MICRO-EPSILON

More Precision

eddyNCDT // Inductive sensors based on eddy currents

Powerful eddy current measuring system for miniature sensors
eddyNCDT 3070

- Wide range of applications with multiple sensor models
- Extremely high temperature stability
- High resolution and linearity
- Frequency response 20 kHz (-3dB)
- Measuring rate 200 kSa/s
- Versions for ferromagnetic and non-ferromagnetic targets
- Analog output (U/I) digital output
- Intuitive configuration via web interface

High performance for the industry

The eddyNCDT 3070 is a powerful, inductive sensor system based on eddy currents for measuring ranges smaller than 1 mm. The system comprises a compact controller, a sensor and an integrated cable and is factory-calibrated either for ferromagnetic or non-ferromagnetic materials.

Integration into plant and machinery

As sensor and controller are temperature-compensated, a high measurement accuracy can be achieved even in fluctuating temperatures. The sensors are designed for ambient temperatures up to a maximum of +200 °C and an ambient pressure up to 700 bar. The compact controller design as well as the sensor robustness make the measuring system ideal for integration into plant and machinery.

New benchmark in controller technology

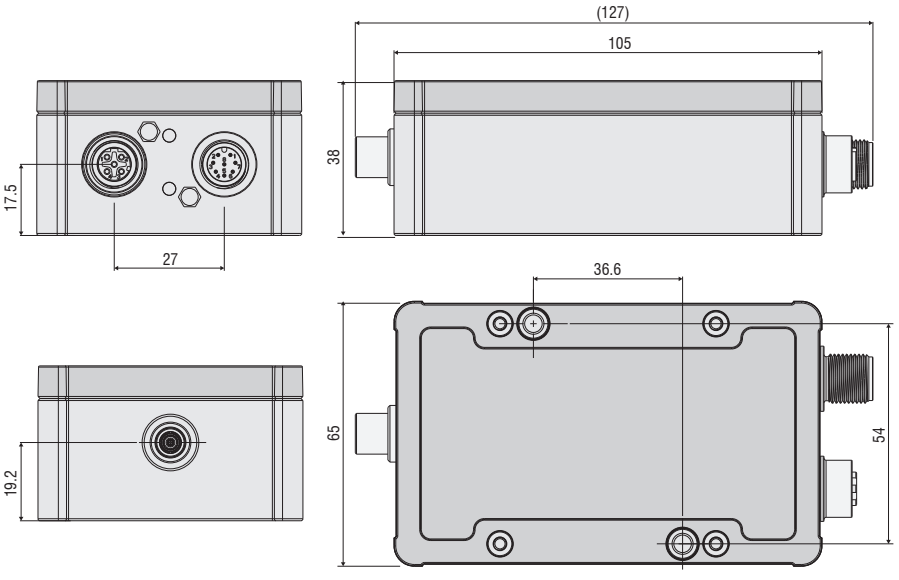
The industrial-grade M12 Ethernet interface offers a modern fieldbus connection. Configurable analog outputs enable to output the measured values as voltage or current. For multi-system operation, the systems offer a new kind of frequency separation (LF/HF) which enables to operate several sensors next to one another without requiring any synchronization.

Features	Controller type	
	DT3070	DT3071
Active temperature compensation for sensor and controller	✔	✔
Frequency separation (LF & HF)	✔	✔
Ethernet interface	✔	✔
Intuitive web interface	✔	✔
Multipoint calibration regardless of the distance (up to 3-point calibration)	✔	✔
Scalable measuring range via analog output (teach function)	✔	✔
Scalable analog output	✔	✔
Switching and temperature outputs	-	✔
5-point calibration	-	✔
Storage of multiple characteristic curves	-	✔

When connecting a PC via the Ethernet interface, a modern web interface can be accessed without any further installation and enables the parameterization of sensor and controller. The DT3071 controller provides enhanced features such as 5-point calibration, setting of switching and temperature outputs, as well as storage of multiple characteristic curves.

