



Features

- ▶ Precipitation sensor for automatic weather stations
- ▶ Linearised pulse output, e. g. for connection to external data loggers
- ▶ Serial output signals, e. g. for easy connection to PLC
- ▶ Selectable measuring ranges as well as absolute or gliding sum for the output signals
- ▶ Exchangeable, weighing tipping bucket system according to Joss-Tognini, overflow proof
- ▶ 2 cm³ tipping bucket (2 g water) for precise precipitation measuring in regions with normal rain falls
- ▶ Winter-fit model (15189 H serial) with electronically controlled 2-circuit heating
- ▶ Weatherproof materials (anodized aluminium, stainless steel) guarantee a long durability
- ▶ Funnel according to the WMO Standard No. 8



Function

The weighing precipitation sensor (15189 serial) measures the rain quantity by a tipping bucket developed by Joss-Tognini, the bearings of which have been arranged for low friction. Errors that normally occur due to incomplete draining because of surface tension are automatically compensated by the specific form of the tipping bucket.

The tipping bucket can hold 2 cm³ (2 g) of water. The collecting surface of 200 cm² (WMO standard) means that one bucket charge is equivalent to a precipitation rate of 0.1 mm per square meter.

If the bucket is tipped, the reed contact that is integrated in the sensor will be closed. This signal can be sent as pulse and/or via the serial interface.

The bounce-free, linearised pulse output is permanently parallel to the serial interface.

For application in snowfall regions the heated variety (15189 serial) is available for all-year-round measurements. Two separate controlled heating circuits with lowest hysteresis are providing an optimal temperature at which snowing up of the sensor will normally be prevented and evaporation from the heated surfaces will be minimized.

The precipitation sensor (15189 serial) is mounted on a pedestal that is equipped with a connection piece and are attached to a tube with an outside diameter of 60 mm.

The precipitation sensor (15189 serial) is made of weather-resistant aluminium and stainless steel. This assures a long durability.

Dimensional drawing and mounting of the protective covering

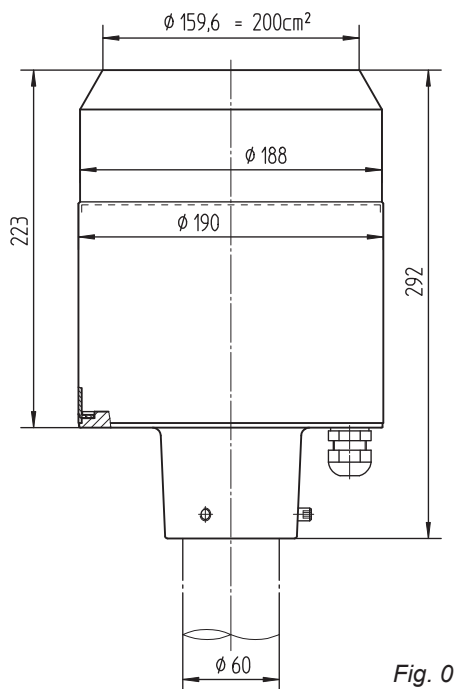


Fig. 0

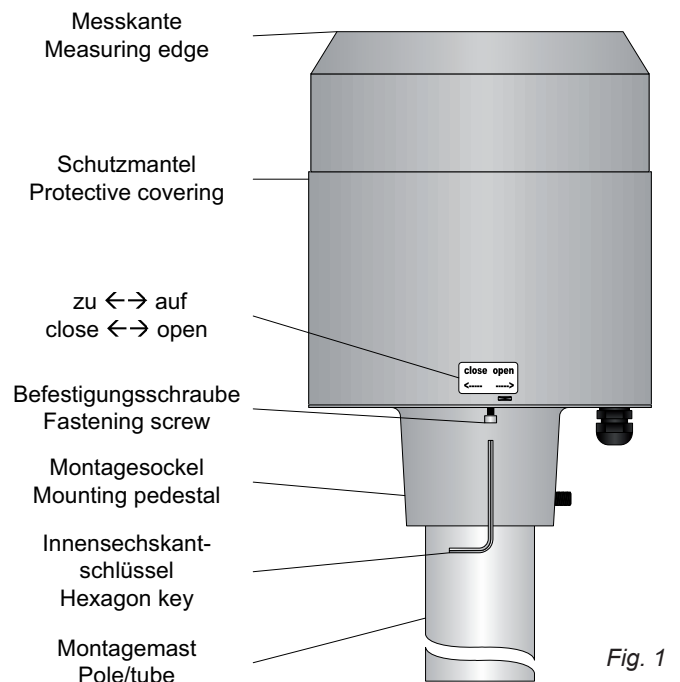


Fig. 1

Installation

Mounting of the sensor

The sensor must be mounted on a tube or pole with an outer diameter of 60 mm. A metallic extension tube with a minimum length of 100 mm is recommended if a wooden pole is used.

