Model **DCS-45** Differential Capacitance Type Proximity Sensor

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**Application**
- Paper remaining amount detection
- Detection of banknotes
- Coin quantity detection
- Human proximity detection
- Detection of remaining liquid level
- Detection of remaining level of grains
- Detection of kerosene level (non-contact)
- Level detection of coffee powder (non-contact)

**Features**
- Detection of minute capacitance change is possible by the differential capacitance detection method.
- Minute capacitance changes within the fF (femto farad) range can be detected.
- Capacitance change can be output as an analog voltage.
- Detection of changes due to the thickness of a single sheet of paper.
- Non-contact detection of liquid inside plastic piping.
- Non-metallic liquid in the tank can be detected without contact.

**Rating/Performance**

<table>
<thead>
<tr>
<th>Model</th>
<th>DCS-45</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detection Surface</td>
<td>Upper side detection</td>
</tr>
<tr>
<td>Detection Level</td>
<td>0 to 45 mm</td>
</tr>
<tr>
<td>Power Voltage</td>
<td>12 V to 24 V DC (Operating voltage range: 10 V to 30 V DC)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>10 mA DC or less (at 12 V DC)</td>
</tr>
<tr>
<td>Output Voltage</td>
<td>0 to 5 V DC, non-detection output 1 V</td>
</tr>
<tr>
<td>Output Impedance</td>
<td>1 kΩ</td>
</tr>
<tr>
<td>Response Time</td>
<td>10 ms or less</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>0 to 50 °C (-10 to 55 °C during storage)</td>
</tr>
<tr>
<td>Humidity Range</td>
<td>30 to 80 % RH (30 to 85 % RH during storage)</td>
</tr>
<tr>
<td>Load Resistance</td>
<td>100 kΩ or more</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>500 V AC, 50/60 Hz for 1 min (Between live parts and the case)</td>
</tr>
<tr>
<td>Insulation Resistance</td>
<td>50 MΩ or more, at 500 V DC megger (Between live parts and the case)</td>
</tr>
<tr>
<td>Vibration Resistance</td>
<td>Durability: 10 to 55 Hz, Double amplitude: 1.5 mm in X-, Y-, and Z-direction, each 2 hours (Device not powered)</td>
</tr>
<tr>
<td>Shock Resistance</td>
<td>Durability: 500 m/s² (Approx. 50 G) in X-, Y-, and Z-direction, each 3 times (Device not powered)</td>
</tr>
<tr>
<td>Ingress Protection</td>
<td>IP64</td>
</tr>
<tr>
<td>Case Material</td>
<td>PPS</td>
</tr>
<tr>
<td>Cable</td>
<td>ø3, 3-core round cord of 0.15 mm² and insulation 1.0 mm and 1 m in length (oil and heat resistant)</td>
</tr>
<tr>
<td>Weight</td>
<td>Approx. 40 g</td>
</tr>
</tbody>
</table>

**Characteristics Graph (Typical Example)**

- **Example of remaining level (ground model)**
- Depending on the type of detector and the distance from the sensor to the detector.

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* Depending on the type of detector and the distance from the sensor to the detector.
**Dimensions**

Range of detection

- 35 ± 0.2
- 27 ± 0.2
- 12
- 6.1
- 45

Model Type and Lot No.

- 40 ± 0.2
- 11.6
- 26
- 1000 ± 30
- 88
- 85.3

**Output Circuit**

![Output Circuit Diagram]

- **Detection circuit**
- **AMP**
- **Constant voltage circuit**
- **Brown**
  - Brown Vcc Power Voltage
- **Black**
  - Black OUT Output Signal
- **Blue**
  - Blue GND GND

- Wire Color
  - Brown
  - Black
  - Blue

- Signal Name
  - Vcc
  - OUT
  - GND

- Function
  - Power Voltage
  - Output Signal

**Influence By Surrounding Metals**

The sensor detection side and the back are shielded and less susceptible to interference, but if minute effects (tens of mV) cannot be ignored, use them with enough distance as shown in the figure below.

- Metal on the side
  - 3 or more
  - 25 or more
  - 150 or more

- Metal on the forward

Unit: mm

**Mutual Interference**

When using two or more sets of sensor of the same frequency type, separate them in the distance shown below more to avoid possible mutual interference.

- 70mm
- 40mm
- 150mm

**Precautions During Use**

1. The principle of operation of differential capacitance type proximity sensors is an analog output sensor that detects the difference between a reference capacitance inside the sensor and the capacitance of the sensor detection surface.

   There are two motion models, the "ground model" in which the capacitance decreases in principle and the "floating model" where the capacitance increases. The output voltage is set to 1 V at the time of non-detection, and if the detection object has a large capacitive coupling with ground, the ground model is applied and the output voltage increases from 1 V to 5 V. When the detection object has small capacitive coupling with ground, the floating model is applied if it comes close enough to come into contact with the detection surface, at which time the output voltage falls from 1 V to 0 V.

2. Never peel off the film on the detection surface as this will prevent capacitance from being detected.

3. For other precautions, please refer to "General Precautions" of differential capacitance type proximity sensors.