

Precipitation Transmitter

Weighing scale principle

Instruction for Use

5.4041.x1.00x



Dok. No. 021857/11/22

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

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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.

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1 Available Models

Order no.	Heating	Power supply	Heating supply	Connection type	Signal output
5.4041.01.000	Yes	9,8 ... 32VDC	24VDC / 140 W	Plug	RS485 ASCII-Protocol,-, PULSE OUTPUT
5.4041.01.001	Yes	9,8 ... 32VDC	24VDC / 140 W	Plug	RS485 MODBUS RTU, PULSE OUTPUT
5.4041.11.000	No	9,8 ... 32VDC	-	Plug	RS485 ASCII-Protocol,-, PULSE OUTPUT
5.4041.11.001	No	9,8 ... 32VDC	-	Plug	RS485 MODBUS RTU, PULSE OUTPUT

Scope of Supply:

- Precipitation transmitter, collection vessel included
- Operating instructions

2 Application

The device combines cutting-edge weighing technology in a very small space with a self-emptying collection vessel. The system provides excellent resolution and high precision. Even minute drops will be measured.

The weighing precipitation transmitter is suited for use in meteorological and hydrological monitoring networks as well as applications in the area of environmental monitoring.

Modbus RTU-interface facilitates installation of the sensor and its integration into networks. The device is WMO-compliant and is equipped with interfaces which are compatible with sensors with tipping bucket balances and other weighing systems. Other features are the compact, robust design, a very low weight, stainless steel housing, weather resistance and longevity. High connectivity is ensured by multiple interfaces as well as easy installation and maintenance.

Scope of application:

- Meteorology
- Climatology
- Hydrology
- Industry
- Environmental monitoring

3 Construction and Mode of Operation

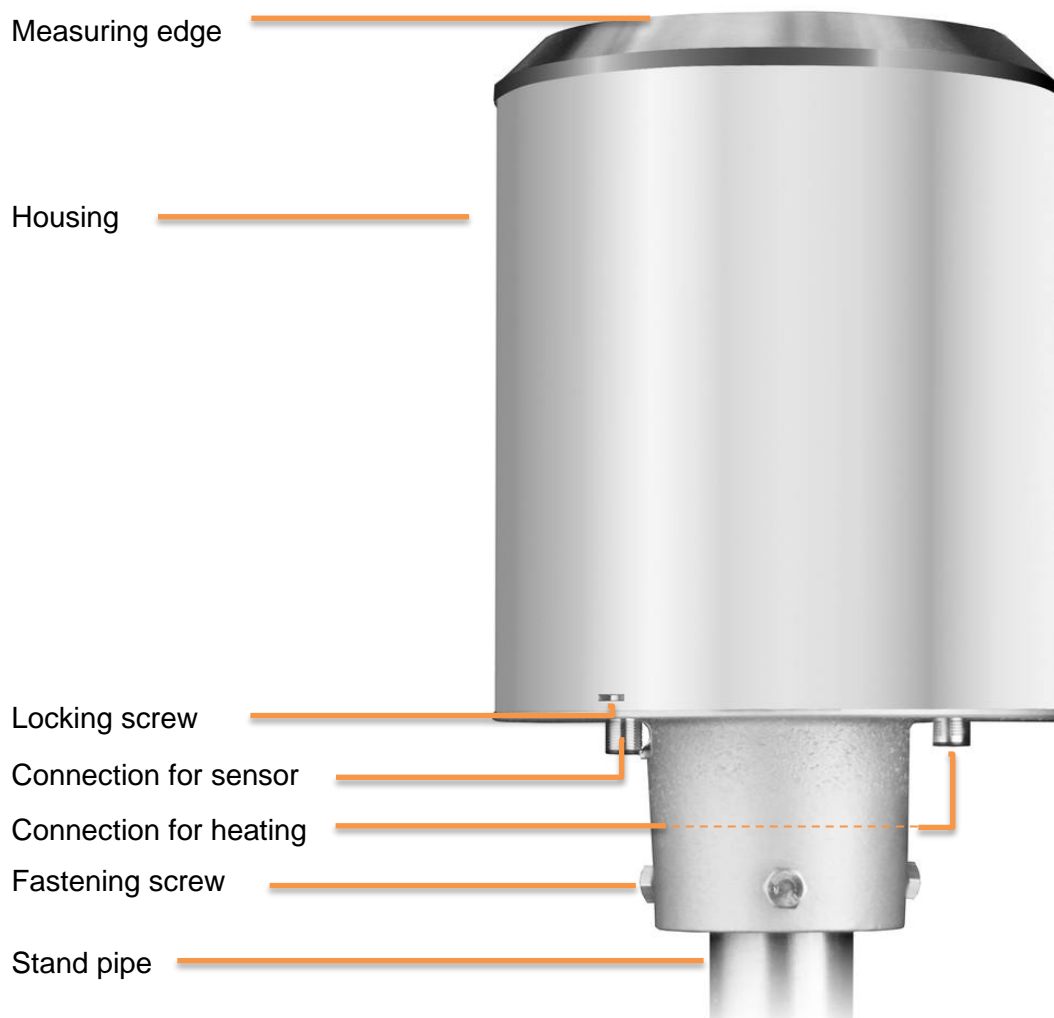


Figure 1: Construction

The precipitation transmitter measures the quantity and intensity of precipitations. The precipitation transmitter combines cutting-edge technology with a self-emptying collection vessel. This allows the device to reach high resolution and precision with a significantly smaller overall volume. The precipitation transmitter thus features higher resolution and precision than traditional precipitation transmitters working on the basis of the tipping bucket balance principle, as it does not require a catch tank.

The main sensor is a high-precision weighing cell with overload protection. If required, its temperature coefficient is determined with a temperature probe inside the housing. The pulses of the Reed contact triggered by the tipping movements of the collection vessel are used for the correction of errors in case of high precipitation intensities. In addition, the self-emptying mechanism of the collection vessel permits weighing without interruptions.

3.1 Measured Values and Electrical Output

The precipitation transmitter measures/calculates the following values:

Quantity of precipitation (pulse)

The precipitation quantity is issued in real time with a maximum resolution of 0.01mm via the pulse output.

