

Instruction for Use

021222/02/09

Precipitation Transmitter

5.4032.35.007 / 008 / 009 / 010 / 011 / 107 / 108

5.4032.45.008 / 009



ADOLF THIES GmbH & Co. KG

Hauptstraße 76 37083 Göttingen Germany
Box 3536 + 3541 37025 Göttingen
Phone +49 551 79001-0 Fax +49 551 79001-65
www.thiesclima.com info@thiesclima.com

Safety Instructions

- Before operating with or at the device/product, read through the operating instructions. This manual contains instructions which should be followed on mounting, start-up, and operation. A non-observance might cause:
 - failure of important functions
 - Endangering of persons by electrical or 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 voltage-free state.
- **Adolf Thies GmbH & Co KG** guarantees proper functioning of the device/products provided that no modifications have been made to the mechanics, electronics or software, and that the following points are observed:
 - All information, warnings and instructions for use included in these operating instructions must be taken into account and observed as this is essential to ensure trouble-free operation and a safe condition of the measuring system / device / product.
 - The device / product is designed for a specific application as described in these operating instructions.
 - The device / product should be operated with the accessories and consumables supplied and/or recommended by **Adolf Thies GmbH & Co KG** .
 - Recommendation: As it is possible that each measuring system / device / product under certain conditions, and in rare cases, may also output erroneous measuring values, it is recommended using redundant systems with plausibility checks with **security-relevant applications**.

Environment

- As a longstanding manufacturer of sensors Adolf Thies GmbH & Co KG is committed to the objectives of environmental protection and is therefore willing to take back all supplied products governed by the provisions of "*ElektroG*" (German Electrical and Electronic Equipment Act) and to perform environmentally compatible disposal and recycling. We are prepared to take back all Thies products concerned free of charge if returned to Thies by our customers carriage-paid.
- Make sure you retain packaging for storage or transport of products. Should packaging however no longer be required, arrange for recycling as the packaging materials are designed to be recycled.



Documentation

- © Copyright **Adolf Thies GmbH & Co KG**, Göttingen / Germany
- Although this 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.

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1 Models

The precipitation transmitter can be delivered in the following versions:

Order - No.	Heating	Heating-Supply	Connection
5.4032.35.007	no	-----	Plug
5.4032.35.008	yes	24 V AC / DC; 48,5 W	Plug
5.4032.35.107	no	-----	Plug
5.4032.35.108	yes	24 V AC / DC; 48,5 W	Plug
5.4032.35.009	yes	42 V AC / DC; 48,5 W	terminal strip
5.4032.35.010	yes	24 V AC / DC; 48,5 W	terminal strip
5.4032.35.011	no	-----	terminal strip
5.4032.45.008	yes	24 V AC / DC; 113,5 W	Plug
5.4032.45.009	yes	42 V AC / DC; 118,5 W	terminal strip

Table1: Models

2 Application

The instrument is designed to measure the height, quantity and the intensity of the precipitation striking the surface of the earth. The measuring principle is basing on the description „Guide to Meteorological Instruments No 8“ of the WMO (World Meteorological Organization).

3 Mode of Operation

The rain, collected by the collecting surface of 200 cm², is conducted through a inflow-sieve into a tipping-bucket. After having collected the rain amount of 2 cm³ of precipitation the bucket tips over, and the other tipping-bucket half is ready for collecting the rain.

This tipping procedure is detected by Hall-Sensors, and induces an output pulse in combination with connected electronics. The procedures recur with continuous precipitation.

$$2 \text{ cm}^2 \text{ tipping-bucket volume} = 1 \text{ tipping-bucket puls} = 0,1 \text{ mm precipitation}$$

Output 1: As the number of tipping procedures is not linear to the precipitation intensity, an intensity-dependent linearization is carried out in the connected electronics. The linearization procedure is basing on a intensity-dependent pulse-number-correction for the precipitation intensity range of approx. 0,5... 11 mm/min.

Each instrument is calibrated with a precipitation quantity of 200 cm³ (=10 mm precipitation height).

Output 2: is available only as potential-free contact. This output is not linearized.

- Precipitation transmitters with optional integrated heating liquefy solid precipitation, such as snow, and are, therefore, suitable for winter operation
- Precipitation transmitters 5.4032.45.008 and 5.4032.45.009 have an additional casing heater, and so are particularly suited for the use in the mountains.
- All parts are corrosion-resistant. The cover is made of stainless steel (V2A).

