

# INDU AIRSPEED INDICATOR Manual

Kanardia d.o.o.

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Revision 1.1



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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	January 2020	Airspeed sensor change.

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# 1 Introduction

First of all, we would like to thank you for purchasing our device. Indu airspeed is an electronic device, which mimics classical airspeed 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 Airspeed Indicator is not TSO approved as a flight instrument.

## 1.1 General Description

The airspeed is an electromechanical device. It consists of high precision electronic differential pressure sensor, which provides dynamic air pressure information in digital form. The electronics reads the sensor and drives stepper motor turning a needle. Airspeed information is also shown on a colour LCD display. When connected to a CAN bus the airspeed outputs airspeed and OAT <sup>1</sup> 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 custom made and must be specified when ordering the device.

There is a special version<sup>1</sup> of airspeed indicator that can display true airspeed (TAS) and outside air temperature (OAT) information on

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<sup>1</sup> Must be specified at the time of order. Please refer to “INDU Airspeed Ordering Form” for more details.

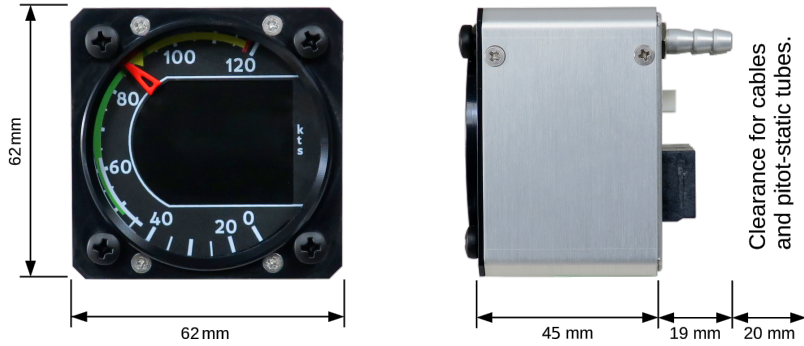
LCD display. This requires an external OAT probe to be connected to airspeed and an Indu Altimeter to be present on same CAN bus.

## 1.2 Technical Specification

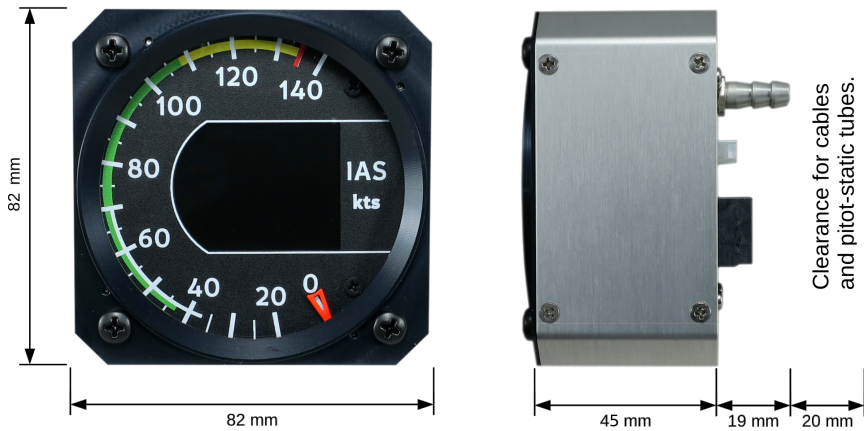
Table 1 shows some basic technical specification of Indu Airspeed Indicator.

Description	Value
Weight	57 mm: 160 g (cca 210 g with OAT probe)
	80 mm: 210 g (cca 260 g with OAT probe)
Size	57 mm: 62 x 62 x 45 (64 with connectors)
	80 mm: 82 x 82 x 45 (64 with connectors)
Operational voltage	6 ~ 32 V
Power consumption	1.26 W
Current	105 mA at 12 V
	53 mA at 24 V
Operating temperature	-30 ~ +85 °C
Humidity	30 ~ 90 %, non condensing
Airspeed sensor	12 bit, 0 ~ 69 hPa, 381 km/h (205 kt), resolution < 0.1 km/h
OAT	12 bit, range -55 ~ 125 °C, 0.5 °C accuracy
Communication	CAN bus, 29 bit header, 500 kbit, Kanardia protocol

Table 1: Basic technical specifications.



(a) 57 mm



(b) 80 mm

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



## 1.3 Options

### 1.3.1 Scale

The instrument can be delivered with different scales. Basically, there are no standard scales and you have to define the scale units and scale markings at the time of order. Scale is then custom made for each individual order.

