



AKM 345 Gen2

Oil Temperature Indicator AKM OTI Type 34

Winding Temperature Indicator AKM WTI Type 35

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1. General

The AKM345 next generation, GEN2 for short, is a world class, robust CE approved fully weather proofed temperature indicator, used globally for electricity transformers. It is designed and manufactured for long and trouble free outdoor operation under all conditions.



To secure maintenance-free operation, the installation on the transformer must be made with care.

2. Installation

- Before installation check for possible damage from transport handling.
- Do not carry the instrument by the capillary. Do not twist the capillary when unwinding it, or bend too sharply – min radius 25 mm. Clamp it along its entire length at approx 400 mm intervals. Excess capillary can be wound in a spiral with min diam.100 mm.
- Leave at least 15% thermal expansion space in oil filled pockets.
- The non-vibration mountings included must be used to prevent mechanical wear out caused by transformer vibrations.
- Installation shall prevent instrument casing temperatures over +70°C for standard types.

3. Calibration Check

- Each instrument is factory calibrated and no further calibration is required.
- Check calibration put the bulb in boiling water (+100°C) or in a well stirred bath (min water or oil volume 5 litres) with a control thermometer. Read the thermometer after 15 minutes. If indication error is larger than 5°C we recommend contacting local agent or manufacturer for further assistance.

4. Switch Setting

- Switches are factory calibrated.
- Each switch is individually adjustable and provided with a scale.
- Open instrument front cover by loosening the two lower retaining bolts.
- Loosen the knurled-head screw on the red pointer.
- Hold the screw in position and rotate the scale drum until the red pointer under the knurled screw points at the desired contact point on the scale.



- Tighten the screw in this position.
- • Check that contact is obtained by slowly turning the shaft of the drum so that the pointer of the temperature gauge moves towards higher values on the scale. The shaft of the drum must not be turned in the other direction since the calibration of the instrument may change. When checking the instrument must be in a vertical position.

4.1. (Optional) Adjustable Switch Differential Setting Instructions

- Adjust alarm set point as described above.
- Adjust the multi-turn adjusting screw located beneath the switch scale plate fully clockwise. At this point the differential will be set at 5°C. (When turned fully anti-clockwise the differential is set at 25°C)
- Pull down the brass test lever (located on the right hand side) slowly to verify correct alarm and differential setting. For example if the alarm is set at 50°C and the adjusting screw is set fully anti-clockwise, the switch will energize at 50°C on rising temperature. It will de-energize on lowering temperature at 25°C.



Never force the test lever upwards.



- Fine-tune differential setting by gradually turning the adjusting screw.

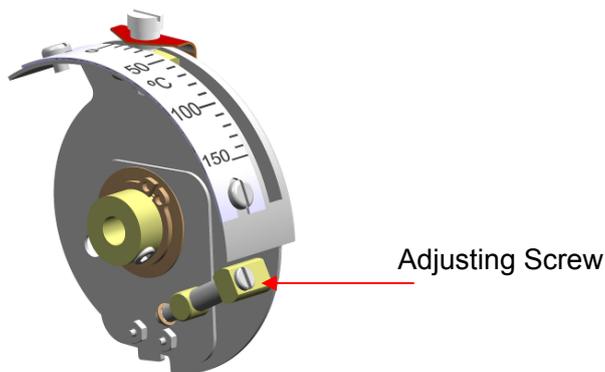


Figure 1 – Switch Setting Scale



5. Technical Data – Matching Resistance TD50/TD76

	TD50	TD76	TD50/5 Amp
Max Cont. Input at 100% Load	2.2 A from CT	2.65 A from CT	5.0 A from CT
Adj. Range	0 - 80% of Input Current from CT	45 - 85% of Input Current from CT	0 - 35% of Input Current from CT
Insulation	2kV, 50Hz, 60s to Earth	2kV, 50Hz, 60s to Earth	2kV, 50Hz, 60s to Earth
I₃ Resistance	0 - 11Ω	1.75 - 13Ω	0 - 11Ω

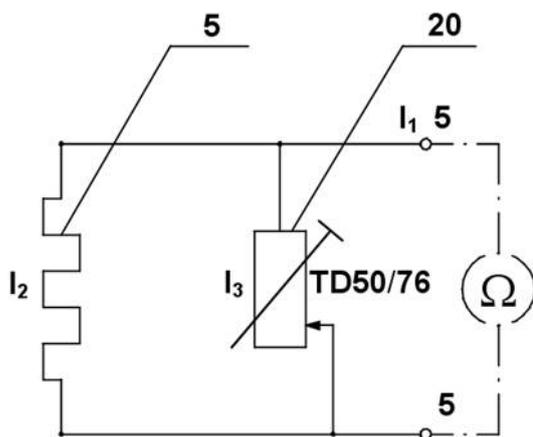


Figure 2 – TD Adjusting Schematic



5.1. Instructions for Adjusting Matching Resistance

1. Check or calculate current in A from Your Current Transformer (at bushing) at 100 % transformer load.
2. Check the required Winding Temperature gradient in °C or K.
3. Use the graph in Fig.3 for the CT current and gradient to determine the required resistance setting in Ohms. Take note of this value.
4. Connect a multi meter, (Example: Fluke) set for resistance measurement to the terminals 5-5 inside the WTI.
5. Adjust the matching resistance TD50 or TD76 until you reach the required resistance value. For TD50/5A see section 5.4.
6. Secure the lock nut on the matching resistance for this setting.
7. Check operation and make final adjustments if necessary.
8. Please consult Customer Service for additional information.

