

Ultrasonic Anemometer 2D

Short - Instruction for Use

4.382x.xx.xxx

from software version V3.18



Dok. No. 021952/11/21

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.

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Patent

Patent No.: EP 1 448 966 B1

Patent No.: US 7,149,151 B2

Shipment

- 1 x Ultrasonic Anemometer
- 1 x Short instructions for use (the complete instructions for use 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/4.382x.xx.xxx_US-Anemometer-2D_e.pdf

Operating Instructions

These operating instructions describe all possible applications and settings of the instrument. **The Ultrasonic Anemometer 2D is 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 these detailed operating instructions and via the serial interface of the Ultrasonic Anemometer 2D it is possible for the user to adapt the factory-settings to his own requirements.

1.1 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 from below. After electrical connection (see chapter 3.4) the ultrasonic anemometer is fitted on the tube or mast socket. Now the mechanical north adjustment of the Anemometer takes place, see chapter 3.3.

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 10Nm.

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.

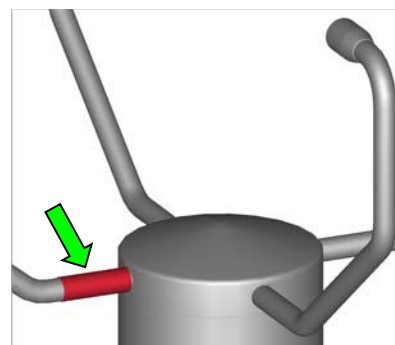
1.2 Alignment to north

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

To align the anemometer, the **arm of the sonic transformer marked red must point to north** (true north). To do so, select a conspicuous feature of the landscape to the north or south with a compass and turn the mast or anemometer until the opposing arms are aligned in this direction.

Note:

When aligning the instrument to north using a compass, the magnetic variation (= deviation in direction of compass needle from true north) and local interfering magnetic fields (e.g. iron parts, electric cables).



Alignment of the Anemometer on a Ship

- The reference point for the anemometer is the roll-axis of the ship where the ship bow "0°" (North) is assigned.

For exact determination of the wind direction the anemometer must be mounted with alignment **to the roll-axis** of the ship.

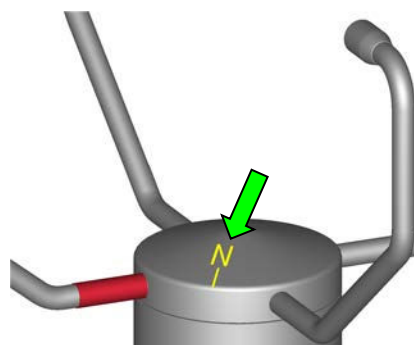
The **red-marked sensor- arm** must point to the ship- bow (nose).

Note:

When aligning the anemometer on another moving objects (for ex. vehicles, wind generator etc.) this procedure can be applied, as well.

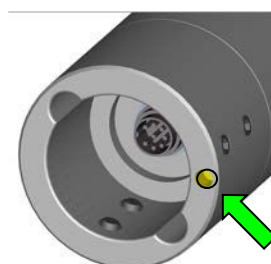
Attention:

If an additional **north marking "N"** is attached on the sensor head (see figure), it is overriding for the north alignment.



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.



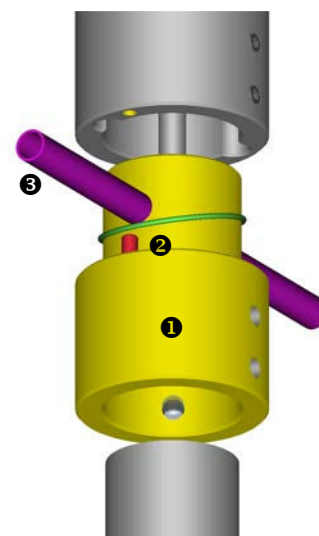
A North- ring ❶ is available as an optional feature to assist with alignment and for simple replacement of the ultrasonic anemometer without readjustment of north.

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.

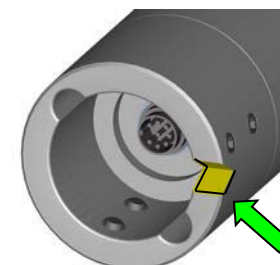
The direction bearing tube is then removed and the ultrasonic anemometer mounted on the north pin of the north- ring and screwed in place.