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

- $V_{NE}$  – **Red line on the top of yellow arc.** This designates never exceed speed limit. This is a speed, which should never be exceeded due to the risk of structural failure.
- $V_A$  – **Top of green and bottom of yellow arc.** This designates the design maneuvering speed. This speed is limited by aircraft structural characteristics at full control inputs deflection.
- $V_{FE}$  – **Top of white arc.** This defines maximal extended flap speed. Note that a different speed limit may be defined for partial extended flap.
- $V_{REF}$  – **Yellow triangle.** The triangle defines the reference speed. This defines the landing reference speed or threshold crossing speed.
- $V_{S1}$  – **Bottom of green arc.** Stall speed or minimum steady flight speed for which the aircraft is still controllable in a specific configuration. This is usually a clean configuration with flaps retracted. Note that bottom of green arc usually starts at 10% higher value.

- $V_{S0}$  – **Bottom of white arc.** Stall speed or minimum flight speed in landing configuration. Note that bottom of white arc usually starts at 10% higher value.

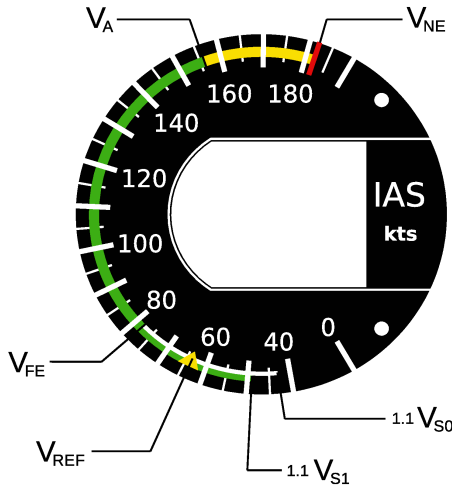


Figure 2: A scale example with the markings.

### 1.3.2 Display

By default instrument displays indicated airspeed information on LCD display. Instruments with OAT option can be configured to display IAS, OAT and true airspeed<sup>2</sup> information. Figure 3 shows all three display configurations. Display configuration must be specified at the time of order.

If you want a different LCD display layout, you can configure it yourself with our Customizer desktop application.<sup>3</sup> This option re-

<sup>2</sup> Airspeed instrument must be connected to Indu Altimeter via CAN bus.

<sup>3</sup> Available from April 2020

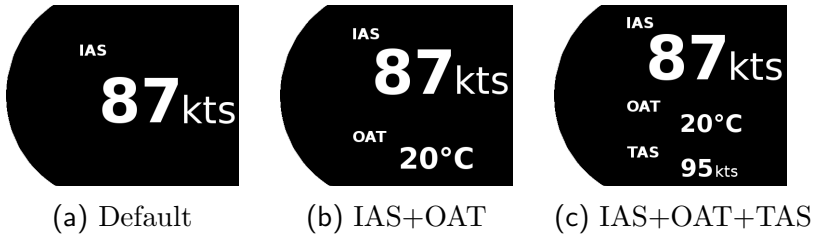


Figure 3: Display configurations

quires Kanardia’s Blu device for transferring the configuration from an Android device to your Indu Airspeed Indicator. Please read our Customizer Manual for more information.

### 1.3.3 Visual Warnings

The instrument can be configured<sup>1</sup> to show three types of warnings on LCD display:

- **$V_A$  exceeded.** Yellow IAS value designates that the IAS value has exceeded the design maneuvering speed  $V_A$  (Figure 4a).
- **$V_{NE}$  exceeded.** Red IAS value designates that the IAS value has exceeded the never exceed speed limit  $V_{NE}$  (Figure 4b).

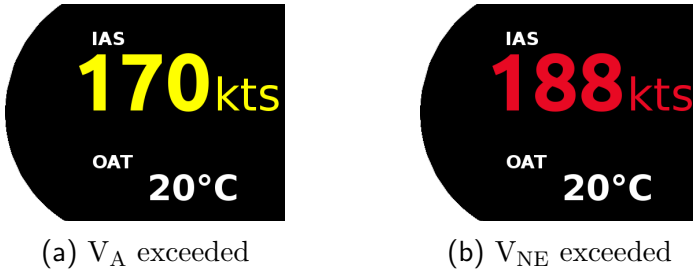


Figure 4: Visual warnings

## 2 Installation

Indu Airspeed Indicator requires a standard size 57 or 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.

### 2.1 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 5 illustrates the mounting hole for both sizes of instrument.

### 2.2 Sensor Offset

Sensor offset can be tuned with the help of Indu Altimeter. Please refer to altimeter manual for more details.