Intensity of precipitation of the last minute (RS485-interface)

The precipitation transmitter performs six measurements per minute and adds these values up in a moving sum. This means that every new measured value is added to the previous five measured values, resulting in the new intensity value of the last minute.

Intensity of precipitation since the last retrieval (RS485-interface)

The difference in quantity since the last retrieval is divided by the time that passed since the last retrieval. If the last retrieval took place less than 30s ago, the intensity of the last minute is used automatically.

Quantity of precipitation since the last retrieval (RS485-interface)

Difference of quantities between the new and the last retrieval.

Minimum precipitation intensity of the last X minutes (RS485-interface)

For X minutes, the value for the intensity of the last minute is compared every minute with the one of the previous minute and the lower value of the two is retained.

Maximum precipitation intensity of the last X minutes (RS485-interface)

For X minutes, the value for the intensity of the last minute is compared every minute with the one of the previous minute and the higher value of the two is retained.

Average intensity of the last X minutes (RS485-interface)

Counts the precipitation quantity over X minutes in steps of 0.01mm and divides the result by the X minutes.

Variance (RS485-interface) variance of measured values over 4s

The two pulse outputs can be matched so that they output the quantity of precipitation with a resolution of 0,01...1mm and closing times of 10...500ms.

Alternatively, they can be configured in such a manner that they output the status of the heating (heating ON/OFF) or the precipitation status (YES/NO).

The Rs485-interface at the precipitation transmitter can be operated in ASCII- or Modbus-protocol. See chapter 1. Available Models.

3.2 Heating

For applications in regions with seasonally or permanently low temperatures, the precipitation transmitter is available in a heated version. The internal heating is divided into two parts: a funnel heating along the inner surface of the catch funnel of the precipitation transmitter melts solid precipitations and the outlet heating below the protection grille and the collection vessel prevents complete freezing of the outlet. With operating temperatures of -40 ... 70°C, the target temperature of the funnel surface of the heated precipitation transmitter is 2 C. The operability is checked continuously and can be queried via the Rs485-interface or the pulse output.

In the factory default setting, the heating is switched on (measuring device with heating). The heating is supplied with power via a separate power supply line. Funnel heating and outlet heating can get very hot. Danger of burns! Always switch off/separate the power supply before opening the device.

4 Recommendations Side Selection

To minimize water splashing up, it is recommended to avoid installation sites with a hard surface like concrete and to install the precipitation transmitter on grass or other soft surfaces instead.

In general, the sensor should not be placed on roofs or slopes.

According to WMO-recommendations, precipitation gauges have to be installed at a distance of no less than four times the height of the next obstacle. If this is not possible, care has to be taken to maintain an elevation angle of less than 45° towards surrounding plants, buildings etc.

The measuring device has to be set up in such a manner that the catch is aligned horizontally and that its distance from the floor is 1m. When snow is to be regularly expected in the area of the measuring device, this distance should be increased accordingly.

Please note:

Precipitation gauges have to be installed for vibration-free operation.

5 Installation

Please note:

*Electrical work has to be carried out by skilled staff.
The device may only be opened in dry surroundings.
Avoid damaging the exposed electronic parts. Open the device only when power supply is off.*

5.1 Mechanical Mounting

Please note:

The enclosed tipping bucket balance may only be operated with this precipitation transmitter. Avoid damaging the upper funnel edge.

Required tools

- jaw wrench (13mm)
- Allen wrench (6mm)
- slotted screwdriver (approx. 2.5 blade width)

1. Place the precipitation transmitter on top of a tube or mast with an external diameter of 60mm. Use the jaw wrench (13mm) to pre-tighten the screws at the base evenly. Tighten them completely only when step 17 has been completed.
2. To improve operational safety, we recommend to ground the sensor with the aid of the integrated earth screw. This can be performed by means of a suitable earthing cable and an earth bolt (not included in the scope of supply) or through a connection to an existing grounding system.

3. Open the device.
4. Unscrew the thumb screw at the bottom.
5. Grasp upper edge of the funnel and at the mast holder and turn the upper part counter-clockwise (open →).
6. Lift the housing off carefully, watch out for the clamping connector of the heating.



Figure 2: Open the device

7. Remove the clamping connector of the heating.

8. Put the housing aside.

9. Lift off the internal protective cylinder.

Internal protective cylinder



Inner parts without collection vessel

Spirit level



Figure 3: Inner parts and protective cylinder

Installation of the collection vessel

13. Unpack the collection vessel

14. Push the collection vessel with the side where the magnet is placed (red marking) towards the Reed contact (red marking), against the bearing spring.

15. Insert the other side of the axle into the other side of the bearing.

16. Make sure that the collection vessel tips perfectly.

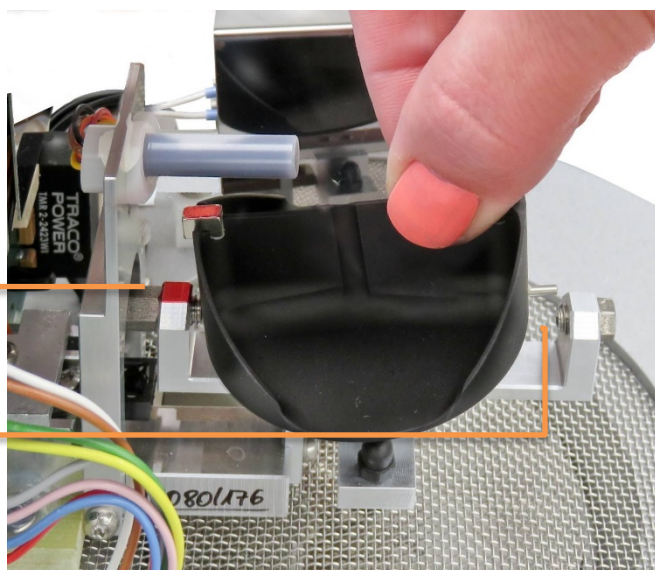
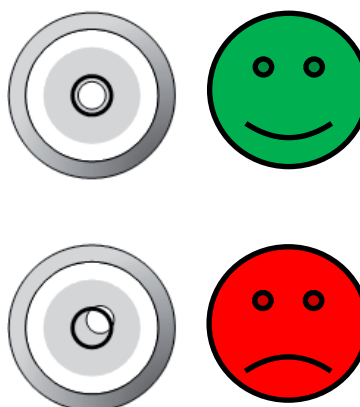


Figure 4: Installation of the collection vessel

17. Level the device with the aid of the bubble level (**see figure 3**), tightening the hexagon bolts at the base evenly.