For information:

A precipitation height of 1 mm corresponds to a water volume of 1 litre on 1 m² ground area.

4 Recommendation Site Selection / Standard Installation

Depending on the wind velocity, a certain amount of the precipitation particles are blown away over the deposit area. Therefore, an installation in a completely open area as well as at the direct lee-side of an object is to be avoided. Gardens e.g., where hedgerows or similar objects offer protection against the wind, are more suitable.

The World Meteorological Organization recommends that precipitation gauges be installed at a distance which is at least four times as high as the next higher object. If this is not possible, it is to be observed that an elevation angle of $\leq 45^\circ$ towards the surrounding plants, buildings etc. is adhered to.

The precipitation gauge is to be installed in such a way that the collection area is horizontal and is situated 1 m above ground. If snowfall is to be expected regularly within the area of the measuring instrument this distance should be increased respectively.

Attention:

Precipitation gauges are to be installed in a way that ensures a vibrationless operation.

5 Installation

Attention:

- *The electrical connection is to be carried out by experts only.*
- *Please open the instrument only with dry ambient conditions.*
- *Do not damage the exposed electronics!*

5.1 Mechanical Mounting

Attention:

- *The included tipping bucket must be operated only with this precipitation transmitter.*
- *Please don't touch the inner surfaces of the tipping bucket.*
- *The drain pins of the tipping bucket must not be deformed.*

Remark:

The combination filter/cram (14/15) in the collecting funnel is to be removed in winter operation with snow fall

Tools Required:

- Wrench, wrench width 13
- Allen wrench, wrench width 3

Installation is carried out as follows (see also Fig. 1)

1. Remove the precipitation transmitter from the box.
2. Remove the small box from the collecting funnel of the housing **(1)**.
Unpack tipping bucket **(7)** and filter **(12)** and put them aside.

Important:

The tipping bucket is allocated to the precipitation transmitter.

Tipping bucket and precipitation transmitter are marked each by the same tipping bucket number.

The tipping bucket number is located as small label

- on the small box.
- on the pan
- on the base

3. Remove the bag from the collecting funnel of the housing **(1)**, remove the combination filter/cram **(14/15)** and put it aside.
4. Put the precipitation transmitter on a suitable base, and fix it by means of the screws **(4)** inside the base **(3)**.
5. Loosen two screws **(2)** at the housing **(1)** and lift the housing carefully up.
6. Please check, if the level- indicator **(5)** on the ground plate indicates a horizontal mounting, if necessary, correct it by the screws **(4)** inside the base **(3)**.
7. Push the collector **(13)** upward by loosening the knurled screw **(11)** and fix it.
8. Then insert the tipping bucket **(7)** carefully into the bearing cup of the pan **(6)**.

Important:

- The magnet **(10)** of the tipping bucket must indicate towards the pc-board.
- Please check once again if the tipping bucket, and the precipitation transmitter have the right allocation (synchronize numbers).

9. Afterwards, test the tipping bucket manually on trouble-free tipping.
10. Insert the filter **(12)**, which was put aside, into the collector **(13)**.
11. Put the collector back into lower position, and fix it.
12. Put the housing carefully back on the instrument, and fix it by means of the two instrument screws.
13. Insert the combination filter/cram **(14/15)**, which was put aside, into the passage of the collecting funnel.

