



e-SENSE monitoring well modem

OPERATING INSTRUCTIONS



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All it takes for environmental research

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About these instructions



When the symbol shown on the left is placed before a section of text, this means that an important instruction follows.



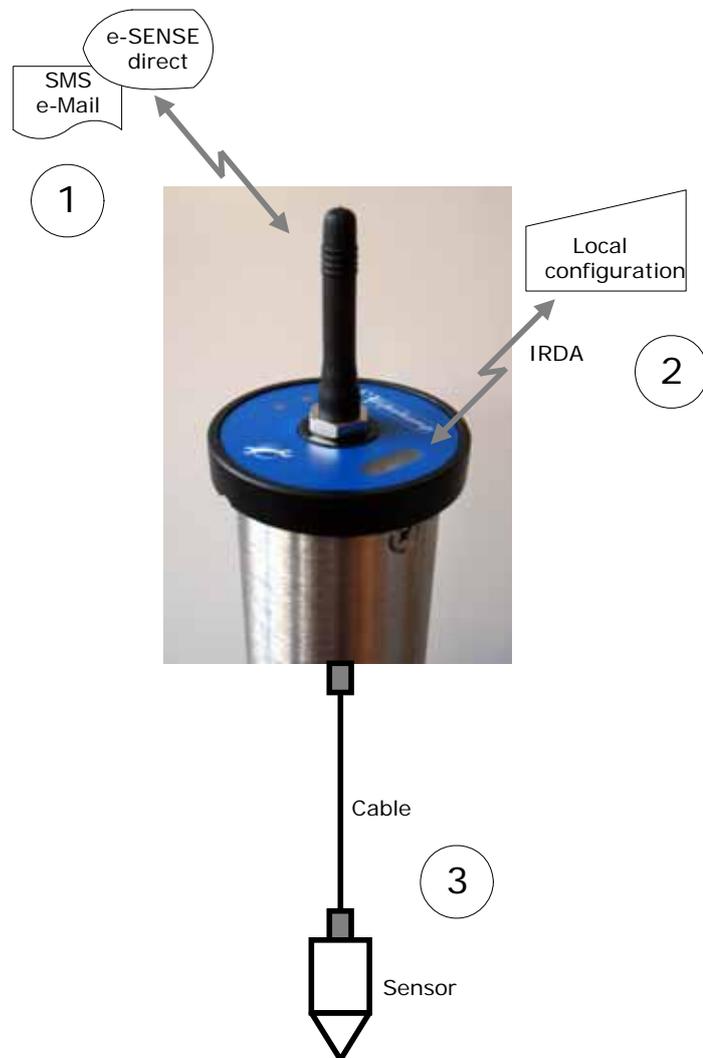
When the symbol shown on the left is placed before a section of text, this means that an important warning follows pointing out a risk of injury to the user or damage to the device. N.B. The user is responsible at all times for sufficient personal protection.

Text

Text in italics means that the actual text is shown on the device or display screen.

1. Introduction

These instructions describe the SMS / GPRS **e-SENSE® monitoring well modem** (hereinafter called the monitoring well modem). This monitoring well modem is very easy to use. Following a short description of the functionality, we will address what needs to be taken into consideration when starting to use the device, we will then address the possible applications and troubleshooting.



1.1 Functionality

In the main, the operation of the monitoring well modem consists of ensuring that data is transported by SMS or e-mail (GPRS) from sensors in the field to a central receiver station.

We can divide the configuration into three components; See figure above.

- 1) e-SENSE direct, the home base
- 2) configuration options, e-SENSE monitoring well modem configuration tool
- 3) e+ sensor / Diver® by *Schlumberger Water Services* / analog sensor (optional) / internal barometric sensor (optional)



Please download the software e-SENSE monitoring well modem configuration tool before you start. The software can be downloaded from: www.eijkelkamp.com at *Products / Software*.

Functionality of internal baro sensor

If the internal (baro) compensation option is activated, the modem will only send compensated data. The raw baro sensor data and the connected logger data is then not available. Raw data is still available when the internal (baro) compensation option is switched off. The temperature data is still available in both cases, provided that the temperature sensor is activated.

