

Instruction for Use

021742/05/14

Wind Direction Transmitter „First Class“

Low Power Device with digital output, 8 Bit serial-synchronous

4.3151.x0.000



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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
 - Endangering of persons by electrical or mechanic effect
 - Damages at 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 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 under certain conditions, and in rare cases, may also output erroneous measuring values, it is recommended to use redundant systems with plausibility checks with **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, arrange for recycling as the packaging materials are designed to be recycled.



Documentation

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- 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.

1 Models available

Order - No.	Measuring range	Electrical Output	Supply	Heating
4.3151.00.000	0...360°	Digital: 8 Bit Serial Synchron	3,3V...42V DC	yes (24 V AC / DC)
4.3151.10.000	0...360°	Digital: 8 Bit Serial Synchron	3,3V...42V DC	without

2 Application

The wind direction transmitter serves for the detection of the horizontal wind direction in the field of meteorology and the technology of environmental protection.

Special characteristics:

- High level of measuring accuracy and resolution
- High damping ratio at a small delay distance
- Low starting threshold
- Low current consumption (3.3V@1.4 mA)

For wintertime use the wind direction transmitter (see chapter 1 models available) is optionally equipped with an electronically regulated heating, which guarantees the smooth running of the ball bearing, and prevents ice forming in the space between the external rotation parts.

3 Mode of Operation

The dynamic characteristics of the wind vane is achieved by the aluminum lightweight construction. The co-action of wind vane and balance weight results in a high damping ratio with small delay distance as excellent characteristic of the complete vane.

The axis of the wind vane is running in ball bearings and carries a diametrically magnetized magnet at the inner end. The angle position of the axis is scanned contact-free by a magnetic angle sensor (TMR-Sensor, Tunnel Magneto Resistance) through the position of the magnet field. As the sensor is operated in magnetic saturation, effects by external magnetic fields can almost be eliminated.

The connected electronics calculates the angle position of the axis and provides the respective serial-synchronous output signal.

An AC- or DC-voltage of 24 V is intended for the separate supply of the optional heating. In all probability, the heating guarantees a trouble-free function of the Wind Direction Transmitter First Class even under extreme meteorological icing-conditions.

The outer parts of the instrument are made of corrosion-resistant anodized aluminum, and stainless steel. Highly effective labyrinth gaskets and O-rings protect the sensitive parts inside the instrument against humidity and dust.

Wind Direction Code

The wind direction (0... 360°) is transformed into an 8 bit Gray-code (Thies special), and then output. The resolution is 2.5°. 144 increments per revolution.

