Ultrasonic Anemometer 3D
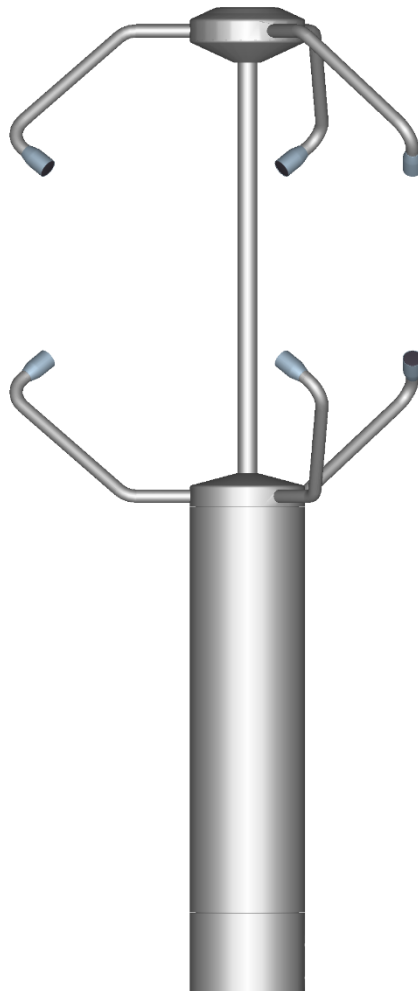
Short - Instruction for Use

4.383x.xx.xxx

from Software version V3.20

THE WORLD OF WEATHER DATA

Safety Instructions

- Before operating with or at the device/product, read through the operating instructions.
  This manual contains instructions which should be followed on mounting, start-up, and operation.
  A non-observance might cause:
  - failure of important functions
  - endangerment of persons by electrical or mechanical effect
  - damage to objects

- Mounting, electrical connection and wiring of the device/product must be carried out only by a qualified technician who is familiar with and observes the engineering regulations, provisions and standards applicable in each case.

- Repairs and maintenance may only be carried out by trained staff or **Adolf Thies GmbH & Co. KG**. Only components and spare parts supplied and/or recommended by **Adolf Thies GmbH & Co. KG** should be used for repairs.

- Electrical devices/products must be mounted and wired only in a voltage-free state.

- **Adolf Thies GmbH & Co KG** guarantees proper functioning of the device/products provided that no modifications have been made to the mechanics, electronics or software, and that the following points are observed:

- All information, warnings and instructions for use included in these operating instructions must be taken into account and observed as this is essential to ensure trouble-free operation and a safe condition of the measuring system / device / product.

- The device / product is designed for a specific application as described in these operating instructions.

- The device / product should be operated with the accessories and consumables supplied and/or recommended by **Adolf Thies GmbH & Co KG.**

- Recommendation: As it is possible that each measuring system / device / product may, under certain conditions, and in rare cases, may also output erroneous measuring values, it is recommended using redundant systems with plausibility checks for **security-relevant applications**.

Environment

- As a longstanding manufacturer of sensors Adolf Thies GmbH & Co KG is committed to the objectives of environmental protection and is therefore willing to take back all supplied products governed by the provisions of "*ElektroG*" (German Electrical and Electronic Equipment Act) and to perform environmentally compatible disposal and recycling. We are prepared to take back all Thies products concerned free of charge if returned to Thies by our customers carriage-paid.

- Make sure you retain packaging for storage or transport of products. Should packaging however no longer be required, please arrange for recycling as the packaging materials are designed to be recycled.

Documentation

- © Copyright **Adolf Thies GmbH & Co KG**, Göttingen / Germany

- Although these operating instruction has been drawn up with due care, **Adolf Thies GmbH & Co KG** can accept no liability whatsoever for any technical and typographical errors or omissions in this document that might remain.

- We can accept no liability whatsoever for any losses arising from the information contained in this document.

- Subject to modification in terms of content.

- The device / product should not be passed on without the/these operating instructions.

Short instructions for use

These operating instructions describe the installation of the instrument. **The *Ultrasonic Anemometer 3D i*s factory-set**.

