

E-KSS-100 CAPACITIVE LEVEL SWITCH USER MANUAL

- E-KSS-100 level switch is designed to be used in industrial environments for level detection in silos containing bulk solids.
- Before installation, read the user manual thoroughly.
- The installation, wirings and adjustments must only be performed by persons qualified in instrumentation.
- Keep the unit away from the flammable gases that could cause explosion.
- The life of the electronic unit is 10 years. (minimum period for technical support)

1. DESCRIPTION

E-KSS-100 is used for level detection in silos containing bulk solids. -The operation principle of the switch is sensing the capacitance variations between the walls of the silo and the probe. The level switch has a dust proof aluminum case containing the electronic unit and the level probe mounted to this case.

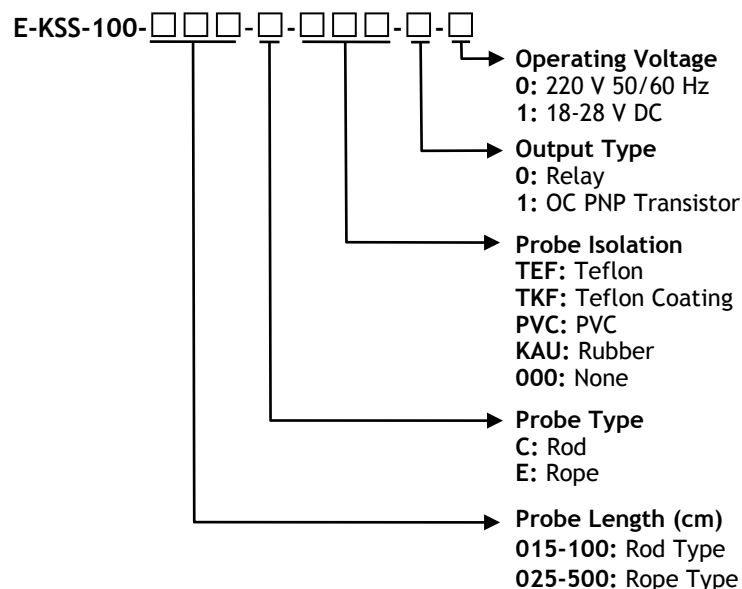
The level output is taken by means of a relay or open collector PNP transistor. The relay contacts can switch 5 amper current at 220 V AC for resistive loads. The transistor output supplies 24 V DC to the load and it is current limited for about 80 milliamps.

Various type probes are used in the level switch depending upon the intended application.