Increment 0 = 0° = North and corresponds to the sector 0... 2.5°

Increment 143 = 357.5° corresponds to the sector 357.5... 0°

Schritt x 2.5°	Bit 0 / Spur A	Bit 1 / Spur B	Bit 2 / Spur C	Bit 3 / Spur D	Bit 4 / Spur E	Bit 5 / Spur F	Bit 6 / Spur G	Bit 7 / Spur H	Schritt x 2.5°	Bit 0 / Spur A	Bit 1 / Spur B	Bit 2 / Spur C	Bit 3 / Spur D	Bit 4 / Spur E	Bit 5 / Spur F	Bit 6 / Spur G	Bit 7 / Spur H	Schritt x 2.5°	Bit 0 / Spur A	Bit 1 / Spur B	Bit 2 / Spur C	Bit 3 / Spur D	Bit 4 / Spur E	Bit 5 / Spur F	Bit 6 / Spur G	Bit 7 / Spur H	
0									36									72									108
1	■								37	■								73	■								109
2	■	■							38	■	■							74	■	■							110
3	■	■	■						39	■	■	■						75	■	■	■						111
4	■	■	■	■					40	■	■	■	■					76	■	■	■	■					112
5	■	■	■	■	■				41	■	■	■	■	■				77	■	■	■	■	■				113
6	■	■	■	■	■	■			42	■	■	■	■	■	■			78	■	■	■	■	■	■			114
7	■	■	■	■	■	■	■		43	■	■	■	■	■	■	■		79	■	■	■	■	■	■	■		115
8	■	■	■	■	■	■	■	■	44	■	■	■	■	■	■	■		80	■	■	■	■	■	■	■	■	116
9	■	■	■	■	■	■	■	■	45	■	■	■	■	■	■	■		81	■	■	■	■	■	■	■	■	117
10	■	■	■	■	■	■	■	■	46	■	■	■	■	■	■	■		82	■	■	■	■	■	■	■	■	118
11	■	■	■	■	■	■	■	■	47	■	■	■	■	■	■	■		83	■	■	■	■	■	■	■	■	119
12	■	■	■	■	■	■	■	■	48	■	■	■	■	■	■	■		84	■	■	■	■	■	■	■	■	120
13	■	■	■	■	■	■	■	■	49	■	■	■	■	■	■	■		85	■	■	■	■	■	■	■	■	121
14	■	■	■	■	■	■	■	■	50	■	■	■	■	■	■	■		86	■	■	■	■	■	■	■	■	122
15	■	■	■	■	■	■	■	■	51	■	■	■	■	■	■	■		87	■	■	■	■	■	■	■	■	123
16	■	■	■	■	■	■	■	■	52	■	■	■	■	■	■	■		88	■	■	■	■	■	■	■	■	124
17	■	■	■	■	■	■	■	■	53	■	■	■	■	■	■	■		89	■	■	■	■	■	■	■	■	125
18	■	■	■	■	■	■	■	■	54	■	■	■	■	■	■	■		90	■	■	■	■	■	■	■	■	126
19	■	■	■	■	■	■	■	■	55	■	■	■	■	■	■	■		91	■	■	■	■	■	■	■	■	127
20	■	■	■	■	■	■	■	■	56	■	■	■	■	■	■	■		92	■	■	■	■	■	■	■	■	128
21	■	■	■	■	■	■	■	■	57	■	■	■	■	■	■	■		93	■	■	■	■	■	■	■	■	129
22	■	■	■	■	■	■	■	■	58	■	■	■	■	■	■	■		94	■	■	■	■	■	■	■	■	130
23	■	■	■	■	■	■	■	■	59	■	■	■	■	■	■	■		95	■	■	■	■	■	■	■	■	131
24	■	■	■	■	■	■	■	■	60	■	■	■	■	■	■	■		96	■	■	■	■	■	■	■	■	132
25	■	■	■	■	■	■	■	■	61	■	■	■	■	■	■	■		97	■	■	■	■	■	■	■	■	133
26	■	■	■	■	■	■	■	■	62	■	■	■	■	■	■	■		98	■	■	■	■	■	■	■	■	134
27	■	■	■	■	■	■	■	■	63	■	■	■	■	■	■	■		99	■	■	■	■	■	■	■	■	135
28	■	■	■	■	■	■	■	■	64	■	■	■	■	■	■	■		100	■	■	■	■	■	■	■	■	136
29	■	■	■	■	■	■	■	■	65	■	■	■	■	■	■	■		101	■	■	■	■	■	■	■	■	137
30	■	■	■	■	■	■	■	■	66	■	■	■	■	■	■	■		102	■	■	■	■	■	■	■	■	138
31	■	■	■	■	■	■	■	■	67	■	■	■	■	■	■	■		103	■	■	■	■	■	■	■	■	139
32	■	■	■	■	■	■	■	■	68	■	■	■	■	■	■	■		104	■	■	■	■	■	■	■	■	140
33	■	■	■	■	■	■	■	■	69	■	■	■	■	■	■	■		105	■	■	■	■	■	■	■	■	141
34	■	■	■	■	■	■	■	■	70	■	■	■	■	■	■	■		106	■	■	■	■	■	■	■	■	142
35	■	■	■	■	■	■	■	■	71	■	■	■	■	■	■	■		107	■	■	■	■	■	■	■	■	143

Table 1: 8 Bit Thies Gray Code

4 Recommendation Site Selection / Standard Installation

In general wind measurement instruments should be able to detect the wind conditions of a large area. In order to obtain comparable values when determining the surface wind, measurements should be taken at a height of 10 meters over an even area with no obstacles. An area with no obstacles means that the distance between the wind direction transmitter and an obstacle should be at least 10 times the height of the obstacle (s. VDI 3786 Part 2). If it is not possible to fulfill this condition then the wind direction transmitter should be set up a height where local obstacles do not influence the measured values to any significant extent (approx. 6 - 10 m above the obstacle). The wind direction transmitter should be set up in the center of flat roofs and not on the edge in order to avoid any preferential directions.

5 Installation

Attention:

Storing, mounting and operation under weather conditions is permissible only in vertical position, as otherwise water can get into the instrument.

Remark:

When using fastening adapters (angle, traverses, etc.) please take a possible effect on the measurements by turbulences into consideration.

Caution:

The device may only be supplied with a power supply of the "Class 2, limited power".

5.1 Wind Vane Mounting

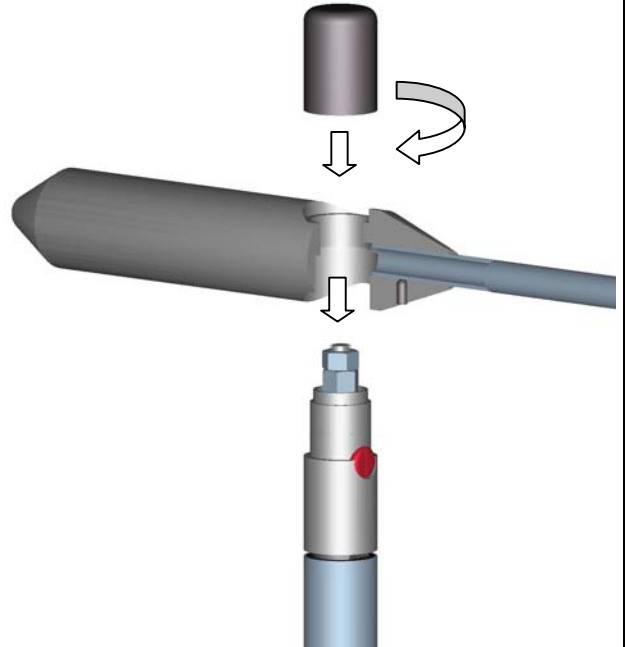
Before the wind direction transmitter can be installed at its selected site, the wind vane must be mounted on the housing.