Identification for the factory setting derives from the order No. and the respective "Factory Setting"

Order number and Setting
see supplementary sheet
"Factory Setting"

With the detailed operating instructions and via the serial interface of the Ultrasonic Anemometer 3D it is possible for the user to adapt the factory-settings to his own requirements.

Contents

Figure

Patent Protection

This instrument is patent-protected.
Patent No.: EP 1 448 966 B1
Patent No.: US 7,149,151 B2

Shipment

1 x Ultrasonic Anemometer Compact
1 x Short Instructions for use (the complete operating manual is available for download)
1 x Supplementary Sheet: Factory Setting
1 x Factory certification

The instructions for use are available for download under the following link:

https://www.thiesclima.com/db/dnl/4.383x.xx.xxx_US-Anemometer-3D_e.pdf

1 Device versions

Bezeichnung	Artikel- Nr. *	Messgröße	Ausgang / Schnittstellen / Ausstattung
US-Anemometer 3D	4.383x.xx.xxx	Depending on article no.	Configuration concerning - outputs - data telegrams - scaling - heating - etc.

2 Preparation for operation

2.1 Installation of anemometer

Proper installation of the ultrasonic anemometer is carried out using a tube socket Ø 50mm and 40mm in length The inside diameter of the pipe socket must be at least 40mm as the ultrasonic anemometer is electrically connected to the connector from below (s. Accessories: Connecting cable, compl.). After connection the ultrasonic anemometer is fitted onto the tube or mast socket.

The measurement path formed by transformer 1 (arm marked red) and 4 must be aligned in a west-east direction, see **chapter 2.1**. Precise vertical alignment of the device is also necessary.

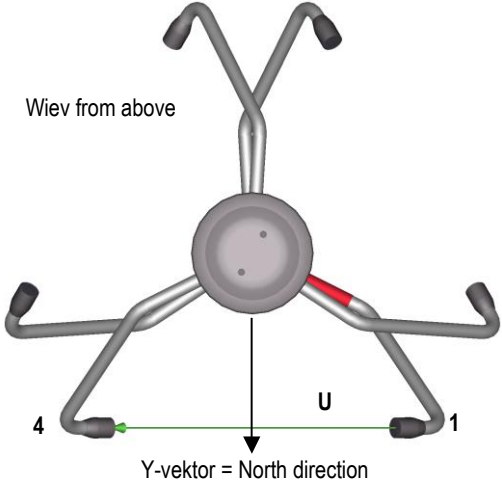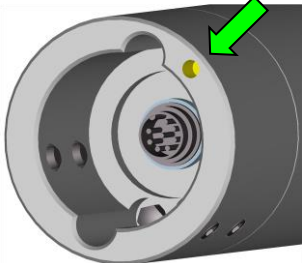The instrument must be fixed safely at the shaft by means of the four Allen keys (M8X12 NIRO V4A DIN 916).

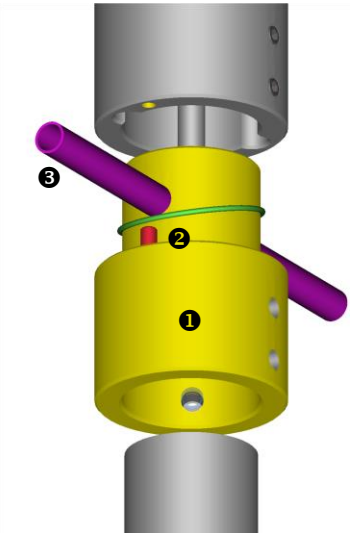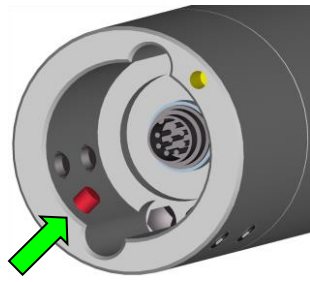- Acc. to manufacturer the screws have a max. torque of 10 Nm.

When screwing, please take care that the material of the on-site pipe socket/mast does not deform.

Suitable tools:

- Allen key size 4 or
- torque wrench with respective adaptation.

2.2 Alignment to north

For exact determination of the wind direction the anemometer has to be installed aligned **to the north** (true north).

