acam mess·electronic

PICOTURN®

Data Sheet

PICOTURN 1st Generation

Rotational Speed Measurement System for Turbochargers

September 30th, 2014
Document No: DB_PT1G_en V1.6

Published by acam-messelectronic gmbh

Legal note

The information provided by this data sheet is believed to be accurate and reliable. However, acam cannot be held liable for any of its contents, neither for accuracy, nor for completeness. The compiled information is believed correct, though some errors and omissions are likely. We welcome any notification, which will be integrated in succeeding releases.
The acam recommendations are believed useful, the firmware proposals and the schematics operable, nevertheless it is the customer's sole responsibility to modify, test and validate them before setting up any production process.
acam products are not designed for use in medical, nuclear, military, aircraft, spacecraft or life support devices. Nor are they suitable for applications where failure may provoke injury to people or heavy material damage. acam declines any liability with respect to such non-intended use, which remains under the customer's sole responsibility and risk. Military, space and nuclear use is subject to German export regulations.
acam does not warrant, and it is not implied that the information and/or practice presented here is free from patent, copyright or similar protection. All registered names and trademarks are mentioned for reference only and remain the property of their respective owners. The acam logo and the PICOTURN logo are registered trademarks of acam-messelectronic gmbh, Germany.

Support / Contact

For a complete listing of Direct Sales, Distributor and Sales Representative contacts, visit the acam Web site at:

http://www.acam.de/sales/distributors/

For technical support you can contact the acam support team or distributors. The contact details of acam are:

support@acam.de or by phone +49 7244-74190

Important Safety Information

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 acam declines any liability with respect to such non-intended use.

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 on the turbocharger and its safe operation. If you have any questions or doubts regarding the installation or operation, please contact the distributor from whom you purchased the sensor or alternatively contact acam directly.

Signal words and symbols used

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

⚠CAUTION	CAUTION indicates a hazardous situation which, if not avoided, could result in minor or moderate injury
NOTICE	NOTICE is used to address practices not related to physical injury

Safety messages

The following list provides an overview of potential damage 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 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 turbocharger 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.

Warranty

acam warrants to the original purchaser of its PICOTURN products the fitness and merchantability. In case of approved warranty claims, acam will repair or replace any products or parts thereof that prove to be defective in workmanship or material, or credit the original purchaser with an amount equal to the original purchase price for a period of one (1) year after purchase. This is the purchaser's sole and exclusive remedy and constitutes the complete financial responsibility of acam for a warranty claim.

If the original purchaser was not the end customer but a wholesaler (distributor), different warranty regulations and warranty periods may apply. Please direct any request in this case to the distributor first. In either case, for reimbursement or replacement of an alleged defective product, a warranty claim to (a) the distributor or (b) acam directly must be submitted within thirty (30) days and a Return Material Authorization Form completed (available from the distributor or at support@acam.de).

Limitations on warranty

acam shall not be liable to the end user under any circumstances for any special, incidental or consequential damage, including, without limitation, damage to or loss of property other than for the PICOTURN products themselves; damage incurred during installation, repair or replacement; lost profits, revenue or opportunity; losses resulting from or related to downtime of PICOTURN products; loss of use; the cost of replacement, transportation, power, or compression; the cost of substitute products; or claims of third parties for such damage, howsoever caused, and whether based on warranty, contract, and/or tort (including negligence, strict liability or otherwise).

acam disclaims all other warranties, expressed or implied.

Content

1 PT1G Series – Product List

Table 1: Product list

Part No.	Product	Description			
Sensors					
		Sensor length/ thread length	Diameter	Cable length	Temperature range sensor head
586	**PICO**TURN-SM5.1	60 mm/54 mm	M5 x 0.8	1.5 m	-40°C to +180°C
933	**PICO**TURN-SM5.3	60 mm/54 mm	M5 x 0.8	1.5 m	-40°C to +230°C
998	**PICO**TURN-SM5.5	46 mm/40 mm	M5 x 0.8	1.5 m	-40°C to +230°C
1059	**PICO**TURN-SM5.6	75 mm/69 mm	M5 x 0.8	1.5 m	-40°C to +230°C
934	**PICO**TURN-SM5F.2	41 mm/25 mm	M5 x 0.5	1.5 m	-40°C to +230°C
1081	**PICO**TURN-SM5F.3	56 mm/40 mm	M5 x 0.5	1.5 m	-40°C to +230°C
1574	**PICO**TURN-SM5F.5	76 mm/40 mm	M5 x 0.5	1.5 m	-40°C to +230°C
Accessories					
1242	**PICO**TURN-BM V6.2	Signal conditioning box, BNC connectors for analog and digital output, banana jacks for 8 to 30 V power supply			
1244*	**PICO**TURN-BM V6L*	Like **PICO**TURN-BM V6.2 but with Lemo connector for power supply			
890	**PICO**TURN-CT	Calibration device for PICOTURN-BM controllers			
594	Extension cable	SMB extension cable for sensors, 1.5 m long			
696	Clamping nut	M5 fine thread nut for sensors –SM5F.x			

* On special request only

230°C types: 250°C for max. 5 min

For applications which require a longer sensor cable, please use the extension cable (part number 594).