Tools:

Not required

Procedure

1. Remove wind transmitter housing from the packing.
2. Remove cap by counter-clockwise rotation.
3. Remove wind vane from the packing
4. Mount the wind vane on the housing acc. to figure.
5. Wind vane rotate until it falls into the guide.
6. Put the cap on the thread, and tighten it manually by strong clockwise rotation. Please do not use tools.



Remark

The wiring must be prepared so far, that plug and cable have been pushed through instrument carrier, mast, traverse etc., and can be connected to the wind direction transmitter at the moment of the „Mechanical Mounting”, described in the following (please refer also to chapter 5.4).

5.2 Mechanical Mounting

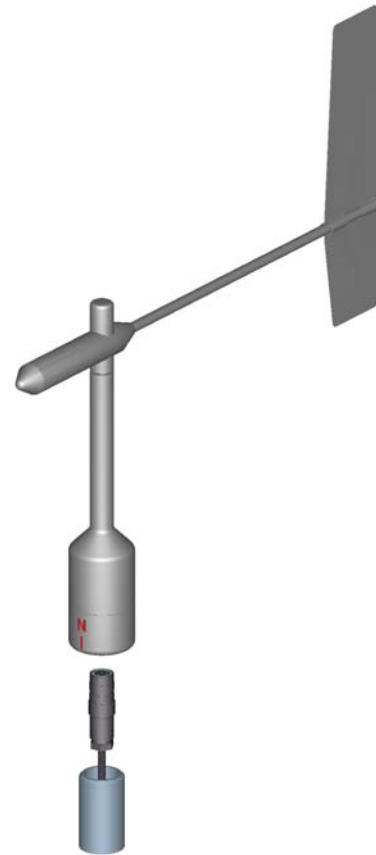
The wind direction transmitter must be mounted on an instrument carrier, which is suited for the measurement. For dimensions of wind direction transmitter please refer to chapter 10.

Tools:

Hexagon socket wrench SW3
(Allen key)

Procedure:

1. Push cable/ plug connector of the wind direction transmitter through the borehole of the mast, tube, arm etc.
2. Put wind direction transmitter on mast, tube, arm etc.
3. Align the wind direction transmitter "northwards" (**procedure see chapter 5.2.1**).
4. Safeguard the wind direction transmitter by two M6-Allen head screws



Remark:

Suitable instrument carriers are masts, tubes, traverses, arms, adapters, adapters of POM for isolated mounting, which correspond to the mounting dimensions of the wind transmitter, and to the static requirements.

The inner diameter of the instrument carrier should be ≥ 20 mm based on plug- and cable feed-through.

5.2.1 North Alignment

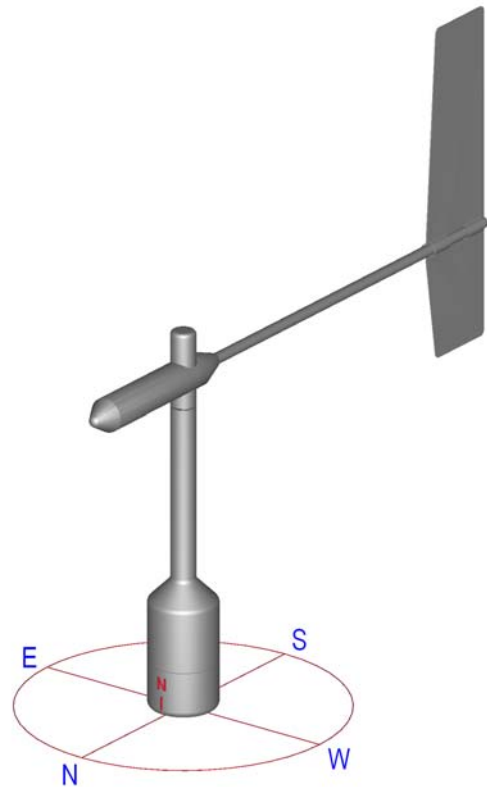
For the precise determination of the wind direction the wind direction transmitter must be aligned **northwards** (geographical north).

Tools:

Hexagon socket wrench SW3
(Allen key)

Procedure:

1. Rotate north marking (I) at the housing and wind vane axially one above the other, acc. to figure.
2. Determine a prominent spot in the surrounding area (tree, building etc) in northward direction, by means of a compass.
3. Locate the prominent spot over wind vane and balance weight of the wind direction transmitter.
4. Align wind direction transmitter. The north marking must indicate the *geographical north*.
5. In case of conformity, safeguard the wind direction transmitter by two M6-Allen head screws



Remark:

If the north alignment is carried out by compass, please consider the local declination (= deviation of direction of the magnetic needle from the true north), and local magnetic interferences (e.g. hardware, electric cable).

