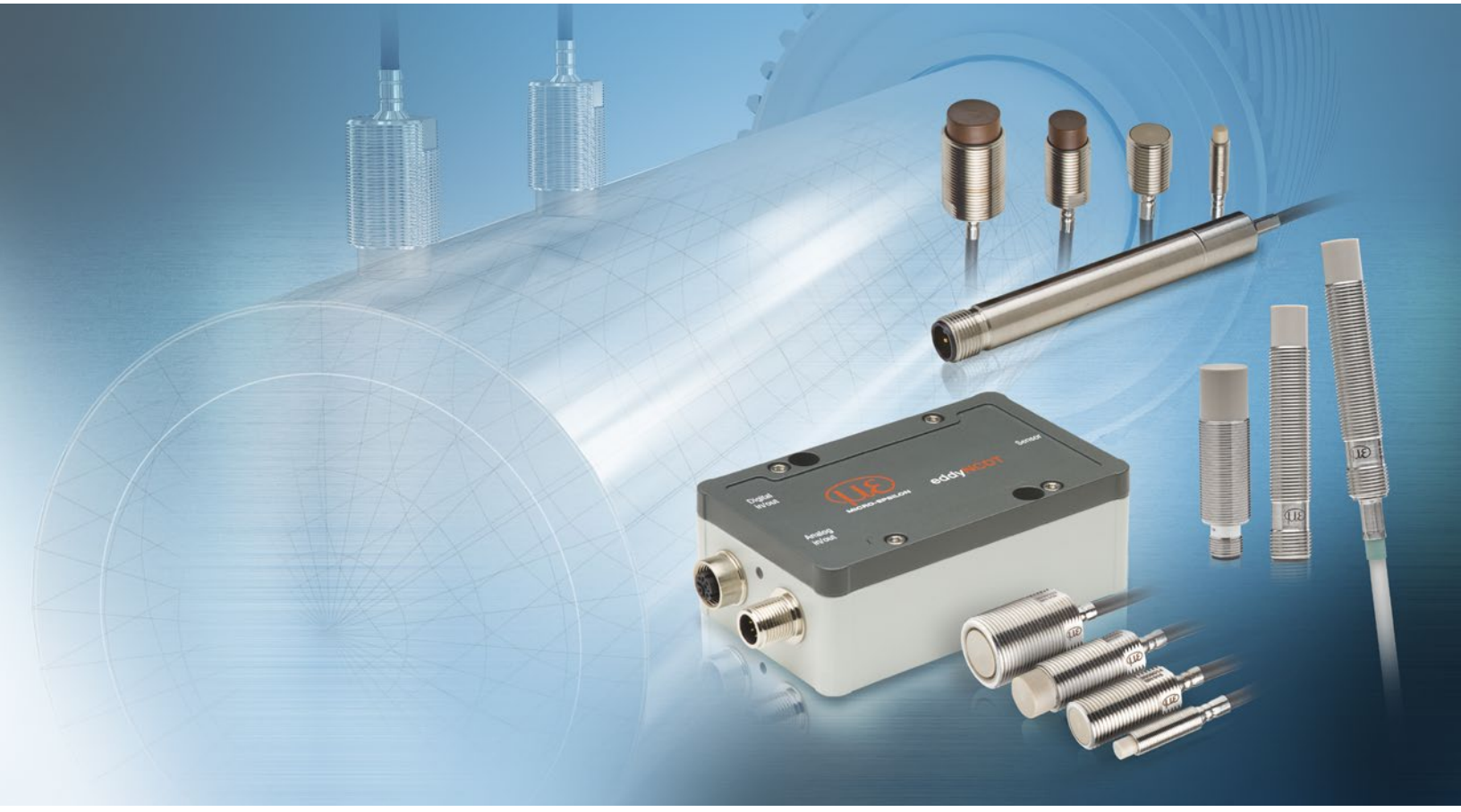
MICRO-EPSILON

# More Precision

## eddyNCDT // Inductive sensors based on eddy currents



# Spindle Growth System
# eddyNCDT SGS4701

- Miniature sensor design
- M12 controller - Integration into spindle or flange mounting
- Sensors for ferromagnetic and non-ferromagnetic targets
- Temperature measurement integrated




### 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.

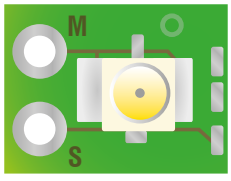
### System design

The SGS 4701 consists of a sensor, a sensor cable and a controller, factory calibrated for ferromagnetic and non-ferromagnetic targets. 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.

