INDU TACHOMETER
Manual

Kanardia d.o.o.

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Revision 1.2

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Revision History

The following table shows the revision history of this document.

Rev.	Date	Description
1.0	June 2016	Initial release.
1.1	July 2019	Reformatted, Engine time
1.2	October 2020	Minor fixes

Contents

1 Introduction

First of all, we would like to thank you for purchasing our device. Indu Tachometer is an electronic device, which mimics classical RPM instrument construction and combines it with the state of the art electronics. This results in the best of both worlds; a perfect and intuitive analogue reading combined with high precision of modern electronics.

This manual describes the technical description of the unit, installation and operation.

CAUTION: Indu Tachometer is not TSO approved as a flight instrument.

1.1 General Description

Indu Tachometer is an electromechanical device. It consists of special analogue input stage electronics which in combination of microcontroller converts input electrical signal into RPM value. The electronics reads the electrical signal from RPM sensor and drives stepper motor turning a needle. RPM information is also shown on a colour LCD display. When connected to a CAN bus instrument outputs RPM and engine hours[1] data which can be used by other Kanardia devices.

Display is divided linearly in 230°scale with colour LCD display in the center. Scale is user configurable and must be specified when ordering the device.

The instrument is avaliable[1] in 57 mm and 80 mm size.

[1] Must be specified at the time of order. Please refer to "INDU RPM Ordering Form" for more details.

1.2 Technical Specification

Table 1 shows some basic technical specification of Indu Tachometer.

Description	Value
Weight	57 mm: 150 g
	80 mm: 200 g
Size	57 mm : 62 x 62 x 45 mm
	80 mm : 82 x 82 x 45 mm
Operational voltage	6 $\sim$ 32 V
Power consumption	1.26 W
Current	105 mA at 12 V 53 mA at 24 V
Operating temperature	-30 $\sim$ +85 °C
Humidity	30 $\sim$ 90 %, non condensing
Engine RPM input signal	0 $\sim$ 1000 Hz
Rotor RPM input signal	0 $\sim$ 1000 Hz
Communication	CAN bus, 29 bit header, 500 kbit, Kanardia protocol

Table 1: Basic technical specifications.

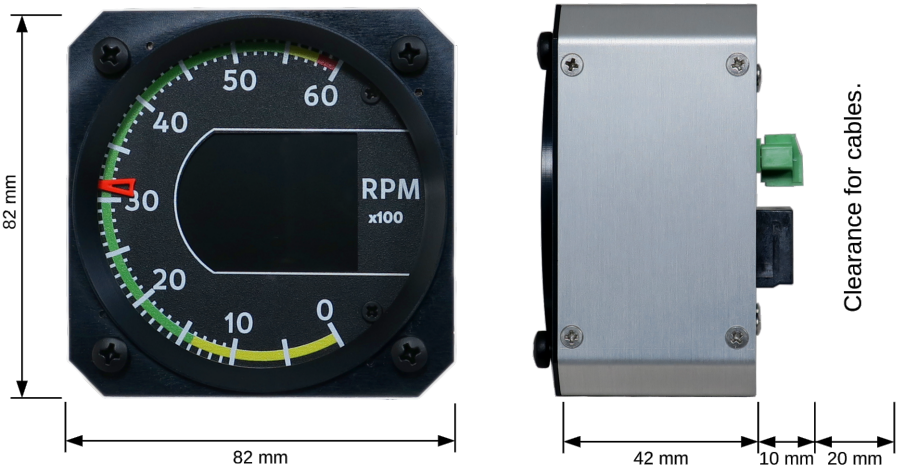
2 Options

2.1 Scale

Figures 2 and 3 show three standard scale configurations for each size of instrument: D-motor, Lycoming and Rotax. Custom scale is also avaliable on request.

Scale holds color-coded markings in order to give the pilot immediate reference. The following markings are possible:

(a) 57 mm

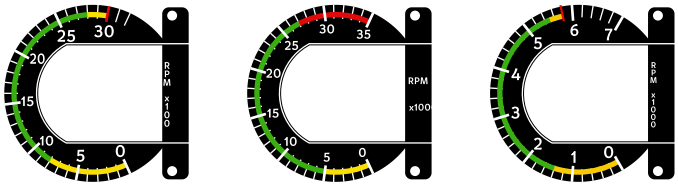


(b) 80 mm

Figure 1: Front and side view of the Indu Tachometer with its principal dimensions.

