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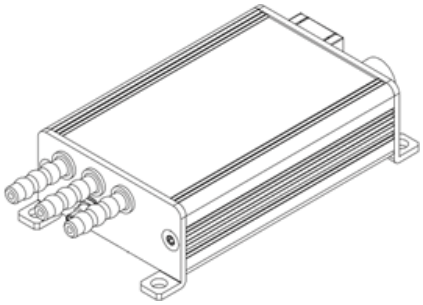

AIR Glide Sensor Unit

Installation Manual

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Notes

General Information

IMPORTANT!

Please read this manual carefully before installing or operating the device!

Pay attention to the restrictions on use!

This manual is an essential part of the device and must be kept in a safe place!

Document identification / revision status

This manual supports the following product types:

- P/N T276 ”AIR Glide Sensor Unit”

Actual version: **AIR Glide Sensor Unit Installation Manual • 18.T275T276.1-1.5-EN, Version 1.5(192)**

Version history

Revision	Date	Status	Author	Changes, comments	Approved
1.4	02/26/2013	released	M. Foerderer	Added Content	-
1.5	05/30/2013	released	M. Foerderer	Added ISU Mounting	-
1.7	21/10/2013	released	M. Frderer	Details added	-
1.8	07/11/2013	released	M. Frderer	Inst. Checklist Added	-
1.9	07/11/2013	released	M. Frderer	Add Info on FLARM Interface	-
1.9	20/02/2014	released	M. Frderer	AIR Branding	-

Contents

1 General

1.1 System Description

AIR Glide Sensor Unit (ISU) is a high precision ADAHRS that detects aircraft attitude, airspeed, altitude, position, and more aircraft related data.
A typical AIR Glide installation consists of at least one display and one AIR Glide Sensor Unit (ISU). The ISU collects and processes sensor data, the display unit displays the current flight situation derived from sensor data in an easy to understand fashion and accepts user input.

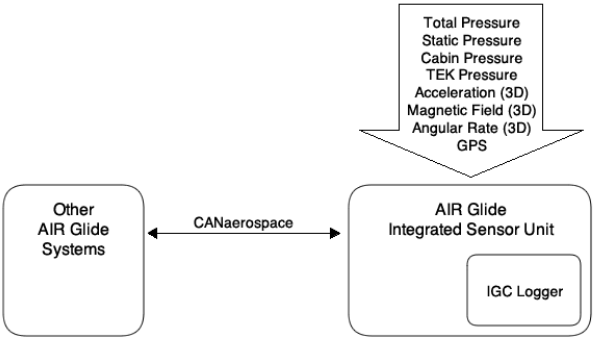


Figure 1: System Diagram

1.2 Design Goals

AIR Glide is designed for use in gliders as an aid to better and more efficient flying. The AIR Glide Sensor Unit is small, robust and can be mounted inside glider cockpits with relative ease.
AIR Glide is intended to assist the pilot fly the glider efficiently and safely. The design employs state of the art technology, with an interface that is simple to use. The on-board audio processing system generates high quality sound, the integrated display delivers superior readability with nearly no reflections.

In many gliding accidents, pilot overload is known to be a contributing factor. Cross-country flying, competitions, busy airspace and flying in unfamiliar terrain can all cause a high pilot workload for long durations. A design goal of AIR Glide is to help relieve this situation by giving advisory messages and alarms when the aircraft is not being flown safely or efficiently.

1.3 Sensors

The instrument comprises digital solid-state sensors and uses high speed digital microcontrollers for all processing, delivering excellent fidelity, long-term stability, increased resistance to interference, and low drain on the aircrafts power supply.
The instrument requires only a total energy probe of Braunschweig/Irving type or equivalent protruding from the aircraft.
The air data sensor is highly customizable so the pilot can get the very best performance by tuning compensation factors.

1.4 Third party devices

AIR Glide Installations can be interfaced with third party navigational devices such as PDAs or other EFIS systems as well as FLARM® compatible collision warning units. Certain installations require optional accessories.

1.5 Included Parts and Accessories

1.5.1 Delivery Part List

The following parts are contained in each AIR Glide Sensor Unit delivery.

Item	Partnumber	Description
Sensor Unit	T276	AIR Glide Sensor Unit (ISU)
GPS Antenna	T265	Active GPS-antenna with SMC connector

1.5.2 Available Accessories

The following parts may be ordered directly from AIR Avionics or from authorized dealers.

