Ultrasonic Evaporation Transmitter

Instruction for Use

6.1432.x0.xxx

Firmware V1.8

Dok. No. 021676/06/22

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.

Contents

1 Models

Order no.	Measuring range	Electrical output	Electrical connection
6.1432.10.040	0...100mm	0…20mA	5 m cable LiYCY 6 x 0.25mm²
6.1432.10.041	0...100mm	4…20mA	5 m cable LiYCY 6 x 0.25mm²
6.1432.10.073	0...100mm	0…. 5V	5 m cable LiYCY 6 x 0.25mm²
6.1432.20.400	0...100mm	Thies serial synchronous	5 m cable LiYCY 4 x 0.25mm²

2 Application

The Ultrasonic-Evaporation Transmitter serves to automatically measure the water level or evaporation in the evaporation pan (class A).

The instrument is well-suited for garden centres, plant and seed breeding establishments as well as for agro-economic use to determine the required amount of plant water and artificial field irrigation in order to achieve an optimal harvest.

Based on a reference height, the changing water levels are measured using an ultrasonic sensor.
The output value of the determined water level or the evaporation calculated from this takes place through interfaces depending on the device version:

- Thies serial synchronous
- RS485 interface
- Analogue interface

3 Mechanical Mounting

Put the Ultrasonic-Evaporation Transmitter in the evaporation pan. The device is to be aligned by means of the level and the jack screw. Afterwards, fill the evaporation pan up with water to the upper measuring range marking on the Ultrasonic-Evaporation Transmitter.

The water level must always be between the two marks as the device is adjusted by the manufacturer within this measuring range.