Re-assembly of the device

19. Re-insert the internal protective cylinder carefully.
20. Connect the clamping connector of the heating.



21. Set the housing back on the base plate – place embossed parts into the recesses.

22. Push the housing downwards and then turn it clockwise into the direction „close“ ←.

23. Fasten the housing with the thumb screw.



Figure 5: Re-assembly of the device



To protect the collection vessel against contamination, the dirt trap has to be installed in the funnel.

24. Insert the enclosed dirt trap into the centre of the funnel. The cap on the dirt trap also serves as protection against coarse dirt. The dirt trap stands loosely in the centre of the funnel.

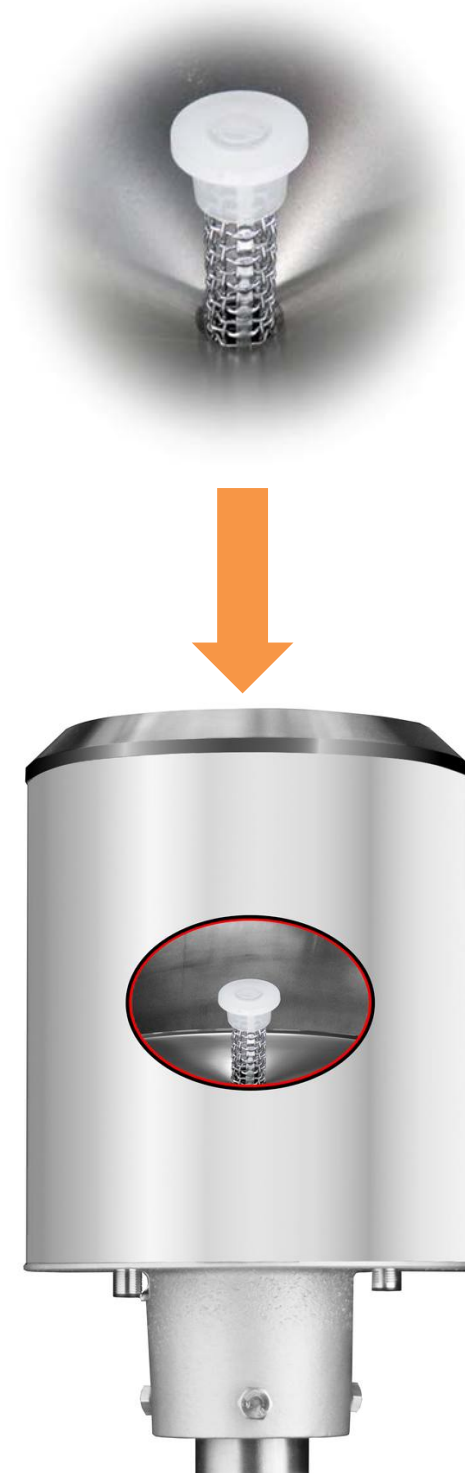


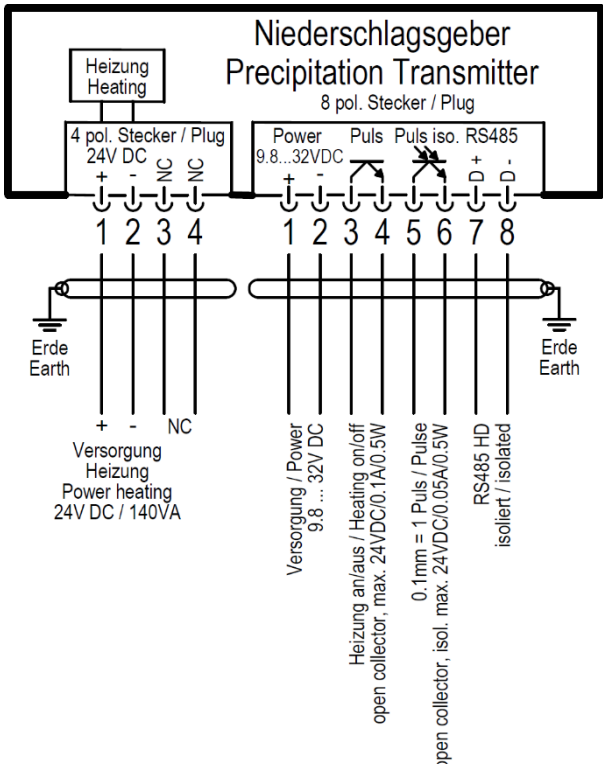
Figure 6: Dirt trap

5.2 Electrical Mounting

Type of cable	Plug	Cable specification
Signal cable	8-wire – 214127	PUR, shielded, 8 x 0.25mm ² (Ø 6mm)
Heating cable	4-Wire – 214135	PUR, 4x1.5mm ² (Ø 8,4mm)

