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PICOTURN®

Data Sheet

PICOTURN 1st Generation

Rotational Speed Measurement System for Turbochargers

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Content

1 PICOTURN-1G Series – Product List

Part No.	Product	Description			
Sensors					
		Sensor length/ thread length	Diameter	Cable length	Temperature range sensor head
586	PICOTURN-SM5.1	60 mm/54 mm	M5 x 0.8	1.5 m	-40 °C to +180 °C
933	PICOTURN-SM5.3 (*)	60 mm/54 mm	M5 x 0.8	1.5 m	-40 °C to +230 °C
998	PICOTURN-SM5.5 (*)	46 mm/40 mm	M5 x 0.8	1.5 m	-40 °C to +230 °C
1059	PICOTURN-SM5.6 (*)	75 mm/69 mm	M5 x 0.8	1.5 m	-40 °C to +230 °C
934	PICOTURN-SM5F.2	41 mm/25 mm	M5 x 0.5	1.5 m	-40 °C to +230 °C
1081	PICOTURN-SM5F.3 (*)	56 mm/40 mm	M5 x 0.5	1.5 m	-40 °C to +230 °C
1574	PICOTURN-SM5F.5 (*)	76 mm/40 mm	M5 x 0.5	1.5 m	-40 °C to +230 °C
Accessories					
1242	PICOTURN-BM V6.2	Controller with BNC connectors for 8 to 30 V power supply			
890	PICOTURN-CT	Calibration Device for PICOTURN-BM controllers			
594	Extension cable	SMB Extension cable for sensors, 1.5 m length			
696	Clamping nut	M5 fine thread nut for sensors –SM5F.x			

(*) on request

230 °C types: 250 °C for max. 5 min

For applications which require a longer sensor cable , please use Extension cable (Part No. 594).

2 PICOTURN-BM V6

2.1 Description

PICOTURN 1st generation is built for sensing the rotational speed of turbochargers with the sensor mounted directly to the compressor wheel. The sensor is made of a simple coil with ferrite core. If a vane of the compressor wheel is brought in front of the sensor, its inductance is changed. This change of inductance is measured by a TDC (Time-to-Digital Converter), and the measured data is processed by a DSP to finally give 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.

The PICOTURN-BM V6 is our latest generation of PICOTURN. It is optimized with respect to similar sensitivity for the different kinds of sensors. 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). Also the use of an extension cable between the controller box and the sensor is possible.

The number of vanes is programmable between 1 - 15 / 16 – 31. The PICOTURN-BM offers two kinds of interface:

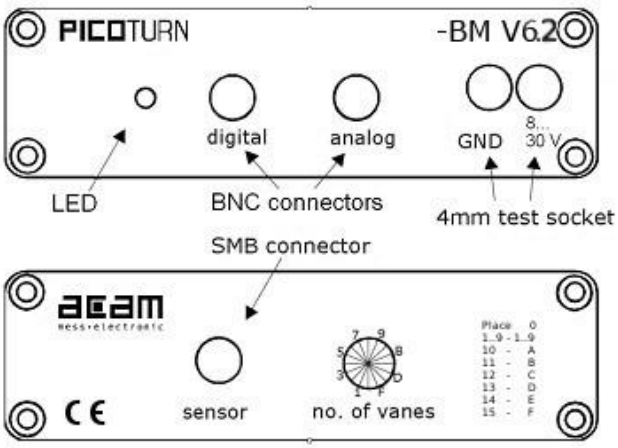
- Digital pulse interface
- Analog interface 0.5 V – 4.5 V

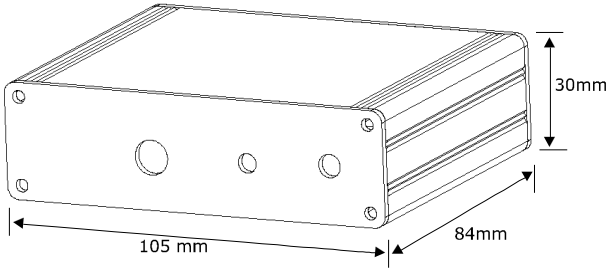
A measurement system requires at least a PICOTURN-BM V6 controller and a sensor from our PICOTURN-SMx.x series. The sensor is connected to the controller by a coaxial cable

with two inner conductors and about 1.5 m (59') length (max. 3 m (118')). The connector is SMB type. The controller is mounted into an aluminum case.