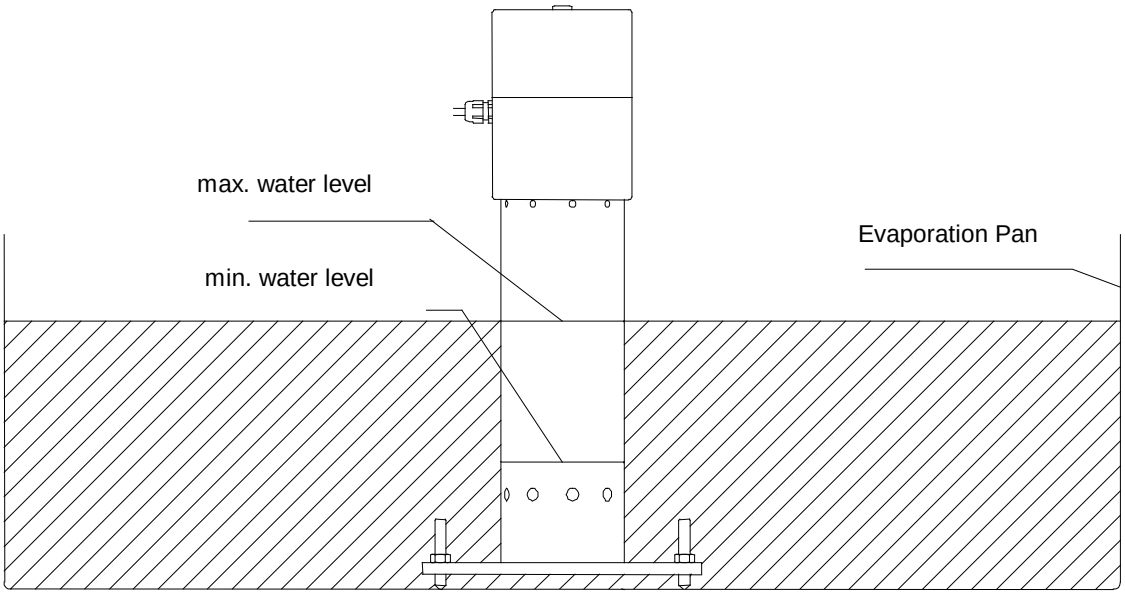


Figure 1: Ultrasonic-Evaporation Transmitter with evaporation pan

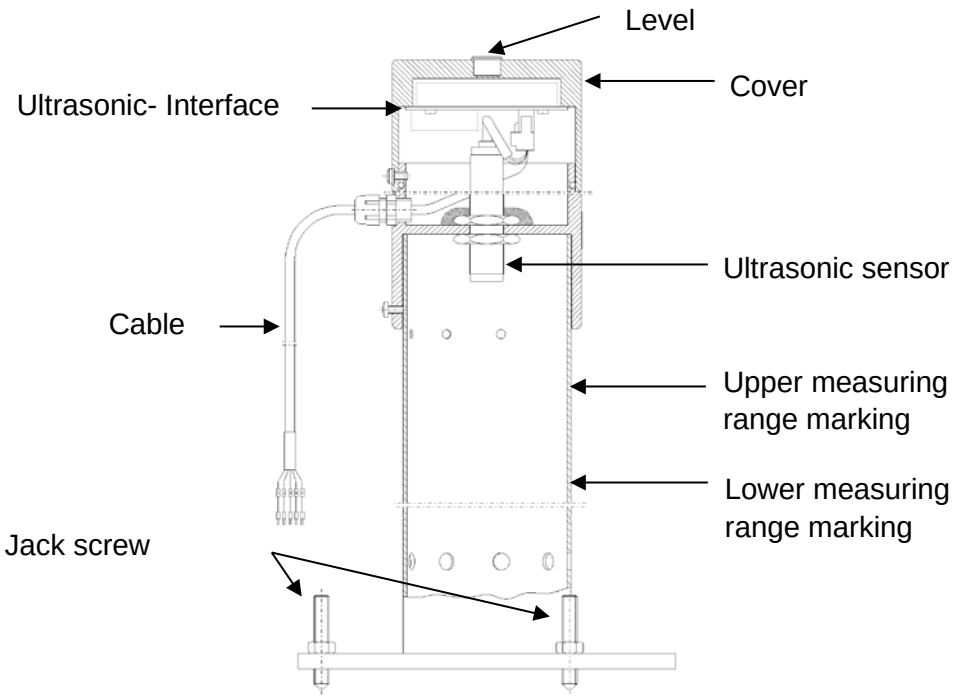
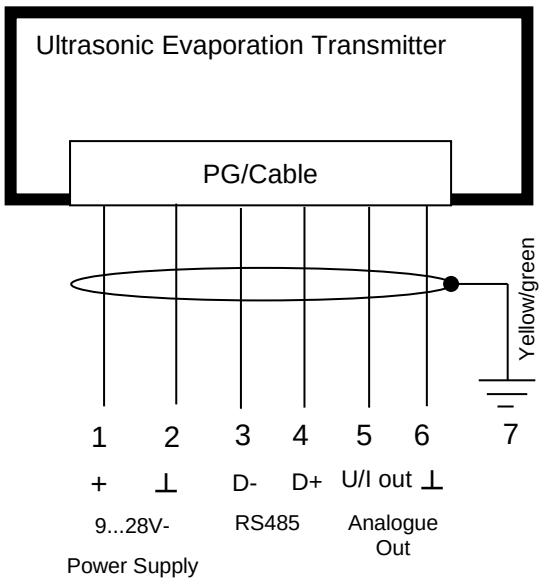
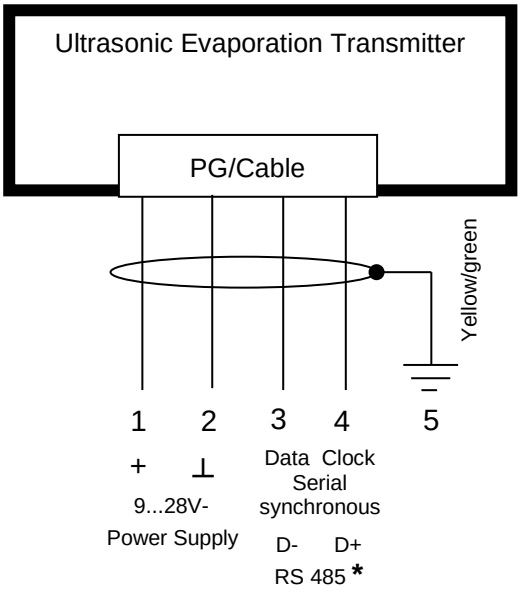


Figure 2: Sectional view

4 Electrical Mounting (Connection diagrams)

Model ”Analogue” 6.1432.10.040 6.1432.10.041 6.1432.10.073	

Model ”Thies- Serial-Synchronous” 6.1432.10.400	 *: RS485 only 5 seconds after switching on (see ch. 10.1)

5 Maintenance

After proper mounting, the instrument works maintenance free.