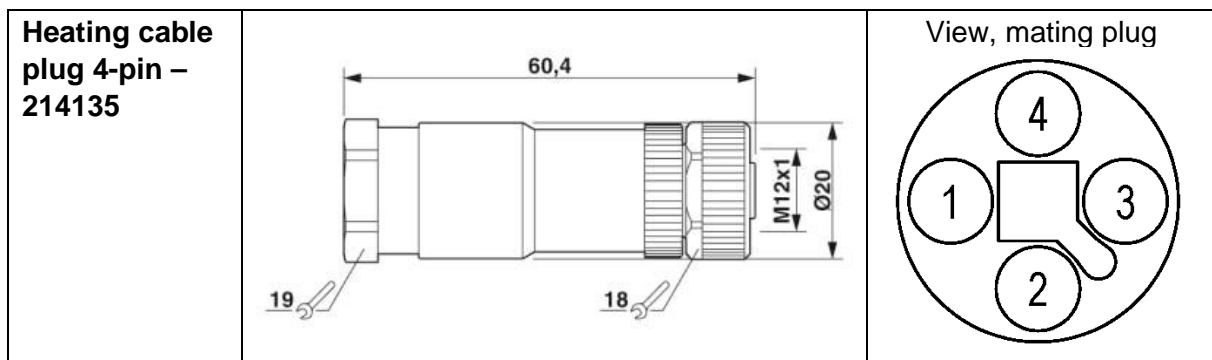
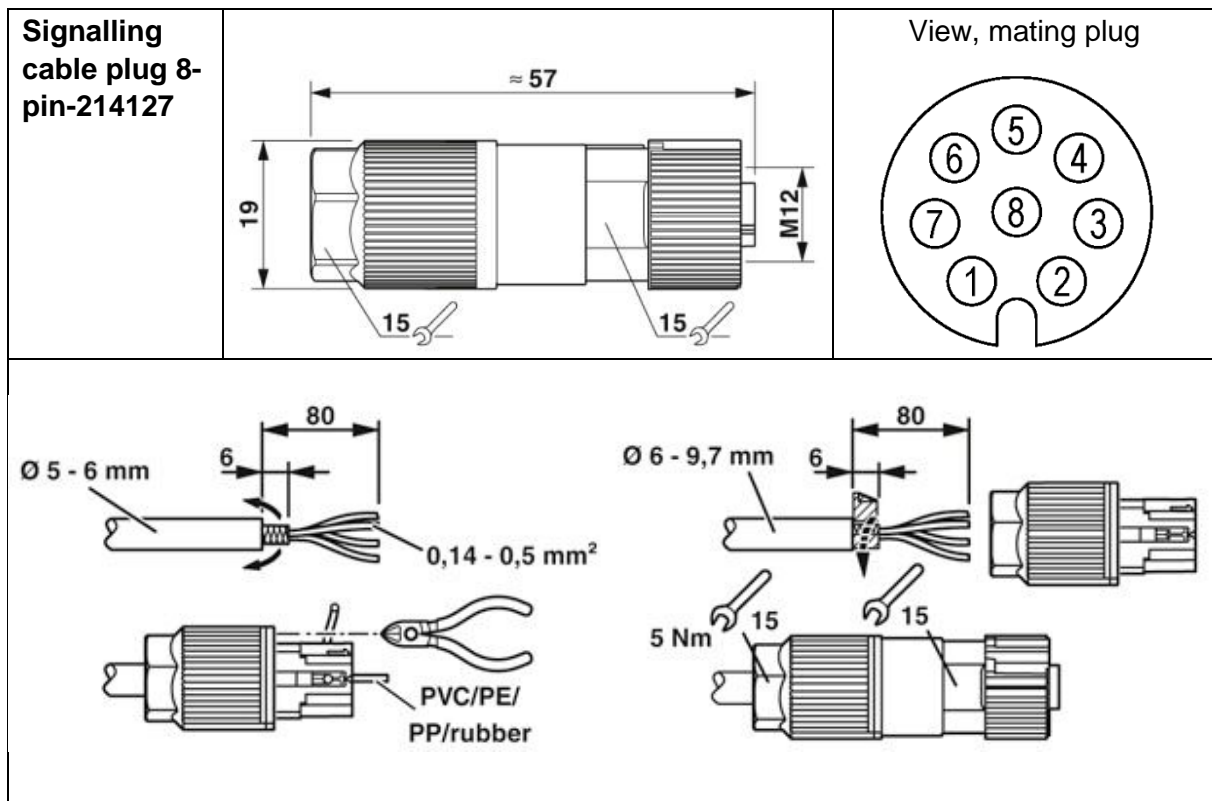
To avoid malfunctions, all wires which are not used have to be connected to an unused terminal or they have to be insulated. You can obtain configured cables from us optional. See 9. Accessories.

5.3 Plug Mounting

Order no.	Connection diagram
5.4041.01.00x 5.4041.11.00X without heating; meaning that heating plug and heating cable are not required.	 <p style="text-align: center;">Niederschlagsgeber Precipitation Transmitter 8 pol. Stecker / Plug</p> <p>Heizung Heating</p> <p>4 pol. Stecker / Plug 24V DC</p> <p>Power 9.8...32VDC</p> <p>Puls Puls iso. RS485</p> <p>1 2 3 4 1 2 3 4 5 6 7 8</p> <p>Erde Earth</p> <p>+</p> <p>-</p> <p>NC</p> <p>Versorgung Heizung Power heating 24V DC / 140VA</p> <p>Versorgung / Power 9.8 ... 32V DC</p> <p>Heizung an/aus / Heating on/off open collector, max. 24VDC/0.1A/0.5W</p> <p>0.1mm = 1 Puls / Pulse open collector, isol. max. 24VDC/0.05A/0.5W</p> <p>RS485 HD isoliert / isolated</p> <p>Erde Earth</p>

Please note:

Observe connection order described in point 5.4.1.



5.4 Power Connection and Signal Transmission

For the connection of the measuring system to a data acquisition device as e. g. the data logger, a connection cable with an M12-plug is required. A separate power cable is required for the power supply to the heating. The cables have to be connected as shown in the connection diagram.

5.4.1 Connection Order

Connections have to be carried out in the following order:

1. Connect external power connection of heating.
2. Connect sensor cable.

The maximum possible distance between measuring device and data recording device depends on the interface used. The standards applicable to the values obtained with RS485 (1000 m) apply.

Cable cross-section [mm ²]	1.5	
Length of cable [m]	Heating output [VA]	Line loss [VA]
1.0	138.5	1.5
1.5	137.7	2.3
5.0	132.6	7.4
10.0	125.8	14.2

This table provides an overview over output losses with different cable lengths. The output loss has to be taken into account when considering the energy balance.

5.5 System Start

The device starts automatically as soon as the sensor cable is connected. After approx. 15s, the device is ready to operate, starts to measure and transmits data in accordance with the device configuration.