2 PICOTURN 1st Generation

2.1 Description

PICOTURN 1st generation ("PT1G") is a system for sensing the rotational speed of turbochargers. It does this by detecting contactless and directly the individual vanes of the aluminum compressor wheel. PICOTURN-SMxx sensors are made of a simple coil with a ferrite core. If a compressor wheel's vanes are brought in front of the coils, the inductance changes. In the PICOTURN-BM signal conditioning box, this change of inductance is measured by a TDC (Time-to-Digital Converter), and the measured data is processed by a DSP which finally emits a signal proportional to the rotational speed. The system is capable of speed measurement up to 400,000 rpm. The minimum speed is 200 rpm. PICOTURN is a universal speed measurement system for all standard compressor wheels (down to 32 mm (1.3') wheels). The high sensitivity allows a large distance between sensor and the rotating vanes in the range of 1 mm at 0.6mm vane thickness. Even the rotational speed of compressor wheels made out of titanium may be measured (depending on alloy). The use of an extension cable between the controller box and the sensor is also possible.

2.2 PICOTURN-BM V6.2

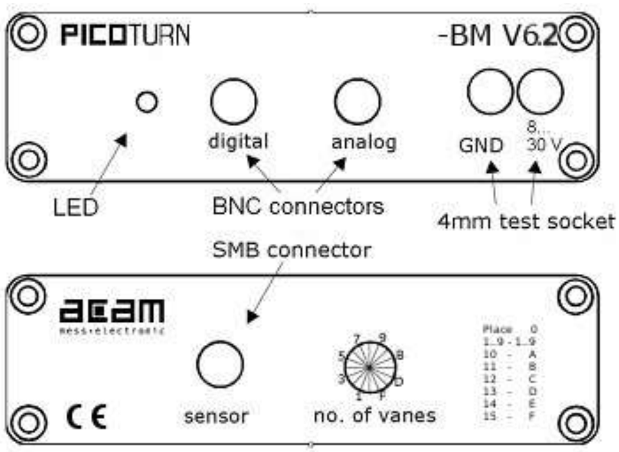
The PICOTURN signal conditioning box drives the sensor, converts the sensor signal to rotational speed and provides this information as a digital pulse output or an analog output voltage. The PICOTURN-BM V6.2 is our most recent version of the PICOTURN signal conditioning boxes. It is optimized with respect to similar sensitivity for different kinds of sensors. The number of vanes is programmable between 1 - 15 / 16 – 31. The box offers two kinds of interface:

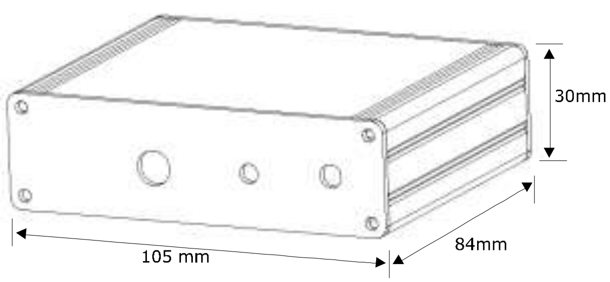
- Digital pulse interface
- Analog interface 0.5 V – 4.5 V

A measurement system requires at least a PICOTURN-BM V6.2 box and a sensor from our PICOTURN-SMx.x series. The sensor is connected to the box by a coaxial cable with two inner conductors, about 1.5 m (59') long (max. 3 m (118')). The connector is SMB type. The box comes with a aluminum housing.

2.3 Mechanical Dimensions

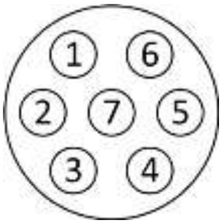
2.3.1 PICOTURN-BM V6.2





2.3.2 PICOTURN-BM V6L

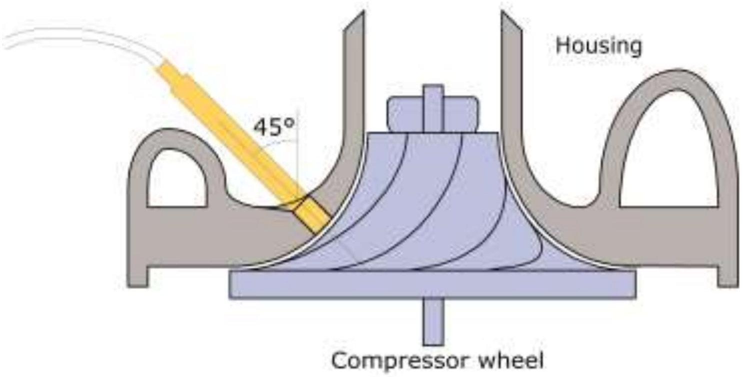
On request, acam offers a special version of PICOTURN-BM V6.2 with a Lemo connector instead of the 4mm banana jacks for power supply. In addition to the power line, digital and analog output signals are also available on the Lemo connector. The Lemo order number for the fitting male connector is EXG.1B.307.HLN. The pin assignment is as follows:



Pin 1 – n.c.
Pin 2 - GND
Pin 3 – +8..+30 V
Pin 4 – Analog OUT
Pin 5 – GND
Pin 6 - Digital OUT
Pin 7 – n.c.

