APPLICATION

The devices are designed for remote measurement and record of six physical quantities of various ranges.
The input signal shall be direct voltage or current or resistance change.

DESCRIPTION

Description of device frame:
Measuring and recording devices are located on the frame and slid into the box. The frame can be slid out. The face of the box is covered with transparent door with a label on it.
Basic design of the recorder consists of the following functional blocks:

- Recording table
- Unit of print and paper feed
- Linear motor with servo amplifier and scale
- Mother board of printed circuit with switchover of measuring places and pre-amplifier, on which there are connecting connectors for range units and other functional blocks and for connecting stripe cable with the box of the device and there is also interconnecting field on this mother board for the assignment of measuring place for corresponding scale of the device
- Connectors for connection of electronic circuits of individual measuring channels and for connection with the terminal board of the box
- Range units
- Board of control paper feed and print with circuits of signalling and adjustment of limit switches
- Box of the device with terminal board and mains source

Range units are accessible after sliding the device from the box and unscrewing the covering label.
The device has no cut-out fuse. It is protected against overload by non-destructive thermally dependent limiter in the circuit of primary wiring of the supply transformer.
Individual measuring places have mutual galvanic separation.
Colours on the label in the bottom part of door correspond to individual measuring places. The colours in scale indicate the actually measured place and are equal with the colour of the record.
Applied colours are (in order): 1. velvet
2. red
3. black
4. green
5. blue
6. brown

TECHNICAL DATA

The device is designed pursuant to ČSN EN 61010-1 as an electrical equipment of protection class I for application in mains with category of overvoltage in installation III and pollution grade 2.
The inner source for power supply of input signal circuits complies with ČSN EN 61010-1, Article 6.3.
Electric strength:
of mains circuit against protective terminal:
AC 2200 V
of inlet circuit against mains circuit:
AC 4000 V
of inlet circuit against protective terminal:
AC 500 V
of signalling relay contact circuit against protective terminal:
AC 2200 V
of signalling relay contact circuit against mains circuit:
AC 4000 V
of signalling relay contact circuit against inlet circuits:
AC 4000 V
of one signalling relay contact circuit against contacts of other relays: AC 2000 V
between disconnected contacts of the same signalling relay:
AC 1000 V
between input circuits of individual measuring places:
AC 100 V
Protective elements are connected inside the device, which shall be disconnected for the electric strength test.
The device is only designed for being built-in.

Power supply:
Type of power supply mains: 1 / N / PE AC 230 V, 50 Hz
Tolerance of supply voltage: ±10 %
Tolerance of mains frequency: 48 to 62 Hz
Coefficient of upper harmonics: max. 10 %
Electric insulation resistance: min. 20 MΩ
Power input: max. 10 VA
Ingress protection: pursuant to ČSN EN 60529:
box with lid in design (172 39x xx2) (tilting down) IP 52
box with lid in design (172 39x xx3) (tilting to side) IP 54
terminals IP 20
Weight: 4 kg
Applied materials:

- The box is made of metal sheet and is painted
- The door is made of an alloy casting with a glass inspection hole
- Type of terminals is specified in Figure 4

Record:
Type of record:
point, width of record: 100 mm
visible length of record: 80 mm (for rolled paper)
Movement of record paper 0, 10, 20, 60, 120 mm / hour.
Interval of printing depending on feed of the recording paper:
For six-curve design: 0, 2, 4, 12, 24 s
For other designs: 0, 4, 8, 24, 48 s
Length of the recording paper: rolled 16 m
folded 8 m
Accuracy class of the device related to time recording pursuant to ČSN IEC 258-A1, Article 2.1.4: 0.05
Informative number of points printed by one head is 200 000 for each tip.

OPERATION CONDITIONS

Ambient temperature: 0 to 50 °C
Relative ambient humidity:
10 to 95 % with upper level of water content 29g H_2O/kg of dry air
Atmospheric pressure: 86 to 106 kPa
Vibrations:
Frequency range [Hz] 10 to 55
Drift amplitude [mm] 0.35
At a special request, we deliver a recorder, which complies with the conditions of seismic resistance on the acceleration level of 30m.s^{-2} in the frequency range 1 to 33Hz.
Heating period: 20 minutes
Type of operation: continuous
Operation position: horizontal

METROLOGICAL DATA

Input signals:
1. Voltage DC
Maximum range: 0 to +/- 20 V
Minimum range: 0 to 5 mV
Start of suppression: max. 200 % of measurement span
Overload of input signals: max. 5x range
2. Current DC
Maximum range: 0 to 20 mA
Minimum range: 0 to 50 μA
Start of suppression: max. 200 % of measurement span
Overload of input signals: max. 5x range
3. Resistance
Maximum range: 0 to 300 Ω
Minimum range: 0 to 10 Ω
Start of suppression: max. 500 % of measurement span
Input resistance pursuant to input signal:
For voltage: to 100 mV inclusive ≥10 MΩ
over 100 mV ≥1250 Ω / 1 V

For current: to 1 mA voltage drop ≥ 50 mV
over 1 mA inclusive voltage drop ≥ 100 mV

Limits of permitted basic error:
Limits of permitted basic error with adjusted range unit:± 0.5 %
± 1 % for voltage ranges below 10 mV and for resistance ranges below 20 Ω.
The basic error is related to nominal range of input signal.
Linearity error: max. ± 0.2 %
Hysteresis: max. 0.3 %
Repeatability: max. 0.2 %
Dead sector: max. 0.2 %
Long-term drift for 240 hours: max. ± 0.4 %

Additional errors:
- In case of ambient temperature change per each 10 °C:
  - for input signal to 10 mV and 20 Ω inclusive: ± 0.3 %
  - for other input signals: ± 0.2 %
- within the whole operation range of supply voltage: ± 0.1 %
- within the whole operation range of vibrations: ± 0.5 %
- Impact of interfering signals: max. 1 %
  - for serial in case of interfering signal 1 x range, however max. 5 V and 50 Hz
  - for parallel in case of interfering signal 500 x range, however max. 10 V and 50 Hz

The impact of other influencing quantities in the operation field has no metrological importance.

Compensation of comparison ends of thermoelectric couples:
- Internal: accuracy: ± 0.5 °C and 0.2 % per each 10 °C of ambient air temperature
- External: related temperature: 0 °C, or 20 °C, or 50 °C, or 70 °C

In case external compensation is required, its value shall be specified. Compensation of individual ranges may be discretionary.

Changeover period of printer: below 0.5 s / 100 mm.

