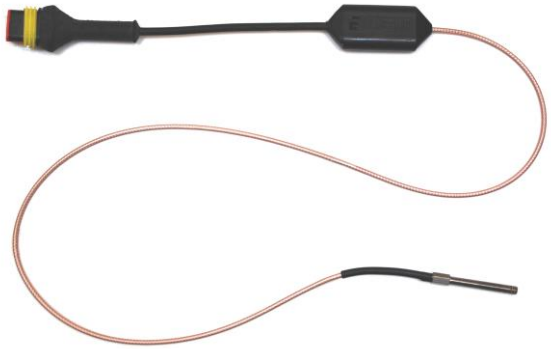
ScioSense



PT2G Series

Smart Sensor System for Turbocharger Speed Detection

PT2G datasheet

Revision: 2

Release Date: 2023-12-15

Document Status: Production

PICOTURN® is a system for measuring the rotational speed of turbochargers. It´s functional principle is one-megahertz pulse induction and eddy current discrimination, done with a solenoid sensor that is mounted in the compressor housing through a bore. The sensor detects and counts compressor vanes one by one. When compared to optical detection, this inductive method benefits from its lack of sensitivity to dirt, oil and dust. When compared to the magnetized nut method, the PICOTURN system is safer as there is no concern with nuts coming loose and destroying the charger and the engine. When compared to a competing, entirely analog inductive vane counting system, the fully digital PICOTURN device turns out to be rugged, reliable, simple to use and very cost-effective.

In the PT2G (2nd generation), part of the remote electronics has now been placed close to the sensor body for under-hood operation. Consequently, cable length and placement of the data logger have ceased to be an issue.

As before, the sensor solenoid is housed in a M5 threaded sleeve with two different pitches and various lengths available. The second generation system is no longer compatible with earlier first generation components (PTBM-V6). First and second generation components must be handled separately. Sensor placement and system operation in general, however, remain unchanged.

Key Features & Benefits

Eddy-current damping based rotational speed sensors

Rotational speed 390 rpm to 400,000 rpm

Dedicated for compressor wheels made of **aluminum or titanium**

Output: TTL pulse every 2nd vane

Wide operating ranges:

- Electronics: -40 to +85°C
- Sensor tip: -40 to +230°C (250°C peak 5 min.)
- Sensor tip -H type: -40 to +250°C (270°C peak 5 min.)
- VDD: 5 V