For easy adjustment place a spirit-level on the upper measuring edge.



Attention! Do not damage the measuring edge!

Place the sensor on the end of the pole until it fits in. By using the allen key (4 mm) provided, tighten the screws in the mounting pedestal evenly. Adjust the upper measuring edge to an exact horizontal position. By doing this, the tipping bucket will automatically be positioned vertically inside the device and will work symmetrically to the collecting funnel.

Mounting of the protective covering (Fig. 1)

When mounting the protective covering, please make sure that the sign "close <- -> open" (close <- -> to) is positioned above the fixing screw. Especially when using the heated version you have to pay attention to this step. This avoids that the cable of the protective covering heating may block the tipping bucket.



Attention!

In order to protect the tipping bucket the dirt spiral must be inserted in the collection funnel (fig. 2).

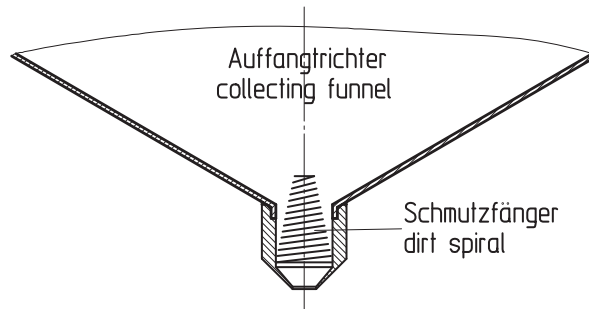
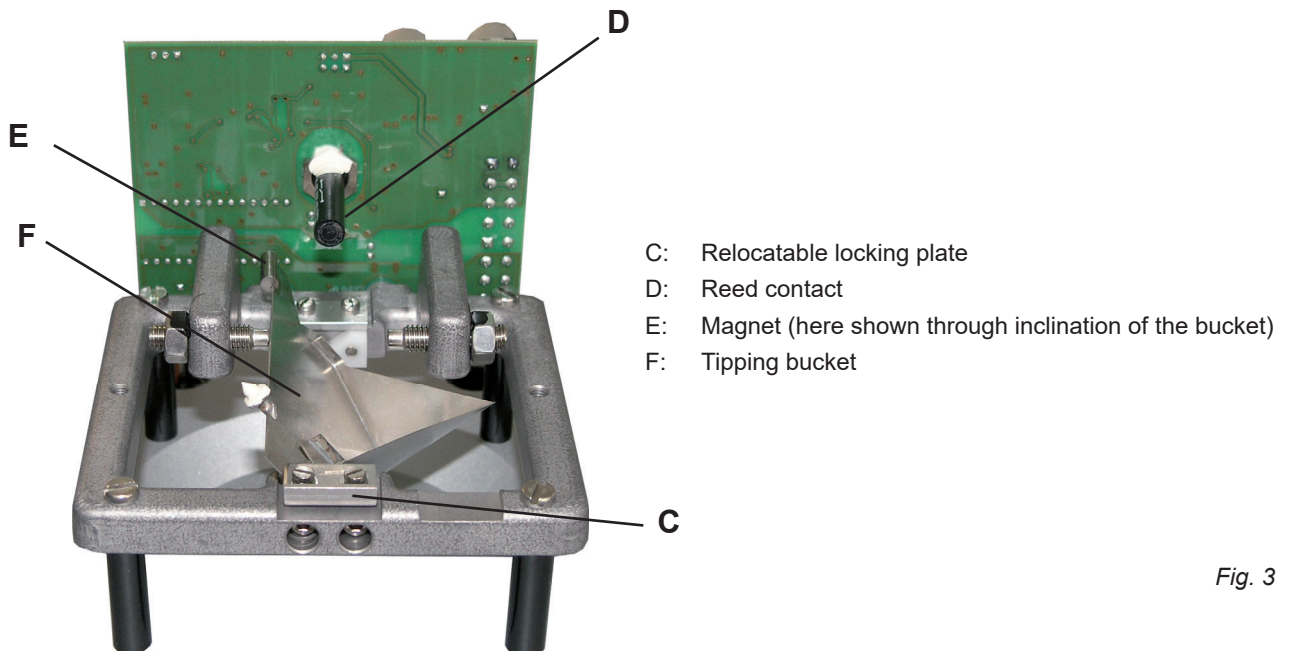


Fig. 2

Dismounting of the protective covering

Loosening the screw (fig. 1) with the provided 3 mm allen key until the protective covering can be turned right to the stop position and take off upward then.