Item	Ordernumber	Description
Display Unit	27.110.002	AIR Glide display unit
NMEA Interface Unit	27.120.001	Interface unit for NMEA client devices to CANaerospace bus-systems
CANaerospace Cable 0.3m	27.000.002	M12 PUR industrial grade CAN cable, length 0.3m
CANaerospace Cable 1m	27.000.002-1	M12 PUR industrial grade CAN cable, length 1m
CANaerospace Cable 3m	27.000.002-2	M12 PUR industrial grade CAN cable, length 3m

Instrument tubing 5mm	30.000.002	Instrument tubing 5mm for pneumatic connections

To order accessories, visit www.air-store.eu

2 Safety, Liability and Support

2.1 Safety instructions and restrictions on use

Installation and operation must be on the basis of non-interference with and no hazard to the existing suite of other equipment necessary for safe flying operation, or installed to comply with official requirements. Installation and operation must comply with official regulations and requirements.

The pilot is ultimately responsible for all flight decisions and for operating the aircraft safely at all times. For situational awareness only!

Never make safety critical decisions based diplayed information.

The Sensor Unit does not have a ETSO or FAA-TSO airworthiness certification. Make sure that it is legal to install it in your aircraft.

Do not use the unit if pilot-workload is increased by failure of AIR Glide systems or attached subsystems.

2.2 Intellectual Property and Liability

Butterfly Avionics GmbH, will not be liable for errors/changes/omissions in this document - specifications are subject to change without notice. Butterfly Avionics its associates, development team, suppliers, manufacturers and data suppliers accept no responsibility for any damage or claims that may arise from use of AIR Glide.

Trademarks referred to in this document are the property of their respective holders. Any decompiling, disassembly, reverse engineering, or modification of the instrument or firmware are strictly prohibited without specific written permission from Butterfly Avionics GmbH.

2.3 Support

2.3.1 World

To get support, please contact your local authorized AIR Avionics dealer.

2.3.2 Europe

Please contact us via eMail or Phone. Find more information on www.air-avionics.com or +49 (0) 6224 82 83 87 0

2.4 General Installation Information

2.4.1 Recommended procedure

- Recommended Installation procedure
  - Read all manuals and the aircraft type pilots manual and maintenance manual thoroughly.
  - Examine the aircraft to determine its particular requirements.

- Decide on an installation position, ensuring it complies with the legal and airworthiness requirements of the aircraft type and installation requirements defined in this manual.
- Mechanically install AIR Glide, checking first for sufficient space for connectors and pneumatic tubing.
- Connect the aircraft pneuatic lines to the pneumatic ports on the Sensor Unit.
- Perform the electrical installation.
- Perform firstuse setup, including device configuration and latest software updates.
- After installation and configuration, check all switches operate correctly.
- Make notes on the work performed and configuration settings, and store the notes with the aircraft maintenance manual.
- Have a professional engineer check the installation, and perform any weight and balance calculations and compass adjustment.
- Perform a flighttest to ensure the device is functioning correctly.

Ensure that the mechanical installation does not interfere with full control movements, canopy jettison and other safety features of the aircraft.

If in doubt as to how to perform any of these steps, seek professional help from a licensed aircraft maintenance facility.

3 Electrical Systems

3.1 General Information

3.1.1 Electrical Installation

The electrical installation has to be undertaken according to the guidelines and regulations applicable to the specific aircraft type. When uncertain as to how to perform any aspect of the installation, you should consult with an aeronautical engineer or an aircraft maintenance facility.
In all cases the installation is to be performed only with expert advice in accordance with this guidance.

3.1.2 M12 CANaerospace Cables

For connection of all CANaerospace nodes (Sensor Unit, Display Unit etc.) M12 DeviceNet®-cables are used. The supplied cables are extremely rugged and have a polyurethane-based jacked. They fullfill highest level requirements regarding flammability, robustness and isolation.

3.2 Power Supply

3.2.1 Power Supply

The Sensor Unit is supplied via the CANaerospace bus power. The Sensor Unit is rated for input voltages from 9V to 31V DC.

3.2.2 Power Requirements

Input Voltage	9V to 31V DC
Power Requirements	below 1W at 12V

3.2.3 Power and CANaerospace Bus

The AIR Glide Display Units supply power to subsystems connected to the CANaerospace bus. Power supplied into the CANaerospace bus by Display Units is sufficient to supply Sensor Units and NMEA Interface Units attached to the same CANaerospace bus.