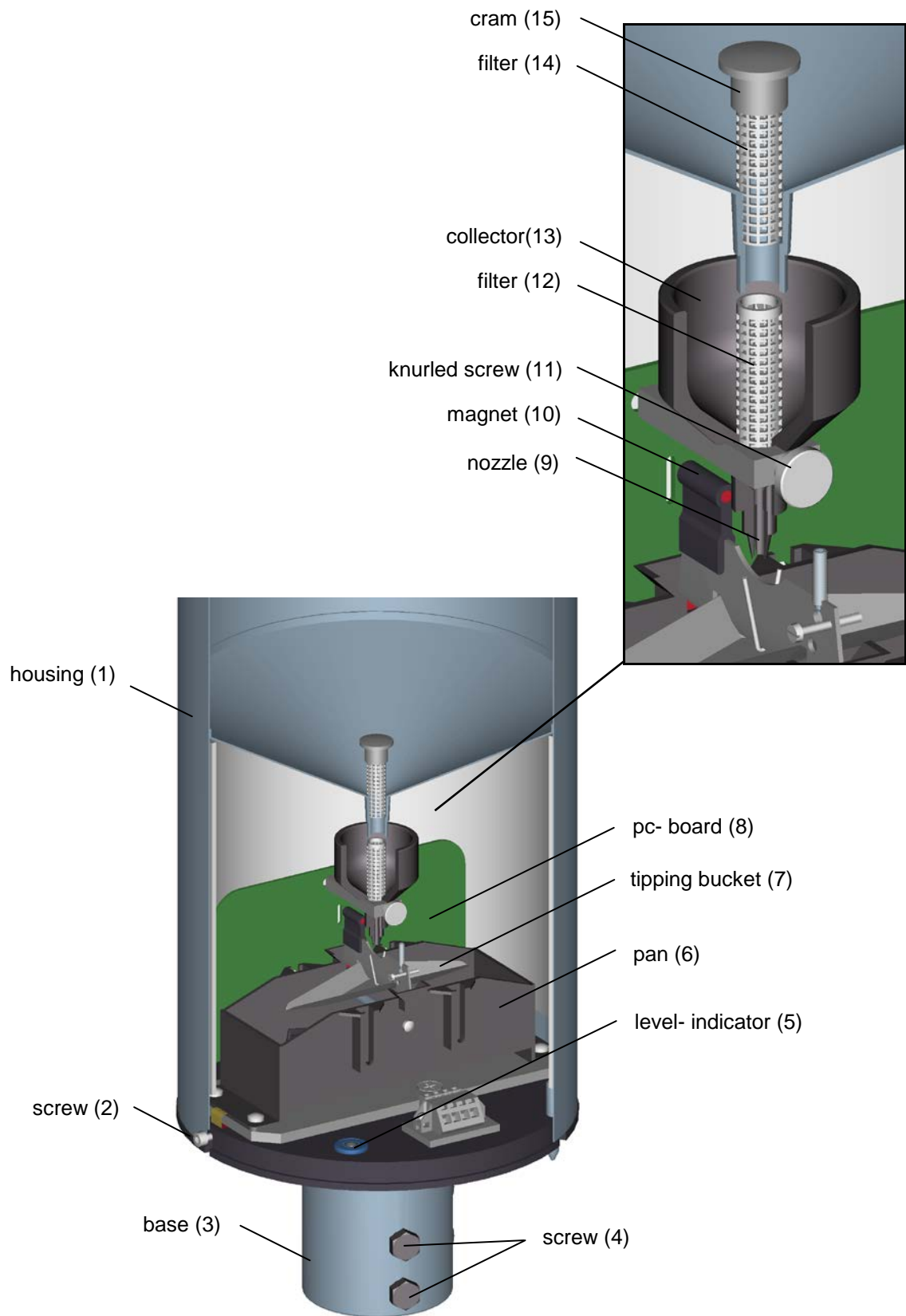


Figure 1: Instrument construction

5.2 Electrical Mounting for Instruments with Plug

- Please solder a cable (for ex.. LiYCY 0,5 mm²) to the attached connecting plug acc. to the respective connecting diagram (see also chapter 10).
- Plug-mounting see chapter 6

Remark:

The connecting plug at the model without heating does not use connections 6 and 7.

5.2.1 Plug mounting

Applies only to instruments with connection „plug“.

