

Laser Precipitation Monitor

Short - Instruction for Use

5.4110.xx.x00

V2.7x STD



Dok. No. 021954/11/21

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.

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Shipment

- 1 x LNM
- 1 x Short instructions for use (the complete instructions for use is available for download)
- 1 x Factory calibration certification

The instructions for use are available for download under the following link:

https://www.thiesclima.com/db/dnl/5.4110.xx.x00_Laser_Precipitation_Monitor_eng.pdf

1 Models

Order-No.	Operating Voltage	Option Meas. Channel	Option Extended Heating	Type of Connection
5.4110.00.000	24V ~/= AC/DC	No	No	Cable gland
5.4110.00.100	115V~ AC	No	No	Cable gland
5.4110.00.200	230V~ AC	No	No	Cable gland
5.4110.00.300	12...24V= DC	No	No	Cable gland
5.4110.10.000	24V ~/= AC/DC	Yes	No	Cable gland
5.4110.10.100	115V~ AC	Yes	No	Cable gland
5.4110.10.200	230V~ AC	Yes	No	Cable gland
5.4110.10.300	12...24V= DC	Yes	No	Cable gland
5.4110.01.000	24V + 26V ~/= AC/DC	No	Yes	Cable gland
5.4110.01.100	115V~ AC	No	Yes	Plug connecting + Cable gland
5.4110.11.100	115V~ AC	Yes	Yes	Plug connecting + Cable gland
5.4110.01.200	230V~ AC	No	Yes	Plug connecting + Cable gland
5.4110.11.200	230V~ AC	Yes	Yes	Plug connecting + Cable gland

Electrical outputs for all versions: RS485/422 and two optocouplers.


2 Construction of the Measuring Instrument

The Laser Precipitation Monitor consists of the following: a varnished aluminium housing, protection IP 65, a laser head (anodised aluminium), fixed at the housing cover, a receiver head (anodised aluminium) fastened by means of carrier arms (see also **Figure 1** and **Figure 2**).

The aluminium housing contains the electronics with all necessary interfaces. Furthermore, the electronics is equipped with light diodes (LED's), which facilitate an easy and efficient check resp. diagnosis of the sensor even without serial data connection (**Figure 3**). In the chapter "Maintenance" (see **chapter 4**) you find a functional description of the LED's.

The replaceable laser head consists of a laser driver circuit board (incl. laser diode), a rectangular window for the beam forming, a lens and a heated glass pane. The electrical connection to the electronics is carried out by a 10-pole ribbon flat cable leading to the "Connector Laser".

The receiver head consists of a receiving circuit board with photo diode and electronics, a lens and a heated glass pane. The electrical connection is done by a 6-pole ribbon flat cable leading to the “Connector Receiver”.



Attention:
Do not look into the invisible laser beam! In case the laser caution labels on the housing are not legible any more the sensor must not be operated!
Even with a longer exposure time the intensity of the invisible laser beam is considered as safe for the human eye (without using optical instruments). A skin-contact with the invisible radiation is, in general, harmless.