Overview: Status LED (green) on the motherboard	
System Start	Uninterrupted lighting of LED for approx. 3 seconds
Operating	Fast flashing of LED

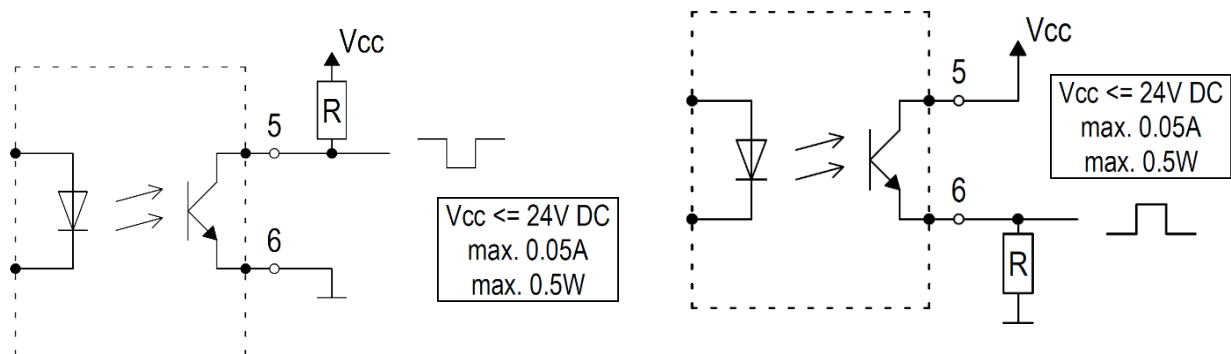
5.6 Interfaces

The precipitation transmitter is equipped with the following interfaces:

- Serial interface:
 - RS485, (half duplex), ASCII- and MODBUS RTU-protocol,
- Pulse output 1 precipitation:
 - 1 galvanically isolated open collector output
 - Precipitation output according to factory-default resolution and closing time; on request, the factory setting can be modified to customer specifications.
- Pulse output 2 heating:
 - 1 uninsulated open collector output
 - Heating ON/OFF

5.6.1 Examples for the Connection to the Optocoupler

Pulse output 1 precipitation



Pulse output 2 heating

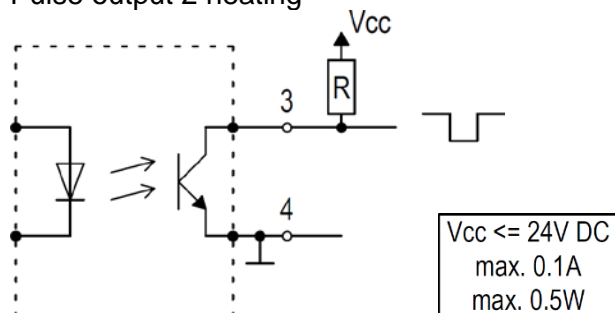


Figure 7: Examples for the Connection to the Optocoupler

5.7 Factory Setting

Relating to connection diagram (5.2. Electrical assembly), factory default settings.

Order no.	Heating ¹	Resolution ²	Closing time ²	Protocol	Modbus ID	Baud-rate	Frame format
5.4041.01.000	A	0.1mm	300ms	ASCII	1	19200 Bd	8N1
5.4041.01.001				MODBUS RTU			
5.4041.11.000	Off			ASCII			
5.4041.11.001				MODBUS RTU			

¹) Uninsulated pulse output as status output.

²) Galvanically isolated pulse output.

6 Serial Communication

6.1 RS485-Interface

To enable communication via the RS-485-interface, the precipitation transmitter is equipped with a command interpreter which supports the following 2 modes:

- ASCII
- MODBUS RTU

Interface setting:

Baud rate: 19200 Baud
 Data bits: 8
 Parity: none
 Stop bits: 1

6.2 ASCII-Protocol

The measuring system is able to reply with the defined ASCII-protocol via the RS485-interface. In this protocol, the sensor may be addressed every 10s, while it is recommended to work with intervals of 60s.

Basically, a command is set up as follows:

- <STX><Command><CR><LF>

<STX> Start protocol (Start text)
 <Command> Command containing 1 character (please refer to list of commands)
 <CR> Carriage Return (13dec; 0x0D)
 <LF> Line Feed (10dec; 0x0A)

Addressing is not possible in case of the precipitation transmitter, for this reason, it may not be used in the bus system. It may only be used as single measuring system. (Bus operation s.h. MODBUS-RTU).

When a command containing a parameter is transmitted, the parameter is checked. When it is valid, the parameter is saved and acknowledged in the “echo telegram”. When it is invalid, the parameter is ignored and the value set in the “echo telegram” is issued.

Example:

<STX>a<CR><LF>	measured value query
0.059;0.073;0.031<CR><LF>	reply

0.059	= Average intensity in mm/min
0.073	= Max. intensity in mm/min
0.031	= Min. intensity in mm/min

<STX>m<CR><LF>	measured value query
1.120;67.200;1.120;67.200;11.200;25.400;0;12<CR><LF>	reply

1.120	= Intensity in mm/min
67.200	= Intensity in mm/h
1.120	= Average intensity since last retrieval in mm/min
67.200	= Average intensity since last retrieval in mm/min
11.200	= Quantity since last retrieval in mm
25.400	= Total precipitation volume* since system start in mm
0;	= Status of heating (1 = ON, 0 = OFF)
12	= Temperature in °C

The measured values are separated by semicolon.

6.2.1 Overview over Commands

Command	Description
a	Query of measured values with time interval
e	Output error string
i	Output device information
m	Query of measured values

6.2.1.1 Command a

<STX>a<CR><LF> Query of measured values with time interval

Description: With this command, precipitation intensities relating to a defined time interval, can be issued.
On request, the time interval can be set according to customer specifications.