3 Sensor Application

⚠CAUTION Prior to the PICOTURN product installation, be sure that the turbocharger is cool.



In principle, the sensor body should be mounted as indicated (see sketch on the right). 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).

NOTICE 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.

NOTICE 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).

3.1 Technical Data

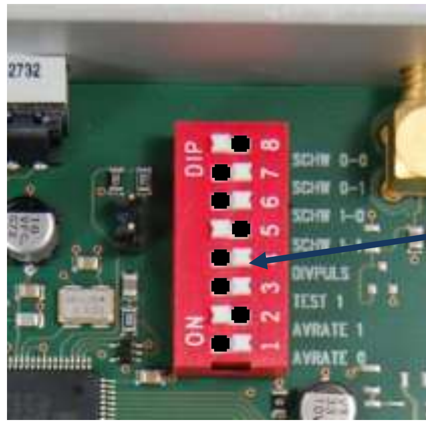
Table 2: Operating conditions

<table>
<tr><td>Case size W x H x L</td><td colspan="4">105 x 30 x 85 mm³ (4.1‘*1.18‘*3.35‘)</td></tr>
<tr><td>Supply voltage/current</td><td colspan="4">8 to 30 V DC/ typ. 45 mA</td></tr>
<tr><td>Distance between vane and sensor</td><td colspan="4">~ 1.0 mm (for vanes .6 mm thick)</td></tr>
<tr><td>Digital output</td><td colspan="4">pulsed 5V CMOS, 50% duty cycle
Frequency precision 0.009% of FS
1 pulse per N vanes, N = 1 to 31</td></tr>
<tr><td rowspan="7">Analog output</td><td colspan="4">0.5 V to 4.5 V (80.000 rpm/V)
Voltage precision 0.5% of FS @ 25°C
Update rate:</td></tr>
<tr><td>N = 4</td><td>104 Hz</td><td>N = 10</td><td>260 Hz</td></tr>
<tr><td>5</td><td>130 Hz</td><td>11</td><td>286 Hz</td></tr>
<tr><td>6</td><td>156 Hz</td><td>12</td><td>313 Hz</td></tr>
<tr><td>7</td><td>182 Hz</td><td>13</td><td>339 Hz</td></tr>
<tr><td>8</td><td>208 Hz</td><td>14</td><td>365 Hz</td></tr>
<tr><td>9</td><td>234 Hz</td><td>15</td><td>391 Hz</td></tr>
<tr><td>Number of vanes/pulse*</td><td colspan="4">1 to 15 / 16 to 31</td></tr>
<tr><td>Operating temperature range sensor
-SM5.1
-SM5.3, … (more sensors in chapter 1)</td><td colspan="4">
- 40°C to + 180°C
- 40°C to + 230°C (250°C max. 5 min)</td></tr>
<tr><td>Operating temperature range box</td><td colspan="4">- 40°C .. +85°C</td></tr>
</table>

*If the analog output is used, the number of vanes is selectable between 4 to 31.

3.2 Number of Vanes – Code Switch

The number of vanes of the turbo wheel is set by a rotational code switch placed on the backside of the □-BM V6.2 box case. The standard range is 1 to 15 vanes, which can be changed to 16 to 31 vanes by setting an inside DIP switch. To set the DIP switch the case must be opened (default=off). The position of the DIP switch “DIVPULS” can be seen in the photo below, marked by an arrow.



No.4: DIVPULS:

Division Factor

1 to 15 or

16 to 31

Table 3: Division factors for vane number

Code switch	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
DIVPULS = off	1 (1,2)	1 (1)	2 (1)	3 (1)	4	5	6	7	8	9	10	11	12	13	14	15
DIVPULS = on	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31

(1): Not applicable to analog output
(2): Sensor positioning signal at analog output, see section 3.5

3.3 Analog Interface

The analog output voltage covers 0.5 V to 4.5 V. The slope is 80.000 rpm/V, corresponding to 0 rpm at 0.5 V and 320,000 rpm at 4.5 V output voltages, respectively. The above values are valid only if the number of vanes is correctly encoded. The analog output works correctly for vane numbers of 4 to 31, it is not applicable for settings of 1, 2 and 3.