6 Measuring Function

The ultrasonic sensor determines the distance to the water surface in the range of the marks "max. water level" and "min. water level".
This corresponds to the

“max. water level“ = 0mm height of the water level
and the
“min. water level“ = 100.0mm height of the water level

If the water level of 101.0mm is exceeded, an error message is issued.

Processing the measurements and the output of the water level height or evaporation is dependant on the device version.

The measuring range for the height of the water level which is adjusted by the manufacturer is 0...100mm.

6.1432.10.400:
Device version with Thies serial synchronous output and power saving mode.

With the 1st clock pulse, the sensor exits the power down modus and transfers the contents from the memory. Then a new measurement begins, the memory is overwritten with new measurements and the power down modus is restored.

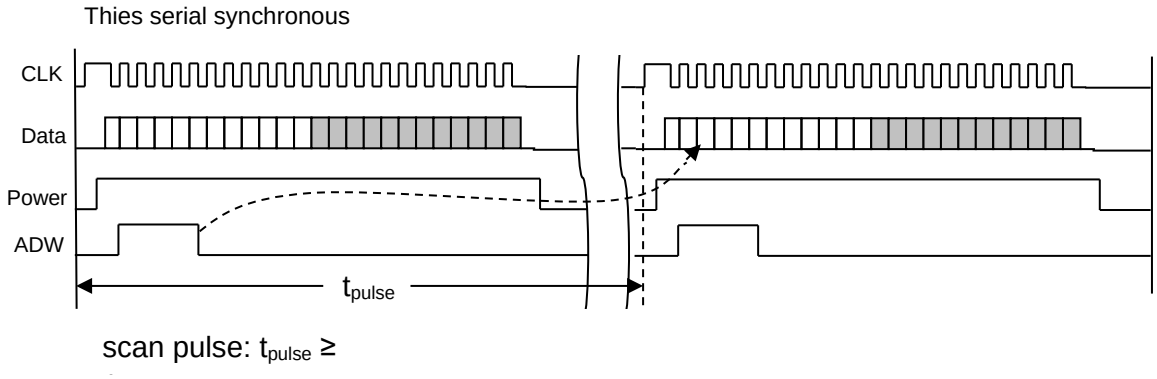


Figure 3: Thies serial synchronous

Note

After applying the supply voltage, the serial interface RS485 is switched on for 5 seconds. Within the 5 seconds, the output from the Thies serial synchronous can be switched over to the RS485. (see **chapter 10.1)**.

6.1432.10.0xx:

Device version with analogue output.

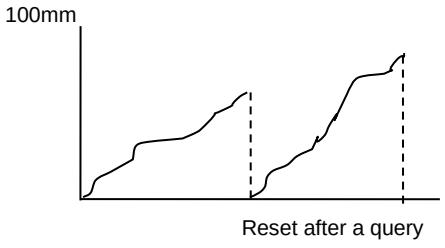
After each 100ms (t_{pulse}) a measurement is automatically completed and the analogue output value is updated.

7 Measuring and Output Parameters

1.) **Height of the water level** in "mm“

2.) **Evaporation** in "mm“
Only the evaporated part of the water in "mm" is added to the total amount of evaporation and the water intake (precipitation) is ignored.

Description for the output of the "evaporation":

Digital output: The evaporated part of the water is added up to the max. amount of evaporation of 100mm. The output occurs on demand or constantly (dependant on setting). After the output, it is reset to 0mm. See figure 6.	 **Figure 4**

The evaporated part of the water is **always** added up to the max. amount of evaporation of 100mm.

The output occurs on request or constantly (dependant on setting).

After exceeding the maximum value of 100mm, it is reset to 0mm. The output restarts from 0mm.

See figure 7.

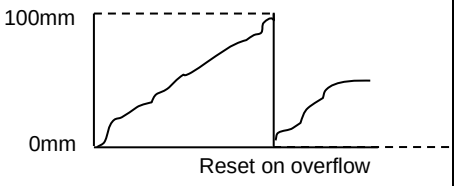


Figure 5

Analogue output:

The evaporated part of the water is added up to the max. amount of evaporation of 100mm.

The analogue output occurs constantly. After exceeding the maximum value of 100mm, it is reset to 0mm. The analogue output restarts from 0mm.

See figure 7.

