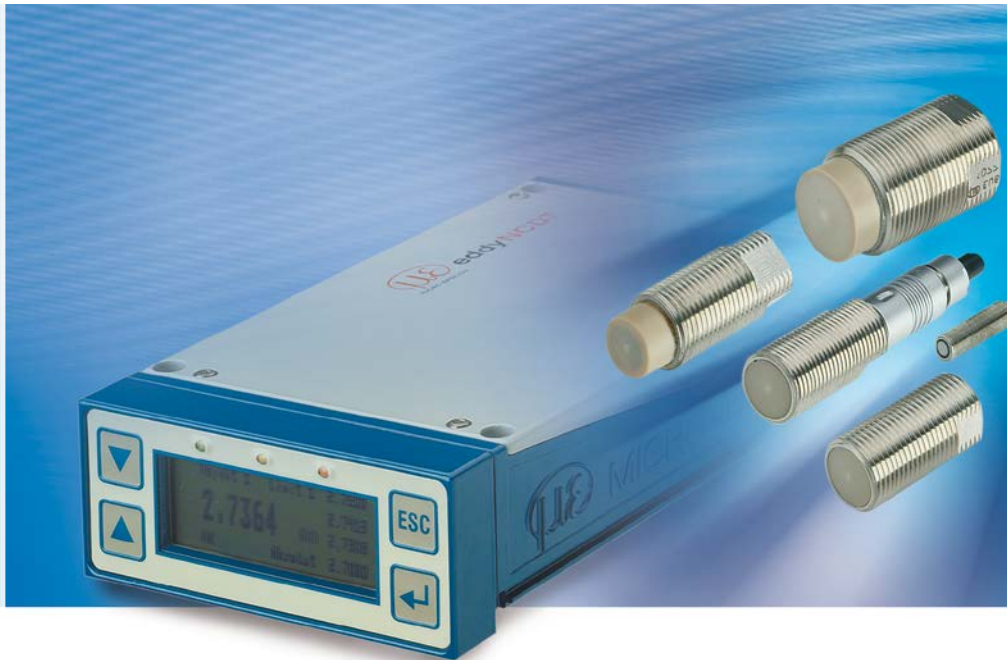# More Precision

eddyNCDT // Eddy current sensors for displacement and position

- *Micrometer accuracy*

- *Ideal for fast measurements:
  Bandwidth up to 100kHz (-3dB)*

- *Numerous sensor models even for
  customer-specific applications*

- *Robust sensor construction for
  harsh environments*

- *Synchronised multi-channel
  measurement*

The eddyNCDT 3300 eddy current measuring system is one of the most flexible and highest performing eddy current displacement measurement systems worldwide. Due to a mature technical design, the system offers numerous benefits to customers in multiple application areas such as manufacturing automation, machine monitoring and quality control.

Multifunctional controller
The eddyNCDT 3300 system includes high-performance processors for reliable signal conditioning and further processing. The innovative three-point linearisation technique it uses enables almost completely automatic linearisation which makes possible the optimum accuracies for every metallic measuring object and every installation environment. Operation is supported by an illuminated LC graphical display and on-screen prompts.

Linearisation and calibration
Systems in the eddyNCDT 3300 series can be individually linearised and calibrated by the user. Therefore, optimum measurement accuracies will always be achieved, even in the case of failed measuring object materials or harsh ambient conditions. The adjustment is made using three distance points (①,②,③) which are defined by a reference standard.
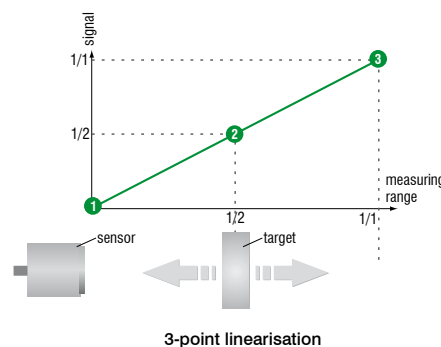
Maximum precision due to field calibration
In order to achieve maximum precision, eddyNCDT 3300 provides the field calibration function for achieving extremely precise measurement results. The following influences are taken into account:
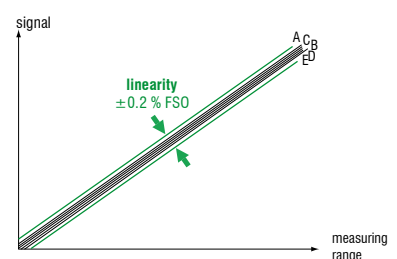**A: Different target materials**
B: Different target sizes (measuring spot)
C: Target shape
D: Side preattenuation
E: Target tilt angle
The measuring range can also be extended using the field calibration.

