VAN WALT
Monitoring your needs

Operating Instructions

Rain Gauge

Contents

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Introduction

The e+ RAIN sensor consists of a datalogger and a separate rain gauge sensor. This manual describes how to use the datalogger and the rain gauge and what their various functions are. A description is provided of how to use the Logger Data Manager® (LDM) e+ software. It includes a guide to the preparation of the software and explains various aspects of its use. This is followed by a description of the various possibilities available for carrying out rain measurements. It concludes with instructions for calibration and regular maintenance.

e+ RAIN: datalogger, field support and rain gauge

1. Description

1.1 Package contents

0 e+ RAIN sensor, which consists of a datalogger (11.41.21.01), rain gauge (11.41.21.02), LDM e+ software (11.11.14) and battery set e+ logger (11.41.90.01)

0 Available separately:

- Stand for the rain gauge for use in the field (11.41.92.01), includes special fixing nut.
- IrDa readout unit (11.31.90) for wireless connection with a (laptop) computer
- Readout unit (11.11.10) for connecting with a (laptop) computer
- DRC Readout cable, for connecting to a (laptop) computer by means of a DRC communication cable (11.11.45). Available in the following lengths:

5 m	(11.11.38)
10 m	(11.11.39)
15 m	(11.11.40)
30 m	(11.11.41)
60 m	(11.11.42)
80 m	(11.11.43)
100 m	(11.11.44)

- e-SENSE e+ sensor cable for connecting to an e SENSE SMS modem (field modem) available in the following lengths:

1 m	(11.31.78)
5 m	(11.31.70)
10 m	(11.31.71)
15 m	(11.31.72)
30 m	(11.31.73)
60 m	(11.31.74)
80 m	(11.31.75)
100 m	(11.31.76)
200 m	(11.31.77)

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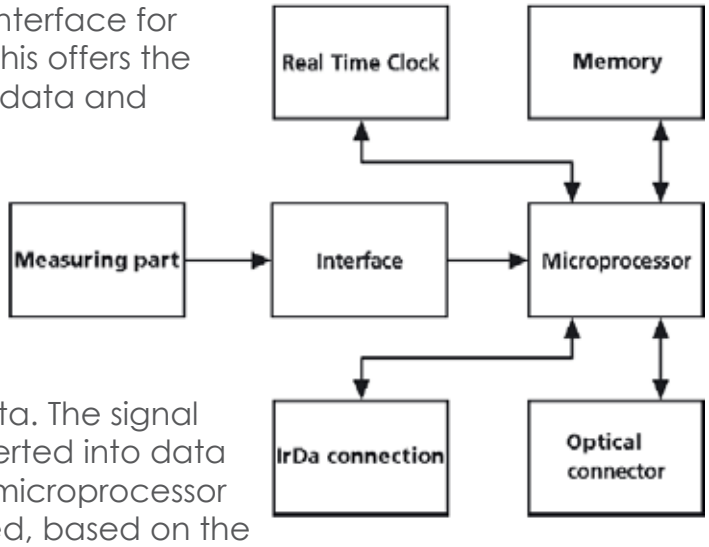
The raingauges tipping bucket mechanism is immobilised before shipping to prevent damage in transit. To release the mechanism, remove the funnel from its base by unscrewing the three thumbscrews. Remove the piece of foam from under the bucket mechanism. This foam may be saved and used whenever the raingauge is moved

1.2 General

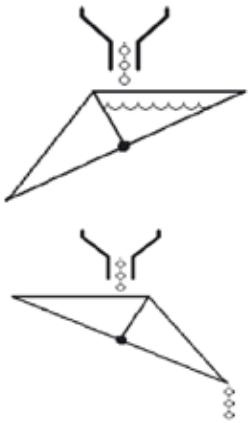
The e+ RAIN sensor is an intelligent sensor that consists of a specific sensor section as well as a so-called datalogger that houses the micro-electronics. The datalogger has an internal memory for storing the measurements but also provides the means for reading the digital data. To make this possible the datalogger has an optical connector for a communication cable or a readout unit or an IrDa interface for communication by means of an IrDa readout unit. This offers the advantage of intercompatibility, reliable transfer of data and the possibility of stand-alone use.



1.3 Datalogger

The datalogger is designed around a microprocessor that performs the role of saving periodical measurements in the memory and enables a connected device to read the stored data. The signal that the sensor part delivers to the interface is converted into data that can be processed by the microprocessor. The microprocessor records the data in the memory with a sample speed, based on the internal Real Time Clock (RTC). It is possible by means of available communication channels, namely the optical connector and the IrDa link, for a device that has been connected to communicate with the microprocessor and read the data stored in the memory or adjust settings such as the sample speed, for instance. The datalogger of the e+ sensor has 2 measuring channels and the memory range is divided proportionally over the available channels. The memory has the capacity to store 30.000 measurements per channel.

1.4 Measuring section



The rain gauge is part of the e+ RAIN sensor and is manufactured from UV-proof synthetic material. It furthermore has an aerodynamic design which ensures that measurements suffer as little as possible interference from the wind. The system operates on the so-called 'tipping bucket' method, in which rain is captured via a funnel and poured into a basin that is fixed on a hinge. A pre-determined amount of rain results in the bucket tipping and emptying itself. Brief contact results with a switch. In this way the amount of rain equals the number of switch contacts during a specific time unit. The rain gauge is fitted with a 5-pole connector for connection with the datalogger.

2. Technical specifications

Datalogger

Number of channels	:	2 channels
Memory capacity	:	30,000 measurements per channel
Measurement intervals	:	1...60 seconds
	:	1...60 minutes
	:	1...24 hours
Datalogging method	:	Measures at chosen times Resolution
	:	0.0033%, 15 bit (data storage) Clock accuracy
	:	<1 sec. per day
Alarm	:	0...100% of the measuring range
Battery status	:	0 to 100% Temperature operating range
	:	-20 ... +70 °C Relative humidity range
	:	0...100%
Power supply	:	3.6 V (AA) lithium battery 2.3 Ah
Battery life	:	6 years (typical for 10-minute sample speed)

Rain gauge

Diameter rain gauge	:	254 mm Height rain gauge
	:	340 mm Output signal
	:	contact
Nominal measurement sensitivity	:	0.20 mm rain fall per contact
Maximum contact power	:	300 mA Power supply
	:	None Weight
	:	1 kg

3. Taking into use

3.1 **Settings**

There is no need to configure any settings before installation of the datalogger. To achieve optimal measurement precision the datalogger's factory settings for the range can be used. The rain gauge is factory-calibrated and is supplied with a calibration specification, which state the actual measuring sensitivity, the so-called calibration factor. The deviation of this calibration factor from the nominal sensitivity is 2% at most, which means that the accuracy is always greater than 2% if the Range setting is not introduced.