2.2 Mechanical Dimensions

2.2.1 PICOTURN-BM V6.2

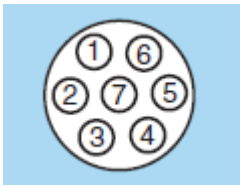




2.2.2 PICOTURN-BM V6L

Acam offers a special version with a Lemo connector instead of the 4mm banana connectors for power supply. In addition to the power line also the digital and analog output signals are available. The Lemo order number for the opposite male connector is EXG.1B.307.HLN. The pin assignment is as foloows:

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.



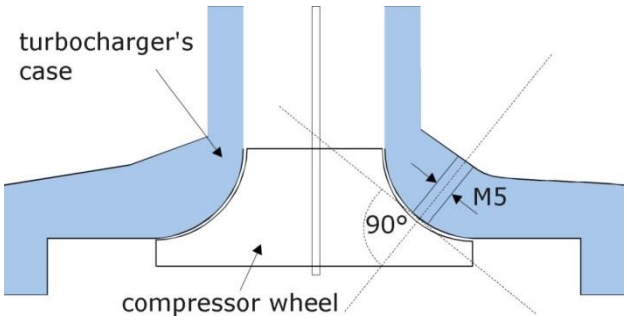
2.3 Installation

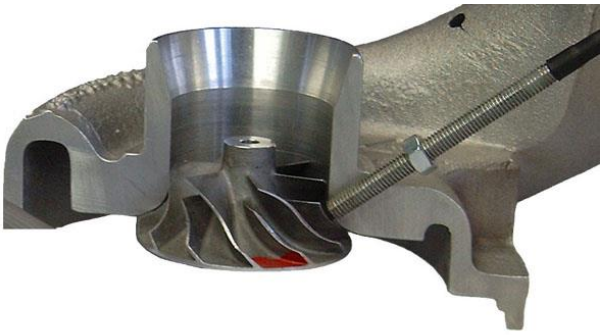
Installation is done by the following steps:

1. Connect the controller to a power supply (battery, stationary power supply), connecting the positive pole to the red connector (labelled '8 V - 30 V' and the negative pole to the black connector (labelled 'GND').
2. Set the number of vanes (for details see section 2.5 below)
3. Connect digital and/or analog outputs of the **PICO**TURN-BM controller unit to your data recorder (e.g. frequency counter, scope).
4. Mount the sensor at the compressor wheel. The maximum distance between sensor head and wheel depends on the shape of the vanes, especially their thickness. For aluminum vanes of 0.6 mm (0.024') thickness, the maximum distance is about 1 mm (0.039').
5. The mounting hole must be of M5 x 08- or M5 x 0.5-type and should be perpendicular to the inner surface of the turbocharger.
6. Connect the sensor to the ‚Sensor'- input at the backside of the controller.

The sensor should be mounted as close as possible to the compressor wheel. Make sure that it doesn't touch the wheel (Danger of destroying the compressor wheel)!

The signal quality is indicated by the controller's LED that should be shining continuously. For details see section 2.7 'LED – Display Functionality' in this manual.





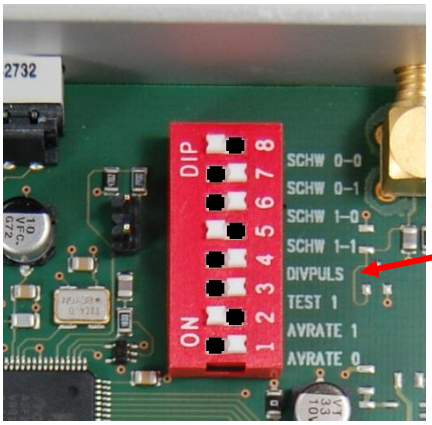
2.4 Technical Data

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

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

2.5 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 **PICO**TURN-BM V6 controller case. The standard range is 1 to 15 vanes, which can be shifted to 16 to 31 vanes by setting an inside DIP switch. For setting 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

Table 1: 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 2.8"

2.6 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 mentioned 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 setting 1, 2 and 3.