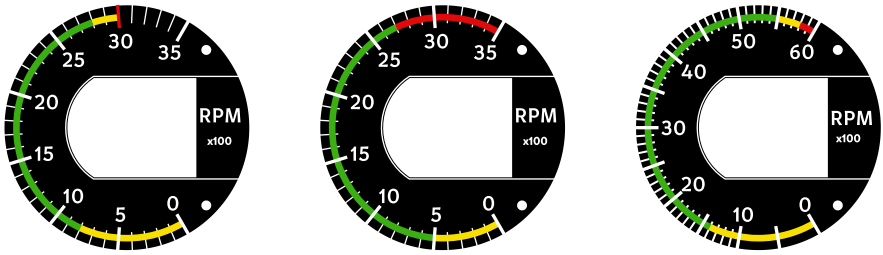
- Engine limit – **Red arc between D and E.** This mark/arc designates the engine max RPM limits. The engine shall never operate in this area.

- Engine high-RPM range – **Upper yellow arc between C and D.** This designates the range of RPM, which should not be used for longer period and should be generally avoided.
- Recommended range of RPM – **Green arc between B and C.** This designates the recommended range of RPM.
- Engine low-RPM range – **Lower yellow arc between A and B.** This designates the range of RPM, which should not be used for longer period and should be generally avoided.



(a) D-motor (b) Lycoming (c) Rotax

Figure 2: Standard 57 mm scales.



(a) D-motor (b) Lycoming (c) Rotax

Figure 3: Standard 80 mm scales.

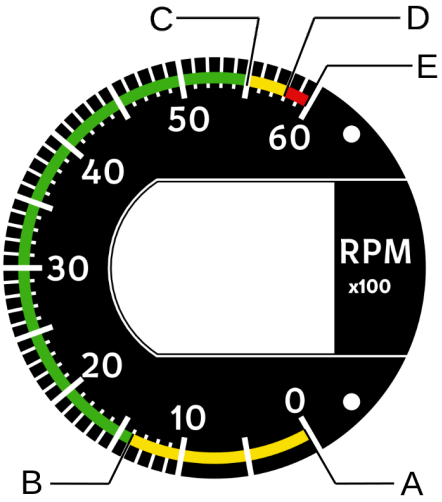


Figure 4: A scale example with the markings.

2.2 Display

By default, Indu Tachometer displays engine RPM information on LCD display. Instruments with engine time recorder option displays also engine time information. Figure 5 shows all possible display configurations. Display configuration must be specified at the time of order.

(a) Default

(b) RPM + totalizer

(c) Rotor RPM

Figure 5: Display configurations.

If you want a different LCD display layout, you can configure it yourself with our Customizer application. This option requires Kanardia's BLU plug for transfering the configuration from your Android device to your Indu Tachometer. Please read our *Customizer Manual* for more information.

2.3 Visual Warnings

Indu Tachometer can be configured[1] to show two types of warnings on LCD display:

- **RPM yellow zone.** Yellow RPM value designates that the engine operates in yellow zone, which was defined at the time of order (Figure 6a).
- **RPM red zone.** Red RPM value designates that the engine operates in red zone, which was defined at the time of order (Figure 6b).

(a) Yellow zone

(b) Red zone

Figure 6: Visual warnings.

3 Special Versions

Special versions of Indu Tachometer instrument are avaliable with engine time recorder and/or additional rotor RPM input. This special functionality must be specified at the time of order.

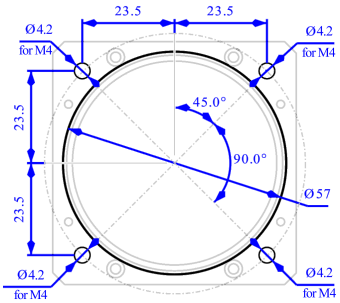
- **Engine time recorder.** Instrument measures and stores engine running time on integrated memory module. The engine time value is displayed on LCD display (Figure 5b).
- **Rotor RPM.** Instrument is modified to support two RPM sensors. Engine RPM value is presented by the mechanical needle while the rotor RPM value is displayed on LCD display (Figure 5c). The engine time value can also be displayed on LCD display.