1.2 Applications

The use of the monitoring well modem has several practical advantages. In the first place, the use of GSM communication provides the means to take measurements and send them using a wireless connection from any conceivable location. This means that the system can be used at locations where there is no electricity or telephone network available.

Furthermore, it is unnecessary for a person to read out the (measuring) data from the sensor in the field, as the monitoring well modem is tasked with reading the data and sending them.

Because these data are sent to the central receiver station completely independently, the system is more or less maintenance free. It is unnecessary for a person to regularly inspect the condition of the sensors or to read out the measuring values in the field using a laptop. After the sensors and monitoring well modem have been installed, the only activity required in the field is to replace the battery(ies) of the monitoring well modem and the connected sensor.

2. Getting started

This chapter explains how you can immediately start to use the monitoring well modem.



Please download the software **e-SENSE monitoring well modem configuration tool** before you start. The software can be downloaded from: www.eijkelkamp.com at *Products / Software*.

2.1 General

The monitoring well modem can be connected to various types of sensor; the e+ sensors, the Divers and the sensors with an analog output (4 .. 20 mA or 0 .. 5 Vdc). The measuring data are sent by SMS or e-mail to a central server where they are processed. It is possible to remotely configure the monitoring well modem using the central e-SENSE direct server (SMS or e-mail) or locally using a connected laptop running the e-SENSE monitoring well modem configuration tool (hereinafter called the configuration tool) or via standard e-mail programs (text). The monitoring well modem is equipped with two status LEDs (operating status), a service key and IrDA communication.

2.2 Connection and provisions

The monitoring well modem has one connector at the bottom of the housing. In addition, at the top there is a panel with a service key, IrDA, LED indicators and an aerial. The monitoring well modem is (optional) equipped with its own internal barometer and temperature sensor, both can be logged using the log function.



Connector for connecting one sensor (e+ sensor, Diver® or analog sensor)



Panel with service key (spanner), IrDa (right), LED indicators (left: red LED above, green LED below) and aerial (middle)

2.2.1 The connector

The connector is a 5-pole, waterproof, M12 connector. The figure below shows how to connect an e+ sensor.



2.2.1.1 Monitoring well modem analog input

The monitoring well is provided with an analog input. This analog input is able to measure current (0 to 20 mA) or voltage (0 – 5 Volt). The input comprises a mass, port and activation pin. As the monitoring well modem is not active all the time, the activation pin will be activated 10 seconds before the analog measurement becomes active, so that any external meter can enter the value through the analog input.

The analog input behaves like a virtual e+ logger. The software can be used to set the value to any desired parameter, for example m3/h. Just as with an e+ sensor, alarm reports can be generated.

- The standard configuration of the input is for 0-20 mA.
- The analog sensor connected must have its own power source.
- On activation, the activation pin switches to mass (open-collector).

The connections to the M12 logger-connector on the underside are defined as follows:

Connection	Port connector	
1	Rx	(2-wire interface)
2	Mass for analog input	
3	Tx	(2-wire interface)
4	Analog input	(0...20 mA or 0...5 volt)
5	Analog sensor active	(open collector by mass)

Standard adaptor cable item number: 11.31.15.02.01



For reasons of compatibility, pins 1 and 3 are used for the 2-wire interface. Pins 2, 4 and 5 on the monitoring well modem are used for the analog input (software can be set to 0 ... 20 mA or 0 ... 5 volt).

Pin 4 (red) is the current or voltage input

Pin 2 (black) depends on mass

Pin 5 (white) is an open-collector input that is switched to mass when the external analog sensor begins metering.

If an external logger is connected, the analog input runs in time with the external logger. If no external logger is connected, the analog input runs in time with the internal baro. If there is no active internal baro either, the analog input can be set.

Parameter	Analog input
Log interval with external logger / internal baro	In time with external logger or internal baro
Log interval without external logger and without internal baro	1 minute to 24 hours
Send interval with external logger / internal baro	In time with external logger or internal baro
Send interval without external logger and without internal baro	15 minutes to 65,535 minutes
Send start with external logger / internal baro	In time with external logger or internal baro
Send start without external logger and without internal baro	To be set as required by minute **
Altitude	N/A
Offset	N/A
Alarms	Complete range **
Units	mA default - to be set as required **
Range	0 / 20 - default / to be set as required **
Location	Location of e-SENSE modem
Serial number	A + serial number e-SENSE modem

** Functionality as with e+ loggers

2.2.2 The aerial

The modem can be equipped with a 'whip aerial' or an 'external aerial'. The whip aerial must be installed in the following way.