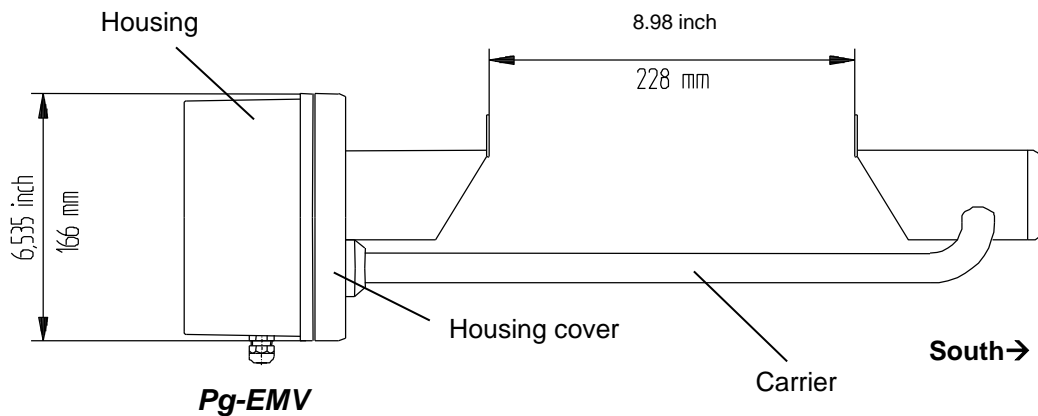


Figure 1: Side view

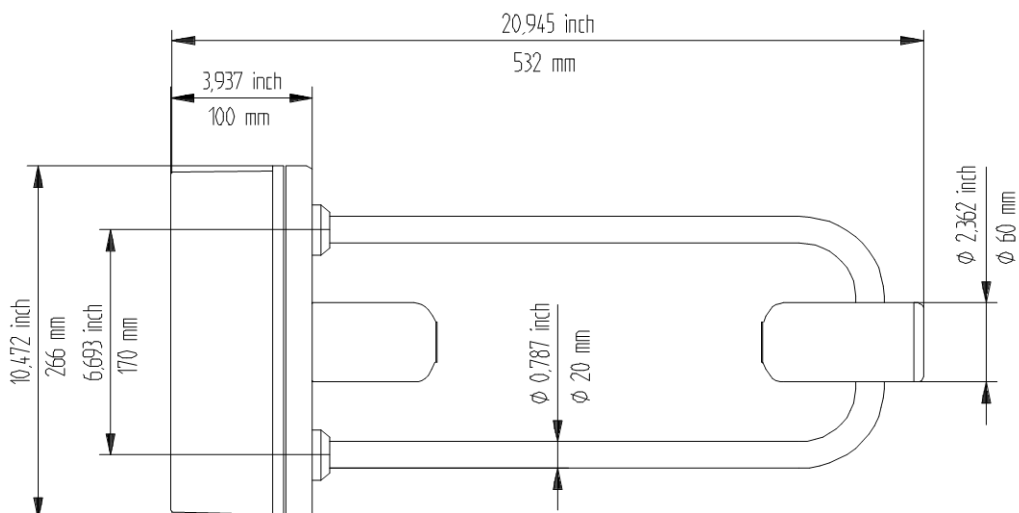


Figure 2: View from above

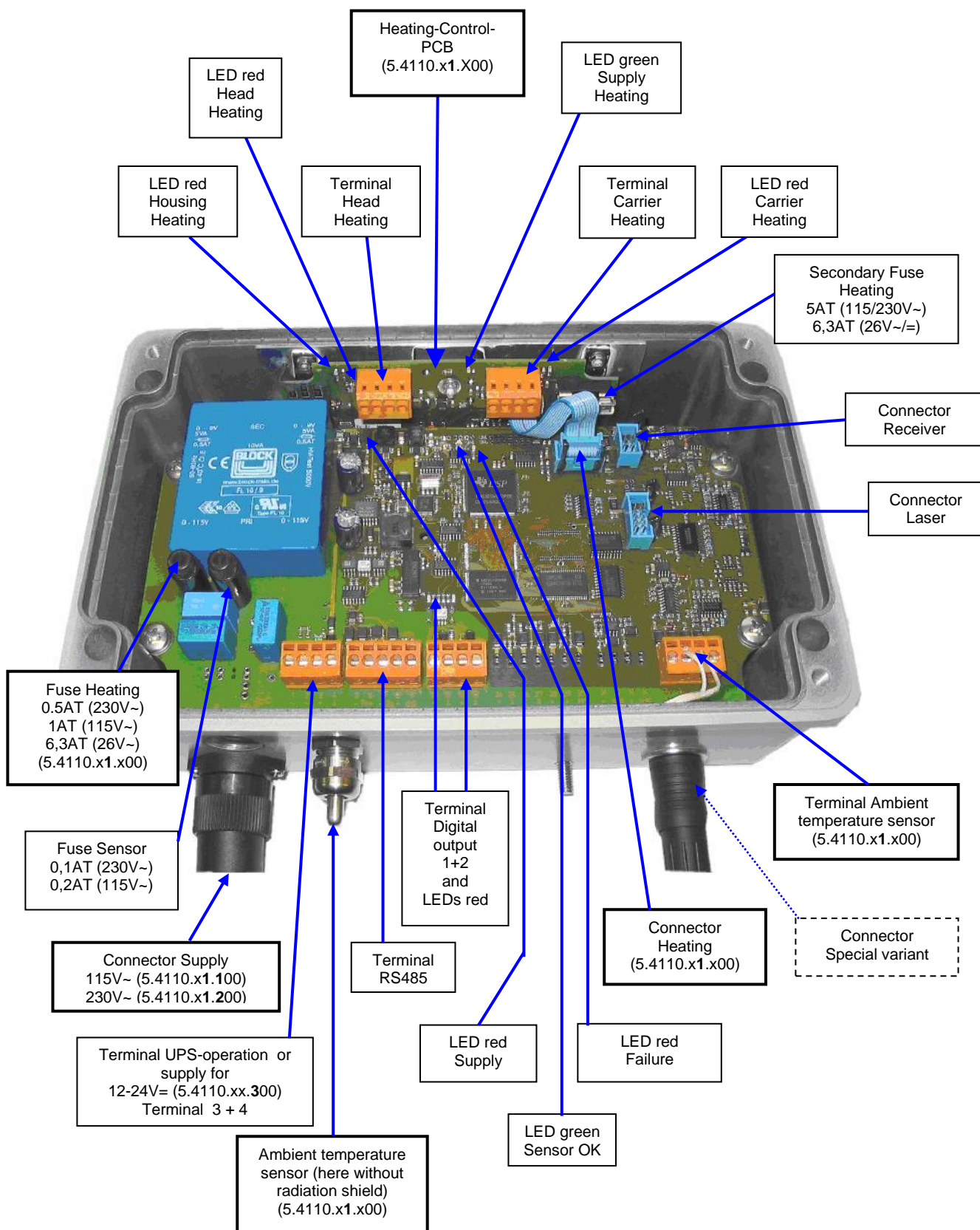


Figure 3: View of the electronic unit / Board for 5.4110.01.200 (version “Extended heating”)

Note: Differences to variant 5.4110.00.200 are accentuated with heavy print frames.

3 Installation



Attention:

The instrument must be mounted and wired only by a qualified expert, who knows and observes the generalities of technics, and applicable regulations and norms.



Attention:

*Do not look into the invisible laser beam!
In case the laser caution labels on the housing are not legible any more the sensor must not be operated!
Even with a longer exposure time the intensity of the invisible laser beam is considered as safe for the human eye (without using optical instruments).
A skin-contact with the invisible radiation is, in general, harmless.*



Attention:

Head and carrier heatings could be hazardous hot! Burn Hazard! (applies only for 5.4110.x1.xxx)

3.1 Suggestions for Mounting Place

Please note the following when selecting the location:

The sub-surface under the Laser Precipitation Monitor shall not consist of dark stone, asphalt or the like, as otherwise, in case of strong sunshine radiation, the ascending air will form so-called streaks. As sub-surface we recommend a lawn.