Hint: If the vane number setting differs from the number of vanes on the wheel, the voltage slope and maximum speed at the analog output changes. This can be used to measure a rotational speed above 320,000 rpm at the analog output (setting a higher number, see example 1), or to increase resolution (setting a lower number, see example 2).

Example 1:
Real vane number: 8
Set number: 12
gives a slope of 1.5*80,000 rpm/V = 120,000 rpm/V. The maximum range is 480,000 rpm

Example 2:
Real vane number: 10
Set number: 5
gives half the slope, 40,000 rpm/V and therefore a better resolution
Maximum speed is 160,000 rpm

3.4 LED – Display Functionality

Table 4: LED diagnostics functionality

Mode	LED behavior	Circumstance	Consequences
A	LED stays dark		No power supply: the supply voltage is missing or below 8 V. Please check the power supply
B	LED on Continuously (green)	Turbo standing still	The rotational speed is zero. The controller is ok and in wait state.
		Turbo rotates	The sensor head is too far away from the wheel. To check the controller, remove the sensor and check that the LED is blinking.
C	LED on Continuously (red)	Turbo rotates	The system is operating normally.
D.1	LED shines red with short green breaks	Turbo rotates	The sensor signal is correctly captured most of the time and the controller can measure. But the signal strength is quite low. If possible, bring the sensor head 0.1 to 0.2 mm closer to the wheel.
D.2	LED shines green with short red breaks	Turbo standing still	There are electromagnetic disturbances. On engine test stations this might be due to ground loops. Add an additional GND wire from the controller box to the engine. Otherwise the signal might be disturbed, especially at low rotational speeds.
		Turbo rotates	The sensor signal is too weak. If possible bring the sensor head closer to the wheel.
E	LED blinking fast with about 8 Hz (red/green)	Sensor not connected	Please connect the sensor.
		Sensor disconnected for device test	Device test. The controller is ok and the supply voltage sufficient.
		Sensor connected	The sensor, the sensor cable or the sensor connector is defective or the power supply voltage is too small (below 8V).

3.5 Analog Signal for optimal Sensor Positioning

The measurement signal can also be tested quantitatively. This is helpful during application but may also be of interest during operation. It helps to achieve a higher signal-to-noise ratio of the measurement chain.

The number of vanes has to be set to 0 (code switch set to ‘0’ and internal DIP switch DIVPULS off). A voltmeter has to be connected to the analog output, being set to the right measurement range (e.g. 5 V). In contrast to all other settings, the output voltage is below 0.2 V when the turbo is standing. Any other setting of the number of vanes results in an output voltage of 0.5 V at standing turbo.

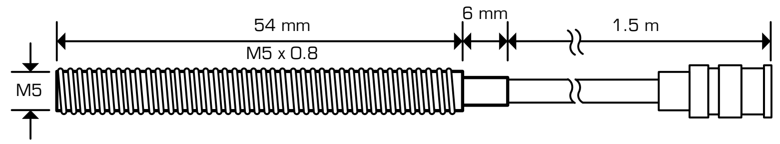
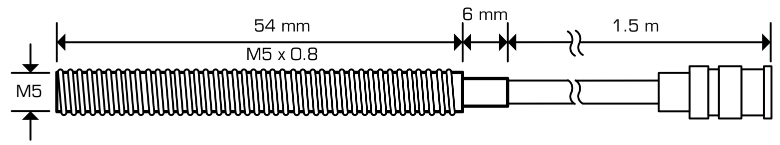
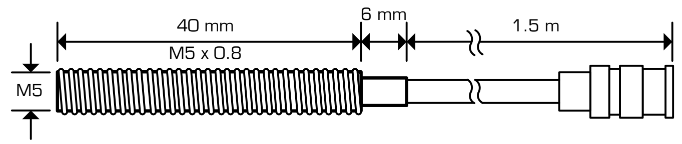
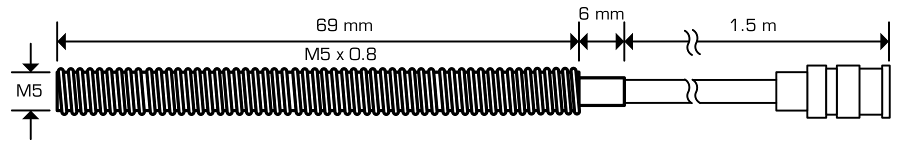
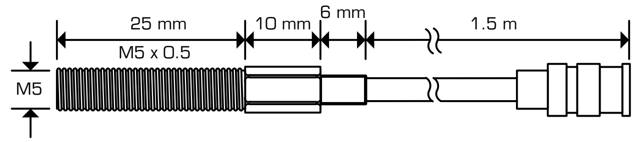
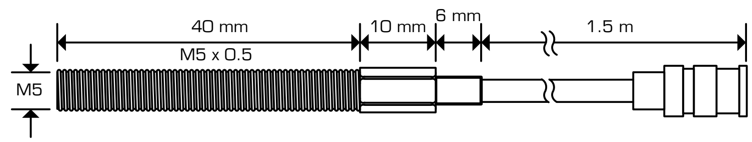
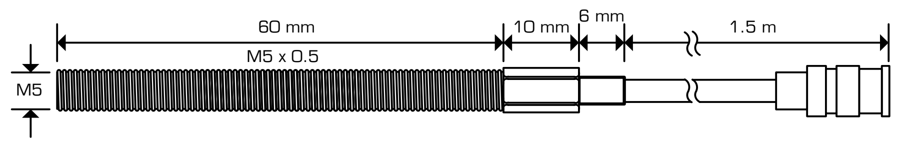
When the turbo wheel rotates, the indicated voltages can be interpreted according to the following table, assuming that the noise level is low (engine off):