The evaporated part of the water is added *in an adjustable time interval* (up to the max. amount of evaporation of 100mm)

The analogue output occurs constantly. After exceeding the adjusted time interval, it is reset to 0mm. The analogue output restarts from 0mm.

See figure 8.

Interval time t_n
1 min
2 min
10 min
1 h

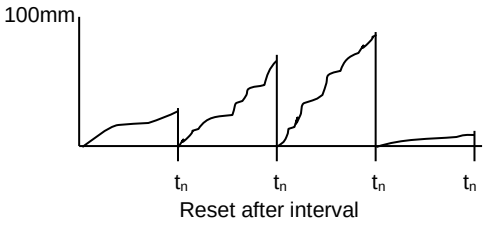


Figure 6

Interface	**Output parameters**			
	Height of-water level [mm]	Total evaporation [mm] acc. to fig. 6	Total evaporation [mm] acc. to fig. 7	Total evaporation / time [mm / t] acc. to fig. 8)
Thies serial synchronous	X	X	X	
RS485 interface	X	X	X	
Analogue interface	X		X	X

Table 1: Interface / Parameter

8 Interfaces

8.1 Thies Serial Synchronous (6.1432.20.400)

The interface transfers a 12bit (or 24bit) data word (binary code). The data word contains the measurement value with a resolution of 10bits as well as an error bit identification (bit 11).

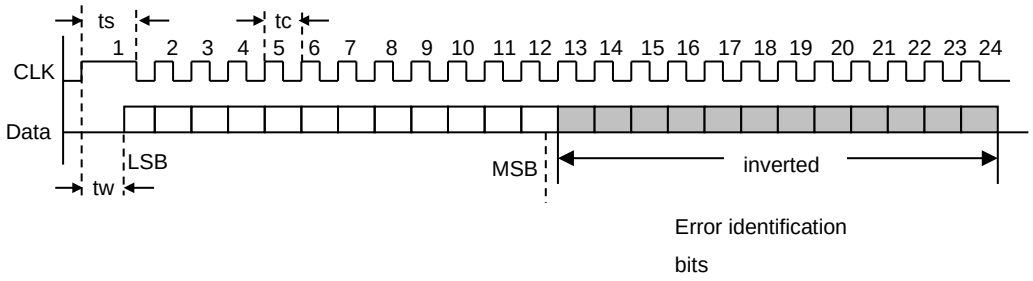
	Description	Integer
Measurement	0...100.0mm	0...1000
Error	Measuring range	2048 + 3

11	10	9	8	7	6	5	4	3	2	1	0
e	0	n	n	n	n	n	n	n	n	n	n

Recognition of an error

Data

The transfer begins after the first clock signal with the LSB (see images). After a total of 12 clock signals, the complete data word is transferred. Optionally, with 12 further clock signals, the inverse data word is transmitted. This can be used to recognise errors when transferring data.



Parameter	Symbol	Min	Max	Unit
Start pulse (1. clock pulse)	ts	1	10	ms
Clock pulse length	tc	0.2	10	ms
Waiting time until measurement value ok	tw	---	0.5	ms
Request rate of measurement value	f	---	1	Hz

8.2 Serial Interface RS485

The RS485 operates is operated in half-duplex mode. For a corresponding termination, a termination resistor (120 Ω) must be connected if required.

Bus operation:

Through the concept of ID-based communication, the use of a bus system is possible.
The requirements for this are:

- Different IDs of the individual bus users.
- Master/slave structure, this means that a device exists in the bus which requests the data of the individual devices cyclically.

Hint for model 6.1432.20.400:
RS485 active only 5 seconds after switching on (see **chapter 10.1**)

8.3 Analogue Interface (6.1432.10.0xx)

According to the device version, current or voltage output is available, see **chapter 1**.