Applications

- Turbocharges on engine test benches
- Turbocharges in test cars

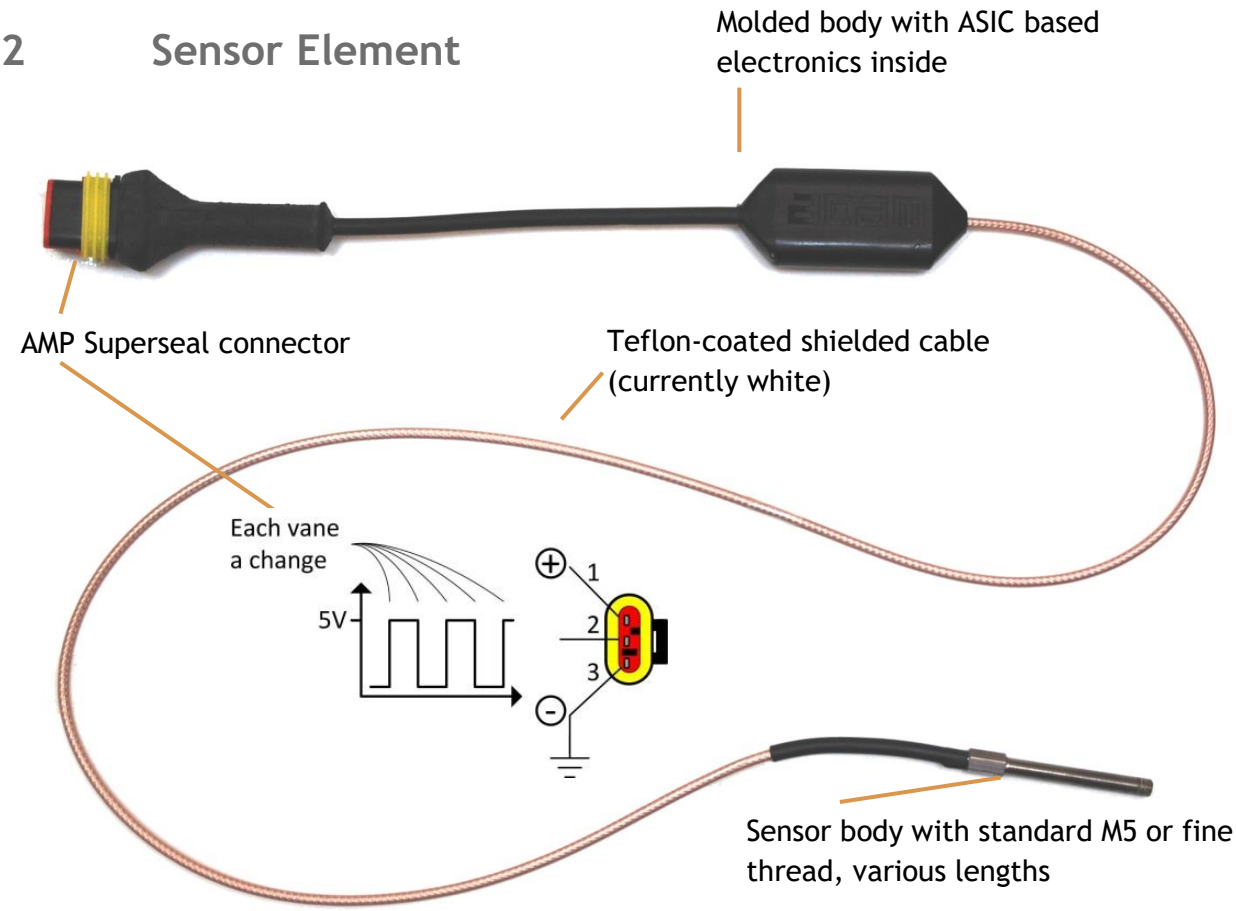
Content Guide

1 PT2G Series – Product List

Table 1: Product list

Part No.	Product	Description			
New		Sensor length/ thread length	Diameter	Cable length	Temperature range sensor head
220160010	PT2G-SM5.3	60 mm/54 mm	M5 x 0.8	0.95 m	-40 °C to +230 °C
220160009	PT2G-SM5.5	46 mm/40 mm	M5 x 0.8	0.95 m	-40 °C to +230 °C
220160006	PT2G-SM5.6	75 mm/69 mm	M5 x 0.8	0.95 m	-40 °C to +230 °C
220160004	PT2G-SM5F.2	41 mm/25 mm	M5 x 0.5	0.95 m	-40 °C to +230 °C
220160012	PT2G-SM5F.3	56 mm/40 mm	M5 x 0.5	0.95 m	-40 °C to +230 °C
220160008	PT2G-SM5F.5	76 mm/60 mm	M5 x 0.5	0.95 m	-40 °C to +230 °C
H-types for higher temperature and higher sensitivity					
220160015	PT2G-H-SM5.3	60 mm/54 mm	M5 x 0.8	0.95 m	-40 °C to +250 °C
220160017	PT2G-H-SM5.5	46 mm/40 mm	M5 x 0.8	0.95 m	-40 °C to +250 °C
220160018	PT2G-H-SM5.6	75 mm/69 mm	M5 x 0.8	0.95 m	-40 °C to +250 °C
220160016	PT2G-H-SM5F.2	41 mm/25 mm	M5 x 0.5	0.95 m	-40 °C to +250 °C
220160013	PT2G-H-SM5F.3	56 mm/40 mm	M5 x 0.5	0.95 m	-40 °C to +250 °C
220160014	PT2G-H-SM5F.5	76 mm/60 mm	M5 x 0.5	0.95 m	-40 °C to +250 °C
Standard types: 250°C peak temperature for 5 min. H-types: 270°C peak temperature for 5 min, higher sensitivity, for use in critical applications.					