4 Installation

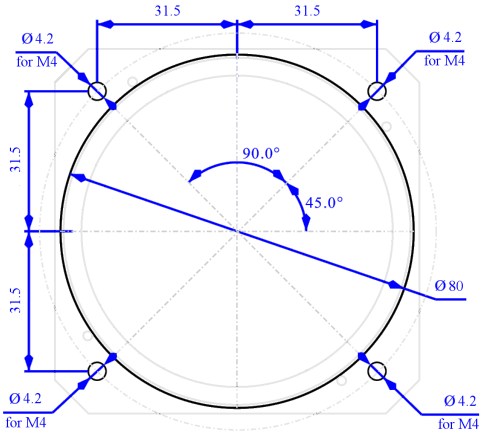
Indu Tachometer requires a standard size 57/80 mm hole in the instrument panel. The position of the hole must ensure that the instrument is always visible from the pilot's perspective.

4.1 Mounting Dimensions

The mounting screw holes are located on a circle of 66.5/89 mm diameter. The instrument is mounted using four screws type M4. To prevent internal stresses, please make sure that the instrument panel is flat. It is highly recommended that the instrument panel is mounted using rubber shocks, which reduce the vibrations. Figure 7 illustrates the mounting hole for both sizes of instrument.



(a) 57 mm



(b) 80 mm

Figure 7: Instrument panel cutout and mounting hole. Note: Figures are not in scale.

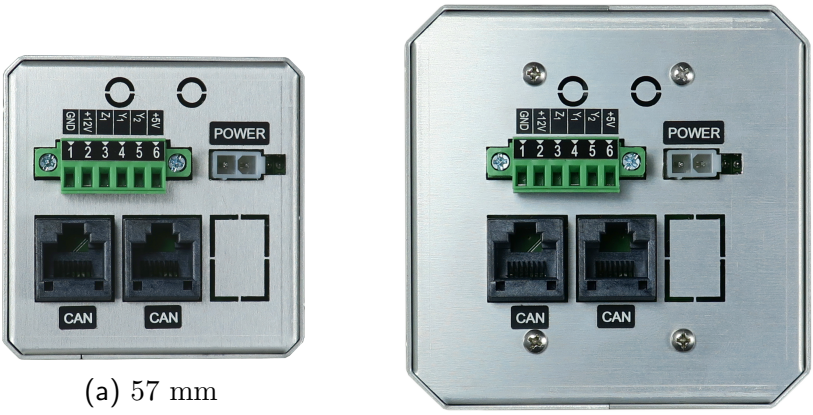
4.2 Connections

Figure 8 illustrates all connections at the back side of the instrument.

4.2.1 RPM Signal Input

The RPM signal is obtained from RPM sensor. Most of the engines are already equipped with such sensor. Refer to your engine manual for wiring. If your engine is not equipped with RPM sensor, refer to engine manual for supported sensors and sensor installation.

Section 4.3 provides some wiring examples of most common RPM sensor types.



(a) 57 mm

(b) 80 mm

Figure 8: Back view of the instrument with connections.

4.2.2 CAN Bus - CAN

Connection to the CAN bus is optional and is not required for the normal operation.

Use standard RJ45 ethernet cable to connect it with other Kanardia equipment.

When connected to the bus, Indu Tachometer will transmit engine RPM, rotor RPM[1] and engine time[1] data to other units connected to the bus.

4.2.3 Power - POWER

Connect supplied connector at the back of the instrument. The connector has a notch on one side, which protects from wrong orientation.

Connect blue lead to negative (ground) terminal and red lead to positive (+6 to +32 V) terminal.

4.3 Sensors

Most of the engines come with factory installed RPM sensors. This section describes most commonly used sensor types and provides wiring example for each type. Refer to your engine manual for identifying RPM sensor type and wiring.

4.3.1 Variable-Reluctance (Magnetic) Pickup

Two wires are used. One wire is connected to "Z1" pin and the other is connected to "GND" pin on RPM connector. Refer to Figure 9a for proper connection schema.

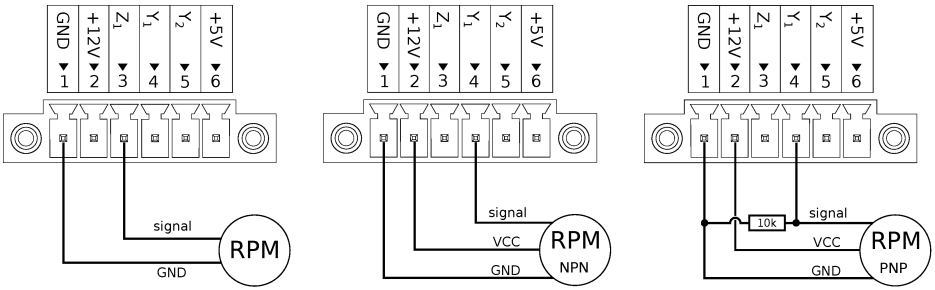
4.3.2 Trigger Coil

Rotax (912) engines usually come equipped with a trigger coil for monitoring engine RPM. One wire is connected to "Z1" pin and the other wire is connected to "GND" pin on RPM connector. Refer to Figure 9a for proper connection schema.