Remark:

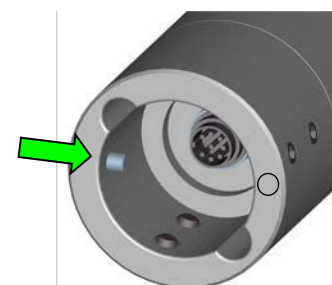
For Model 4.3820.36.390 and 4.3820.46.390 only

In the bottom of the anemometer stand there is a north notch in the form of an isosceles triangle. The upper notch vertex indicates towards the red-marked arm. The north notch serves for the use of a so-called north-alignment-ring. The north-alignment-ring is not included in delivery.



Remark: For Model 4.3822.40.340 only

In the anemometer stand there is a south drilling with cylinder pin. The pin is opposite to the red-marked north arm.



1.3 Electrical Installation for Ultrasonic Anemometer with Connector

The ultrasonic anemometer is equipped with a plug for electrical connection. A coupling socket (mating) is included in delivery. It is located in the lower part of the transport packing. A plastic fit-up aid for holding the bush insert while screwing it together with the coupling sleeve, is included in delivery.

1.3.1 Cables, Cable preparation, Coupling socket Installation

For pin assignment please refer to supplement „factory settings“. Examples see chapter 3.4.2.

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 communications; 7- 8mm cable diameter, resistant to ultraviolet rays, overall shielding.

Caution:

The cable to be connected must be at least the operating voltage class 01 correspond HAR (100V).

Remark:

Optionally, a completely converted connecting cable can be included in delivery for the ultrasonic-anemometer (see accessories).

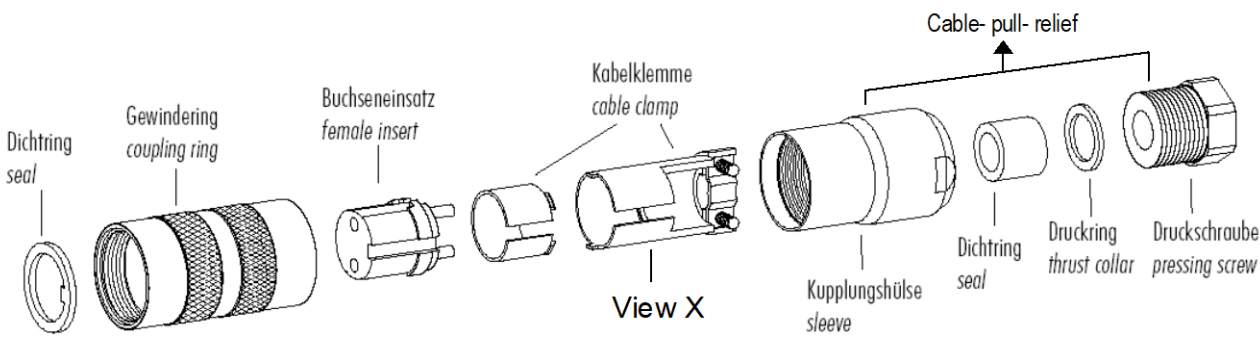
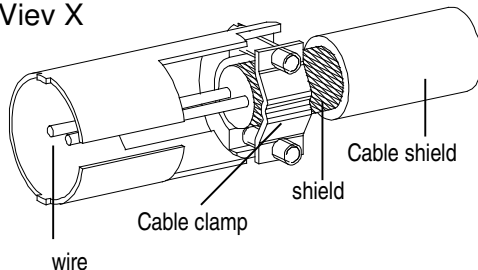
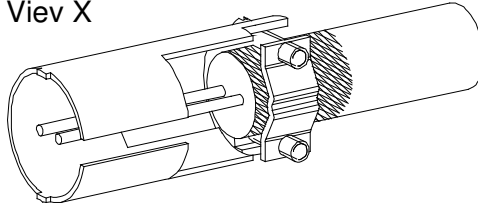
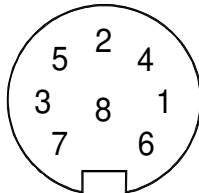
Coupling socket 507550 (Binder, Serial 423), EMC with cable clamp	
	