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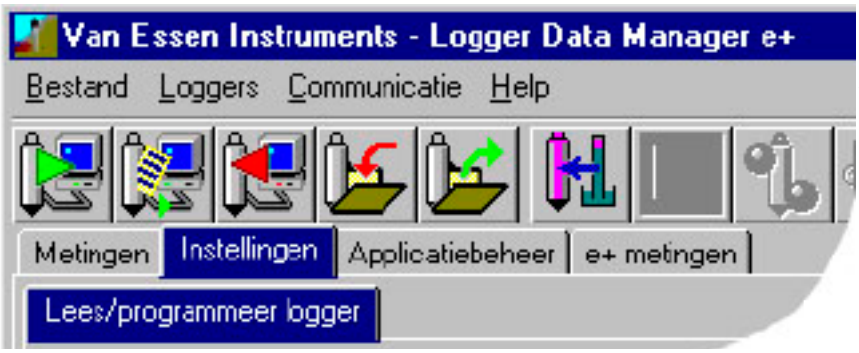
To be able to configure the datalogger, the following are required: LDM e+ software, a readout unit (see Chapter 1.1, "Package contents") and a (laptop) computer. LDM e+ is a universal software package, suitable for the e+ datalogger as well as the Diver® from Van Essen Instruments and can be used for configuration as well as for reading the data. The LDM e+ is simple to install but make sure the user account for installations under Windows NT, 2000 or XP has adequate access rights for the installation of software and that the computer being used has a CD-ROM drive. When the CD is placed in the CD-ROM drive setup will automatically commence. If this is not the case it can be started by going to Start -> Run, and enter: <X>:\setup.exe, in which <X> will be the letter indicating the CD-ROM drive. Next connect the readout unit to an available COM port on the computer. Now launch LDM e+, press the Application Management tab and enter the following settings options:

- Selected port: should show the number of the port to which the readout unit is connected
- User type: in this case Basic is sufficient, only select Advanced if special settings such as the datalogger units need to be adjusted
- English / Deutsch / Nederlands: this allows you to select the preferred language.

LDM e+ is ready for the configuration of the datalogger, which should now be placed in the readout unit.



To enter and adjust settings for the datalogger the appropriate window can be accessed by clicking on the Settings tab in LDM. Before starting, the current settings for the datalogger first need to be entered. This requires clicking on the button on the toolbar shown on the right. The left-hand side of the window shows the general settings for the datalogger (note: for Diver settings a slightly different window may be shown). In the right-hand section of the window settings can be created for the 2 individual measuring channels, including the Range setting referred to earlier. The figure on the next page illustrates the setting options per channel. For more information about the calibration of the rain gauge and determining the correct Range setting, please refer to Chapter 7, "Maintenance".

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Sensor channel settings

	AlarmLow	HystLow	HystHigh	AlarmHigh	Reflevel	Range	Unit	'Master'	'Altitude'
	0,00	0,00	100,00	100,00	0,00	100,00	mm	00	0
▶	0,00	0,00	500,00	500,00	0,00	500,00	mm	00	0

ID 1 : Rain

ID 2 : Integrator

Once the setting options have been entered, all the settings will be programmed into the datalogger by clicking on the button on the toolbar as shown on the right. The e+ sensor is now ready to be installed. It should be noted that it is not necessary with the e+ sensor to stop the datalogger in advance, as the new settings will be activated as soon as the datalogger is started again.

3.2 Connection

When the installation of the e+ sensor is a permanent one and the datalogger is located in an easily accessible place, the IrDa-interface provides a useful alternative to a permanently installed connecting cable. The IrDa interface has an optical unit that makes it possible for the datalogger to be read from a distance of 1...2 metres. It is fitted with a 9-pole sub-D connec- tor for connecting to the COM port of a computer. To read the datalogger's data in the field use should be made of a laptop computer.

When it is not possible to have as datalogger and a computer close together because the e+sensor is being permanently installed, one can resort to the use of a DRC readout cable in combination with a communication cable. A DRC readout cable is available in different lengths and which is fitted with a special connector for connection to a DRC communication cable. It also has an optical interface for the datalogger. The DRC communication cable comes in a standard length. It is fitted with connector for connection to the readout cable and has a 9- pole sub-D connector to connect it to the COM port of a computer.

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It is common practice in an e-SENSE measuring system for the e+ sensor to be permanently installed. This requires it to be connected by means of an e+ sensor e SENSE cable to an e-SENSE SMS modem (field modem). An e-SENSE measuring system is designed to carry out remote wireless transmission of the measurement data from the e+sensors by means of an SMS modem to a central (Internet) database. This does away with having to read data in the field. For further information about e SENSE measuring systems, the e-SENSE data site or e-SENSE direct and points of note in connection with the installation, you are referred to the instruction manual for the e-SENSE SMS modem (field modem), the e-SENSE data site and e-SENSE direct. For more information about the types and lengths of connection cable as well as the IrDa-interface please refer to Chapter 1.1, "Package contents".

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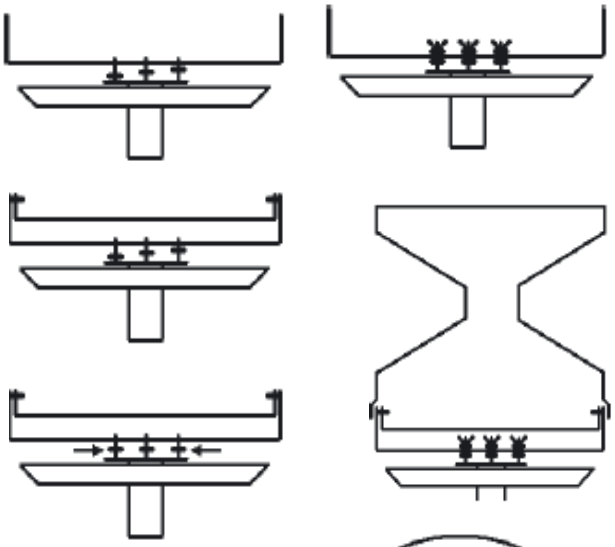
3.3 Installation

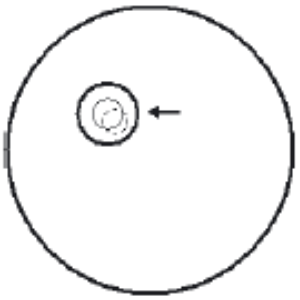
Prior to installation it is important to find a suitable location for the rain gauge. In the first instance one should look for a setting where the measuring cannot be interfered with by obstacles. A useful rule of thumb is to position the rain gauge at a height that is at least twice that of nearby obstacles. In the case of special applications it is possible that there may be other special requirements. Secondly, it is important for the rain gauge to be placed in a horizontal position. Also look for a location where the stand for the rain gauge can be placed in a stable and horizontal position.