Output: int_{avr} Average intensity in mm/min
 int_{max} Max. intensity in mm/min
 int_{min} Min. intensity in mm/min

Default: 1h

Reply telegram: int_{avr}; int_{max};int_{ret_min}<CR><LF>

6.2.1.2 Command e

<STX>e<CR><LF> Output error string

Description: This command performs a system analysis

Output: 1 Internal service
 2 Error exceedance by 10°C with heating ON
 3 Internal service
 4 Error temperature sensor in the interior of the device
 5 Error temperature sensor at the funnel
 6 Internal service
 7 Internal service
 8 Internal service
 9 Internal service

Reply telegram: 1;2;3;4;5;6;7;8;9<CR><LF>

Value range: 0 = false, 1 = true

6.2.1.3 Command i

Description: With this command, production data can be queried.

<STX>i<CR><LF> Output device information

Output:	No.	Serial number of device
	P	Board version
	S	Firm ware version
	Cell	Serial number of weighing cell

Reply telegram: No;P;S;cell;<CR><LF>

6.2.1.4 Command m

<STX>m<CR><LF> Query of measured values

Description: The command triggers the transmission of current measured values.

Output:	int _m	Intensity in mm/min
	int _h	Intensity in mm/h
	int _{ret_min}	Average intensity since last retrieval in mm/min
	int _{ret_h}	Average intensity since last retrieval in mm/min
	am _{red}	Quantity since last retrieval in mm
	am _{tot}	Total quantity of precipitation* since system start in mm
	S _{he}	Status of heating (1 = ON, 0 = OFF)
	t _{in}	Temperature in °C

* also refer to chapter 6.4

Reply telegram: int_m; int_h; int_{ret_min}; int_{ret_h}; am_{red}; am_{tot}; S_{he}; t_{in}<CR><LF>

6.3 Command Interpreter MODBUS-RTU

When the command interpreter MODBUS-RTU has been set, the transmitted bytes are interpreted according to the MODBUS specification (<http://www.modbus.org/>). The precipitation transmitter represents a MODBUS Slave in this context.

Data transmissions are carried out in packages, so-called frames, of 256 Bytes maximum. Each package contains a 16Bit CRC check sum (initial value: 0xffff).

The following MODBUS-functions are supported:

- 0x04 (Read Input Register).
- 0x10 (Write Multiple Registers).

6.3.1 Measured Values (Input Register)

The measured values occupy 16 or 32bits, i. e. 1 or 2 register addresses. Their allocation is shown in the following table:

Register address	Parameter name	Unit	Multi-plier	Description	Data type
31001	Volume of precipitation	mm	10	1 decimal	S16
31101	Volume of precipitation	mm	1000	3 decimals	U32
31103	Quantity of precipitation since last retrieval	mm	1000	3 decimals	U32
31201	Precipitation intensity of the last minute (sliding)	mm/min	1000	= Mean value (1-min.) 3 decimals Time base = 1 Min. Measuring rate = 6 x per minute	S16
34901	Sensor status		1	Evaluated bit by bit	U16
34921	Heating status		1	1 = ON; 0 = OFF	S16
34922	Internal temperature	°C	10	1 decimal	S16
34931	Total heating output in percent	%	1	-	S16

0xD8F1=-9999 or 0xFF676981=- 9999999 is issued as error code or invalid value. The explanation of sensor status (error) is specified in point 6.3.4.

6.3.2 Configuration Parameters

Register address	Parameter name	Unit	Multiplicator	Description	Data type
40001	ID		1	MODBUS-address: 1...247	U16
40200	Baud rate		0.01	96 = 9600Bd 192 = 19200Bd 384 = 38400Bd	U16

6.3.3 Mapping Register Modbus

Register address	Content of register	Unit	Factor	Description	Data type
46001	31001	Register address	1	Total quantity of precipitation	S16
46002	31101	Register address	1	Total quantity of precipitation (High-WORD)	U16
46003	31102	Register address	1	Total quantity of precipitation (Low-WORD)	U16
46004	31103	Register address	1	Quantity of precipitation since last retrieval (High-WORD)	U16
46005	31104	Register address	1	Quantity of precipitation since last retrieval (Low-WORD)	U16
46006	31201	Register address	1	Precipitation intensity of the last minute (sliding)	S16
46007	34901	Register address	1	Sensor status (error)	U16
46008	34921	Register address	1	Heating status	S16
46009	34922	Register address	1	Internal temperature	S16
46010	34931	Register address	1	Total heating output in percent	S16

6.3.4 Sensor Status (error) Explanation

Answer	Meaning	Value range
1	Reserved	0 ... 99
2	Error exceedance by 10 °C with heating ON	0 or 1
3	Reserved	0 or 1
4	Error temperature sensor in the interior of the device	0 or 1
5	Error temperature sensor at the funnel	0 or 1
6	Reserved	0 or 1
7	Reserved	0 or 1
8	Reserved	0 or 1
9	Reserved	0 or 1

Output 0 = OK

Output 1 means: error

6.3.5 Quantity of Precipitation

For the measurement of the quantity of precipitation from data set to data set via serial protocols (e. g. Modbus), the difference between the total quantity of precipitation and the previous value has to be determined.

Note:

The value overflow of the precipitation sum has to be considered in the calculation of the difference. The value overflow occurs at 60000g collected liquid. For sensors with a catch area of 200cm², this results in a value overflow at 3000mm.

6.4 Pulse Output

Each pulse is equivalent to a defined quantity of measured precipitation. The value range of the toggle factor is 0,01 ... 200mm/pulse, (default setting: 0.1mm/pulse).

7 Maintenance, Checks and Troubleshooting

Maintenance and checks

1. Visual controls for contaminations should be performed regularly - depending on the surroundings and seasonal effects (spider and bird populations, pollen, leaves etc.). As laid down in chapter 6 of the "VDI Richtlinien - Umweltmeteorologie - Meteorologische Messungen - Niederschlag, VDI 3786 Blatt 7 (Dezember 2010)" [VDI guidelines - environmental meteorology - meteorological measurements - precipitation, VDI 3786, sheet 7 (December 2010)], monthly inspections are recommended. In high pollution areas, weekly inspections may be necessary in order to warrant correct measurement results.