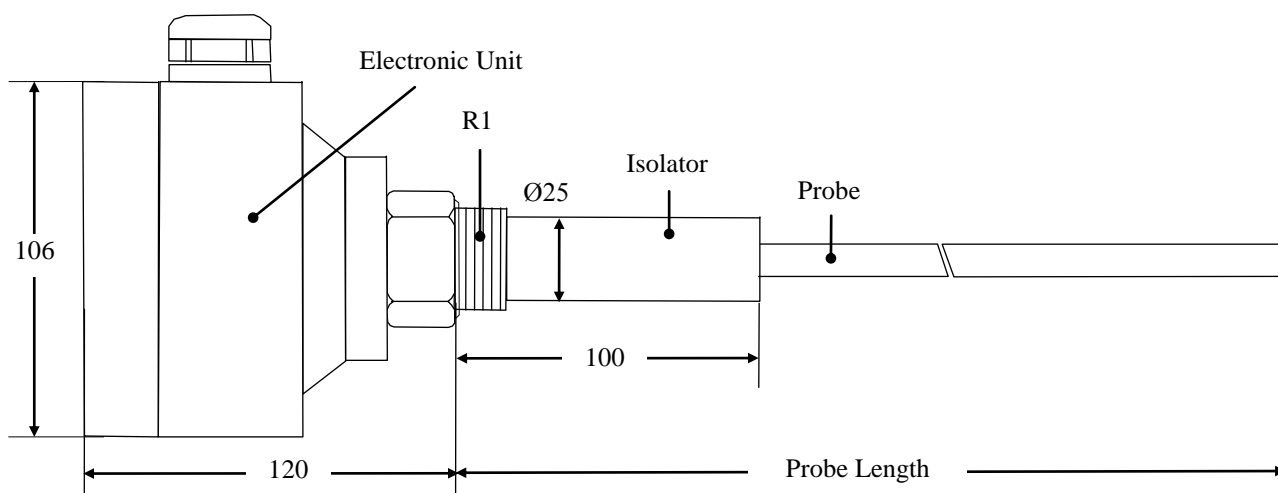
2. TECHNICAL SPECIFICATIONS

Operation Voltage	220 V 50/60 Hz AC or 18-28 V DC
Power Consumption	Maximum 3 W
Output Type	Relay (NO-C-NC) or Open Collector PNP Transistor
Operating Temperature	Electronic Unit: 0-50 °C, Probe: 0-100 °C
Pressure	Nominal 2 bars
Probe Length	Rod Types: 15-100 cm, Rope Types: 25-500 cm
Process Connection	If L<1000 mm, R1" If L>1000 mm, R1 ½"
Protection Class	IP65

3. TYPE CODING



4. DIMENSIONS



STANDARD PROBES:

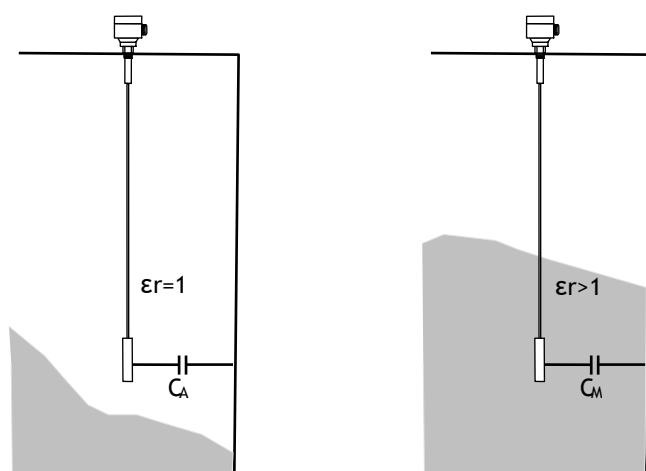
Rod Types : Probe Length can be ordered between 15 and 100 cm. Rod diameter is 10 mm (excluding isolation).

Rope Types : Probe Length can be ordered between 25 and 500 cm. For probe lengths less than 75 cm, the diameter of the rope is 10 mm, otherwise 8 mm (excluding isolation thickness). A counter weight made of iron is attached to the end of the rope type probes. The diameter of the counter weight is 30 mm. The height of the counter weight is 50 mm, if the length of the probe is less than 75 cm. If the length of the probe is between 75 and 300 cm, the height of the counter weight is 100 mm. For probes longer than 300 cm, the height of the counter weight is 200 mm.

5. OPERATION

5.1 Operation Principle

The probe of the level switch and the silo wall form a capacitor. One of the electrodes of the capacitor is the probe and the other is the silo wall. As long as the probe is in the air, the capacitance value of the formed capacitor C_A is depended upon the dielectric constant of the air ($\epsilon_r = 1$). The value of the formed capacitor is directly proportional to the relative dielectric constant ϵ_r of the material between the electrodes. If there is some material in the silo that has a relative dielectric constant $\epsilon_r > 1$ and the probe is covered with material, the value of the formed capacitor C_M will be greater than C_A . The level switch detects this difference and drives the output circuit.

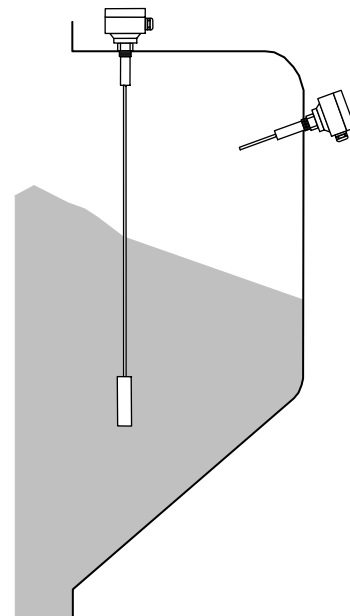


The level switch can be used for materials that have a relative dielectric constant $\epsilon_r > 3$. If the material is conductive or has a high relative dielectric constant, touching to material is enough and immersion depth almost has no importance. As the relative dielectric constant of the material decreases, the immersion depth must increase for proper level detection.

