

10.6.9 Electromagnetic compatibility (EMC)

according to IEC 61326-1 (Emmission: Class A, Immunity: industrial environment)

10.6.10 Common mode noise rejection

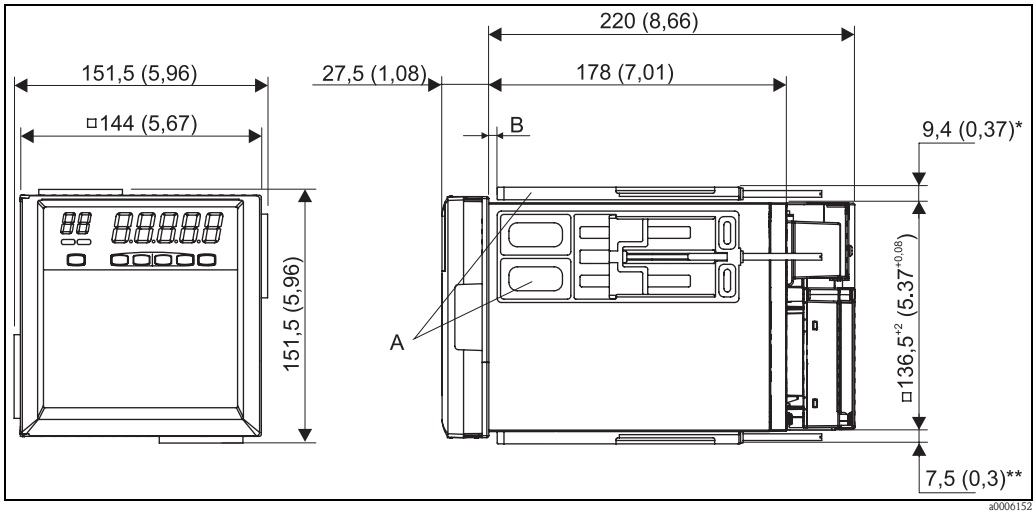
120 dB (50/60 Hz ± 0.1%)

10.6.11 Normal mode noise rejection

≥ 40 dB (50/60 Hz ± 0.1%)

10.7 Mechanical construction

10.7.1 Design, dimensions



Dimensions in mm (inch), unless otherwise specified, tolerance is ± 3%.
Tolerance = ± 0.3 mm (0.01 inch) when below 10 mm (0.39 inch)

** Dimensions before attaching the mounting bracket*
*** Dimensions after attaching the mounting bracket*

Pos. A: Mounting bracket
Pos. B: Mounting panel thickness 2 to 26 mm (0.08 to 1.02 inch)

10.7.2 Weight

- 1-channel pen recorder: approx. 2.1 kg (4.63 lb)
- 3-channels pen recorder: approx. 2.3 kg (5.07 lb)
- 6-channels dot recorder: approx. 2.5 kg (5.51 lb)

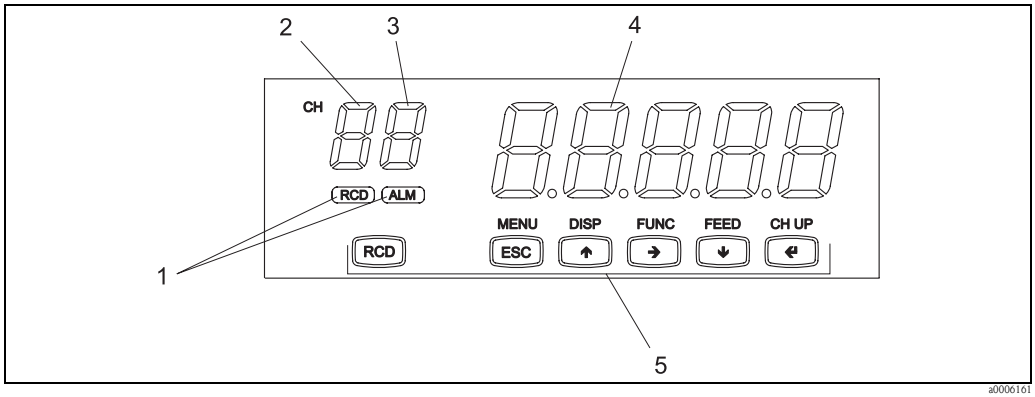
10.7.3 Material

- Front door/cover: aluminum die-cast
- Case: Drawn steel

10.7.4 Terminals

- Wire cross-section input terminals: max. 0.5 mm^2 (20 AWG) (screw terminals)
- Wire cross-section power supply terminals: 0.5 to 1.5 mm^2 (20 to 16 AWG) with crimp-on lugs (screw terminals)

10.8 Human interface



10.8.1 Display and operating elements

Item No.	Display functions
1	**Status displays, dimensions approx. 2.5 x 7.5 mm (0.1 x 0.3 inch)** ■ **RCD:** Lit green = recording Is not lit = recording finished or interrupted ■ **ALM:** Lit red = alarm (limit value violation) Is not lit = limit value violation overridden
2	**Channel display** 7-segment LED, dimensions approx. 12.6 x 6.8 mm (0.5 x 0.27 inch), lit orange, displays the channel number in question: 1, 2, 3, 4, 5 or 6 The channel display is permanently set for one channel or can be switched automatically between the channels every 2 seconds.
3	**Alarm display (limit value monitoring)** 7-segment LED, lit orange, displays the limit value violations **H** (upper limit value) and **L** (lower limit value) of the channel in question. Adjustable alarm hysteresis, from 0.0 to 1.0% of the recording range (in increments of 0.1%)
4	**Measured value display** 5 x 7-segment LED, dimensions approx. 18.0 x 9.7 mm (0.71 x 0.38 inch), lit green, displays the measured value of the configured channel or additional status messages, e.g. ERROR in the event of an error message. Display range from -19999 to 30000, decimal position can be set as required.
5	**Keyboard:** Operation and configuration via 6 operating keys on the front interacting with the LED displays.