- C: Relocatable locking plate
- D: Reed contact
- E: Magnet (here shown through inclination of the bucket)
- F: Tipping bucket

Fig. 3

Assembly of the tipping bucket



To avoid damages of the tipping bucket during transport, it is separately packed and should be inserted in the precipitation sensor on site only after mounting the gauge on the mast.

For the assembly first you must remove the protective covering.



Attention! When fitting the tipping bucket, proceed with utmost caution so that the sharp edges of the tipping bucket are not damaged and the middle wall is not bent!

During operation the tipping bucket lies on the precision bucket bearings. To reduce the friction, which is produced at one tipping, the bearings are made of abrasion-resistant delrin.

The mounted tipping bucket is secured against eventual changes of position by means of two plates.

To insert the tipping bucket, first the relocatable locking plate **C** (fig. 3) must be pushed back.

Now insert the tipping bucket **F**. Make sure that the magnet **E** attached at the middle wall of the tipping bucket rests under the capsule with the embedded reed contact **D**.

Finally the tipping bucket must be secured by pushing back the relocatable locking plate **C**.

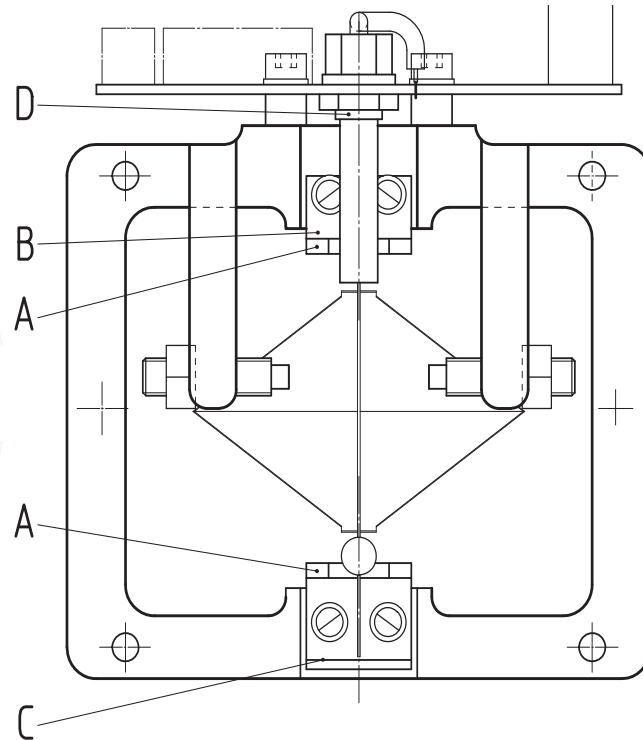


Fig. 4

- A: Tipping bucket bearings
- B: Fixed locking plate
- C: Relocatable locking plate
- D: Reed contact
- E: Magnet (here shown through inclination of the bucket)
- F: Tipping bucket

Electrical connection

The sensor will be connected to the cable by leading the cable through the conduit gland to the connector inside the sensor housing. The recommended cable type is:

(2) (4) x AWG 20 CU L sw;
diameter approx. 5.1 mm



When the cable is transferred inside the soil it is recommended to protect the cable with a protecting plastic tube.

(15189 H serial) Version with heating

The precipitation sensor (15189 H serial) comes with a solid-state-thermostat controlled heating for collecting funnel and drain pipe.

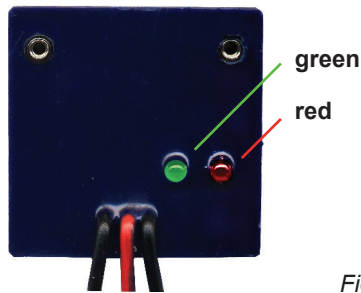
Electrical connection

For the connection of the heating a 2-core cable is required, which has to apply and connected to the power supply unit according to the connecting diagrams with heating.