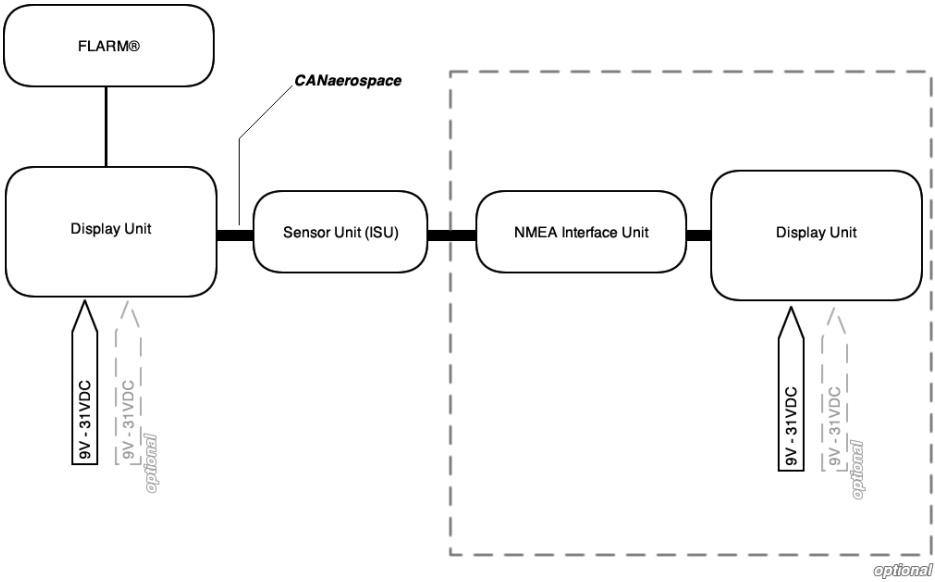


Figure 2: Recommeded Power Supply Configuration

4 Pneumatic Systems

4.1 Pressure Sources

The air data sensor is designed to be connected to three pressure sources in the aircraft:

Total energy probe	- This is used as the primary source of pressure for the TE compensated variometer. This is marked TE on the Sensor Unit.
Pitot port	- Also known as total pressure. Used along with the static port to determine the indicated airspeed. This is marked TOTAL on the Sensor Unit.
Static port	- Used to measure density altitude, and along with the pitot port, to determine indicated airspeed. This is marked STATIC on the Sensor Unit.

4.2 General guidelines for installation of the pneumatic tubing

• Guidelines:	- Dont use flasks or pneumatic gust filters, as TE compensation and gust filtering is performed electronically by AIR Glide. - If desired, do use a moisture trap or dust filters. - When installing in parallel with flow-based or mechanical variometer, it is best to use a Y-adaptor in the total energy line as far away (that is, close to the pressure tapping) from the flow based or mechanical variometer as possible. - Tygon brand tubing or equivalent is recommended. The barbed connectors at the rear of the instrument are designed for 5-6 mm inner diameter pneumatic tubing. The tubing should fit tightly over the barbed connectors to avoid leaks. - Anchor flexible tubing to prevent G-loads causing tubing to move and inducing measurement errors.

5 Interfaces and Options

5.1 CANaerospace Bus System

5.1.1 Description

CANaerospace is a higher layer protocol based on Controller Area Network (CAN) which has been developed for aeronautical applications.
CANaerospace supports airborne systems employing the Line-replaceable unit (LRU) concept to share data across CAN and ensures interoperability between CAN LRUs by defining CAN physical layer characteristics, network layers, communication mechanisms, data types and aeronautical axis systems.
CANaerospace is frequently used in latest avionics systems in commercial and military aircraft such as the Airbus A380, Boeing 787 or F-35 Joint Strike Fighter.

5.1.2 Cables

For connection of all CANaerospace nodes (Sensor Unit, Display Unit etc.) M12 DeviceNet®-cables are used. M12 Cables have an integrated locking mechanism. When connecting cables, take care to properly lock all connectors.

5.1.3 Termination

CANaerospace requires termination resistors to be placed on each end of an installation. Whereas the Sensor Unit already features an internal termination resistor the other end of the installation has to be terminated by an (included in delivery) termination resistor.