3-point linearisation
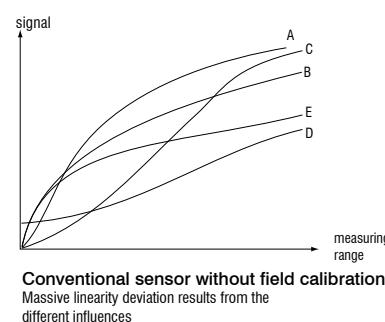
**Synchronisation for
multi-channel applications**
The MCT304 multi-channel platform is available for thickness and displacement measurements with up to four channels. Up to four controllers can be integrated in a single MCT platform. The platforms can be synchronised with each other, whereby the simultaneous operation of any number of eddyNCDT sensors is possible. In order to compensate for opposing sensor influences, there are synchronisation inputs and outputs.

Conventional sensor without field calibration
Massive linearity deviation results from the different influences

linearity
±0.2 % FSO

Best practice:
eddyNCDT 3300 with Micro-Epsilon field calibration
High accuracy though compensation of the influences

Controller		DT3300	DT3301
Linearity		≤±0.2 % FSO	
Resolution [2]	up to 25Hz	≤0.005 % FSO (≤0.01 % FSO using ES04, ES05 and EU05)	
	up to 2.5kHz	≤0.01 % FSO	
	up to 25 / 100kHz	≤0.2 % FSO	
Bandwidth		selectable 25kHz / 2.5kHz / 25Hz (-3 dB); 100kHz for measuring ranges ≤1mm	
Temperature compensation		10 ... 100°C (option TCS: -40 ... 180°C) [3]	
Temperature range	controller	5 ... 50°C	
Outputs		selectable 0 ... 5V / 0 ... 10V / ±2.5V / ±5V / ±10V (or inverted) / 4 ... 20mA (load 350 ohm)	
Power supply		±12VDC / 100mA, 5.2VDC / 220mA [1]	11 - 32VDC / 700mA
Synchronisation		via cable PSC 30 (accessories)	via cable E SC 30 (accessories)
Electromagnetic compatibility		acc. to EN 50081-2 / EN 61000-6-2	
Controller functions		limit switches, auto-zero, peak-to-peak, minimum, maximum, average, storage of 3 configurations (calibrations)	

FSO = Full Scale Output
Reference material: Aluminum (non-ferromagnetic) and Mild Steel DIN 1.0037 (ferromagnetic)
Reference temperature for reported data is 20°C (70°F); Resolution and temperature stability refer to midrange
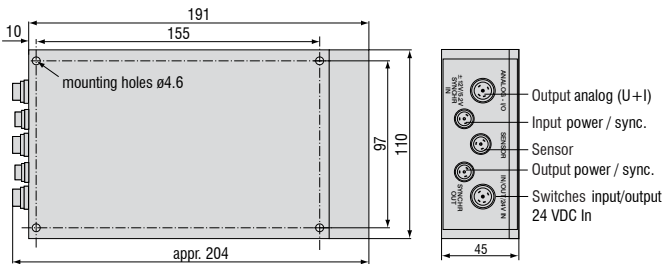Data may differ with magnetic inhomogeneous material.
[1] additional 24VDC for external reset and limit switch
[2] resolution data are based on noise peak-to-peak values
[3] temperature stability may differ with option TCS

