

# AX-TURBO | EDDY CURRENT PROBES

Eddy current probes for turbo speed measurement and gap control.

HM 2408



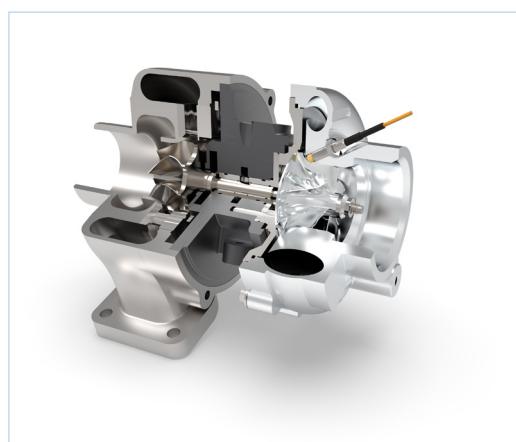
- Measuring on turbo vanes and shafts
- TTL output for speed measurement
- Analogue monitor output for gap control
- High resolution
- High dynamics
- Low current consumption
- High noise immunity

# INTRODUCTION

For more than fifteen years we have been occupied with the development and production of high-quality eddy current probes and drivers for industry and research. The eddylab sensorsystem AX-turbo offers precise and high-resolution eddy current measurements on compressor wheels with TTL speed output and analog monitor output for gap control. Eddy current probes are particularly suitable devices for non-contact measurements on steel, aluminium and titanium vanes. Typical applications are measurements at turbo test benches or under driving test conditions. The extremely high resolution and dynamic range enables the smallest of amplitudes to be detected. eddylab probes are designed for temperatures up to 185 °C and are optimised for the entire temperature range with regard to temperature drift.

## THE BASIC PRINCIPLE

The principle of measurement bases on an oscillating circuit made up of the probe (inductance) and a interconnect capacitance. This circuitry is attenuated in the presence of metallic objects. The oscillating circuit generates magnetic field lines - these induce eddy currents on the surface of conductive objects. The eddy currents counteract their cause and attenuate the amplitude of the oscillating circuit. This effect is decoupled from the oscillating circuit and fed towards further signal processing.

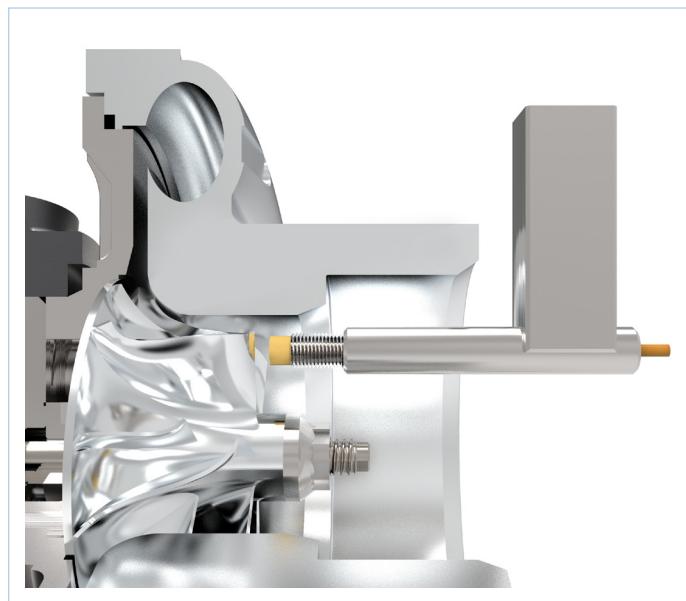


PROBE	T05	T2
distance to vane [mm]	0...1	0...2
temperature range sensor		-60...185 °C
sensor cable PTFE-COAX	ø1,8 mm	ø2,5 mm (max. 2,7 mm)
cable length		3 m
min. bend radius static/dynamic	10/25 mm	15/37 mm
temperature range cable		-55...+200 °C
connection		BNC connector / optional LEMO connector
protection class		IP68
vibration		20 g, DIN EN 60068-2-6
shock		100 g / 6 ms, DIN EN 60068-2-27
check resistance [Ω]	6	8
housing material	stainless steel 1.4305, sensor head PEEK (polyetheretherketon), FPM bend protection	

### BUILT-IN INSTALLATION FOR DRIVING TEST CONDITIONS



### TEMPORARILY MOUNT AT TURBO TEST BENCHES



## CABLE CONFIGURATION

By default, the probes have a BNC plug for the connection at the eddy current probe driver. Optionally the probes are equipped with a LEMO connector. This is necessary for connection to the probe driver with protection class of IP68.