Signalling of exceeding limit values:
Number of adjustable limits: 4
Adjustment range: 0 to 100 %
Outputs: 1 × switch-over contact of relay for each limit, of which relays 1, 2 are idle in case of exceeding the limit (connection of contacts 15-16, 25-26) and relays 3, 4 are active in case of exceeding the limit (connection of contacts 35-37, 45-47)
Assignment of limits to measuring places: discretionary
Contact rating: 250V / 8A AC1
250V / 2A AC15
Contacts of signalling relays can be used either in the mains voltage circuits or in safe voltage circuits; always all relays of one recorder in the same category of circuits.
Values of surface paths correspond to ČSN 33 0420-1.

ELECTROMAGNETIC COMPATIBILITY (EMC)

Resistance to external magnetic and electric fields: max. 400 A/m
Resistance to fast transient phenomena:
level 4 pursuant to ČSN EN 61000-4-4
Resistance to electrostatic discharges:
level 4 pursuant to ČSN EN 61000-4-2
Resistance to short interruptions:
5 periods pursuant to ČSN EN 61000-4-11
Limit values of interfering voltage on mains terminals:
class B pursuant to ČSN EN 55011

DESIGNATION

Data on product:
- Trade mark (on frame)
- Made in CZECH REPUBLIC (on frame)
- Type (on frame)
- Manufacturing number (on frame)
- Type and size of supply voltage, max. power input (on frame)
- Ingress protection (on frame)
- Accuracy class
- Scale position
- Trial voltage
- Symbol for link to independent document
- CE mark

The scale, reading rule and range unit specify the range of measurement, input signal and, as the case may be, the type of the sensor.
Label in the front specifies the measurement range and unit of measured quantity and it can also include printed additional text for the measurement range. The whole data may contain 22 characters including spaces.

DELIVERY

The printer is secured against movement with a rubber arrest.
Unless agreed otherwise with the customer, each delivery includes:
- Delivery note
- Products pursuant to the purchase order
- The following is delivered with each recorder:
  - Resistor Rj 20 Ω for resistance of input signals
  - Reading rule for each range
  - 3 pcs of printing heads
  - 2 pcs of connecting yokes
  - 8 pcs of rolls of recording paper RP120
  - Tray for folded paper
  - Key for design of lid of door tilting to side (172 39x xx3)
  - Vaseline
  - Accompanying technical documentation in Czech in the following range:
    - Product quality and completeness certificate (it declares compliance with Technical conditions and also serves as the warranty certificate)
    - Installation, operation and maintenance manual

If it is established in the purchase contract or agreed otherwise, the following documentation can be also delivered with the product:
- EC Declaration of Conformity
- Other documents

RELIABILITY

Reliability on conditions pursuant to ČSN 18 0023:
Informative value of medium time between failures is 16 000 hours. Medium life is 5 years.

PACKING

Both the device and accessories are packed pursuant to controlled packing regulations
The devices are delivered in a packing ensuring resistance to the impact of thermal effects pursuant to ČSN EN 60654-1 and mechanical effects pursuant to ČSN IEC 654-3.

TRANSPORT

The devices may be transported in the following climatic conditions:
- Ambient temperature: -25 to 60 °C
- Relative ambient humidity: 5 to 95 %, without condensation
- Atmospheric pressure: 86 to 106 kPa

The devices are delivered in a transport package ensuring protection to the following mechanical effects:
- Vibrations: frequency: 10 to 55 Hz
  feed / acceleration: 0.35 mm / 49 m/s^2
- Surges: pulse amplitude: 98 m/s^2
  pulse time: 16 ms

The devices may be stored in conditions complying with the set of combinations of classes IE 21 pursuant to ČSN EN 60721-3-2.

STORAGE

The devices may be stored for the period of 1 year from the dispatching in the following conditions:
- Ambient temperature - 5 to 45 °C
- Relative ambient humidity 5 to 95 %, with upper limit of water content 29g H_2O/kg of dry air, without condensation
- Atmospheric pressure 86 to 106 kPa

The devices may be stored in conditions corresponding to the set of combinations of classes IE 11 pursuant to ČSN EN 60721-3-1.
The storage life is max. 12 months. Afterwards, inspection piece tests of the product shall be made.

PLACING AN ORDER

- Name
- Product number
- Required ranges - pursuant to Figure 1
- As for the label, the required text shall be specified pursuant to table in Figure 3
  Number of measuring place * El. measuring range * Scale stripe * Scale range * External temperature compensation * Text on label - T:
- Number of pieces

Note:
In case of a measuring place not occupied with a range (reserve), the place is occupied with a unit 0 to 20 mA. Indication diode is lit on a clear scale. The pointer is set to 3 to 4 mm.

Purchase order example:

Point recorder	172 397 402		3 pcs		
1	* 4 to 20mA	* S1	* 0 to 600 °C J		* T: BOILER 1
2	*	* S1	* 0 to 100 °C Pt100		* T: TEMPERATURE
3	* 0 to 20 mA	* S3	* 0 to 10m		* T: LEVEL
4	* 0 to 20 mA	* S2	* 4 to 10%		* T: CONCENTRATION
5	* 0 to 1 V	* S2	* 0 to 100%		
6	*	* S3	* 600 to 1000 °C		* T: OVEN 2
Point recorder	172 397 702		2 pcs		
1	* 0 to 20mA		* 0 to 16 t/h	*	* T: BARREL 3
2	*		* 0 to 1200 °C K	* EK 0°C	* T: OVEN
3	*		* 0 to 40 °C Pt100	*	*
Point recorder	172 397 503		5 pcs		
			*200 to 600 °C J	* EK 50 °C	* T: BATH
Point recorder	172 397 803		3 pcs		
1	* 0 to 10V		* 63 to 160mm	*	* T: LEVEL
2	*		* 100 to 300 °C J	*EK 20°C	* T: HEATING
3	* 4 to 20 mA		* 100 to 300 °C J	*	* T: RESERVE
4	* 4 to 20 mA		* 400 to 600 °C	*	* T: TEMPERATURE 1
5	* 4 to 20 mA		* 400 to 800 °C	*	* T: TEMPERATURE 2
6.	Reserve				

TABLE OF DESIGNS

SPECIFICATIONS			ORDERING NUMBER					
			172	39	7	xx	x	xx
Design	without signalling	one-curve				10		
		two-curve				20		
		three-curve				30		
		six-curve				40		
	with signalling	one-curve				50		
		two-curve				60		
		three-curve				70		
		six-curve				80		
	lid	tilting down					2	
		opened to side with lock					3	
	Seismic resistance *)							SEI

Drawing of lids is provided in Figure 2.

*) Design only as a special option after an agreement with the manufacturer

The device may be equipped with one wide or three narrow scale stripes located below each other, which are marked from top to the bottom S1, S2, S3 (refer to Figure 3).
The wide stripe includes one scale and is used for one-curve recorders.
Narrow stripes can have one scale, two scales can be clear. As for two- and three-curve recorders, narrow scale stripes with a simple scale are used. The third scale stripe of two-curve recorders is clear.
As for six-curve design with over three various ranges of scales, narrow stripes with double scales are used.