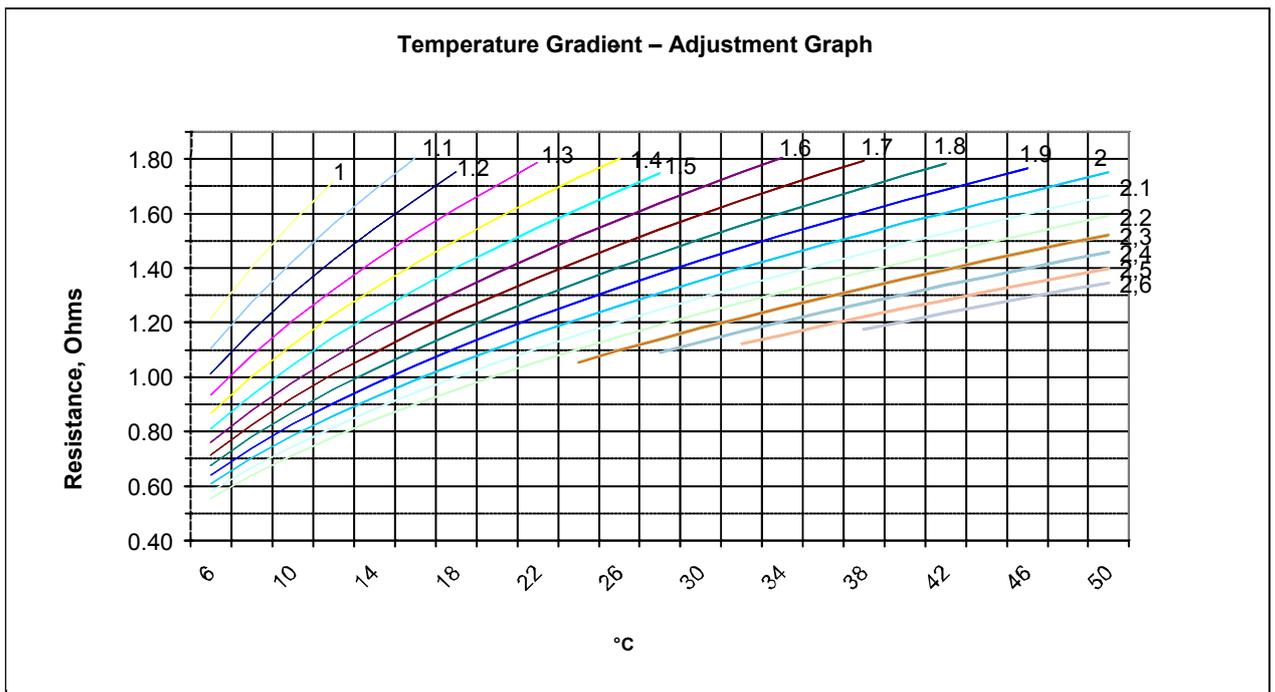


Figure 3 – Temperature Gradient Graph



5.2. Temperature Gradient Graph for WTI with External 1A and 5A Matching Unit

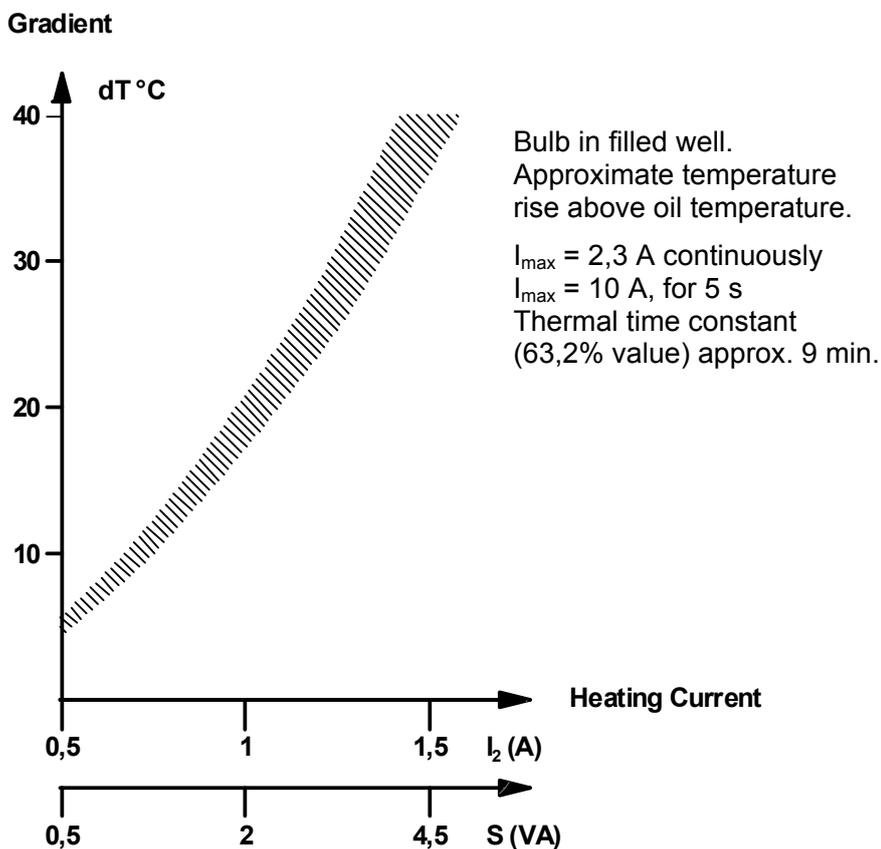


Figure 4 – Guideline for Adjustment of Heating Current



Keep cover mounted, feed a stable current and wait 45 min, before reading winding temperature.

Gradient °C for bulb type 11, 12, 15 and 18											
	10	12	14	16	18	20	22	24	26	28	30
Oil temp. 30°C	0,72	0,79	0,86	0,92	0,99	1,04	1,1	1,15	1,21	1,26	1,31
Heating Current Amp. $I_2 \pm 5\%$											



5.3. Wiring the AKM345 Double Gradient Option

5.3.1. Background

The Double Gradient option allows for setting two separate winding simulations in the same Winding Temperature Indicating Thermometer. The CT input is provided with two independently adjustable potentiometers for determining the heater current. Switching between the heater currents is performed external to the thermometer.

5.3.2. Wiring Recommendations

The potentiometers are wired to the 56 and 57 terminal block positions. The CT input is wired to the 5-5 positions as shown.

- To activate the 56 Gradient, jumper between the right 5-5 and 56 terminal block position.
- To activate the 57 Gradient, jumper between the right 5-5 and 57 terminal block position.

An example of external switch wiring is shown below.

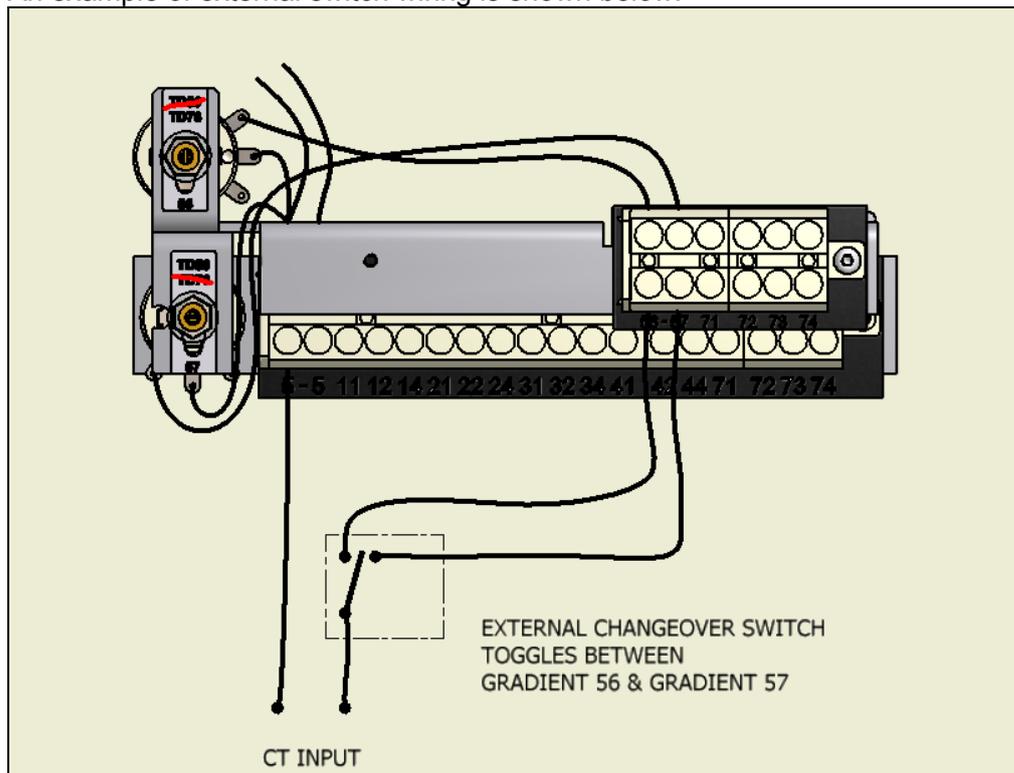


Figure 4.1 – Guideline for wiring Double Gradient Option

5.4. Using the 5 Amp Internal CT Option



The AKM 345 TD50(5 AMP) option allows for the input of up to 5 amps winding temperature simulation current without the expense or additional wiring required by an external matching unit. It is available with up to 4 switches. The 5 amp option employs an internal CT which accepts 5 amps at the primary and outputs 2.2 amps at the secondary. The secondary current is in parallel with a standard TD50 matching resistance and heater. For temperature rise calculations please refer to Figure 3.

- **Accuracy of 2.2A output at 5A input:**
 - +/-5% at 0 - 1.6 Ω secondary load
 - +/-10% at 1.6 - 1.8 Ω secondary load
- **Max continuous primary current: 6A**
- **Max primary current: 10 a for 2 minutes**

5.5. Setting the Matching Resistance

There are two methods of setting the matching resistance depending on the accuracy required. Use **Method A** for maximum ease of use and **Method B** for maximum accuracy.

5.5.1. Method A

- Disconnect the white separable connector and using an ohmmeter at the "R" pins, adjust the matching resistance to meet the target R5-5 value which will provide the desired heater current (see Section 5.1 instructions).
- Re-connect the white separable connector. After the matching resistance has been set and the white connector is re-mated, the winding simulation input current is wired to the terminal block at the 5-5 positions as shown.

5.5.2. Method B

- Disconnect the white separable connector and using an ohmmeter at the "R" pins, adjust the matching resistance to meet the target R5-5 value which will provide the desired heater current (see Section 5.1 instructions).
- Jumper between one pin of the "R" connector and one pin of the "I" connector, and connect an ammeter between the remaining two pins, as shown.
- Input the desired primary current at positions 5-5 on the terminal block and note the current flowing in the circuit. You now have the exact ratio of input to output current at secondary load. Disconnect power before disconnecting the ammeter and jumper– the secondary leads must always be connected in-circuit or shorted when the CT is powered.
- Using the measured secondary current, re-calculate the desired R5-5 value which will provide the exact heater current necessary for the desired winding simulation. Using an ohmmeter at the "R" pins, adjust the matching resistance to meet this R5-5 value.



- Re-connect the white separable connector. After the matching resistance has been set and the white connector is re-mated, the winding simulation input current is wired to the terminal block at the 5-5 positions as shown.

