METALCHEM Level Switch EP-53N105TZ

Purpose:

The ESP-50 level switch is designed to signal and control the level of liquids with good and poor electrical conductivity in open and closed tanks.
It is used for sound and optical signaling, for level control, independent emptying or filling of such objects as drinking water tanks, milk tanks, sewage sumps, condensate tanks, pneumatic water pumps, boilers, chemical tanks, beverage and food tanks, irrigation tanks and others.
One **ESP-50** switch contains three parallel channels, allowing to independently signal the corresponding levels of liquids in one, two or three tanks, which simplifies the design of control systems.
Using the **ESP-50** switch , it is possible to monitor the level of working fluids in a wide range of pressures, temperatures and chemical activity.
The liquid, however, should not be:
- with too high a suspension content;
- with significant crystallization, releasing sediment;
- should not have other properties that cause the electrode of the sand (sensor) to be coated with a non-conductive layer.

The electronic unit of the alarm device (electronic relay **EP-5**) may also be used for signaling and controlling any other physical quantities that can be converted into an electrical one proportional to these quantities (for example: lighting signaling and flame absence signaling - using appropriate photoresistors).

N OTE. The alarm device may not be installed in rooms containing explosive vapors or gases.

The electronic unit of the alarm device (electronic relay EP-5) can also be used for signaling and controlling any other physical quantities that can be converted into electrical impedance proportional to these quantities (for example: signaling of lighting and signaling of the absence of flame - using appropriate photoresistors, signaling and regulation of temperature when working together with an appropriate thermistor or contact thermometer, signaling and regulation of pressure or flow when working together with a contact pressure gauge, etc.

The safety of service personnel is ensured by very low current and voltage values.

The alarm cannot be installed in rooms containing explosive vapors or gases.

Technical specifications:

Response ranges for specific electrical conductivity of the control environment:

Range	Conductivity, Ohm/m^{-1}
1	≥2.0
2	≥2.0 · 10^{-1}
3	≥2.0 · 10^{-2}
4	≥2.0 · 10^{-3}

Accuracy of signaling the liquid mirror relative to the longitudinal axis of symmetry of the sensor electrode (for horizontal installation) or the end of the probe electrode (for vertical installation): ± 5 mm

Sensor SK-30 or SK-35

Maximum working pressure: 6.4 MPa

Temperature of the controlled environment: –30...+200 °C

Transition resistance between the connection contact and the sensor's sensitive electrode: ≤0.5 Ohm

Dry insulation resistance: ≥5 MOhm

Sensor component materials: 0H19N9G6TE* steel, 1H18N9T steel, glazed porcelain, epoxy resin

Length "L" of the sensor electrode: 100+2000 mm ; in sections L_{max} = 1000 mm

Sensor weight: SK-30: 0.225 kg / SK-35: 0.150 kg

* The properties of 0H19N9G6TE steel are approximately similar to 1H18N9T steel.

Electronic relay EP-5

Normal operating position (NP): 90 ±90°

Maximum sensitivity (on the 4th range): 500 kOhm

Voltage on sensor electrodes: ≤10 V (amplitude voltage)

Maximum currents in the circuits of individual sensors (also in case of a short circuit of the sensor):

Range	Current, mA
1	≤30
2	≤3
3	≤0.3
4	≤0.03

Delay on or off:

Permissible load of output relay contacts:

continuous contact current (thermal): 4 A

contact switching current: 5 A

Maximum frequency of changes in channel operating states: 1.5 Hz

Electrical operating strength of the relay amplifier: 10^{7} operations of each channel

Supply voltage:

voltage: 220 ($^{+10\%}_{-15\%}$)

frequency: 50 Hz ± 2%

Power consumption, no more than: ≤12 V A

Enclosure protection rating: IP50

Weight, no more than: 2.5 kg

Overall dimensions: 297x155x130 mm

terms of Use

- external part of the SK-30 or SK-35 sensor:
  - ambient temperature no more than +50 °C - from –10 °C to +45 °C;
- electronic relay EP-5:
  - ambient temperature from –20 to +50 °C
  - atmospheric pressure from 80 to 120 kPa
  - relative humidity at 35°C - 95%, without condensation.

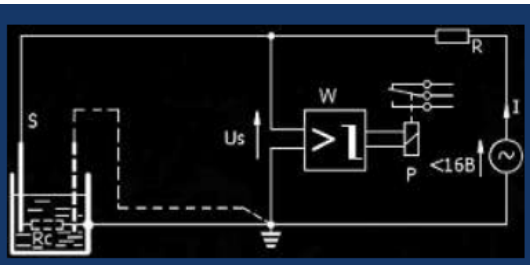
Permissible impacts

The device is not intended for use in the following conditions:

- explosive premises;
- control of environments that produce solid deposits on the sensor electrode;
- exposure to shaking and impacts.