### ■ STANDARD VERSION WITH BNC CONNECTOR

BNC connector, diameter max. 15 mm

### ■ VERSION WITH LEMO CONNECTOR FOR IP68

LEMO connector, diameter max. 11 mm



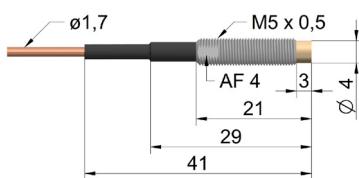
## TECHNICAL DATA

PROBE DRIVER	AX-TURBO
max. speed frequency	150 kHz (max. rpm = $\frac{150 \text{ kHz} \times 60}{\text{number of vanes}}$ ), e.g. 900 000 rpm (10 vanes)
operating temperature range	-40...+85 °C
storage temperature range	-50...+100 °C
humidity	100 %
vibration	5 g, DIN EN 60068-2-6
shock	15 g / 11 ms, DIN EN 60068-2-27
protection class	IP40, optional IP68 with LEMO connector
housing	anodised aluminium sealed with o-ring, mounting bores
housing size	134 x 65 x 30 mm (l x w x h)
weight	350 g
<b>Supply</b>	
supply voltage	24 VDC ± 10 %
current consumption	50 mA
power on peak current	n.s.
reverse polarity protection	yes
protection circuit	bipolar suppressor diode 36 V
isolation voltage	mind. 1 kV
<b>Analog output</b>	
speed output	TTL 1 pulse / vane
monitor output (distance)	0,5...4,5 V
filter corner frequency monitor output	100 Hz
connection supply / output	M12 connector 4 pole (IP68) for supply / output
connection sensor	1 x BNC female connector / LEMO (IP68)
output protection circuit	varistor
<b>General data and industrial standards</b>	
electromagnetic compatibility	EN 61326-1 / EN 55011
RoHS	appropriate standard 2002/95/EG
MTBF	EN 61709, > 360.000 h

## TECHNICAL DRAWINGS

### ■ TYPE T05

T05-G-KA

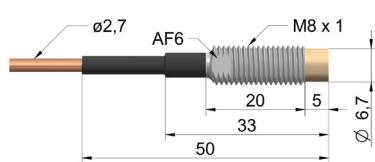


T05-G-KA-VK10



### ■ TYPE T2

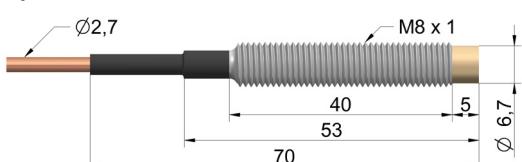
T2-G-KA



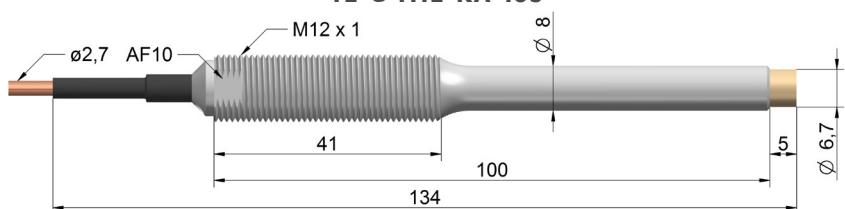
T2-G-KA-VK23 (SHORT VERSION)



T2-G-KA-VL20



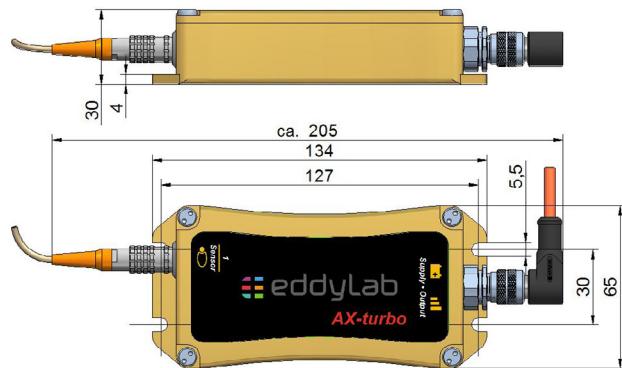
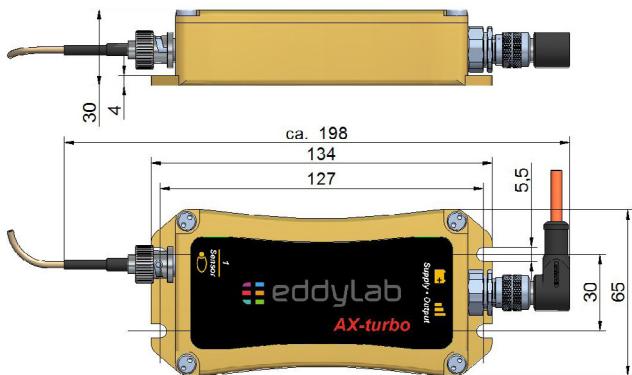
T2-G-M12-KA-105