- Stringing parts on cable acc. to plan given above. - Stripping cable sheath 20mm cutting uncovered shield 15mm Stripping wire 5mm. Cable mounting 1: Putting shrink hose or insulating tape between wire and shield. Cable mounting 2: If cable diameter permits, put the shield backward on the cable sheath. - Soldering wire to the insert, positioning shield in cable clamp. - Screwing-on cable clamp. - Assembling remaining parts acc. to upper plan. - Tightening pull-relief of cable by screw-wrench (SW16 und 17).	Cable mounting 1 View X  Cable mounting 2 View X 

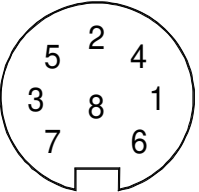
Figure 1: Coupling socket installation

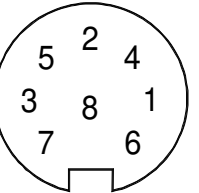
1.3.2 Connector Pin Assignment (Examples of Function) for devices: 4.382x.xx.xxx

Remark:

- For exact allocation of function please refer to supplement "Factory Settings"
- The pins 1 – 6 (incl.) are galvanically isolated from the supply voltage and from housing.
- Device 4.3824.34.319 is delivered permanently connected with a 17m cable.

• Serial Interface, full-duplex			View of solder terminal of coupling socket
Pin	Allocation	Function	
1	RXD-	Serial interface	
2	TXD-	Serial interface	
3	ADIO	Function not preset	
4	RXD+	Serial interface	
5	TXD+	Serial interface	
6	AGND	Ground for analogue and serial	
7	AC/DC	Supply, reverse-polarity protected	
8	AC/DC	Supply reverse-polarity protected	
	Shield	Shield against electric fields	

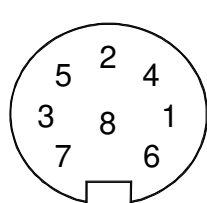
• Serial Interface, half-duplex and analogue outputs			View of solder terminal of coupling socket
Pin	allocation	Function	
1	WG	Analogue output wind velocity	
2	TXD- / RXD-	Serial interface	
3	ADIO	Function not preset	
4	WR	Analogue output wind direction	
5	TXD+ / RXD+	Serial interface	
6	AGND	Ground for analogue and serial	
7	AC/DC	Supply, reverse-polarity protected	
8	AC/DC	Supply, reverse-polarity protected	
	Shield	Shield against electric fields	

• Serial Interface, half-duplex and analogue inputs			View of solder terminal of coupling socket
Pin	Allocation	Function	
1	0-9,96V	Analogue input	
2	TXD- / RXD-	Serial interface	
3	0-9,96V	Analogue input	
4	0-9,96V	Analogue input	
5	TXD+ / RXD+	Serial interface	
6	AGND	Ground for analogue and serial	
7	AC/DC	Supply, reverse-polarity protected	
8	AC/DC	Supply, reverse-polarity protected	
	Shield	Shield against electric fields	

1.3.2.1 Connector Pin Assignment for device: 4.3821.31.319

Remark:

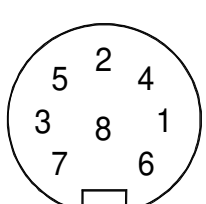
- The pins 1 – 6 (incl.) are galvanically isolated from the supply voltage and from housing..
- With this model the functions of PIN 3 are available on PIN 2, as described in the Instructions for use.

• Serial Interface, half-duplex and analogue inputs			View of solder terminal of coupling socket
Pin	Allocation	Function	
1	0 ... 10,0 V	Analogue output wind velocity	
2	5 V < 170 ° 0 V ≥ 170 °	Analogue output wind direction	
3	TXD- / RXD-	Serial interface	
4	0 ... 10,0 V	Analogue output wind direction	
5	TXD+ / RXD+	Serial interface	
6	AGND	Ground for analogue and serial	
7	24 V AC/DC	Supply, reverse-polarity protected	
8	24 V AC/DC	Supply, reverse-polarity protected	
⏏	Schirm	Shield against electric fields	