Table 5: Positioning by analog voltage

Voltage	LED Light	Interpretation
Less than 0.20 V	LED shines green permanently or with short red breaks	The sensor is too far away, bring it closer to the wheel. The LED is also permanently green if the wheel is standing still or too slow (below 200 rpm).
Between 0.20 V and 0.25 V	LED shines red with short green breaks	Bring the sensor 0.1 mm closer to the wheel.
More than 0.25 V but less than 4 V	LED shines red permanently	Good signal. For gasoline engines it should be more than 1.5 V to have enough margin against noise.
More than 4 V	LED shines red permanently	Be careful. The sensor is very close to the wheel and might touch it.

3.6 Dimensions

Table 6: Mechanical dimensions of sensors

PICOTURN-SM5.1	
PICOTURN-SM5.3	
PICOTURN-SM5.5	
PICOTURN-SM5.6	
PICOTURN-SM5F.2	
PICOTURN-SM5F.3	-SM5F.3 
PICOTURN-SM5F.5	-SM5F.5 

3.7 Practical Hints

a) On engine test stands add an additional GND wire from the GND input of the PICOTURN-BM (black connector) to the engine. This is not necessary in cars.

b) The cable length should be only as long as necessary. The shorter the cable, the better the sensor signal quality will be. On engine test stands, the 1.5 m sensor cable length should be sufficient. The maximum total cable length is 3 m.

c) Prefer the digital output if both output signals can be used. It shows higher dynamics and better precision. The analog output might need a recalibration from time to time to fix voltage offset and slope. For recalibration we offer the PICOTURN-CT calibration device.

d) When you want to open the controller box, release the 4 upper screws. In case the screws are too tight, use a screwdriver and strike it with a brief but strong force. This will loosen the screw.

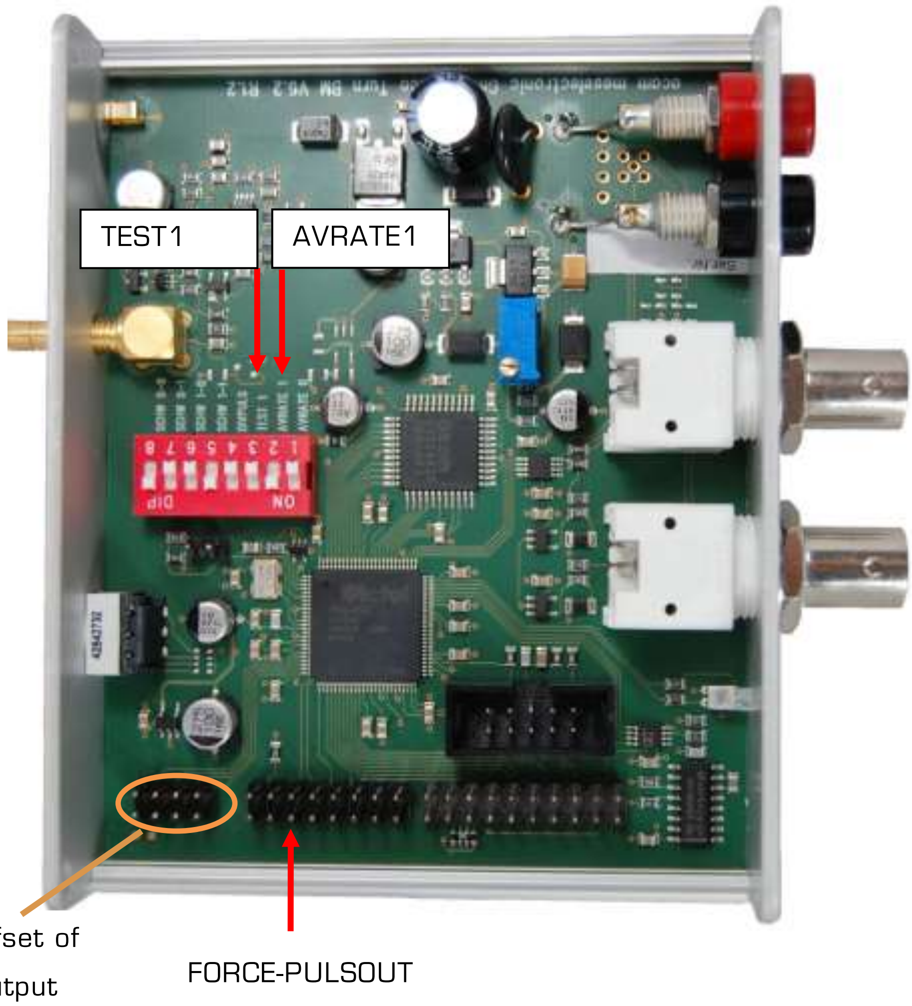
3.8 Measurement at high signal levels

The default setting of PICOTURN-BM V6.2 is for medium and weak signals. The internal DIP switches for filter settings will be set as follows:

