Ultrasonic Anemometer 1D

Operating Instructions 4.3860.00.141 / 340 / 341 (State: 11/05)

1.Range of application/ General

The Ultrasonic Anemometer 1D serves for the acquisition of the horizontal air flow and direction in tunnels, tubes or similar applications. Due to the high measuring rate the instrument can be used also for the inertia-free measurement of gust- and peak-values.

The measuring values are available via serial interface as analogue signals and/or data telegram.

Analogue output (see item 6.3).
Flow speed with or without direction detecting.

Digital output (see item 6.)
Flow speed with direction detecting, and virtual-temperature..

If necessary, the sensor branches are automatically heated with critical ambient temperatures. Thus, the function is guaranteed also with negative temperatures.

2. Mode of Operation

The **Ultrasonic Anemometer 1D** consists of 2 ultrasonic transducers which are opposite each other at a distance of 200 mm.
The transformers act both as acoustic transmitters and acoustic receivers.
When a measurement starts, a sequence of 2 individual measurements in 2 directions of the measurement paths is carried out at maximum possible speed.
The measuring directions (acoustic propagation directions) rotate clockwise. Mean values are formed from 2 individual measurements, and are used for further calculation.
A measurement sequence takes approx. 10 m/sec at +20°C.

3. Measuring Principle

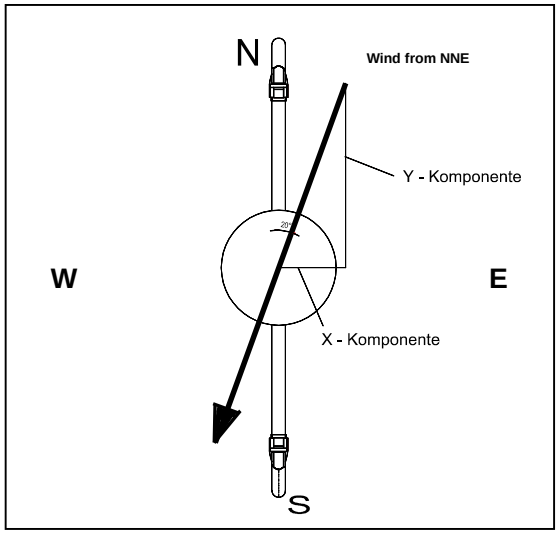
3.1 Flow Speed and Direction

The speed of an air flow superposes the propagation speed of the sound in silent air.
An air flow in the propagation direction of the sound supports its propagation speed ,and leads to its raise. An air flow against the propagation direction, however, leads to a reduction of the propagation speed of the sound.
The propagation speed resulting from the superposition leads to different running times of the sound at different air flows, and directions over a fixed distance of measurement.
As the sound speed is much depending on the air temperature, the running time of the sound is measured in both directions, thus avoiding any effect of the temperature on the measuring result.

Behaviour of the instrument with inclined flow:
Due to the special construction of the ULTRASONIC 1D the instrument measures the Y-component of the wind speed. When dividing the wind speed into the scalar dimensions Vx and Vy you will realize the following connection between the wind speed components Vx, Vy, and the actual speed:

Vx = Wg * sin(Wr)
Vy = Wg * cos(Wr)

With ws => wind speed and wd => wind direction



Due to the fact that the ULTRASONIC has only one measurement path the indicated wind speed is depending on the actual speed, and the angle of the incoming flow. The dependence corresponds exactly to the formula given above.
The highest accuracy is achieved when the sensor branches of the ULTRASONIC are mounted with +10° or –10 ° to the longitudinal direction of the main wind direction.

3.2 Acoustic-Virtual Temperature

As previously mentioned, the speed of the propagation of sound is shows a radix dependency on the absolute air temperature, but is rather independent of air pressure, and only slightly dependent of humidity. Thus these physical properties of gases can be used to measure air temperature at constant and known chemical composition.
It is a measurement of gas temperature which is made without thermal coupling to a solid state sensor.

The advantages of this measured variable is, on the one hand, its inertia free reaction to the actual gas temperature, and, on the other hand, the avoidance of measurement errors such as those which occur when a solid state temperature sensor is heated up by radiation.

Due to the low dependency of the speed of propagation of the sound on the air humidity, the “Virtual Temperature” refers to dry air (0% humidity) under the same pressure conditions as that one actually measured.