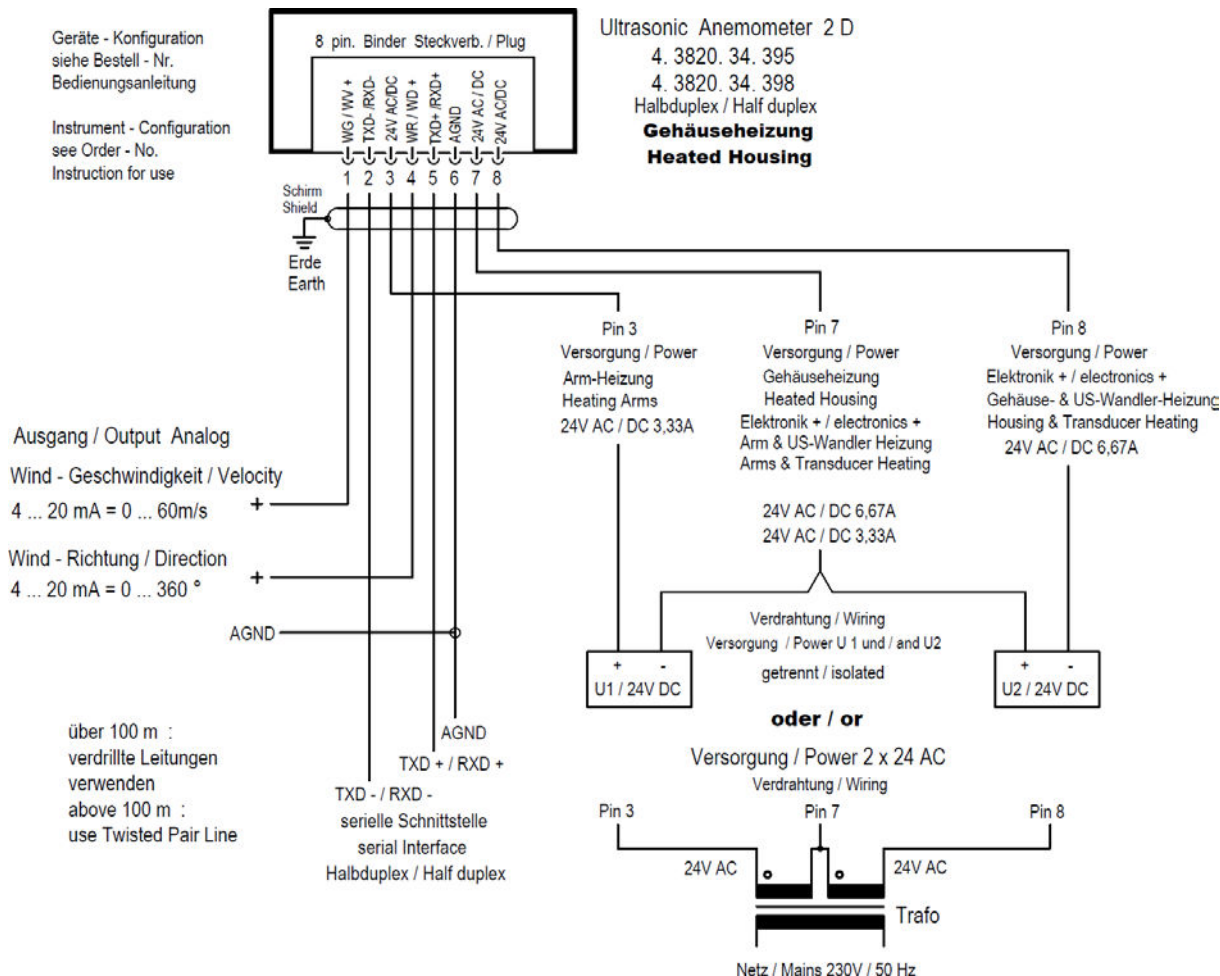
1.3.2.2 Connector Pin Assignment for device: 4.3820.34.395 / 4.3820.34.398

Remark:

With this instrument type there is no function of PIN 3 available as given in the instructions for use.