- TEST1 = On
- AVRATE1 = On
- AVRATE0 = Off

If the sensor provides a very high signal level (analog output voltage > 4 V at vane number = 0, see section 3.5), then you should make changes stepwise in the following order, until the signal voltage falls below 4V:

1. Screw back the sensor a little bit
2. Set AVRATE1 = AVRATE2 = Off
3. Set TEST1 = Off.



All r testing and should be open.

3.9 Measuring very high Rotational Speeds

The default settings of the PICOTURN-BM V6.2 are optimized for rotational speed measurement up to 280.000 rpm. For measuring higher rotary speed, it could be helpful to adjust the internal filter settings to avoid interferences. In case of problems at high speed, the following steps can be tried:

1. If possible, the usage of an extension cable between the sensor and the PICOTURN-BM V6.2 evaluation box should be avoided. Conneting the sensor directly to the box gives the highest sensitivity.

All other steps require opening the box. Remove the upper four screws from the aluminum case and lift-off the housing cover. Then try one of the following:

2. Set DIP switch ‘AVRATE1’ to OFF (see picture above). This adjustment tunes the internal filter for a wider range and improves the system for measuring higher speed frequency.
3. It can also be helpful to put a jumper on the edge connector to activate signal ‘FORCE_PULSOUT’ (see picture above). This switches off the double peak suppression and thereby increases the system’s reaction speed.

After these steps the system supports a safe detection up to 100.000 vanes per second. Please consider the increased sensitive of the system towards external disturbances due to the extended sensitivity range of the internal filter. Therefore we recommend to apply steps 2 or 3 only as far as required for a stable high speed measurement.

4 Calibration

4.1 PICOTURN-CT ("PTCT")

This device is for testing and calibrating the PICOTURN-BM boxes. It simulates the behavior of a sensor mounted to a turbocharger. A selectable vane frequency / revolution speed is reproduced very precisely and allows the verification and calibration of the analog and digital output signals over the entire measurement range.

You select the number of vanes on a virtual compressor wheel and its simulated revolution speed by pushbutton code switches.

- Up to 32 vanes

PTCT front

PTCT back

- Revolution speeds between 0 and 360,000 rpm in steps of 40,000.

The calibration unit itself does not measure revolution speeds and can only be operated in conjunction with a PICOTURN-BM device.