The deviation of the measured “acoustic-virtual temperature”, compared with the real air temperature, is linear-dependent from the absolute humidity content of the air.
The part of water vapour in the air increases proportionally the sonic speed, as H_2O-molecules have approx. only half of the mass of the remaining air-molecules (O_2 and N_2).
The rise of the sonic speed leads to an apparent (virtual) rising of the measured temperature in humid air compared with dry air of the same temperature.

The deviation of the measured virtual temperature in humid air, compared with real air temperature, can be corrected according to the following correlation, when the value of absolute humidity is given:

$$T_r = T_v - 0{,}135\ K * m^3 / g * a_{abs}$$

and **Tr** represents the real air temperature, $\mathbf{T_v}$ the measured acoustic-virtual temperature and **a** the absolute humidity in grams H_2O per m^3 of air.

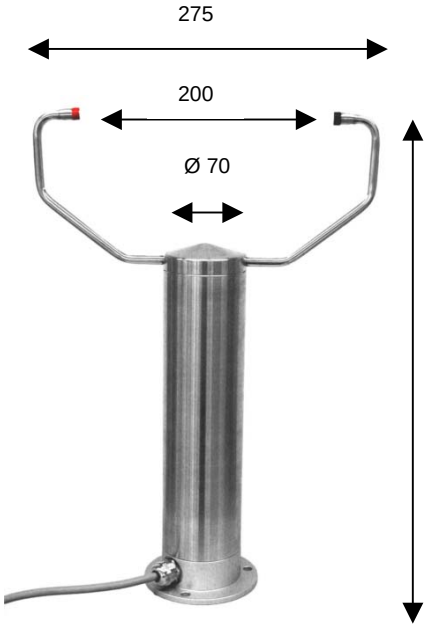
4. Technical Data

Flow speed	Meas. Range 4.3860.00.340 4.3360.00.341 4.3860.00.141	 0...20 m/s 0...20 m/s 0...10 m/s
	Accuracy	± 0.1 m/s , at the range 0 ... 5 m/s resp. ± 2 % rms from meas. value , at > 5 m/s
	Resolution	0.1 m/s
Recognition of direct.	Meas. range	1° / 181° (Info: 0° = calm)
Virtual Temperature	Meas. range	- 40 .... + 70 °C
	Accuracy	± 0.5 K
	Resolution	0.1 K
Data output digital	Output	Flow speed, - direction, and virtual-temperature As: Instantaneous value, gliding mean value 1sec; 10sec; 1min; 2min; 10min
	Interface	RS 485 / RS 422
	Baud rate	1200, 2400, 4800, 9600, 19200 selectable
	Output rate	1 per 100 m/sec up to 1 per 25.5 sec, selectable
	Status identification	Heater status, Path disturbance
- analog	Output	Flow speed with and without recognition of direction (no virtual-temperature analog output) as: Instantaneous value, gliding mean value 1sec; 10sec; 1min; 2min; 10min
	Output signal	0 ... 20 mA or 4... 20 mA
	Electr. output 1	Direction-independent **e.g.** 0... 20 mA = 0... 20 m/s (0...10 m/s)
	Electr. output 2	Direction-independent **e.g.** 0...10...20 mA = **-**20...0...20 m/s (-10…0…+10 m/s)
		Load at current output max. 400 Ω
		Load at voltage output min. 4000 Ω
	Update rate	1 per 100 msec
	Resolution	12 bit
General	Internal meas. rate	400 measurements per second, at 25 °C
	Temp. range	- 40 ... + 70 °C
	Supply voltage	electronics, 12 ... 24 V AC/DC ± 10%, max. 3 VA
		heater , 24 V AC/DC ± 10%, max. 35 VA
	Protection	IP 66
	Icing	acc. to THIES STD 012001
	Corrosion	No corrosion after 3 month of salt fog and condensation
	EMV	EN 55022 5/95 class B; EN50082-2 2/96
	Model	V4A Stainless steel for housing and sensor arms
	Mounting	Flange plate with boring
	connection	5 m cable via PG-screwing
	Weight	approx. 3 kg