Model		DT3070	DT3071
Resolution [1]	Static (20 Hz)	0.005 % FSO	
	Dynamic (20 kHz)	0.025 % FSO	
Frequency response (-3dB)		selectable (20 kHz, 5 kHz, 20 Hz)	
Measuring rate	Analog output	200 kSa/s (16 bit)	
	Digital interface	50 kSa/s (16 bit)	
Linearity [2]		< ±0.2 % FSO	< ±0.1 % FSO
Temperature stability [3]		< 0.05 % FSO / K	
Temperature compensation		+10 ... +50 °C	
Target material [4]		Steel, aluminum	
No. of characteristic curves		1	max. 4
Supply voltage		12 … 32 VDC	
Power consumption		typ. 2.5 W (max. 2.8 W)	
Digital interface		Ethernet	Ethernet / selectable: switching output (TTL), temperature output (0...5 V)
Analog output		0 … 10 V; 4 … 20 mA (short circuit proof)	
Connection		Sensor: plug connector triaxial socket; supply/signal: 8-pole M12 connector; Ethernet: 5-pole M12 connector (cable see accessories)	
Mounting		Through bores	
Temperature range	Storage	-10 … +70 °C	
	Operation	0 … +50 °C	
Shock (DIN EN 60068-2-27)		15 g / 6 ms in 3 axes, 2 directions and 1000 shocks each	
Vibration (DIN EN 60068-2-6)		5 g / 10 … 500 Hz in 3 axes, 2 directions and 10 cycles each	
Protection class (DIN EN 60529)		IP67 (plugged)	
Material		Aluminum die-cast	
Weight		approx. 230 g	

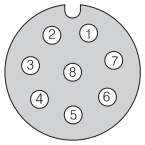
FSO = Full Scale Output
[1] RMS noise relates to mid of measuring range
[2] Value with 3-/5-point linearization
[3] Values are referenced to the mid of the measuring range within the compensated temperature range
[4] Steel: St37 steel DIN1.0037, aluminum: AlMg3



Pin assignment IN/OUT/24V IN

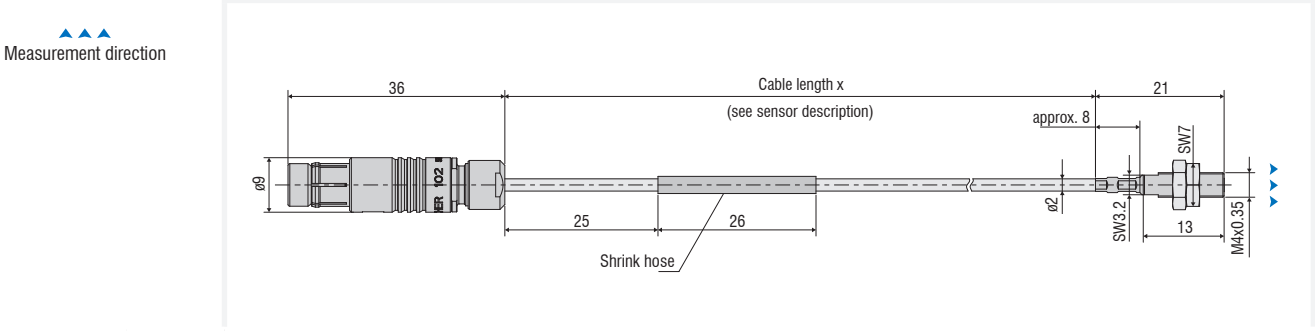
Pin	Assignment	Color (cable: PCx/8-M12)
1	Analog output $U_{Displacement}$	White
2	Supply +24 V	Brown
3	Limit value 1 / U_{Temp} sensor	Green
4	Limit value 2 / U_{Temp} controller	Yellow
5	GND Temperature, limit value	Gray
6	GND analog output	Pink
7	GND supply	Blue
8	Analog output $I_{Displacement}$	Red