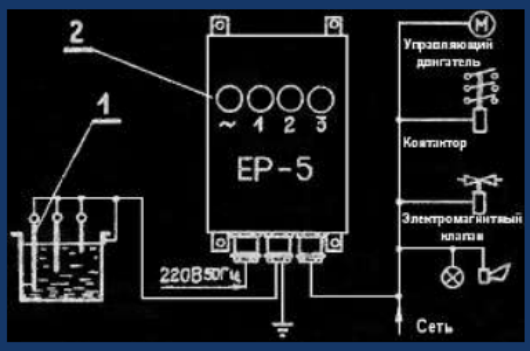
Design and operating principle

The operating principle of the alarm involves the use of a conductive liquid to close an electrical circuit when the level of the liquid changes relative to an electrode installed at a certain height in the tank.



When the electrode and liquid come into contact (resistance R_c decreases accordingly), electric current begins to flow in the circuit: current source, matching resistor R (range), connecting wire, electrode S, conductive liquid, conductive tank wall or additional electrode for a non-conductive tank, and a second connecting wire. The control signal U_s decreases , and the relay system is activated.

To ensure greater reliability of the alarm operation over a wide range of temperature, pressure, chemical aggressiveness and electrical conductivity of the liquid, electrodes with a corresponding insulating-mechanical system (so-called conductometric probes or sensors) are used, as well as a sensitive high-resistance amplifier-relay unit.



The ESP-50 alarm consists of two units that can be used independently in different areas:

1. conductometric probes of the SK type, which are sensors for changes in liquid level;
2. electronic relay EP-5, which is a trigger amplifier that responds by switching the contacts of the output relays when the level changes.

The remaining signaling and actuator devices indicated in the block diagram, connected to the EP-5 relay , are designed and assembled by the consumer based on individual needs.

SK conductometric sensors

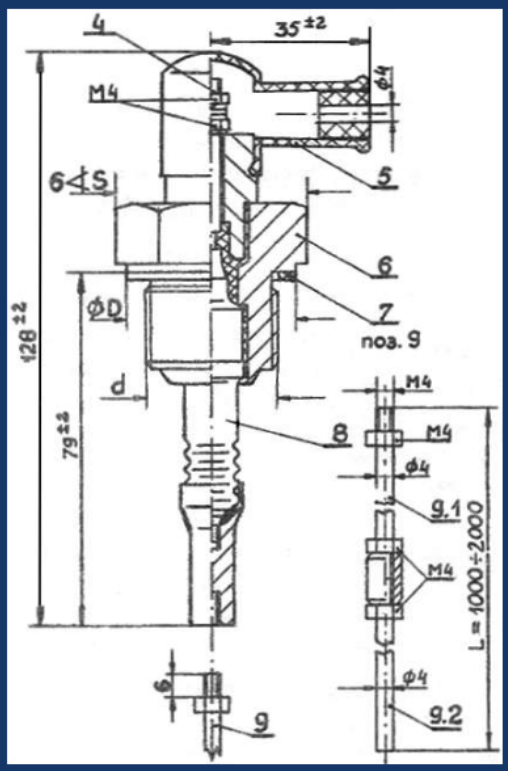
Conductometric probes are sensors that respond by changing the active resistance between the probe electrode and the mass of the container when the liquid exceeds the level determined by the position of the electrode.

The sensors are manufactured in two versions: SK-30 and SK-35, differing in the sizes of the thread, sealing gasket, and hexagon.

The operating parameters of both SK-30 and SK-35 sensors are the same.

4 - clamp with nuts for connecting the sensor to the electronic relay;
5 - rubber cap;
6 - body;
7 - sealing gasket;
8 - ceramic insulator;
9 - electrode;
9.1; 9.2 - segment

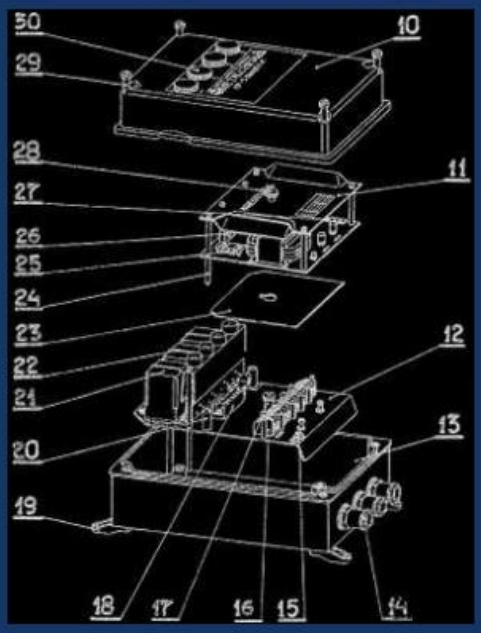
nts from which the electrode pos. 9 is mounted when the length L exceeds 1000 mm.



