

## Instruction for Use

021517/07/08

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### ***Wind Direction Transmitter „First Class“***

- Device with digital output, RS 485
- Wind velocity signal acquisition

**4.3150.x0.400**



### **ADOLF THIES GmbH & Co. KG**

Hauptstraße 76

Box 3536 + 3541

Phone ++551 79001-0

[www.thiesclima.com](http://www.thiesclima.com)

37083 Göttingen Germany

37025 Göttingen

Fax ++551 79001-65

[info@thiesclima.com](mailto:info@thiesclima.com)

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## **1 Models available**

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<b>Order- No.</b>	<b>Wind direction Meas. range</b>	<b>Wind velocity Input [Hz]</b>	<b>Electrical Output</b>	<b>Supply</b>	<b>Heating</b>
4.3150.00.400	0...360°	1000 Hz @ 50m/s	RS 485	3,3V...42V DC	with (24 V AC / DC)
4.3150.10.400	0...360°	1000 Hz @ 50m/s	RS 485	3,3V...42V DC	without

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## 2 Application

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

The measuring value is available as serial data telegram via an RS485 interface. The data telegram is able to operate, for ex., wind displays, weather displays, dataloggers, process control systems or to communicate with PC and software "Meteo-Online".

The wind direction transmitter can acquire wind velocity signals and can complete its serial data telegram by the parameter **wind velocity**.

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 – 15V @6,0mA)
- Option for connecting an anemometer „First Class 4.3350.x0.000 “.
- Data telegram additionally with wind velocity
- Simple mounting and dismounting

For winter time 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. Electrical supply of the wind transmitter heating is provided for ex.. by our power supply unit order-no. 9.3388.00.000.

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### **Remark:**

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

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## 3 Mode of Operation

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### **Wind direction**

The dynamic characteristics of the wind vane is achieved by the aluminum light-weight 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 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 output signal.

### **Acquisition of Wind Velocity**

Additionally to the wind direction acquisition the wind direction transmitter offers the option of sup-

plying the wind velocity signal from the *Wind transmitter First Class 4.3350.x0.000*. The wind velocity signal is acquired and analyzed and is available in the output telegram along with the acquired wind direction.

### **General**

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.

## **4 Recommendation Site Selection / Standard Installation**

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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**

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### **5.1 Mounting of the Wind Vane**

Before the wind direction transmitter can be installed at a selected site, the wind vane and the balance weight must be mounted at the adaptors of the wind direction transmitter. The individual process steps are explained in the following list, and by the drawing (figure 1). Necessary tool: Philips screw driver.

- **Wind vane:**
  - Remove the screw M3 from the thin adaptor.
  - Put the wind vane onto the thin adaptor. (The longer part of the wind vane deflector must indicate upward).
  - Put the screw M 3 through the hole of the wind vane from below into the adaptor, and screw tight.
- **Balance weight:**
  - Remove the screw M3 from the thicker adaptor.
  - Put the balance weight onto the thicker adaptor.
  - Put the screw M 3 through the hole of the balance weight from below into the adaptor, and screw tight.

**Remark:**

As the screws are covered with locking varnish they are rough-running with the fastening.

The screw head must be immersed completely in the counter-bore of balance weight and wind vane!