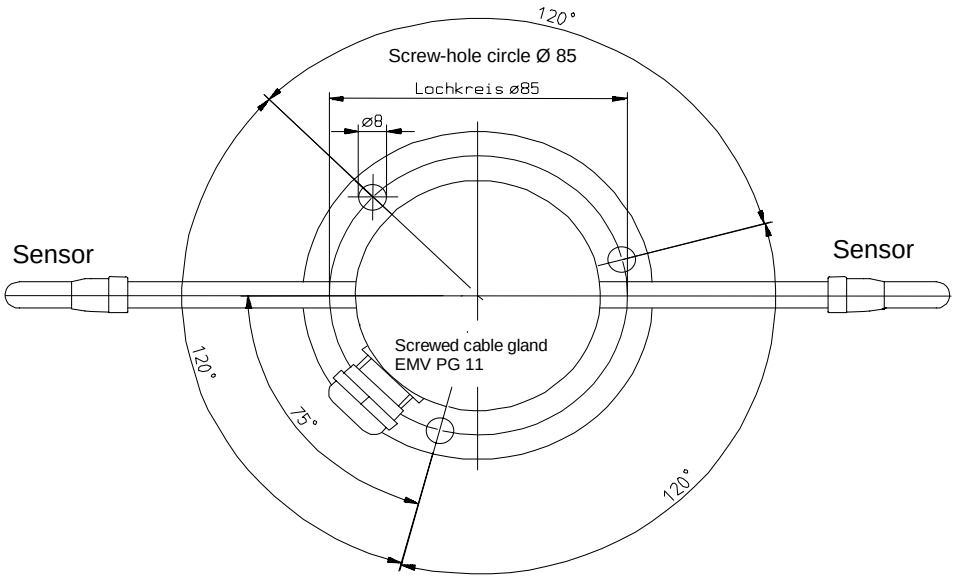
5. Plug Connection Assignment

Cord -Nr.	Function	Remark
1	Analogue output Airflow **without** recognition of direction	0 / 4 – 20 mA
2	Analogue output Airflow **with** recognition of direction	0 / 4 – 20 mA
3	Analogue Ground	AGND
4	TX+	serial interface
5	RX+	serial interface
6	GND	serial interface
7	RX-	serial interface
8	TX-	serial interface
9	Power heater / electronics 24 V AC/DC	bridged with cord 10
10	Power heater / electronics 24 V AC/DC	bridged with cord 9
11	Power heater / electronics 24 V AC/DC	bridged with cord 12
12	Power heater / electronics 24 V AC/DC	bridged with cord 11

Dimensions



Topview Ultrasonic Anemometer 1D



5.1 Remarks concerning Power Supply of Instrument:

The connecting cables for the heating (9 u. 10; 11 u. 12) must be bridged on the supply side in order to guarantee the complete heating power!

6. Interface Description

6.1 Telegram forms

6.1.1 Telegram VD (STX)xx.x xxx*xx(CR)(ETX)

Z. NR.	FUNCTION
1	STX (HEX 02)
2	10^1 flow speed
3	10^0 flow speed
4	. (HEX 2E) Decimalpoint
5	10^{-1} flow speed
6	space (HEX 20)
7	10^2 flow direction
8	10^1 flow direction
9	10^0 flow direction
10	* (HEX 2A) Check sum identifer
11	High Byte Check sum in HEX
12	Low Byte Check sum in HEX
13	CR (HEX 0D) Carriage Return
14	ETX (HEX 03)

6.1.2 Telegram VDT (STX)xx.x xxx xxx.x xx*xx(CR)(ETX)

Z. NR.	FUNCTION
1	STX (HEX 02)
2	10^1 flow speed
3	10^0 flow speed
4	. (HEX 2E) Decimal point
5	10^{-1} flow speed
6	space (HEX 20)
7	10^2 flow direction
8	10^1 flow direction
9	10^0 flow direction
10	space (HEX 20)
11	+ or - sign
12	10^1 Temperature
13	10^0 Temperature
14	. (HEX 2E) Decimal point
15	10^{-1} Temperature
16	space (HEX 20)
17	High Byte Statusbyte
18	Low Byte Statusbyte
19	* (HEX 2A) Check sum identifier
20	High Byte Checksum in HEX
21	Low Byte Checksum in HEX
22	CR (HEX 0D) Carriage Return
23	ETX (HEX 03)

6.1.2.1 Telegram VDT (STX)xx.x xxx xxx.x xx*xx xx.x xxx(CR)(ETX)

When using the standard deviation the VDT-telegram is extended by the standard deviations of wind speed and wind direction.