4.2 Technical Data

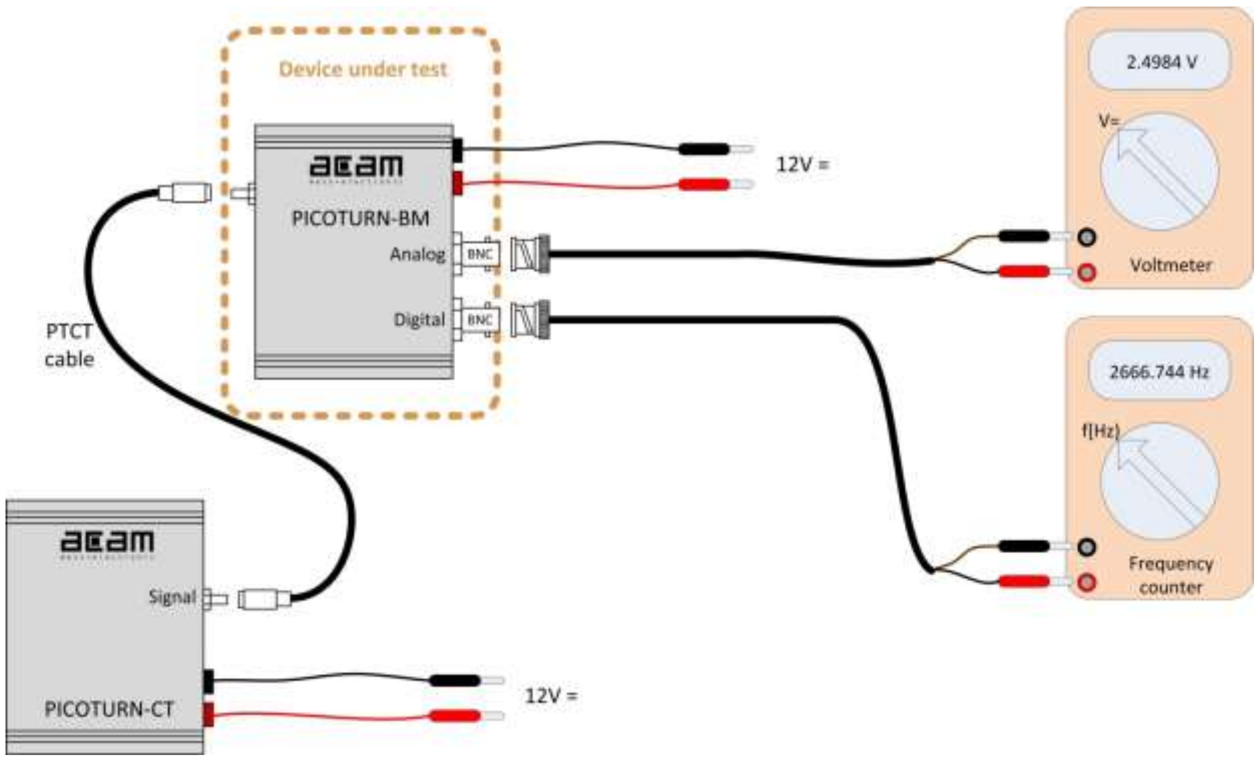
Table 7:Technical data

Supply voltage (box)	9 to 16 V	
Consumption (box)	20 mA @12 V	
Temperature (box)	-40°C to +85°C (-40°F to +185°F)	
Dimensions (box)	105 mm x 85 mm x 30 mm	
Length of PTCT cable MNR936, connecting CT and PICOTURN-BM	From SMB to SMB	Approximately 0.15 meters

4.3 Setup

In order to get started the following steps are necessary:

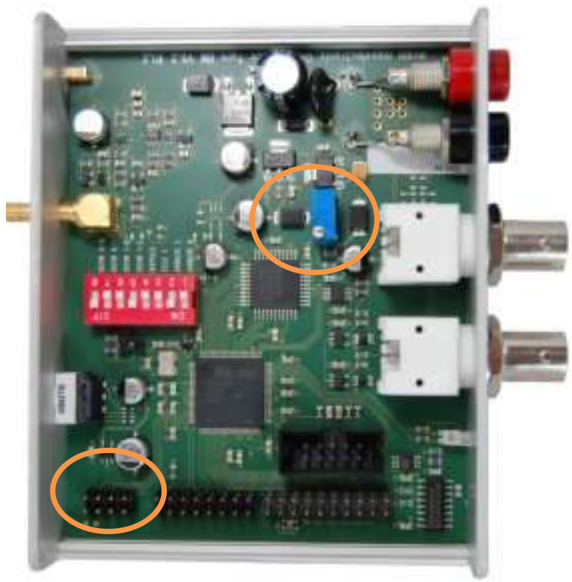
- Connect PICOTURN-BM device under test to a 12 V DC power supply (battery, stationary power supply). Connect the positive pole to the red connector, and the negative pole to the black connector. Connect the PTCT to the same power supply.
- Connect the PICOTURN-BM by means of the short PTCT cable to the PTCT.
- Connect the analog output of the PICOTURN-BM to a calibrated, precision multimeter to measure the output voltage.
- Connect the digital output to a calibrated, precision frequency counter.



4.4 Calibration process

For calibration please open the housing. The internal four jumpers (see figure below) adjust the offset in steps and the blue potentiometer adjusts the maximum value. The jumpers from left to right add 5 mV, 10 mV, 20 mV or 40 mV, respectively, in offset.

1. Configure the PICOTURN-BM and PTCT for the same vane number, e.g. 7 .
2. Set the PTCT to speed "7" = 280,000 rpm. The analog output voltage of the PICOTURN-BM should be 4.0 V. Adjust the potentiometer for an output voltage of 4.0 V, as precisely as feasible.



3. Now set the Speed at PTCT to 0 = 0 rpm. The analog output voltage should be 0.5 V. Correct the lower value by means of the jumper to come as close as possible to 0.5V.
4. Now check the upper value by setting the speed at PTCT to "7" again. If now the upper output voltage shows an increased deviation from 4.0 V, repeat steps 2-4 untill no further improvement is achieved.

4.5 Verification

The calibration is done in two steps. First, the number of vanes is set to a fixed value and only the speed setting is changed. Second, the speed is set to a fixed value and the vane number is changed.

4.5.1 Fixed Vane Number

The number of vanes is set to a fixed value, namely 10, on both PICOTURN-BM and PTCT. On the PICOTURN-BM rotational encoder, "A" stands for 10.

In the following the setting for speed is increased from 0 to 8 by means of the pushbuttons, and the values for output voltage and frequency are recorded, entered to the report and compared with the target values. The report is available as a ready-made Excel sheet from acam at no charge.

