Installation notes for eddy current sensors

Eddy current sensors are sub-divided into shielded sensors (e.g. ES05) and unshielded sensors (e.g. EU05). A narrower distribution of the field lines is achieved with shielded sensors and they are not sensitive to radially adjacent metals. For unshielded sensors, the field lines emanate sideways from the sensor. The measuring range is therefore usually larger.

The correct installation is crucial for the signal quality.
The instructions below apply to installations with metallic materials. An installation in a non-metallic environment is not critical.

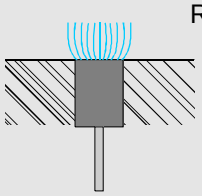
The eddy current sensors are matched to the target material as standard…

... St37 for ferromagnetic targets

... Aluminium for non-ferromagnetic targets

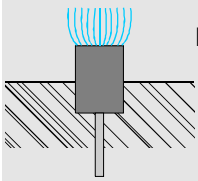
For other materials, a linearity calibration (LC) can be performed in order to achieve the best possible temperature stability. A linear calibration is also required for special target shapes (see page 2) or in the case of non-symmetrical damping.
The TCS option is required for increasing the temperature stability in the case of a temperature range deviating from the standard (> 100 °C). Thereby, the installation environment must be taken into account.

ES: shielded Sensors



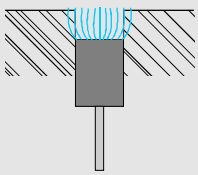
Right ✓

Flush mounting



Right ✓

Protruding mounting

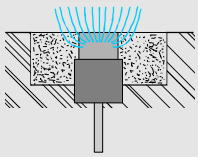


False ✗

Surrounding material damps the sensor.

Result: shortened measuring field, non-linear characte-ristics, measurement may not be possible under certain circumstances

EU: unshielded Sensors

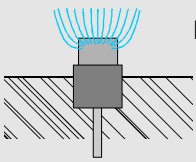


Right ✓

Sensor must be installed free-standing.

Minimum clearance around the sensor must be maintained. Guide value: 3 times the sensor diameter

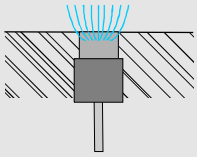
Tip: Recess can be sealed with non-conductive materials for increasing the mechanical stability



Right ✓

Protruding sensor installation

Projecting length: 2-3 times the measuring range



False ✗

Surrounding material damps the standard version of the sensor

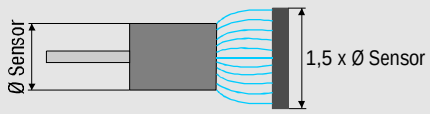
Result: Measurements not possible

* Compensation for special targets (“LC”) possible

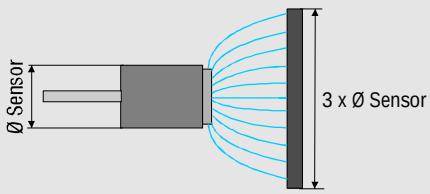
Measuring object size for eddy current sensors

The relative size of the measuring object to the sensor has effects on the linearity deviation for eddy current sensors. Ideally, the measuring object size for shielded sensors is at least 1.5 times the sensor diameter and at least 3 times the sensor diameter for unshielded sensors. From this size, almost all magnetic field lines run from the sensor to the target. Therefore almost all magnetic field lines penetrate the target via the face and so contribute to eddy current generation, where only a small linearity deviation occurs.

Series ES: shielded Sensors



Series EU: unshielded Sensors



If the required target minimum size cannot be complied with, the following aspects must be taken into account for a sufficiently high linearity:

- The size of the measuring object must not change
- The target must not be moved laterally to the sensor face
- A successful automatic calibration is a prerequisite to minimise linearity errors
- A linearity calibration on the corresponding measuring object must be performed without fail. A change of the measuring object size has significant effects on the measurement results
- The penetration depth of the magnetic field lines for the measuring object thickness must be complied with

The target material and the type of sensor used are important criteria for achieving the required linearity. The dependency of the linearity on the criteria increasingly reduces as the sensor size increases.

The automatic calibration function is an important pre-condition for reducing linearity errors. The following table shows the relationship between sensors, the measuring object size and the effect on the automatic calibration.

Example of sensor selection for the automatic calibration with different target diameters

	Sensor	ES04A	ES04M	EU05A	EU05M	ES1A	ES1M	ES2A	ES2M	EU3A	ES4M
Targetdiameter	40mm	√	√	√	√	√	√	√	√	√	√
	10mm	√	√	√	√	√	√	√	√	√	√
	8mm	√	√	√	√	√	√	√	√	√	√
	6mm	√	√	√	√	√	√	o	√	o	o
	4mm	√	√	√	√	√	√	x	x	x	x
	2mm	o	√	o	√	x	x	x	x	x	x
	1mm	x	+	x	√	x	x	x	x	x	x

√ Automatic calibration successful, small linearity errors

o Automatic calibration successful, increasing linearity errors

x Automatic calibration not successful, measurement is not meaningful

A = non-ferromagnetic materials M = ferromagnetic materials