The position of the Y vector of the transformed natural coordinate system is vertical to the measurement path **U** formed by the ultrasonic transformers **1** and **4**.

The device must thus be aligned so that the direction of north is vertical to the path U away from the device; projection of the measurement path U onto the horizontal plane must thus be in a west-east direction.

When aligning the device to north using a compass, the magnetic variation (= deviation in direction of compass needle from true north) and local magnetic fields (e.g. iron parts, electric cables) should be taken into account.

Wiev from above

U

4   1

Y-vektor = North direction

In the bottom of the anemometer stand there is a **north-drilling**.
The north- drilling serves for the use of a so-called north- ring with bolt. The north- ring is not included in delivery.

A North- ring ❶ is available as an optional feature to assist with alignment and for simple replacement of the ultrasonic anemometer without readjustment of north.

On initial installation this north- ring is mounted loose so it still rotates on the measuring mast. The north pin ❷ of the north- ring must show northward.

The direction bearing tube ❸ also supplied is inserted through the horizontal bores of the north- ring.

With this tube a conspicuous point in the landscape, building, tree or hill to the north can be selected, a bearing taken and the adapter fixed to the measuring mast with the screws.

The direction bearing tube is then removed and the ultrasonic anemometer mounted on the north pin of the north- ring and screwed in place.

Remark: For Model 4.3832.40.340 only

In the bottom there is a **south-drilling with cylinder pin**.
The cylinder pin is opposite to the „measurement path **U**" and opposite to the North-drilling.

2.3 Cables, Cable preparation, Coupling socket Installation

A prepared connecting cable can be supplied for the ultrasonic anemometer (see Accessories).

If the user wishes to procure the cable himself, the cable must have the following properties: 8 cores; 0.5 to 0.75mm² core cross-section for supply; min. 0.14mm² core cross-section for data communication; max. 8mm cable diameter, resistant to ultraviolet rays, overall shielding.

The coupling socket (mating connector) is included in the scope of supply. This is placed in the bottom of the box for shipment.

The pin assignment can be found in these operating instructions (**section 2.4**).

Coupling socket 507550 (Binder, Serial 423), EMC with cable clamp

Dichtring *seal* · **Gewindering** *coupling ring* · **Buchseneinsatz** *female insert* · **Kabelklemme** *cable clamp* · Cable- pull- relief · View X · **Kupplungshülse** *sleeve* · **Dichtring** *seal* · **Druckring** *thrust collar* · **Druckschraube** *pressing screw*

1. Stringing parts on cable acc. to plan given above.
2. Stripping cable sheath 20mm
   Cutting uncovered shield 15mm
   Stripping wire 5mm.

   Cable mounting 1:
   Putting shrink hose or insolating tape between wire and shield.

   Cable mounting 2:
   If cable diameter permits, put the shield backward on the cable sheath.
3. Soldering wire to the insert, positioning shield in cable clamp.
4. Screwing-on cable clamp.
5. Assembling remaining parts acc. to upper plan.
6. Tightening pull-relief of cable by screw-wrench (SW16 und 17).

