MICRO-EPSILON

More Precision

eddyNCDT // Inductive sensors based on eddy currents

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.

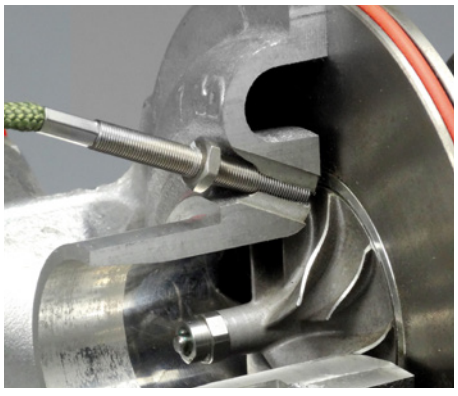
Easy handling

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.

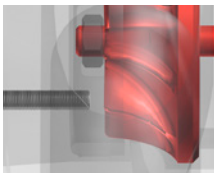
Measuring aluminum and titanium blades

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



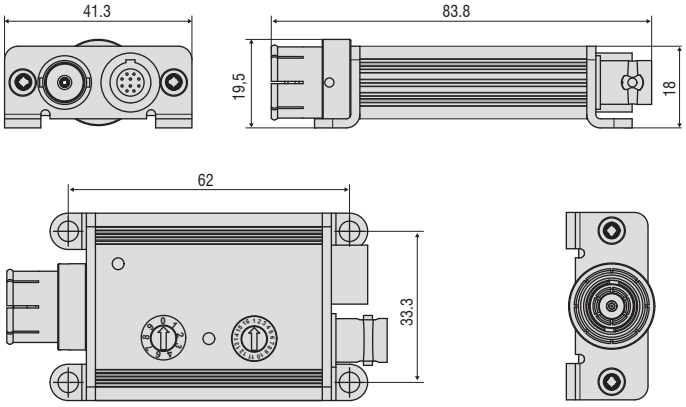
Axial installation

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

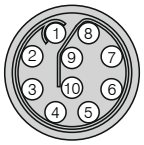


Dimensions in mm, not to scale.

Pin assignment for power supply and signal

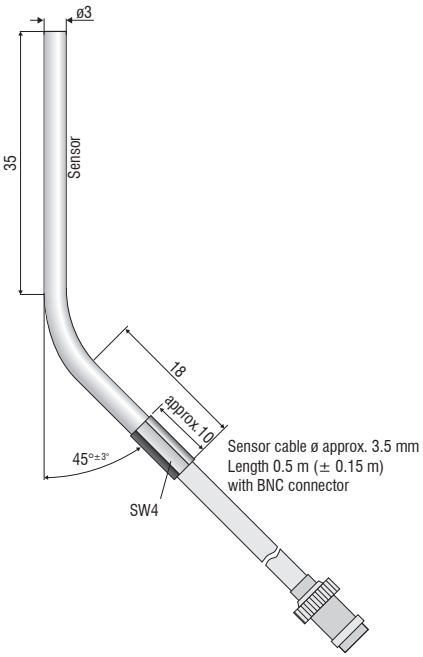
Pin	Assignment	Color (cable: PC140-x)
1	Analog output for rotational speed 0 … +5 V	Blue
2	reserved, not connected	Yellow
3	TTL pulses, digital	Green
4	reserved, not connected	-
5	GND	Black
6	reserved, not connected	-
7	Power supply -	White
8	Supply voltage +9 … 30 VDC	Brown
9	Not assigned	-
10	Not assigned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

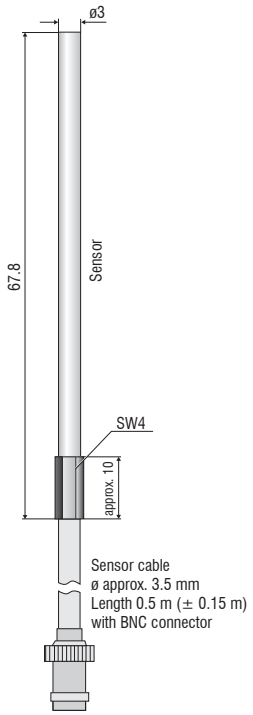
10-pin cable connector
View on solder side