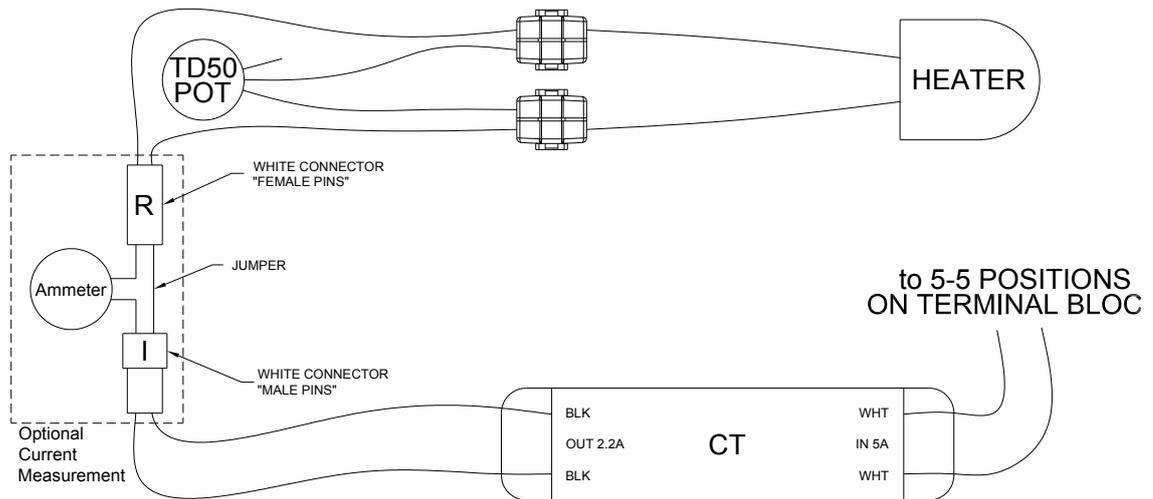


Figure 4.2 – TD50 / 5 Amp Wiring Example



6. Mounting Styles and Dimensions

6.1. Seismic Mount

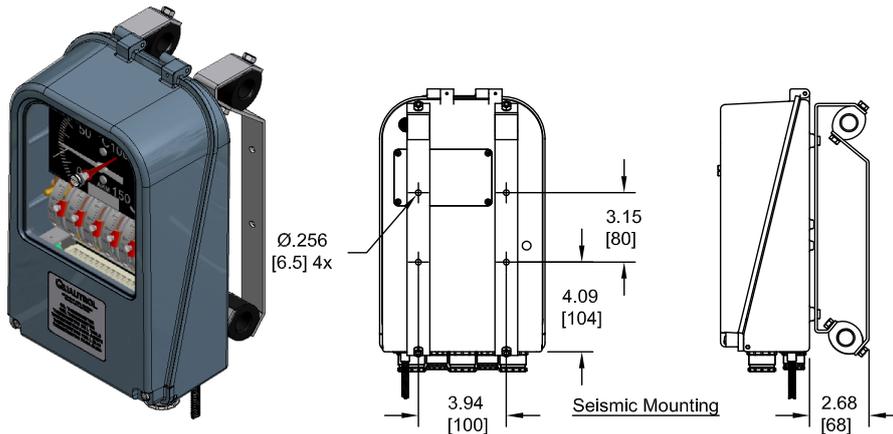


Figure 5 – Siesmic Mount



Special mounting for high amplitude, low frequency conditions

6.2. Universal Mount

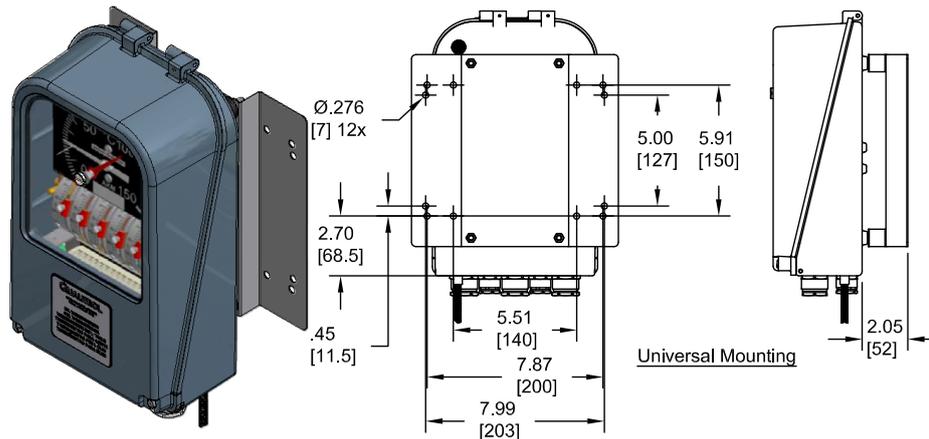


Figure 6 – Universal Mount



Adaptor plate for many different mounting bolt patterns



6.3. Anti-Vibration (Standard) Mount

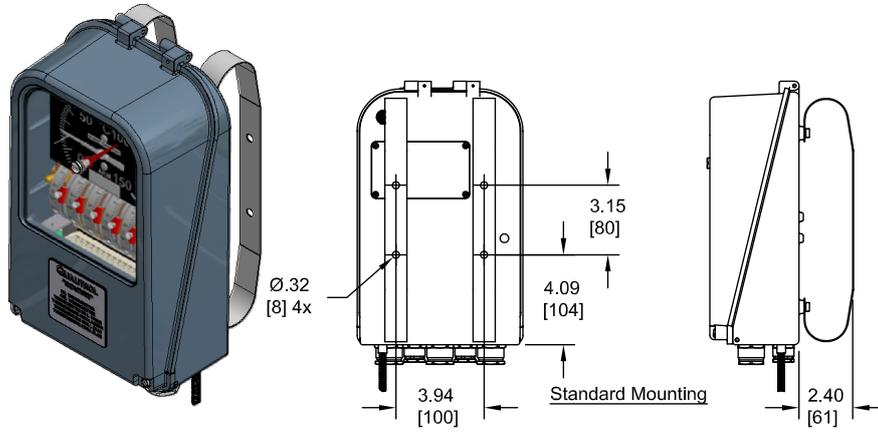


Figure 7 – Anti-Vibration (Standard) Mount



Standard mounting, highest instrument isolation available



7. Front Cover Removal

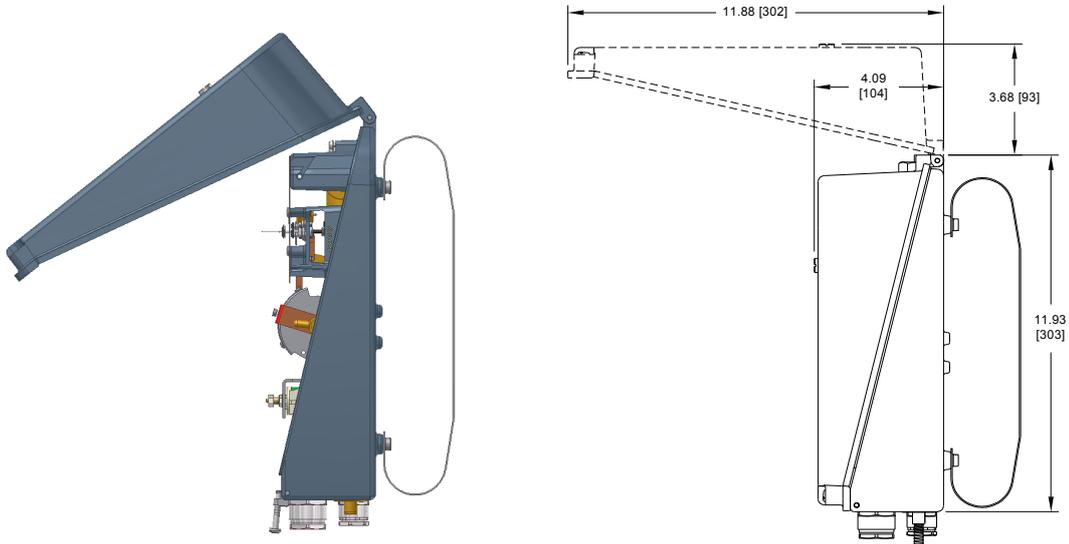


Figure 8 – Cover Hinge Side View

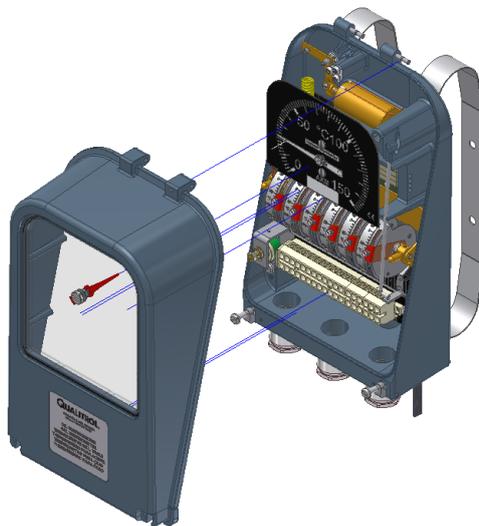


Figure 9 – Front Cover Removal

Cable glands: M25 (max 3) and M20 (max 2)



After unlocking the front cover, lift the front cover up fully, slide the top cover to the right and remove. To refit, reverse the above instructions.