Z. NR.	FUNCTION
1	STX (HEX 02)
2	10^1 flow speed
3	10^0 flow speed
4	. (HEX 2E) Decimal point
5	10^{-1} flow speed
6	space (HEX 20)
7	10^2 flow direction
8	10^1 flow direction
9	10^0 flow direction
10	space (HEX 20)
11	+ or - sign
12	10^1 Temperature
13	10^0 Temperature
14	. (HEX 2E) Decimal point
15	10^{-1} Temperature
16	space (HEX 20)
17	10^1 flow speed (standard deviation)
18	10^0 flow speed (standard deviation)
19	. (HEX 2E) Decimal point
20	10^{-1} flow speed (standard deviation)
21	space (HEX 20)
22	10^2 flow direction (standard deviation)
23	10^1 flow direciton (standard deviation)
24	10^0 flow direction (standard deviation)
25	space (HEX 20)
26	High Byte statusbyte
27	Low Byte statusbyte
28	* (HEX 2A) Check sum identifer
29	High Byte Check sum in HEX
30	Low Byte Check sum in HEX
31	CR (HEX 0D) Carriage Return
32	ETX (HEX 03)

6.1.3 Telegram V4DT (STX)xxx.x xxx xxx.x x xx*xx(CR)(ETX)

Z. NR.	FUNCTION
1	STX (HEX 02)
2	10^2 flow speed
3	10^1 flow speed
4	10^0 flow speed
5	. (HEX 2E) Decimal point
6	10^{-1} flow speed
7	space (HEX 20)
8	10^2 flow direction
9	10^1 flow direction
10	10^0 flow direction
11	space (HEX 20)
12	+ or - sign
13	10^1 Temperature
14	10^0 Temperature
15	. (HEX 2E) Decimal point
16	10^{-1} Temperature
17	space (HEX 20)
18	K, N, M, S = km/h, Knots, m/s, mph
19	space (HEX 20)
20	High Byte Statusbyte
21	Low Byte Statusbyte
22	* (HEX 2A) Check sum identifier
23	High Byte Check sum in HEX
24	Low Byte Check sum in HEX
25	CR (HEX 0D) Carriage Return
26	ETX (HEX 03)

6.1.4 Telegram NMEA V 2.0 $WIMWV,xxx.x,R,xxx.x,N,A*xx(CR)(LF)

Z. NR.	FUNCTION
1	$ (HEX 24) Dollar
2	W (HEX 57)
3	I (HEX 49)
4	M (HEX 4D)
5	W (HEX 57)
6	V (HEX 56)
7	, (HEX 2C) Comma
8	10^2 flow direction
9	10^1 flow direction
10	10^0 flow direction
11	. (HEX 2E) Decimal point
12	10^{-1} flow direction
13	, (HEX 2C) Comma
14	R (HEX 52)
15	, (HEX 2C) Comma
16	10^2 flow speed
17	10^1 flow speed
18	10^0 flow speed
19	. (HEX 2E) Decimal point
20	10^{-1} flow speed
21	, (HEX 2C) Comma
22	K, N, M, S = km/h, Knots, m/s, mph
23	, (HEX 2C) Comma
24	A, V A = valid, V = non valid
25	* (HEX 2A) Check sum identifier
26	High Byte Check sum in HEX
27	Low Byte Check sum in HEX
28	CR (HEX 0D) Carriage Return
29	LF (HEX 0A) Line Feed

6.2.1 Forming of Checksum

The checksum is the result of the byte-wise EXOR-combination of the bytes output in the telegram.
The EXOR-combination comprises all bytes between the telegram start sign „STX", or "$" within the NMEA-telegram, and the byte "*" as identifier for starting the checksum.
Thus, the bytes „STX" or. „$" and „* " will not be taken into consideration with the checksum calculation!

6.2.2 Definition of Status Byte

The status byte contains information about the current state of the system.
The information comprises:

- error events with the measurement value acquisition
- a possible de-calibration caused, e.g., by a change in the measurement path length (due to mechanical deformation of the transducer carrying arms)
- the operation state of the instrument heating.