Depending on the wind speed and wind direction the precipitation particles are swirled by the Laser Precipitation Monitor so that the fall speed is changed. This might cause a deterioration of the sensor quality. Therefore, you should avoid an installation in the open country (particularly mountain tops) or directly in the lee of an obstacle. Well-suited are flat locations with wind breaks (e.g. hedges).

According to the WMO-directive for precipitation measuring instruments the distance between the installed sensors and the next obstacle should be at least four times the height of this obstacle.

If this is not practicable, at least keep an azimuth angle of $< 45^\circ$ with regard to the surrounding plants, buildings etc. Logically consistent would be also to mount the sensor on a mast top. We recommend a measuring height of at least 1m or rather 1.5 to 2m in snowy sites. Other devices should be mount with a distance of at least 1m on the same mast. The side distance to other objects should be greater than 2m.

We recommend to operate the Laser Precipitation Monitor in an enclosed area for human safety, although the intensity of the invisible laser beam is considered as safe for the human eye (without using optical instruments, Laser Class 1M according to EN 60825-1:1994 A2:2001). Pay attention to stand to local regulations regarding laser safety.

It is not advisable to install the Laser Precipitation Monitor directly on a street, because it is, for example, possible that water particles, whirled up by the vehicles, might lead to erroneous measurements. In this case, we recommend to install the instrument with a respective distance and height. At streets the alignment of the sensor should be not to the south, but at right angles with the street (receiver head farthest away to the lane).

3.2 Mechanical Installation

Tools:

- Allen wrench (Inbus) SW4.
- Combination wrench or ring spanner wrench SW10.
- Combination wrench SW16 und SW20.
- Tools to work in cables (for example: skinning tool, gripper for cable end sleeve).
- Screw driver for slotted screws, blade width 2 and 6mm.
- Tools for the shortening of straps.

3.2.1 Mounting on Mast

The delivered mast holder of the Laser Precipitation Monitor is designed for a mast diameter of 48... 102mm (1.9... 4inch). The mast should be electro-conductive, and be connected to the ground potential (foundation/grounding bound). Otherwise, the sensor is to be connected to the ground potential by a cable with minimum 6mm² diameter. Due to its sensitivity the sensor is susceptible to vibrations. Therefore, the mast diameter should be preferably large, and the mast should be fixed on a concrete foundation by means of firmly welded-on struts. From a mast height of approx. 2m up the mast should be additionally fixed by three stay-wires.

Remark: For models with supply 115VAC / 230VAC

The mast should be electro-conductive, and be connected with the ground potential (base/ground strip). Apart from that the sensor is to be connected to the ground potential by means of a cable (>6mm²).

3.2.2 Mounting Angle

First, the mounting angle (with or without housing) should be fastened at the mast. Because of the shading effect of the mast the angle is to be mounted at the highest possible place. Align the angle to the south acc. to **Figure 5** ($\pm 10^\circ$, Northern hemisphere), and fasten it at the top of the mast. It is advisable to have a second person holding the Laser Precipitation Monitor during the mounting. In case no second person is available, it is also possible to separate the mounting angle from the Laser Precipitation Monitor (2 nuts M6 below, 2 screws above [accessible after removing the housing cover]).

Does only apply to the models with supply 115VAC / 230VAC:

In case an electro-conductive mast is used, the straps should be fastened directly, i.e. without insulator. If the mast is not electro-conductive, a potential equalisation should be established between ambience (for ex. fundament) and sensor by means of a cable ($>6\text{mm}^2$).

1. Cut 2 pieces of the necessary length off the strap (1 meter) acc. to the table below.
Note: The cut surfaces could after cutting have sharp edges. Risk of injury.
2. Insert the strap into the housing from the screw head side, and bend a projection of 20mm over the ridge (**Figure 4**).
3. Put the free end of the prepared clamp around the mast and the mounting angle, and screw it on (**Figure 5**).
4. 2 Straps are provided for each mounting angle.

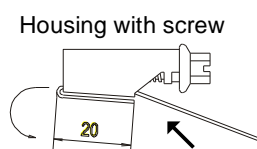


Figure 4: Strap housing

Mast Ø	Mast Ø	Length strap
48mm	1.9inch	250mm (10inch)
60mm	2.4inch	310mm (12.2inch)
80mm	3.2inch	370mm (14.6inch)
90mm	3.5inch	400mm (15.8inch)
102mm	4inch	440mm (17.3inch)

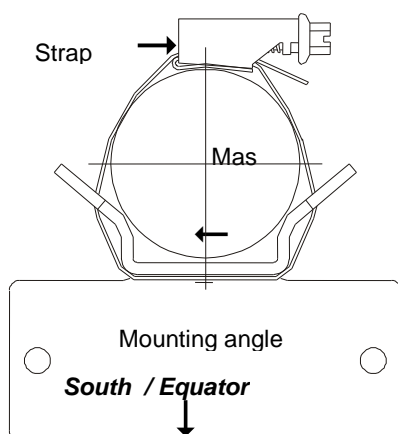


Figure 5: Strap, Mast, Mounting angle

3.2.3 Mounting of the Housing Cover

Remove, first, the 4 screws in the edges. Afterwards, turn down the cover carefully.

When the housing is open, please take care that no humidity (precipitation) can lay down on the electronics.

3.3 Electrical Installation



Attention:

The instrument must be mounted and wired only by a qualified expert, who knows and observes the generalities of technics, and applicable regulations and norms.



Attention:

*Do not look into the invisible laser beam!
In case the laser caution labels on the housing are not legible any more the sensor must not be operated!*



Attention:

Head and carrier heatings could be hazardous hot! Burn Hazard! (applies only for 5.4110.x1.xxx)

After the housing cover (**chapter 3.2.3**) has been opened, electrical connection can be carried out according to wiring diagram (**chapter 6**).