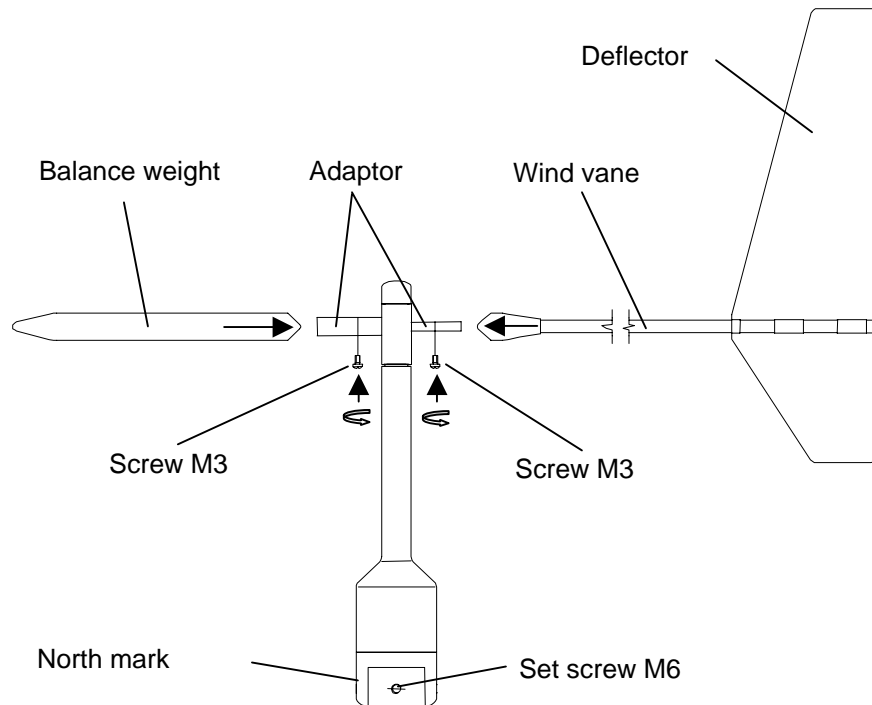


Figure 1: Mounting of the wind vane

## 5.2 Electrical Mounting

Solder a shielded cable with diameter 7-8 mm and a core cross-section of 0,5...0,75 mm<sup>2</sup> to the enclosed coupling socket.

- The number of necessary wires is given in the connection diagram (chapter 6).

Cable recommendation	
Type/ No. of cores /Diameter	Cable diameter
LIYCY 4 x 0,75 mm <sup>2</sup>	ca. 7 mm
LIYCY 5 x 0,50 mm <sup>2</sup>	ca. 7 mm
LIYCY 6 x 0,75 mm <sup>2</sup>	ca. 7,7 mm
LIYCY 7 x 0,50 mm <sup>2</sup>	ca. 7,5 mm
LIYCY 8 x 0,50 mm <sup>2</sup>	ca. 8 mm

## 5.3 Mechanical Mounting

Mount the transmitter onto a pipe socket of R 1" (Ø 33,5 mm) and a length of 25 mm. The pipe socket must have an internal diameter of at least 25 mm as the wind direction transmitter must be connected electrically with a plug from below. After electrical connection the wind direction transmitter is put onto the pipe socket, and is fixed by means of 2 threaded pins (female hexagon 3 mm) at the base of the transmitter.

**Attention:**

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

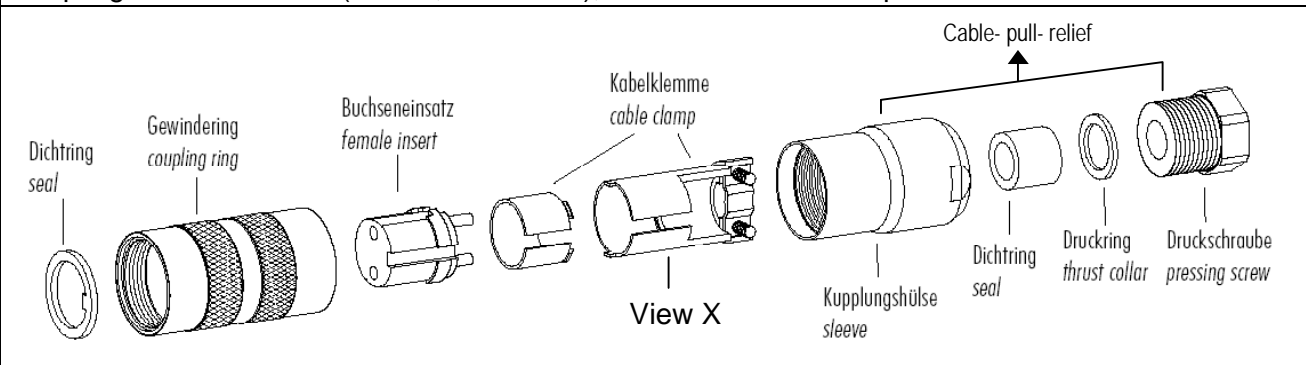
## 5.4 North Alignment

**Remark:**

When the wind direction transmitter is in operation, the north marking (line mark) at the base of the transmitter must indicate to the geographical north.

