More Precision

eddyNCDT SGS // Spindle Growth System

- *Cost-effective design*
- *Miniature sensor design*
- *Miniature, compact controller*
- *Sensor technology can be integrated completely into the sensor*
- *Suitable for ferro- and non-ferromagnetic materials*
- *Temperature measurement integrated in the sensor*

Measuring thermal extension in spindles

The displacement measurement system SGS 4701 (Spindle Growth System) has been developed specifically for high speed milling machine applications. Due to high machining speeds and the heat generated, the linear thermal extension of the precision machine tool spindle 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 extension of the spindle. These measurement values are fed into the CNC machine tool as correction values, compensating for any positioning errors.

The SGS 4701 operates on the eddy current measuring principle. This non-contact measurement is wear-free. Furthermore, the measurement procedure is resistant to disturbances such as heat, dust and oil.

System structure

The SGS 4701 consists of a sensor, a sensor cable and a controller, factory calibrated for ferromagnetic and 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 extension, 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 controller can be integrated in the spindle or installed on the housing via a flange.
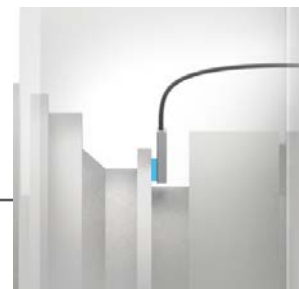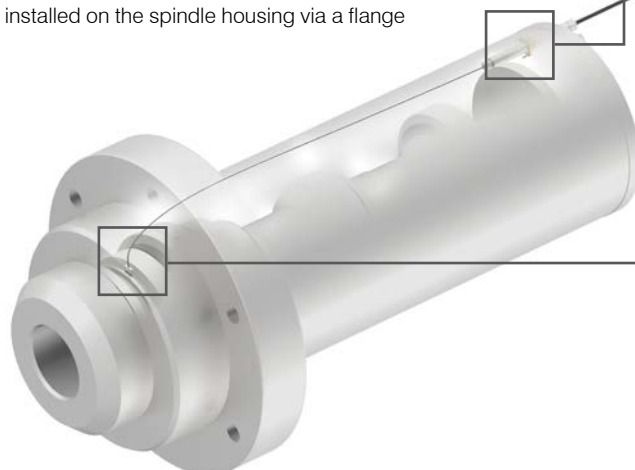
Typical installation:
Measurement on the labyrinth ring

Sensor system		SGS4701
Measuring range		500µm (option 250µm [2])
Offset		100µm (option 50µm [2])
Linearity		±2µm
Resolution [1]		0.5µm
Bandwidth		2000Hz
Target		ferromagnetic / non-ferromagnetic
Minimum target diameter		6mm (option 3.5mm [2])
Operating temperature	sensor	0 ... +90°C
	controller	10 ... +70°C
Temperature stability	sensor	±150ppm FSO/°C (MMR)
	controller	±500ppm FSO/°C (MMR)
Temperature compensation range	sensor	+10 ... +80°C
	controller	+10 ... +70°C
Supply voltage		12 ... 32VDC
Analog out	displacement	0.5 - 9.5V ≙ 100 - 600µm (option 50 - 300µm [2])
	temperature	0.5 - 9.5V (≙ 0 ... +90°C)
Protection class	sensor / controller	IP67 [3]
Dimensions	EMU04(102)	12x10x4.5mm [4]
	EMU04(121)	10x4x4mm [4]
Sensor cable [3]	diameter	Ø 1.13mm
	length	1000mm (400 - 1500mm on request)
	min. bending radius	12mm
	jacket	FEP