3.3.1 Electrical installation with cable glands

In order to carry out an EMC-compatible installation the cable screen/shielding (except the supply cable, which, in general, is not shielded) is to be connected to the contact spring of the screwed cable gland (**Figure 6**).

1. With the Standard Contacting (see Figure 6.1):

- Strip back the outer sheath and screen (shielding).
- Make a round cut in the outer sheath approx. 15mm along but do not remove the sheath.
- Guide the cable through the cable gland.
- Pull off the outer sheath.
- Pull back the cable until the connection is made between the cable screen and contact spring.
- Turn shut... and it is ready for use!

2. With thin Wires without an Inner Sheath (see Figure 6.2):

- Strip back the outer sheath.
- Pull back the screen braid approx. 15-20mm over the outer sheath.
- Insert the cables into the cable gland until the contact is made between the cable screen and contact spring.
- Turn shutand it is ready for use!

3. When Routing the Cable Screen to another Connection (see Figure 6.3):

- Expose the screen braid approx. 10mm.
- Guide the cable through the cable gland until the connection is made between the cable screen and contact spring.
- Turn shut...and it is ready for use!

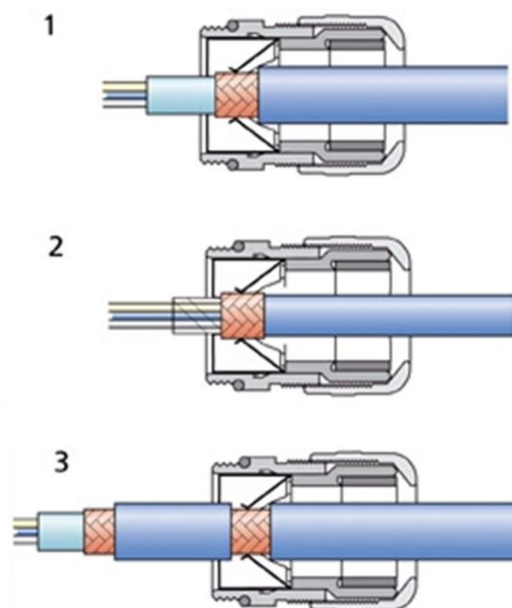


Figure 6: Screen cable connection to the cable gland

The cables are guided through the respective cable gland to the sensor connecting terminals (**Figure 3**). They are connected by means of the respective tension clamp technique. Wiring diagram see **chapter 6**.

For the orange-coloured connecting terminals put a commercially available screw-driver with a blade width of up to 2mm resp. 0,1inch into the upper rectangular opening. Insert the respective cable into the lower round opening. After the screw driver has been removed the cable is fixed by spring tension.

With the **green- orange-coloured connecting terminals (only for PCB Rev.A)** please press down the orange-coloured lever by means of a screw-driver (cable 0,1-1,5mm² resp. 26-16 AWG).

After having been guided through the cable gland into the cover, the supply cable is to be shielded against EMC-disturbances by means of the available grey ferrite tube. For this, after connection of the cables, the ferrite tube is to be fastened directly at the cover panel by means of the binder (see **Figure 7**).

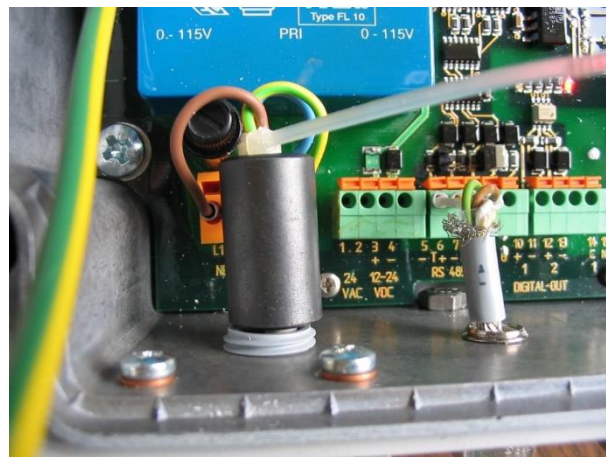


Figure 7: Connection of power supply (here 115 or 230VAC) with ferrite tube and binder

After all connections have been established the supply can be switched on:
 With an operating supply the red Supply-LED (top left corner of PCB) must flash continuously (**Figure 3**). The green Sensor-OK-LED flashes with 5hz when the signal processor operates properly (after approx. 5 seconds). In case the LED's show a different behaviour please refer to **chapter 4.1.1** how to determine the possible error.

NOTE:

All supply voltages must be potential-free (exception 115VAC and 230VAC). For example, with the 24VAC-supply there must be used a separate winding of the transformer only for this sensor. In addition, we recommend to provide for a separator in the installation (for example switch or fuse), and to mark this.

When the instrument operates properly the cover should be fastened (see the following chapter), and the instrument should possibly be configured by means of a commercially available terminal program (**chapter 7 Serial communication**).

3.3.1.1 Electrical Installation via Connector

Instruments equipped with connectors, have pre-assembled flange plugs, which are integrated at the housing. The flange plug for the supply with pre-assembled cable has a ferrite sleeve which is already affixed at the cable (between plug and pc-board) against the wall by cable connector.

3.3.2 Closing the Instrument Cover

Lift up the housing cover carefully, and take care that no cable is jammed between cover and housing. Moreover, the gasket must fit in the groove provided for. Tight the screws strongly and crosswise to ensure the proper sealing of the housing (torsional moment of at least 2,0Nm).