## 5.5 Plug mounting

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



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.

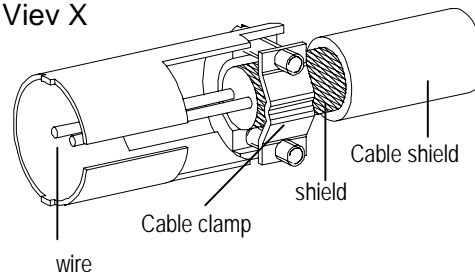
**Cable mounting 2**

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

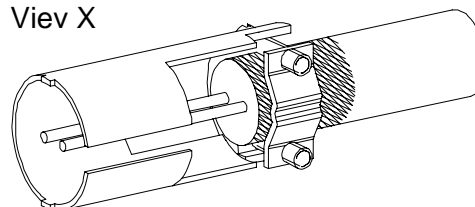
3. Soldering wire to the insert, positioning shield in cable clamp.
4. Screwing-on cable clamp.
5. Assembling remaining parts acc. to upper plan.
6. Tightening pull-relief of cable by screw-wrench (SW16 und 17).

**Cable mounting 1**

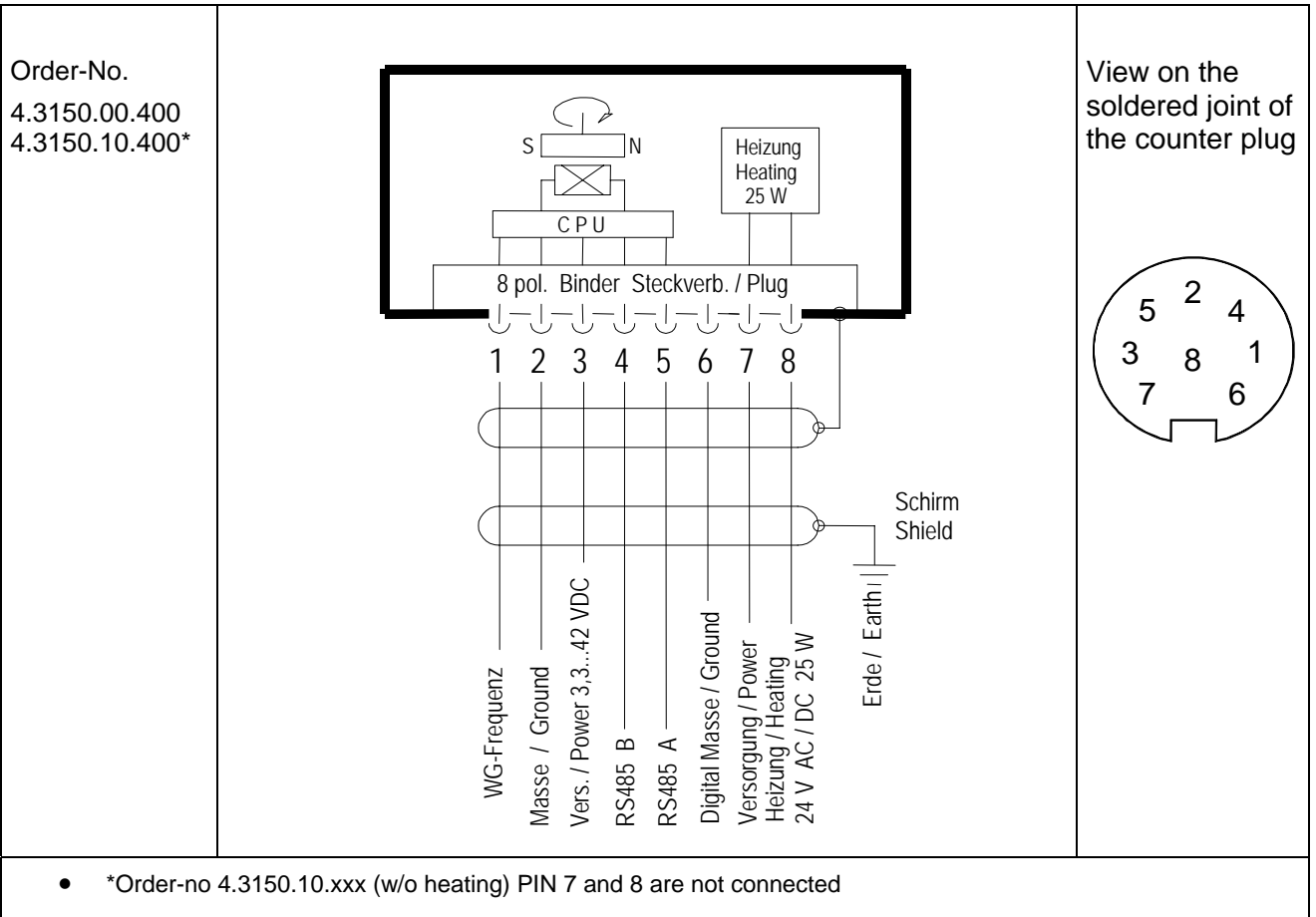
View X

**Cable mounting 2**

View X

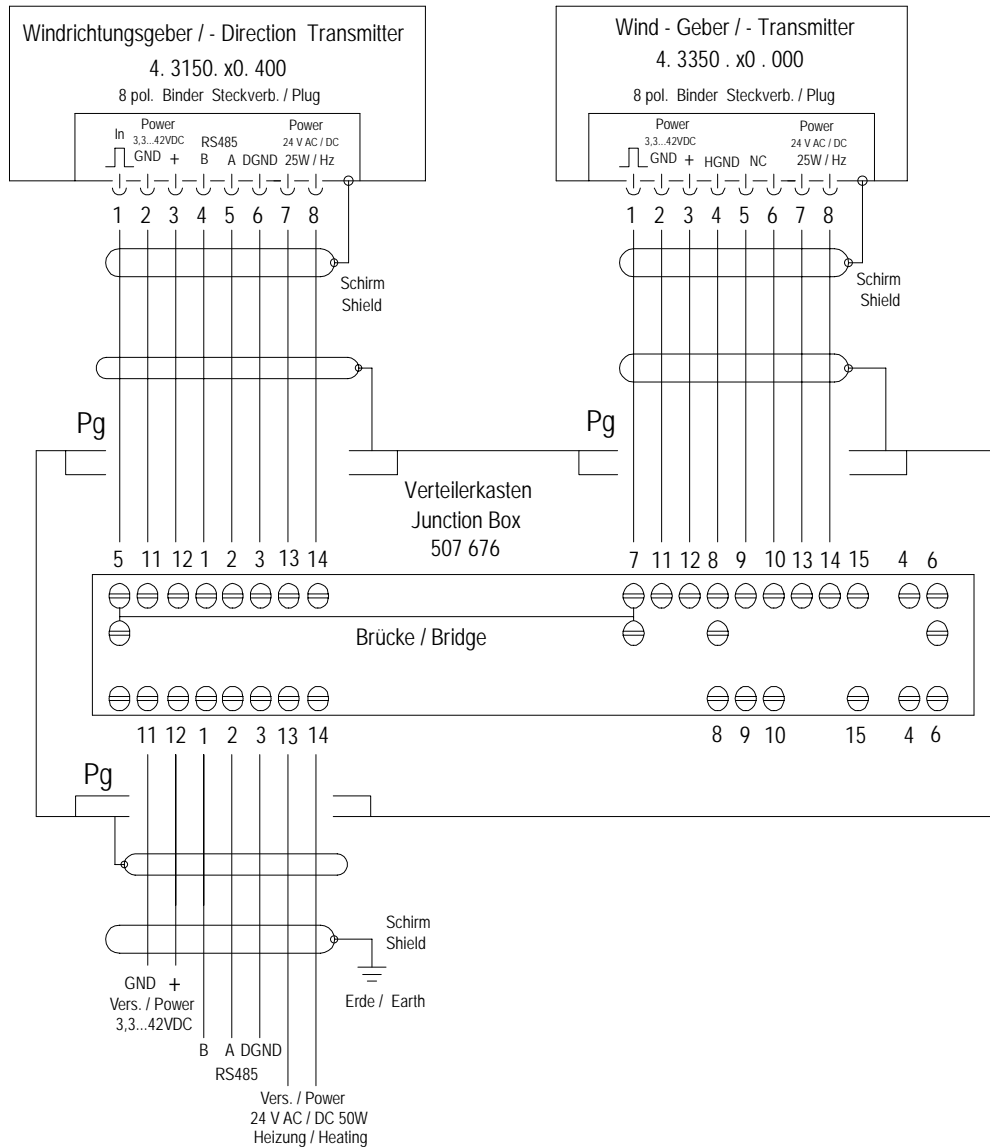


## 6 Connecting Diagram



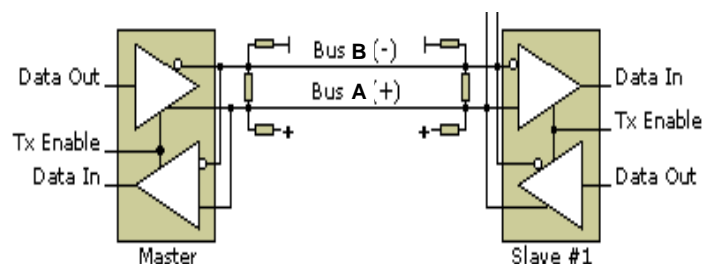
Pin	Name	Function
1	WV-frequency	Input wind velocity
2	GND	Supply ground
3	+Vcc	Supply 3.3 V ... 42 V DC
4	Serial B	RS 485 (B), serial- synchron Clock
5	Serial A	RS 485 (A), serial- synchron Clock
6	DGND	Digital ground / ground wind velocity
7	HZG	Heating supply:
8		Voltage: 24 V AC/DC Power: 25 W
*Order-no 4.3150.10.xxx (w/o heating) PIN 7 and 8 are not connected		