8-pole M12x1 housing connector
View on pin side



All dimensions in mm, not to scale

Standard sensors
eddyNCDT 3070

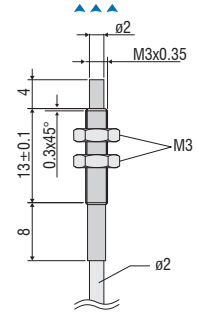


Model		ES-S04-C-CAx
Measuring range		0.4 mm
Start of measuring range		0.04 mm
Resolution [1] [2] [3]		0.02 µm
Linearity [1] [4]		< ±1 µm
Temperature stability [1] [2]		< 0.14 µm / K
Temperature compensation		+10 … +180 °C
Sensor type		shielded
Min. target size (flat)		Ø 5 mm
Connection		integrated cable, axial, length 0.25 m, 0.5 m or 0.75 m [5] bending radius: static ≥ 10 mm, dynamic ≥ 20 mm
Mounting		Screw connection (M4)
Temperature range	Storage	-20 ... +180°C
	Operation	-20 ... +180°C
Pressure resistance		100 bar (front)
Shock (DIN EN 60068-2-27)		30 g
Vibration (DIN EN 60068-2-6)		15 g
Protection class (DIN EN 60529)		IP50
Material		Stainless steel and ceramic
Weight		approx. 25 g

[1] Valid for operation with DT307x referenced to the nominal measuring range
[2] Relates to the mid of the measuring range within the compensated temperature range
[3] RMS value of the signal noise, static (20 Hz)
[4] Only with DT307x controller and 3-/5-point linearization
[5] Length tolerance cable: ±0.03 m

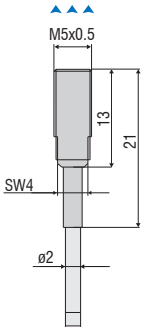
Special sensors
eddyNCDT 3070

Measurement direction



Cable length 0.25 m ±0.04 m

1:1



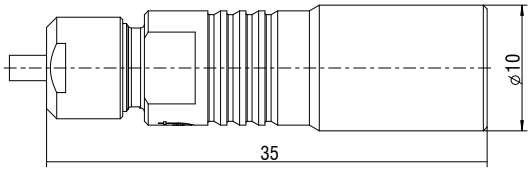
Cable length 0.25 m

1:1

Model	EU05	ES08
Measuring range	0.5 mm	0.8 mm
Start of measuring range	0.05 mm	0.08 mm
Resolution [1] [2] [3]	0.025 µm	0.04 µm
Linearity [1] [4]	< ±0.5 µm	< ±0.8 µm
Temperature stability [1] [2] [4]	< 0.175 µm / K	< 0.28 µm / K
Temperature compensation [4]	0 … +150 °C	0 … +150 °C
Sensor type	unshielded	shielded
Min. target size (flat)	Ø 9 mm	Ø 7.5 mm
Connection	integrated cable, axial, length approx. 0.25 m [5]	integrated cable, axial, length approx. 0.25 m [5]
Mounting	Screw connection (M3)	Screw connection (M5)
Temperature range Storage	-20 ... +150 °C	-20 ... +150 °C
Temperature range Operation	0 ... +150 °C	0 ... +150 °C
Pressure resistance	-	20 bar (front)
Protection class (DIN EN 60529)	IP64 (plugged)	IP64 (plugged)
Material	Stainless steel and ceramic	Stainless steel and plastic

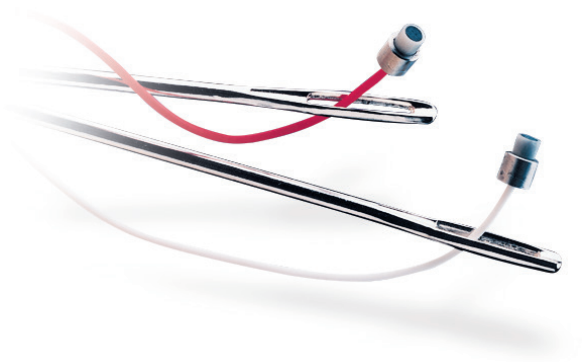
Operation with DT307x requires special calibration (LC)
[1] Valid for operation with DT307x referenced to the nominal measuring range
[2] Relates to the mid of the measuring range within the compensated temperature range
[3] RMS value of the signal noise, static (20 Hz)
[4] Only with DT307x controller and 3-point or 5-point linearization
[5] Length tolerance cable: ±10 %

Dimensions cable sockets ES05 and ES08



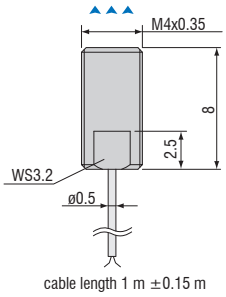
All dimensions in mm, not to scale

Special sensors
eddyNCDT 3070



Subminiature sensors for restricted spaces

As well as standard sensors in conventional designs, miniature sensors with the smallest possible dimensions that achieve high precision measurement results are also available. Pressure-resistant versions, screened housings, ceramic types and other special features characterize these sensors, which achieve highly accurate measurement results despite their small dimensions. These miniature sensors are primarily used in high pressure applications, for example, in combustion engines.