9 Command Interpreter

9.1 Command List

Command	Command format	Description	Key
BR	<id>BR<param>	Baud rate	Yes
DS	<id>DS<param>	Memory reset for analogue output	Yes
ID	<id>ID<param>	Device ID	Yes
KY	<id>KY<param>	Activate key/password	No
OR	<id>OR<param>	Set output interval	Yes
TR	<id>TR<param>	Scan measured values	No
TT	<id>TT<param>	Automatic measured value output ON/OFF	Yes
VT	<id>VT<param>	Typing (Height of water level / evaporation)	Yes
VR	<id>VR	Request software version	No

Table 2: command list

9.2 General Structure when Sending a Command

The evaporation transmitter has a command interpreter with which the performance of the device can be changed. This is how, for example, the baud rate, the device ID etc can be changed. Basically, a command has the following structure:

<id><command><CR> or

<id><command><parameter><CR>

id:	sensor ID. Always double-digit and in the range of 00...98 (99: Joker*)
command	see command list (table 2)
parameter:	a **five-digit** value to set a new parameter value.
<CR>:	Carriage Return (13_{dec}; 0x0D)

A test of the command syntax is carried out. If a correct command is received, this is acknowledged with an "echo telegram".

Example:	00BR00005<CR>	send command
	!00BR00005<CR>	echo telegram

If a command is sent to the device without the parameter value, the currently set value is transmitted.

Example:	00BR<CR>	send command
	!00BR00005<CR>	echo telegram

In order to avoid an undesired parameter adjustment, some commands (see command list) are secured by a "key". This "key" must be sent before the actual command.

Example: changing the baud rate

00KY00001<CR>	release key-secured command
00BR00006<CR>	set baud rate to 19200

> ***Attention:***
>
> ***The key-secured commands are released as long as the supply voltage is switched or the command 00KY00000<CR> is sent.***

*: If setting of ID is unknown use all-purpose “99”(so-called joker).

9.2.1 BR Command

<id>BR<param><CR> Set the baud rate

<id>BR Scan current BR parameter

Command echo !xxBRxxxxx

Access: Reading/writing

Description: With the BR command and the parameter 0000x, the desired baud rate is set.

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)

Range: 2 to 8

Initial value: 5

9.2.2 DS Command

<id>DS<param><CR> Memory reset for the analogue output

Command echo !xxDS0000x

Access: Reading/writing

Description: With the DS command, the interval times for resetting the memory are set, see figure 8 - 9.

Parameter description:

00000	Total evaporation up to 100mm, then Reset
00001	Total evaporation of over 1min, then Reset
00002	Total evaporation of over 2min, then Reset
00003	Total evaporation of over 10min, then Reset
00004	Total evaporation of over 60min, then Reset

Range: 0 to 4

Initial value: 0

9.2.3 Command ID

<id>DI<param><CR>	Set device ID
<id>ID	Scan current ID parameter
Command echo	!xxIDxxxxx
Access:	Reading/writing
Description:	This command sets the identification number. The ID is used in each telegram of the measuring transducer. After the ID has been changed, the devices will immediately answer with the new ID number.
Range:	0 to 98 (99:Joker, all-purpose ID)
Initial value:	0

9.2.4 KY Command

<id>KY<param><CR>	Key
Command echo	!xxKYxxxxx<CR>
Access:	Writing
Description:	With the KY command, the value for the key (password) is set. Changing the parameters is only possible if this value is set to "00001".
Range:	0 / 1
Initial value:	0

9.2.5 OR Command

<id>OR<param><CR>	Set output interval for *ATG* (command TT, see chapter 9.2.7)
Command echo	!xxORxxxxx
Access:	Reading/writing
Description	With the OR command and the parameter xxxxx, the output interval for the telegram output is set. The parameter output is in ms. The interval adjustment range is 1000ms...60000ms.
Parameter description:	Interval 1...60s
Range:	1000…60000
Initial value:	1000

9.2.6 TR Command

<id>TR<0000x><CR> Measurement value request

Command echo --

Access: Reading

Description: The command releases the one-time transmission of the current measurement value.

Response telegram: **xxx.x**<CR> e.g. 078.3mm

205.1<CR> **error code** (range exceeded)

Parameter description:

00001	Height of water level
00002	Total evaporation

Range: 1 / 2

Initial value: --

9.2.7 TT Command

<id>TT<param><CR> Automatic measurement output (ATG)

Command echo !xxTTxxxxx

Access: Reading

Description: The command sets / issues the automatic measurement output.

Setting of output interval: command OR (see ch. 9.2.5)

Response telegram **xxx.x**<CR> e.g. 078.3mm

205.1<CR> **error code** (range exceeded)

Parameter description:

00000	Measurement output off
00001	Height of water level
00002	Total evaporation

Range: 0, 1, 2

Initial value: 0

9.2.8 VR Command

<id>VR<CR> Scan software version number

Command echo xxVRxxxxxx

Access: Reading

Description: Reading the software version

Parameter description: 00018 = V1.8

9.2.9 VT Command

<id>VT<param><CR> Set output parameter

Command echo !xxVT0000x

Access: Reading/writing

Description: With the VT command, the output water level or evaporation is set. Also, the reset function is determined with a digital measurement output, see fig 7-8.