Controller dimensions

Quadruple limit switch
- Two freely definable minimum and maximum limit values
- Individual switching threshold
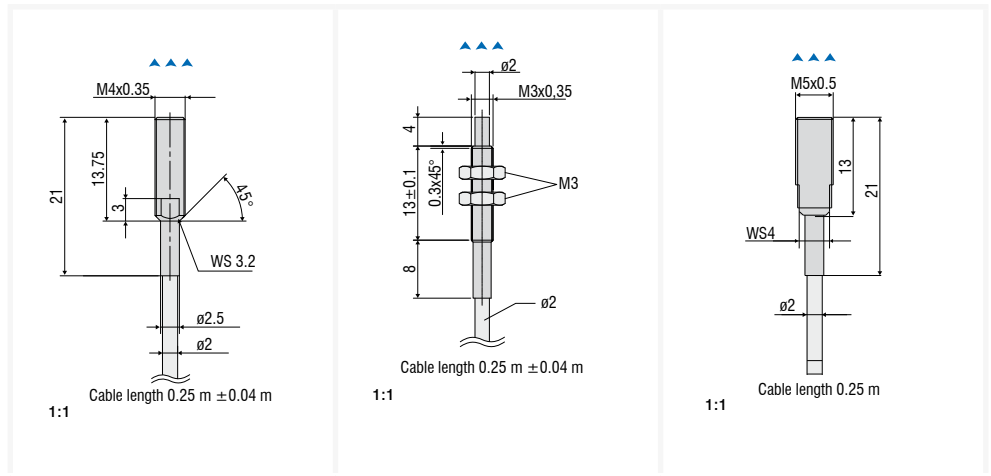- LED display for upper and lower limit warnings

Automatic calibration
- Three-point linearisation for optimum onsite calibration

Four configurations can be stored
- Factory calibration and three individual configurations can be stored
- Simple microprocessor-controlled singlecycle calibration

Types of output
- Voltage / current
- Metric / inch and graphical display
- Display of auto-zero, peak-to-peak value, minimum, maximum
- Scalable display for conversion to indirect measured values

Measurement direction

Connector side

ES04 diagram: M4x0.35, 21, 13.75, 3, 45°, WS 3.2, ø2.5, ø2, Cable length 0.25 m ±0.04 m, 1:1

EU05 diagram: ø2, M3x0,35, 4, 13±0.1, 0.3x45°, M3, 8, ø2, Cable length 0.25 m ±0.04 m, 1:1

ES08 diagram: M5x0.5, 13, 21, WS4, ø2, Cable length 0.25 m, 1:1

| Sensor type	ES04	EU05	ES08
Design	shielded	unshielded	shielded
Measuring range	0.4mm	0.4mm	0.8mm
Offset distance	0.04mm	0.05mm	0.08mm
Linearity	≤ ±0.8µm	≤ ±1µm	≤ ±1.6µm
Resolution	0.02µm	0.025µm	0.04µm
Temperature stability (MMR)	≤ ±0.06µm/°C	≤ ±0.075µm/°C	≤ ±0.12µm/°C
Temperature max.	150°C	150°C	150°C
Pressure resistance sensor front	100bar	-	20bar
Integrated cable/ length	approx. 0.25m	approx. 0.25m	approx. 0.25m
Temperature sensor cable	180°C	180°C	180°C
Housing material	stainless steel	stainless steel and ceramic	stainless steel and plastic