2:1

ES04/180(25) Shielded sensor

Measuring range 0.4 mm

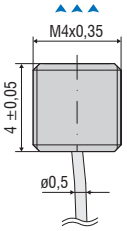
Temperature stability: ≤ ±0.035% FSO/°C

Connection: integrated coaxial cable, 1 m (ø 0.5 mm), short silicone tube at the cable outlet

Pressure resistance (static): front side 100 bar

Max. operating temperature: 180 °C

Housing material: stainless steel



3:1

ES04/180(102) Shielded miniature sensor

Measuring range 0.4 mm

Temperature stability: ≤ ±0.035% FSO/°C

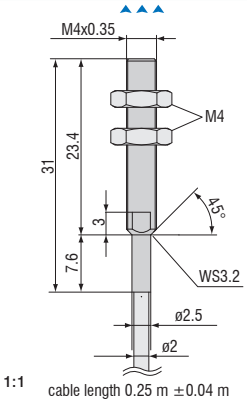
Connection: integrated coaxial cable 0.8 m (ø 0.5 mm) with adapter PCB

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

Max. operating temperature: 150 °C

Housing material: stainless steel and ceramic

Connection cable: ECx/1, length ≤6 m



1:1

ES04(34) Shielded sensor

Measuring range 0.4 mm

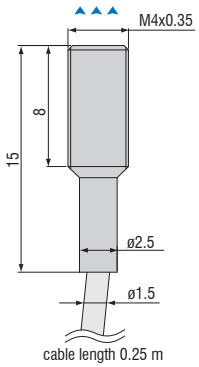
Temperature stability: ≤ ±0.035% FSO/°C

Connection: integrated coaxial cable 0.25 m (ø 2 mm) with protected triaxial socket

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

Max. operating temperature: 150 °C

Housing material: stainless steel and ceramic



2:1

ES04(35) Shielded sensor

Measuring range 0.4 mm

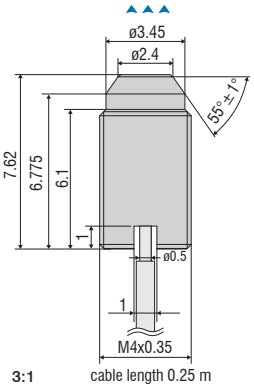
Temperature stability: ≤ ±0.035% FSO/°C

Connection: integrated coaxial cable 0.25 m (ø 1.5 mm) with protected triaxial socket