Choosing the right measuring location is of great importance as far as obtaining accurate measuring results is concerned



First of all the stand for the meter must be placed in a stable and horizontal position. This will require drilling a hole in the soil in which to place the tube of the stand. After putting the tube in position place the leftover soil back into the hole and tamp it down well while holding the tube in an upright position. Place the fixing platform of the stand on top of the tube and finish by securing it with socket-head screws.

The rain gauge is now completely disassembled, after which it is reassembled step by step back on the stand:



1. Place the outer base plate with the three fixing holes on the platform on the stand.
2. Place the inner base plate with the recesses on the outer base plate. The recesses need to fit correctly into the studs while it must be ensured that the inner base plate cannot be pushed up by the connecting cable.
3. Align both base plates with the aid of the adjustable rings of the stand.
4. Check the horizontal position with a spirit level that is fixed to the inner base plate.
5. Secure the outer base plate by screwing the wing nuts on the stud bolts of the stand.
6. Assemble the rain gauge.

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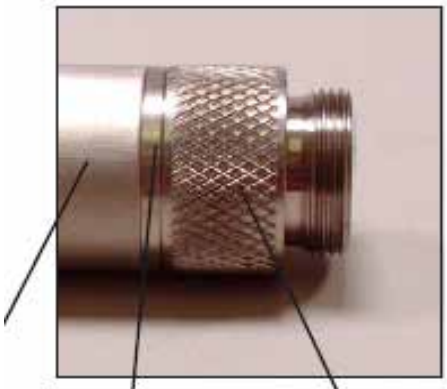
7. Remove the protective cap (with eye) and the O-ring of the e+ logger.



8. Remove the nut from the e+ logger. Note that the support ring and the battery cover are not moved (the battery housing will not be water tight anymore).

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10.Re-place the O-ring (that was removed in step 7) in the seat of the e+ logger

To continue installation for:

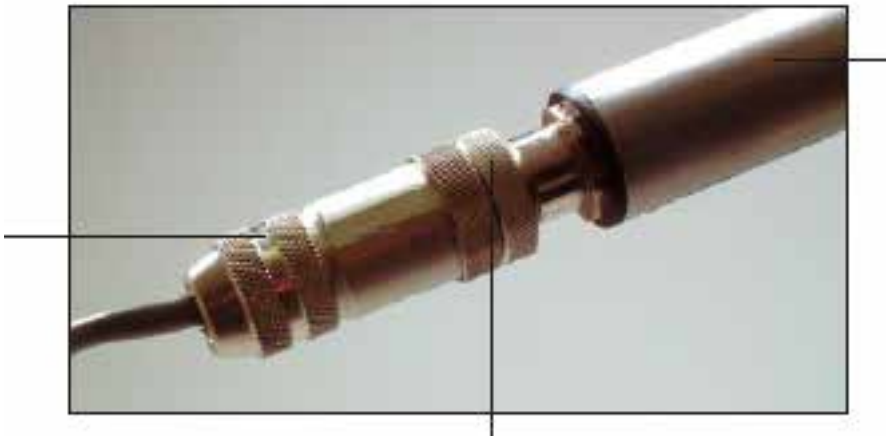
- IRDA-readout: step 11 till 14
- Communication cable: step 15 till 18

11.Screw the logger nut on the e+ logger (or use the optional protective cap) and turn it hand tight. It is also possible to use the protective cap with eye again, however it must be removed when reading out the logger.

Logger nut

Protective cap (optional)

12.Connect the sensor connector to the e+ logger and screw it handtigth with the ring nut.



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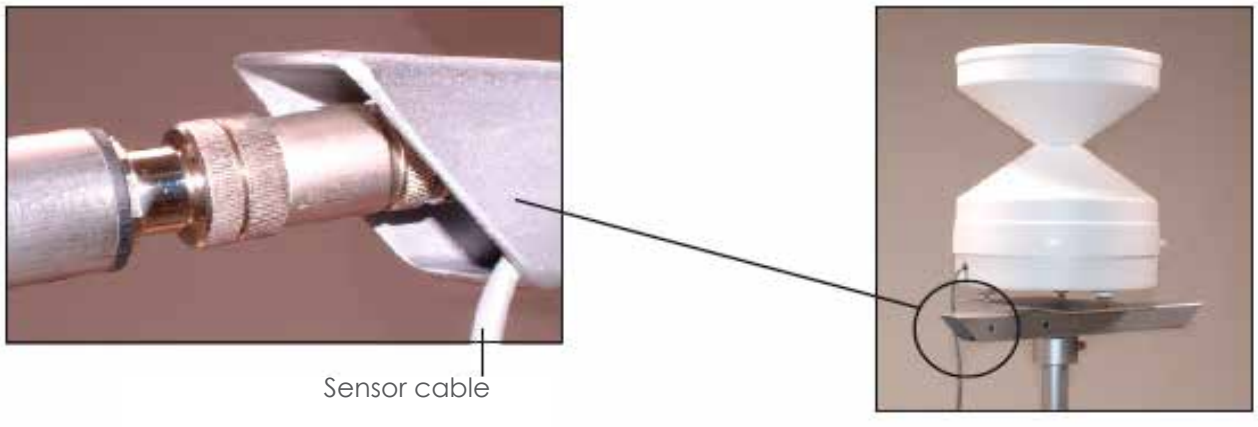
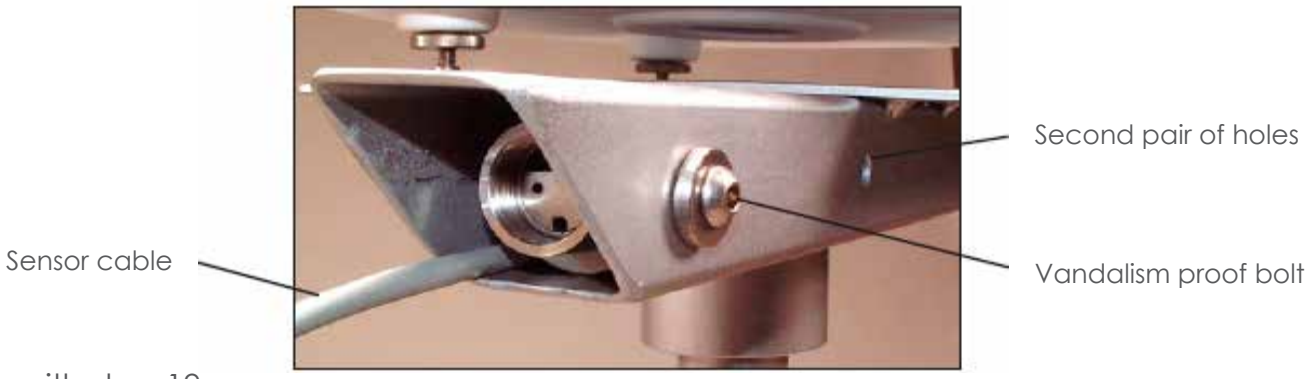
13.Shove the e+ logger in the square tube of the measuring station, the sensor cable is curved along the e+ logger.