4.3.3 Active Inductive RPM Sensors.

- NPN (Open Collector Output)
  Connect sensor +5/+12 V input with appropriate +5/+12 V pin according to sensor specifications. Sensor ground is connected to "GND" pin. Signal must be connected to "Y1" pin. Refer to Figure 9b for proper connection schema.

- PNP (Open Emitter Output)
  Sensor wiring is the same as for NPN sensor, but you have to connect 10kOhm resistor between "Y1" and "GND" pin. Refer to Figure 9c for proper connection schema.



(a) Trigger coil (b) Active NPN (c) Active PNP

Figure 9: Wiring diagram for most commonly used RPM sensor types.

4.4 Examples

4.4.1 Rotax 912

Table 2 shows settings for Rotax 912 engine. *Pulses* is set to one as there is only one pulse per RPM. *Prop reduction* value is set to one – no reduction is applied and output value will be engine RPMs.

Option	Selection/Setting
Channel	Z only
Function	Engine RPM
Sensor	Rotax
Report time	0.2 – 0.5 s
Filter	about 0.5 s
Pulses	1
Prop reduction	1

Table 2: Settings appropriate for Rotax 912 engine.

4.4.2 Rotax 582

Table 3 shows appropriate settings for Rotax 582 engine. When engine is equipped with Ducati DCDI ignition (newer engines) then *Pulses* shall be set to 6. If the engine has some other ingition then *Pulses* may be set to 2 or 3, depending on the ignition used – you will have to experiment. *Prop reduction* value is set to one – no reduction is applied and output value will be engine RPMs. Also note that *Sensor* must be set to `Rotax 582`. Namely, the signal of 582 engine is exeptionaly ugly and requires different processing.

Option	Selection/Setting
Channel	Z only
Function	Engine RPM
Sensor	Rotax 582
Report time	0.2 – 0.5 s
Filter	about 0.5 s
Pulses	6 for Ducati DCDI (2 or 3 otherwise)
Prop reduction	1

Table 3: Settings appropriate for Rotax 582 engine.

4.4.3 Jabiru

Table 4 shows typical settings for Jabiru engines. *Pulses* is set to two as two metal tabs are attached to the inside of the flywheel. Prease refer to the Jabiru installation manual for more details.

4.4.4 Lycoming and Continental

Let's assume a Lycoming engine, with Hall sensor. Such sensors are usually installed in magneto vent hole. They typicaly give one pulse

Option	Selection/Setting
Channel	Z only
Function	Engine RPM
Sensor	Jabiru
Report time	0.2 – 0.5 s
Filter	about 0.5 s
Pulses	2
Prop reduction	1

Table 4: Settings appropriate for Jabiru engine.

per revolution in 4 cylinder engine and 1.5 pulses in 6 cylinder engine. In this case, the configuration is shown in table 5. A trick is used for 6 cylinder engine: 3 pulses are used with reduction of 0.5, which yields 1.5 pulses per revolution. There are many different sensors solutions for Lycomming and Continental engines and some other settings may be required.

Option	Selection/Setting
Channel	Any Y
Function	Engine RPM
Sensor	Digital Pulse
Report time	0.2 – 0.5 s
Filter	about 0.5 s
Pulses	1 (4 cylinder), 3 (6 cylinder)
Prop reduction	1 (4 cylinder), 0.5 (6 cylinder)

Table 5: An example for Lycoming engine. 6 cylinder version uses trick with reduction set to 0.5 in order to get 1.5 pulses per revolution.

4.5 Engine Time - Totalizer

Some Indu Tachometers are able to count and display engine time as well. Engine time is factory set to 0 by default. Any other time can be set, but this must be specified from the customer at the time of order.

Engine time starts counting as soon as engine RPM signal is detectected.

4.5.1 Setting New Time

New engine time can be also set afterwards, but this requires some additional equipment: *Blu* and an Android device (telephone or tablet) and *Kanja* software installed on the device. Please refer to the *Blu & Kanja* Manual for more details.

5 Maintenance & Repair

No special maintenance is required.

The instrument has no serviceable parts inside. In the case of malfunction, it must be sent to factory for a repair.

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