INSTALLATION AND CONNECTION

The device is connected to the panel by means of two connecting yokes pursuant to drawing in Figure 2. Drawing of connecting terminal board is provided in Figure 4.

WARNING:
The device has no fuse of mains power supply and shall be secured with an external fuse pursuant to ČSN EN 60127-2.

Connection of input signals:
The sensors (input signal) are connected by means of two, three or four-core cable with total insulation resistance of at least 6 MΩ. Resistance value of input signal voltage circuit to 100 mV may be max. 300 Ω.
Connection of voltage or current input signals and thermoelectric couples shall be made pursuant to Figure 5.

With respect to two-wire connection of temperature resistance sensors pursuant to Figure 5, resistor Rj shall be adjusted to the resistance value of sensor circuit (i.e. resistance of both wires including resistance of internal wiring of the sensor) and shall be connected between terminals 3 and 4. Maximum resistance value of the circuit may be 20 Ω.
With respect to three-wire connection of temperature resistance sensors pursuant to Figure 5, resistor Rj shall be connected to terminal 4 and adjusted to the resistance value of internal wiring of the sensor. Resistance value of individual inlet wires to terminals 2 and 4 shall be equal and may be max. 20 Ω. Resistance of wire to terminal 1 is not balanced.
In case of four-wire connection of the resistance temperature sensor with auxiliary loop pursuant to Figure 5, the resistance

value of individual inlet wires shall be the same and may be max. 20 Ω.

Three-wire connection of the resistance temperature sensor with auxiliary loop or resistance sensor in four-wire connection shall be made pursuant to Figure 5. The resistance value of individual inlet wires shall be the same and may be max. 20 Ω.
Connection of the resistance transmitter shall be made pursuant to Figure 5. The resistance value of individual inlet wires shall be the same and may be max. 20 Ω.

COMMISSIONING

The equipment may only be used in the way, for which it is designed by the manufacturer.
Basic handling:
Doors of the recorder in design (172 49x xx2) are opened by tilting down.
Doors in design (172 49x xx3) are opened after unlocking the lock to the side.
By pressing two levers on the sides of the recording table, it is released, turned to the front and removed. To use rolled recording paper, remove and store the tray of folded paper. To use folded recording paper, remove and store unreeling and reeling coils.
The device is slid from the box by pressing the pawl of the arrest located in the left bottom part and by simultaneous pulling by the fingerboard after releasing the screw in the middle of the fingerboard.
By sliding the truck of the linear motor between the stops, rubber arrest is released. If the truck is transported again, it shall be secured again.
On the printer shaft, slide the printing head from the accessories while holding the arm of the printer to avoid its damage. The printing head is slid into the position, in which the securing spring engages into the groove on the shaft circuit. The head may not be pressed excessive behind the groove; it shall be released by slight pulling backwards.
Speed of feed of the recording paper and, at the same time, interval of printing are selected when the recording table is removed by the combination of levers of the DIP switchover in the bottom part of the device (refer to Figure 6). Visible period of recording and operation period of one roll of the rolled paper are provided in the following table:

Feed [mm/h]	Operation period	Visible period of record
10	66 days	8 h
20	33 days	4 h
60	11 days	80 min
120	5.5 days	40 min

We recommend adjusting the speed of feed of the recording paper pursuant to the expected speed of change of the measured quantity from the following table:

Design of device	Change of measured quantity [% per minute]	Minim. recommended speed [mm/h]
One-curve	1.5	10
	3	20
	9	60
	18	120
Two-curve	0.75	10
	1.5	20
	4.5	60
	9	120
Three- and six-curve	0.5	10
	1	20
	3	60
	6	120

Signalling set-up:
If the device is equipped with signalling that the limit is exceeded, assign individual limits 1 to 4 to the required measuring channels by means of the interconnecting field on the left side of the device at first. The assignment is made by means of shortcuts pursuant to Figure 7. The assignment can be combined arbitrarily.
The limits 1 and 2 are breaking; the relay is tripped to idle conditions when the pre-set value is exceeded. The limits 3 and 4 are switching; when the pre-set value is exceeded, the relay is switched. Figure 4 illustrates the contacts in idle positions (relay disconnected).
Switching value is adjusted for individual limits by means of control elements located above the switchover of feed speed of the recording paper (refer to Figure 6).

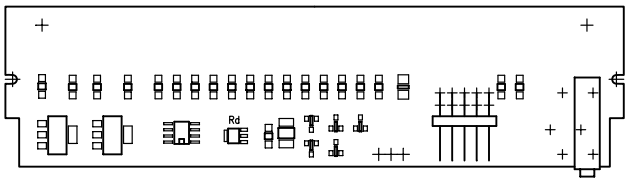
By the combination of lever of the top DIP switchover, the function is switched over from the position of measurement M to the position for adjustment of the required limit - position 1 to 4. By the relevant potentiometers 1 to 4, the required limits are set-up; their size is given by the position of the pointer of the measuring device.
The LED diodes are also used to indicate the scale and the measuring channel. After the set-up of all limits, the switchover of function is returned to the position of measurement M.
Inserting recording paper:
Inserting rolled recording paper:
Release the beginning of the roll. Insert the unreeling coil into the roll and press the roll with paper into the grooves in the rear top part of the table. Slide the paper under the brake bar and lead it over teeth of the transport cylinder under the transparent cut-off ruler and slide it over the bottom guide bar into the slot in the reeling coil. By turning the reeling coil, reel about two turns and the paper is tight.
Inserting folded recording paper:
Insert the recording paper into the tray in the rear top part of the table, slide the paper under the brake bar and bring it over teeth of the transport cylinder under the transparent cut-off ruler and let it fall freely to the bottom tray.
Insert the recording table into the grooves in the front bottom part of slid-in device. By turning it is returned to the original position secured with arrest levers.
After the connection of supply voltage and the settlement period (20 minutes), the device is prepared for operation.