3.3.3 Optocoupler output

In **Figure 8** you see 2 ways of connecting external instruments (“pull-up”-circuit to clamp 10/11 (output 1) and “pull-down” circuit to clamp 12/13 (output 2)). The load resistor R should preferably be low (for example $V_{cc}=5V$, $R = 5V/1mA = 5k\Omega$). The connecting cables should be shielded, and the receiving input should be equipped with respective EMC-filters (not showed in **Figure 8**).

For the optical check of the outputs near the clamp resides two red LED’s, which light when the respective output is on.

With the command “D1” (respective “D2”, see **chapter 7.2.8**) you can configure the outputs.

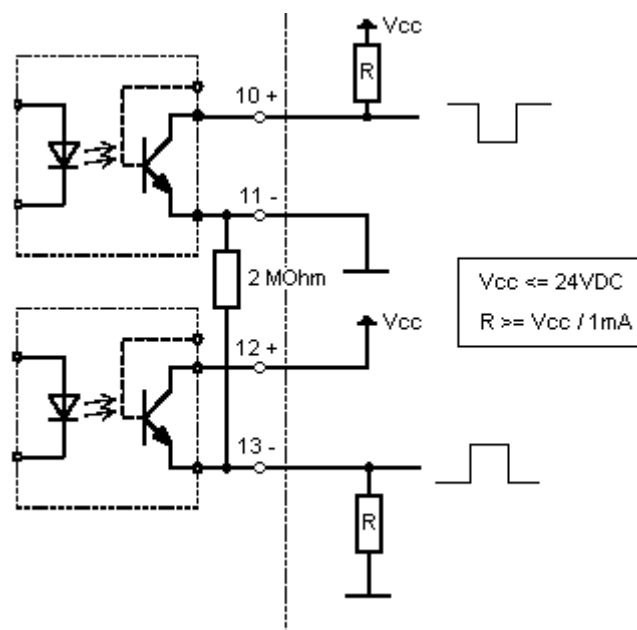


Figure 8: Examples for the connection to the opto-couplers

4 Maintenance



Attention:

Do not look into the invisible laser beam!



Attention:

Head and carrier heatings could be hazardous hot! Burn Hazard! (applies only for 5.4110.x1.xxx)

4.1 Checking the sensor

The simulation of precipitation can be generated as follows:

Move an object (or a finger) at least 15 times per minute as quick as possible through the invisible laser beam between the sensor heads. Then, with the next minute-change, the sensor outputs the precipitation type "Precipitation (not identified)" as well as a respective precipitation quantity. This simulation can be started five minutes after the instrument has been switched on.

4.1.1 Checking the LED's

In case no terminal program with PC is available the checking of the Laser Precipitation Monitor is limited to the control of the following LEDs. You will see them after removing the cover (see **Figure 3**):

- SUPPLY (red, on the left above) must shine when AC supply is switches on.
- SENSOR-OK (green, middle above) flashes with 5Hz if DSP operates properly.
- FAILURE (red, middle above) flashes with 5Hz if an error and with 0.5Hz if an warning has been detected.

In case the SUPPLY-LED does not flash the supply should be checked. The models with „115VAC“ and „230VAC“ operating voltage a safety fuse situated directly above the orange connecting terminal „L1“and “N” (left, below). All models have an additional electronic fuse for the supply. In case this fuse has activate the external supply must be switched off for approx. 30 seconds so that the fuse can cool down.

If the FAILURE LED flashes you should control the glass panes, and maybe clean them. After the supply has been switched on the FAILURE LED lights up for 5 seconds.

Additional for variant "Extended Heating" (5.4110.x1.x00):

- LED "SUPPLY HEATING" (green, Heating-Control-PCB) must be on when the supply is OK.

- LED's (red, Heating-Control-PCB) for checking the three heating circuits must be on, when the respective circuit is switched on (Command "HG", "HK" and "HB").

The primary fuse of the heating supply ("Fuse Heating") is located beside the "Fuse Sensor" (see **Figure 3**). The secondary fuse is situated on Heating-Control-PCB.

4.1.2 Checking by means of a terminal program

First, the Laser Precipitation Monitor must be connected to the respective COM interface of the used PC by an interface converter (RS485/RS232).

Start a terminal program, and configure the interface according to the sensor interface (baud rate, parity, etc.). Now the Laser Precipitation Monitor is ready for request. See also **chapter 7**. The factory setting of the serial interface: 9600 Bd, 8, N, 1, full-duplex, ID:00

Check the control voltage (4010 ± 5) through the diagnostic command („<id>dd“). In case the value is outside the value range, and cleaning the glass panes shows no effect the Laser Precipitation Monitor is to be sent-in for inspection. Moreover, the internal temperature (without sun radiation max. $\pm 4^\circ$ difference compared with the ambient temperature, does not apply to model 5.4110.x1.x00 when heating is on [extended heating]) as well as the laser driver temperature (approx. 10° higher than the internal temperature) can be checked. Please note that for variant "Extended Heating" (9.4110.x1.x00) the difference between internal and ambient temperature is higher, when the heating is on.

Switch-on the telegram „Particle Event“ („<id>tm00003“). Drop a preferably spherical object with a diameter smaller than 8mm through the measuring area.

Example 1: with 4mm steel ball (dropped from the middle of the laser head screen):

Reply from the sensor:

9476;588;497800898;4.04;00.90;3.71;00.89;+19

Diameter: 4.04mm

Speed: 0.9m/s

Example 2: with finger moving through the measuring area:

Reply from the sensor:

16370;2158;499106556;7.71;00.39;6.19;00.34;+19

Re-activate the starting conditions after test end, for example, the data format set before.