Bit 0	**0 = no error**	**1 = general error event, measurement value probably correct, measurement value acquisition disturbed**
Bit 1	**reserved (for virtual –temperature)**	**between both measurement paths is > 8 K.**
Bit 2	**reserved**	
Bit 3	**0 = heating switched off**	**1 = Heating switched on**
Bit 4 to 7	**reserved**	

The error event reported by Bit 0 does not necessarily cause the output of an erroneous measurement value.
Certain weather conditions like extreme precipitation and snowfall may disturb the measurement acquisition for a short time, caused by sonic burst-echoes at the precipitation particles.
Such an event, however, is realized by a plausibility-algorithm, which leads to an immediate re-measurement of the instrument – until a correct value is available.
The output measurement value is generally correct, in spite of the reported error, and does not contain the erroneous data.
If Bit 1 is continuously set during the operation, you should reckon on a de-calibration of the instrument due to mechanical deformation of the measurement arms.

6.3 Output of Analogue Values

1. Output:
Flow speed **without** flow direction output.
Example:
0...20 mA = 0... 20 m/s or 4... 20 mA = 0... 20 m/s

2. Output:
Flow speed **with** flow direction output
Example:
0....10 mA = 20... 0 m/s (from direction 1°)
10...20 mA = 0... 20 m/s (from direciton 181°)

Remark: The **red** mark at the sensor branch= north or resp. 1°
The black mark at the sensor branch = south or resp. 181°
No analogue output of the virtual-temperature.

6.4 Telegram Output and Analogue Value Output in Case of Error Events

In the following cases the digital telegram outputs „F" as measurement value figure instead of numbers:

- If the measurement acquisition is constantly disturbed for more than 10 seconds in spite of multiple measurements

In this case the analogue output is set on maximum current value (20 mA).

7. Averaging Procedure:

The Ultrasonic 2D forms the gliding mean value through a FIFO-memory the capacity of which comprises up to 600 values.
In the free running measurement mode the measurement data rate is exactly 10 Hz or 100msec, and forms, at the same time, the updating rate for the averaging memory (FIFO-memory).
If averaging is requested the measured data are recorded in the FIFO-memory stated above, the capacity of which is built-up depending on the selected averaging period.
If the averaging period is, for example, 10 seconds, 100 memory cells are used, and in case of an averaging period of 1 minute 600 cells.
From a selected averaging period > 1 minute up the data flow will be pre-averaged; because the memory capacity of 600 values cannot be exceeded.

The Ultrasonic 2 D combines two different and useful procedures of mean value forming:

- The forming of vectorial mean values
- The forming of scalar mean values

These different procedures can be selected, according to the case of application, for averaging the flow speed as well as the flow direction.

When averaging the flow speed the mean value forming takes the flow direction into account, and takes into consideration the wind speed when averaging the wind direction.
Thus, both averaged dimensions, wind speed and wind direction, are valuated each one by the other.

The scalar forming of the mean value averages both the flow speed and flow direction independently from each other.

The vectorial and scalar procedure can be used independently with wind speed and wind direction within an output telegram.

8. Standard Deviation

Starting with the firmware version V 1.8 the ULTRASONIC is capable to calculate the standard deviation. The standard deviation for flow speed and flow direction is determined at an averaging period of > 1 sec. The calculation is carried out in accordance with the following formula:

$$Y = \sqrt{\frac{1}{n}\sum_{i=0}^{i<n}\left(\overline{M} - Xi\right)^2} \qquad \text{with} \qquad \overline{M} = \frac{1}{n}\sum_{i=0}^{i<n} Xi$$

The standard deviation is activated through the command “DE00001”. It is important that the ULTRASONIC reduces the measuring interval to 50 hz when calculating the standard deviation. This is necessary for the instrument to finish the calculations of the standard deviations between two measuring cycles. The calculation of the standard deviation is activated when the selected averaging period is > 1sec.

9. Bus-Ability, Synchronisation of the Measurement on the Query Telegram:

9.1 Duplex-Mode

The Ultrasonic supports absolutely any operation at an RS485/RS422 data bus in co-operation with further instruments (bus operation).
Supported are both semi-duplex bus-topologies and full duplex bus-systems.
In the semi- and full duplex operation the line drivers of the Ultrasonic are active only for the time of data transmission.
The remaining time the line drivers are off-line ("three-state-mode").
The direct connection to a PC with RS232 interface makes an interface-converter RS 485 / RS 232 necessary, e.g. our accessories order-no. 9.1702.20.000

Command for Selecting the duplex-mode (DM for duplex mode):

DM00000 **for semi-duplex (2-wire operation)**

DM00001 **for full duplex (4-wire operation) (state of delivery).**

In case of bus operation a spontaneous output of the Ultrasonic is suppressed – the instruments respond only on request of the bus master.