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

Cable connection: **without** cable shield

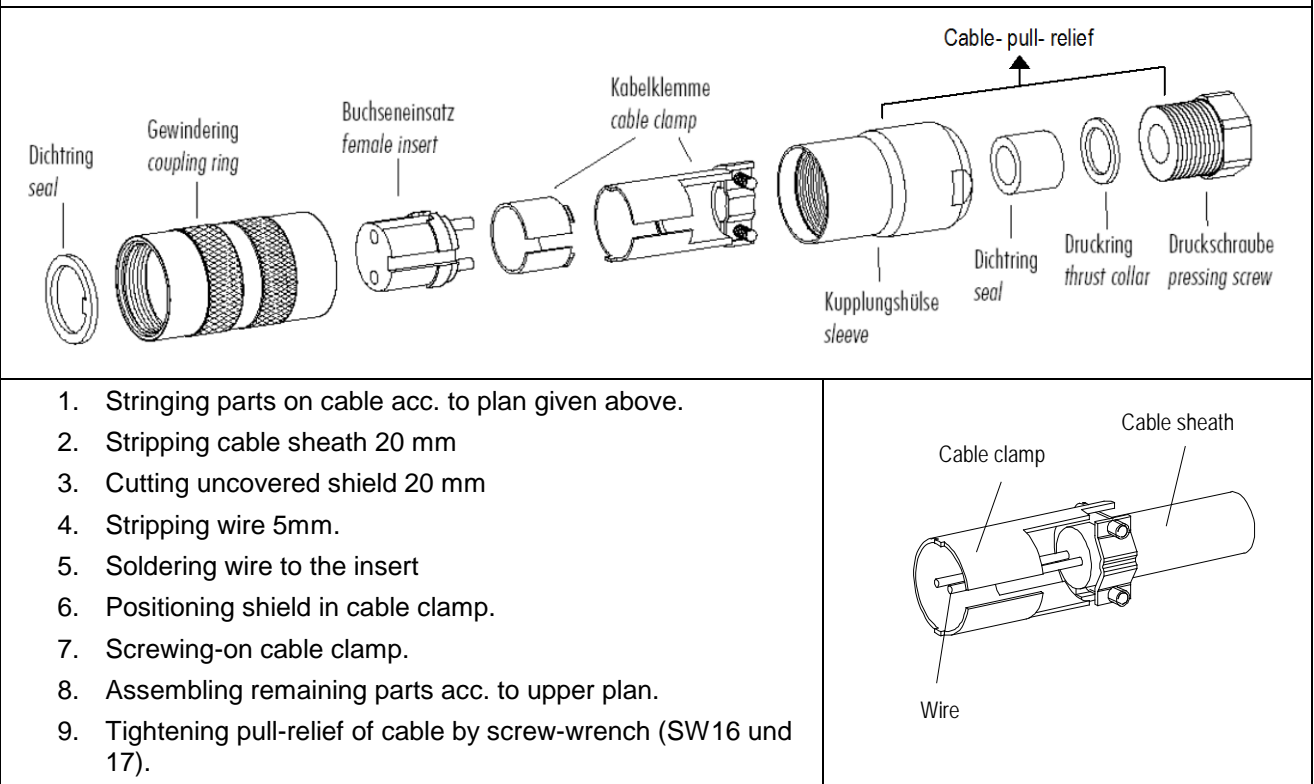


Figure 2: plug mounting

5.3 Electrical Mounting for Instruments with Terminal strip

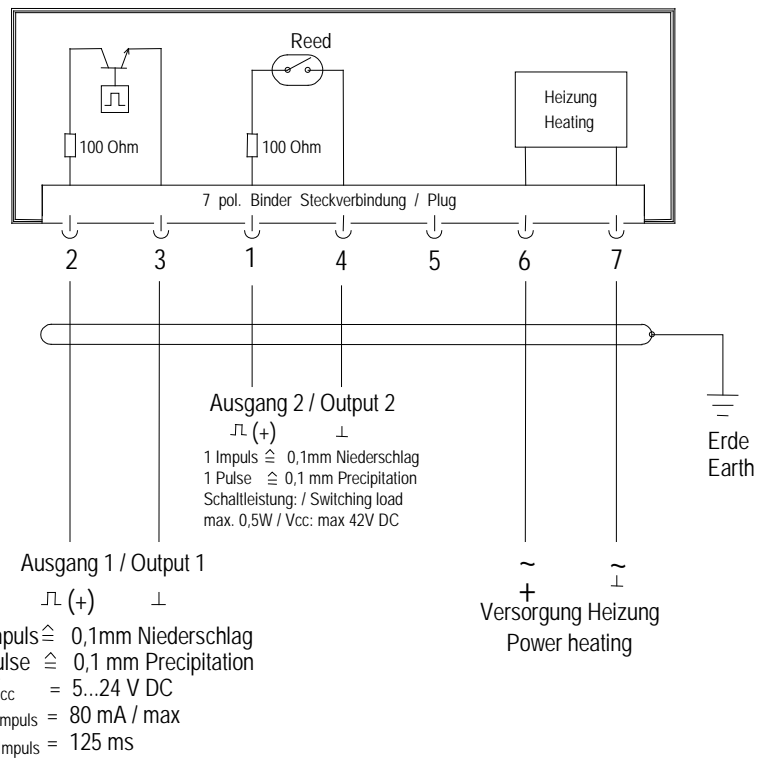
- Please clamp a cable (for ex. LiYCY 0,5 mm²) to the built-in terminal strip acc. to the respective connecting diagram (see also chapter 10).