MMR = midrange

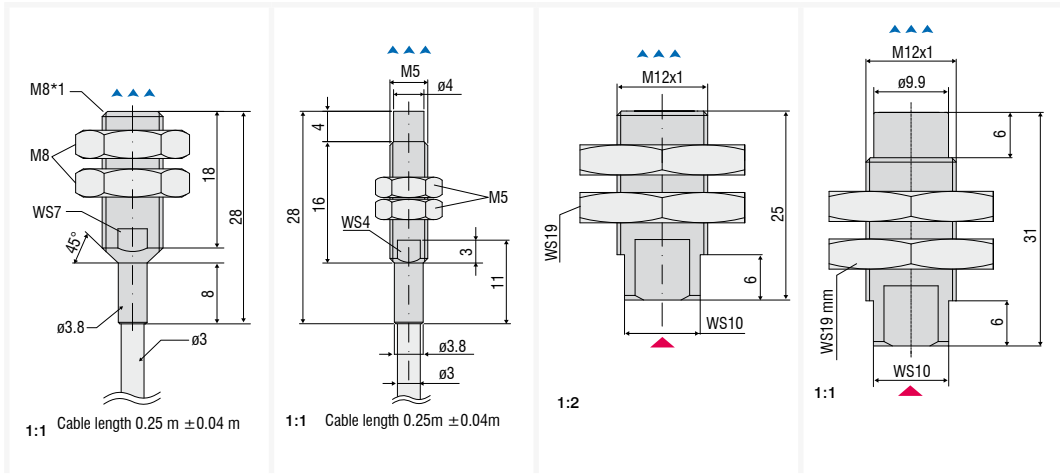**ECx sensor cable,** length is selectable up to x≤15m
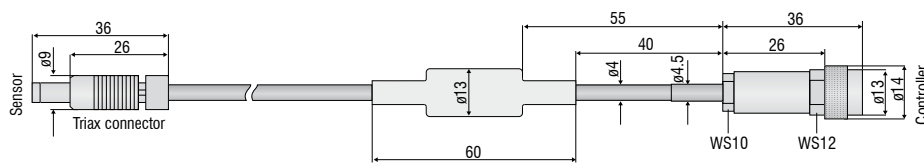
ECx/1 extension cable for solder connection, length is selectable up to x≤15 m
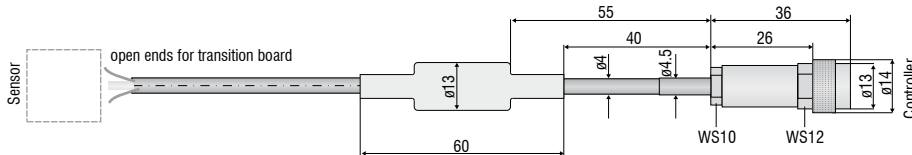
ECx/2 extension cable for plug connection, length is selectable up to x≤15 m
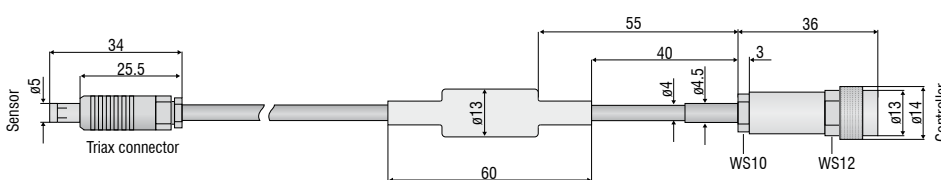
Measurement direction

Connector side

| Sensor type	ES1	EU1	ES2	EU3
Design	shielded	unshielded	shielded	unshielded
Measuring range	1mm	1mm	2mm	3mm
Offset distance	0.1mm	0.1mm	0.2mm	0.3mm
Linearity	$\leq \pm 2\mu m$	$\leq \pm 2\mu m$	$\leq \pm 4\mu m$	$\leq \pm 6\mu m$
Resolution	$0.05\mu m$	$0.05\mu m$	$0.1\mu m$	$0.15\mu m$
Temperature stability (MMR)	$\leq \pm 0.15\mu m/°C$	$\leq \pm 0.15\mu m/°C$	$\leq \pm 0.3\mu m/°C$	$\leq \pm 0.45\mu m/°C$
Temperature max.	150°C	150°C	150°C	150°C
Pressure resistance sensor front	-	-	20 bar	20 bar
Integrated cable/ length	approx. 0.25m	approx. 0.25m	-	-
Temperature sensor cable	180 °C	180 °C	-	-
Housing material	stainless steel and plastic	stainless steel and plastic	stainless steel and plastic	stainless steel and plastic

MMR = midrange

Cable

Cable design	coaxial with sheath wire
Sheath material	FEP/Flour-Thermoplast
Temperature resistance	-30°C to +200°C
Outer diameter	3.9mm ±0.1mm
Bending radius	one-time bending during installation: 2 x cable diameter
	minimum bending radius for movement: 5 x cable diameter
	optimum bending radius at continuous movement: 10 x cable diameter
Suitable for use with robots	no

| Plug	Controller side	Sensor side		
Model		ECx	ECx/1	ECx/2
Type	5-pole female connector, cable socket	male connector, triaxial	male connector 5-pol	male connector, triaxial
Locking method	screw	push-pull	screw	push-pull
Protection class	IP67	IP67 (when connected)	IP67 (when connected)	IP68
Temperature resistance	-30 to +85°C	-30 to +150°C	-40 to +85°C	-65 to +135°C
Material housing	Brass nickel-plated	Brass nickel-plated, mat	Brass nickel-plated	Brass nickel-plated, mat
Mechanical service life	> 500 mating cycles	> 500 mating cycles	> 500 mating cycles	> 500 mating cycles