When aligning the wind direction transmitter on a moving object (e.g. vehicle, wind wheel, ship etc) please consider that the "north point" to be determined, might possibly be located on the object.

5.3 Electrical Mounting

5.3.1 Cable

Solder a shielded cable with diameter 7-8 mm and a core cross-section of 0,5...0,75 mm² to the enclosed coupling socket.

- The number of necessary wires is given in the connection diagram (chapter 5.4).

5.3.1.1 Cable Recommendation

No. of wires/ diameter / type / cable diameter
CABLE 8x0,5mm ² LIYCY BLACK, UV- resistant, Ø 7,6 mm

5.3.2 Cable Shield

The connection of the cable shield between sensor and data acquisition device should be selected in way, that in case of over-voltages no equalizing currents will flow that might destroy the electronic components.

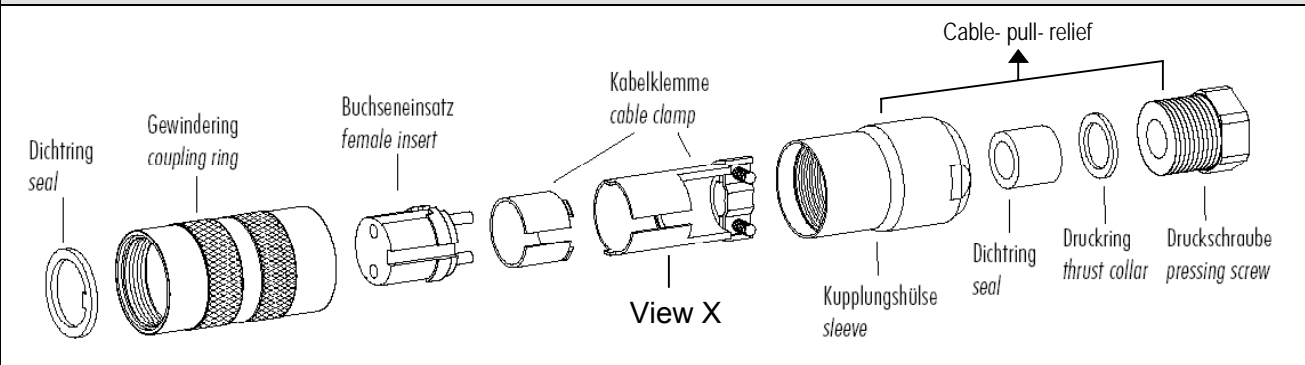
The connection of the cable shield should depend on the selected isolated, or respectively, non-isolated mounting of the sensors.

5.3.2.1 Connecting Recommendation for the Cable Shield

	Sensor Carrier	Sensor	Shielding / Ground	Lightning Protection
1.	Metallic measurement mast, grounded	Isolated mounting at the measuring mast (e.g. by non-metallic brackets, holder etc. or by metallic brackets, holder etc. with isolated plastic adaptors)	Apply the cable shield between sensor and data acquisition device (e.g. datalogger) both-sided. Ground data acquisition device.	Mount metallic lightning protection rod on the mast. Alternatively: Install separate lightning protection rod beside the measurement mast.
2.	Metallic measurement mast, grounded	Non-isolated mounting at the measurement mast (e.g. by metallic brackets, holders etc.)	Apply cable shield between sensor and data acquisition device (e.g. datalogger) only one-sided at the acquisition device.. Ground data acquisition device.	Mount metallic lightning protection rod on the mast in isolated condition , and ground lightning protection rod. Alternatively: Install separate lightning protection rod beside the measurement mast.
3.	Metallic measurement mast, not grounded (mounted in isolated condition, e.g. on the attic)	Non-isolated mounting at the measurement mast. (e.g. by metallic brackets, holders etc.)	Apply the cable shield between sensor and data acquisition device (e.g. datalogger) both-sided. Ground data acquisition device.	Mount metallic lightning protection rod on the mast in isolated condition , and ground lightning protection rod. Alternatively: Install separate lightning protection rod beside the measurement mast.
4.	Non-metallic measuring mast (=isolated)	Mounting at the measurement mast. (e.g. by metallic brackets, holders etc.)	Apply the cable shield between sensor and data acquisition device (e.g. datalogger) both-sided. Ground data acquisition device.	Mount metallic lightning protection rod on the mast, and ground lightning protection rod. Alternatively: Install separate lightning protection rod beside the measurement mast.

5.3.3 Plug and Cable Mounting

Coupling socket, Type: Binder, Serial 423, EMC with cable clamp



Cable connection: **with** cable shield

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

Cable mounting 1

Putting shrink hose or insulating tape between wire and shield.