Parameter description:

00000	Height of water level
00001	Total evaporation, reset at 100mm
00002	Total evaporation, reset on request

Range: 0, 1, 2

Initial value: 1

10 Configuration of the Output Types

10.1 Thies Serial Synchronous (6.1432.20.400)

xxVT00000	Height of the water level, 100...0mm
xxVT00001	Total evaporation, reset at 100mm
xxVT00002	Total evaporation, reset on request

To reconfigure the parameters, the interface must be switched from Thies serial synchronous to RS485.
Procedure:

- Connect evaporation transmitter via an RS485 interface to a PC.
- Start a terminal programme (observe baud rate).
- Switch on supply voltage for the evaporation transmitter.
- Press the ESC button within 5 seconds after switching on.
- The successful change-over is confirmed with the echo "!00SS00001“.

Sending the command "00KY00001“ means that the programming of the VT parameter is released. The output parameters can now be programmed with the VT command.

Activating the Thies serial synchronous output occurs by interrupting the supply voltage.

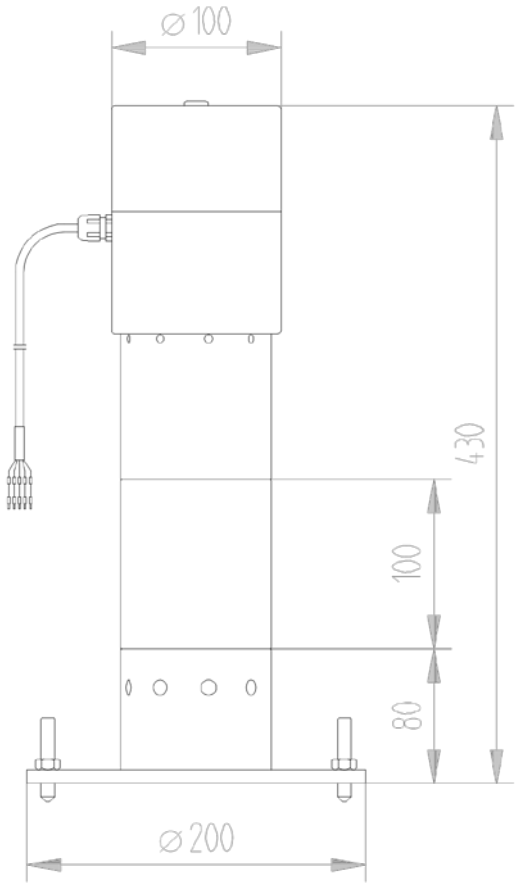
10.2 Analogue Output (6.1432.10.0xx)

xxTT00001	xxVT00000	xxDS00000	Height of the water level, 100...0mm
xxTT00002	xxVT00001	xxDS00000	Total evaporation, reset at 100mm
xxTT00002	xxVT00002	xxDS0000x	Total evaporation, reset on request