Sensor type	Size		
	S	D	d
SK-30	36	36	M27x1.5
SK-35	30 or 22	30	M20x1.5

The sensors can be mounted either in the side wall or in the vault of the tank (horizontally or vertically in relation to the liquid surface).

Electronic relay EP-5



The electronic relay EP-5 consists of the following main components:

10 - housing cover;
11 - relay amplifier - containing a 3-channel electronic unit together with a power source, connected to the base 12 using a multi-pin plug 18, 26;
12 - base panel – with three output relays 21, mounting terminals 16 and signal lamps 22;
13 - body - with seals P 13.5 14 and ears 19 for fastening the block.

The EP-5 relay is equipped with four-range sensitivity switches, allowing the system to be matched to liquids with different conductivities, independently for each channel.

Switching for each range is accomplished by screwing the screw into the corresponding hole of the range switch until it stops.

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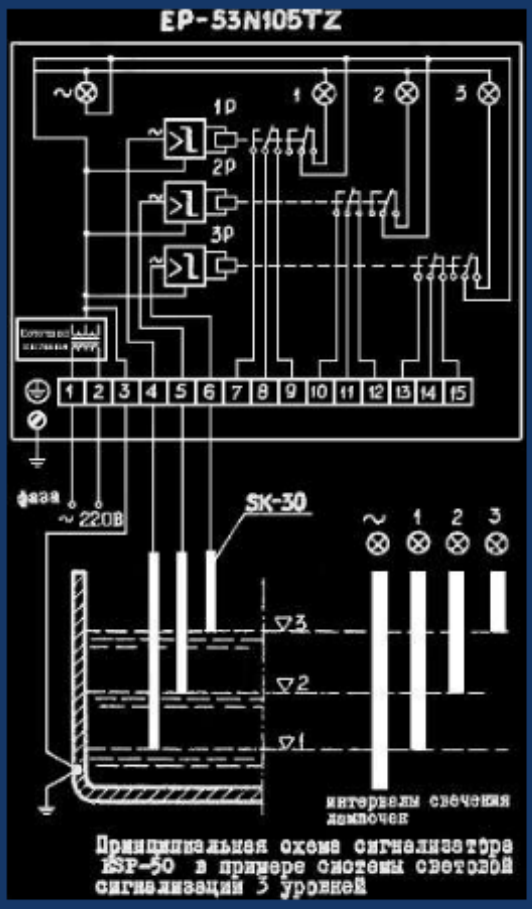

Принципиальная схема сигнализатора ESP-50 в примере системы световой сигнализации 3 уровней

At the input of each channel there is a potentiometric voltage divider, powered by a transformer.

One branch of the potentiometer is a sensor, the second is a corresponding range resistor.

The signal received from the divider controls a trigger with two paired transistors, which in turn controls the output relay.

The operating state of the trigger, like the relay, depends on the signal level at the input, determined by the ratio of resistances:

R_{cz} / R_x, where

R_{cz} - probe resistance

R_x is the value of the range resistor.

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The system operates in the following way: a drop in the resistance of the sensor R_{cz} below a certain value leads to a decrease in the control signal of the relay amplifier, the relay being switched off, and the signal lamp being turned on, and, conversely, an increase in the resistance of the sensor leads to the relay being switched on and the signal lamp being turned off.

Range resistors, the values of which are selected by a range switch, allow the system to be adapted to different measurement limits R_{cz} (liquids with different conductivities) independently for each channel.

The power supply is common to all channels.

Installation procedure

- SK-30 sensors are installed by screwing into M27 x 1.5 threaded sockets, and SK-35 sensors are installed with M20 x 1.5 threads in the side wall or vault of the tank.

  For horizontal installation, sensors with an electrode length of 100 mm should be used.

  For vertical installation, the electrode length is selected based on the distance between the sensor and the liquid level. Adjustment is made by shortening (cutting) or lengthening (screwing in segments) the electrode. For sensors longer than 0.6 m on a tank with intense liquid flow, the end of the sensing element must be secured through an insulator or mounted in a perforated metal pipe with a diameter of at least 80 mm.

