

smartEDDY® 4.0 Eddy Current Encircling Coil Sensors



Encircling Coil.

SE Systems, a premier manufacturer of quality RF sensors for testing metal parts and products, produces a wide array of Standard Encircling Coil Sensors.

For even greater selection, SE also manufactures standard surface sensors, ID sensors for inspection of holes and tubes, and a wide range of custom sensors for specific applications.

By leveraging the thousands of available and different coils, SE Systems enables users to select

the ideal sensor for their application.

While smartEDDY is designed to work with virtually any eddy-current sensor, using the right sensor is critical to achieving test success. For example, many sensor manufacturers fail to consider important design details that can compromise your measurement or test. As a result, poor sensors can lead to unstable tests, erroneous measurements, incessant adjustments, and frequent sensor replacement.

SE Systems is committed to producing the highest quality sensors in order to give you the best possible test performance.

► SE Systems' Sensors Are Designed With The Following Important Design Details

- Sensor impedance
- Sensing area
- Field orientation
- Sensitivity
- Pressure insensitivity
- Temperature insensitivity
- Electromagnetic shielding
- Cable integrity
- Wear resistance
- Damage tolerance

► The Role Of An Encircling Sensor

RF encircling sensors are designed to test metal parts or products. Frequently, these are cylindrical parts such as wire, rods, tubes and fasteners, which are passed through the sensor. The

sensor generates RF energy that penetrates the part, interacting with the local conductivity and magnetic permeability to induce electrical current around the circumference of the part. Some of the energy is reflected back to the sensor, carrying information about the part shape, discontinuities, electrical conductivity, and magnetic permeability.

SE's Standard Encircling Coil Sensors produce eddy-currents that travel in a sheath around the circumference of a cylindrical part. The axial width of the current sheath is determined by the sensor design. In the case of unshielded absolute sensors, the sheath width is determined by the coil width and diameter. With shielded sensors, the sheath width is discrete and determined by the shield separation. For differential unshielded sensors, the resolution is determined by the separation between coil centers.

► Standard Encircling Sensors

Standard encircling coil parameters:

Coil diameter:

- 0.005 to 1.750 inch (0.12 mm to 44.5 mm)
- Custom sizes above 1.750 inch

Resolution:

- High speed
- High resolution
- Ultra-high resolution

Configuration:

- Absolute
- Differential

Mode:

- Impedance
- Reflectance

Shielding:

- Stainless Steel
- Unshielded

All standard encircling sensors are assembled in anodized aluminum housings that measure 4.62 inches wide x 2.8 inches high x 1 inch deep (117 mm wide x 71 mm high x 25 mm deep). Sensors feature integral twist-lock Burndy cable connectors, are temperature compensated to reduce sensitivity

to changes in ambient temperature, and have a documented sensitivity and measured frequency spectrum.

Shielded Sensors

These sensors have stainless steel guides that truncate the axial field and serve to shield the sensing area from the external environment.

Shielding provides such benefits as:

- Defined sensing area
- Isolation from surrounding metal
- Better temperature compensation
- Less electromagnetic interference
- Deeper penetration
- Better wear resistance
- Greater damage tolerance

Standard axial resolution is as follows:

- Diameters between 0.005 and 0.032 inch have axial resolution ~0.025 inch (0.6 mm).
- Diameters between 0.032 and 0.125 inch have axial resolution ~0.06 inch (1.5 mm).
- Diameters between 0.125 and 0.875 inch have axial resolution ~0.1 inch (2.5 mm).
- Diameters between 0.875 and 1.75 inch have axial resolution ~0.2 inch (5 mm).

Ultra-High Resolution Shielded Sensors (-UHR)

Ultra-high resolution sensors are used to detect very small defects. The higher resolution may increase the required fill factor and slow the maximum line speed. When ordering, add "UHR" to the part number.

Ultra-high resolution shielded sensors have the following axial resolution:

- Diameters between 0.005 and 0.032 inch have axial resolution ~0.017 inch (0.4 mm).
- Diameters between 0.032 and 0.125 inch have axial resolution ~0.03 inch (0.8 mm).
- Diameters between 0.125 and 0.875 inch have axial resolution ~0.05 inch (1.3 mm).
- Diameters between 0.875 and 1.75 inch have axial resolution ~0.1 inch (2.5 mm).

High-Speed Shielded Sensors

Sensors with larger axial resolution can be used to increase maximum line speed. The larger resolution can also be used to extend the test to lower frequencies. When ordering, add "HS" to the part number.

High-speed shielded sensor axial resolution is as follows:

- Diameters between 0.005 and 0.032 inch have axial resolution ~0.1 inch (2.5 mm).
- Diameters between 0.032 and 0.125 inch have axial resolution ~0.2 inch (5 mm).
- Diameters between 0.875 and 0.125 inch have axial resolution ~0.2 inch (5 mm).
- Diameters between 0.875 and 1.75 inch have axial resolution ~0.4 inch (10 mm).

► Severe Wear Options

Continuous product applications, such as tube, rod and wire mills, should have separate guides before and after the sensor to minimize contact with the test materials. Following are four options that SE offers to greatly extend the life of a sensor should the part ever contact the sensor. When ordering, add the corresponding suffix letters to the part number.

UHMW Inserts (-IS)

As required, replaceable ultra-high molecular weight polyethylene inserts of approximately 0.05 inch (1.3 mm) thickness can be added. The insert can be replaced after significant wear is detected and before the sensor degrades.

Hardened Housing (-HD)

Shielded sensors can be provided with a hardened, RC 55 stainless steel shield.

Ceramic Cores (-CC)

Aluminum oxide, one of the hardest materials known, provides nearly infinite life if the test surface is relatively smooth. The sensing element can still be damaged by sharp protrusions that may crack the core. Aluminum oxide cores are available for sensors less than

1/8-inch (3 mm) in diameter. All sensors less than 1/32-inch (0.8mm) have aluminum oxide cores.

Diamond Dies (-DD)

Diamond dies can be added to all sensors less than 1/8-inch (3mm) in diameter before and after the core.

► Custom Sensors

SE Systems is well known for building custom sensors that meet special needs. SE Systems has manufactured multiple element sensors for inspecting super-conducting cable on cabling lines, nuclear fuel assemblies during maintenance intervals, in-die stampings in press, and fuel injector bodies during manufacture.

SE Systems builds:

- Sensors with sensing area diameters ranging from a fraction of a mm to several meters
- Remote field, reflectance, high temperature and water proof sensors
- Sensors with shaped sensing areas and current flowing perpendicular to the test surface.

SE Systems can provide high precision sensors with impedance and sensitivity matched to better than one percent. These sensors eliminate the need for changing test parameters when a sensor is replaced. Add "HP" for the high precision option.

Contact an SE applications engineer for further information.

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