Hint: If the setting of vane number 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, example 1), or to increase resolution (setting a lower number, example 2).

Example 1:
Real 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 number: 10
Set number: 5
gives half the slope, 40,000 rpm/V and therefore a better resolution
Maximum speed is 160,000 rpm

2.7 LED – Display Functionality

Mode	LED behaviour	Circumstance	Consequences
A	LED stays black		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 o.k. 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 optimized.
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 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 o.k. 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).

2.8 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.

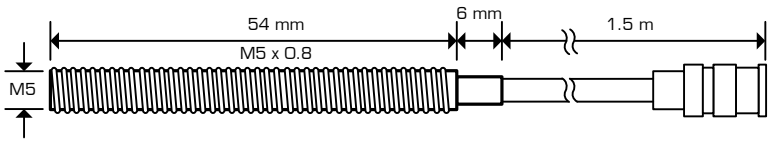
The number of vanes has to be set to 0 (code switch set to '0' and internal DIP switch DIVPULS off). A voltmeter has to be connected to the analog output, being set to the right measurement range (e.g. 5 V). In contrast to all other settings, the output voltage is below 0.2 V when the turbo is standing. 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 bet interpreted according to the following table, assumed that the noise level is low (engine off):

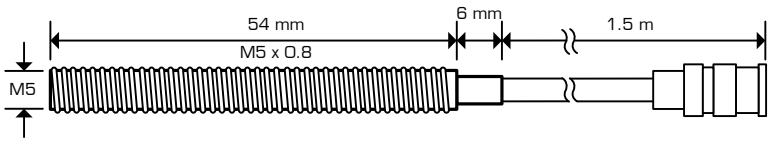
Voltage	LED Light	Interpretation
Less than 0.20 V	LED shines green permanetly or with short red breaks	The sensor is too far away, bring it closer to the wheel. The LED is also permanently green if the wheel is standing still or too slow (below 200 rpm).
Between 0.20 V and 0.25 V	LED shines red with 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 permanently on (red)	Be carefull. The sensor is very close to the wheel and might touch it.