Measurement direction

Connector side

1:1

1:2

1:2
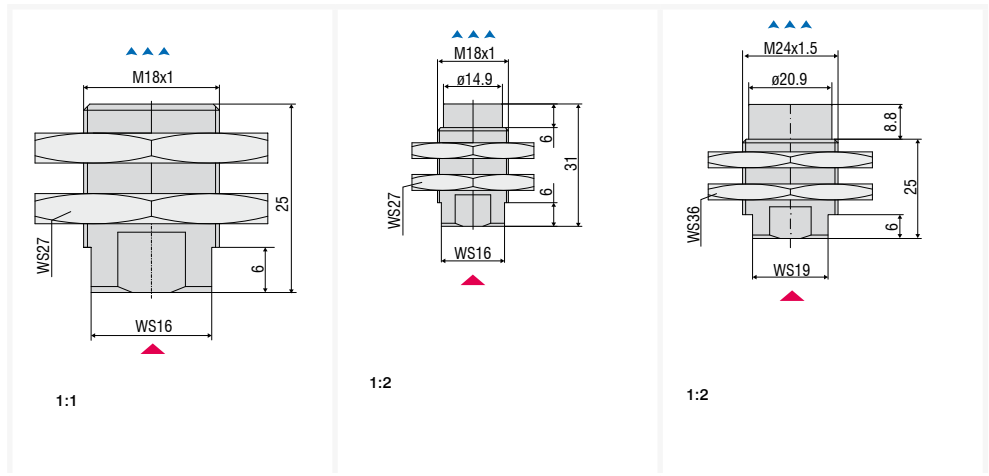
| Sensor type	ES4	EU6	EU8
Design	shielded	unshielded	unshielded
Measuring range	4mm	6mm	8mm
Offset distance	0.4mm	0.6mm	0.8mm
Linearity	≤±8µm	≤±12µm	≤±16µm
Resolution	0.2µm	0.3µm	0.4µm
Temperature stability (MMR)	≤±0.6µm/°C	≤±0.9µm/°C	≤±1.2µm/°C
Temperature max.	150°C	150°C	150°C
Pressure resistance sensor front	20bar	20bar	20bar
Integrated cable/ length	-	-	-
Temperature sensor cable	-	-	-
Housing material	stainless steel and plastic	stainless steel and plastic	stainless steel and plastic

MMR = midrange

ECEx sensor cable extension, length is selectable up to x≤15 m
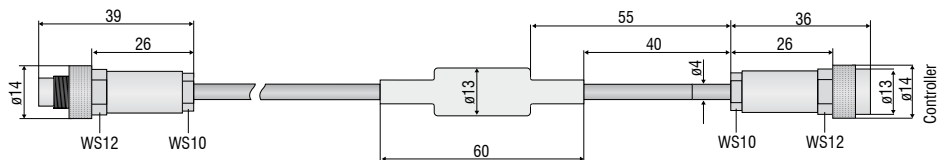
ECx/90 sensor cable with 90°connector (sensor-sided), length is selectable up to x≤15 m