Apply a layer of Vaseline to the O-ring of the connector.



Holding the nut, screw the aerial into the top socket until it is '**hand tight**'. Then tighten the aerial a further **half** turn using a 13 mm open-ended or ring spanner.

The 'external aerial' is installed in the same way as above.



Apply a layer of Vaseline to the O-ring of the connector.



Screw in the connector with the nut '**hand tight**' in the top socket. Then tighten the aerial a further **half** turn using a 13mm open-ended spanner.

2.2.3 The panel

The panel has one service key indicated by the 'spanner', two status LEDs (red and green) on the left-hand side and an IrDA interface on the right-hand side. The aerial is in the middle.

First start

When the service key is pressed for **five** seconds and the monitoring well modem is already configured, the monitoring well modem will log on to the central receiver station (when logging on, both LEDs are active).

If the monitoring well modem is not configured, the red LED will flash. Press the service key, for **15** seconds, until the monitoring well modem enters the configuration mode. The red LED will light. In the configuration mode, the IrDa interface is active for communication with the configuration tool.

Operating

When the service key is pressed for **five** seconds, the monitoring well modem enters the status mode and one of the two LEDs flashes to show the status.

Configuration mode

When the service key is pressed for **15** seconds, the monitoring well modem enters the configuration mode and one of the two LEDs will be lit (dependent on the error condition). In the configuration mode, the IrDa interface is active for communication with the configuration tool.



When setting the well monitoring modem to configuration mode, all processes active in the modem at the time are shut down appropriately.

If after 15 seconds the red or green LED is not on continuously, release the service key and press once more for 15 seconds. Do this until one of the two LEDs is on.

The configuration mode must be exited by pressing the service key for **one** second, or via the configuration tool. After exiting the configuration mode, the monitoring well modem automatically runs through the log on procedure. The first 10 seconds the LEDs remain off! Then both LEDs will be active.

When the log on procedure has completed successfully, both LEDs will go out. If not, then the red LED will light (indicating an error condition) and the monitoring well modem will automatically enter the configuration mode.



If the red LED is on continuously: The monitoring well modem will turn itself off if it has been in configuration mode for 10 minutes and there has been no activity. The log on procedure will then not be performed. Any changes made will be saved. The monitoring well modem can be activated again by pressing the service key for 5 seconds.



If the green LED is on continuously: The monitoring well modem will turn itself off if it has been in configuration mode for 10 minutes and there has been no activity. The log on procedure will then proceed. Any changes made will be saved.

Legend



Red LED is on continually



Green LED is on continually



LED off



Red LED is flashing



Green LED is flashing

Configuration mode, press service key ca. 15 seconds



Press the service key for 15 seconds. During the first 5 seconds the LEDs will stay off.



After ca. 5 seconds both LEDs will flash fast (approx. 5x per second). Keep the service key pressed!



After ca. 10 seconds the green or red LED starts flashing more slowly (ca. 1 time per second). Keep the service key pressed till one of both LEDs is on continually!



Configuration mode: monitoring well modem without error condition.



Configuration mode: monitoring well modem with error condition.

Log on procedure after quitting the configuration mode



External e+ sensor / Diver detected, log on procedure running.



Warning no external e+ sensor / Diver detected, log on procedure running.



Note: it is possible that both LEDs stay on short after flashing. This indicates that the settings are stored in the monitoring well modem. The LEDs will go out after a while. Log on was finished successfully.

In operation



without error condition



With error condition

2.3 Making ready for use

Monitoring well modems may be configured by Eijkelkamp, but can also be configured by the end user with the aid of the configuration tool software. Configuration includes:

- Communications settings such as dial-up numbers, GPRS settings and internet gateway etc.
- Time intervals such as activation interval and send interval
- Configuration of function of the built-in barometer (internal baro for Diver compensation)
- Max. number of text messages per channel
- Configuration of e-mail, e-mail server

Before starting the installation:

- The sensor in use must be stopped and **must contain no data** (not strictly necessary, but certainly preferable, because these data will be send when logging on).
- The sensor in use must be connected to the monitoring well modem.
- The sensor in use must be configured. This can be done using the configuration tool (tab sensors. See below for possible settings).
- The first time to send the SMS (or e-mail) and the interval between sending SMSs must be determined (tab sensors of the configuration tool).
- e-SENSE direct must be installed on the PC or on the central server and brought into operation, if text messages are used (see instructions for use for e-SENSE direct).