OPERATION AND MAINTENANCE

The condition of used-up recording paper is indicated by a red line about 1 to 2 m from the end of the roll.
When using rolled paper, slide out the rolling coil from the removed table by pulling it downwards. Remove the left face of the coil and hold the coil by the right face. By turning the rolled paper against the direction of reeling, the paper is released and can be removed. The empty reeling coil is returned back.
Folded paper is removed after tilting the tray of folded paper.
Inserting new recording paper is made as specified above.
When replacing the printing head, remove the recording table and slide out the front part of the recorder from the box. Switchover of the feed speed of the recording paper is switched to the zero position. Slide out the printing head by a slight pulling to the left from the shaft of the printer. At the same time, you need to hold the arm of the printer with your left hand to avoid the damage to the arm. The new printing head is inserted as specified above.
If a change of colour of the printing head occurs while handling the device with respect to colour corresponding to the measured place, it is necessary to adjust the required colour by manual rotation of the printing head to the front.
Correct function of the printer after the replacement of the printing head can be tested at feed speed adjusted to zero by the push-button of manual control on the left side of the recorder.
When replacing the recording paper, we recommend removing dust from the device that is formed by rolling the recording paper and possible impurities captured on the tip of the printing head.
At least at each replacement of the printing head, guiding bars of the linear motor shall be cleaned. After cleaning, the rods are greased with a small amount of grease from the accessories.
When replacing the range units, unscrew the cover on the top part of the device. The original range unit is removed from the connector and a new one is slid into its place. For accurate adjustment, the range unit shall be fine adjusted by potentiometers MIN and MAX pursuant to designation on the panel.
Replacement of scale is performed after unscrewing two screws on the sides of the scale. During the replacement, pay attention not to damage the indicator.
The adjustment of LEDs on the right side of scales indicating the assignment of the measured channel to the given situation

is made in the interconnecting field in the right rear side of the device when the cover is removed. It is made as required when changing the range and scale pursuant to Figure 7.
The device may be slid out from the box after disconnecting the connector of the connecting cable in the rear part of the device. Terminals of current circuits are bridged with a diode; therefore, when the cable is disconnected, it is not necessary to interconnect them.
WARNING: Before sliding the device from the box, the device shall be disconnected from supply voltage.

To adjust dynamic properties of the servo mechanism with linear motor, there is potentiometer Rd on the board of the servo amplifier - refer to figure.



In case of problems with stability of the whole servo loop (pointer bouncing), this potentiometer can be used to modify dynamic behaviour. This operation shall be made with adjusted zero feed speed of the paper. Move the coil of the linear motor with a finger from settled position and monitor its immediate settlement. Potentiometer Rd has no mechanical stops, suitable position shall be determined by a trial by monitoring the settlement of the linear motor. It is necessary to pay attention to avoid damage to instable leads to mobile part of the motor.

SPARE PARTS

Printing heads:
They are delivered by the manufacturer; they are delivered with the following ordering numbers:

For one-curve recorder	039 560 415
For two-curve recorder	039 561 515
For three-curve recorder	039 562 615
For six-curve recorder	039 563 715

THE PURCHASE ORDER SHALL SPECIFY:
- Name
- Ordering number
- Number of pieces

PURCHASE ORDER EXAMPLE:
Printing head for one-curve recorder
039 560 415 1 pc

Recording paper:
It is delivered with designation RP 120
THE PURCHASE ORDER SHALL SPECIFY:
- Name
- Designation
- Number of pieces

PURCHASE ORDER EXAMPLE:
Recording paper RP 120 4 pcs

Range unit (to be delivered by the manufacturer)**:**
The measurement range is entered by the beginning and the end of the range for the input signal. In case of direct connection of thermocouples and resistance thermometers to the recorder, the range of measurement of range units is entered by specification of the beginning and end temperatures, type of sensor and value of related temperature in case of application of thermocouples with external compensation of comparison ends.
THE PURCHASE ORDER SHALL SPECIFY:
- Name
- Product number 039 498 815
- Required ranges - pursuant to Figure 1
- Number of pieces

PURCHASE ORDER EXAMPLE:

Range unit	039 498 815	4 to 20 mA	1 pc
Range unit	039 498 815	4 to 20 mA	1 pc
Range unit	039 498 815	0 to 20 mA	1 pc

Label:
It is delivered pursuant to drawing in Figure 3 with the following ordering numbers:

For one-curve recorder	039 365 715
For two-curve recorder	039 366 815
For three-curve recorder	039 367 915
For six-curve recorder	039 369 015

THE PURCHASE ORDER SHALL SPECIFY:
- Name
- Product number
- Required ranges - pursuant to Figure 1
- Required text may be specified for the label pursuant to table in Figure 3

PURCHASE ORDER EXAMPLE:
Label for one-curve recorder 039 365 715 0 to 250 °C
T: oven 1 1 pc

Scale:
It is delivered pursuant to drawing v Figure 3 with the following ordering numbers:

For one-curve recorder	039 447 115
For multi-curve recorder single	039 448 215
For multi-curve recorder double	039 449 315

A reading rule is delivered with the scale.
THE PURCHASE ORDER SHALL SPECIFY:
- Name
- Product number
- Required ranges (2 ranges for double scale) pursuant to Figure 1
- Number of pieces

PURCHASE ORDER EXAMPLE:

Scale	039 447 115	0 to 600°C J	1 pc
Scale	039 449 315	0 to 600°C J	
		0 to 400°C K	1 pc

REPAIRS

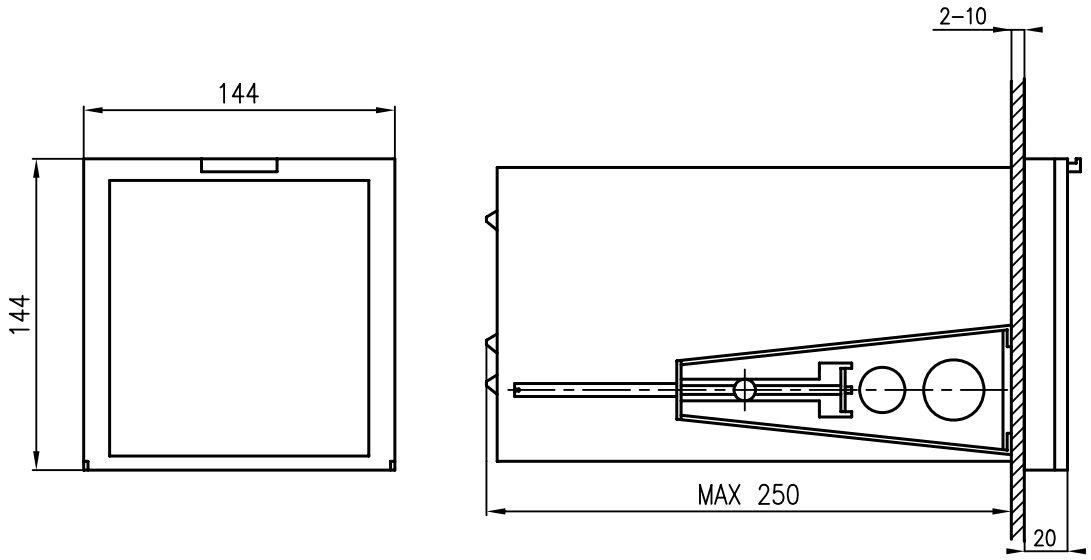
The devices shall be repaired by the manufacturer. The devices shall be sent for repair in the original packing without accessories.