▲ ▲ ▲
Measurement direction

▲
Connector side

1:3

1:2

1:3

1:8
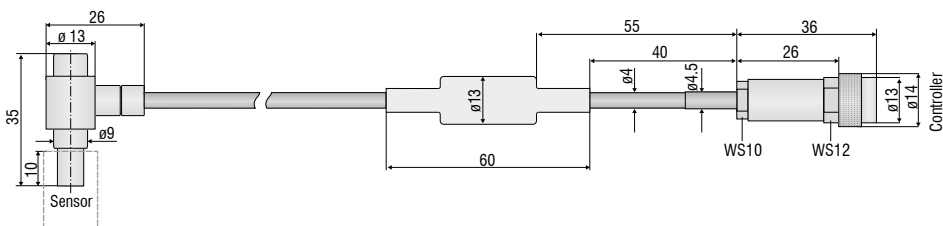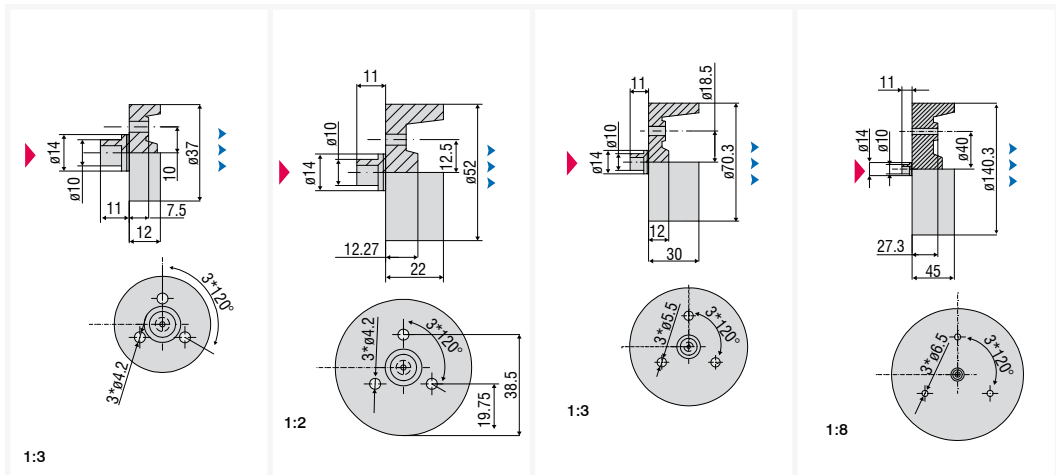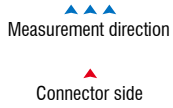
Sensor type	EU15	EU22	EU40	EU80
Design	unshielded	unshielded	unshielded	unshielded
Measuring range	15mm	22mm	40mm	80mm
Offset distance	1.5mm	2.2mm	4mm	8mm
Linearity	≤±30µm	≤±44µm	≤±80µm	≤±160µm
Resolution	0.75µm	1.1µm	2µm	4µm
Temperature stability (MMR)	≤±2.25µm/°C	≤±3.3µm/°C	≤±6µm/°C	≤±12µm/°C
Temperature max.	150°C	150°C	150°C	150°C
Pressure resistance sensor front	-	-	-	-
Integrated cable/ length	-	-	-	-
Temperature sensor cable	-	-	-	-
Housing material	epoxy	epoxy	epoxy	epoxy

MMR = midrange

Cable
Cable design	coaxial with sheath wire
Sheath material	FEP/Flour-Thermoplast
Temperature resistance	-30°C to +200°C
Outer diameter	3.9mm ± 0.1mm
Bending radius	one-time bending during installation: 2 x cable diameter
	minimum bending radius for movement: 5 x cable diameter
	optimum bending radius at continuous movement: 10 x cable diameter
Suitable for use with robots	no

Plug	**Controller side**	**Sensor side**	
Model		**ECEx**	**ECx/90**
Type	5-pole female connector, cable socket	5-pole male connector	male connector, triaxial, angle
Locking method	screw	screw	push-pull
Protection class	IP67	IP67 (when connected)	IP67 (when connected)
Temperature resistance	-30 to +85°C	-30 to +85°C	-65 to +135°C
Material housing	Brass nickel-plated	Brass nickel-plated	Brass nickel-plated, mat
Mechanical service life	> 500 mating cycles	> 500 mating cycles	> 500 mating cycles

**Subminiature sensors for confined installation space**

In addition to standard sensors in conventional designs, miniature sensors can also be supplied which achieve high precision measurement results with the smallest possible dimensions. Pressure-resistant versions, screened housings, ceramic types and other special features characterise these sensors, which achieve highly accurate measurement results despite the small dimensions. The miniature sensors are employed in high pressure applications, e.g. in combustion engines.
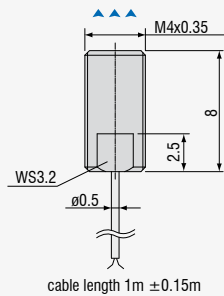
ES04/180(25) Shielded Sensor

Measuring range 0.4mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 1m (ø 0.5mm), short silicon tube at cable exit

Pressure resistance (static): front 100bar

Max. operating temperature: 180°C

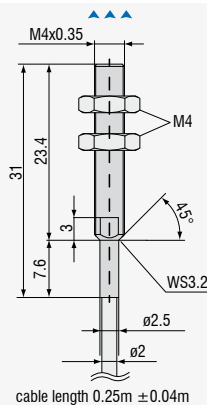Housing material: stainless steel

Sensor cable: ECx/1 or ECx/2, length ≤6m

2:1
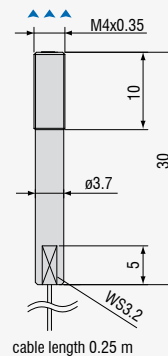
ES04/180(27) Shielded Sensor

Measuring range 0.4mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 0.5mm) with solder connection board