Cable mounting 1
Viev X

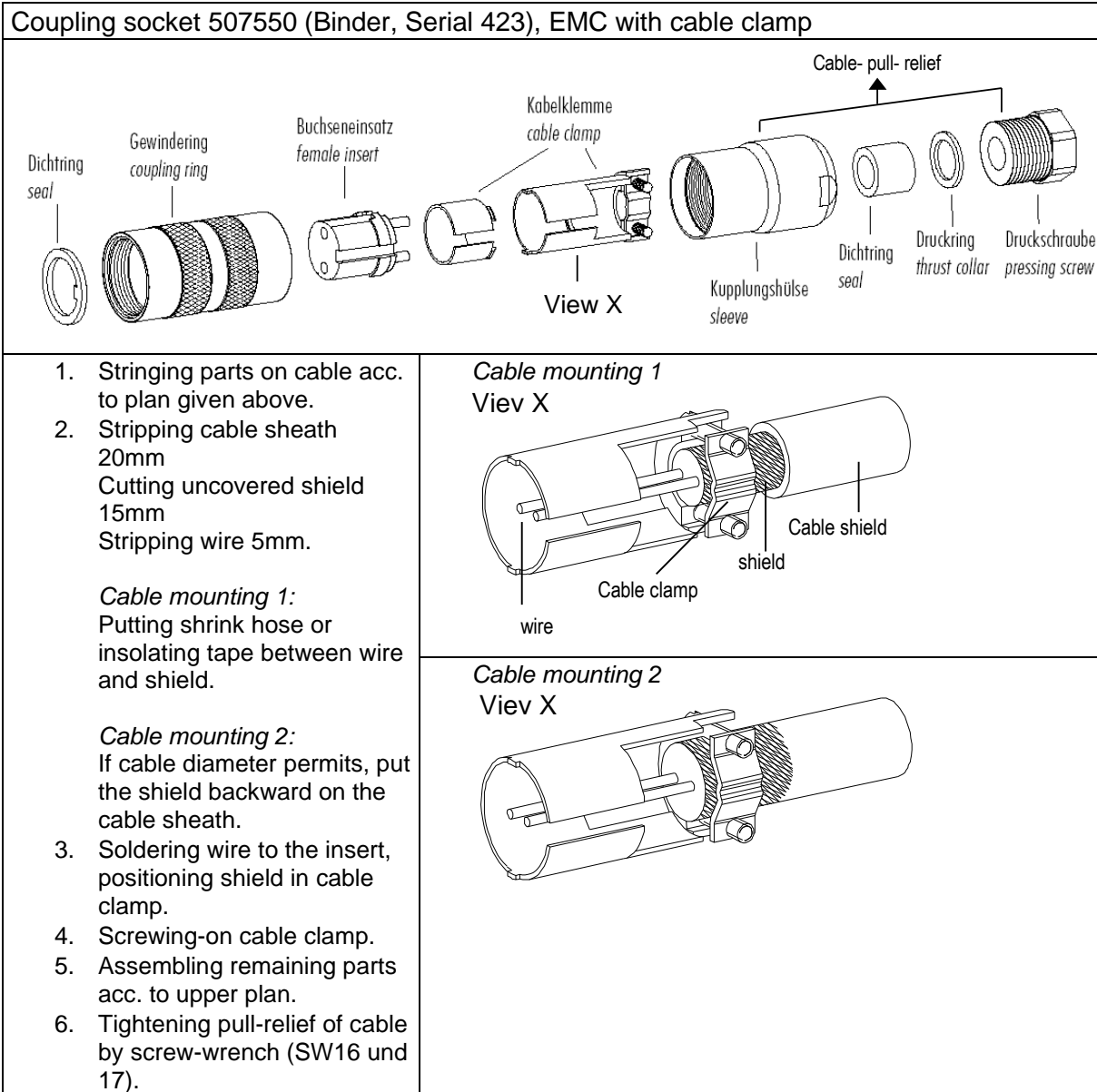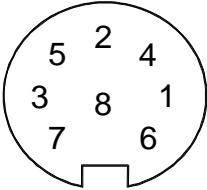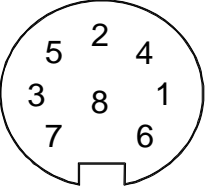Cable shield · shield · Cable clamp · wire

Cable mounting 2
Viev X

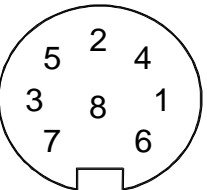**Figure 1: Coupling socket installation**

2.4 Connector pin assignment (functional examples)

> **Note:**
> - *The exact functional assignment can be found in the supplementary sheet "Factory Setting".*
> - *Pins 1 to 6 (inclusive) are electrically isolated from the supply voltage and the housing.*

Pin	Assignment	Function	
• **Serial interface, full duplex**			**View of solder terminal of coupling socket**
Pin	**Assignment**	**Function**	
1	RXD-	Serial interface.	
2	TXD-	serial interface.	
3	ADIO	Function not preset.	
4	RXD+	Serial interface.	
5	TXD+	Serial interface.	
6	AGND	Analog ground.	
7	AC/DC	Supply, reverse-polarity protected.	
8	AC/DC	Supply, reverse-polarity protected.	
⏚	Shield		