8. Contact Rating / Breaking capacity

	RATED VOLTAGE	RESISTIVE LOAD	INDUCTIVE LOAD
STANDARD SWITCH	125 VAC	15 A	15 A
	250 VAC	15 A	15 A
	30 VDC	15 A	10 A
	125 VDC	0.75 A	0.4 A
	250 VDC	0.3 A	0.3 A
MBO	125 VAC	10 A	6 A
	250 VAC	3 A	1.5 A
	30 VDC	10 A	10 A
	125 VDC	10 A	6 A
	250 VDC	3 A	1.5 A
GOLD	30 VDC	0.1 A	-
	125 VDC	0.1 A	-
DPDT	125 VAC	10 A	6 A
	250 VAC	10 A	4 A
	30 VDC	10 A	4 A
	125 VDC	0.5 A	0.05 A
	250 VDC	0.25 A	0.03 A
GW	125 VAC	15 A	15 A
	250 VAC	15 A	15 A
	30 VDC	6 A	5 A
	125 VDC	0.5 A	0.05 A
	250 VDC	0.25 A	0.03 A

Figure 10 – Switch Selection

- **MBO** = Magnetic Blow Out, high DC switching, minimum Electrical Operations = 100,000 Cycles, all others 500,000 cycles minimum.
- **GOLD** = Typically used for low current low voltage applications, e.g., SCADA or computer connections.
- **DPDT** = Double Pole Double Throw, 2 x changeover contacts.
- **GW** = Similar to Gold and used for high DC voltage and low current applications.



Switch Selection: Select switch type (default is 15A), this will be applied to all switches. Select the number of switches to be adjustable, (default is 0), then select the switch differential of the remaining switches. This will automatically default to 12± 2°C.



9. Terminal Block Arrangements

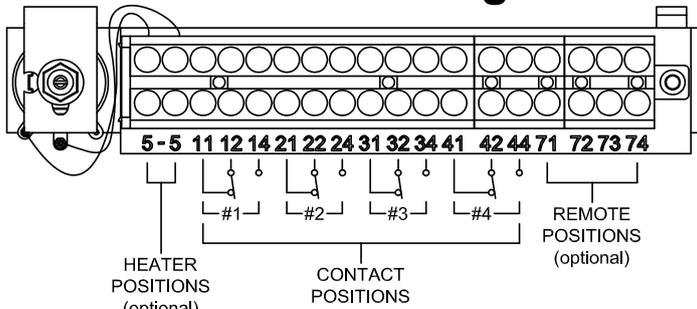


Figure 11 – 2 to 4 Switches w/Optional Heater and Remotes

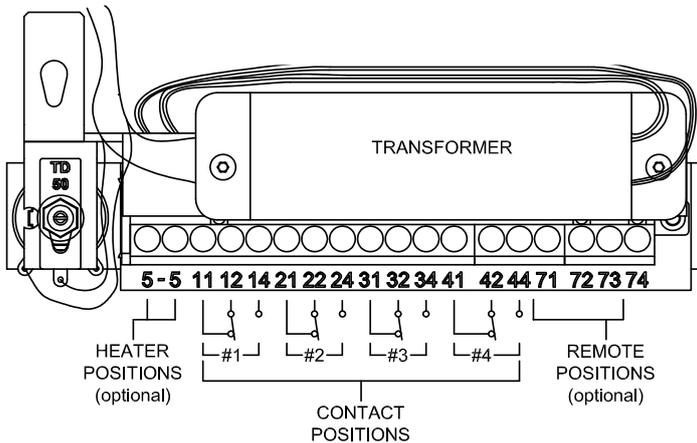


Figure 11.1 – 2 to 4 Switches w/Optional Heater and Remotes (TD50 5 Amp)

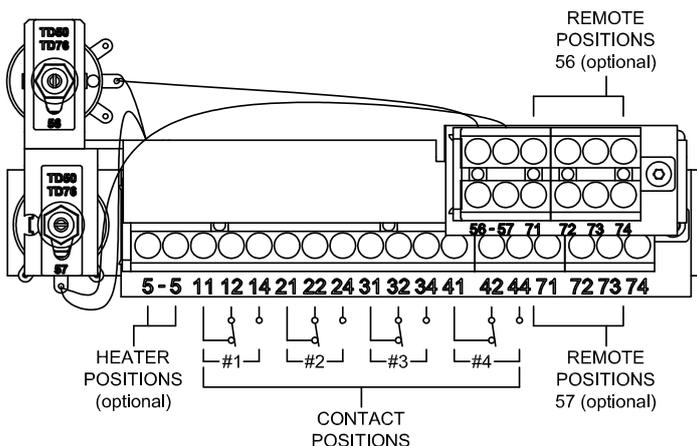
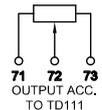
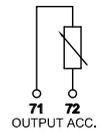
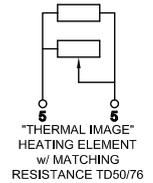
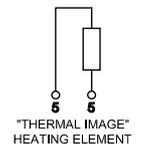


Figure 11.2 – 2 to 4 Switches w/Optional Heater and Remotes (Double Gradient)

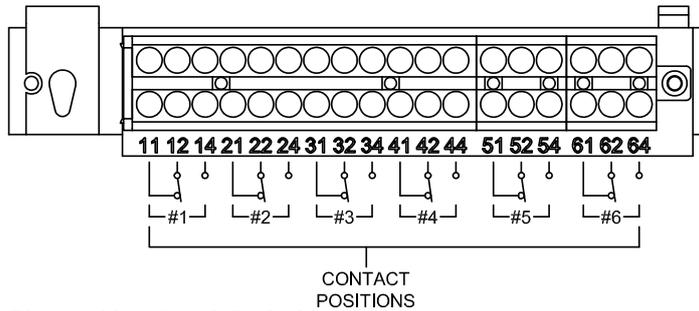


Figure 12 – 5 to 6 Switches only

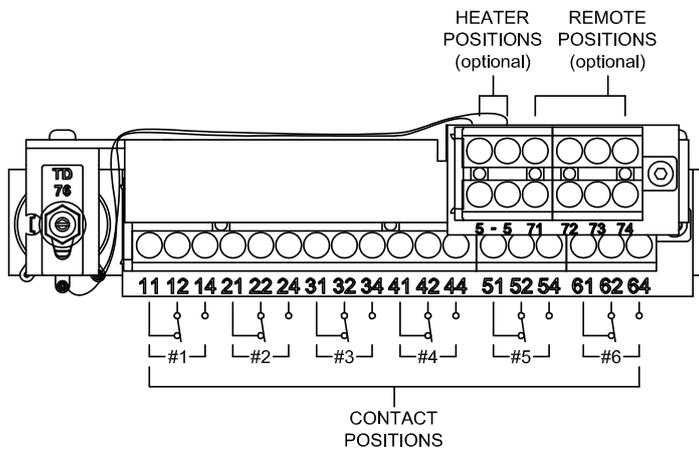


Figure 13 – 5 to 6 Switches w/Optional heater and Remotes



For options not shown, please consult Configuration Form or contact QUALITROL Customer Service Centre.