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

Max. operating temperature: 150 °C

Housing material: stainless and ceramic



3:1

ES04(70) Shielded sensor

Measuring range 0.4 mm

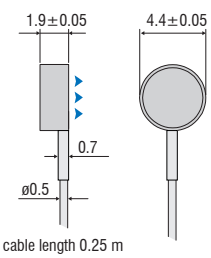
Temperature stability: ≤ ±0.035% FSO/°C

Connection: integrated coaxial cable 0.25 m (ø 0.5 mm) with adapter PCB

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

Max. operating temperature: 150 °C

Housing material: stainless and ceramic



3:1

ES05/180(16) Shielded sensor

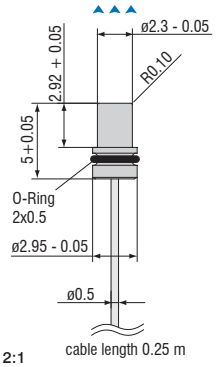
Measuring range 0.5 mm

Temperature stability: ≤ ±0.035% FSO/°C

Connection: integrated coaxial cable 0.25 m (ø 0.5 mm) with adapter PCB

Max. operating temperature: 180 °C

Housing material: stainless steel and epoxy



2:1

EU05(65) Unshielded sensor

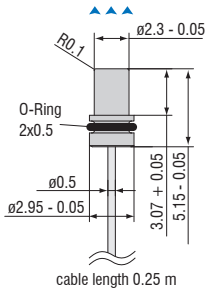
Measuring range 0.5 mm

Connection: integrated coaxial cable
0.25 m (ø 0.5 mm) with adapter PCB

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

Max. operating temperature: 150 °C

Housing material: ceramic



2:1

EU05(93) Unshielded sensor

Measuring range 0.4 mm

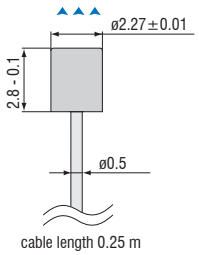
Temperature stability: ≤ ±0.035% FSO/°C

Connection: integrated coaxial cable
0.25 m (ø 0.5 mm) with adapter PCB

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

Max. operating temperature: 150 °C

Housing material: ceramic



3:1

EU05(66) Unshielded sensor

Measuring range 0.5 mm

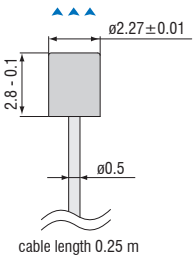
Temperature stability: ≤ ±0.035% FSO/°C

Connection: integrated coaxial cable
0.25 m (ø 0.5 mm) with adapter PCB

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

Max. operating temperature: 150 °C

Housing material: ceramic



3:1

EU05(72) Unshielded sensor

Measuring range 0.4 mm

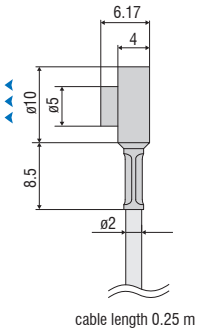
Temperature stability: ≤ ±0.035% FSO/°C

Connection: integrated coaxial cable
0.25 m (ø 0.5 mm) with adapter PCB

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

Max. operating temperature: 150 °C

Housing material: ceramic



1:1

EU1FL Unshielded flat sensor

Measuring range 1 mm

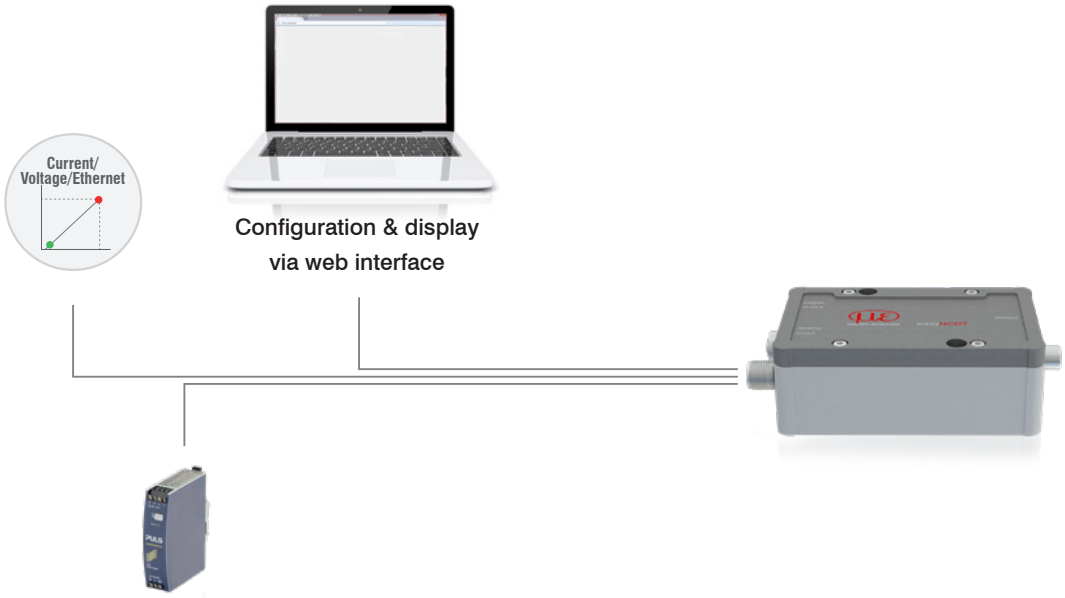
Temperature stability: ≤ ±0.025% FSO/°C

Connection: integrated coaxial cable
0.25 m (ø 2 mm) with protected triaxial socket