5.2 Installation

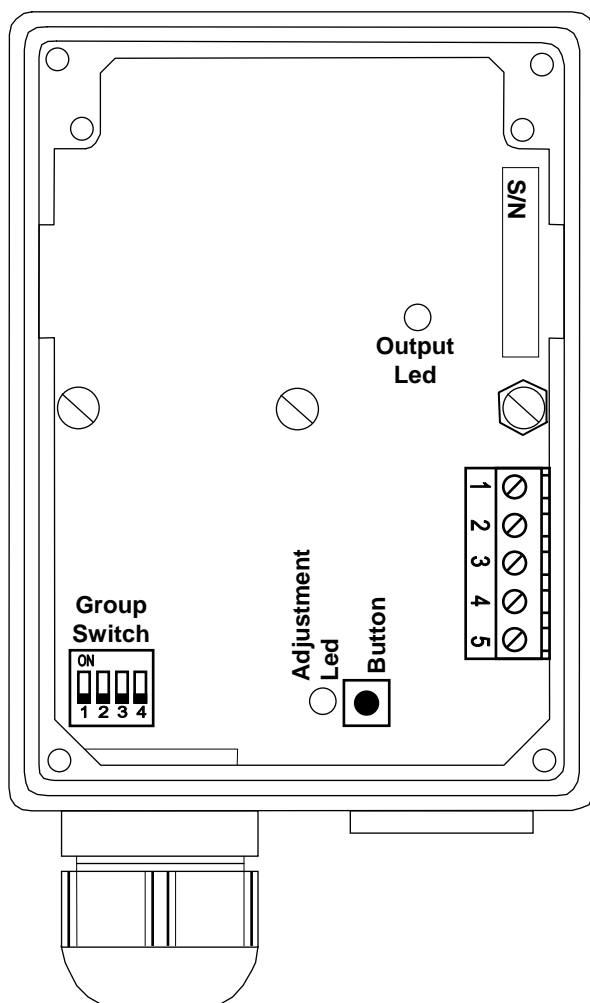
E-KSS-100 level switches can be installed in a silo from the above or on the side walls. For the detection of low and high limits, two switches having different probe length can be mounted to the top of the silo or two short length switches on the side walls. For the detection of powdery and fine grained materials the use of rod type switches are advised. Typical installations are given in the right Figure. The following points must be taken in to account during installation.

1. Sufficient distance must be allowed between the silo inlet and the probe. Otherwise, inflowing material may cause wrong indication and may damage the probe.
2. The level switch senses the capacitance variation between the probe and the case of the switch. No extra precaution is necessary for metal silos. If the silo is made of non conducting material (such as plastic), a counter electrode must be formed by mounting a sheet metal to the outer surface of the silo and connecting this to the case of the switch.
3. The probes must not be near to the probable material build up zones in the silo.
4. If more than one level switch is mounted in a silo, the distance between the probes must be more than 50 cm in order to avoid mutual interference.



5.3 Wirings and Adjustments

In order to access the connection terminals and the adjustment components of the E-KSS-100 level switch, the top lid must be removed. To remove the lid, four screws on the lid should be unscrewed. The view of the switch without the top lid is shown in the left Figure. In this Figure, the locations of Output Led (the output state indicator), connection terminals, Adjustment Led, Button, and Group Switch (switch for adjustments) are shown.



The cable inlet (PG16) is shown in the left bottom of the Figure. The connection cables are passed through the cable inlet and connected to the connection terminals.

The operating voltage is applied to the terminals 1 and 2. If the operating voltage is DC, positive and negative leads must be connected to the terminals 1 and 2 respectively. Electronic unit includes a protection diode for reverse connection. If reverse connection has been done, the device would not be operated.

The terminals 3, 4 and 5 are respectively normal closed (NC), normal open (NO) and common (C) contacts for relay output devices. For resistive loads, the relay contacts can switch 5 amper current at 220 V AC.

For PNP transistor output switches the collector lead of the transistor is connected to the terminal 5, the terminal 4 is the load return. If the operating voltage is DC, negative supply lead (2) can also be used as load return. The transistor output current is limited to about 80 milliamps.