The function of the heating elements can be tested also at ambient temperatures above the control temperature of the solid-state thermostat. For this simple test a regular magnet has to be held close to the blue housing of the switching circuit. When reaching a surface temperature of approximately 50 °C the current will be switched off.

Both blue thermostat modules are fitted internally on the funnel surface as well on the bottom of the housing.

The operational conditions will be indicated with colored light-emitting diodes (LED) on the thermostatic module (fig. 5):



green: supply voltage
red: heating on

Fig. 5

Initial operation

If the sensor system has been completely mounted and electrically assembled, the sensor will be ready for operation according to the sensor settings. The operational check has to be performed.

Maintenance and operational check

The precipitation sensor (15189 serial) is nearly maintenance-free. The sensor should be checked and cleaned periodically in order to guarantee its proper operation, since dirt accumulation may cause errors of measurement. The time interval of cleaning depends on the local conditions.

The **operational check** of the sensor may be performed by the use of artificial precipitation. The contents of a 200 cm³ buckets test container of water must be conducted into the collecting funnel through a nozzle in such a way that the drops fall into the funnel beside the outlet. The nozzle of the test container (approx. diameter 0.6 mm) should be adjusted to allow a complete water run out into the funnel within 10 to 20 minutes.

After the artificial precipitation has gone through, 100 ± 2 bucket Tippings should have been counted.

Rinse the sensor thoroughly for cleaning. Clinging particles of dirt in the collecting funnel or outlet pipe may be removed with a piece of wood.

If unsatisfying measurement results occur after this cleaning procedure, the tipping bucket should be disassembled for cleaning.

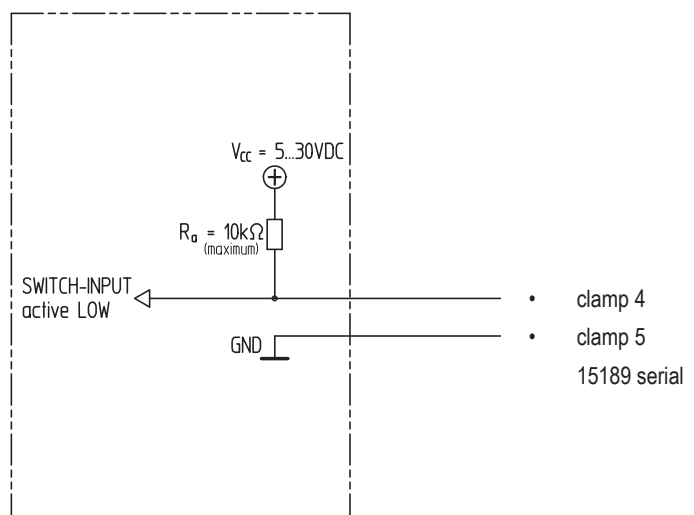


Please take care not to damage the tipping bucket!

The dismantled tipping bucket can be cleaned by placing it in warm water with some scouring material and by carefully scraping off unwanted dirt using a small piece of wood.

Connection pulse output

The sensor 15189 serial can be connected directly to a pulse input (as shown on the right).





Connecting diagram · without heating

Niederschlags-Sensor
precipitation sensor
00.15189.002060 (2 ccm)
00.15189.004060 (4 ccm)