2.9 Dimensions

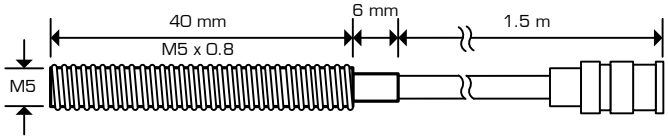
PICOTURN-SM5.1



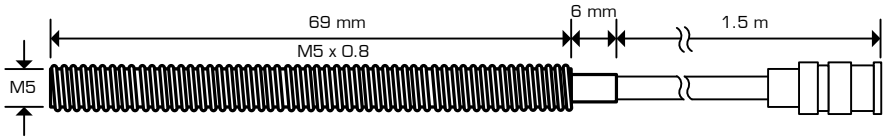
PICOTURN-SM5.3



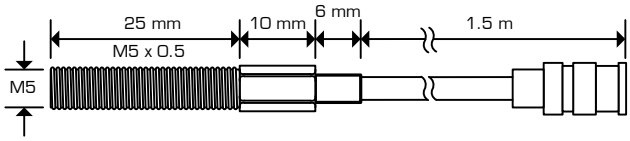
PICOTURN-SM5.5



PICOTURN-SM5.6

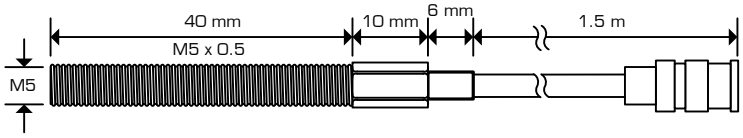


PICOTURN-SM5F.2



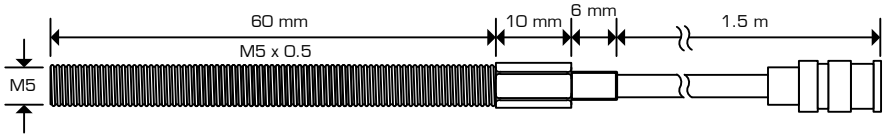
PICOTURN-SM5F.3

-SM5F.3



PICOTURN-SM5F.5

-SM5F.5



2.10 Practical Hints

a) On engine test stands add an additional GND wire from the GND input of the **PICO**TURN-BM controller (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 will be the sensor signal quality. 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 re-calibration from time to time to fix voltage offset and slope. For re-calibration we offer the **PICO**TURN-CT calibration device.

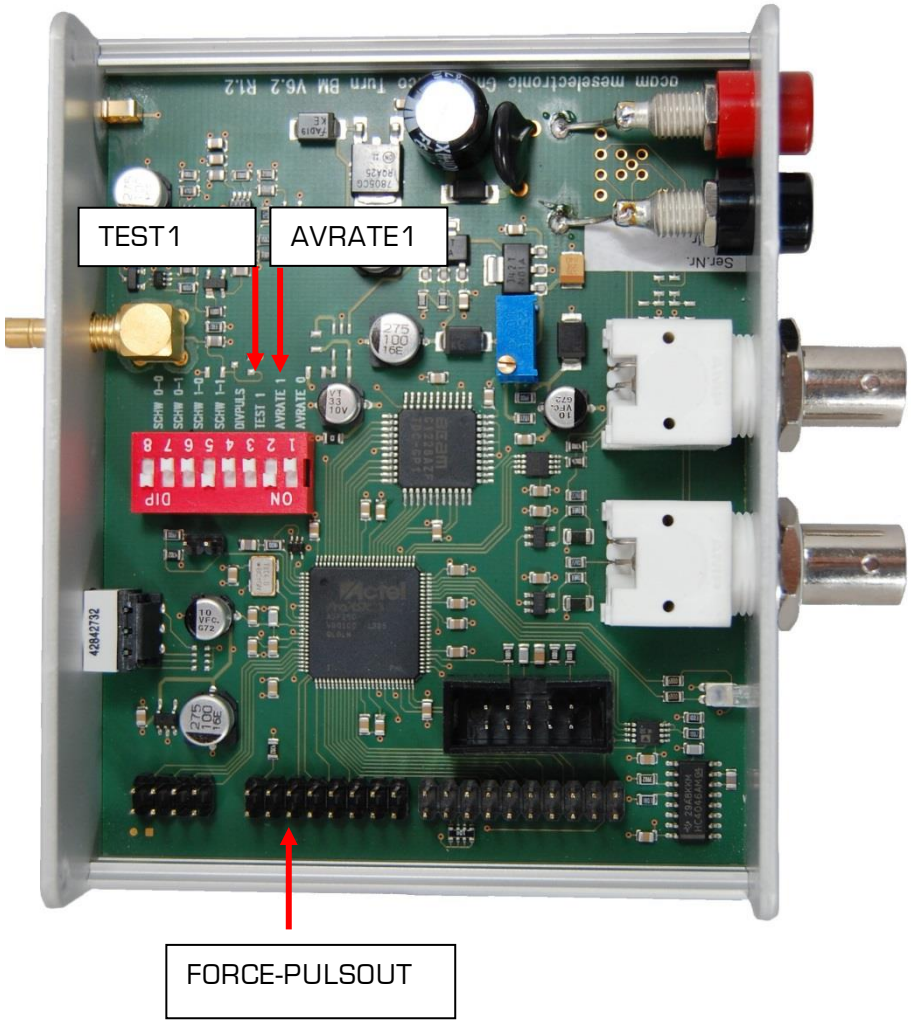
d) When you want to open the controller box, release the upper 4 screws. In case the screws fit very tough, apply the screw driver and give him a short, strong beat. This will loosen the screw.