5 Technical Data

General:	
Ambient conditions	-40... +70 °C, 0... 100% r.h.
Maximum altitude	<1500m MSL (for greater heights please refer to the manufacturer)
Dimensions	0,27 x 0,17 x 0,54m 10.63 x 6.7 x 21.3inch (w/o mast holder)
Weight	4.8kg (5.4110.x0.xxx) 6.5kg (5.4110.x1.xxx) ("Extended Heating"-variant)
Housing electronics	Aluminium die-casting, varnished
Housing sensors	Aluminium (anodised)
Protection	IP65
Maintenance	Automatic soil-recognition for cleaning the optics
EMC Immunity	EN61326 in conjunction with EN61000-4-3 10V/m (5.4110.x1.xxx: 7V/m (10V/m)) EN61000-4-4 level 4 (power line ±4kV, signal line ±2kV) EN61000-4-5 level 4 (power line ±2kV _{symmetric} ±4kV _{asymmetric} , signal line ±2kV _{symmetric})
Radiation	EN61326 class B
Mounting	Mast mounting (∅ 48... 102mm, 1.9... 4inch) Stainless steel

Power supply:	
5.4110.x0.0xx: Supply voltage (heating + electronics) Max. current consumption 24V~/= AC/DC-input Note: supply must be potential-free	24V~ AC +15% -30% / 20...30V= DC 750mA
5.4110.x1.0xx: Supply voltage (heating + electronics) Max. current consumption 24V~/= AC/DC-input Supply voltage Extended Heating Max. current consumption Extended Heating Note: Both supplies must be potential-free, also among each other.	24V~ AC +15% -30% / 20...30V= DC 750mA 26V~ AC ±15% / 22...30V= DC 6.3A
5.4110.x0.1xx: Supply voltage AC (heating + electronics) Maximum power consumption	115V~ AC +10% -25% 15VA

5.4110.x1.1xx: supply voltage AC (heating + electronics) Maximum power consumption	115V~ AC +10% -25% 150VA
5.4110.x0.2xx: Supply voltage AC (heating + electronic) Maximum power consumption	230V~ AC +10% -25% 15 VA
5.4110.x1.2xx: Supply voltage AC (heating + electronic) Maximum power consumption	230V~ AC +10% -25% 150VA
5.4110.x0.3xx: Supply voltage DC (heating + electronic) Maximum current consumption 12V..24V= DC Note: supply must be potential-free	12 ... 24V= DC $\pm 10\%$ <550mA(12V=) <500mA(24V=)
Buffer input/UPS-operation: ¹ Supply voltage DC (only electronics) Current consumption DC input (only electronics) Note: supply must be potential-free Applies for all models except 5.4110.xx.3xx	12 ... 24V= DC $\pm 10\%$ < 150mA (12V=) < 75mA (24V=)

Heating:	
Glass pane heating	2.5W each (with temperature regulation)
Option: heating for extreme conditions (5.4110.x1.xxx)	The heating is controlled in dependency on the ambient temperature. Laser-/Receiver-Head: 9W each Carriers: 27W each Housing: 20W
Sensors: Laser diode Laser class Modulation frequency Photo diode Measuring area Ambient temperature sensor	785nm, max. 0,5mW optical power Laser class 1M (EN 60825-1:1994 A2: 2001) 172.8KHz with day light filter (< 700nm) 40...47cm ² (instrument-specific) 7.067inch ² (8.98 x 0.787inch) NTC (5.4110.x0.xxx) Pt100 (5.4110.x1.xxx , measurement current < 0.8mA))
Electronics for evaluation:	
Digital signal processor	TMC320VC33 (55.3MHz)

RAM-memory	136KB
Flash-memory	256KB (for firmware and parameter, to be uploaded via serial interface) No. of changes: 1 million
14Bit-A/D-converter	scanning 109KHz (for optical measuring signal)
12Bit-A/D-converter	For self diagnosis and optional measuring input
Data output:	
RS485/RS422	Potential isolation up to 1KV 1200,2400,4800,9600,19200,38400,57600,115200Bd 7 / 8 data bits, parity none(N) / even(E) / odd(O) 1 / 2 stop bits full-duplex (4-wire) or half-duplex (2-wire), latency time 20ms (half-duplex) terminator resistor (560Ω) switch able
Digital output	2 optocouplers (max. 24VDC, max. 1mA) Potential isolation up to 1KV Function selectable

Precipitation:	
Particle size (effective) ²	0,16 ... >8mm Ø
Particle speed	0,2 ... 20m/s
Identification of precipitation types: -drizzle (DZ), freezing drizzle (FZDZ) -rain (RA), freezing rain (FZRA) -hail (GR) -snow (SN) -snow grains (SG), ice needles (IC) -soft hail (GS), ice grains (PL)	Hit rate (compared with synoptic observation, wind speed < 3m/s) >97% (Intensity > 0.01mm/h) >99% (>= 2 particles/min, no solid precipitation) >97% ³ (>= 2 particles/min) >99% (no mixed precipitation) >60% >85%
³) According to human observer	
Output Precipitation Type	SYNOP (Tab.4677 + 4680), METAR (Tab.4678)
Accuracy ⁴ Error intensity-/quantity measurement (rain equivalent) compared with reference sensor (wind speed < 3m/s)	±5% ≤ 15% (rain, 0,5... 20mm/h) ≤ 30% (snow)
⁴) Adjustment under laboratory conditions with a specific test system with the permissible tolerance of ± 5%. Each LNM is supplied with a factory acceptance certificate after passing the calibration.	
Minimum Intensity (depending on precipitation type)	< 0,001mm/h (drizzle)