## 6.1 Example Connection Diagram



## 7 Serial Interface (RS485)

The wind direction transmitter has an RS485 interface, which is operated in half-duplex mode. For a respective termination (terminating resistance) of the connecting cable must be provided externally (no termination in the wind direction transmitter).



Principle circuit diagram

## 8 Placing into operation

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The wind direction transmitter is to be connected to a voltage source and a RS485 interface, as given in the connection diagram. With the connection of the supply voltage, and after a delay of 5 sec, the output of serial data starts automatically with the following setting:

Setting of interface :

Baud rate	9600 baud
Data bits	8 bit
Parity bit	no
Stop bit	1

## 9 Serial Communication

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For communication purpose the wind transmitter has a command interpreter. By means of this interpreter the behavior of the instrument can be changed. Thus, for example, the baud rate the instrument ID, and the starting behavior can be adapted to the own requirements. On principle, the command has the following construction:

AABB<CR> or AABBCCCCC<CR>

with:

AA: Wind transmitter – ID. Is always two-digit and in the range 00... 98

*ID-works setting: 00*

BB: the command, see list of commands

CCCC: A five-digit value for setting a new parameter value.

<CR>: Means here carriage-return ( enter-button). This sign terminates the entering of commands.

A check of the command syntax is carried out in the wind transmitter. The correct reception of a command is acknowledged with „echo telegram“ for ex.:

00BR00005<CR> transmitting command

!00BR00005<CR> echo telegram

If a command is transmitted to the instrument without parameter value, it serves for querying the value currently set. For example, by means of the command

00BR<CR>

the current baud rate is queried. The reply telegram, for ex., appears as follows:

!00BR00005<CR> **00005** = 9600baud (see table of baud rates)

In order to avoid an unmeant parameter adjustment some commands (see list of commands) are secured by a so-called “key”. This “key” must be transmitted before the actual modification command.