2.11 Measuring very high Rotational Speeds

The default settings of the **PICO**TURN-BM V6 are optimized for rotational speed measurement up to 280.000 rpm. For measuring higher rotary speed, it could be necessary 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 **PICO**TURN-BM V6.2 evaluation box should be avoided. Connecting 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: Set DIP switch ‘AVRATE1’ to OFF (see picture below). This adjustment tunes the internal filter for a wider range and improves the system for measuring higher speed frequency.

2. Alternatively or in addition, DIP switch 'TEST1' may be set to ON (see picture below). This setting changes the internal filter scheme to a bandpass, which may increase signal stability, depending on the application.
3. It can also be helpful to put a jumper on the edge connector to activate signal 'FORCE_PULSOUT' (see picture below). 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 1 to 3 only as far as required for a stable high speed measurement. .

3 PICOTURN-CT

3.1 Description

This device is for testing and calibrating the PICOTURN-BM device which is used to measure the rotational speed of turbochargers. It simulates the behavior of a sensor mounted to a turbo charger.

It is connected to the control unit PICOTURN-BM instead of a sensor. 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.

The PICOTURN-BM system is designed for revolution speeds of up to 350,000 rpm. The minimum revolution speed is 200 rpm. The calibration unit PICOTURN-CT covers that entire range.

The number of vanes on a virtual compressor wheel and its simulated revolution speed are selected by push-button code switches.

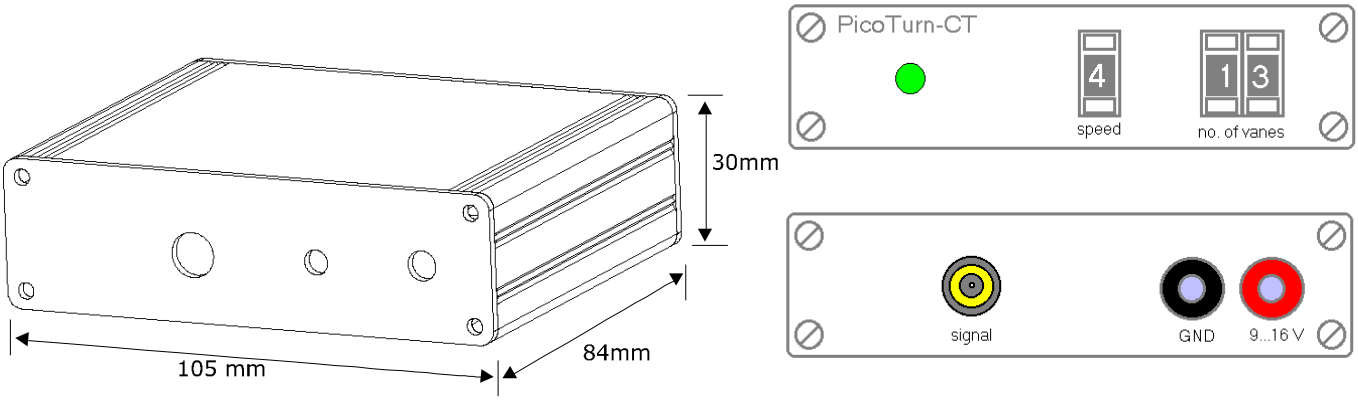
- up to 32 vanes
- revolution speeds between 0 and 360,000 rpm in steps of 40,000 rpm

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

3.2 Basic Structure

The PICOTURN-CT device provides a signal output on an SMB connector, intended for being plugged to the PICOTURN-BM signal input via a coaxial cable. PICOTURN-CT is housed in an aluminum case similar to PICOTURN-BM. It needs to be powered by a 9 to15 Volts DC power supply and can be operated in parallel with the power supply for the PICOTURN-BM device, using the banana plug sockets. The current consumption of the calibration unit alone is about 20 mA.