Sensors
turboSPEED DZ140

Measurement direction

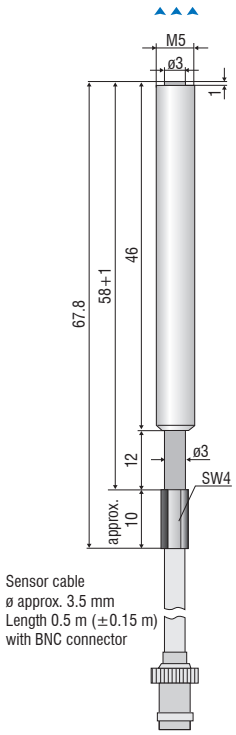


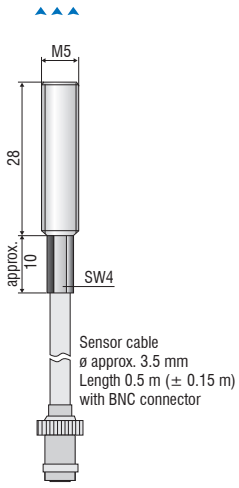


Model		DS 05(03)	DS 05(04)
Sensor type		shielded	shielded
Connection[1)]		integrated cable, axial, length 0.5 m	integrated cable, axial, length 0.5 m
Mounting		Clamping/adapter	Clamping/adapter
Temperature range	Storage	-40 ... +200 °C	-40 ... +200 °C
	Operation	-40 ... +200 °C	-40 ... +200 °C
Feature		curved housing	-

[1)] Length tolerance ± 0.15 m

Measurement direction



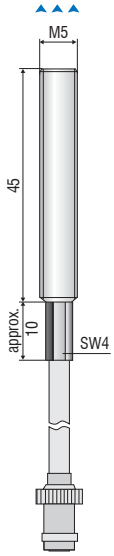


Model		DS 05(07)	DS 05(14)
Sensor type		shielded	shielded
Connection[1)]		integrated cable, axial, length 0.5 m	integrated cable, axial, length 0.5 m
Mounting		Screw connection (M5)	Screw connection (M5)
Temperature range	Storage	-40 ... +200 °C	-40 ... +200 °C
	Operation	-40 ... +200 °C	-40 ... +200 °C
Feature		-	Length of housing 42.5 mm

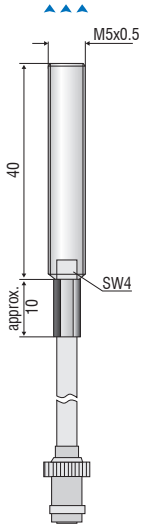
[1)] Length tolerance ± 0.15 m

Sensors
turboSPEED DZ140

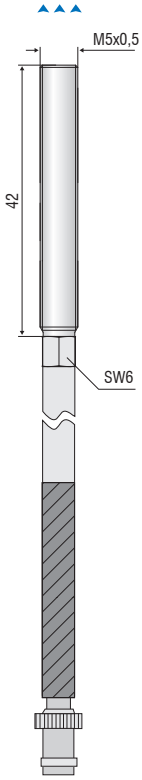
Measurement direction



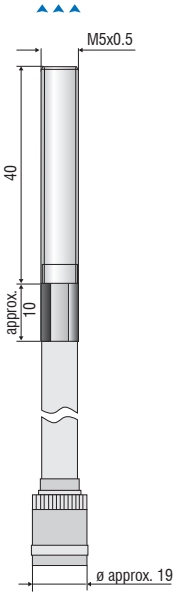
Sensor cable
ø approx. 3.5 mm
Length 0.5 m (± 0.15 m)
with BNC connector



Sensor cable
ø approx. 3.5mm
Length 0.75m (± 0.15 m)
with BNC connector



Sensor cable
ø approx. 6.0
Stainless steel IP 40
Length 0.8m (± 0.15 m)
with BNC connector



Sensor cable
ø approx. 4.5 mm
Length 0.8 m (± 0.15 m)
with triax BNC connector

Model		DS 05(15)	DS 1	DS 1(04)	DS 1/T
Sensor type		shielded	shielded	shielded	shielded
Connection[1)]		integrated cable, axial, length 0.5 m	integrated cable, axial, length 0.75 m	integrated cable, axial, length 0.8 m	integrated cable, axial, length 0.8 m
Mounting		Screw connection (M5)	Screw connection (M5)	Screw connection (M5)	Screw connection (M5)
Temperature range	Storage	-40 ... +200 °C	-40 ... +235 °C	-40 ... +235 °C	-40 ... +235 °C
	Operation	-40 ... +200 °C	-40 ... +235 °C	-40 ... +235 °C	-40 ... +235 °C (short-term +285 °C)
Feature		-	-	Protective hose (stainless steel)	-