• Serial interface, HD, analogue outputs, heated housing with own supply			View on soldered connection of the coupling socket
Pin	Assignment	Function	
1	WG	Analogue output wind velocity	
2	TXD- / RXD-	Serial Interface	
3	24V AC/DC 6,26A*	Supply for Housing-Heating	
4	WD	Analogue output wind direction	
5	TXD+ / RXD+	Serial interface	
6	AGND	Ground for analogue and serial	
7	24V AC/DC 6,26A / 3,75A*	Supply for electronics, Arm-Heating, US-Transducer-Heating, Housing-Heating	
8	24V AC/DC 3,75A*	Supply for electronics, Arm-Heating, US-Transducer-Heating	
⏏	shield	Shield against electric fields	

* In order to reduce the current load of the connector contacts, the supply connection for the heated housing (PIN 3), and the supply connection for the electronics and heating (PIN 8) must be fed-in via separate power supplies (mutual connection of supplies is PIN 7). In case, of alternating current (AC) supply (current transformer), these connections must be carried out phase-shifted, and in case of DC supply must be carried out with reverse polarity (e.g. + at PIN 3 and – at mutual PIN 7 of the heated housing supply, as well as – at PIN 8 and + at mutual PIN 7 for the supply of electronics and heating), see also the following connection diagram.



1.3.2.3 Connector Pin Assignment for device: 4.3820.34.317

Remark:

With this instrument type there is no function of PIN 3 available as given in the instructions for use.

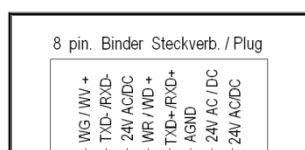
• Serial interface, HD, analogue outputs, heated housing with own supply			View on soldered connection of the coupling socket
Pin	Belegung	Funktion	
1	WG	Analogue output wind velocity	
2	TXD- / RXD-	Serial Interface	
3	24V AC/DC 3,33A*	Supply for Arm-Heating	
4	WD	Analogue output wind direction	
5	TXD+ / RXD+	Serial interface	
6	AGND	Ground for analogue and serial	
7	24V AC/DC 3,75A / 2,91A*	Supply for electronics, Arm-Heating, US-Transducer-Heating	
8	24V AC/DC 0,42A*	Supply for electronics, US-Transducer-Heating	
⏏	Shield	Shield against electric fields	

* The connected polarity of the power supplies can be freely selected.

A compensation of the supply currents for reducing the current load on PIN 7 of the plug connector is not necessary.

Geräte - Konfiguration
siehe Bestell - Nr.
Bedienungsanleitung

Instrument - Configuration
see Order - No.
Instruction for use



Ultrasonic Anemometer 2 D
4. 3820. 34. 317
Halbduplex / Half duplex

ohne Gehäuseheizung
without Heated Housing

Ausgang / Output Analog

Wind - Geschwindigkeit / Velocity

4 ... 20 mA = 0 ... 60m/s

Wind - Richtung / Direction

4 ... 20 mA = 0 ... 360 °

AGND

über 100 m :
verdrehete Leitungen
verwenden
above 100 m :
use Twisted Pair Line

TXD + / RXD +
AGND
TXD - / RXD -
serielle Schnittstelle
serial Interface
Halbduplex / Half duplex

Pin 3
Versorgung / Power
Arm-Heizung
Heating Arms
24V AC / DC 3,33A

Pin 7
Versorgung / Power
Elektronik + / electronics +
Arm & US-Wandler-Heizung
Arms & Transducer Heating

Pin 8
Versorgung / Power
Elektronik + / electronics +
US-Wandler-Heizung
Transducer Heating
24V AC / DC 0,42A

24V AC / DC 0,42A
24V AC / DC 3,33A

Verdrahtung / Wiring

Versorgung / Power U 1 und / and U2

getrennt / isolated

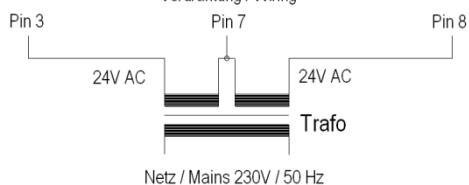
U1 / 24V DC
Polung beliebig
Polarity free selectable

U2 / 24V DC
Polung beliebig
Polarity free selectable

oder / or

Versorgung / Power 2 x 24 AC

Verdrahtung / Wiring



1.4 Electrical Installation for Ultrasonic Anemometer with Screwed Cable Gland

The ultrasonic anemometer is equipped with a fix-connected cable by means of a screwed cable gland. The cable end is open. The core ends are marked by means of pin numbers on cable marking rings.