When semi-duplex operation is set, a spontaneous telegram output is not selectable.
In case the spontaneous telegram output has been selected erroneously this could lead to a blocking of the receivers at slow baud rates.

9.2 Synchronisation on Data Query

Certain application make it necessary to interrogate cyclically a collective of instruments within a short time (e.g. 5 instruments within 100 ms).
There might be the following problem: the Ultrasonic can be contacted during a measurement by the asynchronous query and is then not ready for transmission.
In order to guarantee an immediate instrument response without delay, the possibility of temporal measurement synchronisation on the query is used.

Command for activating the ability for measurement-synchronisation on the query:

MT00001 **(Measurement Trigger) Synchronisation Ability on.**

MT00000 **Synchronisation Ability off.**

In case the instrument receives, with active synchronisation, a telegram inquiry through the command TR0000x, and further inquiry follow with intervals of less than 2,5 seconds, the instrument runs synchronously to the inquiries and responds with smallest possible delay.
If there are no queries for more than 2,5 seconds, the instrument leaves the synchronous mode and changes into a spontaneous measurement value acquisition.
This return to the spontaneous mode of measurement guarantees that all control functions derived from the measurement data (e.g. switch-on heating etc.) will be able to operate also in case of a failure of query telegram.
As soon as a new query occurs in the spontaneous mode the instrument synchronises immediately on the query telegram.

9.3 Averaging with Active Synchronisation

In case the measurement values should be averaged please take care that – with active synchronisation – the exact, internal time basis of 100 ms for forming the measurement values is not used. In this case, the time is determined by the query-repetition-rate.
It is advisable to switch-off the synchronisation ability if it is not absolutely necessary.

10. List of control commands

The Anemometer 1D can be controlled via its serial data interface using the commands in the following list.
Any standard terminal program such as “procomm“ , “telix“ or a *Windows* terminal program (e.g. “*Hyper Terminal”*) can be used.
All adjustments are stored in a E²ROM so that the adjusted parameters cannot get lost after switching off or failure of power supply.