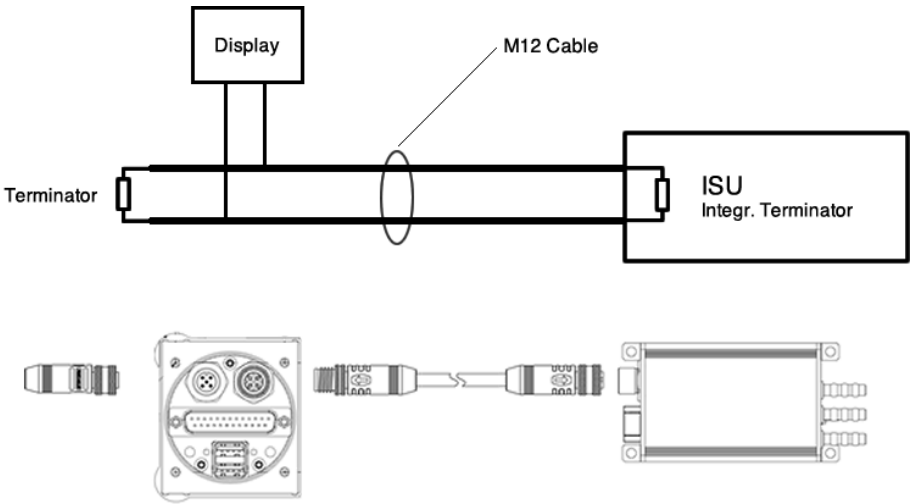


Figure 3: CANaerospace Termination in AIR Glide Installations

6 Installation

6.1 Mechanical Installation

6.1.1 Position

The ISU can be mounted in the front of the fuselage (i.e. in the area of the instrument panel) or in any other suitable area of the aircraft-fuselage. Installation within a range of of up to 2meters outside the center of gravity does not provide noticeable disadvantages, however installation outside the instrument panel may be beneficial in terms of lower (electro-)magnetic disturbance.

> ***Positioning the ISU as far away as possible from any magnetic disturbance source is crucial to correct operation of the AIR Glide system.***

6.1.2 Alignment

The ISU has to be installed in flight-direction and straight in all three of the aircrafts axes. As a reference plane the aircrafts natural position when flying at normal speeds is to be taken. Consult your aircrafts manual or weight-and-balance reports for details.

> ***Make sure to mount the ISU top-side-up. The top of the ISU is where the serial number sticker is placed.***

> *Straight alignment of the ISU is crucial for good functionality of the whole AIR Glide System. Be very careful, especially regarding alignment in the yaw axis. Misaligned ISUs do not work properly.*

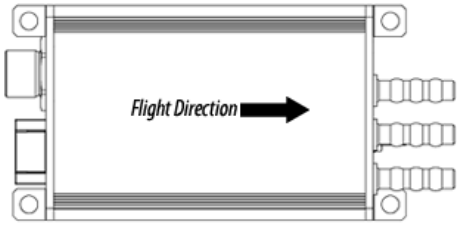


Figure 4: ISU Flight direction

6.2 Mounting and Vibrations

Vibrations or elasticity of the Sensor Units installation has negative influence on the calculated values. Mounting the Sensor Unit in vibrating environments leads to indication errors as long as vibration exists.

Take care that the ISU is mounted rigidly to the aircrafts structure.

The ISU is mounted with four M4 screws at the mounting flanges attached to the unit.

> ***Make sure to only use non-magnetic screws e.g. out of plastic or high-grade steel. High-grade steel (A4) screws are supplied. Never install metallic screws with magnetized tools. Be very careful! More information in the chapter "Magnetic Disturbance" of this manual.***

6.3 GPS Antenna

The supplied GPS-Antenna is directly connected to the Sensor Unit. Good GPS receiving quality is crucial for correct operation of the Sensor Unit.
Please make sure that the GPS antenna is installed in a place with non-shielded view to the sky.

> *Please keep a minimum distance to other GPS antennas of at least 20cm and some distance to other electronic equipment.*

> *Do not install GPS Antennas underneath of conductible surfaces such as carbon fiber oder metal. Do not install GPS Antennas underneath thick non-conductive material.*

6.4 Magnetometer disturbance

6.4.1 General

The ISU contains three magnetic field sensors (one in each axis). An exact measurement of the earth magnetic field is required for correct operation of the whole system.