*Example: modification of baud rate*

00KY00001<CR>     Key-secured command released

00BR00006<CR>     baud rate set to 19200

**Attention:**

***The key-secured commands are released until the supply voltage is activated, or the command 00KY00000<CR> is transmitted.***

**Automatic Baud Rate Setting:**

If the baud rate of a wind transmitter is unknown, it can be set or detected by the following method. For this, it is necessary to set a possible baud rate (see table of baud rates).

- Constant transmission of the sign <CR> (for ex. approx. 4sec constant confirmation of enter button)
- Constant transmission of the command <id>BR<CR> until the wind transmitter replies with the telegram !xxBR0000x . The parameter contains then the parameter identification (see table of baud rates) for the preset baud rate.

## 10 List of Commands

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For the wind direction transmitter the following commands are available

	<b>Command</b>	<b>Description</b>	<b>Key</b>
<b>Command KY</b>	<id>KY<param>	KEY-Number (Access authorization)	No
<b>Command TR</b>	<id>TR<param>	Telegram on request	No
<b>Command BR</b>	<id>BR<param>	Setting the baud rate	Yes
<b>Command TT</b>	<id>TT<param>	Automatic Telegram output (ATG) ON/OFF	Yes
<b>Command OR</b>	<id>OR<param>	Setting output interval for ATG	Yes
	<id>ID<param>	Setting wind transmitter ID	Yes

## 11 Commands and Description

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**Command KY**

<id>KY<param>     Release (cancel) KEY secured command

<id>KY             Query of the current KEY- parameter

Command echo       !xxKYxxxxx

Description:        The next command, for ex. command BR for changing the baud rate, is released by the KEY- command and the parameter 00001

The KEY command along with Parameter 00000, or switching-on the supply voltage resets the release.

Parameter description:

Parameter	Description
00000	Access authorization canceled
00001	Access authorization released

### Command TR

<id>TR<param> Telegram on request

<id>TR Query is not relevant (!xxTR00000)

Command echo no Echo

Description: The TR command with parameter 0003 starts a measurement and the transmission of the current measuring values,.

Response telegram (<STX>xx.x xxx.x\***HL**<CR><ETX>)

Parameter description:

Parameter	Description
00003	Request for current measuring value (on request)

### Command BR

<id>BR<param> Setting the baud rate

<id>BR Query of the current BR-Parameter

Command echo !xxBRxxxxx

Description: By the BR command and with parameter 0000x the requested baud rate is set.

Parameter description:

Parameter	Description
00002	1200 baud (8n1)
00003	2400 baud (8n1)
00004	4800 baud (8n1)
00005	9600 baud (8n1)
00006	19200 baud (8n1)
00007	38400 baud (8n1)
00008	57600 baud (8n1)

### Command TT

<id>TT<param> Automatic Telegram output (ATG) ON/OFF

<id>TT Query of the current TT-Parameter

Command echo !xxTTxxxxx

Description: By the command TT and the parameter 0000x the automatic telegram output is switched on or off resp.

Parameter description:

Parameter	Description
00000	Automatic telegram output OFF
00001	Automatic telegram 3 ON

### Command OR

<id>OR<param>

Set output interval for ATG.

<id>OR

Query of the current OR-parameter

Command echo

!xxORxxxxx

Description:

By the command OR and the parameter xxxxx the output interval is set for the telegram output. The parameter is specified in ms. The interval range is 100ms ... 60000ms.

Parameter description:

Parameter	Description
XXXXX	Interval 100ms .... 60000 ms

### Command ID

<id>DI<param>

Set wind transmitter ID

<id>ID

Query of the current ID-parameter

Command echo

!xxIDxxxxx

Description:

By the ID-command and the parameter 000xx the Wind transmitter ID is set. The ID-setting range is 0..98. The ID guarantees the operation of several wind transmitters in one bus system.