10.8.2 Memory backup

A built-in lithium battery backs up the setup parameters (battery life: approx. 10 years at room temperature).

10.9 Certificates and approvals

10.9.1 CE-Mark

The device meets the legal requirements of the EC directives. Endress+Hauser confirms that the device has been successfully tested by applying the CE mark.

10.9.2 CSA

Certified by CSA22.2 No. 61010-1 (NRTL/C[1]) installation category II, pollution degree 2

10.10 Ordering information

See product structure → page 7

10.11 Accessories

Accessories available → page 39

10.12 Documentation

- Brochure Field of activities - Recorders and data acquistion technology (FA014R/09/en)
- Technical Information Chromalog T (TI130R/09/en)

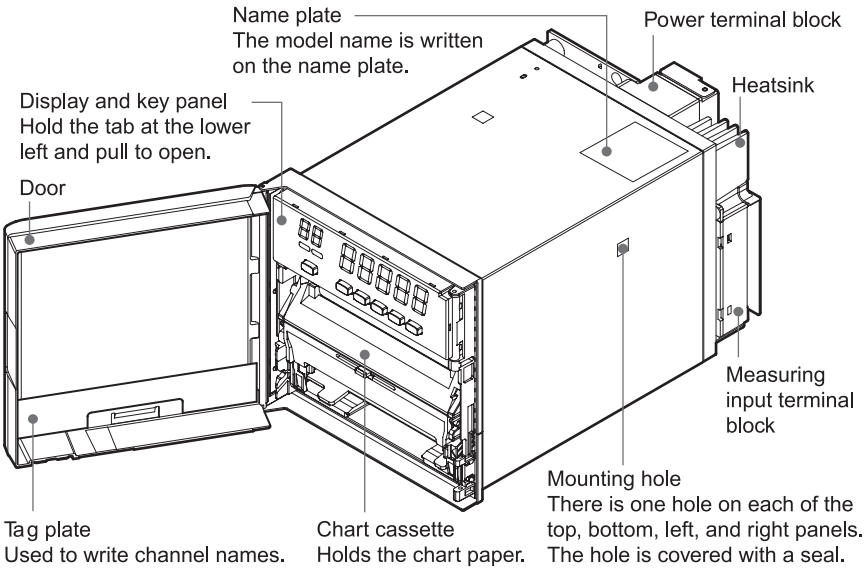
1. 'C' and 'US' are on the left and right side of the CSA mark respectively.

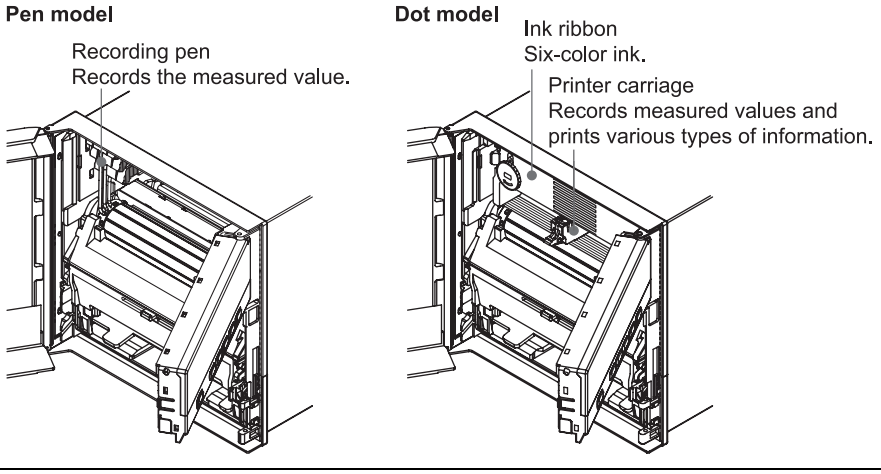
11 Appendix

11.1 Function introduction

- Input types
  The recorder can measure temperature using thermocouple, RTD and DC voltage. The pen model can record up to 3 channels; the dot model can record up to 6 channels.
- Alarms
  For each channel, high limit alarm and low limit alarm can be assigned to monitor the measured values.
- Recording
  The measured results are recorded with pens or dots on a chart paper. The chart speed can be selected from 10 to 3600 mm/h (0.4 to 141.7 inch/h) on the pen model and 10 to 1200 mm/h (0.4 to 47.2 inch/h) on the dot model.
- Display
  The large 7-segment display shows measured values and alarm status.

11.2 Names of parts





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