Max. operating temperature: 150 °C

Housing material:
stainless steel and epoxy molding

Connection possibilities
eddyNCDT 3070



PS2020
24V power supply

Plug/Socket

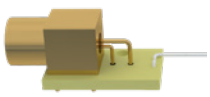
1 Plug Triax 0323118:
Type S 102 A014-120 D4,1
Triaxial plug: type bB0
Connection: push-pull
Temperature resistance: 200 °C

2 Socket Triax 0323141:
Type KE102 A014-120 D4,1
Triaxial socket: type fB0
Connection: push-pull
Temperature resistance: 200 °C

3 Plug Triax 0323727:
Type S 102 A014-120 D2,1
Triaxial plug: Type: mB0
Connection: push-pull
Temperature resistance: 200 °C

4 Plug Triax 0323174:
Type S101 A005-120 D4,1
Triaxial plug: type mA0
Connection: push-pull
Temperature resistance: 150 °C

5 Socket Triax 0323173
Triaxial socket: type fA0
Connection: push-pull
Temperature resistance: 150 °C



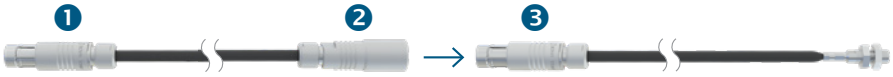
3 Socket Triax 0323121:
Type KE102 A014-120 D2,1
Triaxial socket: type fB0
Connection: push-pull
Temperature resistance: 130 °C

Sensors with socket: cable type EC-x/mB0/mB0

Miniature coaxial cable

Coaxial cable with Viton sheath
Cable diameter: 3.6 mm
Minimum bending radius: static approx. 27 mm / dynamic approx. 54 mm
Temperature resistance: up to 200 °C
Available lengths: 1 m / 3 m (6 m on request)

Sensors with integrated cable: ES-S04-C-CAx/mB0/D2,0
and extension cable: ECE-x/fB0/mB0/D3,6

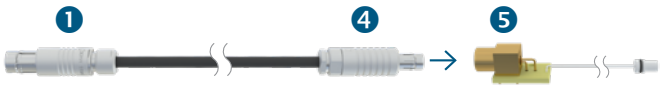


	Coaxial cable (extension cable)	Coaxial cable (sensor cable)
Cable diameter	3.6 mm	2 mm
Minimum bending radius	static approx. 27 mm / dynamic approx. 54 mm	static approx. 10 mm / dynamic approx. 20 mm
Temperature resistance	up to 200 °C	static up to 200 °C
Available lengths	1 m / 3 m (6 m on request)	0.25 m / 0.5 m / 0.75 m

Sensors with integrated cable and open ends
for solder connection via adapter cable: ECA-x/OE/mB0/D3,6

Coaxial cable with Viton sheath
Cable diameter: 3.6 mm
Minimum bending radius: static approx. 27 mm / dynamic approx. 54 mm
Temperature resistance: up to 200 °C
Available lengths: 1 m / 3 m (6 m on request)

Sensors with integrated cable and A0 plug via
adapter cable: ECA-x/mA0/mB0/D3,6



Coaxial cable with Viton sheath
Cable diameter: 3.6 mm
Minimum bending radius: static approx. 27 mm / dynamic approx. 54 mm
Temperature resistance: up to 200 °C
Available lengths: 1 m / 3 m (6 m on request)

Turbocharger speed measurement
turboSPEED DZ140

- Speed range from 200 to 400,000 rpm
- Miniature sensor ø3 mm
- Measurement of aluminum and titanium
- Large measurement distance up to 2.2 mm
- Highest interference immunity
- Sensor operating temperature up to 285 °C

Measuring principle

A coil integrated in the sensor housing is energized by a high-frequency alternating current. The emerging electromagnetic field changes when approaching a turbo charger blade. This is how every blade generates a pulse. The controller identifies the speed (analog 0–5 V) by considering the number of blades.