2 Sensor Element

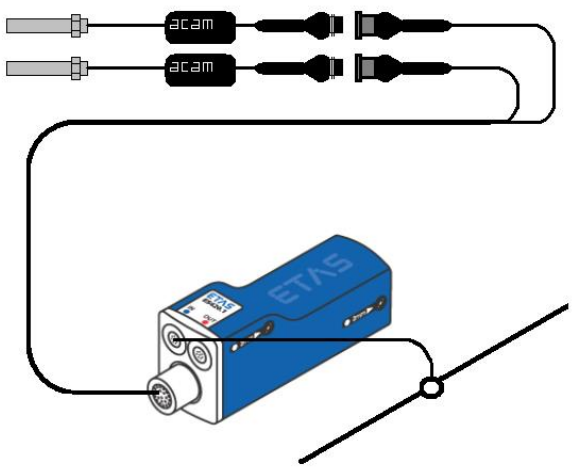


Sensor part number code:
Part No. PT2G-SM…

Figure 1: Sensor element

2.1 Connection Options to Dataloggers

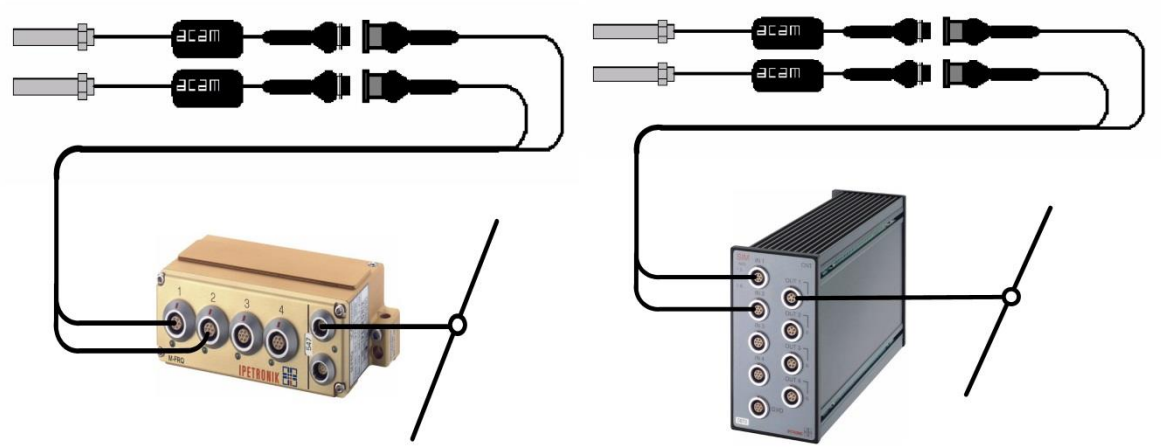
2.1.1 ETAS



Etas F-00K-107-568, www.ETAS.com

Figure 2: Etas

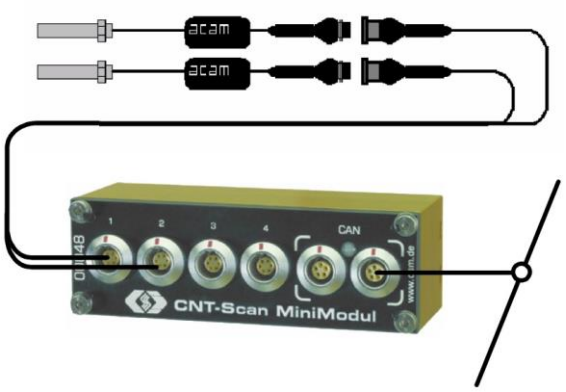
2.1.2 IPETRONIK



www.ipetronik.com

Figure 3: Ipetronik

2.1.3 CSM



www.csm.de

Figure 4: CSM

2.1.4 ATI Accurate Technologies Inc.

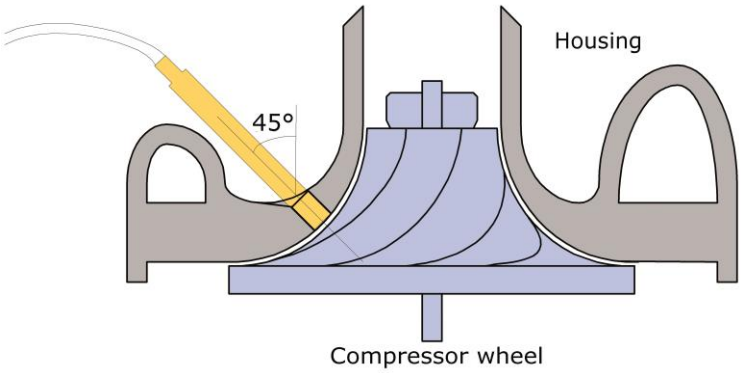
www.accuratetechnologies.com

Figure 5: ATI

3 Sensor Application

CAUTION: Prior to the PICOTURN product installation, be sure that the turbocharger is cold.