Maximum Intensity	1000mm/h
Visibility MOR in precipitation ⁵	0 ... 99999m
Radar reflectivity	-9.9 ... 99.9dBZ
Disdrometer classes	440 classes (22 diameter * 20 speed)

Option Measuring Inputs: 5.4110.1x.xxx	
Temperature (Pt100) (not available for variant 5.4110.11.xxx)	Meas. range: -40... 70°C Accuracy: ±0.1°C (measuring input)
Relative humidity (0-1V)	Meas. range: 0 ... 100% r. h. Accuracy: ±0.1% (meas. range)
Wind Speed (Thies Compact, e.g. 4.3519.00.000)	Meas. range: 0 ... 60m/s Accuracy: ±0.1m/s (measuring input)
Wind direction (Thies Compact, e.g. 4.3129.00.000)	Meas. range: 0 ... 360°
Accessories (Optional):	
Visualisation software LNM-View (9.1700.99.000)	For Windows operating systems Win8, Win10
Instrument Support (4.3187.61.200) For the vibration-reduced operation of the LPM at 2 m height on an available concrete foundation, provided by the customer.	Tube length: 2m Tube diameter: 60mm Weight: 30Kg Material: Steel, hot-dip galvanized

Alteration of technical data reserved

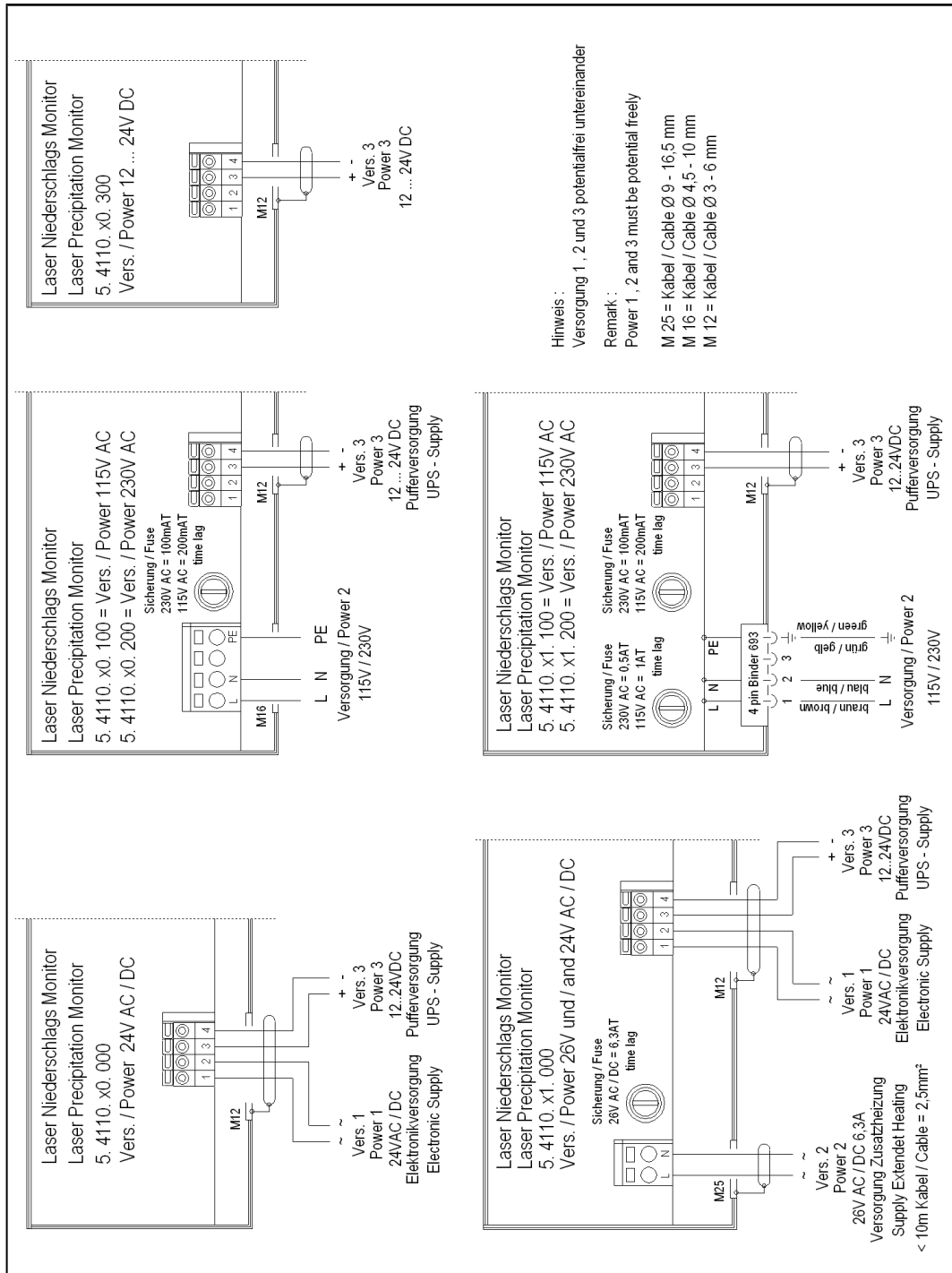
- 1) Supply must be potential-free, or the negative voltage is on the same potential as the housing of the sensor (protective earth). This UPS-supply ("uninterruptible power supply") allows a restricted operation (no heating) of the sensor whenever the normal supply falls out.
- 2) Applies for liquid and solid particles like rain, pellets / graupel and hail. For snow flakes by reason of the less optical extinction a greater maximum diameter can be assumed.
- 5) Visibility in the precipitation: Only atmospheric hazes caused by big hydro-meteors (for ex. drizzle, rain, snow) are acquired.