10. Pocket/Well Installation

INSTALLATION IN POCKET/WELL (EXAMPLE)

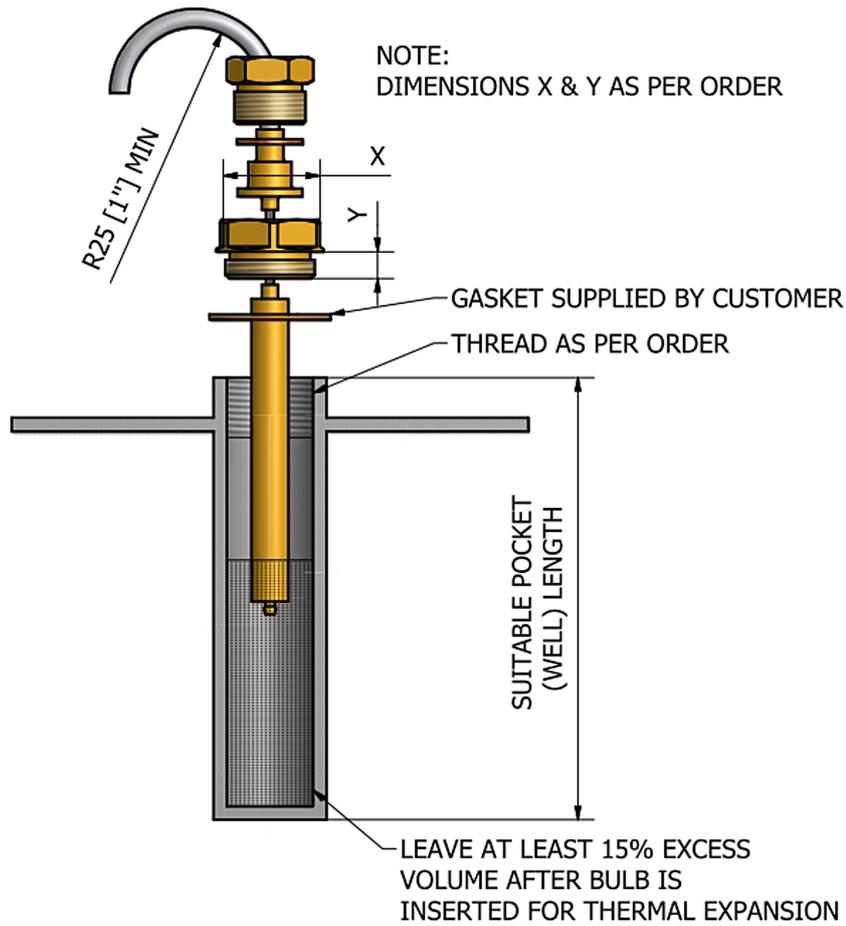


Figure 14 – Pocket/Well Installation



11. Probe Types

11	
12	
13	
14	
15	
16	
18	
19	



12. Maintenance

For the below mentioned executions, a regular control is suggested and if so required, also certain maintenance.

12.1. Protection Class IP 65

To eliminate the risk of condensation build up inside the instrument, the instruments are provided with two desiccant capsules. These can get saturated after a time in operation and a replacement will become necessary. The colour of the gel will change from pink (when new) into white (after saturation). If condensation is occurring inside the instrument, replacement of the capsules will be necessary; part number - **47126**.

12.2. Mountings with Rubber Dampers - Seismic Type and Universal Type

The vibration dampers on these mountings are made of Natural Rubber, NR, (also called Isopren). The expected life time of these parts is estimated to be a minimum of eight years. Since Natural Rubber will age faster when exposed to direct sunlight, high ambient temperatures or corrosive environments, we recommend a regular check of these parts. When the rubber dampers become old they should be replaced.



Please also note that it is important to mount these parts without any torsional stress.



13. Gen2 With Transmitter

General AKM contact thermometers Series 34/Gen2 for oil temperature and Series 35/Gen2 for winding temperature can be supplied with a transmitter for remote indication or recording.

This gives several advantages over the conventional method with a separate resistance thermometer, e.g., lower costs, no errors due to different time constants and connecting wires to indicator.

13.1. Technical Data

- **Housing:** The transmitter is mounted inside the instrument (well protected).
- **Nominal supply voltage:** 20 - 40V DC.
- **Output:** 4 -20mA for dial measurement range.
- **Load:** 500Ω max at 24V DC. User adjustable output can be used to calibrate output directly to load - consult factory.
- **Accuracy:** (Relative to local indication) $\pm 2^{\circ}\text{C}$.
- **Ambient temperature:** -40°C to $+70^{\circ}\text{C}$.
- **Isolation:** SWC per IEEE C37.90.1: 2.5kV oscillatory and 5 kV fast transient in both transverse and common modes.
- **Insulation test:** 2000 V, 50Hz, 60s to earth acc. To IEC 60-2.



Terminals 71, 72, and 73 must be short-circuited during insulation test, and the test voltage shall be raised gradually.

13.2. Installation Instructions



Qualitrol recommends using a separate shielded cable for the wiring to transmitters. This will help assure safe and trouble free operation. The cable should ONLY contain the signals and power supply for the TD Transmitter.



See Figures 15 to 15.7 for suggested wiring TD111, TD119 and TD66.