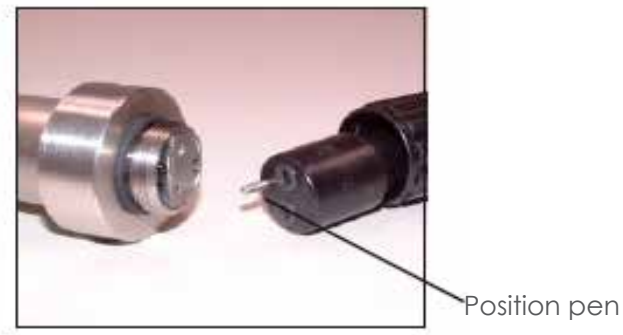


14.Push the e+ logger in the square tube just that far that the tap holes of the mounting nut correspond with the first pair of holes in the square tube. Screw in both vandalism proof bolts.



Continue with step 19

15.Screw the opto-connector of the communication cable on the e+ logger, the postion pen of the opto- connector fits in the free space of the e+ logger.



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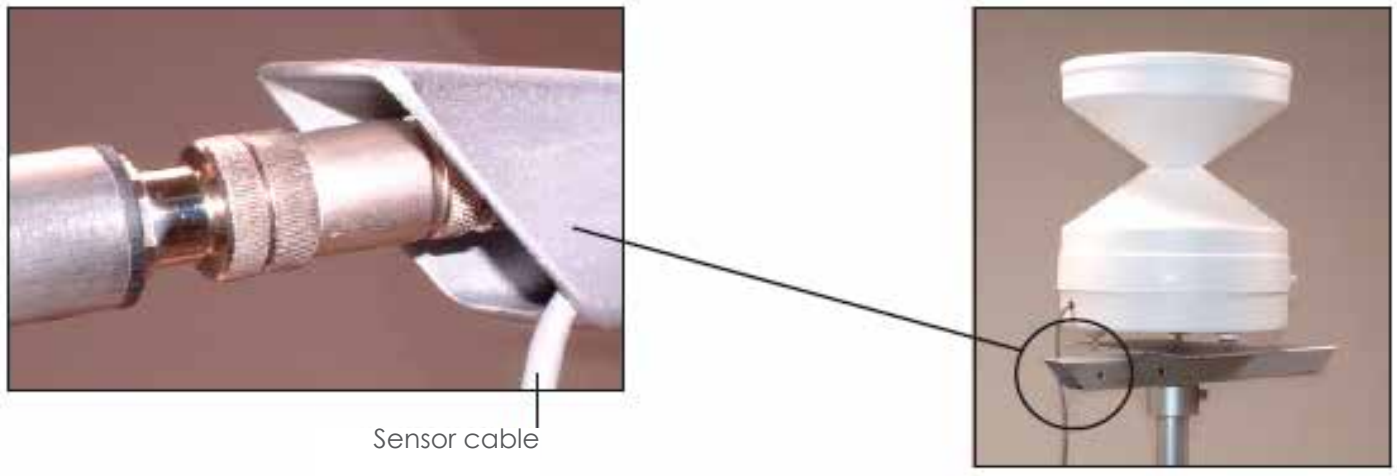
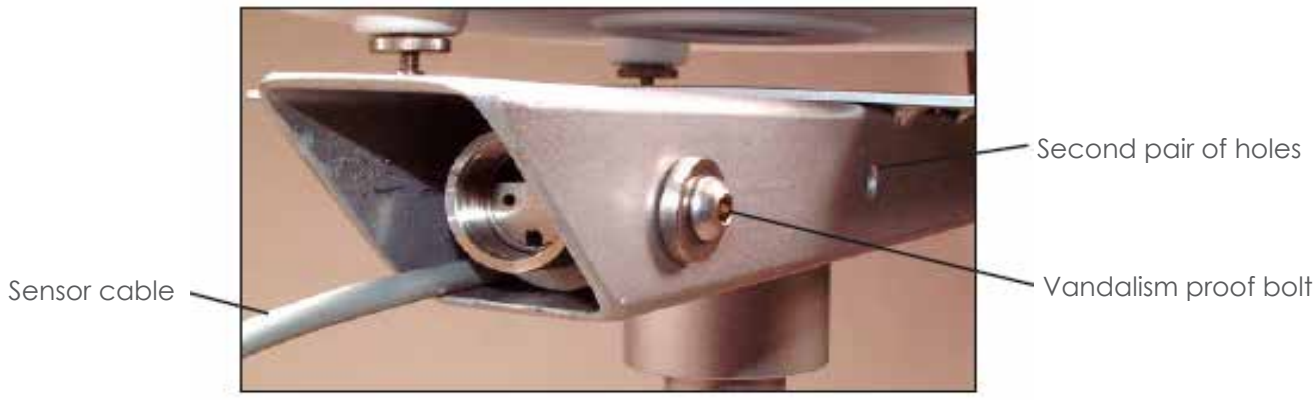
16.Mount the sensor connector to the e+ logger and screw it hand tight.

17. Shove the e+ logger in the square tube of the measuring unit, the sensor cable is curved along the e+ logger.



14.Push the e+ logger in the square tube just that far that the tap holes of the mounting nut correspond with the first pair of holes in the square tube. Screw in both vandalism proof bolts.



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Continue with step 19

15.Screw the opto-connector of the communication cable on the e+ logger, the postion pen of the opto- connector fits in the free space of the e+ logger.

16.Mount the sensor connector to the e+ logger and screw it hand tight.

17.Shove the e+ logger in the square tube of the measuring unit, the sensor cable is curved along the e+ logger.