Pressure resistance (static): front 100bar

Max. operating temperature: 180°C

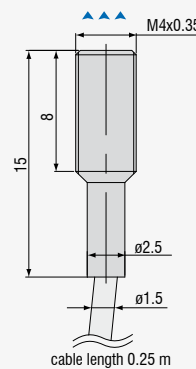Housing material: stainless steel

Sensor cable: ECx/1, length ≤6m

1:1

ES04(34) Shielded Sensor

Measuring range 0.4mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 2mm) with sealed triaxial connector

Pressure resistance (static): front 100bar / rear side splash water

Max. operating temperature: 150°C

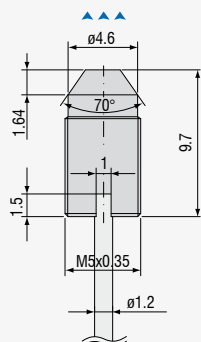Housing material: stainless steel and ceramic

Sensor cable: ECx, length ≤6m

1:1

ES04(35) Shielded Sensor

Measuring range 0.4mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 1.5mm) with sealed triaxial connector

Pressure resistance (static): front 100bar / rear side 5 bar

Max. operating temperature: 150°C

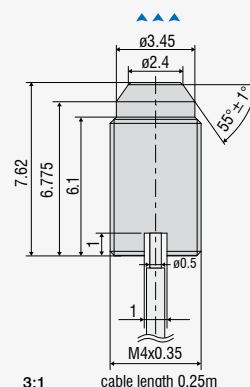Housing material: stainless steel and ceramic

Sensor cable: ECx/1, length ≤6m

2:1

ES04(44) Shielded Sensor

Measuring range 0.4mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.2m (ø 1.2mm) with sealed triaxial connector

Pressure resistance (static): front 100bar / rear side splash water

Max. operating temperature: 150°C

Housing material: stainless steel and ceramic

Sensor cable: ECx, length ≤6m

2:1

ES04(70) Shielded Sensor

Measuring range 0.4mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 0.5mm) with solder connection board

Pressure resistance (static): front 100bar / rear side splash water

Max. operating temperature: 150°C

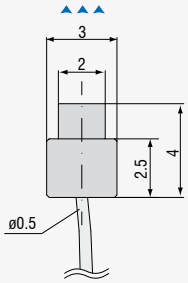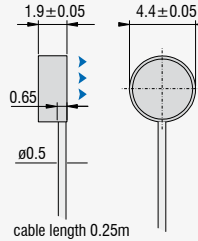Housing material: stainless steel and ceramic

Sensor cable: ECx/1, length ≤6m

3:1

EU05(10) Unshielded Sensor

Measuring range 0.5mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 0.5mm) with solder connection board

Max. operating temperature: 150°C

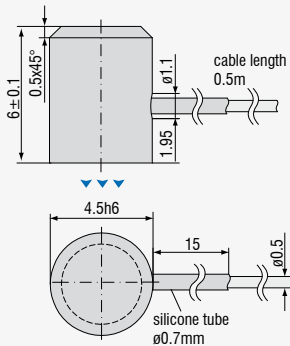Housing material: stainless steel and ceramic

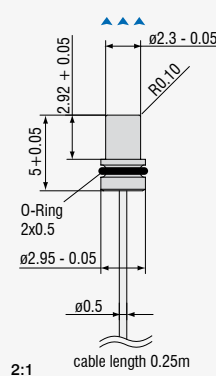Sensor cable: ECx/1, length ≤6m

cable length 0.25m ±0.04m

3:1

ES05/180(16) Shielded Sensor

Measuring range 0.5mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 0.5mm) with solder connection board

Max. operating temperature: 180°C

Housing material: stainless steel and epoxy
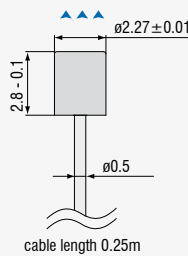
Sensor cable: ECx/1, length ≤6m

cable length 0.25m

3:1

ES05(36) Shielded Sensor

Measuring range 0.5mm

Connection: integrated coaxial cable 0.5m (ø 0.5mm) with solder connection board

Max. operating temperature: 150°C

Housing material: stainless steel and epoxy

Sensor cable: ECx/1, length ≤6m
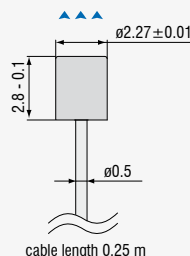
cable length 0.5m

silicone tube ø0.7mm

3:1

EU05(65) Unshielded Sensor

Measuring range 0.5mm

Connection: integrated coaxial cable 0.25m (ø 0.5mm) with solder connection board