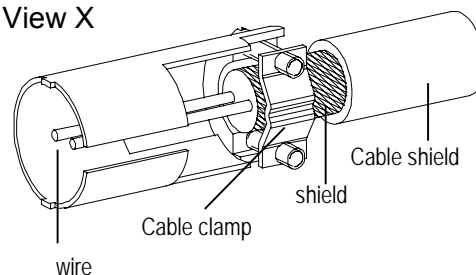
Cable mounting 2

If cable diameter permits, put the shield backward on the cable sheath.

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).

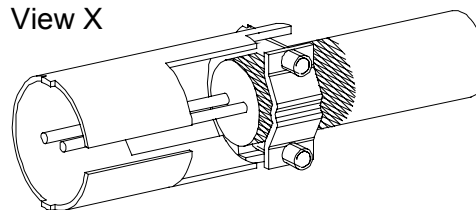
Cable mounting 1

View X



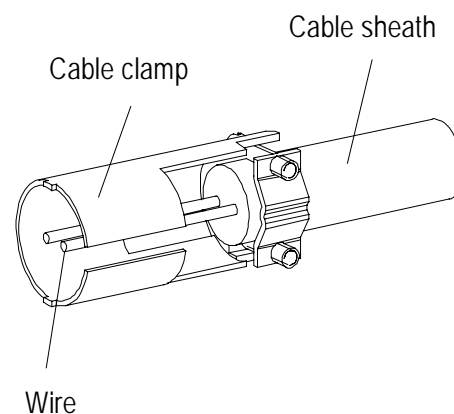
Cable mounting 2

View X



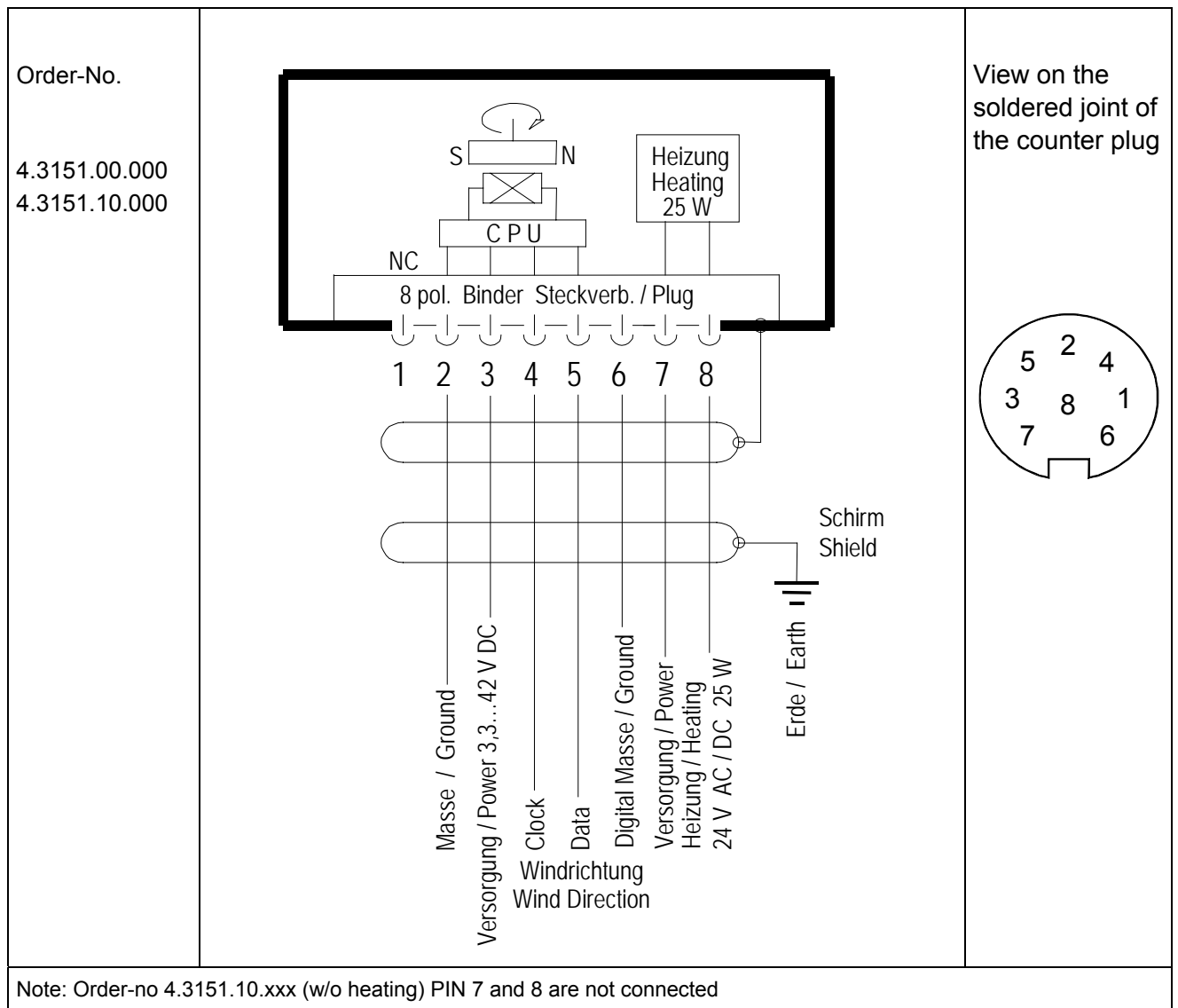
Cable connection: **without** cable shield