Figure 1 Selection of recommended ranges of recorder

THERMOCOUPLE	RESISTANCE Resistance thermometers	CURRENT AND VOLTAGE
0 to 200°C J	-25 to +25° Pt100	0 to 5 mV
0 to 300°C J	0 to +40° Pt100	0 to 10 mV
0 to 400°C J	0 to +50° Pt100	0 to 20 mV
0 to 600°C J	0 to +60° Pt100	0 to 30 mV
0 to 800°C J	0 to +100° Pt100	0 to 40 mV
0 to 900°C J	0 to +150° Pt100	0 to 50 mV
0 to 600°C K	0 to +200° Pt100	0 to 60 mV
0 to 900°C K	0 to +250° Pt100	0 to 80 mV
0 to 1200°C K	0 to +400° Pt100	0 to 100 mV
0 to 1200°C S	0 to +600° Pt100	1 to 5 mV
0 to 1400°C S	0 to 800° Pt100	2 to 10 mV
0 to 1600°C S	15 to +40° Pt100	4 to 20 mV
0 to 100°C J	50 to +100° Pt100	6 to 30 mV
0 to 150°C J	50 to +150° Pt100	8 to 40 mV
0 to 800°C K	100 to +100° Pt100	10 to 50 mV
0 to 1000°C K	100 to +300° Pt100	12 to 60 mV
0 to 1000°C S	100 to +400° Pt100	16 to 80 mV
100 to 300°C J	200 to +600° Pt100	20 to 100 mV
200 to 400°C J	400 to +600° Pt100	-5 to +5 V
200 to 600°C J	400 to +800° Pt100	-10 to 10 V
300 to 600°C J	-200 to -100° Pt100	-20 to +20 V
400 to 800°C J	-100 to +50° Pt100	0 to 1 V
300 to 600°C K	-60 to +80° Pt100	0 to 5 V
300 to 1200°C K	-50 to 0° Pt100	0 to 10 V
400 to 800°C K	-30 to +50° Pt100	0 to 20 V
600 to 1200°C K	--25 to 0° Pt100	1 to 5 V
600 to 1600°C S	0 to +25° Pt100	2 to 10 V
100 to 200°C J	0 to +80° Pt100	4 to 20 V
100 to 400°C J	0 to +500° Pt100	0 to 5 mA
150 to 350°C J	0 to +550° Pt100	0 to 10 mA
150 to 450°C J	0 to +300° Pt100	0 to 20 mA
200 to 500°C J	200 to +400° Pt100	1 to 5 mA
250 to 450°C J	300 to +550° Pt100	2 to 10 mA
400 to 600°C J	300 to +650° Pt100	4 to 20 mA
500 to 800°C J	500 to +800° Pt100	0 to 1 mA
200 to 600°C K	0 to +60° Ni100	0 to 2 mA
300 to 900°C K	0 to +100° Ni100	-1 to +1 mA
400 to 1200°C K		-2 to +2 mA
500 to 1000°C K		-10 to +10 μA
600 to 1000°C K		-20 to +20 μA
800 to 1200°C K		-50 to +50 μA
600 to 1200°C S		-100 to 100 μA
700 to 1300°C S	**Resistance transmitter**	-200 to 200 μA
800 to 1400°C S	100Ω	-500 to 500 μA
800 to1600°C S		0 to +20 μA
1000 to1600°C S		0 to +50 μA
0 to 200°C Fe-ko		0 to 100 μA
0 to 300°C Fe-ko		0 to +200 μA
0 to 400°C Fe-ko		0 to +500 μA
0 to 600°C Fe-ko		4 to 20 μA
0 to 800°C Fe-ko		10 to 50 μA
200 to 400°C Fe-ko		20 to 100 μA
300 to 600°C Fe-ko		100 to 500 μA
400 to 800°C Fe-ko		0.2 to 1 mA
300 to 1600°C B *)	Compensation of comparison ends is not performed	

Figure 2 Dimensional drawings of recorder

Design of lid that is tilting down (172 39x xx2)



Design of lid that is opened to side with lock (172 39x xx3)

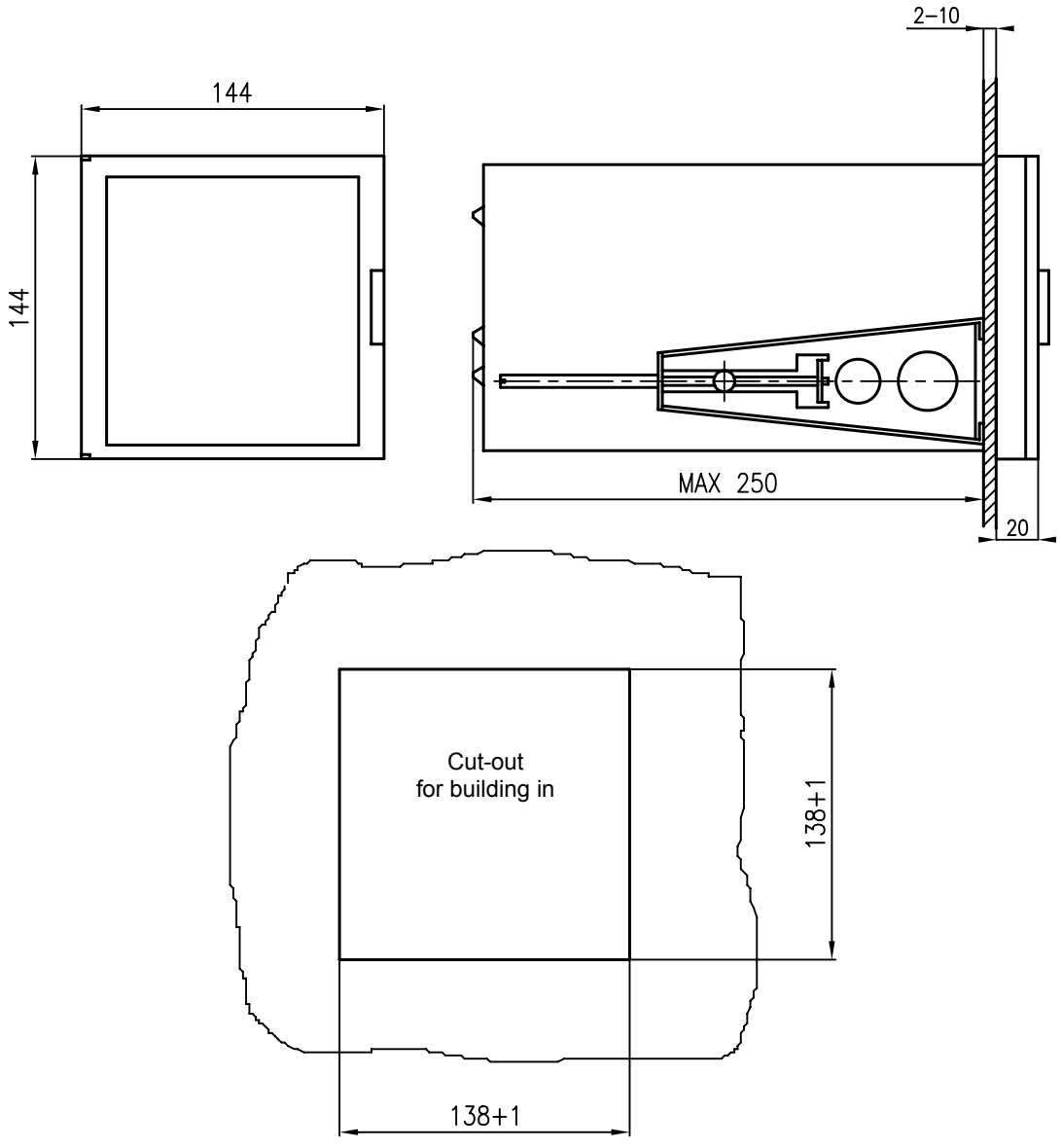
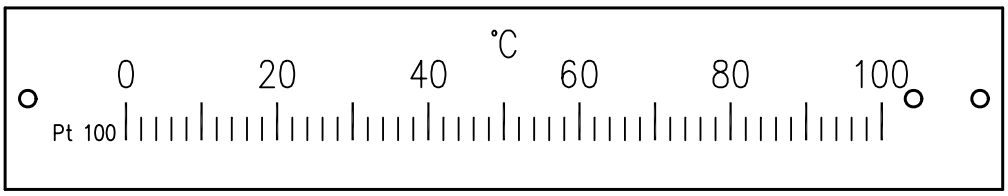