1.4.1 Cable Pin Assignment (Examples of function)

Remark:

*For exact allocation of function please refer to supplement "Factory Settings"
The pins 1 – 6 (incl.) are galvanically isolated from the supply voltage and from housing.*

Cable assignment: Analogue outputs, serial interface half-duplex			
Pin	Colour Code	Assignment	Function
1	white	WG	Analogue output wind velocity
2	green	TXD- / RXD-	Serial interface
3	black 1	ADIO	Heating control
4	brown	WR	Analogue output wind direction
5	yellow	TXD+ / RXD+	Serial interface
6	black 2	AGND	Ground for analogue output and serial interface
7	black 3	AC/DC	Supply, reverse-polarity protected
8	black 4	AC/DC	Supply, reverse-polarity protected
	green / yellow	shield	

2 Maintenance

As the instrument does not have moving parts, i.e. is not subject to wear during operation, only minimal servicing is required. Given that the sensor surfaces are normally kept clean by rain, it will only be necessary to occasionally remove residues from the sensor surfaces in regions with very little rain. Cleaning can be carried out as required using non-aggressive cleaning agents in water and a soft cloth during routine checks.

Attention:

During storage, installation, de-installation, transport or maintenance of the anemometer it must be ensured that no water gets into the shaft and connector or cable gland of the anemometer.

3 Warranty

Damage caused by improper handling or external influences, e.g. lightning, do not fall under the warranty provisions. The warranty entitlement expires if the instrument 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.