11 Technical Data

Range	0...100mm
Accuracy	± 1,5% of the range @ 0... 50°C
Measurement principle	Ultrasonic running time with temperature compensation
Measurement parameters	Height of water level (mm), total evaporation (mm)
Parameterisation	
Thies Serial Synchronous	Height of the water level, total evaporation, total evaporation/scan
RS485 (auto)	Height of the water level, total evaporation, total evaporation/output
RS485 (on request)	Height of the water level, total evaporation, total evaporation/scan
Analogue output	Height of the water level, total evaporation, total evaporation per unit of time (1, 2, 10, 60min)
6.1432.10.400	Thies serial synchronous
Data word	12Bit (24bit) Thies serial synchronous (see chapter 8.1)
Clock	$U_{(CLK)}$ low < 0,8V, $U_{(CLK)}$ high > 2,0V
Data	$U_{(Data)}$ low < 0,8V @ $R_L = \infty$, $U_{(Data)}$ high <15V @ $R_L = \infty$
Scan pulse	t_{pulse} > 1sec
Error code	205.1 range exceeded
6.1432.10.040 (-.041)	0...20mA (4...20mA) = 0...100mm
	4mA @ water at the upper measuring range marking
Resistance	max. 500 ohms (with an operating voltage of ≥ 15V)
6.1432.10.073	0...10V (0...5V) = 0...100mm @ >1kΩ
	0V @ water at the upper measuring range marking
Measurement interval	100ms (for all varieties with analogue outputs)
Operating voltage (U_B)	9…28V DC
Operating current	
U_B >= 9V	Icc_{active} < 90mA
U_B <= 28V	Icc_{active} < 70mA
6.1432.10.4xx	Icc_{min} < 2mA (Power Down) Icc_{max} = Icc_{active} (switch-on current U_B=9V: 1A)
6.1432.10.5xx	Icc = Icc_{active}
6.1432.10.x4x	Icc = Icc_{active} + Iout (analogue)
6.1432.10.x73	Icc = Icc_{active} + Iout (analogue)
Ambient temperature	-15...+50°C
Protection	IP67 (when installed as intended)
Connection type	cable, 5m, type: LIYCY
Dimensions	See dimension diagram
Weight	3,5kg

12 Dimension Diagram



13 EC-Declaration of Conformity

Manufacturer: Adolf Thies GmbH & Co. KG
Hauptstraße 76
37083 Göttingen, Germany
http://www.thiesclima.com

Product: Ultrasonic Evaporation Transmitter

Doc. Nr. 501-44698_CE

Article Overview:

6.1432.10.040 6.1432.10.041 6.1432.10.061 6.1432.10.073 6.1432.20.400

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

2014/30/EU	26.02.2014	DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility.
2017/2102/EU	15.11.2017	DIRECTIVE (EU) 2017/2102 of the European Parliament and of the Council of November 15, 2017 amending Directive 2011/65 / EU on the restriction of the use of certain hazardous substances in electrical and electronic equipment.
2012/19/EU	13.08.2012	DIRECTIVE 2012/19/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 on waste electrical and electronic equipment (WEEE).
2018/1139/EU	04.07.2018	Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency.

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

DIN EN 50625-1	2014-09	Collection, logistics & Treatment requirements for WEEE. General treatment requirements.
DIN EN 61000-6-2	2019-11	Electromagnetic compatibility Immunity for industrial environment
DIN EN 61000-6-3:2007 + A1:2011	2011-09	Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments
DIN EN 61010-1	2020-03	Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements
DIN EN 63000	2019-05	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances.

Legally binding signature:

General Manager - Dr. Christoph Peper

Legally binding signature:

Development Manager - ppa. Jörg Petereit

This declaration certificates 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.

14 UK-CA-Declaration of Conformity

Manufacturer: Adolf Thies GmbH & Co. KG
Hauptstraße 76
37083 Göttingen, Germany
http://www.thiesclima.com

Product: Ultrasonic Evaporation Transmitter

Doc. Nr. 501-44698_CA

Article Overview:

6.1432.10.040 6.1432.10.041 6.1432.10.061 6.1432.10.073 6.1432.20.400

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

1091	08.12.2016	The Electromagnetic Compatibility Regulations 2016
RoHS Regulations 2012	01.01.2021	The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012
3113	01.01.2021	Regulations: waste electrical and electronic equipment (WEEE)
2018/1139/EU	04.07.2018	Regulation (EU) 2018/1139 of the European Parliament and of the Council of 4 July 2018 on common rules in the field of civil aviation and establishing a European Union Aviation Safety Agency.

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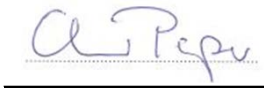
BS EN 50625-1	31.03.2014	Collection, logistics & Treatment requirements for WEEE. General treatment requirements
BS EN IEC 61000-6-2	25.02.2019	Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments
BS EN IEC 61000-6-3	30.03.2021	Electromagnetic compatibility (EMC). Generic standards. Emission standard for equipment in residential environments
BS EN 61010-1+A1	31.03.2017	Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements
BS EN IEC 63000	10.12.2018	Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

This declaration of conformity is issued under the sole responsibility of the manufacturer.

Legally binding signature:



General Manager - Dr. Christoph Peper

Legally binding signature:

Development Manager - ppa. Jörg Petereit

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Please pay attention to the security advises of the provided instructions for use.

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

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