Please note:

In order to avoid faulty measurements, please disconnect all external cables before cleaning the interior of the sensor. Funnel heating and outlet heating can get very hot, when the heating is operated with the housing open. Danger of burns! We thus recommend to disconnect the plug of the power supply for the heating during cleaning and maintenance work.

2. All parts getting into contact with water should be cleaned regularly. Rinsing with clear water should suffice to remove the majority of contaminations. Persistent dirt at the catch funnel or in the outlet has to be removed carefully. Slight contaminations of the collection vessel are harmless. The collection vessel can be cleaned with water and a mild cleaning agent.

3. Make sure that the device is set up in a stable, perpendicular position and check the bird control ring, the sensor and particularly the funnel surface for damages.
4. Keep the measuring site free from overgrowing bushes and trees.
5. During frost and snow-fall periods, the bird control ring has to be removed.

Note:

When cleaning the collection vessel, take care to avoid damages. Do not clean the measuring system and the collection vessel with a steel brush, similar gadgets or aggressive cleaning agents.

Troubleshooting

Heating was switched off after the device had been set up.

(Error string: "Error heating" = 1):

- Interrupt the power supply to the sensor.
- Check whether the power connection for the heating and the clamping connector for the funnel heating (inside the device) are connected.
- Reconnect the sensor with the power supply.

Should the problem continue, this may be due to one of the following causes:

- Outlet heating does not work or is not connected internally.
- Funnel heating does not work.
- Power cable of the heating is too long or defective.

Please contact our service department when you have any questions.

8 Technical Data

Description	Value
General	
Types of precipitation which can be measured	Liquid (solid, mixed - heated version)
Measuring principle	Weighing with automatic self-emptying function
Catch	200cm ²
Measuring range (quantity) without limitation	(0.005...∞mm)
Resolution (quantity)	0.001mm (pulse output: 0.01mm)
Precision (quantity) < 6mm/min	0.1mm or 1%
Precision (quantity) ≥ 6mm/min	2%
Measuring range (intensity)	0 ... 20mm/min or 0 ... 1200mm/h
Precision (intensity) < 6mm/min	0.001mm/min or 0.06mm/h
Precision (intensity) ≥ 6mm/min	0.1mm/min or 6mm/h
Ambient temperature without heating	0 ... +70°C
5.4041.11.00x	
Ambient temperature with heating (No icing over or snowdrift)	-40 ... +70°C
5.4041.01.00x	
Storage temperature	-40 ... +70°C
Ambient air humidity	0 ... 100% rel. humidity
Mounting on mast tube	∅ 60mm
Dimensions	292mm x 190mm (H x D)
Weight	approx. 2.7kg
Protection class of the weighing cell	IP67
Power consumption	max. 45mA at 24V Pulse output type 10.5mA at 12V
Supply voltage 5.4041.xx.00x	9,8 ... 32V DC
Supply voltage of heating 5.4041.01.00x	24V DC
Heating data	Electronically controlled, 2 heating circuits
Heating output (with 24V supply)	140W
Heating – target temperature funnel surface	+ 2°C
Heating precision	± 1°C
Heating output funnel	80W
Heating output (outlet / collection vessel)	60W

Signal output	
Pulse output 1 precipitation	Galvanically isolated, Open-Collector
Supply voltage	max. 24V DC
Pulse power	max. 0.05A
Power consumption	max. 0.5W
Pulse output 2 - heating	Open-Collector
Supply voltage	max. 24V DC
Pulse power	max. 0.1A
Power consumption	max. 0.5W
Standards	WMO-No. 8 VDI 3786 sheet 7 EN 61000-2, -4 EN 61000-4-2, -3, -4, -5, -6, -11 NAMUR NE-21

9 Accessories (optional)

Order no.	Denomination	Description
214165	Signalling cable	CABLE, assembled M12 1.5 Meters POL: 8
214166	Signalling cable	CABLE, assembled M12 10 Meters POL: 8
214167	Heating cable	CABLE, assembled M12 1 Meters POL: 4
214168	Heating cable	CABLE, assembled M12 10 Meters POL: 4
9.4031.35.065	Pedestal	Serves as the base for the installation of the precipitation transmitter. The distance between ground and catch area is 0.65m. Pedestals for other distances are available, too.
510217	Tube extension and adaption	The pipe extension / adaptation is required to achieve the collection height of 1m with the stand and to adapt the different diameters.
5.4010.00.010	Bird guard ring	Prevents that birds land and sit on the precipitation transmitter.

