



# More Precision

**eddyNCDT** // Inductive sensors based on eddy currents





- Miniature sensor design
- Sensor can be completely integrated into the spindle
- Miniature controller can be integrated in the spindle or installed via a flange
- For ferromagnetic and non-ferro-magnetic materials
- Temperature measurement integrated in sensor
- Cost-optimized design

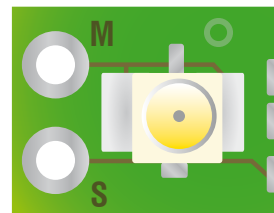
#### Measuring the thermal extension of spindles

The SGS4701 displacement measuring system (Spindle Growth System) is developed specifically for high speed milling machine applications. Due to high machining speeds and the heat generated, the linear thermal expansion of the spindle in precision machine tools needs to be compensated for in order to keep the tool in a defined position at all times. The SGS sensor measures the thermal and centrifugal force expansion of the spindle. These measurement values are fed into the CNC machine tool as correctional values, compensating for any positioning errors.

The SGS4701 operates on the eddy current measuring principle. This non-contact measurement method is wear-free. Furthermore, the measurement procedure is resistant to disturbances such as heat, dust and oil.

#### System design

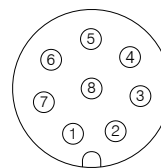
The SGS4701 consists of a sensor, a sensor cable and a controller, factory calibrated either for ferromagnetic or non-ferromagnetic measurement objects. Two miniature sensors enable it to be installed directly in the spindle, where the measurements take place, typically on the labyrinth-ring of the spindle. As well as measuring linear thermal expansion, the temperature of the sensor is also detected and output. The compact controller can be installed on the spindle housing via a flange or directly in the spindle.



The sensor cable must not be shortened as functionality loss may arise. Removing the connector is only permitted behind the plug-sided crimp when using the solder connections.

**S** = signal = inner conductor  
**M** = ground = shield = outer conductor

#### 8-pin M12 plug Pin view onto controller



Pin	Description
1	Ground
2	+24 V
3	Displacement signal
4	Temperature signal
5	not connected
6	do not connect
7	do not connect
8	not connected

Sensor system		SGS4701
Measuring range		500 $\mu\text{m}$ (option 250 $\mu\text{m}$ <sup>2)</sup> )
Offset distance		100 $\mu\text{m}$ (option 50 $\mu\text{m}$ <sup>2)</sup> )
Linearity		$\pm 2 \mu\text{m}$
Resolution <sup>1)</sup>		0.5 $\mu\text{m}$
Frequency response		2000 Hz
Target material		ferromagnetic or non-ferromagnetic
Continuous operating temperature	Sensor	0 ... +90 °C
	Controller	+10 ... +70 °C
Temperature stability	Sensor	$\pm 150 \text{ ppm FSO}/^\circ\text{C}$ (MMR)
	Controller	$\pm 500 \text{ ppm FSO}/^\circ\text{C}$ (MMR)
Temperature compensation range	Sensor	+10 ... +80 °C
	Controller	+10 ... +70 °C
Power supply		12 ... 32 VDC
Analog out (displacement)		0.5 ... 9.5 V $\pm$ 100 ... 600 $\mu\text{m}$ (optional 50 ... 300 $\mu\text{m}$ <sup>2)</sup> )
Analog out (temperature)		0.5 ... 9.5 V ( $\pm$ 0 ... +90 °C)
Protection class	Sensor+Controller	IP67 <sup>3)</sup>
Dimensions	EMU04(102)	12x10x4.5 mm <sup>4)</sup>
	EMU04(121)	10x4x4 mm <sup>4)</sup>
Sensor cable <sup>3)</sup>	Diameter	$\varnothing 1.13 \text{ mm}$
	Length	1000 mm (400 ... 1500 mm on request)
	min. bend radius	12 mm
	Jacket	FEP