Robust miniature controller

As the controller is in a protected miniature housing and designed for ambient temperatures up to 115 °C, the controller is easy to integrate into the engine compartment. turboSPEED DZ140 offers excellent interference resistance for increased EMC requirements as well as in test cells and road tests.

Engine compartment application

The DZ140 eddy current measuring system is resistant to oil and dirt. This is a key advantage especially compared to optical speed measuring systems, as this immunity helps to achieve high precision measurements on a continuous basis.

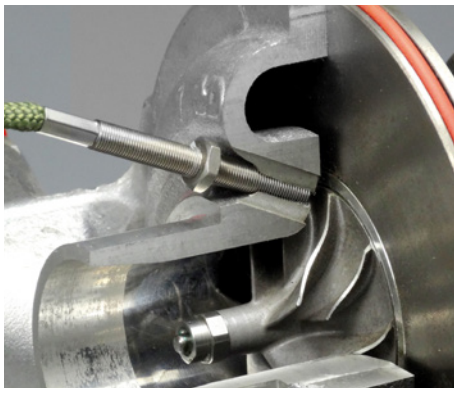
Easy handling

A tri-color ‘status’ LED on the controller indicates when the sensor has reached the ideal distance from the turbocharger blades. This simple feature enables greatly reduced installation time. As the sensor is connected with the controller via a special BNC connector, it is therefore downward compatible with all previous sensor models. An industrial push-pull connector ensures a reliable connection between the controller and the power supply as well as the analog outputs.

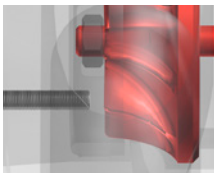
Measuring aluminum and titanium blades

The DZ140 measures both aluminum and titanium blades. The sensors can be mounted at a relatively large distance from the blade. The maximum distance of 2.2 mm enables reliable operation.

Extremely compact design



Large measuring distances both with aluminum and titanium



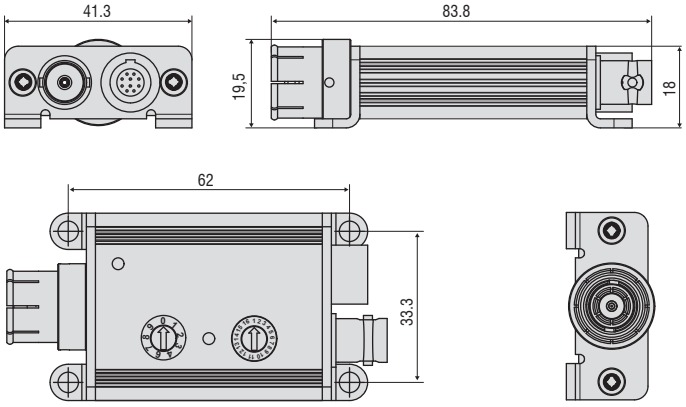
Axial installation

Radial installation

Model		DZ140
Resolution		10 bits
Speed range (measuring range)		200 ... 400,000 rpm
Linearity		< ±0.2 % FSO
Target material		aluminum or titanium
Supply voltage		9 ... 30 VDC (short-term up to 36 VDC)
Max. current consumption		50 mA
Digital output		TTL level (1 pulse / blade with variable pulse duration or 1 pulse / rotation with 100 µs pulse duration)
Analog output		0 … 5 V [1]
Connection		Sensor: triaxial connector; Supply/signal: 10-pole connector, raw signal: coaxial connector (cable see accessories)
Mounting		Screw connection with 4 through-holes
Temperature range	Storage	-40 ... +125 °C
	Operation	-40 ... +125 °C
Protection class (DIN EN 60529)		IP65 (plugged)
Weight		approx. 85 g
Number of blades		adjustable via rotary switch accessible from outside for 1 to 16 blades

FSO = Full Scale Output (speed range)
[1] Rotational speed adjustable via mode rotary switch

Controller DZ140

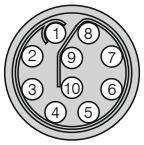


Dimensions in mm, not to scale.