[1)] Length tolerance ± 0.15 m

Cables
turboSPEED DZ140

Connection cables for DZ140 portfolio sensors

Miniature coaxial cable for DS05(x) and DS1 models
Diameter: approx. 3.5 mm
Sheath: thermal protection fabric hose (polyolefin shrink hose)
Temperature range: -50 °C to +200 °C (static)
Minimum bending radius: static approx. 18 mm / dynamic approx. 35 mm
Connection: BNC socket coaxial

Miniature coaxial cable for DS1(04) models
Diameter: approx. 6 mm
Sheath: metallic protective hose (stainless steel)
Temperature range: -50 °C to +200 °C (static)
Minimum bending radius: static approx. 30 mm / dynamic approx. 60 mm
Connection: BNC socket coaxial
Protection class: IP40

Triaxial cable for the DS1/T models
Diameter: approx. 3.5 mm
Sheath: thermal protection fabric hose (polyolefin shrink hose)
Temperature range: -50 °C to +200 °C
Minimum bending radius: static approx. 18 mm / dynamic approx. 35 mm
Connection: BNC socket triaxial

Spindle Growth System
eddyNCDT SGS4701

- Miniature sensor design
- M12 controller – integrable in spindle or mountable with flange
- Versions for ferromagnetic and non-ferromagnetic targets
- Integrated temperature measurement

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 uses the eddy current measuring principle, providing a non-contact, wear-free measurement Furthermore, the measurement procedure is resistant to disturbances such as heat, dust and oil.

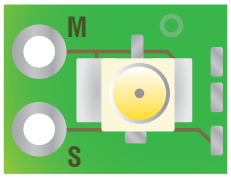
System design

The SGS 4701 consists of a sensor, a sensor cable and a controller, factory calibrated for ferromagnetic and non-ferromagnetic measuring objects. The miniature sensor design enables direct installation in the spindle, where measurements are typically performed on the spindle's labyrinth ring. In addition to measuring linear expansion, the temperature at the sensor is detected and output. The compact controller can be installed on the spindle housing using 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 measuring objects, sensor and controller can be adjusted in the factory which allows for the best possible measurement accuracy to be achieved.

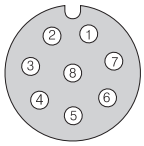


S = Signal = Inner conductor
M = Ground = Shield = Outer conductor

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	NC	Gray
6	assigned internally	Pink
7	assigned internally	Blue
8	NC	Red

8-pole M12x1 housing connector
View on pin side



Model		SGS4701
Measuring range		500 µm (optionally 250 µm [1])
Start of measuring range		100 µm (optionally 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 (optionally 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, optionally 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 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 possible

[2] Static, at mid of measuring range

[3] Values are referenced to the mid of the measuring range within the compensated temperature range

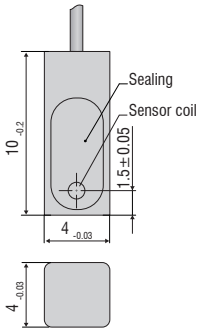
[4] Steel: St37 steel DIN1.0037, aluminum: AlMg

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

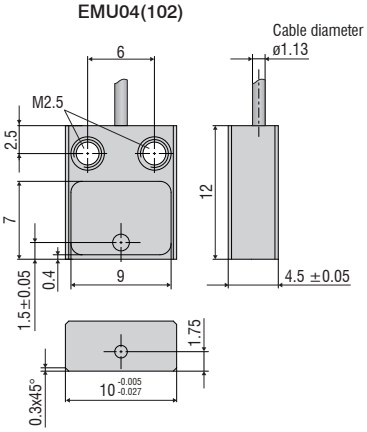
[6] Protection class does not apply for the controller sleeve!