6 Wiring Diagram

ATTENTION: Do not look into the invisible laser beam!

Wiring Diagram Supply:

Note: Wiring diagram communication see following page.



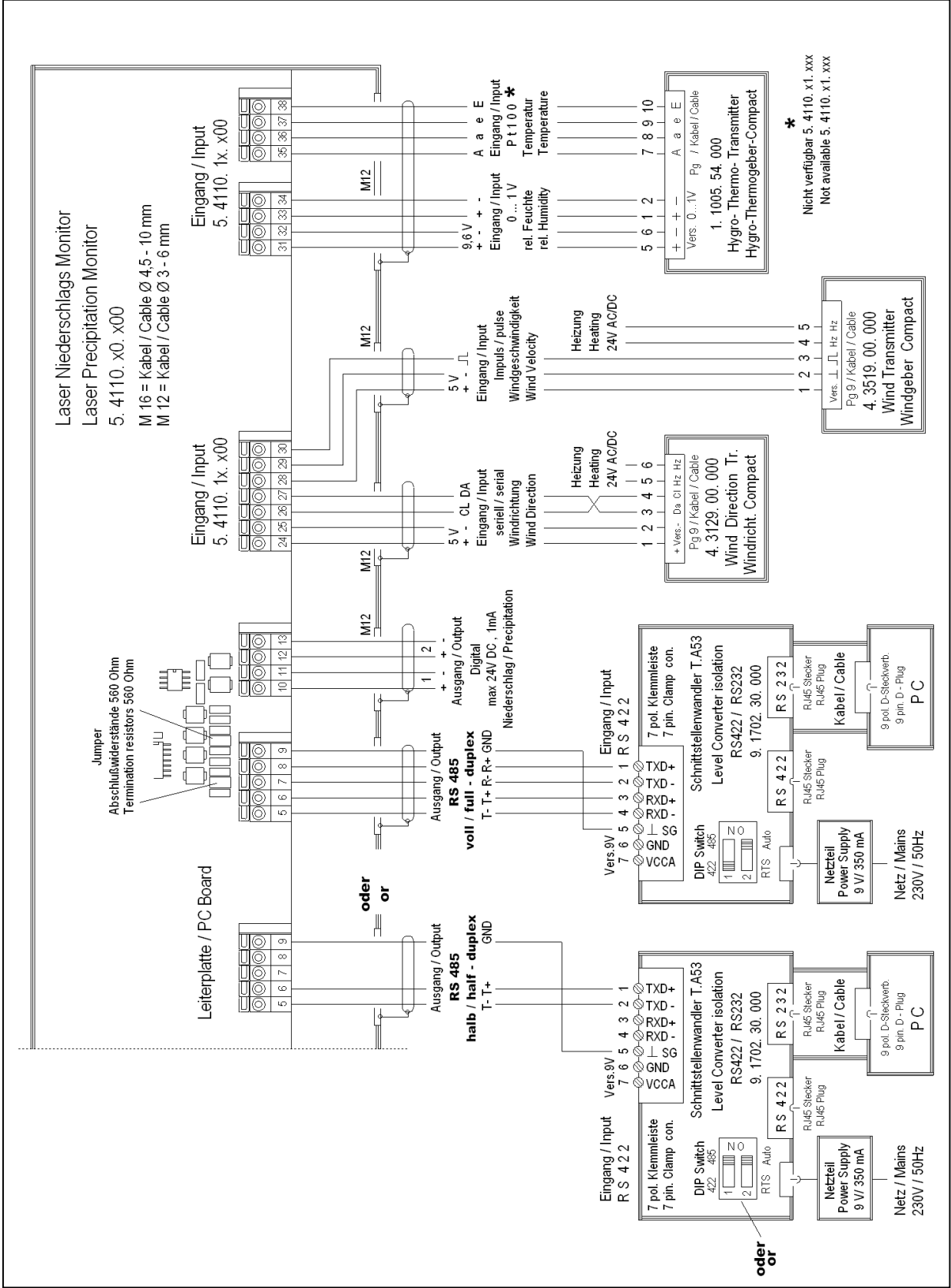
Hinweis :
Versorgung 1, 2 und 3 potentialfrei untereinander

Remark :
Power 1, 2 and 3 must be potential freely

M 25 = Kabel / Cable Ø 9 - 16,5 mm
M 16 = Kabel / Cable Ø 4,5 - 10 mm
M 12 = Kabel / Cable Ø 3 - 6 mm

Wiring Diagram Communication and Measuring Inputs:

Note: Wiring diagram supply see previous page.



**Attention:**

Head and carrier heating could be hazardous hot! Burn Hazard! (applies only for 5.4110.x1.xxx)

NOTE:

Run all supply cables in the housing through the delivered ferrite tube! (see **Figure 7**, applies not for variant 5.4110.x1.xxx)

Power input 1(24V AC/DC) and 3 (12..24 V DC) must be potential-free, or the negative voltage is on the same potential as the housing of the sensor (protective earth).

This UPS-supply (Power 3) allows a restricted operation (no heating) of the sensor whenever the normal supply falls out. (Applies not for variant 5.4110.xx.3xx)

7 More Information / Documents as download

Further information can be found in the short instructions for use. These document and also the instruction for use are available for download under the following links.

Short instruction for use

https://www.thiesclima.com/db/dnl/5.4110.xx.x00_Laser_Precipitation_Monitor_eng_short.pdf

Instruction for use

https://www.thiesclima.com/db/dnl/5.4110.xx.x00_Laser_Precipitation_Monitor_eng.pdf

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

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