1. Stringing parts on cable acc. to plan given above.
2. Stripping cable sheath 20 mm
3. Cutting uncovered shield 20 mm
4. Stripping wire 5mm.
5. Soldering wire to the insert
6. Positioning shield in cable clamp.
7. Screwing-on cable clamp.
8. Assembling remaining parts acc. to upper plan.
9. Tightening pull-relief of cable by screw-wrench (SW16 und 17).



5.4 Connecting Diagram

Connection diagram acc. to chapter 5.3.2.1 no.1, 3 and 4:



Contact	Name	Function
1	-----	Not connected
2	GND	Supply ground
3	+Vcc	Supply 3,3 V ... 42 V DC
4	Clock	Serial-synchron Clock
5	Data	Serial-synchron Data
6	DIG-GND	Digital ground
7	HZG	Heating supply:
8		Voltage: 24 V AC/DC Power: 25 W

6 Serial-synchronous Interface

The serial-synchronous interface has a unidirectional two-leads-interface. When no data query is carried out the wind transmitter is in standby-mode. On the first received clock signal the 8 bit measuring value of the wind direction is accepted in a shift register, and the LSB is connected to the data output. In parallel, the new measuring process is starting. After 8 clock pulses the WD-code is output, and with further 8 clock-pulses the transmission of the inverse WD-code (see table 2) is carried out. The inverse WD-code can be applied for the transmission error control. The simultaneous data output and the starting of a measuring process mean that always the last measuring value is output (see figure 2).

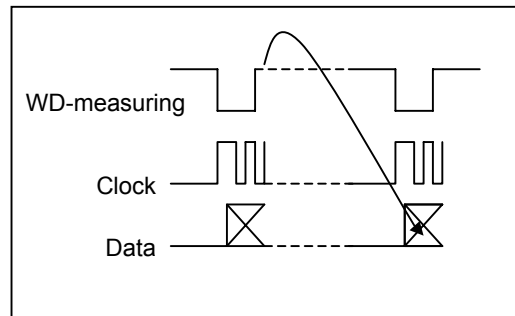


Figure 1: Wind-Direction- Code

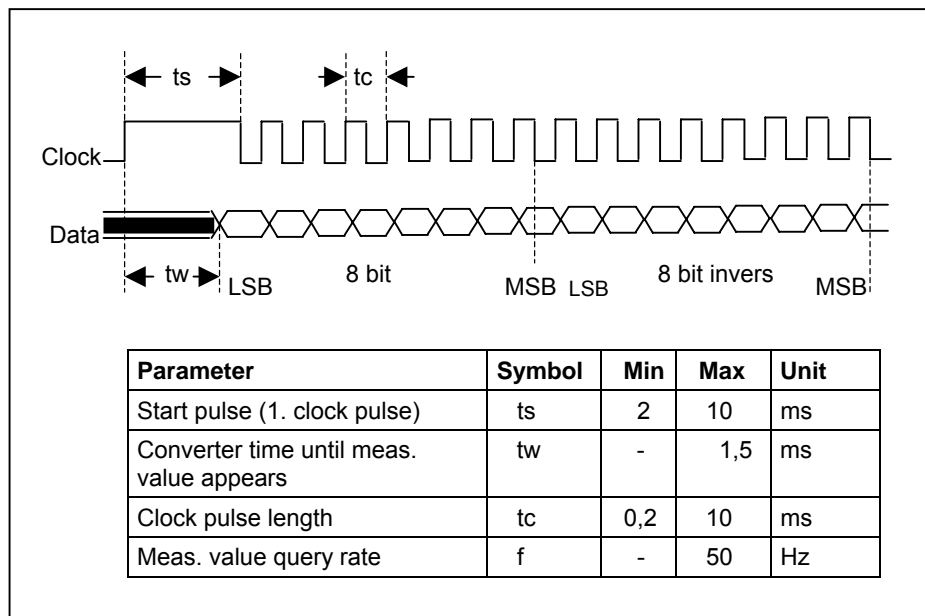


Table 2: Interface specification "serial-synchron."

7 Placing into Operation

Connect the wind transmitter to a power supply unit and a serial-synchronous interface, as described in the connection diagram. After connection of the supply voltage, and after a delay of $t(v) = 5\text{sec}$, while the interface is inactive, the wind direction data can be recalled via the interface.