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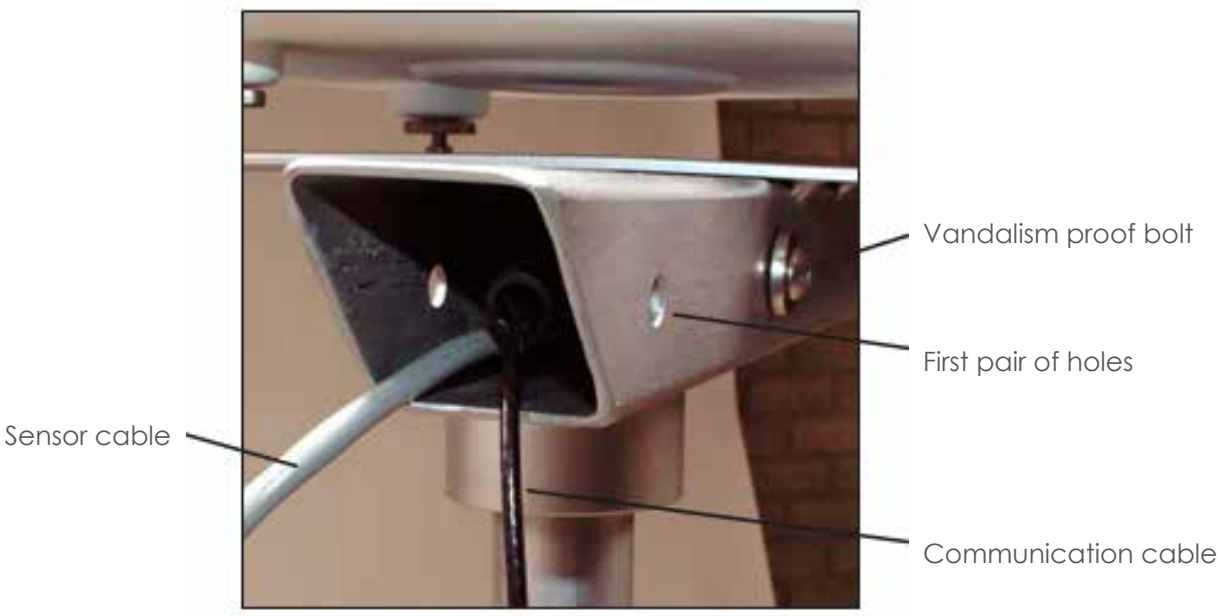
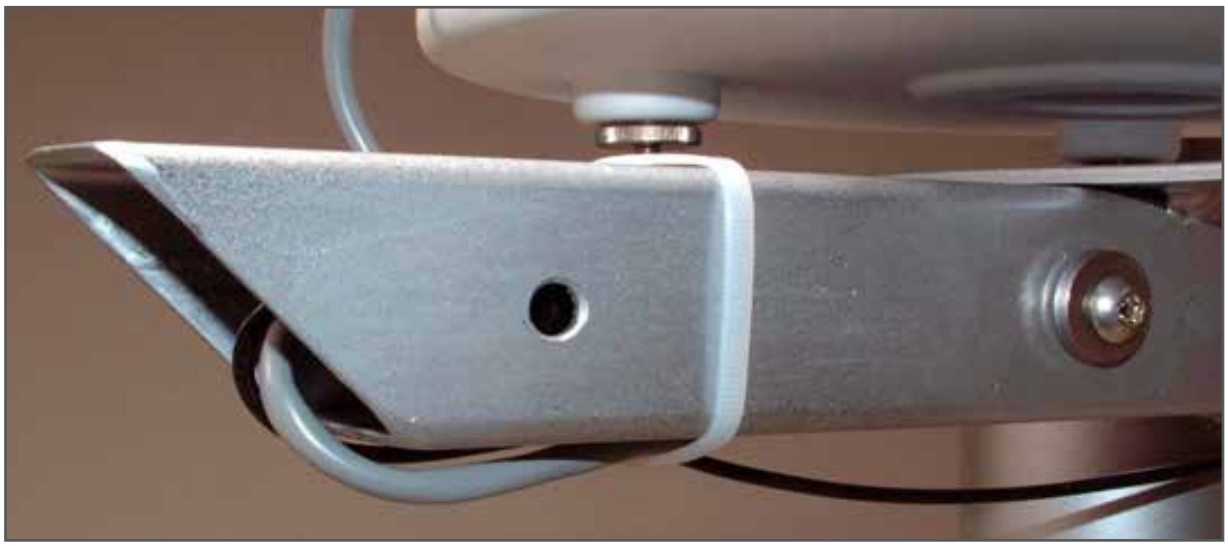
18. Push the e+ logger in the square tube just that far that the tap holes of the mounting nut correspond with the second pair of holes in the square tube. Screw in both vandalism proof bolts.



19. Tighten the cable(s) for example with tie-straps to the measuring unit. Avoid cracking and mind sharp edges.



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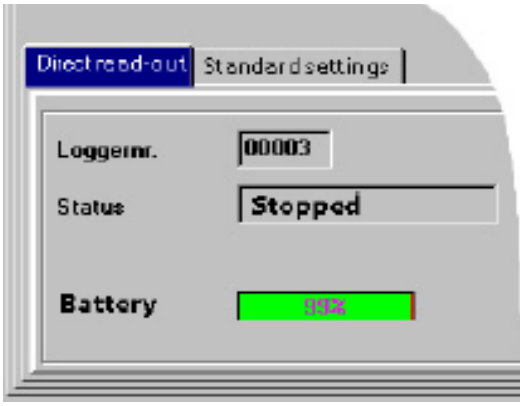
4. Use

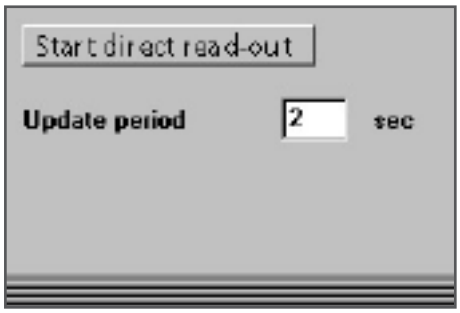
4.1 LDM e+

Just as with the settings, monitoring of the data- logger takes place in the window in LDM e+ under the Settings tab.
It is in this window that two of the most important actions are performed for the operation of the datalogger. These are:



Starting and stopping the datalogger:
Monitoring of the datalogging process can be done by clicking on the tab Direct reading in the Settings window and by clicking on Start direct reading in this screen. The current status will then be read continuously and at the same time the buttons that start and stop the datalogger are correctly activated (in the Settings window). The following functions are now also available:

- Start now: clicking on this button will start the datalogger straight away
- Future start: by clicking on this button the datalogger will start at the time and date that is shown in the Standard Settings window.
- Synchronize logging time with system time on starting: if this box has been checked, the RTC clock of the datalogger is synchronized with the system clock of the computer at start-up.
- Stop: clicking on this button will stop the datalogger immediately



It should be noted that when the datalogger is started all the measurements are erased and a new session is commenced.