> ***Many factors may disturb the measured magnetic field and render many functions in AIR Glide unusable. Therefore a very careful installation taking all such disturbing factors into account is mandatory.***

> ***Speakers generate large magnetic disturbances. Never locate the Sensor Unit next to a speaker. A minimum distance of 0.5m (20 Inches) is required.***

Continuous magnetic disturbances up to a certain field intensity can be filtered by software. Furthermore a magnetometer-compensation function (see Pilot's Manual) helps compensating the magnetometer against such disturbances. Yet only fields of moderate intensity can be compensated.

Alternating magnetic fields with varying field intensity are very critical and can hardly be compensated. Especially critical are power-cables, compasses, speakers and all other electromagnetic or magnetic components in the aircraft. Please keep maximum distance to such components, a list of recommended minimum distances can be found below.

The following plots show magnetic flux densities of certain sources in MicroTesla.

> *The earth magnetic field (measured value) has a magnetic flux density of 40 MicroTesla.*

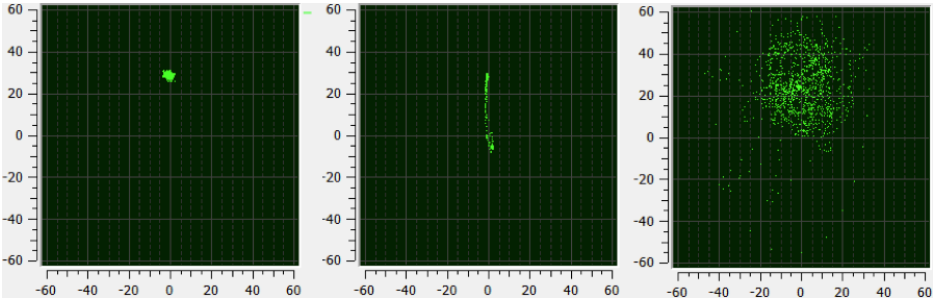


Figure 5: Magnetic Flux Density of Different Disturbance Sources. Normal / Wire 2A / Speaker

A wire with 2A of current already produces magnetic disturbances around the intensity of the earth magnetic field. A speaker creates way larger disturbances than the intensity of the earth magnetic field. If disturbances are of comparable intensity like the to be determined values (earth magnetic field in this case) no measurement is possible.

6.4.2 Installation recommendations

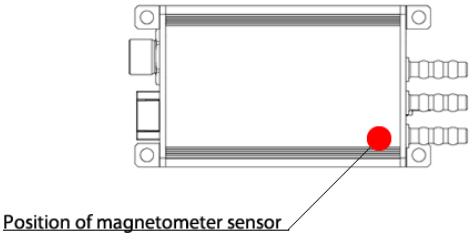


Figure 6: Position of magnetometer inside of ISU housing

The following table gives recommendations for minimum distances between the magnetometer inside the ISU and magnetic disturbance sources in a typical installation.

Disturbance Source	Minimum Distance
Metal part (e.g. metallic screw)	100mm
Wire, Current max. 500mA (e.g. FLARM Powersupply)	150mm
Wire, Current max. 2A (e.g. Battery Wires)	300mm

Avionics Equipment (e.g. XPDR, Radio)	150mm
Data Wire (e.g. RS232)	100mm
Compass	300mm
Speaker	500+ mm