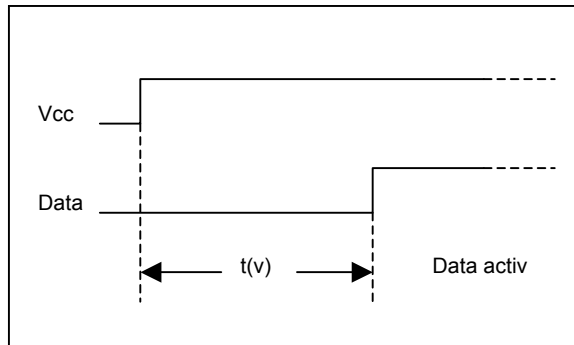


Figure 2: Data- out activation

8 Maintenance

If properly installed, the instrument requires no maintenance.

The ball bearings of the wind direction transmitter are prone to wear, and with a prolonged use they might change the dynamic behavior of the wind vane. Therefore, we recommend checking the instrument in regular intervals.

Cleaning

For the cleaning of the device should use a damp cloth without chemical cleaning agents are used.

Remark:

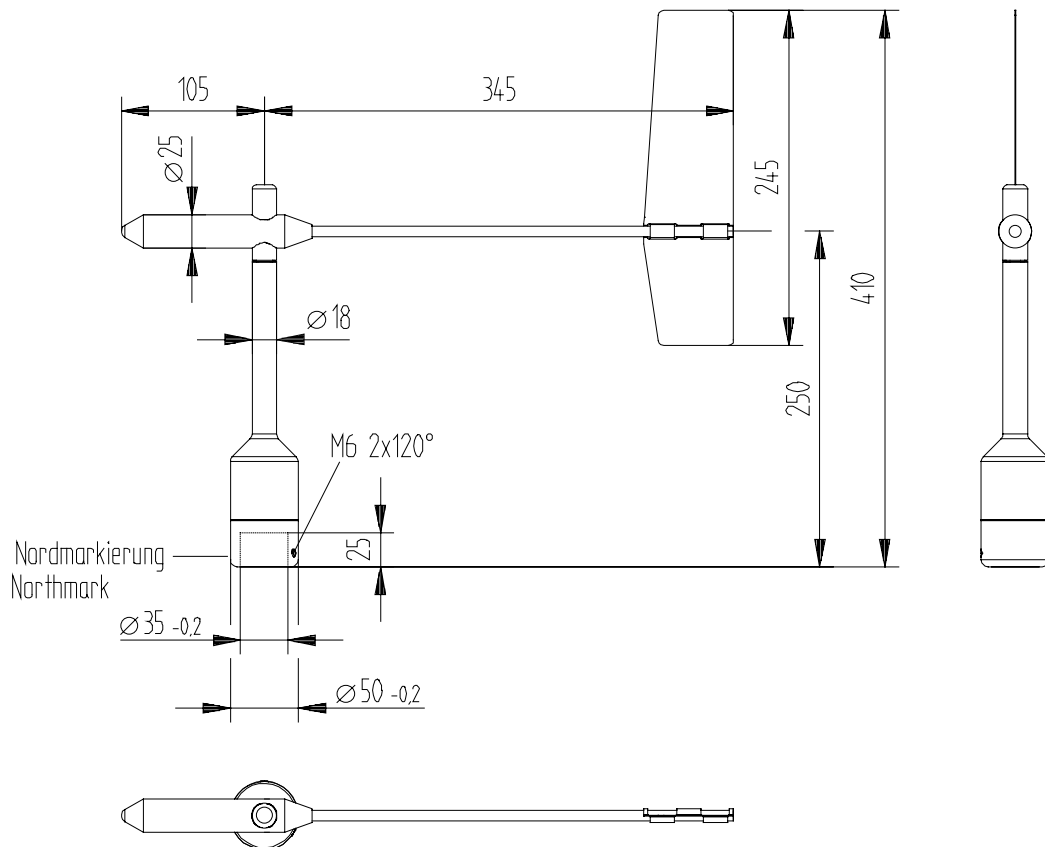
For transport of instrument please use original packing.

9 Technical Data

Characteristic	Description
Measuring range	0 ... 360 °
Measuring Accuracy	1°
Resolution of measuring value	2.5°
Survival speed	85 m/s up to 0,5 h
Permissible ambient conditions for operation	-50 ... +80°C all occurring situations of rel. humidity incl. dew moistening
Output	8 bit serial synchronous (see table 2)
Output-Code	Thies Gray Code (see table 1)
Electrical output	Data (out), Clock I (Data (out) max = 10 mA Clock (in) see table 2 Power- On delay 5sec
Data-Out (Amplitude)	Vcc (max = 15V)
Clock-IN (Amplitude)	3.3V ...Vcc
Starting threshold	< 0.,5 m/s at 10° amplitude (acc. to ASTM D 5366-96) < 0.2 m/s at 90° amplitude (acc. to VDI 3786 Part 2)
Delay distance	< 1.8 m (acc. to ASTM D 5366-96)
Damping ratio	D > 0.3 (acc. to ASTM D 5366-96)
Quality factor	K > 1 $K = \frac{4 \cdot D \cdot \omega_0}{\rho \cdot u}$ D damping ratio, ω_0 angular frequency of undamped oscillation, ρ air density u wind speed.
Heating	Surface temperature of housing neck > 0 °C at 20 m/s up to -10 °C air temperature, at 10 m/s up to -20 °C using the Thies icing standard 012002 on the housing neck heating regulated with temperature sensor
Electrical supply (Vcc)	Vcc 3,3 V DC ...42 V DC Icc < 1.4 mA in standby Icc ≈ 2.5 mA 10Hz query rate
Electrical supply for heating	24 V AC/DC, 45...65Hz (galvanically isolated from housing) Pmax = 25 W
Connection	8-pole plug connection for shielded cable in the shaft (see connecting diagram)
Mounting	Mounting on mast 1" (DIN EN 10255; 1"= Ø 33,4 mm), Remark: mounting on mast 1½ " is possible with separate