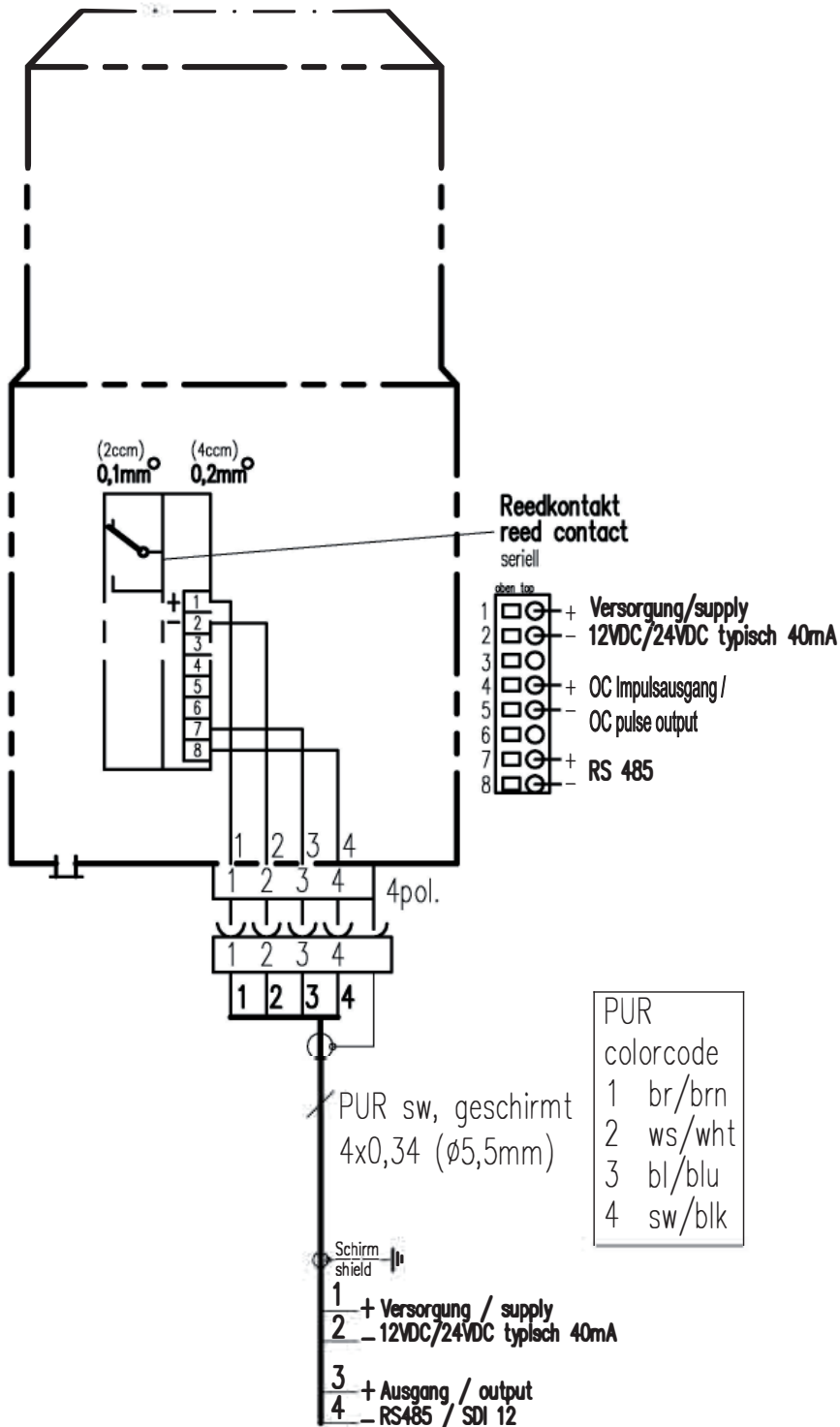


Fig. 7



SDI-12 on RS485

The communication via the SD-12 protocol is based on the standard „SDI-12 A Serial-Digital Interface Standard for Micro-processor-Based Sensors Version 1.3 January 12, 2009“. The precipitation sensor (15189 serial) can be operated with other sensors (15189 serial) in a bus.

Attention: This is not a fully-fledged SDI-12 interface.

Terminating resistor RS 485: The sensor is delivered ex factory with a connected terminating resistor (120 Ω) on the data line. This can be deactivated by pulling the jumper JP5.

On the RS 485 interface of the precipitation sensor (15189 serial) a subset of the SDI-12 protocol was implemented.

Details about the SDI-12 protocol you will find in the a.m. standard document or in the internet on the web page www.SDI-12.org. From the mentioned commands in the standard document the following commands are implemented in the precipitation sensor (15189 serial):

Implemented SDI-12 commands:		
Command	Function	Answer of the sensor
a!	Acknowledge Active	a<CR><LF>
al!	Send Identification	allccccccmmmmmmvvvxxx...xx<CR><LF>
aAb!	Change Address	b<CR><LF>
aCC!	Start Concurrent Measurement and Request CRC	atttnn<CR><LF>
aD0!	Send Data	a<values><CRC><CR><LF>
<i>a = address of the respective sensors; standard address = 0</i>		

The SDI-12 commands always begin with the address of the responding sensors. All other sensors which are also connected to the bus will ignore this command. A SDI-12 command will always be finished with a '!'. The answer of the respective sensors always starts with its actual address and ends with the ASCII characters „Carriage Return“<CR> and „Line Feed“<LF>.