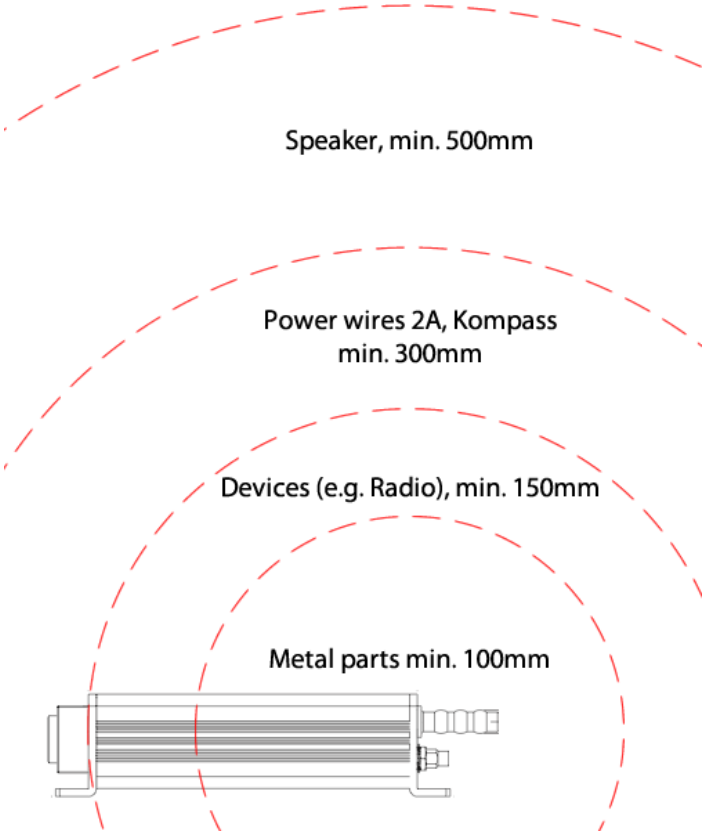


Figure 7: Minimum allowed distances to disturbance sources

6.5 Connectors

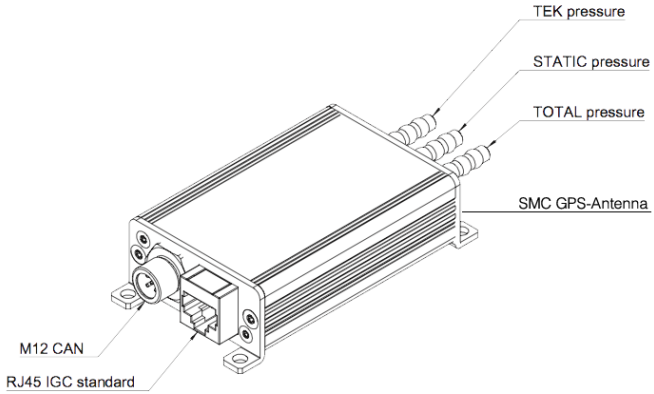


Figure 8: ISU Connectors

6.5.1 M12 CANaerospace Connector

The M12 CANaerospace connector of the ISU is connected to the display unit with the use of an M12 CANaerospace cable (a 1m cable is included). The ISU is internally terminated, therefore it is always installed at the end of a CANaerospace-bus chain.

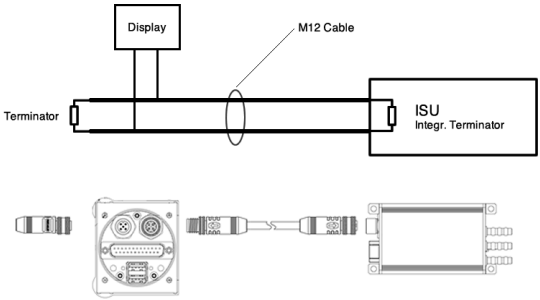
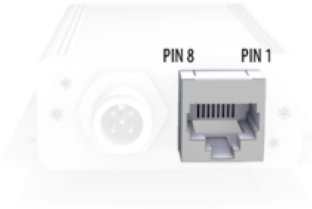


Figure 9: ISU with integral CANaerospace Termination

6.5.2 RJ45 RS232 Connector

The RJ45 connector has a standard IGC pinout. It features an RS232 port as well as a power port through which the ISU can be supplied with external power.

Never connect third party devices to PINs 1 and 2 if the CANaerospace connector (M12) is used.



PIN 1: +9 to +31VDC
PIN 2: +9 to +31VDC
PIN 3: N/C
PIN 4: N/C
PIN 5: TXD (ISU sendet Daten)
PIN 6: RXD (ISU empfängt Daten)
PIN 7: GND
PIN 8: GND

Figure 10: ISU RJ45 connector

The RS232 interface outputs standard NMEA-0183 datasets at a data-rate of 38400Baud. Logic levels are RS232c conform. Besides standard GPS data no other vario-specific datasets are included. In order to use the advanced features of AIR Glide in third party devices, an NMEA-Interface-Box is to be used (see accessories list).