3.3 Dimensions



3.4 Setup

In order to get started the following steps are necessary:

- Connecting both devices to a power supply (battery, stationary power supply), connecting the positive pole to the red connector (labeled '9-15V'), and the negative pole to the black connector (labeled 'GND'). It is possible to operate both devices in parallel with one power supply.
- Plugging the coaxial cable into the SMD connector of the **PICO**TURN-BM device labeled 'sensor'.
- Plugging the other end of the coaxial cable into the SMD connector of the calibration device labeled 'signal'
- Selecting the correct number of vanes at the rotational code switch of the **PICO**TURN-BM device.
- Selecting the same number of vanes with the push-button code switches of the calibration device (choose a value between 04 and 32).
- Connecting the digital and/or analog output connectors to an oscilloscope or voltmeter.
- Selecting the desired rotational speed at the push-button code switch labeled "speed".

A green/red (V6.2) or red (up to V6.1) light-emitting diode displays **PICO**TURN-BM's operating status, which deserves to be recorded. Before plugging the coaxial cable, this LED should blink quickly to indicate "no sensor". After plugging, with "speed" set to zero, it should turn green (V6.2) or dark (up to V6.1). On toggling to a non-zero speed, it should give continuous red light.

3.5 Settings

- The push-button code switch labeled "speed" on the calibration device sets the revolution speed. The simulated speed is given by the number shown on the switch times 40,000 rpm. A switch position of "0" means no rotation, "1" a revolution speed of 40 thousand rounds per minute, "2" means 80,000 rpm, and so on up to "9", which represents 360,000 rpm.

A double push-button code switch permits to choose the "number of vanes" present on the virtual turbocharger compressor wheel, to be simulated.

Please note that the maximum vane frequency (vanes per second) is 100 kHz. Is this frequency exceeded due to "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) provokes standstill simulation, too.

If the control device **PICO**TURN-BM detects no rotation, it goes into a wait mode and the voltage at the analog output connector measures 0,5 V. The LED is green (V6.2) or off (up to V6.1).

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

Table 1: Vane frequency as function of speed and number of vanes setting

'no. of vanes'-Switch \ 'Speed'-Switch	0	1	2	3			6	7	8	9
SZ										
04	0,0	2,667	5,333	8,000	10,667	13,333	16,000	18,665	21,333	23,995
05	0,0	3,333	6,667	10,000	13,333	16,667	20,000	23,337	26,667	30,008
06	0,0	4,000	8,000	12,001	16,000	20,000	23,995	27,992	32,000	36,004
07	0,0	4,667	9,333	14,001	18,665	23,337	27,992	32,680	37,348	42,017
08	0,0	5,333	10,667	16,000	21,333	26,667	32,000	37,348	42,644	48,019
09	0,0	6,000	12,001	18,002	23,995	30,008	36,004	42,017	48,019	53,981
10	0,0	6,667	13,333	20,000	26,667	33,333	40,000	46,674	53,333	59,970
11	0,0	7,333	14,668	22,002	29,326	36,664	44,004	51,348	58,651	66,007
12	0,0	8,000	16,000	23,995	32,000	40,000	48,019	56,022	64,000	71,942
13	0,0	8,667	17,331	26,008	34,662	43,337	52,016	60,698	69,324	77,973
14	0,0	9,333	18,665	27,992	37,348	46,674	56,022	65,359	74,627	84,034
15	0,0	10,000	20,000	30,008	40,000	50,000	59,970	70,053	80,000	90,090
16	0,0	10,667	21,333	32,000	42,644	53,333	64,000	74,627	85,288	95,923
17	0,0	11,335	22,663	34,014	45,351	56,657	68,027	79,365	90,703	0,000
18	0,0	12,001	23,995	36,004	48,019	59,970	71,942	84,034	95,923	0,000
19	0,0	12,666	25,332	37,987	50,697	63,291	76,046	88,692	0,000	0,000
20	0,0	13,333	26,667	40,000	53,333	66,667	80,000	93,240	0,000	0,000
21	0,0	14,001	27,992	42,017	56,022	70,053	84,034	98,039	0,000	0,000
22	0,0	14,668	29,326	44,004	58,651	73,394	87,912	0,000	0,000	0,000
23	0,0	15,332	30,675	45,977	61,350	76,628	91,954	0,000	0,000	0,000
24	0,0	16,000	32,000	48,019	64,000	80,000	95,923	0,000	0,000	0,000
25	0,0	16,667	33,333	50,000	66,667	83,333	100,000	0,000	0,000	0,000
26	0,0	17,331	34,662	52,016	69,324	86,580	0,000	0,000	0,000	0,000
27	0,0	18,002	36,004	53,981	71,942	90,090	0,000	0,000	0,000	0,000
28	0,0	18,665	37,348	56,022	74,627	93,240	0,000	0,000	0,000	0,000
29	0,0	19,333	38,685	57,971	77,369	96,618	0,000	0,000	0,000	0,000
30	0,0	20,000	40,000	59,970	80,000	100,000	0,000	0,000	0,000	0,000
31	0,0	20,672	41,322	62,016	82,645	0,000	0,000	0,000	0,000	0,000
32	0,0	21,333	42,644	64,000	85,288	0,000	0,000	0,000	0,000	0,000