Remark:

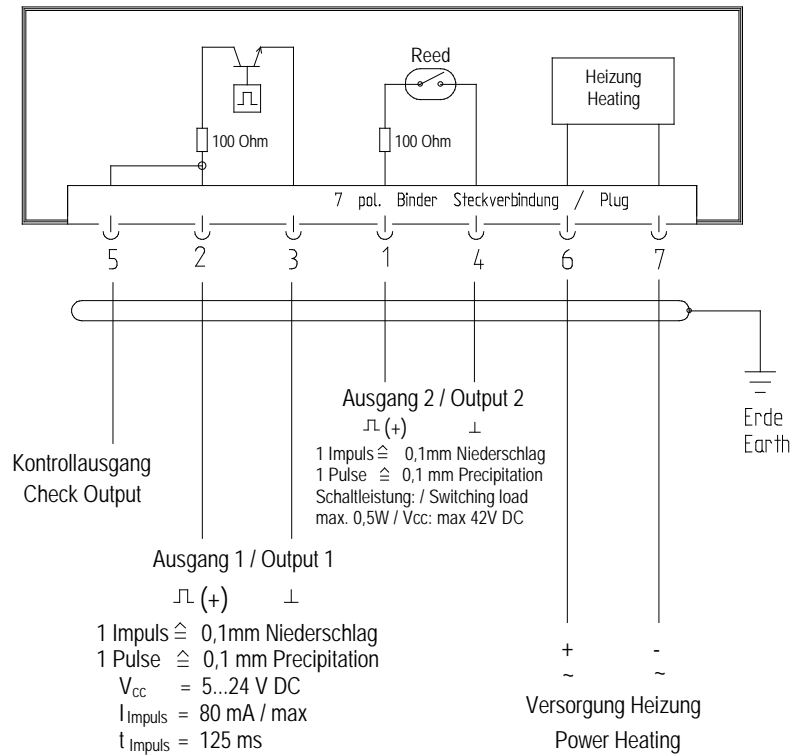
Connections 5 and 6 of the terminal strip are not used at the model without heating.

5.4 Connecting Diagram

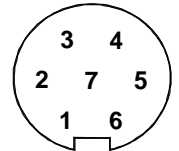
5.4032.35.007
5.4032.35.008
5.4032.45.008



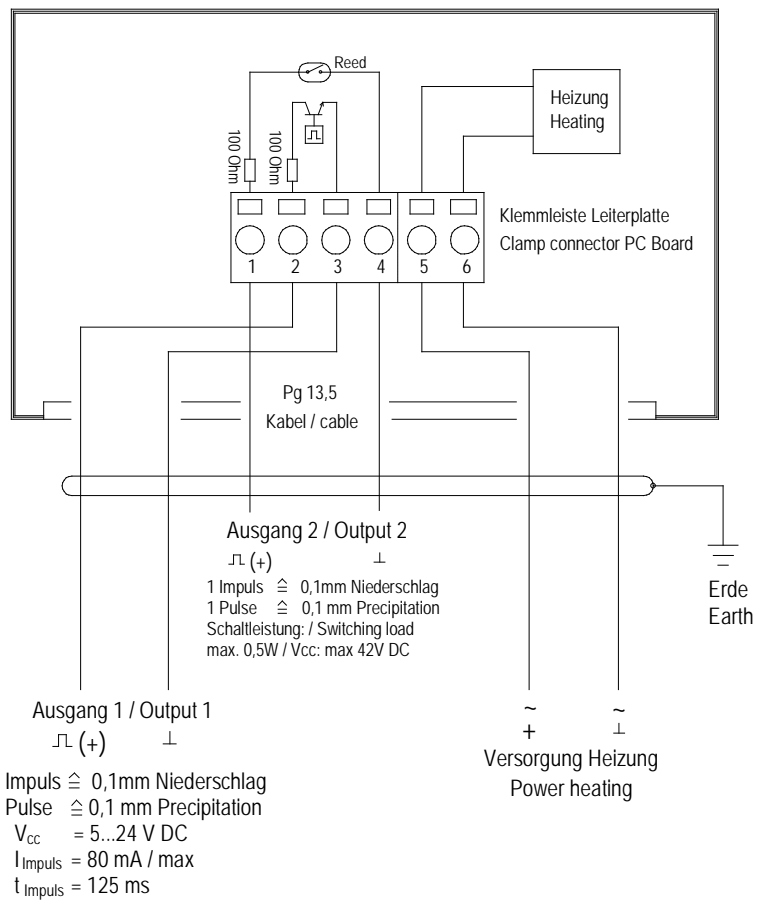
5.4032.35.107
5.4032.35.108



View on the soldered joint of the counter plug.