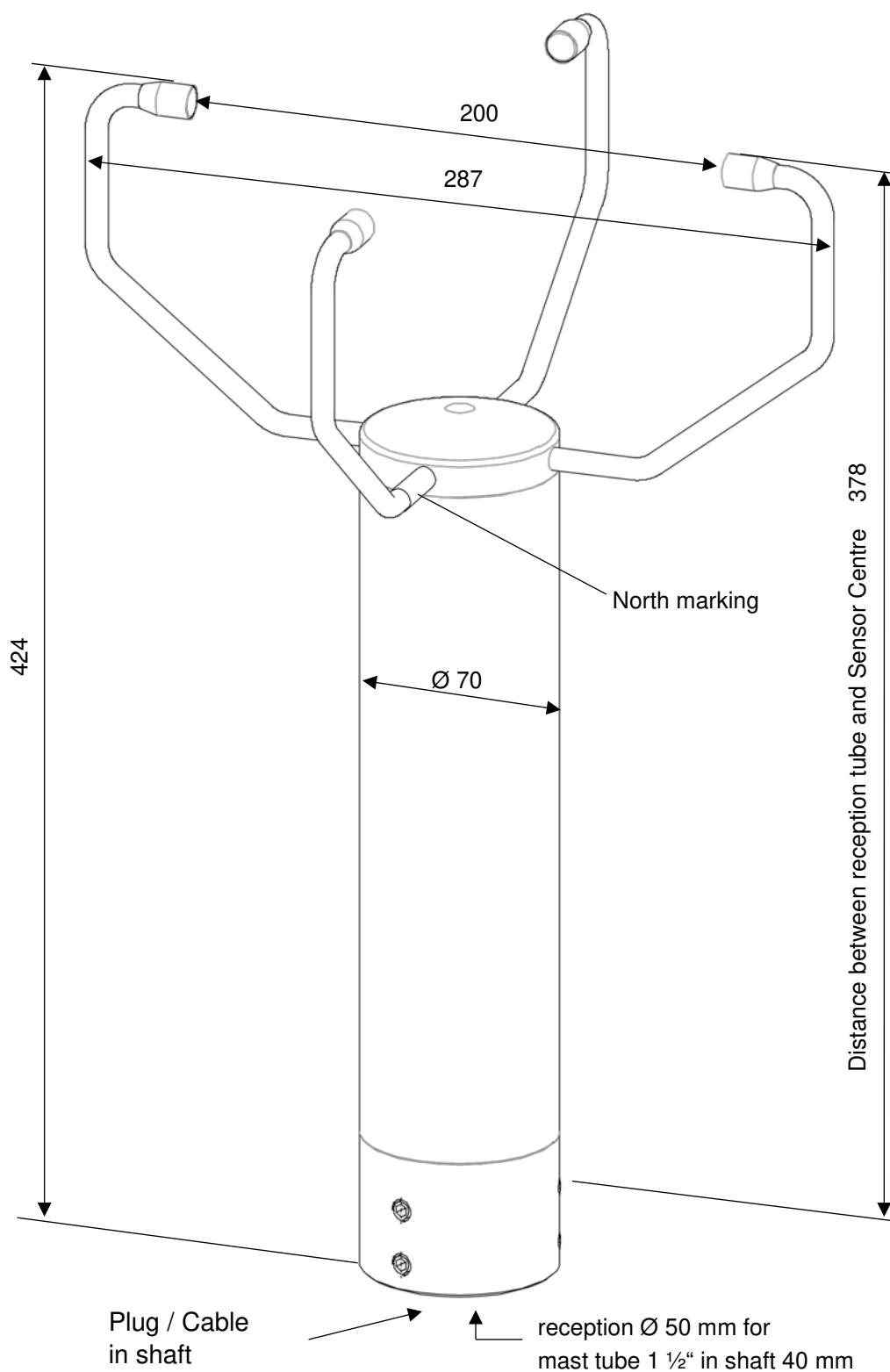
4 Technical data

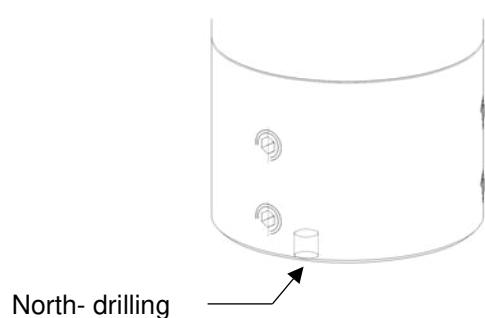
Wind velocity	Measuring range	0.01 ... 85m/s (Starting threshold: 0,01m/s) Scaling of analog output freely selectable.	
	Accuracy	<= 5m/s:	±0,1m/s (rms, mean over 360°)
		>5m/s:	±2% of meas. value (rms, mean over 360°)
	Resolution	0.1m/s:	In the telegrams: No. 1 to 5, 7 to 9, 11 to 13
		0.01m/s:	in the user-defined telegrams: (Nr. 6)
Wind direction	Measuring range	0 ... 360° (0 ... 540 °, 0 ... 720 ° for analogue output, adjustable)	
	Accuracy	± 1.0°	
	Resolution	1°:	In the telegrams: No. 1 to 5, 7 to 9, 11 to 13
		<1°:	in the user-defined telegrams: (No. 6)
Virtual temperature	Measuring range	-50 + 70°C	

	Accuracy	±0.5K to 35m/s
	Resolution	0.1K (in the telegrams No. 1 to 5, 07 to 9, 11 to 013)
Data output digital	Interface	RS 485 / RS 422
	Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 adjustable
	Output	Instantaneous values, wind velocity / direction and acoustic-virtual temp. Sliding mean values 0.5sec..100min freely selectable Standard deviation for wind velocity /direction and acoustic-virtual temp. 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	Electr. output	0 ...+20mA / 0 ... +10V or 4 ... +20mA / 2 ... +10V Wind velocity, wind direction and virt. temperature
		Burden on current output maximum 500 Ω
		Burden on voltage output minimum 4000 Ω
	Output	Instantaneous values Sliding mean values 0.5sec..100min freely selectable
	Output rate	Updating rate 7.5 up to 256msec adjustable
	Resolution	16bit
Analogue inputs	Number	Up to three analog inputs possible (3 x standard, 2 x add. configurable after consulting manufacturer)
	Resolution	16bit
	Sampling rate	0.1 ... 100Hz per channel
	Input range	0 to + 10,0V
	Data processing	Output of measured values in user-specific telegram
	Accuracy	±1,0% of meas. value in the range -40 ... +70°C
	Linearity integral Effective noise free bits	INL: typ. < 6 LSB Typ. 14bit* *with DC-supply for avoiding dynamic crosstalk in the connecting line
General	Internal measuring rate	Up to 400 measurements per second at +20 °C
	Bus mode	Bus mode with up to 99 instruments possible
	Program update	Program update possible in bus mode
Ambient condition	Temperature	Operating temperature -50 ... + 80°C heated -30 ... + 80°C unheated Storing -50 ... + 80°C Measuring operation possible with heating down to -75°C
	Rel. humidity	0 ... 100% r.h.
Operating voltage	Supply electronics - w/o heating operation	U: 8 ...78VDC or 12 ...55VAC, 45 ...65Hz P: typ. 1.5VA , max. 2.5VA
(with 4.382x.0x.xxx)	Supply: electronics + heating - with heating operation of US-arms	U: 24VAC/DC ±15%, 45 ... 65Hz P: typ. 80VA , max. 90 VA @ 24V
(with 4.382x.3x.xxx)	Supply: electronics + heating	U: 24VAC/DC ±15%, 45 ... 65Hz P: typ. 85VA , max. 90 VA @ 24V