Pin	Assignment	Function	
• **Serial interface, half duplex and Analog output**			**View of solder terminal of coupling socket**
Pin	**Assignment**	**Function**	
1	Vx	Analog output Vx.	
2	TXD- / RXD-	Serial interface.	
3	Vz	Analog output Vz.	
4	Vy	Analog output Vy.	
5	TXD+ / RXD+	Serial interface.	
6	AGND	Analog ground.	
7	AC/DC	Supply, reverse-polarity protected.	
8	AC/DC	Supply, reverse-polarity protected.	
⏚	Shield		

Pin	Assignment	Function	
• **Serial interface, half duplex and Analog input**			**View of solder terminal of coupling socket**
Pin	**Assignment**	**Function**	
1	0-10,0V	Analog input.	
2	TXD- / RXD-	Serial interface.	
3	0-10,0V	Analog input.	
4	0-10,0V	Analog input.	
5	TXD+ / RXD+	Serial interface.	
6	AGND	Analog ground.	
7	AC/DC	Supply, reverse-polarity protected.	
8	AC/DC	Supply, reverse-polarity protected.	
⏚	Shield		

3 Maintenance

As the device does not have moving parts, i.e. is not subject to wear during operation, no servicing is required.

> **Note**
>
> *During storage, installation, de-installation, transport or maintenance of the anemometer it must be ensured that no water gets into the shaft or connector of the anemometer.*
>
> *We recommend the threads of the plugs with a suitable corrosion inhibitors to protect against corrosion.*

4 Warranty

Damages caused by improper handling or external influences, e.g. lightning, do not fall under the warranty provisions. The warranty entitlement expires if the device is opened.

Important:
The ultrasonic anemometer must be returned in the original packaging as the warranty entitlement otherwise expires with mechanical damage, e.g. deformation of measuring arms.

We recommend the threads of the plugs with a suitable corrosion inhibitors to protect against corrosion.

5 Technical Data

Wind velocity	Measuring range	0.01 ... 85m/s (Starting threshold: 0.01m/s) Up to 99.99m/s is measured and output Scaling of analogue output freely selectable in wide ranges.	
	Accuracy	≤35m/s:	±(0.1m/s + 1% of measured value) rms (root mean square over 360°)
		>35…≤65m/s:	±2% of measured value rms (root mean square over 360°)
		>65…≤85m/s:	±3% of measured value rms (root mean square over 360°)
	Resolution	0.1m/s:	in telegrams No. 1 to 4
		0.01m/s:	in telegrams No. 5 to 12 and user-defined telegrams
Wind direction	Measuring range Azimuth	0 ... 360°	

	Elevation	0 .. 360°, 0 ... 540°, 0 ... 720° for analogue output, adjustable -90 ... +90°
	Accuracy	$\pm1°$ @ wind velocity >1 …≤35m/s
		$\pm2°$ @ wind velocity >35 …≤65m/s
		$\pm4°$ @ wind velocity >65 …≤85m/s
	Resolution	1°: in telegrams No. 1 to 4
		0.1°: in telegrams No. 5 to 12 and user-defined telegrams
Acoustic virtual temperature	Measuring range	-40 ... +70°C not specified, but useful measuring range: -75 ...+75°C
	Accuracy	$\pm0.5K$
	Resolution	0.1K (in telegrams No. 1 to 5)
Data output digital	Interface	RS 485 / RS 422 Electrically isolated from supply voltage and housing
	Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 adjustable
	Output	Instantaneous values, wind velocity,/direction and acoustic virtual temperature Sliding mean values 0.5sec.. 100min freely selectable Standard deviations, covariances and turbulence intensities for wind velocity/direction and acoustic virtual temperature Predefined data telegrams or user-defined data telegram
	Output rate	1 per 1msec to 1 per 60 seconds adjustable in msec steps
	Status identification	Heating, failure of measurement path, ΔT path temperatures
Data output analogue Electrically isolated from supply voltage and housing	Outputs	0 ... 20mA / 0 ... 10V or 4 ... 20mA / 2 ... 10V for Wind vectors X, Y and Z or *for Wind velocity (azimuth), Wind direction (azimuth) and acoustic virtual- temperature (in preparation).*
		Burden on current output maximum 400Ω
		Source impedance with current output, typically 250000Ω
		Burden on voltage output minimum 4000Ω
		Source impedance with voltage output, typically 4Ω
	Output	Wind vectors X, Y and Z Instantaneous values or sliding mean values 0.5sec..100min freely selectable
	Output rate	Updating rate 7.5 to 256msec adjustable
	Resolution	16bit