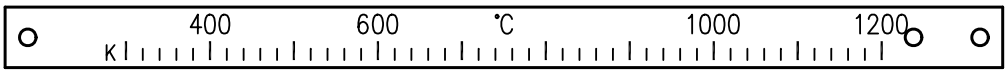
Figure 3 Drawing of scales and labels, specifications of measuring ranges

Spare part number
(ordering number)

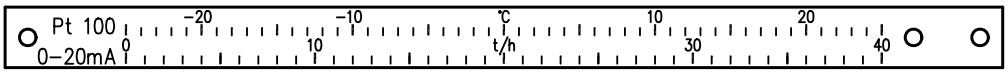
039 447 115 Scale for one-curve design



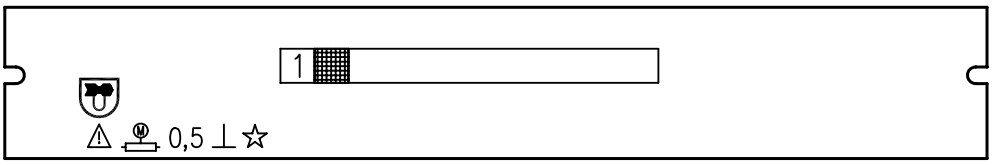
039 448 215 Scale for multi-curve design single



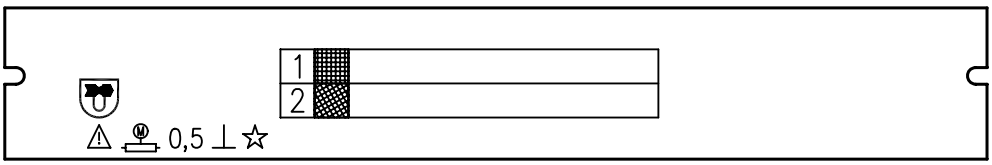
039 449 315 Scale for multi-curve design double