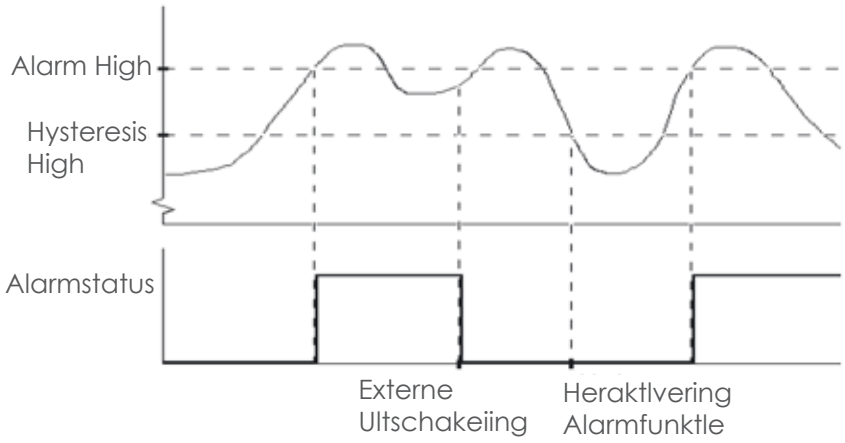
If the datalogger has been started and settings are altered, these changes will not take effect until the next measuring session, i.e. not until the datalogger has been stopped and started again.

Reading the measurements:
The datalogger is read in the Settings field by clicking on the button in the wtoolbar as shown on the right. These measurements are recorded in LDM e+.

All the series of read and recorded measurement data can be viewed in a list under the e+ measurements tab -> Series. If measurement data are read more than once while the datalogger is operating , there will be duplication of measuring data, divided over several measurement series. These data can be removed by clicking on the Remove duplicates button. If a series of measurements has been selected by going to the lists, the measuring results can be viewed and analysed in the e+ measurements window -> Tables and graph, while it is also possible to go to the main window and to export the data via the menu File -> Export.

4.2 Taking rain measurements

The datalogger records the number of contacts made by the rain gauge and converts those to the amount of rain in mm. The datalogger has two ways of processing these contacts. Channel 1 processes the number of contacts, determines the amount of rain between two samplings times and stores this value. Channel 2 is a so-called integrator, that keeps on recording as the new value, the new value from channel 1, with the previous measurement total added to it. This is called the accumulation of data.



In order to measure the daily amount of rain (the most commonly used procedure) the Sample speed of the data- logger is set at 24 hours in LDM e+, e-SENSE direct or on the e-SENSE data site. If a lower Sample speed is selected, a so-called intensity measurement can be taken. Rain intensity measurements are normally expressed in mm per hour, and for these the Sample speed needs to be set at 1 hour. An even lower Sample speed can be selected if the rain intensity needs to be recorded over shorter periods.

e+ Sensors possess an alarm function which activates the alarm status of the sensor when measurement values exceed a certain pre- determined limit. A device that has been connected can detect an active alarm status and depending on its function, can respond by performing a specific task after which it can turn off the alarm status of the datalogger. The alarm function is set by means of alarm boundaries and hysteresis limits. As soon as the measurement values exceed one of the alarm boundaries the alarm status is activated.
The alarm status can be reactivated only once the hysteresis limits are reached. The limit values can be set in LDM e+, but LDM e+ does not support alarm functionality. The relevant settings have the following meanings:

- AlarmHigh: specifies the high limit that will cause the alarm status to be activated.
- HystHigh: specifies the high limit that will cause the alarm function to be reactivate.
- AlarmLow: specifies the low limit that will cause the alarm status to be activated.
- HystLow: specifies the low limit that will cause the alarm function to be reactivated. (note: the low limits do not have any practical use when measuring rain)

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The e-SENSE SMS modem (field modem) and e-SENSE direct do support alarm functionality. When an SMS modem detects an active alarm status for a sensor, e-SENSE direct can transmit an alarm message via the SMS modem direct to a mobile telephone number.

The values of alarm and hysteresis must be within the interval constituted by on the one side the Reference and on the other side by the sum of Reference and Range.

In formula: Ref. <= Alarm <= (Ref. + Range) and Ref <= Hysteresis <= (Ref. + Range)

The user must always (also when no telemetry is used) fill in the values for alarm high, hysteresis high, alarm low and hysteresis low.

The integrator function can be used to determine daily, weekly or monthly totals on the basis of rain intensity measurements. If it is necessary to start obtaining measurement totals, the starting value of the integrator can be set at zero, which can be done by adjusting the datalogger's Master setting to the value '-0'. This is called the 'resetting' of the integrator. In this way, the rain intensity measurements can be used to determine daily, weekly or monthly totals on the basis of daily measurement samples.

5. Applications

The following e+ sensors are currently available:

- Rain fall (intensity and total)
- Soil moisture (volume fraction, conductivity and temperature)

In due course e+ sensors will also be available for the following areas of application:

-Wind (direction and speed)
-Atmospheric conditions (moisture and temperature)
-Atmospheric pressure
-Temperature
-Radiation (pyrano and albedo)
-Flumes (flow rate)
-Infiltration
-Soil erosion
-Evaporation
-Tension
-Pulse
-Current
-Conductivity
-Serial

The following Divers are currently available for the following applications:

-Diver (water level and temperature)

-BaroDiver (atmospheric pressure and temperature)

-CTD-Diver (water level, temperature and conductivity)

-OTD-Diver (water level, temperature and dissolved oxygen)

6. Problems and solutions

This chapter provides useful tips and information if problems occur with the performance of the datalogger or the rain gauge during or after they have been put into operation. The following tips can help you to ascertain what is wrong and possibly correct the fault yourself.

No measurements appear after starting up the datalogger and putting it into service.

- If the datalogger is used in stand-alone capacity:
- Check if the correct type of connection cable has been used or if the cable is damaged, whether the infrared eyes of the datalogger are clean and the readout unit is connected correctly. Next check in LDM e+ under the Application management tab -> Program settings if the correct COM-port has been selected.
- If the datalogger is connected to an e-SENSE SMS modem (field modem) and if e-SENSE direct or the e-SENSE data site is used:
- If the fault occurs in all dataloggers used, there is probably a fault in e SENSE direct or the e-SENSE data site. Consult the instructions for e-SENSE direct or the e-SENSE data site. If the fault only occurs in dataloggers that are connected to a specific SMS modem, there is probably a fault in that SMS modem. Consult the user manual of the SMS modem. If the fault only occurs in one specific datalogger, check if the correct type of connection cable has been used or whether the cable is damaged.

If the measures above do not solve the problem, remove the datalogger and check its operation with a readout unit and a (laptop) computer with LDM e+ installed on it. If communication with the datalogger is not possible in LDM e+, replace the battery as described in chapter 7, "Maintenance". Contact your supplier if the fault cannot be corrected with any of these measures.

Communication with the datalogger is correct, but no measurements appear.