5.4032.35.009
5.4032.35.010
5.4032.35.011
5.4032.45.009



5.5 Supply Example

The precipitation transmitter is supplied via the signal line (two-wire-circuit).

Example 1:

Therefore, R_a may be a maximum of $10\text{k}\Omega$ in the interface at a voltage of $V_{cc} = 5\text{V}$.

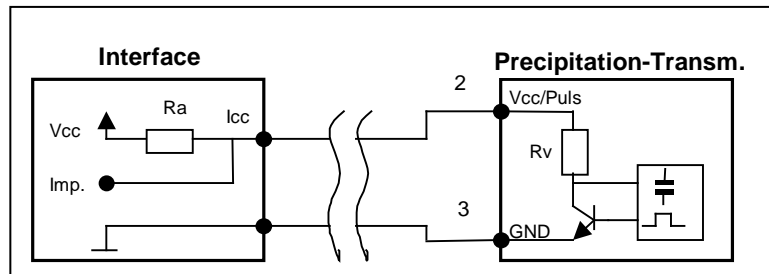


Figure 3: Example - Connection to a Interface

Example 2:

Connection to a SPS. The maximum pulse current (see Technical Data) must not be exceeded.

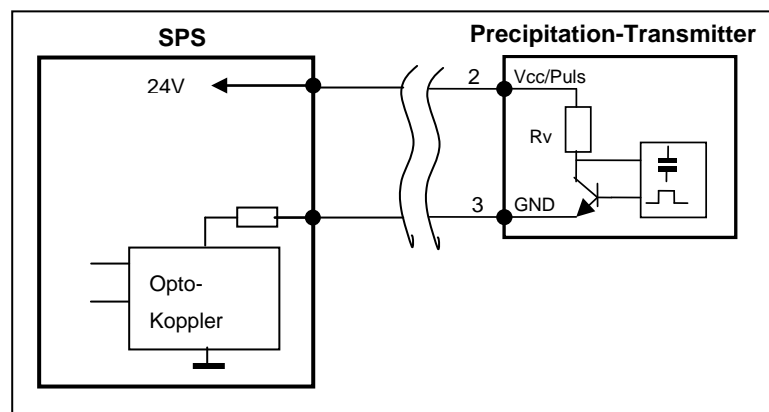


Figure 4: Example - Connection to a SPS

Remark:

Output 2 is reserved just for acquisition systems, which can process only one Reed-contact. Output 2 is not linearized.

6 Maintenance

Attention:

*The electrical connection is to be carried out by experts only.
Please open the instrument only with dry ambient conditions.
Do not damage the exposed electronics!*

Attention:

- *Do not use any benzene, alcohol, or other cleansing agents.*
- *Never treat the inner surfaces of the tipping bucket with emery paper or something similar.*
- *Do not touch the inner surfaces with hands.*
- *Please take care that the draining pins are not deformed.*

The instrument is designed in such a way that all of the parts requiring maintenance are easily accessible once the case has been removed.

The most important factors for precise measurements are a free and undisturbed inflow, and clean, grease-free inner surfaces of the tipping bucket.

The tipping bucket is made of zinc-plate, the surface of which is specifically oxidised, in order to achieve a hygrophile surface. It guarantees an accurate draining behaviour of the measuring liquid, and must not be removed mechanically.

The maintenance interval should depend on the degree of pollution of the instrument. It is advisable to make a visual inspection at short intervals as particles falling from above, such as foliage, bird dropping etc. can affect the measurement.

6.1 Cleansing Procedure

Tools Required:

- a clean cloth
- a small bottle brush
- a soft brush
- possibly gentle soap

Cleansing is carried out as follows: (s.a. Fig. 1: Instrument construction):

1. Switch off supply voltage of heating.
2. Remove the filter **(14)** upward from the collecting funnel of the housing **(1)** and clean it.
3. Loosen the two screws **(2)** at the housing, remove housing and clean it.
4. Remove filter **(12)** from the collector **(13)** and clean it.
5. The collector **(13)** with the **nozzle (9)** can be removed after unscrewing the knurled **screw (11)**. Clean the nozzle boring by means of small bottle brush.