### Customer-specific adjustment

For individual installation situations and measurement objects, sensor and controller can be adjusted in the factory. This enables to achieve the best possible measurement accuracy.



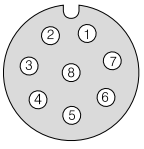

**S** = signal = inner conductor
*M* = ground = shield = outer conductor

**Pin assignment for power supply and signal**

| Pin | Assignment | Color (cable: PC4701-x) |
|---|---|---|
| 1 | GND | White |
| 2 | Supply 12 … 32 VDC | Brown |
| 3 | Displacement signal | Green |
| 4 | Temperature signal | Yellow |
| 5 | n.c. | Gray |
| 6 | internal | Pink |
| 7 | internal | Blue |
| 8 | n.c. | Red |



**8-pin housing connector M12x1**
**View on pin side**



| Model | | SGS4701 |
|---|---|---|
| Measuring range | | 500 µm (optional 250 µm [1]) |
| Start of measuring range | | 100 µm (optional 50 µm [1]) |
| Measuring rate | Analog output | 64 kSa/s (16 bit) |
| Resolution [2] [3] | | 0.5 µm |
| Frequency response (-3dB) | | 2000 Hz |
| Linearity | | < ±2 µm |
| Temperature stability [3] | Sensor | < 150 ppm FSO / K |
| | Controller | < 500 ppm FSO / K |
| Temperature compensation | Sensor | +10 … +80 °C |
| | Controller | +10 … +70 °C |
| Min. target size (flat) | | 6 mm (optional 3.5 mm [1]) |
| Target material [4] | | Steel, aluminum |
| Supply voltage | | 12…32 VDC |
| Power consumption | | 0.6 W |
| Analog output | Displacement | 0.5 … 9.5 V (100 … 600 µm, optional 50 … 300 µm [1]) |
| | Temperature | 0.5 … 9.5 V (0 … 90 °C) |
| Connection | | Sensor: integrated cable [5], standard length 1 m (0.4 ... 1.5 m on request), min. bending radius 12 mm<br>Supply/signal: 8-pole M12 connector (cable see accessories) |
| Temperature range | Sensor | 0 … +90 °C |
| | Controller | +10 … +70 °C |
| Shock (DIN EN 60068-2-27) | | 50 g / 6 ms in each direction, 1000 shocks each |
| Vibration (DIN EN 60068-2-6) | | 20 g / 10 ... 3000 Hz |
| Protection class (DIN EN 60529) | | IP67 (plugged) [6] |
| Weight [7] | | approx. 85 g |

FSO = Full Scale Output

[1] For OEM modifications: sensor with a measuring range of 250 µm and an offset of 50 µm are possible

[2] Static, relates to mid of measuring range

[3] Relates to mid of measuring range, in the compensated temperature range

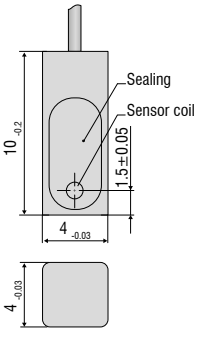
[4] Steel: St37 steel DIN1.0037 / aluminum: AlMg3

[5] Detailed cable specifications can be found in the operating instructions

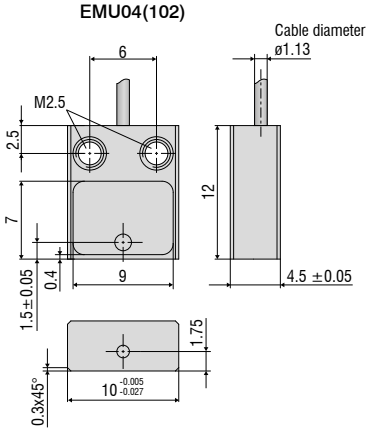
[6] Protection class does not apply for the controller sleeve!