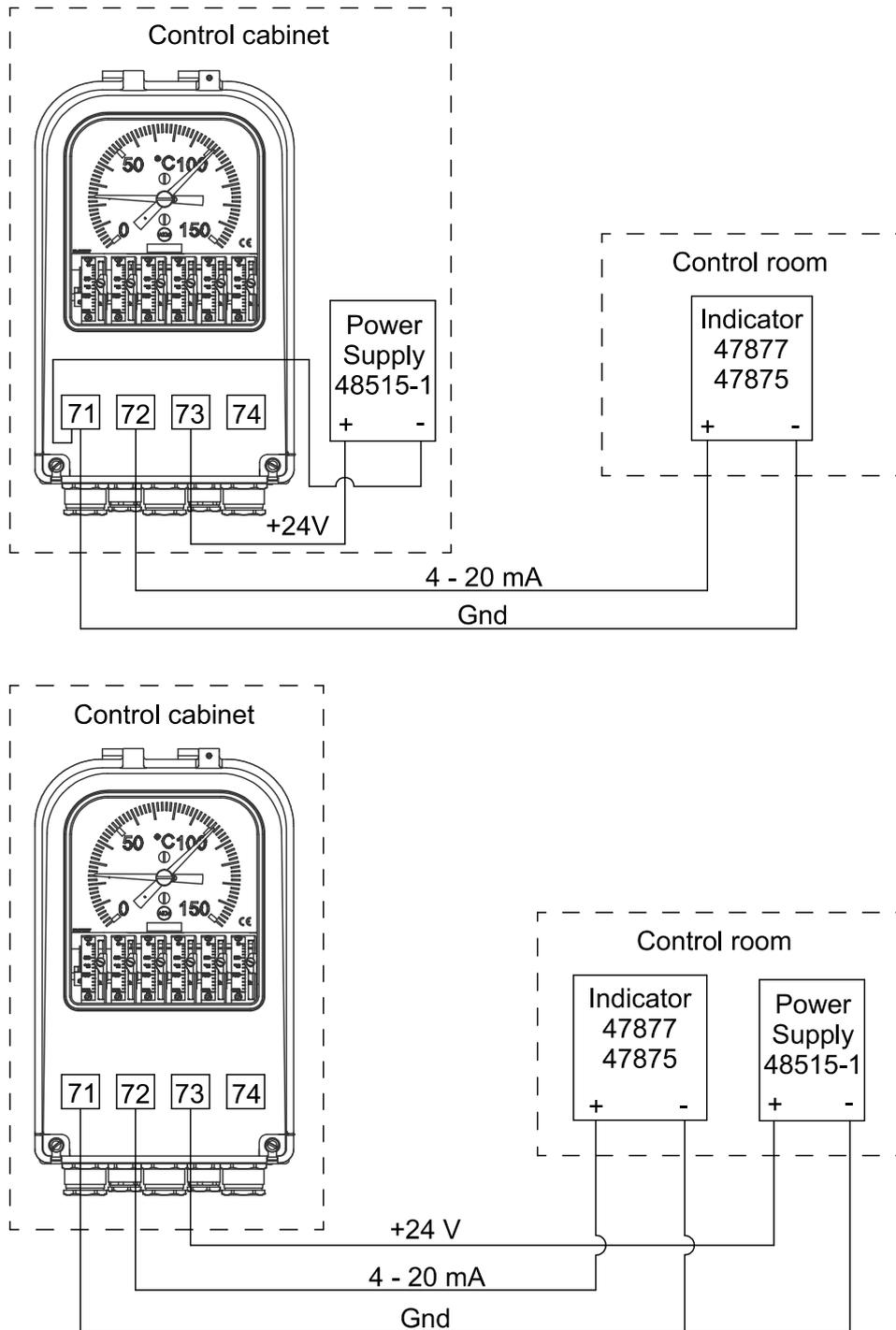


Figure 15 – 4-20mA Suggested Wiring TD111

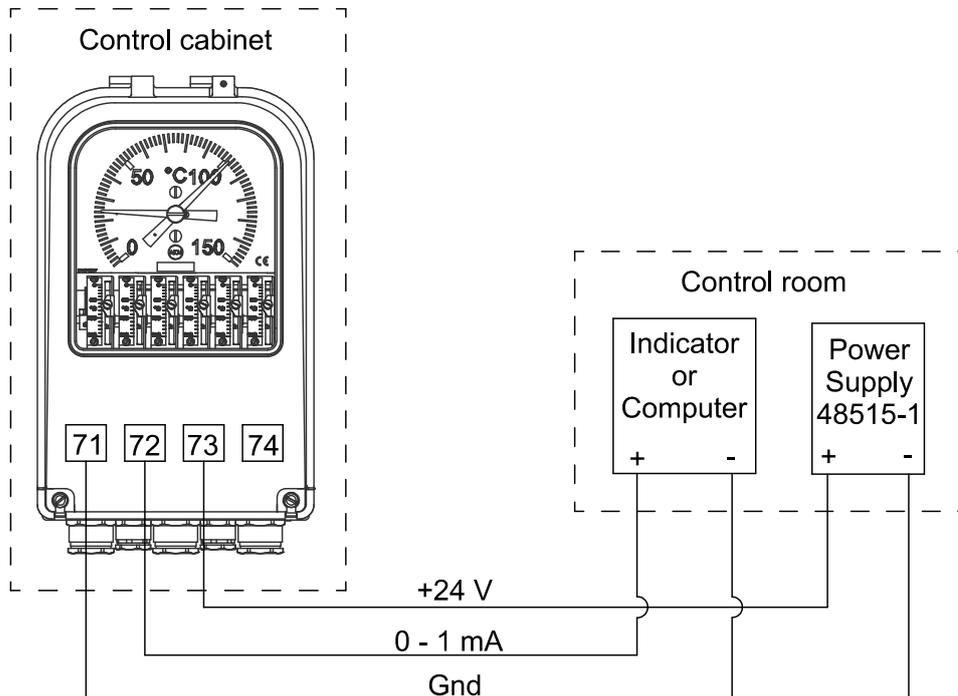
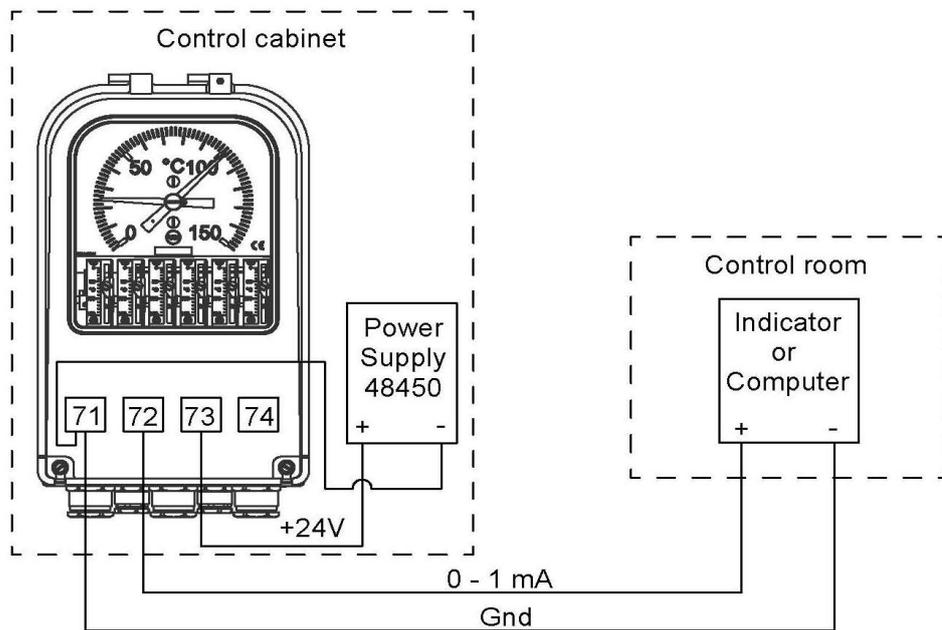