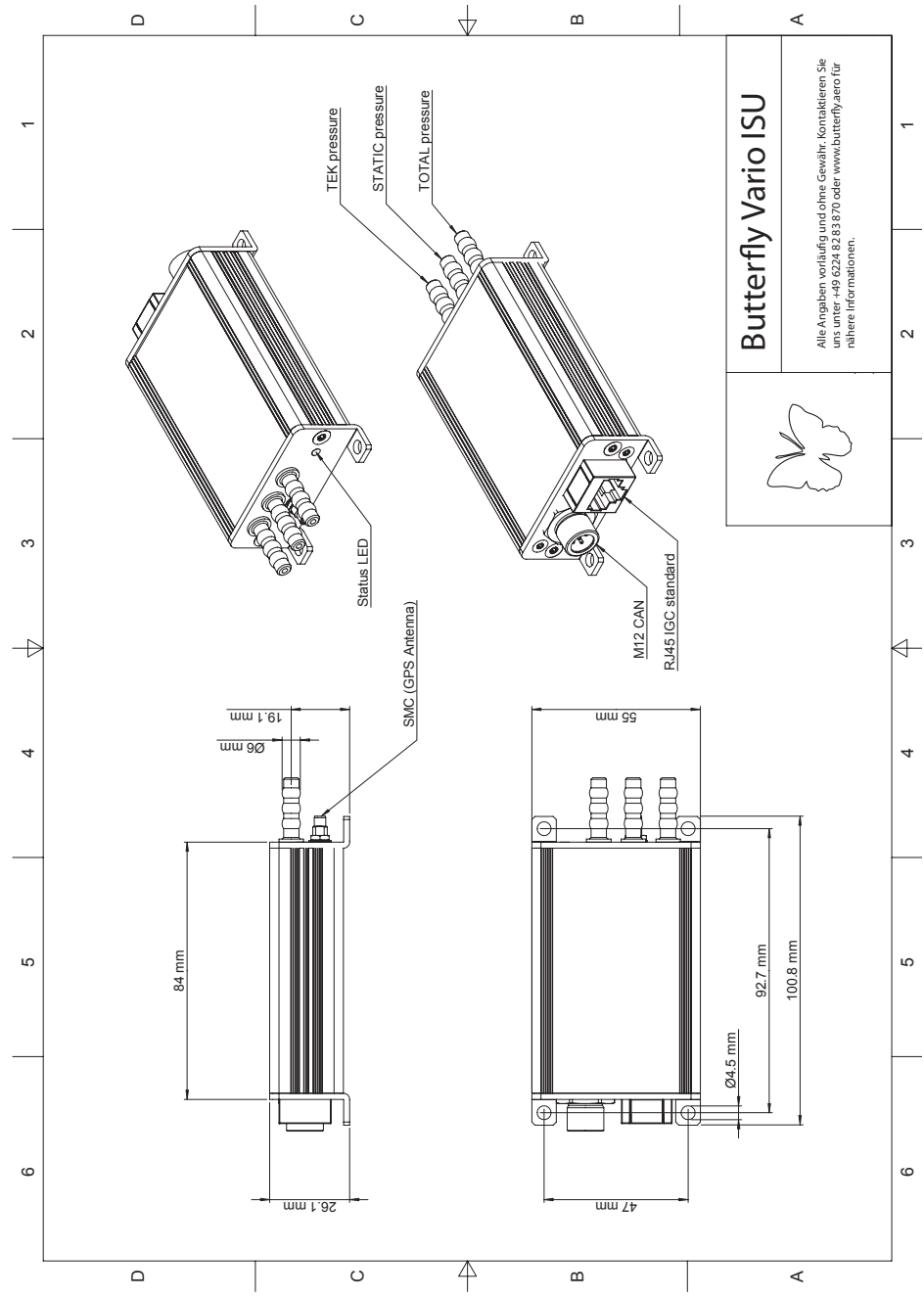


Figure 11: ISU Dimensions

7 Required Actions

7.1 During first flight

• Perform a magnetometer compensation according to the chapter *Magnetometer-Compensation* in the Pilot's Manual of this device (optional)

8 Reviewing Installation

Please perform the installation review checklist below and document the results.

Do not fly if installation review has not been completed!

8.1 Mechanical

Item	Checked/Failed/Remark
All units installed and fixated	
All cables connected, connectors closed, cables fixated	
GPS-Antenna at appropriate position with clear skyview	
All tubings connected	
Installation does not interfere with aircraft systems or emergency procedures	

8.2 Electrical

Item	Checked/Failed/Remark
All cables checked for damage, no damage visisble	

8.3 Magnetic Interference

Item	Checked/Failed/Remark
Complies to all minimum recommended distances to magnetic disturbance sources	
No magnetic screws used	

8.4 Operation

Item	Checked/Failed/Remark
Unit boots correctly shows no error messages	
Latest software updates installed	
Required settings / initial configuration performed	

Notes