[7] Total weight for controller, cable and sensor

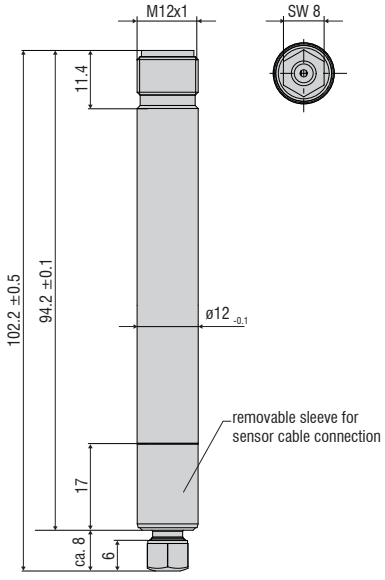
EMU04(121)



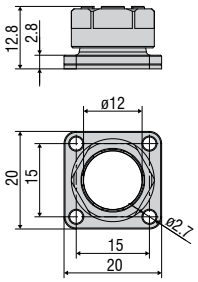
EMU04(102)



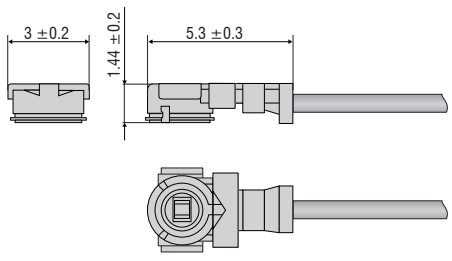
Controller



Clamping flange (optional)



Connector (max. 20 mating cycles possible)



Dimensions in mm, not to scale.

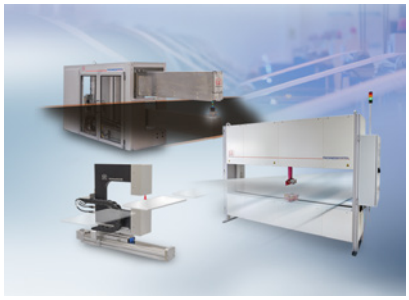
Accessories
eddyNCDT

Item	Description	DT3001	DT3005	DT3020	DT3060	DT3070	DZ140	SGS
PCx/5-M12	**Power supply and signal cable** 5-pole with M12 connector Standard length: 5 m Optionally available: 10 m/20 m/40 m/80 m as drag-chain suitable variant	x	x					
PCx/8-M12	**Power supply and signal cable** 8-pole with M12 connector Standard length: 3 m Optionally available: 5 m/ 10 m /15 m / 10 m also as drag-chain suitable variant			x	x	x		
PC5/8-M12/105	**Power supply and signal cable** Increased temperature resistance up to 105 °C 8-pole with M12 connector Length: 5 m as drag-chain suitable variant			x	x	x		
PC4701-x	**Power supply and signal cable** 8-pole with M12 connector Standard length: 10 m Optionally available: 15 m 10 m also available as drag chain–suitable variant							x
SCD2/4/RJ45	**Ethernet cable** 4-pole with M12 connector on RJ45 connector Standard length: 2 m				x	x		
PC140-x	**Power supply and signal cable** 8-pole connector Standard length: 3 m Optionally available: 6 m						x	
PS2020	**Power supply unit** Input 100-240 VAC Output 24 VDC / 2.5 A; installation on symmetrical standard rail 35 mm x 7.5 mm, DIN 50022	x	x	x	x	x	x	x
IF2035	**Interface module for Industrial Ethernet connection** Connection of RS422 or RS485 interfaces to PROFINET / Ethernet/IP / EtherCAT 2 network connections for different network topologies Ideal for confined spaces due to a compact housing and DIN rail mounting		x	x				
IF1032	**Interface module for Ethernet/EtherCAT connection** 1x RS485 2x analog-in (14 bit, max. 4 ksps), voltage 1x analog-in, (14 bit, max. 4 ksps), current		x	x				
IF7001	**Single-channel converter cable from RS485 to USB** Conversion from RS485 to USB Easy sensor connection via USB Integration into plant and machinery		x	x				

Sensors and Systems from Micro-Epsilon

Sensors and systems for displacement, distance and position

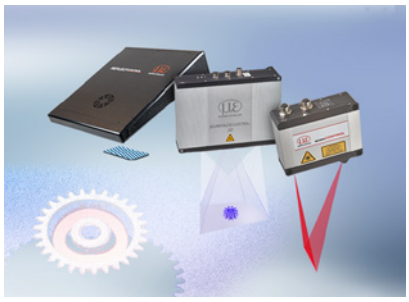
Sensors and measurement devices for non-contact temperature measurement



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

MICRO-EPSILON

MICRO-EPSILON Headquarters
Koenigbacher Str. 15 · 94496 Ortenburg / Germany
Tel. +49 (0) 8542 / 168-0 · Fax +49 (0) 8542 / 168-90
info@micro-epsilon.com · **www.micro-epsilon.com**