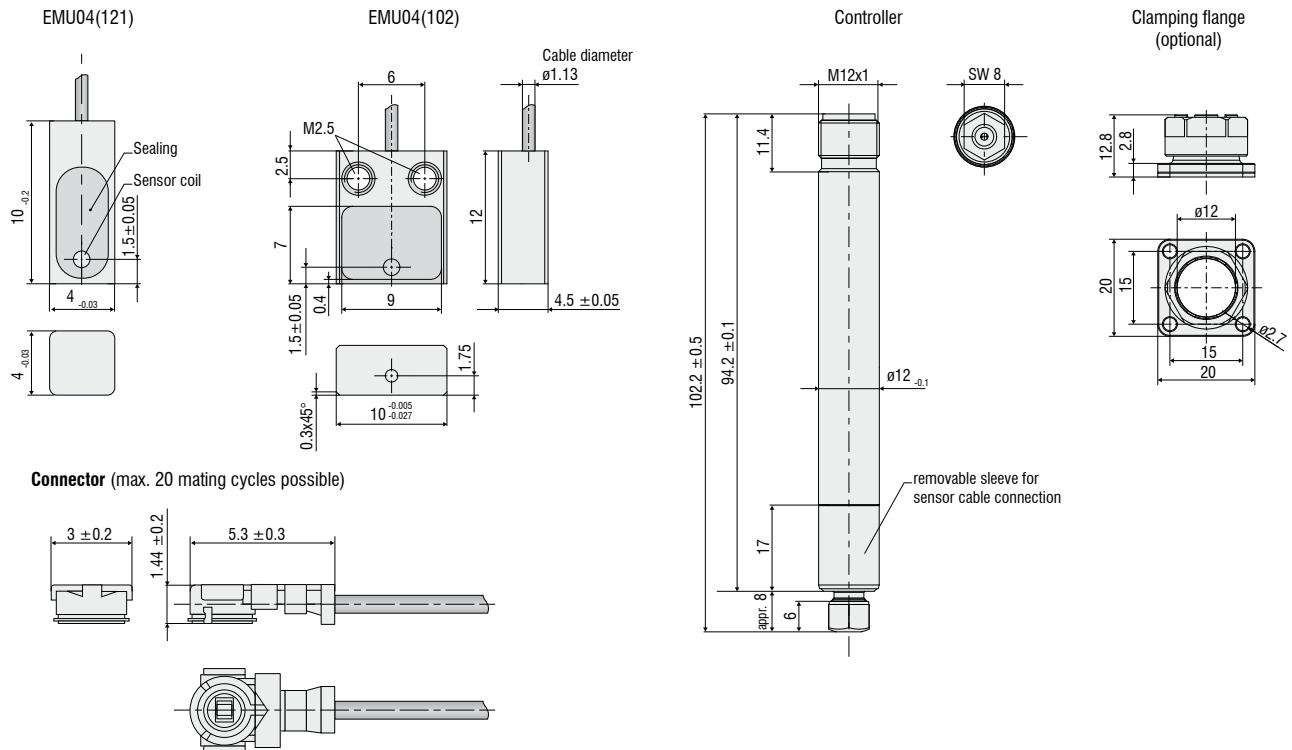
FSO = full scale output; MMR = midrange

<sup>1)</sup> Static, MMR

<sup>2)</sup> For OEM modifications: sensors with a measuring range of 250  $\mu\text{m}$  and an offset of 50  $\mu\text{m}$  are possible

<sup>3)</sup> In mated condition

<sup>4)</sup> Detailed cable specifications can be found in the operating instructions



## High performance sensors made by Micro-Epsilon



Sensors and systems for displacement and position



Sensors and measurement devices for non-contact temperature measurement



2D/3D profile sensors (laser scanner)



Optical micrometers, fiber optic sensors and fiber optics



Color recognition sensors, LED analyzers and color online spectrometer



Measurement and inspection systems