The tolerable deviation is:

Voltage +/- 0.5% of full scale
Frequency +/- 0.009% of full scale

Table 8: Calibration run with fixed vane number

Speed Switch setting	Nominal speed 1/min	Voltage			Frequency			Sta-tus
		actual volts	nominal volts	error % F.S.	actual Hz	nominal Hz	error % F.S.	
0	0	0.5023	0.5000	0.05	0.000	0.000	0.000	**ok**
1	40000	0.9998	1.0000	0.00	666.685	666.667	0.000	**ok**
2	80000	1.4977	1.5000	-0.05	1333.373	1333.333	0.001	**ok**
3	120000	2.0003	2.0000	0.01	2000.056	2000.000	0.001	**ok**
4	160000	2.4984	2.5000	-0.04	2666.744	2666.667	0.001	**ok**
5	200000	3.0017	3.0000	0.04	3333.429	3333.333	0.002	**ok**
6	240000	3.4997	3.5000	-0.01	4000.106	4000.000	0.002	**ok**
7	280000	4.0027	4.0000	0.06	4667.572	4667.445	0.002	**ok**
8	320000	4.5009	4.5000	0.02	5333.408	5333.333	0.001	**ok**

4.5.2 Calibration run with fixed nominal speed

On the PTCT the number of vanes has to be set to 4 and the speed has to be set to 7. This corresponds to a pulse frequency of 18,665.42 Hz.

The number of vane setting on the PICOTURN-BM box is variable. It is changed from 4 to 15 (10..15 = A..F), and again the values for output voltage and frequency are recorded, entered to the report and compared with the target values.

Table 9: Calibration run with fixed speed

No. of vanes setting	Nominal speed	Voltage			Frequency			Sta-tus
		actual	nominal	error	actual	nominal	error	
	1/min	volts	volts	% F.S.	Hz	Hz	% F.S.	
4	279981	4.0006	4.000	0.019	4666.49	4666.355	0.001	**ok**
5	223985	3.3026	3.300	0.061	3733.17	3733.084	0.000	**ok**
6	186654	2.8354	2.833	0.049	3110.99	3110.903	0.000	**ok**
7	159989	2.4994	2.500	-0.011	2666.56	2666.489	0.000	**ok**
8	139991	2.2490	2.250	-0.019	2333.25	2333.178	0.000	**ok**
9	124436	2.0561	2.055	0.015	2073.98	2073.936	0.000	**ok**
10	111993	1.9018	1.900	0.042	1866.60	1866.542	0.000	**ok**
11	101811	1.7719	1.773	-0.016	1696.91	1696.856	0.000	**ok**
12	93327	1.6659	1.667	-0.015	1555.50	1555.452	0.000	**ok**
13	86148	1.5759	1.577	-0.020	1435.85	1435.802	0.000	**ok**
14	79995	1.4989	1.500	-0.022	1333.28	1333.244	0.000	**ok**
15	74662	1.4349	1.433	0.037	1244.40	1244.361	0.000	**ok**

Settings 1, 2 and 3 produce a correct frequency at the digital output, but the analog output is not designed for that and sets the output to 5 V.

Note: The maximum vane frequency (vanes per second) is 100 kHz. If this frequency is exceeded due to the speed and No. of vanes setting, the calibration device automatically goes back to standstill. Choosing parameters out of range (e.g. No. of vanes < 4 or > 32) also causes standstill simulation.

The following table gives an overview of all valid settings for revolution speed and No. of vanes with the resulting vane frequency in kHz (thousands of vanes per second).

5 Miscellaneous

5.1 Last Changes

02. Apr. 07	First edition
14 Nov. 13	Version 1.2, merging the documents (DB_PicoTurnBM + DB_PicoTurnCT); resolution analog output adjusted to 0.5% at 25°C; ordering numbers adds
23 Jan. 14	Version 1.3, PicoTurn-SM5.5L (Part No.1108), PicoTurn-SM5F.3L (Part No.1109) and extension cable 2.5 m (part No.707) removed
13 May 14	Version 1.4, description of new DIP switch in section 2.5; description of new LED (red/green) in section 2.7 and section 2.8; section 2.11; dimensions modified in section 2.9;
8 Aug 14	Warnings and notices added; new description of calibration.
30. Sep 14	Change of section 3.8 due to changes in default settings.

The products PICOTURN comply with EMC Directive 89/336/EEC, applied standard DIN EN 61326, Equipment for Control and Laboratory (for use in electromagnetically controlled environment).

Generic immunity standard part 2 (EN 61000-4-4: 0,5KV, -4-6: 1V), In case of strong electromagnetic disturbances there might be a deviation of the output signal from the specification, but only for the duration of the disturbance.

acam
mess·electronic

acam-messelectronic gmbh
Friedrich-List-Straße 4
76297 Stutensee-Blankenloch
Germany
Phone +49 7244 7419 – 0
Fax +49 7244 7419 – 29
E-Mail support@acam.de
www.acam.de