- If the datalogger is used a stand-alone capacity:
- In LDM e+, check the settings for Sample speed and Future start and also check the system time of the (laptop) computer under Settings, Configuration, Date and Time. Synchronize the RTC when starting up the datalogger. Depending on the set Sample speed and possibly a set Future start, measurements should now become available at a certain point in time.
- If e-SENSE direct or the e-SENSE data site is used:
- Check the settings for Sample speed, Send interval, Send start and Channel is activated. The setting for Sample speed should be lower than the setting for Send interval, while Channel is activated must be active. Depending on the value for Send interval and Send start, measurements should become available at a certain point in time. If this is not the case, check

1. The signal strength level of the e-SENSE SMS modem (field modem), if applicable. Please refer to the user manual of the SMS modem for checking the field strength level of the SMS modem.
2. The signal strength level of the computer GSM modem, if applicable. The field strength level is shown in the status bar of e-SENSE direct.

The datalogger produces incorrect measurements. The fault is in the sensor or the datalogger.

- Check the mechanical parts and the state of maintenance of the sensor, proceeding in accordance with Chapter 7, "Maintenance".
- Check the calibration of the sensor and, if necessary, recalibrate according to the relevant instructions in Chapter 7, "Maintenance".
- Check the Offset and Range settings of the datalogger and, if necessary, reset them. The Offset and Range settings are part of the sensor calibration. Consult Chapter 7, "Maintenance," to correctly determine the values for Offset and Range.

The alarm of the sensor is not functioning or not functioning correctly.

- The alarm function is only supported by e-SENSE direct or the e-SENSE data site.
- If no alarm messages are received: check the settings for Alarm low, Hysteresis low, Hysteresis high and Alarm high. Configure the alarm values if one or more settings are set on zero.
- If an alarm message is received once but not after that: the value for Hysteresis high should be set lower than Alarm high, the value for Hysteresis low should be set higher than Alarm low. If the problem persists, choose both hysteresis values in such a way that they approximate the alarm values better.
- If many alarm messages are received repeatedly: choose the hysteresis values in such a way that the difference with the alarm values is increased. If the problem persists, check the course of the measurements and set a higher Sample speed if the measurements are widely dispersed.

7. Maintenance

Reliable and accurate measuring results can only be achieved with regular maintenance. We recommend you inspect the rain gauge at set times and, if necessary, clean it or repair it in the following areas:

- Regularly inspect the water-collecting basin and the filter for dirt, damage or blockages. It should be noted that during certain periods of the year, leaves, dust and dirt tend to collect in the water-collecting basin and filter. Leaves can simply be removed, while the filter may be cleaned after removing the cover and then the filter. Clean the filter and reassemble in reverse order.
- Regularly inspect the tipping bucket for any dirt. Clean if necessary. When doing this, ensure that the switch is not operated if the datalogger is turned on.
- If at certain times the datalogger is turned off, or if the rain gauge is temporarily out of use for other reasons, take this opportunity to check the hinge point of the tipping bucket. If it is possible to move the tipping bucket to the centre position without it getting off balance, the hinge point must be cleaned thoroughly.
- Check the horizontal position of the instrument every time maintenance is carried out. Despite the solid design of the field support, in practice the rain gauge can loose its balance as a result of ground motion, vandalism or rough handling.

Rain Gauge

- Replace the battery of the datalogger in time with a new battery of the correct type. Chapter 2, "Technical specifications," states the expected life span of the battery. For replacement of the battery, a battery set is available separately (see Chapter 1.1, "Package contents"). Consult the user manual of the battery set e+ logger (11.41.90.01) to replace the battery correctly.

If the datalogger does not function correctly after replacing the battery, short circuit the battery for 5 seconds and then end the short circuit in one direct movement.

The rain gauge is factory-calibrated and is supplied with a calibration specification, elucidated with examples. The instrument is specified with a nominal measuring sensitivity of 0.2 mm rain per contact. The actual value may lie between 0.197 and 0.204 mm per contact. In addition to the nominal specification, the calibration specification states the actual measuring sensitivity of the instrument, the so-called calibration factor. The user has the option of calibrating the instrument, to which a static calibration is performed. Subsequently, the new calibration factor of the instrument is determined via a dynamic calibration measurement. If so desired, the Range setting of the datalogger can then be adjusted in accordance with the new calibration factor.

The static calibration is executed as follows:

- Preceding the static calibration, all maintenance requirements as stated above should be completed.
- Remove the water-collecting basin and check if the rain gauge is mounted horizontally.
- With a pipette or burette, slowly drip 10.13 cm3 water in the tipping bucket. It should tip with the last drop from the pipette or burette. If this does not occur, adjust the relevant thumbscrew and repeat the procedure until the tipping bucket tips at the right moment.
- Repeat the above procedure for the other half of the tipping bucket.

Next, the calibration factor is determined according to the method for dynamic calibration:

- Before the calibration factor is determined, the rain gauge should be connected to the datalogger, the water- collecting basin should be removed from the rain gauge, and a check should be performed to see if the rain gauge is standing in the horizontal position.

Number of contacts	calibrationfactor [mm per contactsluiting]
96.7 - 96.9	0.204
97.0 - 97.4	0.203
97.5 - 97.9	0.202
98.0 - 98.4	0.201
98.5 - 98.9	0.200
99.0 - 99.4	0.199
99.5 - 99.9	0.198
100 - 100.4	0.197

Rain Gauge

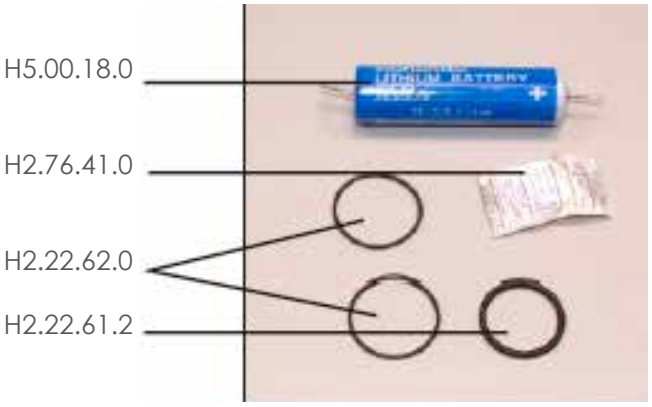
- Fill a reservoir with a lockable opening at the bottom with 1000 cm3 water and attach it above the rain gauge.The amount of water is most accurately determined by measuring the weight of the reservoir before as well as after filling it with water.
- Let the reservoir slowly drip into the tipping bucket until empty. The emptying of the reservoir should take at least one hour. Use the datalogger to record the number of contacts. The number of contacts should roughly be 98, whereby the actual number of contacts determines the calibration factor.