### ■ IP40 PROBE DRIVER WITH BNC CONNECTOR



### ■ IP68 PROBE DRIVER WITH LEMO CONNECTOR



## CONNECTION

### SUPPLY VIA 4-POLE M12 PLUG CONNECTOR (SOCKET)

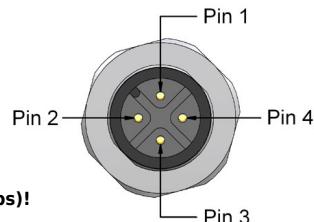
View of the unit and the soldering side of the mating connector.

Pin 1 (brown)	V+
Pin 2 (white)	speed output (pulse TTL)
Pin 3 (blue)	GND
Pin 4 (black)	monitor output (analogue 4,5 V)

For connecting the power, shielded cables in various lengths are available (see accessories).

**Please use only shielded supply cables and set the screen on one side (to avoid earth loops)!**

**Note: Wrong connection of supply voltage at the output could damage the unit.**



## ACCESSORIES

### Cable for power supply with mating connector M12 straight and angled - K4P

Cable with straight connector:	Cable with angled connector:
K4P2M-S-M12	2 m
K4P5M-S-M12	5 m
K4P10M-S-M12	10 m
K4P2M-SW-M12	2 m
K4P5M-SW-M12	5 m
K4P10M-SW-M12	10 m



## INSTALLATION

### ELECTRICAL INSTALLATION

Choose a dry location, preferably with a stable temperature for the electrical installation (eddy current basic module) such as electrical cabinets, terminal boxes, housing, etc.

Connect the supply line, probe lines and output lines. Please ensure that all supply and signal lines are laid separately from energy-carrying lines such as supply and discharge lines from converters and drives, lines from ovens and synchronised appliances or generator lines, etc., in order to avoid malfunctions in the signal behaviour. Please use shielded supply lines only and apply the shield to one side to avoid earth loops.

Please observe the correct assignment of the probes to the respective basic modules and channels. Each individual channel is aligned by the probe as a pair.

### PROBE INSTALLATION

Firstly, install the probe at the relevant installation location and affix the probe using jam nuts or clamp mechanisms. Check the analogue monitor output by turning the compressor wheel by hand. The monitor output must change at least more than 100 mV with passing turbo vanes. If the sensor is closer to the vane, the signal difference increases and signal processing is safe. Please be aware, not to contact the vanes and keeping a minimum clearance of 0,5 mm. If you turn the compressor wheel, the TTL-signal is generated, if the frequency of passing vanes exceeds 10 Hz.

After you have installed the probe, lay the cable. Ensure that the cable is laid without dents and it is not placed under stress. After you have laid the cable into place, do not turn the probe out of the thread, so as to prevent cable damage arising from stress. Secure excess probe cable as far away from temperature influences as possible. **Never shorten the probe cable!**



## PRECAUTIONS

- **Never shorten the probe's coaxial cable.**
- **Lay the cable so that it is protected and avoid running it along objects with sharp edges. A cable that has been squashed or damaged in another manner can tamper with the signal or render the probe unusable.**
- **Avoid placing the cable under tensile or torsional stress. Never turn the probes in the holders inwards or outwards without first loosening the fastenings.**
- **Note the minimum bending radius for dynamic and static installation as specified in the datasheet. Avoid bending the cable.**
- **Protect the plug connections in the coaxial line against humidity and wetness.**
- **The sensors may not be used in strong radioactive environment (nuclear power plant).**

## ORDER CODE

### ■ PROBE

probe type 

**a** sensor type

according to technical drawings, p. 4 (e.g. T05-G-KA)

**b** cable length

1 = 3M: 3 m

**c** cable end

1 = BNC connector (standard)  
3 = LEMO connector

**d** others

1 = - (T2)  
2 = shielded version (T05)

### ■ PROBE DRIVER

AX-turbo-24 

**a** monitor output

1 = 0,5...4,5

**b** protection class

1 = IP40

2 = IP68