The SDI-12 protocol is based on the ASCII character set. The baud rate is 1200 Bd and has the byte frame format 7E1:

- 1 start bit
- 7 data bits
- 1 parity bit (even-parity)
- 1 stop bit

Acknowledge Active a!

This command is used to ensure that the sensor answers to the enquiries of the master. The command quasi requests the sensor to advise whether it is in the bus or not.

The sensor answers with its address and <CR><LF>.

Syntax

Command	Answer
a!	a<CR><LF>
a - address of the sensor	a – address of the sensor
! - end of the command	<CR><LF> – end of the answer

Example:

Command	Answer
0!	0<CR><LF>
1!	1<CR><LF>

Send Identification al!

The command **al!** will be used to ask the sensor for its model number and its firmware version.



Syntax

Command	Answer
a!	a<CR><LF>
<ul style="list-style-type: none"> a – address of the sensor I – command „Send Identification“ 	<ul style="list-style-type: none"> a – address of the sensor LambrchtNSGsrA001 Lambrcht – 8 characters manufacturer name (= Wilh. Lambrecht GmbH) NSGsrA – 6 characters sensor model (= precipitation sensor 1518x serial) 001 – firmware version (= version 1)
! – end of the command	<CR><LF> – end of the answer

Example:

Command	Answer
0!	0LambrchtNSGsrA001<CR><LF>
1!	1LambrchtNSGsrA001<CR><LF>

Change Address aAb!

Ex factory the sensor will be delivered with address 0. In case several sensors are in one bus the address of the sensor can be changed with the command **aAb!**. The address always is a single ASCII character. Standard addresses can be the ASCII characters „0“ to „9“ (decimal 48 to 57).

The sensor answers with its new address and <CR><LF>. After changing the address no further command should be send to the sensor for the duration of 1 second (see also „SDI-12 A Serial-Digital Interface Standard for Microprocessor-Based Sensors Version 1.3 January 12, 2009“).

Syntax

Command	Answer
aAb!	b<CR><LF>
<ul style="list-style-type: none"> a – old address of the sensor A – command „Change Address“ b – new address of the sensor ! – end of the command 	<ul style="list-style-type: none"> b – new address of the sensor
	<CR><LF> – end of the answer

Example:

Command	Answer
0A1!	1<CR><LF>



Start Concurrent Measurement and Request CRC aCC!

Unlike the other standard sensors described in SD-12 documents the precipitation sensor (15189 serial) measures continuously.

The data requested with command **aCC!** therefore will be always immediately available, the sensor (15189 serial) always answers with a00003. This also means that the sensor will not send a service request and ignores signals to cancel the measurement. The data will just be overwritten by the next command **aCC!**. Until then they can be read out several times. During query of data the data generated with **aCC!** will be transferred with a 3-digit CRC check code. How the CRC code can be generated as a check sum can be read in the SDI-12 Standard Version 1.3, 2012, chapter 4.4.12.

Syntax

Command	Answer
aCC!	a00003<CR><LF>
a - address of the sensor	a - address of the sensor
C - Command „Start Concurrent Measurement and Request“	000 - time in seconds the sensor needs until the measuring data are available (= 0 sec)
C - Request for data transfer of the CRC check code	03 - number of provided measuring data
! - end of the command	<CR><LF> - end of the answer

Example:

Command	Answer
2CC!	200003<CR><LF>

Send Data aD0!

The data provided by the command **aCC!** will be requested by the sensor with **aD0!**. The measuring results resp. data will always be transferred with a „+“ or „-“ sign. At the same time the sign is used as a delimiter. The data will be transferred together with the CRC check code. How to form the CRC code as check sum can be read in the SDI-12 Standard Version 1.3, 2012, chapter 4.4.12.

The measuring data will be transferred in metric units.

Measurand	Min	Max	Unit
Puffer 0			
Total precipitation since last data recall	0,0	480	mm/m ²
Total precipitation last minute (gliding)	0,0	8,0	mm/m ²
Total precipitation last hour (gliding)	0,0	480	mm/m ²

The total precipitation since last data recall will be set back automatically after one hour.