Note: The ideal frequency values would all be multiples of 0.3333333 kHz. The reason why some are not is that they are all derived from a single oscillator frequency, with requires sometimes odd divisors. There is no adverse incidence on the calibration of the analog output voltage.

3.6 Interpretation Of Results: The Digital Output

Table 1 shows an overview of the vane frequencies. At the digital output of the **PICO**TURN-BM device, however, the frequency is different. It is that frequency divided by the number of vanes selected on the **PICO**TURN-BM device switch. If the number of vanes settings are identical on both devices, as recommended, the frequency at the digital output of **PICO**TURN-BM will have approximately the following values (as approximate target values):

'Speed'-Switch									
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
0,0	0,667	1,333	2,000	2,667	3,333	4,000	4,667	5,333	6,000
0,0	0,667	1,333	2,000	2,667	or 0,000 (compare Table 1)				

Table 2: Approximate target values of the digital output in kHz

Accurate values can be determined by dividing the table 1 values by the number of vanes setting. Regarding the speed settings '8' and '9' see also section "Extreme Speed" in this document.

3.7 Interpretation Of Results: The Analog Output

The analog output of the control device **PICO**TURN-BM is a 0.5 V – 4.5 V interface. The slope of the output voltage signal versus the turbo wheel frequency is 80,000 rpm/V which means that the voltage is 4.5 V at 320,000 rpm. Please note that the no. of vanes selected at the control device **PICO**TURN-BM influences the voltage at its analog output. The slope of 80,000 rpm/V is only valid for the correct selection of no. of vanes.

Therefore it is important that the no. of vanes selected at the control device **PICO**TURN-BM is equal to the no. of vanes selected at the calibration device.

By changing the revolution speed on the calibration device the stepwise change of the output voltage on the control device **PICO**TURN-BM can be observed. At the starting position with no rotation the voltage is 0.5 V. With each increase of the revolution speed by one the output voltage increases by 0.5 V nearly up to 5 V at a revolution speed of 360,000 rpm.

This stepwise change of the output voltage can be observed at each no. of vanes selected within the valid range.

Please note that when using the analog output the selected no. of vanes has to be between 4 and 31.

The following table shows an overview over the target values of the analog output voltage of the control device **PICO**TURN-BM for all settings of revolution speed and no. of vanes at the calibration device.

'no. of vanes'-Switch

	'Speed'-Switch									
SZ	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
00 bis 03	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5
04 bis 16	0,500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	5,000
17 und 18	0,500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	4,500	0,5
19 bis 21	0,500	1,000	1,500	2,000	2,500	3,000	3,500	4,000	0,5	0,5
22 bis 25	0,500	1,000	1,500	2,000	2,500	3,000	3,500	0,5	0,5	0,5
26 bis 30	0,500	1,000	1,500	2,000	2,500	3,000	0,5	0,5	0,5	0,5
31	0,500	1,000	1,500	2,000	2,500	0,5	0,5	0,5	0,5	0,5

Table 3: Target values of the analog output in volts

Note: The electronics is unable to reach 5,00 volts and will display approx. 4,95 volts instead.

The actual values will be slightly different from the target values since they are generated by a digital-to-analog converter. Variations of plus/minus15 mV are unavoidable even with optimal adjustment.