6. Remove the **tipping bucket (7)** carefully from the pan **(6)**.
7. Clean the inner surfaces with clear water, if heavily soiled (grease) also with gentle soap water. For this, please use a soft brush.
8. In case of heavy pollution please clean also the pan **(6)**.
9. After cleansing, please re-insert the parts in reversed order.

6.2 Check of the Tipping Bucket

For checking the measuring instrument it is advisable to pour a certain amount of precipitation slowly and steadily into the collecting funnel. That means, that for example a quantity of 200 cm² induces a pulse number of 100.

The quantity of 200 cm² should be filled in constantly over a period of approx. 10 minutes.

For Information:

Approx. 98 % of the precipitation in Germany are falling with an intensity of 2 mm/min

Remark:

Every precipitation transmitter is checked, adjusted and calibrated at the manufacturers. If, in the course of time, the adjustment of the tipping bucket has changed as a result of external influences, we suggest a check and calibration in our factory.

7 Technical Data

Description	MIN	TYP	Max	Units
General				
Collector surface		200		cm ²
Volume of tipping bucket		2		cm ³
Measuring range	0		11	mm/min
Measuring range		0,1		mm NS
Accuracy output 1 within the range of 0.. 11 mm/min			± 3 *	%
Ambient temperature (without heating)	0		60	°C
Ambient temperature (with heating)	- 25		60	°C
Ambient temperature at 5.4032.54.008 / 009	- 35		60	°C
Mounting onto mast tube (1 ½")			50	Ømm
Weight			3.3	kg
Output signal 1:				
Pulse length		125		ms
Pulse pause		125		ms
Tipping bucket frequency	0		2	Hz
Operating voltage	5		24	V DC
Standing current (no precipitation)		50	56	µA
Pulse current			80	mA
Ra Max (Ra in the Interface (Vcc=5V) (fig.1)			10	kΩ
Rv (pre-resistance in the precip.transmitter) (fig.1)		100		Ω
Output signal 2: Reed contact (without linearization)				
Pulse length		50		ms
I Pulse frequency	0		2	Hz
Contact load			0.5	W
Contact voltage (Vcc)			42	V
Heating:				
Heating voltage (see model)		24 42		V (AC/DC)
Heating power (see model)		48.5 113.5 118.5		W
Heating – switch-on temperature		5		°C
Heating – hysteresis		2		°C

* The accuracies were determined under laboratory conditions.
 Test medium: distilled water.
 Test volume: 200cm³ = 10mm precipitation = 100 pulses of tipping bucket
 10 mm of precipitation corresponds to a quantity of 600 l/h.

For information:
 A precipitation height of 1 mm corresponds to a water volume of 1 litre on 1 m² ground area