10 Dimension Diagram

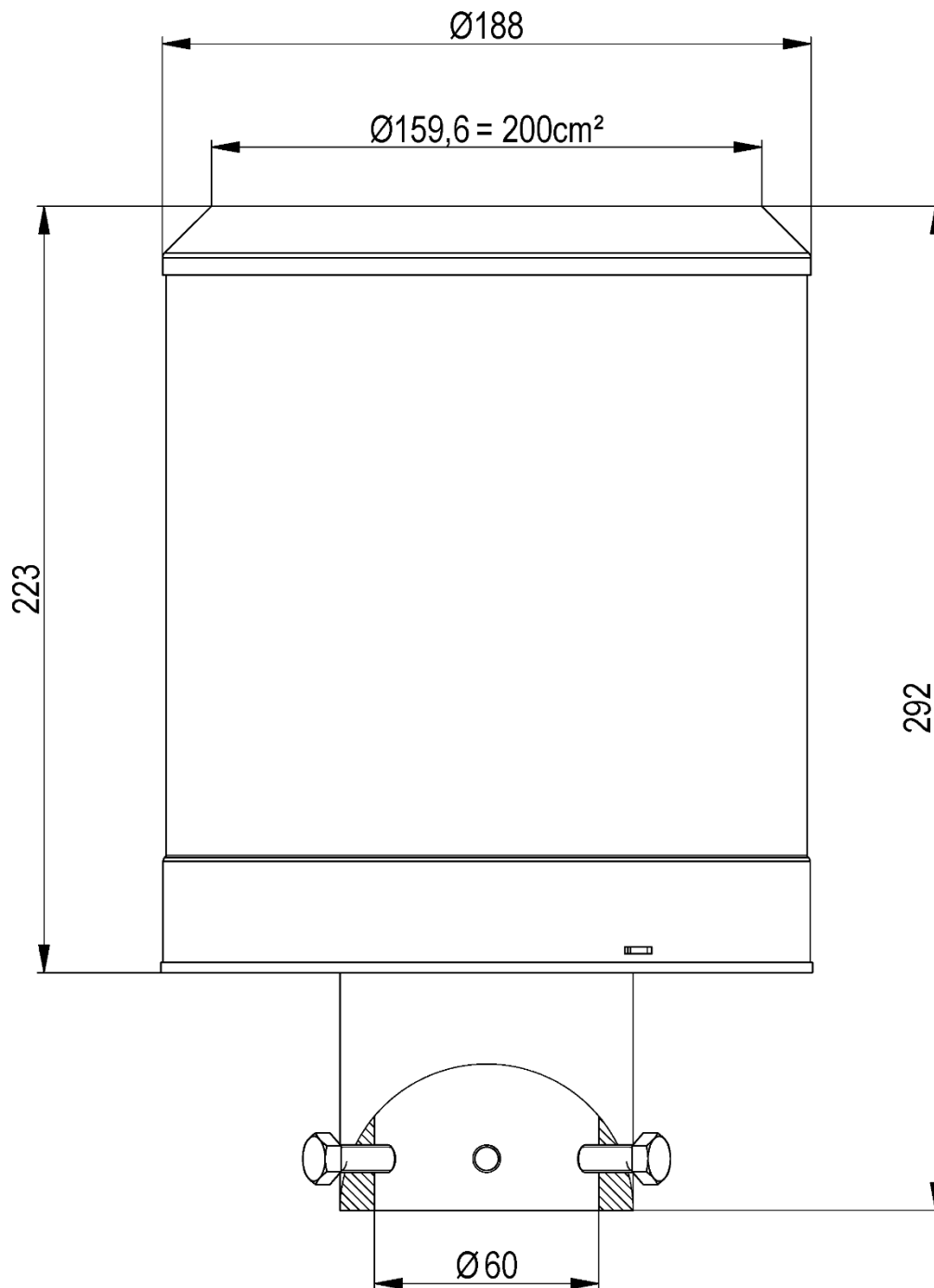


Figure 8: Dimension Diagram

11 EC-Declaration of Conformity

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

Product: Precipitation Transmitter

Doc. Nr. 908-44879_CE

Article Overview:

5.4041.01.000 5.4041.01.001 5.4041.11.000 5.4041.11.001

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).

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

DIN EN 60529	2014-09	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999 + A2:2013); German version EN 60529:1991 + A1:2000 + A2:2013
DIN EN 60945	2003-07	Maritime navigation and radiocommunication equipment and systems. General requirements. Methods of testing and required test results
DIN EN 61000-4-2	2009-12	Electromagnetic Compatibility (EMC) - Part 4-2: Testing and measuring procedures - Testing of immunity to static electricity discharge
DIN EN IEC 61000-4-3	2021-11	Electromagnetic compatibility (EMC) - Part 4-3: Test and measurement procedures - Testing of immunity to high-frequency electromagnetic fields
DIN EN 61000-4-4	2013-04	Electromagnetic compatibility (EMC) - Part 4-4: Test and measurement methods - Testing of immunity to fast transient electrical disturbances / burst
DIN EN 61000-4-6	2014-08	Electromagnetic compatibility (EMC) - Part 4-6: Test and measurement methods - Immunity to conducted disturbances, induced by high-frequency fields
DIN EN 61000-4-11	2021-10	Electromagnetic compatibility (EMC) - Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase (IEC 61000-4-11:2020 + COR1:2020); German version EN IEC 61000-4-11:2020 + AC:2020
DIN EN IEC 61000-6-2	2019-11	Electromagnetic compatibility Immunity for industrial environment
DIN EN IEC 61000-6-4	2020-09	Electromagnetic compatibility (EMC) - Part 6-4: Generic standards - Emission standard for industrial environments (IEC 61000-6-4:2018)
DIN EN 61010-1	2020-03	Safety requirements for electrical equipment for measurement, control, and laboratory use. General requirements
DIN EN IEC 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 Peterit

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.

12 UK-CA-Declaration of Conformity

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

Product: Precipitation Transmitter

Doc. Nr. 908-44879_CA

Article Overview:

5.4041.01.000 5.4041.01.001 5.4041.11.000 5.4041.11.001

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)

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

EN 60529:1991 + A1:2000 + A2:2013	2014-09	Degrees of protection provided by enclosures (IP Code) (IEC 60529:1989 + A1:1999 + A2:2013); German version EN 60529:1991 + A1:2000 + A2:2013
BS EN 60945	15.04.2003	Maritime navigation and radiocommunication equipment and systems. General requirements. Methods of testing and required test results
BS EN 61000-4-2	31.05.2009	Electromagnetic compatibility (EMC). Testing and measurement techniques. Electrostatic discharge immunity test
BS EN IEC 61000-4-3	04.11.2020	Electromagnetic compatibility (EMC). Testing and measurement techniques. Radiated, radio-frequency, electromagnetic field immunity test
BS EN 61000-4-4	30.11.2012	Electromagnetic compatibility (EMC). Testing and measurement techniques. Electrical fast transient/burst immunity test
BS EN 61000-4-6	28.02.2014	Electromagnetic compatibility (EMC). Testing and measurement techniques. Immunity to conducted disturbances, induced by radio-frequency fields
BS EN IEC 61000-4-11	03.04.2020	Electromagnetic compatibility (EMC). Testing and measurement techniques. Voltage dips, short interruptions and voltage variations immunity tests for equipment with input current up to 16 A per phase
BS EN IEC 61000-6-2	25.02.2019	Electromagnetic compatibility (EMC). Generic standards. Immunity standard for industrial environments
BS EN IEC 61000-6-4	30.09.2019	Electromagnetic compatibility (EMC). Generic standards. Emission standard for industrial 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:

Legally binding signature:




General Manager - Dr. Christoph Peper

Development Manager - ppa. Jörg Petereit


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.

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