10.1 List of commands

Command	Function	Remark
<ID> AM 00000	**Vectorial averaging**	**Vectorial averaging of wind speed and direction**
<ID> AM 00001	**Scalar averaging**	Scalar averaging of wind speed and direction
<ID> AM 00002	**Scalar / vectorial averaging**	Scalar averaging of speed / vectorial averaging of direction
<ID> AM 00003	**Vectorial / Scalar averaging**	Vectorial averaging of speed / scalar averaging of direction
<ID> AV 00000	**Instantaneous value**	**Output of the instantaneous values**
<ID> AV 00001	**Mean value over 1 second**	Output of the gliding mean value over 1 second
<ID> AV 00002	**Mean value over 10 seconds**	Output of the gliding mean value over 10 seconds
<ID> AV 00003	**Mean value over 1 minute**	Output of the gliding mean value over 1 minute
<ID> AV 00004	**Mean value over 2 minutes**	Output of the gliding mean value over 2 minutes
<ID> AV 00005	**Mean value over 10 minutes**	Output of the gliding mean value over 10 minutes
<ID> BR 00002	**1200 Baud N 8 1**	Data rate 1200 Baud, 8 Data bits, No Parity, 1 Stop bit
<ID> BR 00010	**1200 Baud E 7 1**	Data rate 1200 Baud, 7 Data bits, Parity Equal, 1 Stop bit
<ID> BR 00003	**2400 Baud N 8 1**	Data rate 2400 Baud, 8 Data bits, No Parity, 1 Stop bit
<ID> BR 00011	**2400 Baud E 7 1**	Data rate 2400 Baud, 7 Data bits, Parity Equal, 1 Stop bit
<ID> BR 00004	**4800 Baud N 8 1**	Data rate 4800 Baud, 8 Data bits, No Parity, 1 Stop bit
<ID> BR 00012	**4800 Baud E 7 1**	Data rate 4800 Baud, 7 Data bits, Parity Equal, 1 Stop bit
<ID> BR 00005	**9600 Baud N 8 1**	Data rate 9600 Baud, 8 Data bits, No Parity, 1 Stop bit
<ID> BR 00013	**9600 Baud E 7 1**	Data rate 9600 Baud, 7 Data bits, Parity Equal, 1 Stop bit
<ID> BR 00006	**19200 Baud N 8 1**	Data rate 19200 Baud, 8 Data bits, No Parity, 1 Stop bit
<ID> BR 00014	**19200 Baud E 7 1**	Data rate 19200 Baud, 7 Data bits, Parity Equal, 1 Stop bit
<ID> DE 00000	**Standard deviation of**	**De-activate calculation of the standard deviation**
<ID> DE 00001	**Standard deviation on**	Activate calculation of the standard deviation
<ID> DM 00000	**Duplex mode half duplex (HD)**	Half duplex, 2-wire operation
<ID> DM 00001	**Duplex mode full duplex (FD)**	**Full duplex, 4-wire operation**
<ID> DV	**Firmware version**	Release of firmware version
<ID> ES 00000	**Sign-echo switched off**	Echo operation of transmitted characters switched off
<ID> ES 00001	**Sign-echo switched on**	Echo operation of transmitted characters switched on
<ID> KY 00000	**Key, no access**	Software-key, access to EEPROM closed
<ID> KY 00001	**Key, open access**	Software- key, access to EEPROM open
<ID> MT 00000	**Measurement trigger off**	**No synchronization of measurement onto request poss.**
<ID> MT 00001	**Measurement trigger on**	**Synchronization of measurement onto request possible**
<ID> OR 00xxx	**Output rate online (spontaneous)**	Output rate xxx times 100ms, value range 00001 up to 00255
<ID> OS 00000	**Flow speed in m/s**	Scale of flow speed in meter per second
<ID> OS 00001	**Flow speed in Km/h**	Scaling of flow speed in kilo meter per hour
<ID> OS 00002	**Flow speed in mph**	Scaling of flow speed in miles per hour
<ID> OS 00003	**Flow speed in Knots**	Scaling of flow speed in knots (nautically)
<ID> SC 00000	**Start value of current 0mA**	Analogue output current 0 - 20mA
<ID> SC 00001	**Start value of current 4mA**	Analogue output current 4 - 20mA
<ID> TR 00000	**no Telegram on request**	
<ID> TR 00001	**Telegram VD on request**	single output of the telegram form, see 6.1.1
<ID> TR 00002	**Telegram VDT on request**	single output of the telegram form, see 6.1.2
<ID> TR 00003	**Telegram V4DT on request**	single output of the telegram form, see 6.1.3
<ID> TR 00004	**Telegram NMEA on request**	single output of the telegram form, see 6.1.4
<ID> TT 00000	**No telegram output**	
<ID> TT 00001	**Telegram VD spontaneous**	Online output of telegram form, see 6.1.1
<ID> TT 00002	**Telegram VDT spontaneous**	Online output of telegram form, see 6.1.2
<ID> TT 00003	**Telegram V4DT spontaneous**	Online output of telegram form, to 6.1.3
<ID> TT 00004	**Telegram NMEA V 2.0**	Online output of telegram form, to 6.1.4

Remark:
Due to the compatibility the telegrams VD and VDT supply the flow speed in 3 digits form
In order to avoid that the measuring range is exceeded the telegrams deliver the flow speed exclusively in the unit of m/s (meters per second)!

10.2 Command Input

Please find your ID (identifier-number) in the works certificate included in the delivery.
For the input of commands and parameters please open first the access to the EEPROM by entering the command (ID) KY00001.
After all inputs have been made the access to the EEPROM should be locked again through the command (ID) KY00000 in order to avoid unauthorised changes of the system parameters.
The command is input by entering the instrument identification number (ID) followed by two letters which specify the actual command followed by a 5-digit code number respective value.
The characters are entered **without a space** and are **activated with Return**.
Entering the command without the 5-digit code number is interpreted as a query of the command status and leads to the output of the current command status.
Correcting the command word during input when an error has occurred is **not allowed** and the command will not be accepted.
All letters must be **capitalised**, otherwise they will not be accepted.

Example : Correction to the analogue output of the start value from 0 mA to 4 mA.
The instrument ID is accepted as 12. The necessary correction of the start value is 4 mA. The value stored in the system up to that point is 0 mA.
First opening of the EE-Prom access:

Input: 12KY00001	System response: user access
Input: 12SC	System response: !12SC00000
Input: 12SC00001	System response: !12SC00001
Input: 12KY00000	System response: protect

The system verifies the accepted input and displays the set value.