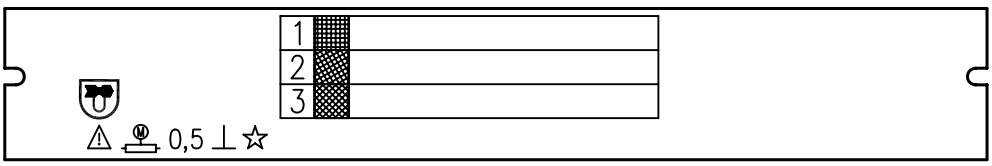
039 365 715 Label for one-curve design



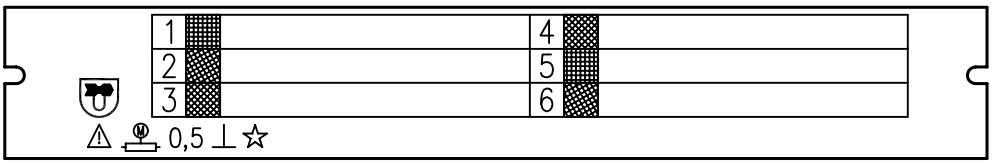
039 366 815 Label for two-curve design



039 367 915 Label for three-curve design



039 369 015 Label for six-curve design

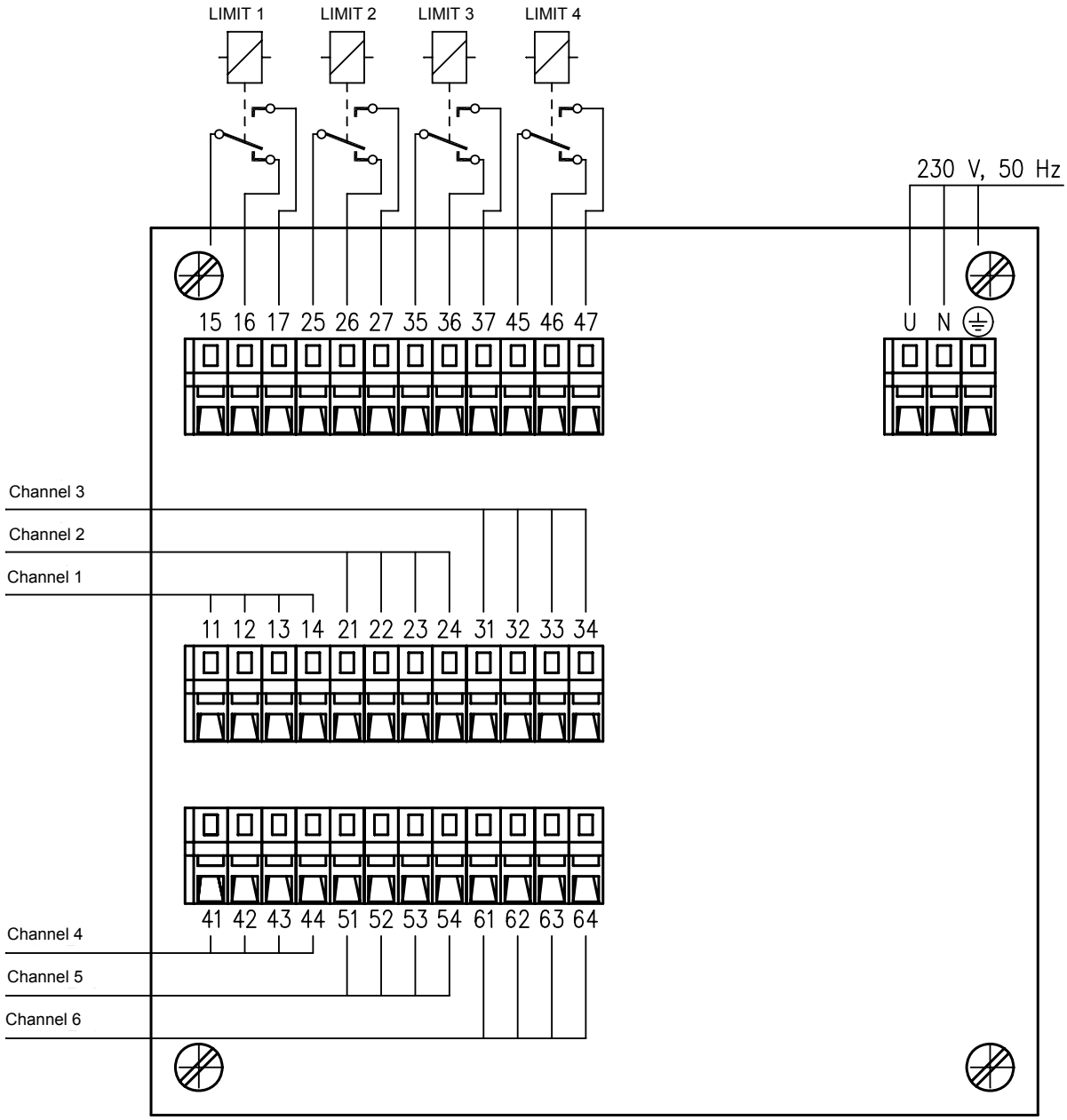


Specifications of measuring ranges (pursuant to the following table):

Number of measuring place * El. measuring range * Scale stripe * Scale range * External temperature compensation * Text on label - T:

MEASURING PLACE NUMBER [x]	It specifies the number of the measure place with gradual printing of points.
ELECTRICAL MEASURING RANGE [xxx…xxx]	The beginning and the end of the range for input signal shall be entered. Recommended ranges are in Figure 1. In case of direct connection of thermocouples and resistance thermometers to the recorder, the electrical measuring range is not specified because values of signals of these sensors are defined by applicable standards.
SCALE STRIPE [S x]	Index x specifies location of the scale stripe, on which the scale of the applicable measured place is requested: 1 - top, 2 - middle, 3 - bottom. It is only identified for the six-curve design with over three various ranges of scales.
SCALE RANGE [xxx…xxx]	The beginning and the end of the range are entered. Recommended ranges are provided in Figure 1. When using thermoelectric or resistance thermometers, the type of sensor shall be specified, which defines the course of scale and, in case of direct connection of such sensors to the recorder, it determines the corresponding electrical measuring range. Unless the type of the sensor is identified, the scale will be delivered with linear division.
EXTERNAL TEMPERATURE COMPENSATION [EK xx °C]	Temperature compensation is performed in case of direct connection of thermocouples to recorders; however only in case of using external temperature compensation of comparison ends when the value of related temperature of such compensation is added behind "EK". Unless the data "EK" is identified in the specification, the device will be delivered with internal compensation of comparison ends in the applicable measuring place.
TEXT ON LABEL T [xxx…xxx]	The label in the front specifies the measurement range, unit of measured quantity and an additional text for the measurement range may be printed there too. The whole data may include max. 22 characters including spaces.

Figure 4 Drawing of terminal board

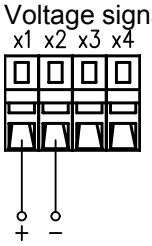


Type of terminals:
Screw-less WAGO 236 for cross-section of wires 0.14 to 2.5mm$^{2.}$
To connect them, use a screwdriver 3.5 × 0.5mm.

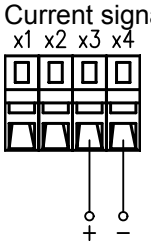
Note:
Installation of terminals CHANNEL 2, CHANNEL 3, STOP, FAST and terminals LIMIT 1 - LIMIT 4 pursuant to design

Figure 5 Connection scheme of input signals

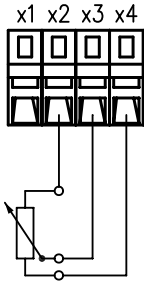
Voltage signals and thermoelectric couples



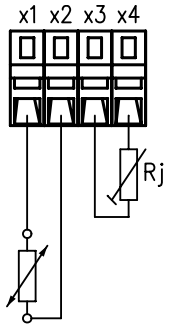
Current signals



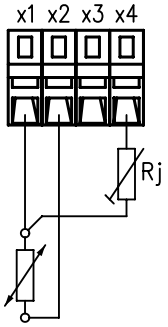
Connection of resistance transmitter



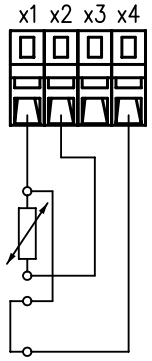
Two-wire connection of resistance temperature sensor



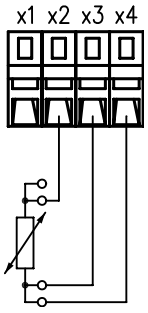
Three-wire connection of resistance temperature sensor