Parameter description:

Parameter	Description
000XX	Wind transmitter ID 0.... 98

## 12 Data Telegram

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Telegram construction

<STX>xx.x xxx.x\*HL<CR><ETX>    z.B. <STX>12.3 345.6\*14<CR><ETX>

Characters	Description
1	STX (HEX 02)
2	10 <sup>1</sup> wind velocity
3	10 <sup>0</sup> wind velocity
4	(HEX 2E) decimal point
5	10 <sup>-1</sup> wind velocity
6	space (HEX 20)
7	10 <sup>2</sup> wind direction
8	10 <sup>1</sup> wind direction
9	10 <sup>0</sup> wind direction
10	(HEX 2E) decimal point
11	10 <sup>-1</sup> wind direction
12	(HEX 2E) '*'
13	H = high nibble check sum
14	L = low nibble check sum
15	CR (HEX 0D) Carriage Return
16	ETX (HEX 03)

The parameters in the data telegram are output with leading zeros.  
(for ex. 01.4 008.7)

On state of delivery the data output is set as follows.

Data output            automatic  
Output                 100ms

The check sum is formed by the XOR-function from the characters between <STX> and „\*“ (starting with Hex00). Afterwards, the 8-bit-check sum is divided into two ASCII-characters (high and low nibble) with a value range of 0...F (Hex).

## 13 Maintenance

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If properly installed, the instrument requires no maintenance. Heavy pollution can lead to blockage of the slot between the rotating and the stable parts of the transmitter. Thus it is advisable to remove the accumulated dirt from the instrument .

Certain symptoms of wear and tear can appear on the ball bearings after years of use. These symptoms are expressed in a lowered sensitivity of response, standstill or run-noises of the ball bearings. In case that such disturbances might occur we recommend to return the instrument - in original package – to the factory for maintenance work.

**Remark**

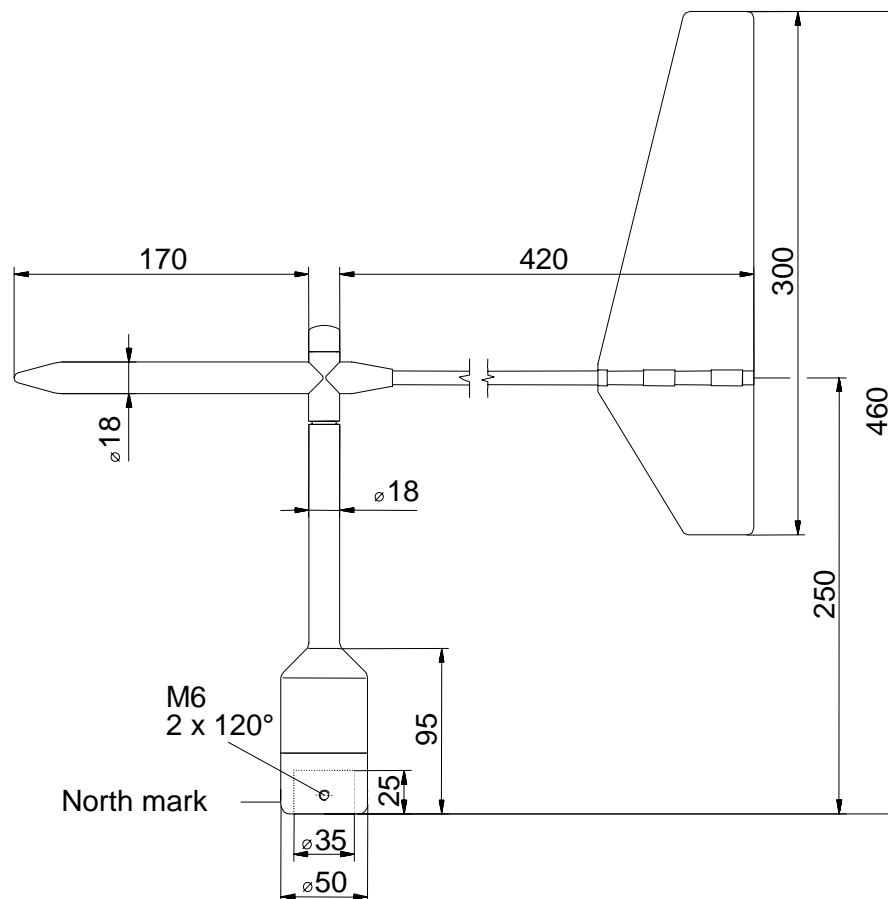
For transport of instrument please use original packing.