Case Connection terminal is used for ground connection. The counter electrode for non-conducting silos must be connected to this terminal.

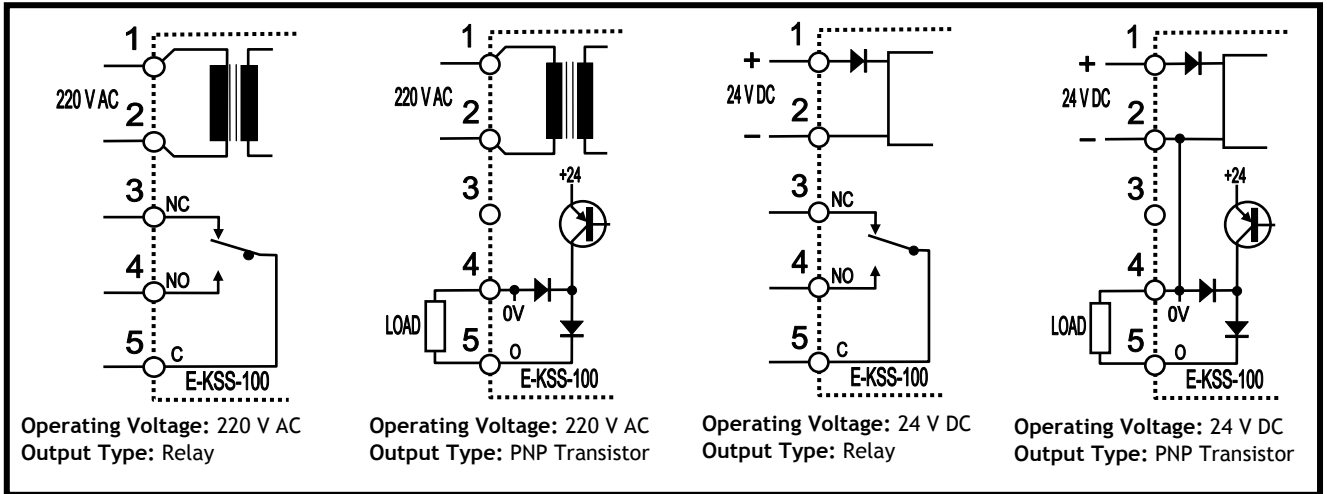
The connection diagrams according to operating voltage and output type are given in the next page.

Output Led lights while the output circuit is energized. During adjustment procedure, the state of level switch is monitored from Output Led.

The position of the switch 4 on the Group Switch determines the output state when material is sensed. If the switch 4 is placed to position “ON”, the output will not be energized when the probe is sensed the material and will be energized when the probe is not sensed the material. If it is placed to position “OFF”, the output will be energized while the probe is sensed the material and will be energized when the probe is not sensed the material.

Before making adjustments, the level switch must be installed in a silo and the operating power is applied as shown in the connection diagrams on the below. The connections must be done according to the type given on the device label (See section 3. TYPE CODING). Be sure to apply correct operating voltage, otherwise the electronic unit may be damaged or will not operate. The device has no internal fuse and power switch, proper fuse and power switch must be installed on the operating power line externally.

CONNECTION DIAGRAMS:



The steps of adjustment procedure are given below.

1. Install the level switch. Apply operating voltage to the level switch as shown in the connection diagrams.
2. While the probe is out of the material, place the switch 1 on the Group Switch to the position “ON” by using a small screwdriver tip. After this operation Adjustment Led will start flashing. While it is flashing, save the empty level measurement by pressing the Button. Then place the switch 1 to its old position.
3. While the probe is in the material(touching material), place the switch 2 on Group Switch to the position “ON”. After this operation Adjustment Led will start flashing. While it is flashing, save the loaded level measurement (material filled) by pressing the Button. Then place the switch 2 to its old position.
4. The adjustment of the Level Switch is completed. Control the Output Led reactions according to material is exist or not exist. If there is a wrong situation repeat the second and third steps.
5. The switch 4 on the Group Switch determines the output state according to the material situation. After adjustments, place the switch 4 to the desired position. Make the output connections.

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