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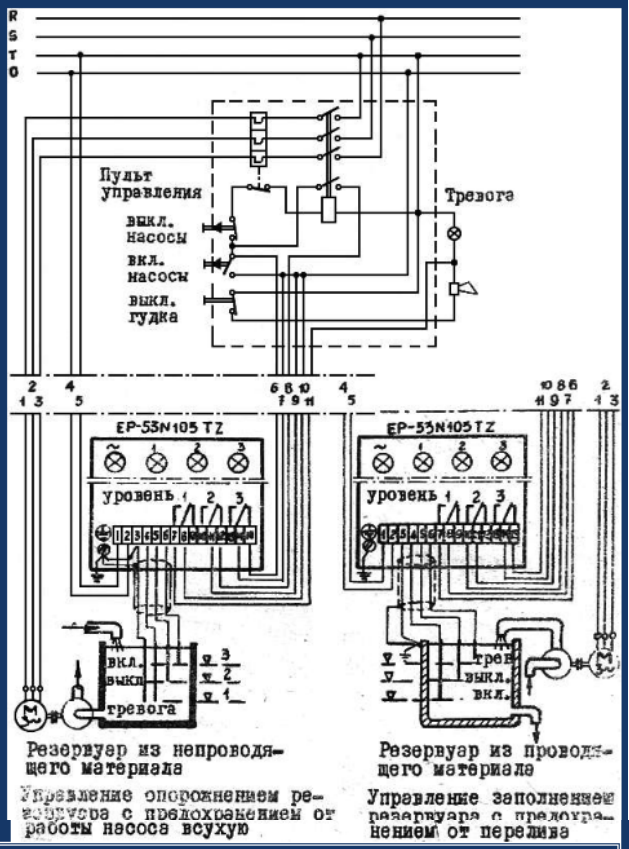
The EP-5 relay should be installed in industrial premises or outside, excluding the possibility of overheating and mechanical damage, contact with liquids and aggressive substances.

An example of the correct connection of an electronic relay with a sensor (liquid level control and emergency level signaling) is shown in the figure.



It is recommended to use copper wires during installation.

The power wires should be connected to the electronic relay in such a way that the phase wire is connected to terminal 1.

The electronic relay chassis should be connected to the ground or neutral wire using an M4 screw for this purpose.

After connecting the wires to the mounting terminals, it is essential to install the separator plate 23, and tighten the fastening nut completely so that the plate does not come loose if vibration occurs.

The EP-5 relay seals can be further sealed using putty after connecting the wires.

The length of the wires connecting the electronic relay and the sensors depends on the type of wires used and their resistance, as well as the sensitivity of the selected operating range of the relay:

If the tank is made of conductive material, check the resistance of the junction between the tank and the wire connecting the tank body to the electronic relay. The resistance should not exceed 1 ohm.

- when operating on the 1st or 2nd range, the distance of the sensor from the relay can be up to several kilometers;
- on the 3rd range the permissible distance is from 10 to 100 meters (depending on the type of wires);
- on the 4th range up to twenty (2 + 20) meters (depending on the type of wires)

To reduce the influence of electrical interference, it is advisable to use shielded wires.

When operating on Band 4, it is recommended to shield individual channels to prevent interference. If the distance between the relay and the sensor is large, channel shielding is mandatory!

To determine the operating range it is necessary:

- Measure the resistance of the probes for two conditions:
  - R_{cz1} – the probe is immersed in liquid (measured using an AC bridge or a technical method (at voltage ≤ 10 V));
  - R_{cz2} – probe above the liquid level, immediately after the level drops (measure with a 250 V megohmmeter (in the case of a conductive tank body, the measurement is carried out between the sensor electrode and the sensor body; in the case of a non-conductive one, between the sensor electrode and the electrode of the additional sensor));

  Notes:

  All measurements must be carried out while maintaining the unconditional disconnection of the wires of terminals 3, 4, 5, 6 of the EP-5 relay.
- Based on the measurements taken, it is necessary to set the required ranges with the electronic relay switch using the data in the table below:

Range	R_{cz1} (kOhm)	R_{cz2} (kOhm)	The measured liquid	Notes
1	< 0.5	> 5	acids, alkalis, molten metals	The resistance values cannot be exceeded within the full temperature range occurring during operation of the object.
2	0.5÷5	> 50	water, plain and contaminated, food products and milk	
3	5÷50	> 500	steam condensate	
4	50÷500	> 5000	steam condensate	

- Connect the electrical system of the alarm according to the diagram and check the operation of all used channels several times under natural operating conditions of the alarm.

The response delay (system response time) should not exceed 1 s.

livery set:

Device - 1 pc.
Probe SK-30 or SK-35 (length according to order) - 3 pcs.

hen submitting an application to PRIBORINVEST, please use the following notation:

P-50 level indicator