Pin assignment for power supply and signal

Pin	Assignment	Color (cable: PC140-x)
1	Analog output for rotational speed 0 … +5 V	Blue
2	reserved, not connected	Yellow
3	TTL pulses, digital	Green
4	reserved, not connected	-
5	GND	Black
6	reserved, not connected	-
7	Power supply -	White
8	Supply voltage +9 … 30 VDC	Brown
9	Not assigned	-
10	Not assigned	-

10-pin cable connector
View on solder side



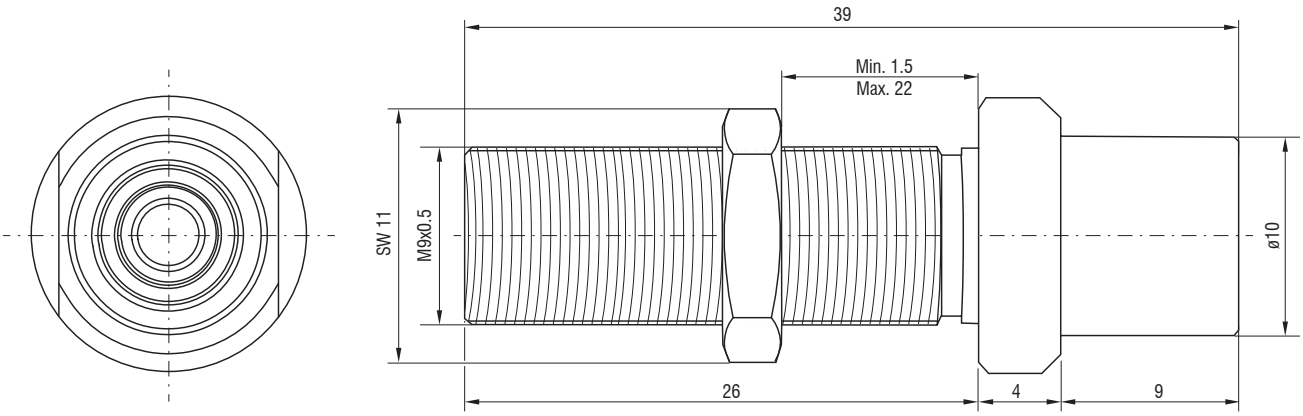
Plug system for vacuum applications
Vacuum feedthrough eddy/fB0/fB0/triax

The eddyNCDT series delivers high-precision measurement results even in airless rooms. The eddy/fB0/fB0/triax vacuum feedthrough also enables eddyNCDT products to be used in vacuum applications.

- Application in vacuums
- Application as a wall duct
- Pluggable version
- Compatible with all common eddyNCDT products

Vacuum feedthrough eddy/fB0/fB0/triax	
Housing material	CuZn39Pb3
O-ring material	FPM (Viton®)
Max. leakage rate (IEC standard 60068-2-17)	$<10^{-8}$ mbar*l/s
Operating temperature [1]	from -20 °C to 150 °C
Mating cycles (IEC 60512-5-9a)	10,000
Vibration (MIL-STD-202 Method 204 Condition B)	10 to 2,000 Hz, 1.5 mm or 15 g, 12 pass cycles per axis, 20 minutes per 10-2000-10 Hz pass cycle, no discontinuity >1 µs
Insulation resistance	10^{10} Ω

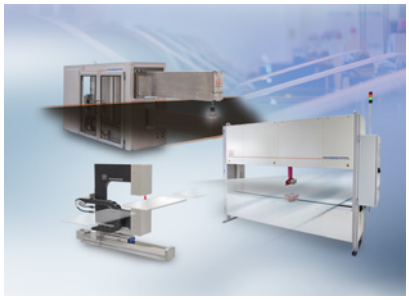
[1] Min. connection temperature: 0 °C



Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

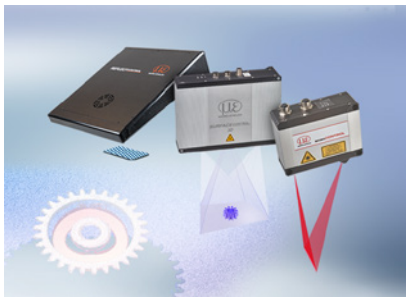
Sensors and measurement devices for non-contact temperature measurement



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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