Figure 15.1 – 0-1mA Suggested Wiring TD119-1

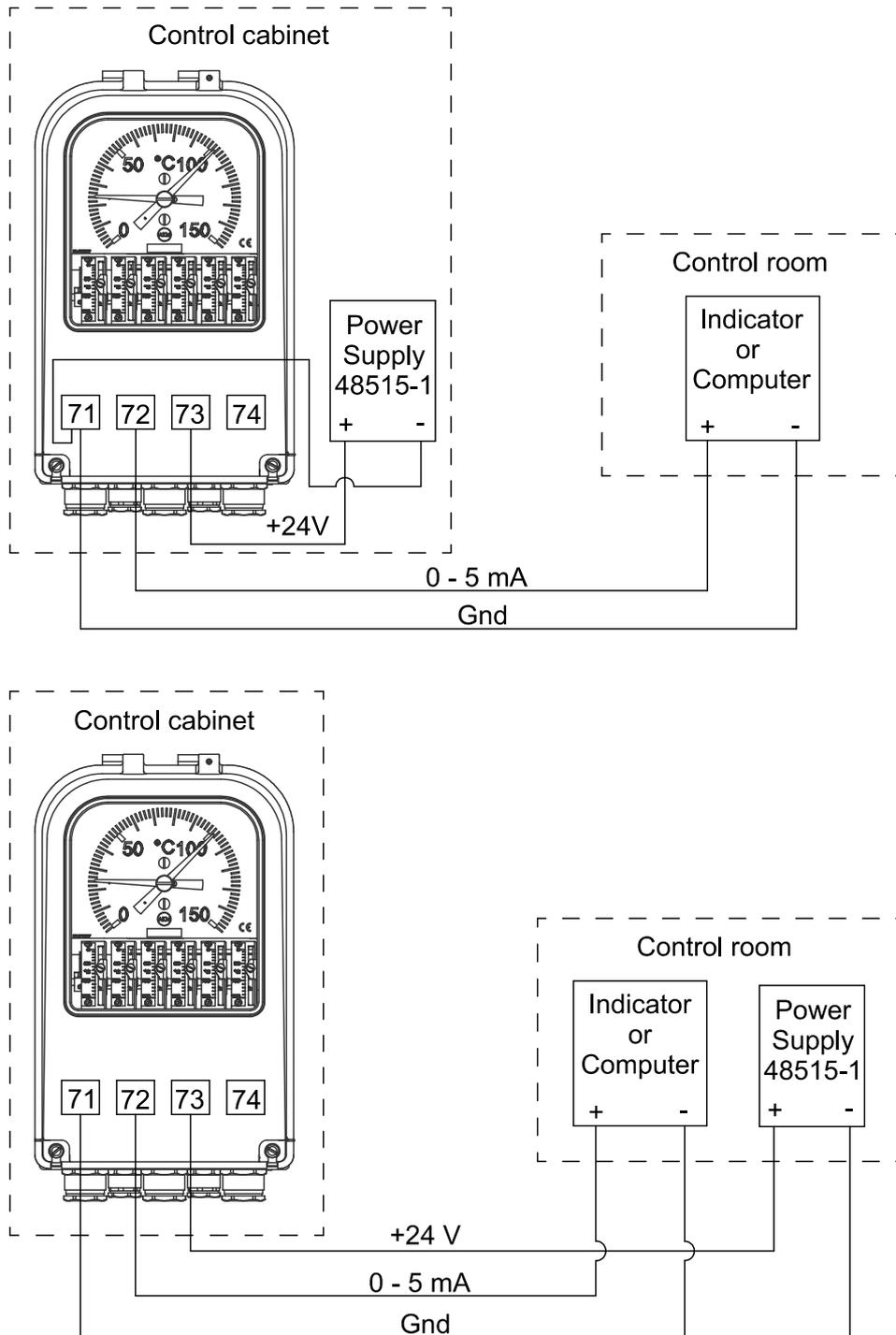


Figure 15.2 – 0-5mA Suggested Wiring TD119-2

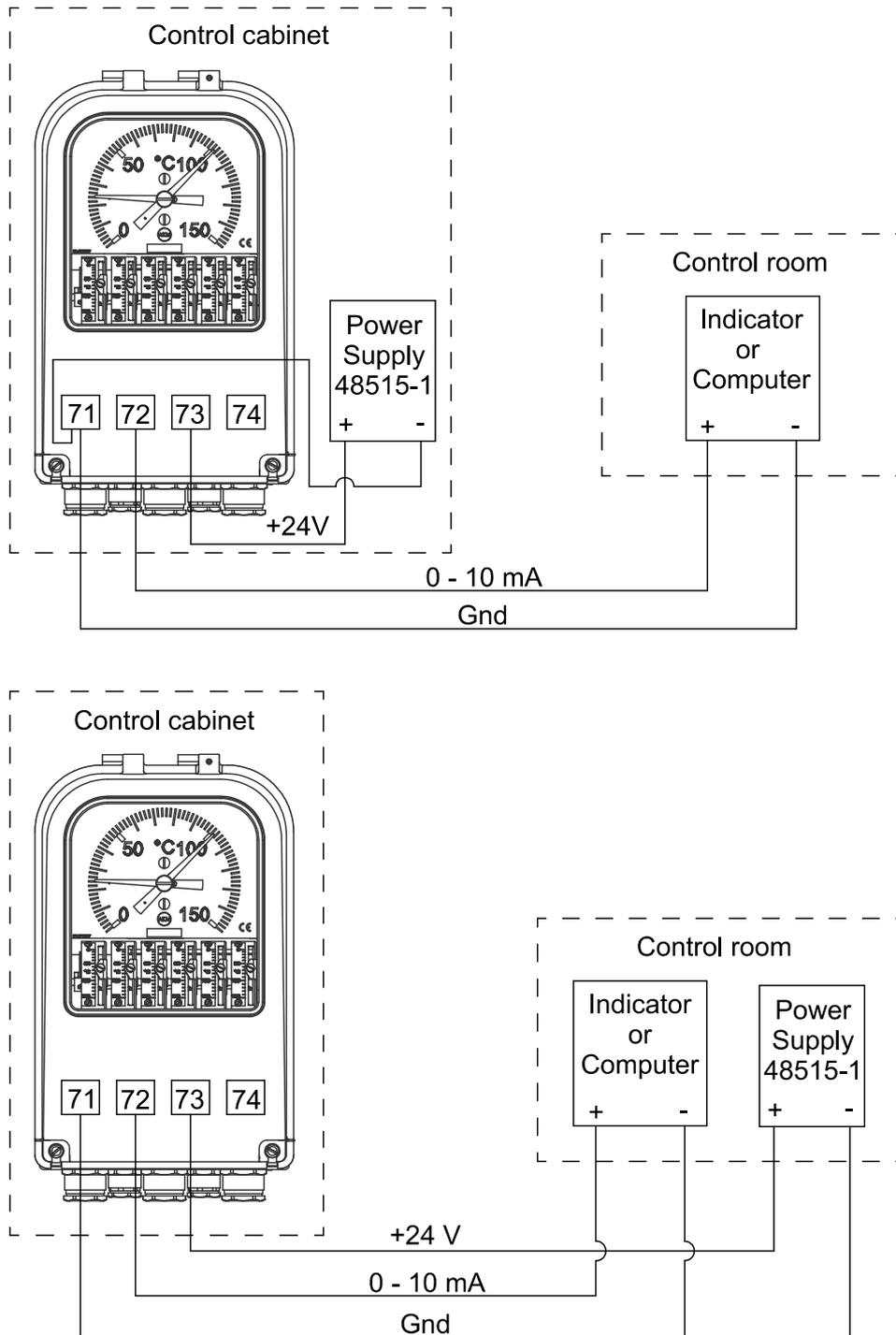


Figure 15.3 – 0-10mA Suggested Wiring TD119-3

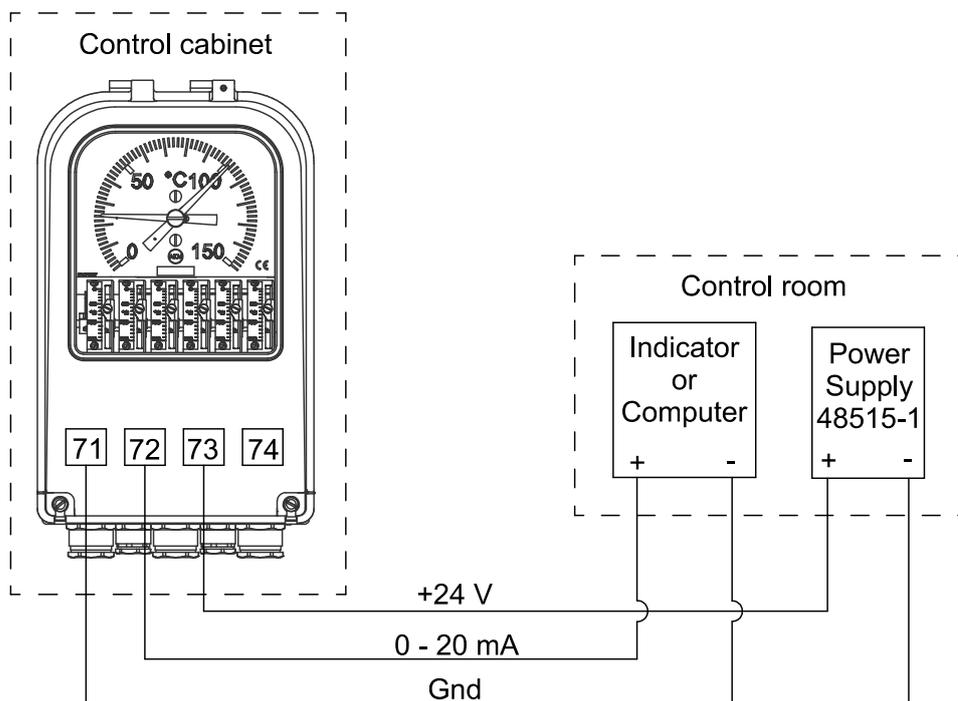
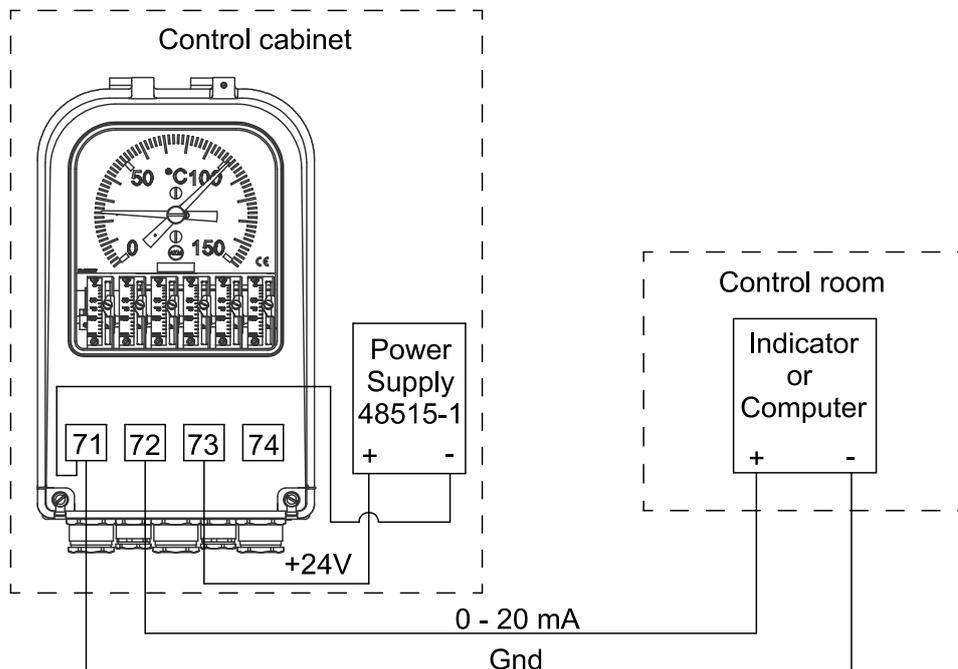