8 Dimension diagram

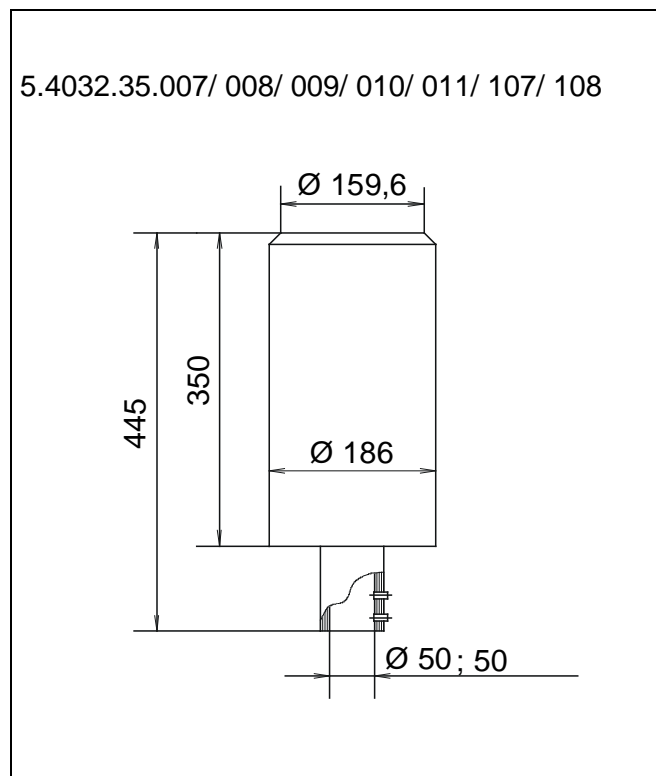


Figure 5 : Dimensional drawing Precipitation Transmitter

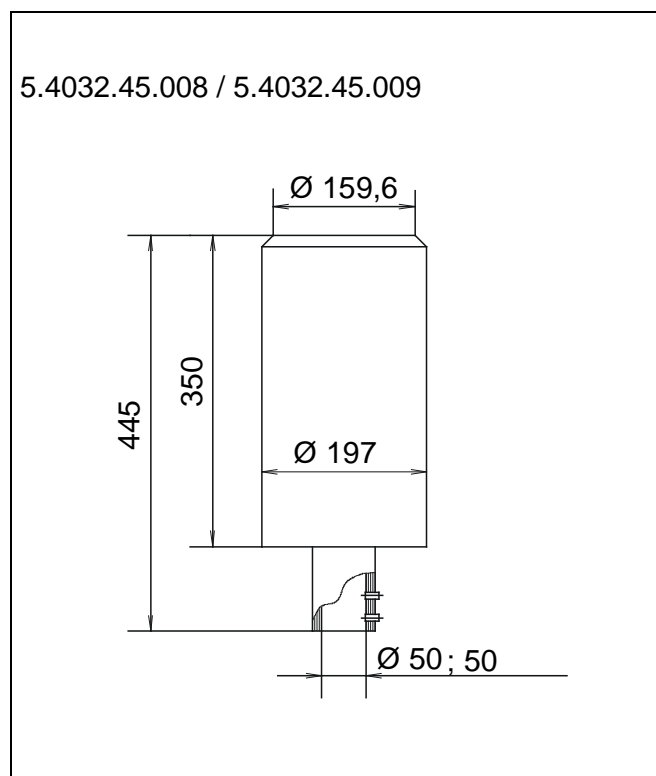


Figure 6: Dim. drawing Precipitation transmitter with casing heating

9 Accessories

(deliverable as options)

Stand 9.4031.35.065	Suitable for all Precipitation- Transmitters	Serves for mounting the precipitation transmitter. The distance from the ground to the collecting surface is about 1,0 meter. Stands are available also for other distances.
Bird protection device 5.4010.00.010	Suitable for 5.4032.35.007 / 008 / 009 / 010 5.4032.35.011 / 107 / 108	Avoids birds sitting on the precipitation transmitter.
Bird protection device 5.4010.00.011	Suitable for 5.4032.45.008 / 008	Avoids birds sitting on the precipitation transmitter.
Power Supply Unit 9.3388.00.000	Suitable for 5.4032.35.008 / 108 / 010	Serves for current supply of precipitation transmitter heating. Primary: 230 V / 50 Hz Secondary : 26V / 3,46 A
Power Supply Unit 9.3388.00.001	Suitable for 5.4032.45.008	Serves for current supply of precipitation transmitter heating. Primary: 230 V / 50 Hz Secondary : 24 V / 140 VA
Power Supply Unit 9.3388.00.001	Suitable for 5.4032.35.009 5.4032.45.009	Serves for current supply of precipitation transmitter heating. Primary: 230 V / 50 Hz Secondary : 42 V / 300 VA
Windprotection 5.4032.00.000	Suitable for Precipitation-Transmitter with Stand	It provides for the precipitation falling nearly swirl-free through the measuring system.

Other accessories on request.

10 EC-Declaration of Conformity

Document-No.: 000901

Month: 02 Year: 09

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

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

Description of Product: **Precipitation Transmitter**

Article No.	5.4032.35.007	5.4032.35.008	5.4032.35.009	5.4032.35.010
	5.4032.35.011	5.4032.35.018	5.4032.35.107	5.4032.35.108
	5.4032.35.228	5.4032.45.008	5.4032.45.009	
	5.4033.35.040	5.4033.35.041	5.4033.35.061	5.4033.35.073
	5.4033.36.040	5.4033.36.041	5.4033.36.061	5.4033.36.073

specified technical data in the document: **021216/02/09; 021286/02/09; 021275/02/09; 021325/02/09**

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

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

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

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

Place: Göttingen

Date: 02.02.2009

Legally binding signature:

issuer:

.....
Wolfgang Behrens, General Manager

.....
Joachim Beinhorn, Development Manager

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



ADOLF THIES GmbH & Co. KG

Hauptstraße 76 37083 Göttingen Germany
P.O. Box 3536 + 3541 37025 Göttingen
Phone +49 551 79001-0 Fax +49 551 79001-65
www.thiesclima.com info@thiesclima.com



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