Analog inputs	Number	Up to five analog inputs possible (3x standard, 2x additionally configurable in consultation with manufacturer)
	Data processing	Output of measured values in user-specific telegram
	Input voltage	0 ... 10.0V
	Sampling rate	0.1 ... 100Hz per channel
	Resolution	16bit
	Accuracy	0.1 % in range –40 ... +70°C
	Linearity Effective noise free Bits	INL: typ. < 6 LSB Typ. 14Bit* * with DC-supply for prevention of dyn. crosstalk in the connecting line
General	Internal measuring rate	Up to 285 complete measuring sequences per second at 20°C (6 individual measurements)
	Bus mode	Bus mode of up to 98 devices possible
	Measuring mode	Standard measuring mode (continuous measurement) Burst mode: Measurement at maximum speed followed by output (max. 40,000 measured values) Synchronous measurement: Measurement specified by external clock pulse via PIN 3 (ADIO) input (max. 250Hz). Measurement can be initiated via rising or falling edge (selectable) of trigger signal. Start of measurement <0.5ms after flank detection. Triggered individual measurement: The flank of an external signal is used for measurement. Measurement can be initiated via rising or falling edge (selectable) of trigger signal. Start of measurement < 0.5ms after flank detection.
	Program update	Program update also possible in bus mode
	Temperature range	Operating temperature – 50 ... + 80°C heated – 30 ... + 80°C unheated Storing – 50 ... + 80°C Measuring operation possible with heating up to -75°C
Operating voltage	Supply: electronics - w/o Heating	U: 8 ... 78VDC or 12 ... 55VAC, 45 … 65Hz P: typ. 1.5VA, max. 2.5VA
(with 4.383x.2x.xxx)	Supply: electronic + heating - with heating of sensor arms, centre rod and US-converter	U: 24VAC/DC ±15%, 4 5… 65Hz P: typ. 150VA @ 24V

(with 4.383x.4x.xxx)	Supply: electronic + heating - with heating of sensor arms, centre rod, US-converter and ..housing	U: 48VAC/DC ±15%, 45 … 65Hz P: typ. 360VA, max. 400VA @ 48V
	Protection type	IP 67 (in case of conventional mounting and screwed and converted coupling socket (if necessary), see chapter „Preparation for operation")
Without US transformer heating	Icing-up resistance	As per THIES STD 012001
With US transformer heating	Icing-up resistance	As per THIES STD 012002
	EMC	EN 55022:1998 class B; EN 55024:1998 EN 61326:1997, A3:2003; Interference field strength and noise immunity both class B
	Housing material	Stainless steel (V4A), 1.4571 acc. to DIN EN 10088-2
	Installation type	e.g. Mast tube Ø 50mm (see dimension drawing)
	Connection type	8-pole plug connection in shaft
	Weight	3.4kg