Three-wire connection of resistance temperature sensor with auxiliary loop



Three-wire connection of resistance temperature sensor in four-wire design



Four-wire connection of resistance temperature sensor with auxiliary loop

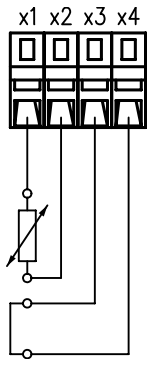


Figure 6 Drawing of design

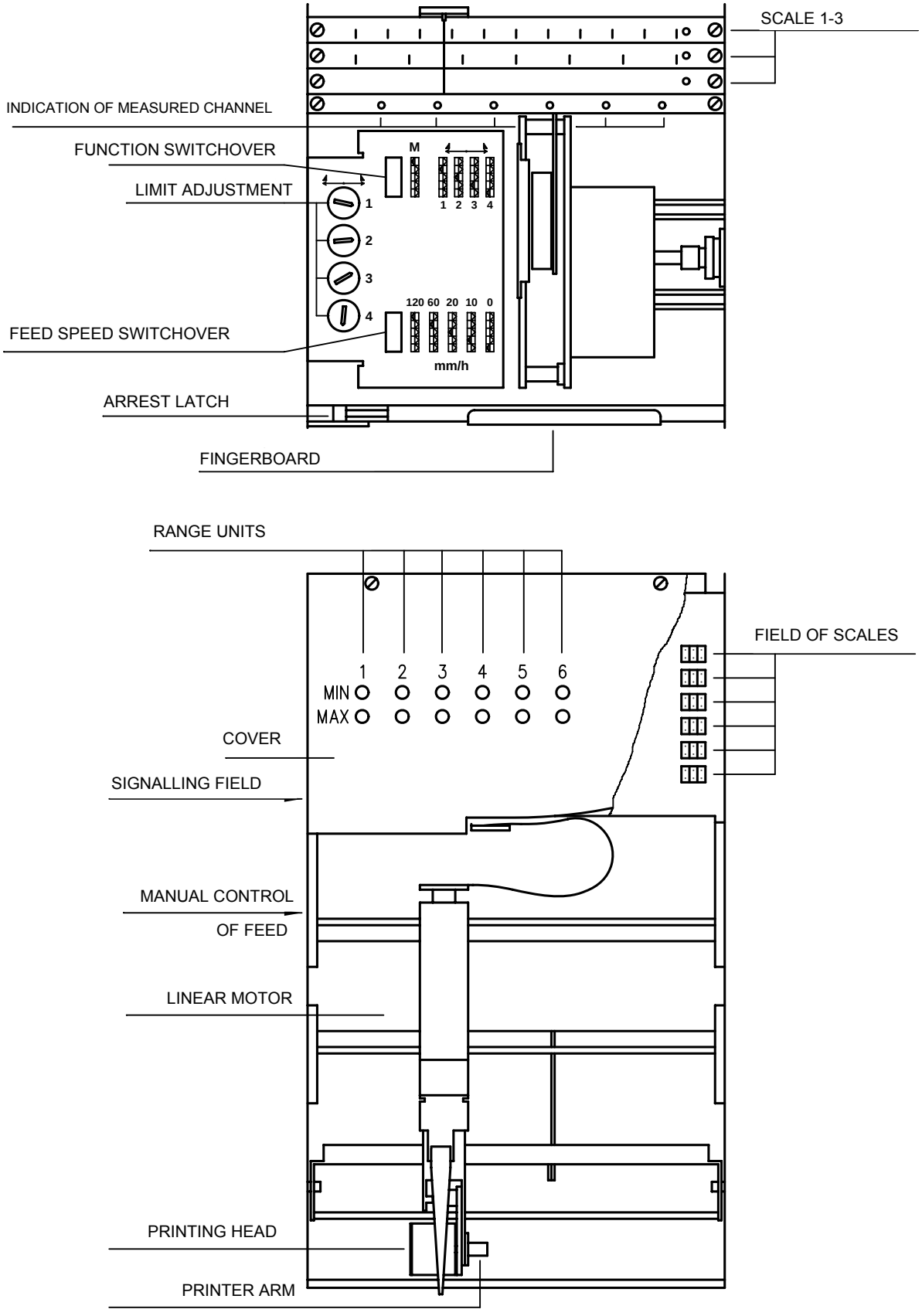
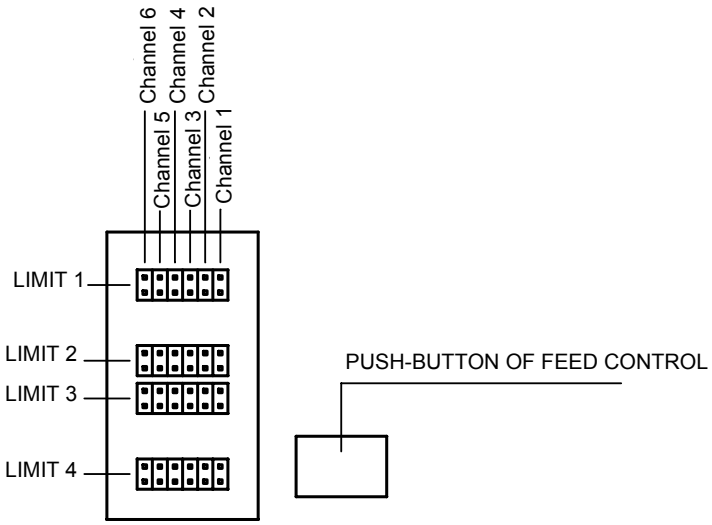


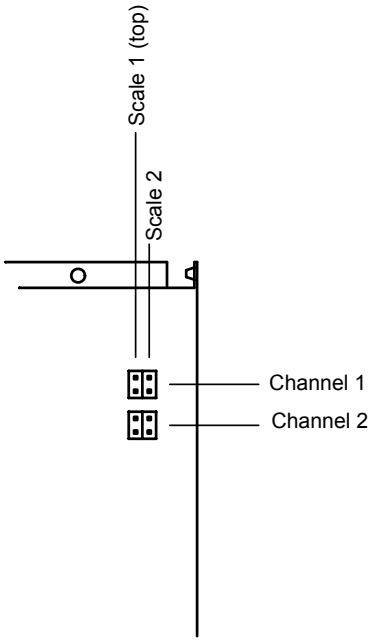
Figure 7 Drawing of interconnecting fields

INTERCONNECTING FIELD OF SIGNALLING

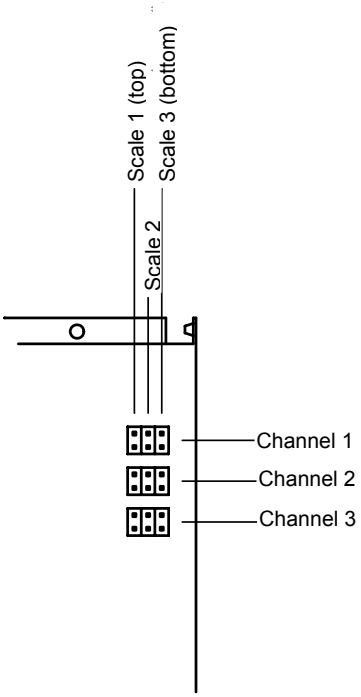


INTERCONNECTING FIELD OF SCALES

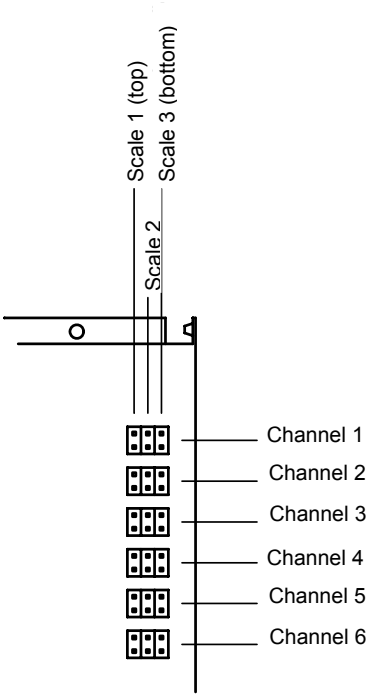
Two-curve design



Three-curve design



Six-curve design



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