

Assured operating distance s_a

Distance from the active area where actuation of the proximity switch is assured under defined conditions:

$$0 < s_a \leq 0.81 \cdot s_n$$

Repeatability R

Change in the actual operating distance s_r , measured over a period of eight hours at a housing temperature of $23 \pm 5 \text{ }^\circ\text{C}$, any level of relative humidity and a supply voltage of $U_e \pm 5\%$ or any voltage within the rated operational voltage range $\pm 5\%$:

$$R \leq 0.1 \cdot s_r$$

Hysteresis H

Distance between the trip points when the measuring plate approaches and moves away from the proximity switch. It is specified relative to the actual operating distance s_r , measured at an ambient temperature of $23 \pm 5 \text{ }^\circ\text{C}$ and rated operational voltage:

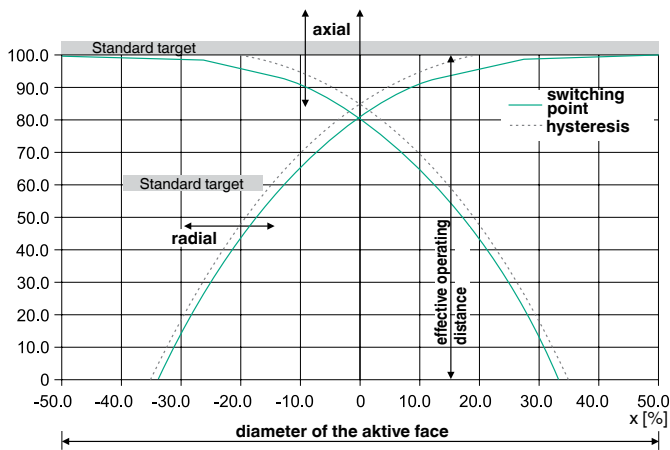
$$H \leq 0.2 \cdot s_r$$

Safely switched off

A proximity switch is switched off safely when the distance between the measuring plate and the active area is at least three times the rated operating distance s_n .

Sideways approach

Above, the focus is on an axial approach to the standard measuring plate. However, if you move the plate sideways into the active zone, you obtain another operating distance s depending on the axial offset. This correlation characterizes the response curve.



Different actuator sizes

Inductive sensors are used to check machine parts in many cases. These very rarely have the same size and shape as the standard measuring plate to which the sensor's technical data applies. The operating distance in particular depends on the size of the metal used to attenuate the sensor.

Generally the operating distance increases only marginally with a larger object surface, but reduces significantly for smaller objects.

If the object being checked is different in size to the standard measuring plate, it is recommended that you verify the operating distance of the selected sensor.

Different actuator materials

In addition to the actuator's dimensions, the material property of the actuator is also of considerable importance. This is characterized by the reduction factor. The reduction factor specifies by what factor the operating distance reduces as a result of different materials versus steel FE 360 (St37) for inductive proximity switches and against a grounded plate for capacitive proximity switches. The lower the reduction factor, the shorter the operating distance for the material in question. Since the reduction factor for inductive proximity switches depends upon the housing and shielding material, this factor varies from type to type. Please use the value in the respective data sheet.

In the case of inductive proximity switches, the conductivity/permeability ratio of the actuator is the parameter for the reduction factor. Some typical reduction factor values are provided below:

Material	Reduction factor
Construction steel	1
Aluminum foil	1
Stainless steel	0.85
Aluminum	0.4
Brass	0.4
Copper	0.3

Step 3: Mounting conditions

Inductive and capacitive sensors can be flush mounted or non-flush mounted.

Sensors that cannot be flush mounted

The largest possible operating distance (in reference to the diameter D of the active area) is reached by sensors that cannot be flush mounted.

In the case of an inductive sensor, coils are used to generate electromagnetic fields. To achieve a forwards or backwards field alignment, the coils are embedded in a pot core. Despite this measure, part of this field is emitted laterally and is affected by the surrounding metal. This lateral effect is also observed with capacitive sensors.

To prevent sensors with a wide detection range from being attenuated by the surrounding metal, clearance must be created around the sensor element.

The size of the clearance can also be determined from the technical data for the respective sensors.

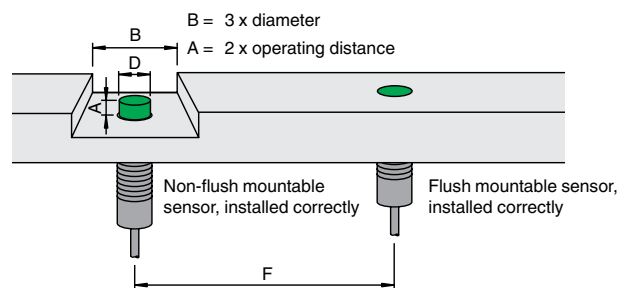
Sensors that can be flush mounted

Sensors that can be flush mounted do not require any clearance. ($A=0$). The advantage of these sensors over ones that cannot be flush mounted is that

they are better mechanically protected and are less sensitive to interference. However, one disadvantage is the shorter operating distance as the active area

of the sensor is already surrounded by metal. The sideways interference from the surrounding metal is reduced by a special internal shield,

but this happens at the detriment of the detection range. These sensors achieve only approx. 60% of the operating distance of non-flush designs.



Further details on the mounting conditions are included in the technical data for the sensors.