The sensor body should be mounted in principle as indicated (see Figure 6). The compressor housing needs to be removed. Drill a hole into the case and cut a thread, according to the chosen sensor housing. Select the position of the hole so that every vane, both big and small, will be sensed. Place the sensor directly in front of the small vanes ("splitter vanes"), avoiding the vicinity of their upper edge (which could induce error into the system).



The correct mounting position and method depends on the individual geometry and characteristics of the turbocharger in use. Contact the manufacturer of the turbocharger for information about details on possible positions and correct mounting instructions.

Figure 6: Sensor Application

IMPORTANT: Make sure the tip of the sensor is approximately flush with the inside contour of the housing. Otherwise, it may hit and damage the compressor wheel.

Notice: Lock torque: The sensor body is not a 5-millimeter bolt, but merely a sleeve with some 0.3 mm thick walls. Apply only a fraction of the torque you would with a solid bolt: 0.3 Nm maximum (finger force, not fist force).

Environment: The sensor element with respect to its electronics and "Superseal" connector has been designed for under-hood operation and is considered engine compartment tolerant.

4 Technical Data

Table 2: Distance

Maximum distance sensor-vanes	Passenger cars	Commercial vehicles
Typical for aluminum wheels	1 to 2 mm	2 to 3 mm
The maximum distance depends strongly on the turbocharger geometry, the vane thickness at the sensor tip and the alloy of the wheel. So only an indication can be given.		

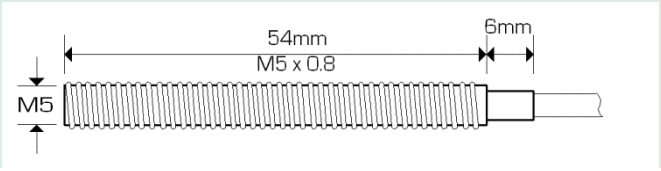
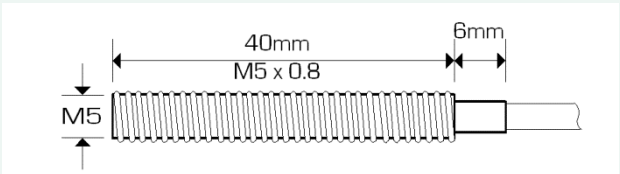
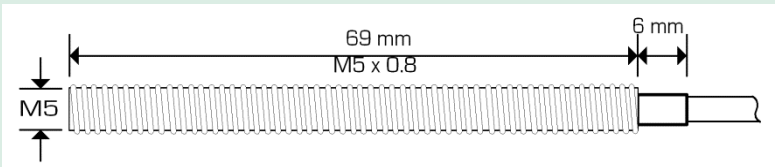
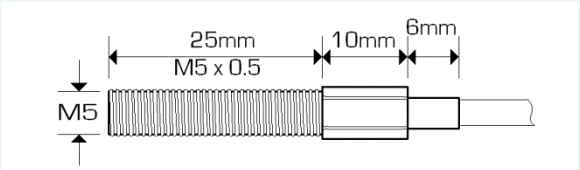
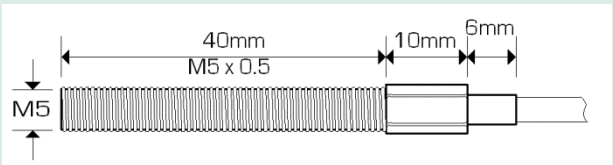
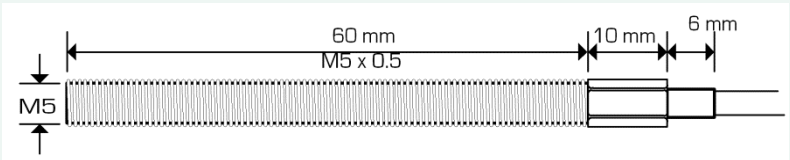
These are approximate values for aluminum compressor wheels. Exact values depend on turbocharger geometry.