Pressure resistance (static): front 700bar / rear side splash water

Max. operating temperature: 150°C

Housing material: ceramic

Sensor cable: ECx/1, length ≤6m

O-Ring 2x0.5

cable length 0.25m

2:1

EU05(66) Unshielded Sensor

Measuring range 0.5mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 0.5mm) with solder connection board

Pressure resistance (static): front 400bar / rear side splash water

Max. operating temperature: 150°C

Housing material: ceramic

Sensor cable: ECx/1, length ≤6m

cable length 0.25m

3:1

EU05(72) Unshielded Sensor

Measuring range 0.4mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 0.5mm) with solder connection board

Pressure resistance (static): front 2000bar / rear side splash water

Max. operating temperature: 150°C

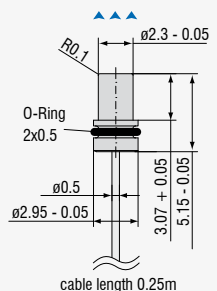Housing material: ceramic

Sensor cable: ECx/1, length ≤6m

cable length 0.25 m

3:1

EU05(93) Unshielded Sensor

Measuring range 0.4mm

Temperature stability ≤±0.025%FSO/°C

Connection: integrated coaxial cable 0.25m (ø 0.5mm) with solder connection board

Pressure resistance (static): front 2000bar / rear side splash water

Max. operating temperature: 150°C

Housing material: ceramic

Sensor cable: ECx/1, length ≤6m

O-Ring 2x0.5

cable length 0.25m

2:1

Articel	Description	eddyNCDT 3001	eddyNCDT 3005	eddyNCDT 3010	eddyNCDT 3100	eddyNCDT 3300
PC3/8	Power- and output cable, 3m, 8 pin			•		
PC5/5	Power- and signal cable	•	•			
SC30	Synchronisation cable, 30cm			•		
CSP 301	Digital signal processing and display unit up to 2 channels			•		
PC3100-3/6/BNC	Outputcable and supply unit, 3m				•	
PS2020	Power Supply 24V / 2.5A; Input 100-240 VAC; Output 24 VDC / 2.5A; DIN rail mounting; 35mm x 7.5mm, DIN 50022				•	•
MC2.5	Micrometer calibration fixture, range 0 to 2.5 mm, division 1 μm, for sensors EPU05 to EPS2, adjustable offset (zero)			•	•	•
MC25D	Micrometer calibration fixture, range 0 to 25mm, division 1 μm, for sensors EPU05 to EPU15, adjustable offset (zero)			•	•	•
ECx	Sensor cable, length selectable up to 15m					•
ECx/90	Sensor cable with 90° connector (sensor-sided) length selectable up to 15m					•
ECx/1	Extension cable for solder connection					•
ECx/2	Extension cable for plug connection					•
SCA3/5	Signal cable analogue, 3m					•
SCA3/5/BNC	Signal cable analogue with BNC connector, 3m					•
SCD3/8	Signal cable digital (switch input/outout), 3m (also for supply 11 - 32VDC); for DT3301					•
SIC3(07)	Signal cable with BNC connector for direct operation with oscilloscope					•
PSC30	Power / Synchronisation cable, 0.3m, for DT3300					•
ESC30	Synchronisation cable, 0.3m, for DT3301					•
PS300/12/5	Power supply Input 100 - 240VAC; Output ±12VDC / 5.2VDC integrated cable 1.5m; for max. 4x DT3300					•
MBC300	Mounting base for controller DT330x, fixing through M4 threaded holes 166x108x60mm					•
MCT304-SM	Tower for max. 4 controller DT 3300; supply 100 - 240VAC					•
MCT304(01)	Tower for max. 4 controller DT 3301; supply 11 - 32VDC					•

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, fibre optic sensors and fibre optics

Colour recognition sensors, LED analyzers and colour online spectrometer

Measurement and inspection systems

MICRO-EPSILON