## 14 Technical Data

Characteristic	Description
Measuring range	0 ... 360 °
Measuring Accuracy	1°
Resolution of measuring value	0,01° @ 12 Bit serial data stream
Output telegram	<STX>xx.x xxx.x*HL<CR><ETX> z.B. 15.3(m/s) 347.1(°)
Measuring time	approx. 6ms / WD-measurement
Survival speed	85 m/s up to 0,5 h
Electric input of wind velocity	0....1000Hz @ 0...50m/s U <sub>PPmax</sub> = 0...15V, U <sub>PPmin</sub> = 0...3V
Permissible ambient conditions for operation	-50 ... +80°C all occurring situations of rel. humidity incl. dew moistening
Electrical output	RS 485: 1200; 2400; 4800; 9600; 19200; 38400; 57600 Baud 8 Bit no parity 1Stopbit  Serial RS485: 1.2; 2.4; 4.8; 9.6; 19.2; 38.4; 57. 6; 115.2 KBAud Resolution: 12 bit
Starting threshold	< 0,5 m/s at 10° amplitude
Delay distance	< 1 m (acc. to ASTM D 53666 – 96)
Damping ratio	D > 0,25 (acc. to ASTM D 53666 – 96)
Quality factor	K > 1  $K = \frac{4 \cdot D \cdot \omega_0}{\rho \cdot u}$  D           damping ratio, ω <sub>0</sub> 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
Power supply	Vcc:           3.3 V ... 42 V DC Icc:           ca. 6 mA

Electrical supply for heating	Voltage: 24 V AC/DC (galvanically isolated from housing) Power: 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	ca. 0,7 kg
Protection	IP 55 (DIN 40050)
EMC	EN 61000-6-2:2001 (immunity) EN 55022:2001, Class B (interfering transmission)

## 15 Dimensional drawing



## 16 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, anodized</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>Wind – Junction box</p> <p>Serves for the connection of several measuring value transmitters. Minimizes the number of cable cores.</p>	507 676	<p>Dimension: 125 x 80x 57 mm</p> <p>Material: Aluminium</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.



# 17 EC-Declaration of Conformity

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Document-No.: **001584**

Month: 06 Year: 08

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.	<b>4.3150.00.000</b>	<b>4.3150.00.001</b>	<b>4.3150.00.012</b>	<b>4.3150.00.110</b>
	<b>4.3150.00.140</b>	<b>4.3150.00.141</b>	<b>4.3150.00.161</b>	<b>4.3150.00.212</b>
	<b>4.3150.00.400</b>	<b>4.3150.10.000</b>	<b>4.3150.10.001</b>	<b>4.3150.10.110</b>
	<b>4.3150.10.140</b>	<b>4.3150.10.141</b>	<b>4.3150.10.161</b>	<b>4.3150.10.212</b>
	<b>4.3150.10.400</b>			

specified technical data in the document: **021413/08/06; 021479/12/06; 021513/10/06; 021516/12/06  
021534/06/07**

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)

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

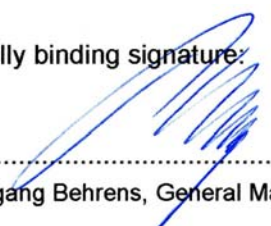
Reference number	Specification
IEC 61000-6-2: 2005	Electromagnetic compatibility Immunity for industrial environment
IEC 61000-6-3: 2006	Electromagnetic compatibility Emission standard for residential, commercial and light industrial environments
IEC 61010-1: 2001	Safety requirements for electrical equipment for measurement, control and laboratory use. Part 1: General requirements

Place: Göttingen

Date: 25.06.2008

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**

Hauptstraße 76      37083 Göttingen Germany  
P.O. Box 3536 + 3541      37025 Göttingen  
Phone ++551 79001-0      Fax ++551 79001-65  
[www.thiesclima.com](http://www.thiesclima.com)      [info@thiesclima.com](mailto:info@thiesclima.com)



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