6 Dimension Drawing

US-Transformer 4

US-Transformer 1

US-Transformer 4

US-Transformer 1

North- drilling

$\varnothing 5,1^{+0,1}$

8 tief

$\varnothing 12$

$\varnothing 70$

405

315

600

Distance: Mast tube- end - Centre measuring lenght

South- drilling
with pin ø 6 mm

$\varnothing 6^{H7}$

$\varnothing 60$

Bottom view

$\varnothing 300$

Intake ø 50 mm
For mast tube 1 ½"
40 mm deep
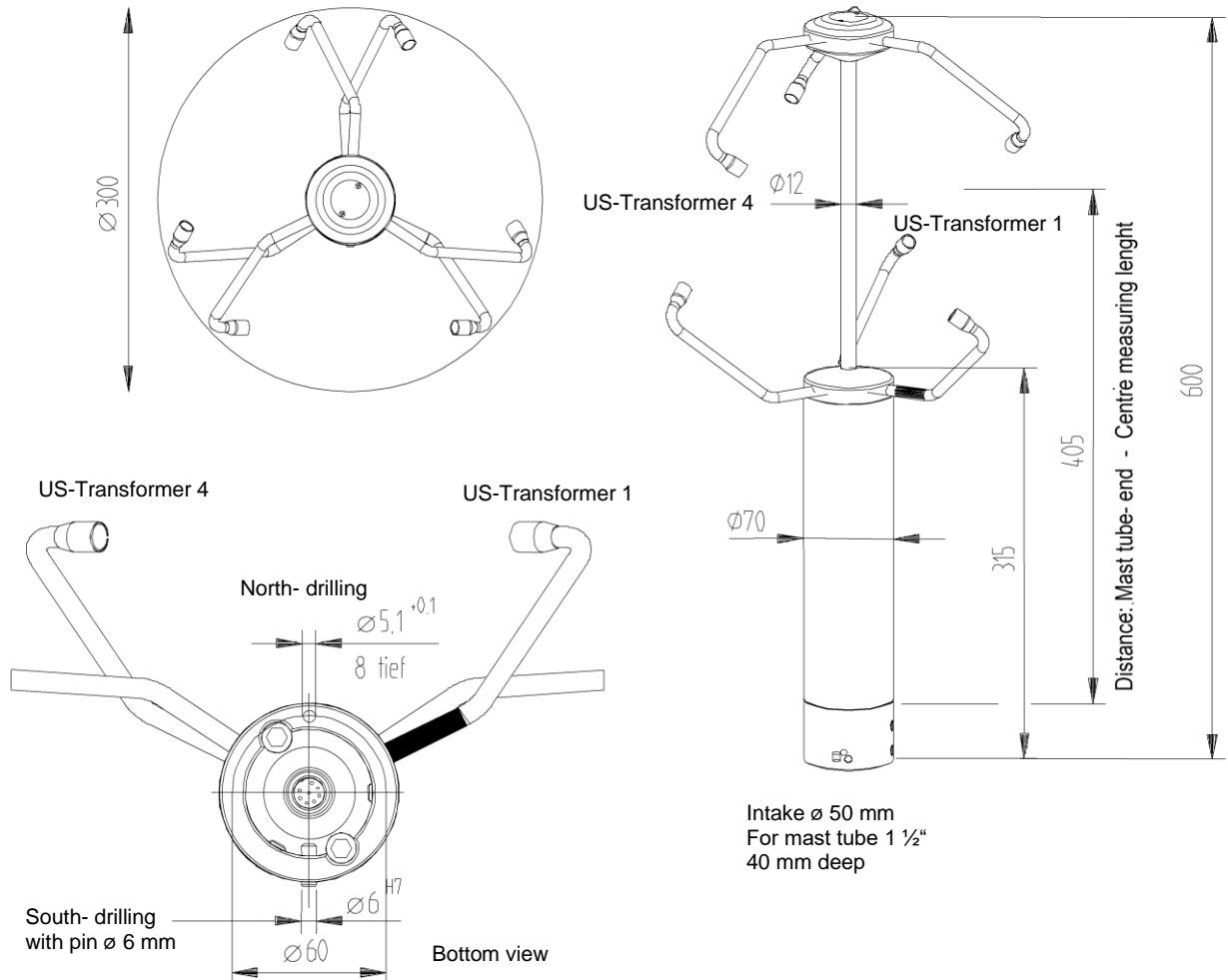
7 More Information / Documents as download

Further information can be found in the short instructions for use. These document and also the instruction for use are available for download under the following links.

Short instruction for use

https://www.thiesclima.com/db/dnl/4.383x.xx.xxx_US-Anemometer-3D_e_short.pdf

Instruction for use

https://www.thiesclima.com/db/dnl/4.383x.xx.xxx_US-Anemometer-3D_e.pdf

Please contact us for your system requirements.
We advise you gladly.

ADOLF THIES GMBH & CO. KG
Meteorology and environmental metrology
Hauptstraße 76 · 37083 Göttingen · Germany
Phone +49 551 79001-0 · Fax +49 551 79001-65
info@thiesclima.com

www.thiesclima.com