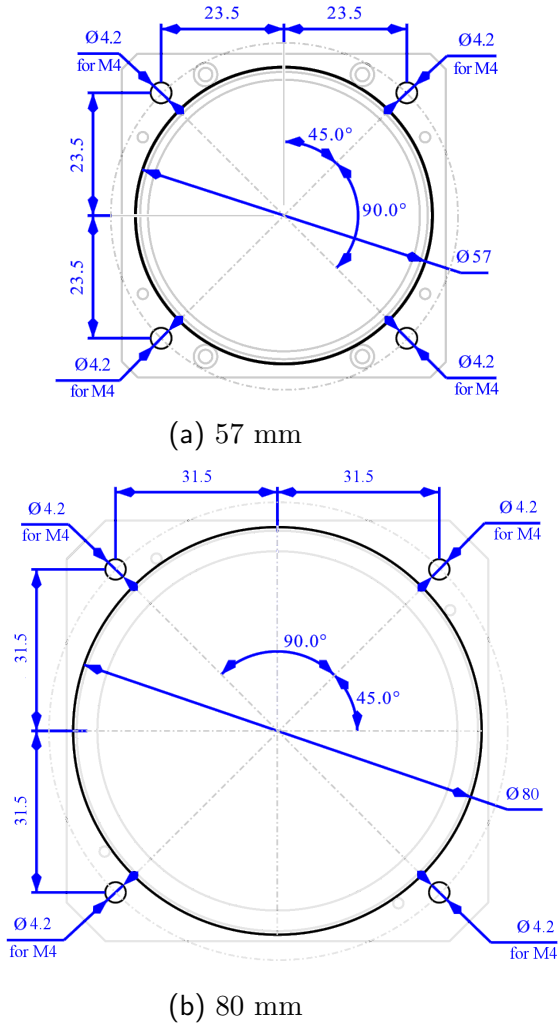


Figure 5: Instrument panel cutout and mounting hole. Note: Figure is not in scale.

## 2.3 Connections

Figure 6 illustrates all connections at the back side of the instrument.

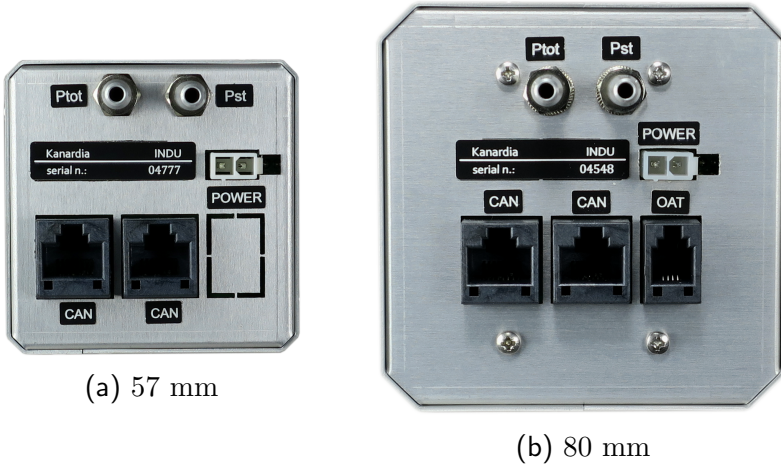


Figure 6: Back view of the instrument with connections.

### 2.3.1 Static Pressure - Pst

Indu Airspeed Indicator must be connected to the static pressure source. Static pressure source is usually obtained from pressure sources located on the fuselage side surfaces or from the static port on the pitot tube.

Locate the existing tube, cut it at an appropriate place and insert a T junction. Install a new tube from junction to the instrument.

It is highly recommended to keep the static tubing as short as possible. The tubing must avoid sharp bends and twists. The tubing must be airtight. Water must not be allowed to enter the tubing.

It is strongly recommended to label each tube before connecting to Indu Airspeed Indicator. This will help a lot if you ever have to remove and re-install the instrument.

### 2.3.2 Total Pressure - P<sub>tot</sub>

Indu Airspeed Indicator must be connected to the total pressure source. Total pressure source is obtained from the total port on the pitot tube.

Same principles as with the static connection apply.

### 2.3.3 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, airspeed will transmit airspeed and OAT<sup>1</sup> data to other units connected to the bus.

### 2.3.4 Power - POWER

Connect supplied connector at the back of Indu Airspeed Indicator. 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 (+12-24 V) terminal.

### 2.3.5 Outside Air Temperature - OAT

Outside air temperature (OAT) probe is shipped with airspeed on request. This is a digital temperature sensor inserted into a threaded aluminium tube. Default OAT cable length is 1.5 meters but other lengths are available on request.

OAT information is required to calculate true airspeed from indicated airspeed and altitude, as well as to provide you with the outside temperature information.