Table 3: Technical data

Supply voltage	+5 V DC ± 0.25 V, from low noise power supply (linear voltage regulator)		
Consumption	20 mA		
Temperature	Cable and electronics		-40 °C to +125 °C (+257 °F)
	Sensor tip	SM types	-40 °C to +**230** °C (+446 °F) +250°C (+482 °F) for 5 minutes
		H-SM types	-40 °C to +**250** °C (+482 °F) +270°C (+518 °F) for 5 minutes
Dimensions (sensor body)	Fine thread M5 x 0.5 With various lengths 25 mm to 60 mm		
	Standard thread M5 x 0.8 With various lengths 40 mm to 60 mm		
Length of sensor element and cable	From sensor tip to sealed electronics		Approximately 0.75 meter
	From sealed electronics to “Superseal” connector		Approximately 0.12 meter
	Total length		Approximately 1.00 meter

4.1 Mechanical Dimensions Sensor Tips

Table 4: Dimensions

Sensor	Drawing
PT2G-SM5.3 PT2G-H-SM5.3	
PT2G-SM5.5 PT2G-H-SM5.5	
PT2G-SM5.6 PT2G-H-SM5.6	
PT2G-SM5F.2 PT2G-H-SM5F.2	
PT2G-SM5F.3 PT2G-H-SM5F.3	
PT2G-SM5F.5 PT2G-H-SM5F.5	

4.2 Technical Data for Specialists

Table 5: Interface data

Pin	Pin Name	Explanation
1	VCC	Supply voltage 5V DC
2	Signal	5V CMOS level, 4 mA max. The signal is square and symmetric. Every rising edge and every falling edge indicates one passing vane, leading to a half frequency pulse as compared to the vane appearance frequency.
3	GND	Common ground for supply and signal. Note that the sensor housing is potential free and not connected to ground.

The PT2G sensors digital output toggles with each vane. In other words, the frequency is half the frequency of vanes. So please take care in case you use your own data logger. Please set only half the frequency or half the number of vanes to get the correct frequency.

Note: A good low-noise power supply is necessary for correct indication of zero speed. A more stringent specification is difficult to define and is not available at present. Generally speaking, linear voltage regulators are satisfactory, switching regulators are not.

5 RoHS Compliance & ScioSense Green Statement

RoHS: The term RoHS compliant means that Sciosense B.V. products fully comply with current RoHS directives. Our semiconductor products do not contain any chemicals for all 6 substance categories, including the requirement that lead does not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, RoHS compliant products are suitable for use in specified lead-free processes.

ScioSense Green (RoHS compliant and no Sb/Br): ScioSense Green defines that in addition to RoHS compliance, our products are free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material).

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6.1 Important Safety Information

6.1.1 Product Use

PICOTURN products are designed for industrial use. The intended use of the product is the measurement of speed of a turbocharger in a test bench environment or in driving tests. For proper installation and usage please follow the mounting instructions in this document. During operation of the test bench (including the motor and turbocharger), no persons must be present in the test room. For use in driving tests, in which persons may be present, use the product in such a way that in case of malfunctions or error, personnel and equipment are not endangered. Any use other than the one described above is considered as non-intended use and ScioSense declines any liability with respect to such non-intended use.

6.1.2 Installation

The speed sensor should be installed by a qualified automotive technician. Please carefully read and follow the instructions given in this manual for proper installation and use of the product. Furthermore, please pay attention to any installation instructions given by the turbocharger manufacturer, especially for the mounting of the sensor at the turbocharger and its safe operation. If you have any question or doubts regarding the installation or operation please contact the distributor from whom you purchased the sensor or alternatively contact ScioSense directly.

6.1.3 Signal words and symbols used

The following symbols and signal words are used in this data sheet.

CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury

NOTICE is used to address practices not related to physical injury

6.1.4 Safety messages

The following list provides an overview of potential damages that can occur if the turbocharger sensor system is not operated as outlined in this manual.

CAUTION Connect an adequate power supply (meeting the specifications for supply voltage and current) in accordance with safety regulations for electrical equipment. Otherwise there is risk of injury and/or damage to or destruction of the sensor and controller box.

NOTICE Mount the sensor according to the installation instruction in this data sheet and/or the installation instructions of the turbocharger manufacturer. If the sensor is mounted incorrectly, the sensor itself; the turbocharger housing; or the turbo charger wheel (blades) can be damaged. Particularly in the case where the sensor goes too far into the turbocharger cavity, the wheel blades may be touched and thus the turbo wheel damaged. As a consequence, single blades of the turbo wheel could be detached and go into the motor and cause further damage there.

7 Revision Information

Table 6: Revision history

Revision	Date	Comment	Page
2	15 Dec 2023	Transfer to Sciosense format All references to PT2G-Bx boxes removed following change notification SC-001490 and SC-001897	All

Note(s) and/or Footnote(s):

1. Page and figure numbers for the previous version may differ from page and figure numbers in the current revision.
2. Correction of typographical errors is not explicitly mentioned.

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