	adapter (option).
Dimensions	See dimensional drawing
Weight	Approx. 0.7 kg
Protection	IP 55 (DIN 40050)

10 Dimensional drawing



11 Accessories

<p>Traverse 0,6 m</p> <p>For mounting the wind speed and wind direction transmitter jointly onto a mast</p>	4.3174.00.000	<p>Horizontal sensor distance: 0,6 m</p> <p>Vertical sensor distance: 0,2 m</p> <p>Mast receptacle: 48 - 50 mm</p> <p>Material: Aluminum, anodised</p> <p>Dimensions: tube Ø 34x4mm, 668 mm long, 756 mm high</p>
<p>Hanger</p> <p>–FIRST CLASS- 1m</p> <p>For the lateral mounting of a wind speed and wind direction transmitter onto a mast tube..</p>	4.3184.01.000	<p>Sensor distance to mast: 1 m</p> <p>Mast clamp: 40 – 80 mm</p> <p>Tube diameter: 34 mm</p> <p>Material: Aluminum</p>
<p>Lightning rod</p> <p>For mounting the a/m traverse or hanger.</p>	4.3100.98.000	<p>Dimension: Ø 12 mm, 500 mm long, 1050 mm high</p> <p>Material: Aluminum</p>
<p>Adaptor</p> <p>For isolated mounting of each wind transmitter and wind direction transmitter on the traverse (4.3174.0.000).</p>	509077	<p>Dimension: A:Ø 34 mm, outside 25 mm high B:Ø 35 mm, inside 45 mm high</p> <p>Material: POM</p>

Please contact us for other accessories such as cables, power supply units, masts, as well as for additional mast- or system-constructions.

Example: Wind transmitter with traverse and lightning rod.



12 EC-Declaration of Conformity

Document-No.: 001585

Month: 05 Year: 14

Manufacturer: **ADOLF THIES GmbH & Co. KG**

Hauptstr. 76
D-37083 Göttingen
Tel.: (0551) 79001-0
Fax: (0551) 79001-65
email: Info@ThiesClima.com

Description of Product: **Wind Direction Transmitter FIRST CLASS**

Article No.	4.3151.00.000	4.3151.00.001	4.3151.00.012	4.3151.00.110
	4.3151.00.140	4.3151.00.141	4.3151.00.161	4.3151.00.173
	4.3151.00.210	4.3151.00.212	4.3151.00.400	
	4.3151.10.000	4.3151.10.001	4.3151.10.012	4.3151.10.110
	4.3151.10.140	4.3151.10.141	4.3151.10.161	4.3151.10.173
	4.3151.10.210	4.3151.10.212	4.3151.10.400	
	4.3151.90.141			

specified technical data in the document: 021741/05/14; 021743/05/14; 021746/05/14; 021750/05/14; 021753/05/14; 021755/05/14

The indicated products correspond to the essential requirement of the following European Directives and Regulations:

- 2004/108/EC DIRECTIVE 2004/108/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC
- 2006/95/EC DIRECTIVE 2006/95/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 12 December 2006 on the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits
- 552/2004/EC Regulation (EC) No 552/2004 of the European Parliament and the Council of 10 March 2004 on the interoperability of the European Air Traffic Management network (the interoperability Regulation)
- 2011/65/EU DIRECTIVE 2011/65/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment

The indicated products comply with the regulations of the directives. This is proved by the compliance with the following standards:

Reference number	Specification
IEC 61000-6-2: 2005	Electromagnetic compatibility Immunity for industrial environment
IEC 61000-6-3: 2006	Electromagnetic compatibility Emission standard for residential, commercial and light industrial environments
IEC 61010-1: 2010	Safety requirements for electrical equipment for measurement, control, and laboratory use. Part 1: General requirements

Place: Göttingen

Date: 16.05.2014

Legally binding signature:

issuer:

.....
Wolfgang Behrens, General Manager

.....
Joachim Beinhorn, Development Manager

This declaration certifies the compliance with the mentioned directives, however does not include any warranty of characteristics. Please pay attention to the security advises of the provided instructions for use.



ADOLF THIES GmbH & Co. KG

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