In order to provide accurate measurements, OAT probe must be installed on a proper place where the probe is not exposed to the disturbing sources of heat:

- engine heat and exhaust heat,
- direct sunlight,
- heated air exited from cabin.

We also do not recommend installing the probe in the heated cabin area, since the elevated temperature in the cabin may influence the back side of the probe, though such influence is usually small.

Please follow these steps to install the OAT probe:

1. Locate a spot in the aircraft taking into account the considerations from above and drill a  $\phi$  8 mm hole.
2. Remove the external nut from the probe but keep the washer, internal nut and plastic insulation tube on the probe.
3. Install the probe into the hole from the interior. Route the cable to the airspeed back panel.
4. Apply some lock-tight and thread the external nut to the probe. The lock-tight is necessary to avoid losing the cap due to vibrations.
5. Tighten the internal nut so that the probe sits firmly and apply lock-tight on the nut. Do not over tight it.



6. Slide the plastic insulation tube over the exposed threads of the probe and cover as much threads as possible. Shrink the tube using hot air blower. Do not use open flame. Plastic insulation (shrink) tube also serves as thermal insulation for the sensor located in the tip.

## 3 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.

## 4 Limited Conditions

Although a great care was taken during the design, production, storage and handling, it may happen that the Product will be defective in some way. Please read the following sections about the warranty and the limited operation to get more information about the subject.

### 4.1 Warranty

Kanardia d.o.o. warrants the Product manufactured by it against defects in material and workmanship for a period of twenty-four (24) months from retail purchase.

#### Warranty Coverage

Kanardia's warranty obligations are limited to the terms set forth below:

Kanardia d.o.o. warrants the Kanardia-branded hardware product will conform to the published specification when under normal use for a period of twenty-four months (24) from the date of retail purchase by the original end-user purchaser ("Warranty Period"). If a hardware defect arises and a valid claim is received within the Warranty Period, at its option and as the sole and exclusive remedy available to Purchaser, Kanardia will either (1) repair the hardware defect at no charge, using new or refurbished replacement parts, or (2) exchange the product with a product that is new or which has been manufactured from new or serviceable used parts and is at least functionally equivalent to the original product, or, at its option, if (1) or (2) is not possible (as determined by Kanardia in its sole discretion), (3) refund the purchase price of the product. When a refund is given, the product for which the refund is provided must be returned to Kanardia and becomes Kanardia's property.

## **Exclusions and Limitations**

This Limited Warranty applies only to hardware products manufactured by or for Kanardia that have the "Kanardia" trademark, trade name, or logo affixed to them at the time of manufacture by Kanardia. The Limited Warranty does not apply to any non-Kanardia hardware products or any software, even if packaged or sold with Kanardia hardware. Manufacturers, suppliers, or publishers, other than Kanardia, may provide their own warranties to the Purchaser, but Kanardia and its distributors provide their products *AS IS*, without warranty of any kind.

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This warranty does not apply: (a) to damage caused by use with non-Kanardia products; (b) to damage caused by accident, abuse, misuse, flood, fire, earthquake or other external causes; (c) to damage caused by operating the product outside the permitted or intended uses described by Kanardia; (d) to damage caused by service (including upgrades and expansions) performed by anyone who is not a representative of Kanardia or an Kanardia Authorized Reseller; (e) to a product or part that has been modified to significantly alter functionality or capability without the written permission of Kanardia; (f) to consumable parts, such as batteries, unless damage has occurred due to a defect in materials or workmanship; or (g) if any Kanardia serial number has been removed, altered or defaced.

To the extent permitted by applicable law, this warranty and remedies set forth above are exclusive and in lieu of all other warranties, remedies and conditions, whether oral or written, statutory, express or implied, including, without limitation, warranties of merchantability, fitness for a particular purpose, non-infringement, and any warranties against hidden or latent defects. If Kanardia cannot lawfully disclaim statutory or implied warranties then to the extent permitted by law, all such warranties shall be limited in duration to the duration of this express warranty and to repair or replacement service as determined by Kanardia in its sole discretion. Kanardia does not warrant that the operation of the product will be uninterrupted or error-free. Kanardia is not responsible for damage arising from failure to follow instructions relating to the product's use. No Kanardia reseller, agent, or employee is authorized to make any modification, extension, or addition to this warranty, and if any of the foregoing are made, they are void with respect to Kanardia.

### **Limitation of Liability**

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## **4.2 TSO Information — Limited Operation**

This product is not TSO approved as a flight instrument. Therefore, the manufacturer will not be held responsible for any damage caused by its use. The Kanardia is not responsible for any possible damage or destruction of any part on the airplane caused by default operation of instrument.