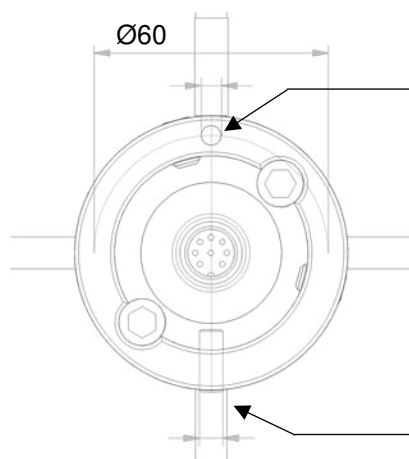
	- with heating operation of US-arms and US-converter	
(with 4.382x.4x.xxx)	Supply: electronics + heating - with heating operation of US-arms US-converter and housing	U: 48 VAC/DC $\pm 15\%$, 45 ... 65Hz P: typ. 280VA , max. 310VA @ 48V
(with 4.3820.34.317)	Supply: electronics + heating - with heating operation of US-arms and US-converter	U: 2 x 24VAC/DC $\pm 15\%$, 45 ... 65Hz P: typ. 85VA , max. 90VA @ 24V separated in 1 x max. 10VA and 1x max. 80VA
(with 4.382x.34.398)	Supply: electronics + heating - with heating operation of US-arms US-converter and housing	U: 2 x 24VAC/DC $\pm 15\%$, 45 ... 65Hz P: typ. 240VA @ 24V
Icing resistance	- w/o transducer heating	acc. to THIES STD 012001
Icing resistance	- with transducer heating	acc. to THIES STD 012002
	Housing material	Stainless steel (V4A)
	Installation type	Mast tube $\varnothing$ 50mm (see dimension drawing)
	Connection type	8-pole plug connection in shaft or with connected cable
	Protection	IP 67 (in case of conventional mounting and screwed and converted coupling socket (if necessary), see chapter „Preparation for operation“)
	Weight	2.5kg

5 Dimension Drawing





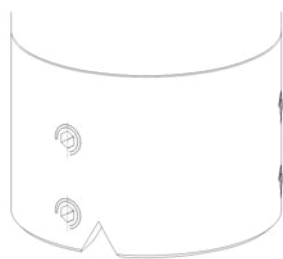
North- drilling



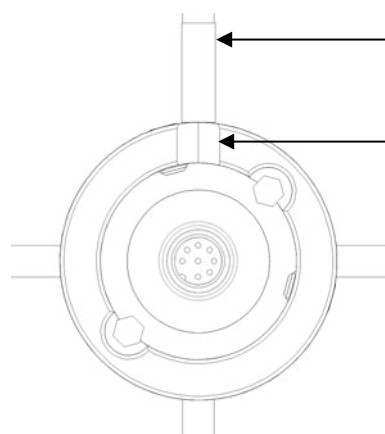
North-drilling
Ø 5,1 +0,1
8mm deep

South-drilling
Ø 6; 10mm
bottom-up

Bottom views



North- notch



North- marking

North-notch
11mm wide
60° 9,5 deep

Bottom views

6 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/4.382x.xx.xxx_US-Anemometer-2D_e_short.pdf

Instruction for use

https://www.thiesclima.com/db/dnl/4.382x.xx.xxx_US-Anemometer-2D_e.pdf

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

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