Syntax

Command	Answer
aD0!	A<values><CRC><CR><LF>
a – address of the sensor	a – address of the sensor
D – command „Send Data“	<values> – required data separated by plus/minus-sign
0 – requirement of data out of the buffer 0	<CRC> – 3 characters CRC code
! – end of the command	<CR><LF> – end of the answer

Example:

Command	Answer
0CC!	000003<CR><LF>
0D0!	0+3.14+2.718+1.414lpz<CR><LF>

Note regarding SDI-12 „Break“ signal

It is not necessary to wake-up the sensor. The sensor does not have a sleep mode. Therefore the reactions on „Break“ signals and all relating timing rules will not apply. The precipitation sensor (15189 serial) ignores „Break“.



Pulse output

The pulse output is permanently activated. The linearised pulses are emitted with a pulse duration of 125 ms. The maximum of output pulses are 100 output signals per minute.

Safety instructions

This system is designed according to the state-of-the-art accepted safety regulations. However, please note the following rules:

1. Before setting into operation, please read all appropriate manuals!
2. Please take notice of internal and state-specific guidelines and/or rules for the prevention of accidents (e.g. the professional association). If necessary ask your responsible safety representative.
3. Use the system according to the manual's regulations only.
4. Always leave the manual at hand at the place of work of the system.
5. Use the system in technically correct conditions only! You have to eliminate influences immediately, which impair the security .
6. Please note the loss of warranty and non-liability by unauthorised manipulation of the system. You need a written permission of the Wilh. Lambrecht GmbH for changes of system components. These activities must be operated by a qualified technician.
7. Prevent the ingress of liquids into the devices without permission.

Warranty

Please note the loss of warranty and non-liability by unauthorised manipulation of the system. You need a written permission of the LAMBRECHT meteo GmbH for changes of system components. These activities must be operated by a qualified technician.

The warranty does not cover:

1. Mechanical damages caused by external impacts (e. g. icefall, rockfall, vandalism).
2. Impacts or damages caused by over-voltages or electromagnetic fields which are beyond the standards and specifications in the technical data.
3. Damages caused by improper handling, e. g. by wrong tools, incorrect installation, incorrect electrical installation (false polarity) etc.
4. Damages which are caused by using the device beyond the specified operation conditions.



Technical data

(15189 serial) Precipitation Sensor with 2 cm³ bucket, unheated

Id-No. 00.15189.002 060

Measuring principle:	weighing tipping bucket designed acc. to Joss-Tognini
Range of application:	0...+70 °C · measuring
Measuring range:	2 cm ³ (2 g water) - volume of bucket 0...8 mm/min
Resolution:	0.1 mm
Accuracy:	± 2 %
Dimensions:	see dimensional drawing
Suitable for mounting:	Ø 60 mm
Weight:	approx. 2.5 kg
Standards:	WMO-No. 8 • VDI 3786 Bl. 7 • EN 50081/82 • VDE 0100
Current consumption:	typically 40 mA, max. 100 mA
Supply voltage:	10...30 VDC (12 VDC/ 24 VDC)

Pulse output for linearized, bounce-free output signal

Switch load: Max. 30 VDC/ max. 0.5 A at pure ohm load

(15189 H serial) Precipitation Sensor with 2 cm³ bucket, heated

Data like (15189 serial) 00.15189.002 060, but in addition with controlled 2-circuit-heating:

Id-No. 00.15189.402 060

Heating data:	electronically controlled, dual-circuit
Accuracy:	4 °C ± 2 °C, controlled temperature within a range of -20...+4 °C
Heating power:	80 W (funnel) 70 W (outlet/ tipping bucket)
Supply voltage:	24 VDC / 150 W
Range of application:	-20...+70 °C (no icing, no snowdrift)

General accessories:

32.14567.060 000	Connecting cable with M12 plug for connection sensor/ data logger; L = 12 m
00.15180.400 000	(1518 S4) Stainless steel mast for concrete foundation
00.15180.800 000	(1518 S8) Stainless steel mast for concrete foundation with base plate
32.15180.021 010	(1518 U21a) Bird protection ring
33.15180.049 000	(1518-49) Dirt spiral (spare part)

For heated versions:

00.14966.200 000	(1496 S62) Power supply unit
32.15188.060 060	(15188 U60f) Connecting cable (2-core), sensor/ filament transformer, L=1 m
32.14622.220 000	(14622 S22) Holder for power supply unit on the mast

Services:

97.15180.000 000	User-specific configuration
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Quality System certified by DQS according to
DIN EN ISO 9001:2015 Reg. No. 003749 QM15

Subject to change without notice.

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