Determine the calibration factor according to the following table:
A calibration factor between 0.197 and 0.204 is considered acceptable. If the calibration factor falls outside these parameters, the static and dynamic calibration should be performed again.
0 To achieve optimal measuring accuracy, the Range setting of the datalogger can be adjusted according to the following formula (see chapter 3.1, "Settings," to change the Range setting):
R = (0.2 / C.F.) * 100
Where:

R = the new Range setting
C.F. = the (determined) calibration factor

Rain Gauge

Appendix; Battery set e+ logger

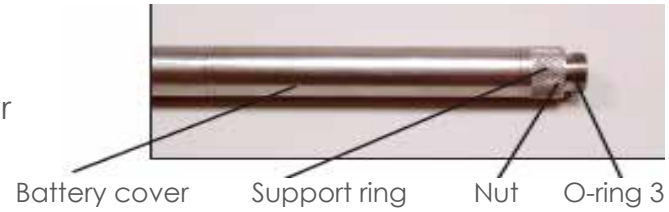


Always replace the 3 O-rings!

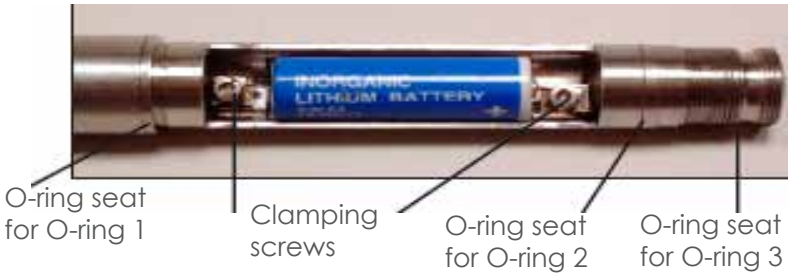
11.41.90.01 Battery set

Description	Art.no.	Qty.
e+ Battery	H5.00.18.0	1
O-ring (d 15,6x1,78)	H2.22.61.2	1
O-ring (d 18 x 1)	H2.22.62.0	2
Socket-head screw wrench	99.75.02.05	1
Acid free vaseline	H2.74.18.0	1
Desiccant pack	H2.76.41.0	1

Required material:
Clean dry towel

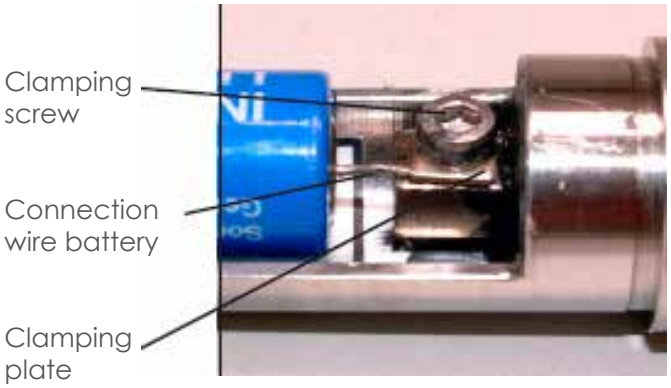


1. Disconnect the sensor connector from the e+ logger
2. Make the outside of the e+ logger dry and clean
3. Remove the O-ring and the nut.
4. Slip the support ring, battery cover and both thin O-rings of the e+ logger.
5. Remove the desiccant pack.
6. Remove the battery by unscrewing the clamping screws
7. Clean the inside and the O-ring seat
   There are 3 O-rings:



1 O-ring 1 —> sealing battery cover sensor-side
2 O-ring 2 —> sealing battery cover Irda-side
3 O-ring 3 —> sealing/locking protective cap

8. Place the new battery (H5.00.18.0) and secure it with the clamping screws and clamping plates. For the correct position of + and - see the sticker in the e+ logger.

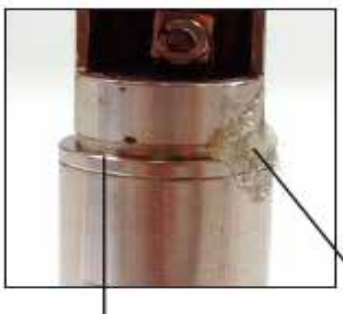


Attention: for the + and -!

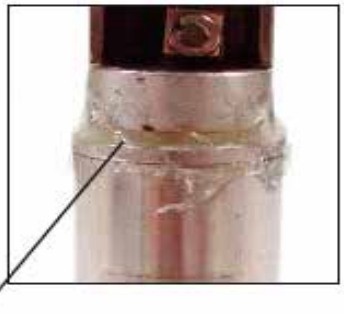
9. Check the functioning and configuration of the e+ logger according to the instructions of the e+ logger.

Rain Gauge

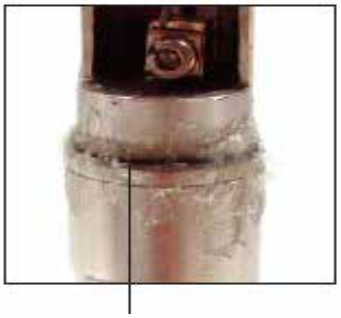
10.Grease the O-ring seat for O-ring 1 ample with vaseline.
11.Carefully slip the O-ring (H2.22.62.0) in the vaseline on the O-ring seat and grease also the outside of the O-ring with vaseline. The O-ring must be covered completely with vaseline.



O-ring seat for O-ring 1



Vaseline



O-ring 1

12.Place the desiccant pack (H2.76.41.0).
13.Slide the battery cover on the e+ logger. Note: the O-ring must slid correctly in the recess of the battery cover.
14.Grease the O-ring seat for O-ring 2 ample with vaseline.
15.Carefully slip the O-ring (H2.22.62.0) in the vaseline on the O-ring seat and grease also the outside of the O-ring with vaseline. The O-ring must be completely covered with vaseline.

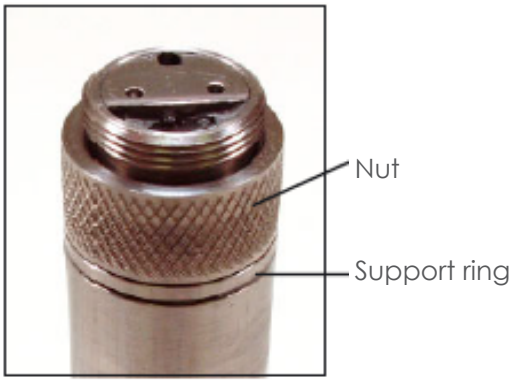
O-ring seat for O-ring 2

Vaseline

O-ring 2

Rain Gauge

16.Place the support ring and screw the nut on the e+ logger, place O-ring 3.



17.Clean the outside of the e+ logger, remove the superfluous vaseline.
18.Re-connect the sensor connector to the e+ logger or replace the protective cap.