Attention: After the supply voltage of the instrument has been switched on or switched off the locking is automatically activated.

For **bus operation** in RS485 interface mode the permanent output of the measuring data must be stopped through the command **(ID)TT00000**. In addition, the echo operation for characters ES00000 must be switched off in order to avoid a bus conflict.
A single data telegram can then be called in through the command **(ID)TR0000(x)** in a telegram form described under item 6.1.
The „X“ in the command string means the selected telegram form (1, 2 or 3).
The ID-number selects the required instrument.

10.3 Pre-setting of Instruments (Models for Delivery)

Model 4.3860.00.141
Seriell Interface:

Typ:	Baudrate:	Telegram:	Duplexmodus:
RS 485 / 422	9600Baud,N81	VDT	full Duplex

Analog Interface:

Typ:	Range:	Current:	
Current, Voltage	0..10 m/s	4 … 20mA	

Command	Function	Remark
<ID> AV 00002	Mean value	gliding mean value over 10 seconds

Model 4.3860.00.340
Seriell Interface:

Typ:	Baudrate:	Telegram:	Duplexmodus:
RS 485 / 422	9600Baud,N81	VDT	full Duplex

Analog Interface:

Typ:	Range:	Current:	
Current	0..20 m/s	0 ... 20mA	

Command	Function	Remark
<ID> AV 00002	Mean value	gliding mean value over 10 seconds

Model 4.3860.00.341
Seriell Interface:

Typ:	Baudrate:	Telegram:	Duplexmodus:
RS 485 / 422	9600Baud,N81	VDT	full Duplex

Analog Interface:

Typ:	Range:	Current:	
Current	0..20 m/s	4 … 20mA	

Command	Function	Remark
<ID> AV 00002	Mean value	gliding mean value over 10 seconds

11. Preparation for Use

11.1 Selecting the Site

As already described above the ultrasonic anemometer transmits sonic bursts which are necessary for the measurement of the propagation speed. If these sonic bursts hit a well sonic-reflecting surface they are reflected as echo and might cause error measurements – under unfavourable conditions.

It is, therefore, advisable to install the US-anemometer with a minimum distance of 1 meter to objects in the measurement area.

11.2 / Direction of Application / Mounting of Anemometer

For the measurement the position of the sensor branches has to be lengthwise to the main wind direction (tunnel direction).
When mounting the ULTRASONIC please take care that it is positioned lengthwise to the main wind direction. The highest accuracy is achieved when the sensor branches of the ULTRASONIC are mounted with +10° or –10 ° to the longitudinal direction of the main wind direction

The red mark at the sensor branch signalises the north, or the 1°-angle-degree of the sensor. The black marked sensor branch signalises the south or the 181°-angle-degree of the sensor.
The proper mounting is carried out through a flange at the base of the anemometer shaft. The electrical connection is done via a fixed cable.

12. Maintenance

As the instrument has no moving parts i.e. operates without wear or tear, only minimal maintenance is required. Please clean the surface occasionally from pollution with non-aggressive cleansing agent in water and soft cloth. These cleansing activities can be carried out – as far as necessary – on occasion of the routine checks.

13. Calibration

The ultrasonic anemometer does not contain any adjustable components such as electrical or mechanical trimming elements. All of the components and materials are invariant in time. Thus, regular calibration because of ageing is not required. Only a mechanical deformation of the transformer arms and the resulting changes in the length of the measurement paths lead to errors in the measured values.
The virtual temperature can be used to check the length of the measurement path. A change in the measurement path length of 0.17% and consequently a measurement error of 0.17% of the wind speed corresponds to a 1 K deviation of the virtual temperature at 20 °C, thus at 6 K deviation, the measurement error of wind speed is approx. 1%.
If the distance of measuring path of the anemometer is de-aligned please contact the producer for a re-calibration of the instrument.

14. Warranty

Damages resulting from improper handling or caused by external influences, e.g. lightning, are excluded from the warranty. The warranty expires if the instrument has been opened.

12. Accessories (Optional)

Power Supply Unit	**9.3388.00.000**	For the power supply of the Ultrasonic
RS 232 / RS 422 converter	**9.1702.20.000**	For signal conversion of RS 422 in RS 232

Attention :

A return of the instruments must be effected in the original packing as otherwise the guarantee expires in case of mechanical damages e.g. by deformation of the transducer arms.

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 info@thiesclima.com