[7] Total weight for controller, cable and sensor

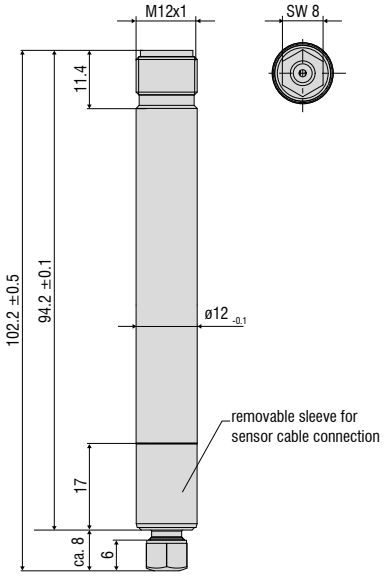
**EMU04(121)**



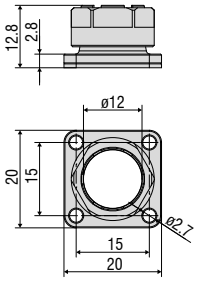

**EMU04(102)**



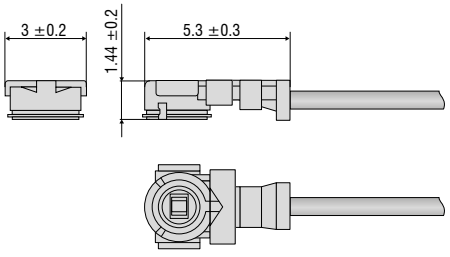

**Controller**




**Clamping flange (optional)**




**Connector (max. 20 mating cycles possible)**




Dimensions in mm, not to scale.

# Accessories
# eddyNCDT

| Article | Description | DT3001 | DT3005 | DT3060 | DT3070 | DT3300 | DZ140 | SGS |
|---|---|---|---|---|---|---|---|---|
| PCx/8-M12 | **Supply and signal cable**<br>8-pole with M12 connector<br>Standard length: 3 m<br>Optionally available: 5 m / 10 m / 15 m<br>10 m as drag-chain suitable variant | | | x | x | | | |
| PCx/5-M12 | **Supply and signal cable**<br>5-pole with M12 connector<br>Standard length: 5 m<br>Optionally available: 10 m / 20 m / 40 m / 80 m<br>as drag-chain suitable variant | x | x | | | | | |
| PC4701-x | **Supply and signal cable**<br>8-pole with M12 connector<br>Standard length: 10 m<br>Optionally available: 15 m<br>10 m as drag-chain suitable variant | | | | | | | x |
| SCD2/4/RJ45 | **Ethernet cable**<br>4-pole with M12 connector<br>on RJ45 connector<br>Standard length: 2 m | | | x | x | | | |
| SCAx/5 | **Signal cable, analog**<br>5-pole with M16x0.75 connector<br>Standard length: 3 m<br>Optionally available: 6 m / 9 m | | | | | x | | |
| SCDx/8 | **Signal cable for switching inputs and outputs:**<br>8-pole with M16x0.75 connector<br>Standard length: 0.3 m<br>Optionally available: 1 m | | | | | x | | |
| PSCx | **Supply and synchronization cable**<br>5-pole with M9 connector<br>Standard length: 0.3 m<br>Optionally available: 1 m | | | | | x | | |
| ESCx | **Synchronization cable**<br>5-pole with M9 connector<br>Standard length: 0.3 m<br>Optionally available: 1 m | | | | | x | | |
| PC140-x | **Supply and signal cable**<br>8-pole connector<br>Standard length: 3 m<br>Optionally available: 6 m | | | | | | x | |
| PS2020 | **Power supply unit**<br>Input 100-240 VAC output 24 VDC / 2.5 A;<br>mounting onto symmetrical standard rail<br>35 mm x 7.5 mm, DIN 50022 | x | x | x | x | x | x | x |

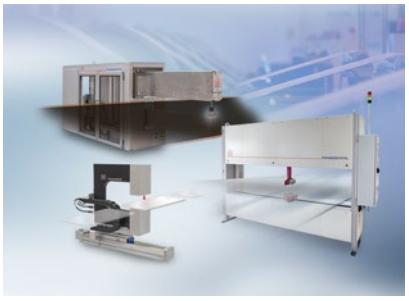
## Sensors and Systems from Micro-Epsilon



Sensors and systems for displacement, distance and position



Sensors and measurement devices for non-contact temperature measurement



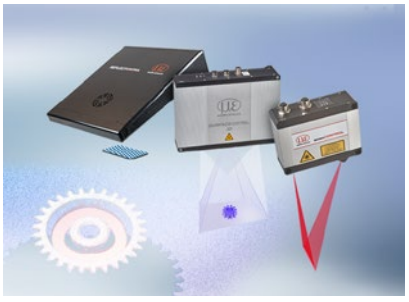
Measuring and inspection systems for metal strips, plastics and rubber



Optical micrometers and fiber optics, measuring and test amplifiers



Color recognition sensors, LED analyzers and inline color spectrometers



3D measurement technology for dimensional testing and surface inspection

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