Figure 15.4 – 0-20mA Suggested Wiring TD119-4

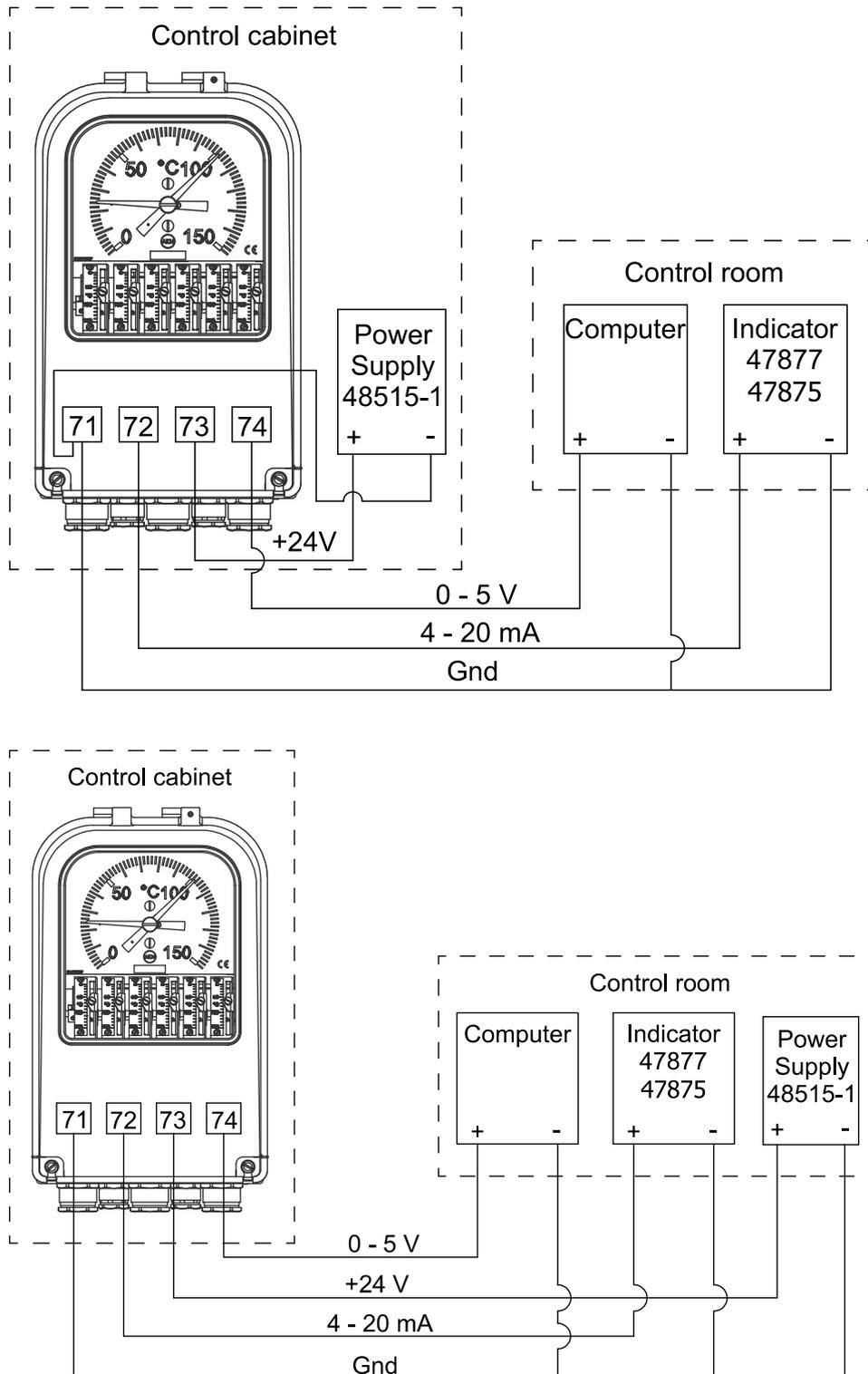


Figure 15.5 – 4-20mA & 0-5V DC Suggested Wiring TD119-5

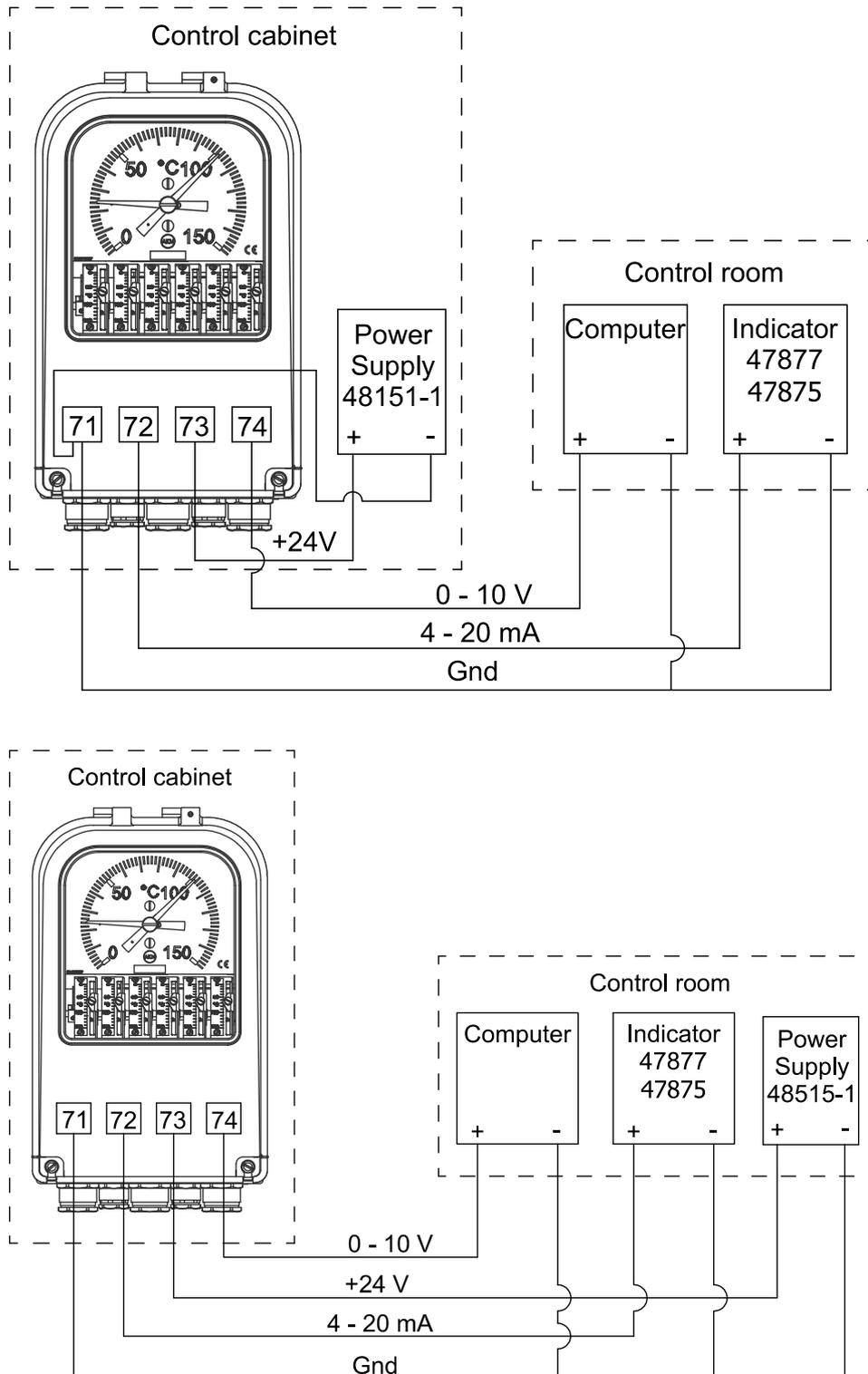


Figure 15.6 – 4-20mA & 0-10V DC Suggested Wiring TD119-5

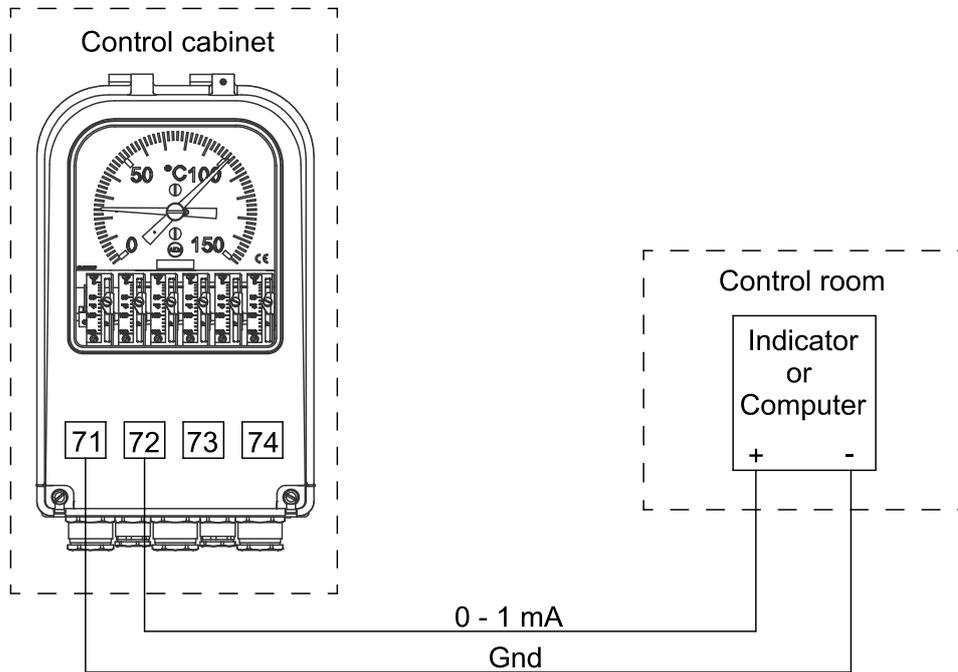


Figure 15.7 – Suggested Wiring TD66 CU10/PT100



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