3.8 Interpretation Of Results: Extreme Speed

On original, "ex works" tuning, **PICO**TURN-BM is optimized for a maximum of 50 thousand vanes per second. In terms of **PICO**TURN-CT settings, this corresponds to "speed" = "7" and "no. of vanes" = "10" and thus 280 thousand rpm. In order to measure higher speed, you may need to modify the **PICO**TURN-BM tuning, see section 2.11.

3.9 Special Mode: Idle Speed

In order to simulate an idle state of the engine, put "no. of vanes" to "01" and "speed" to "1". This results in simulating 666 vanes per second. Accordingly, pulses are detected at the digital output, which depend on setting made to **PICO**TURN-BM. When setting is "0", frequency will be 666 Hz, when set to "5" it will be 133 Hz, when set to "10", it will be 67 Hz and so forth. – This operating mode is intended for test only and does not serve calibration purposes.

4 Miscellaneous

4.1 Literature Guide

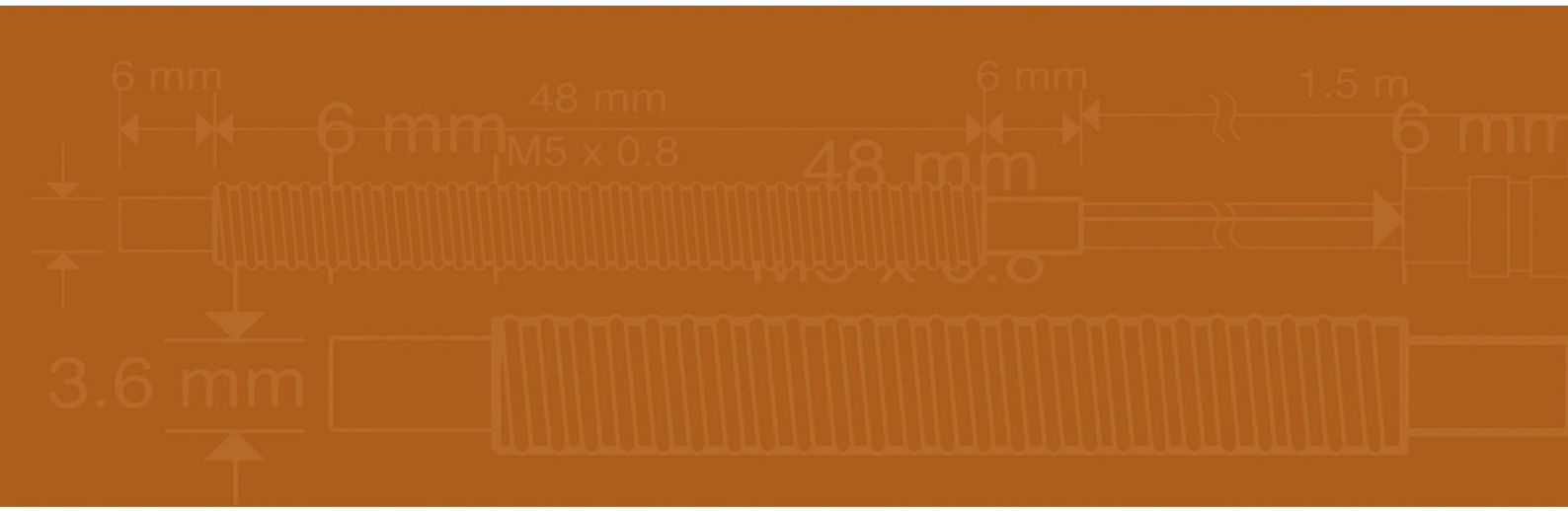
4.2 Last Changes

02. Apr. 07	First edition
14. Nov. 13	Version 1.2, Merging the documents (DB_PicoTurnBM + DB_PicoTurnCT); Resolution analog out adjusted to 0.5% at 25°C; Ordering numbers adds;
23. Jan. 14	Version 1.3, PicoTurn-SM5.5L (Part No.1108), -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;

CE

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.



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