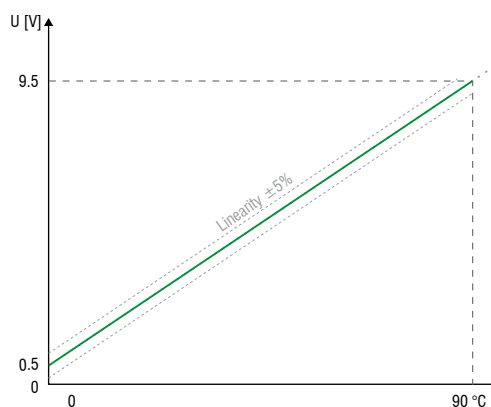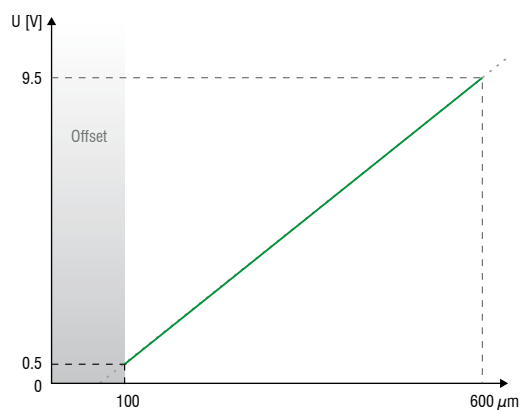FSO = Full Scale Output; MMR = Midrange
[1] static, MMR
[2] For OEM modifications: sensor with measuring range 250µm and offset 50µm
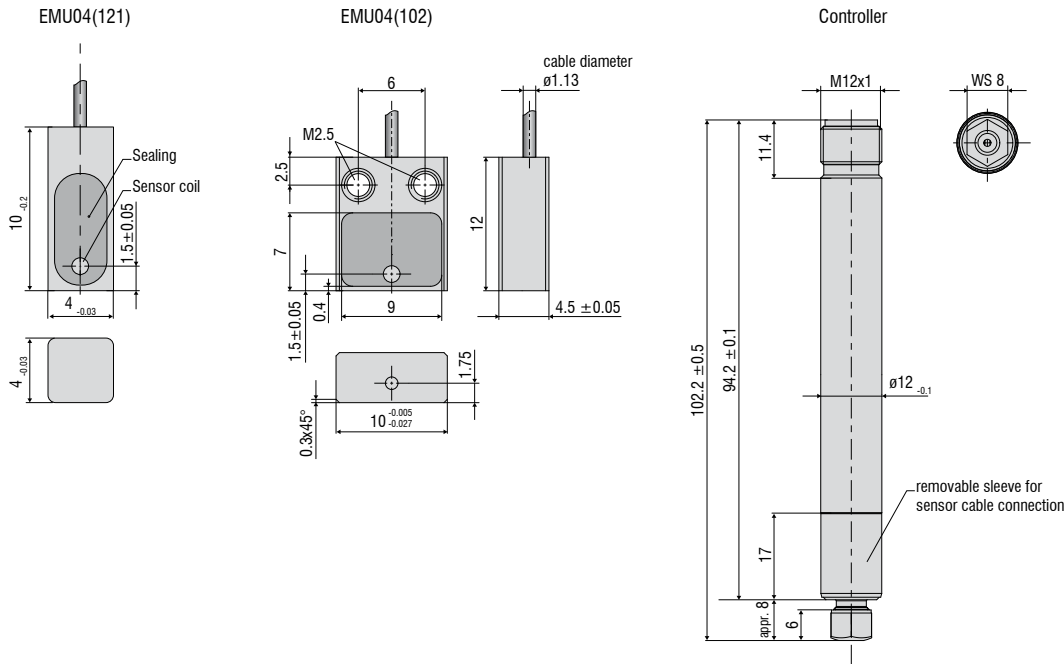[3] In mated condition
[4] Detailed cable specifications can be found in the operating manual

Linear output signal:
The output signal for displacement and temperature is almost linear within the specified measuring range

Technical drawing

Dimensions in mm, not to scale

EMU04(121)

Sealing
Sensor coil
10 -0.2
1.5 ±0.05
4 -0.03
4 -0.03

EMU04(102)

6
M2.5
2.5
7
1.5 ±0.05
0.4
9
0.3x45°
10 -0.005 -0.027
1.75

cable diameter
ø1.13
12
4.5 ±0.05

Controller

M12x1
WS 8
11.4
102.2 ±0.5
94.2 ±0.1
ø12 -0.1
17
appr. 8
6

removable sleeve for
sensor cable connection
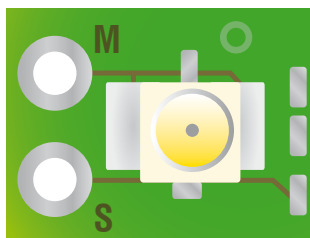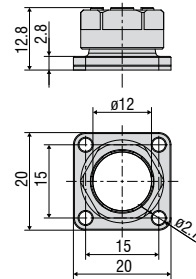
8-pin. M12 connector

Pin assignment (view on controller)

Pin	Signal
1	Ground
2	+24V
3	Displacement signal
4	Temperature signal
5	not connected
6	do not connect
7	do not connect
8	not connected
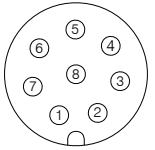
Connector (max. 20 mating cycles possible)

3 ±0.2
1.44 ±0.2
5.3 ±0.3
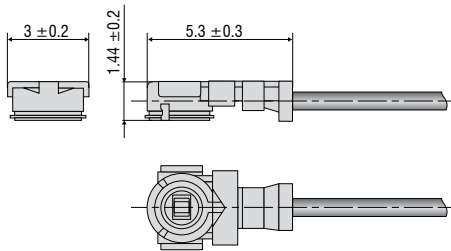
Mounting flange (optional)

12.8
2.8
ø12
20
15
15
20
ø2.7

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

MICRO-EPSILON