There is a distinction between user settings and configuration parameters. Configuration parameters can only be set by Eijkelkamp, these include a 'firmware' update, serial number and the first dial-up number. This also applies for the commercial options including: the internal barometer, redundancy, e-mail, etc.

The following settings can be changed using e-SENSE direct and locally using the configuration tool:

Send intervals	Standard 1440 min. Send SMSs once per day
Measuring interval	Standard is 60 min. Log/ record measurement values once per hour
Activate a channel	Standard is all channels activated. An activated channel sends measurement values, a deactivated channel does not.
Start sending	Standard is 08:00 am. The time at which the monitoring well modem will send the SMSs
Height	Only for 2-eye Divers with a type number <12
Offset	Displacement of zero-point sensor for channel 1
Alarm High / Hysteresis High	Alarm threshold value, standard is maximum range
Alarm low / Hysteresis Low	Alarm threshold value, standard is minimum range
Fluctuation alarm	Standard is maximum range
Wake-up interval	Standard is 120 min. The modem will become active twelve times a day at which times it will check if any update messages have been received
Execute RTC synchronisation	Standard is Active. The monitoring well modem's internal clock will be synchronised with the central server's clock
RTC interval	Standard is 120 days. Every 120 days the monitoring well modem will be synchronised with central server's clock.
Dial-up numbers (2 to 4)	Dial-up numbers. These are the telephone numbers to which the measurement values will be sent
Battery Capacity Alarm	Standard is 20 %. The value at which a low battery alarm is generated
Max. number of SMSs per channel	Standard is 25. This is the maximum number of SMSs that may be sent per send interval per channel.
Data redundancy (optional)	Standard is 0. Three options are possible here: 0, 1 and 2. For option 0, only the current measuring data are sent, for option 1 the measuring data of the current and the previous send interval are sent, for option 2 the measuring data for the current and the previous two send intervals are sent.
e+ sensor average	Standard is deactivated. Average measurement means that multiple measurements will be taken in a minimum of two minutes. The average of these measurements will be saved and/ or sent. This is only applicable for suitable e+ sensors, not for Divers.

-  **The most practical approach is, before going into the field, to first configure the monitoring well modem and then to start it up once and let it log on to the central receiver station on which e-SENSE direct is installed.**
-  **Contact your provider and make an agreement on protection concerning max. SMS per month.**
-  **Eijkelpark Agrisearch Equipment is not responsible for high costs caused by configuration errors.**

2.4 Configuration

Before going into the field, the monitoring well modem must be configured. This can be done using the configuration tool (software).

Press the service key for 15 seconds to enter the configuration mode. Now use the configuration tool, connect the e+ infrared communicator to, for instance, your laptop. The communicator must be held within a distance of 1 m from the monitoring well modem. Read out the current configuration and amend it where required.

-  **If after 15 seconds, neither the red nor the green LED is on continuously, release the service key briefly and press once more for 15 seconds. Do this until one of the two LEDs is on.**

Tip: After the modem has been set, it is advisable to create a screen capture of all the tabs and to save them with the project data. This allows the basic settings to be seen at a glance.

2.4.1 All tabs

These buttons are present on all tabs:

The **Reload info** button is used to refresh only the information on this 'status' tab.

The **Prepare modem for installation** button is used to turn off the modem. As soon as the modem is installed in the field, it can be started by pressing the service key for **five** seconds.



Prepare modem for installation can only be used if both the modem and the connected sensor are configured together in the office.

The **Save all changed settings and close the modem** button is used if no logger is connected to the monitoring well modem. After pressing the service key, the monitoring well modem will immediately enter the configuration mode.

Using the **Save all changed settings and restart the modem** button causes the monitoring well modem to exit the configuration mode and log on with the new settings.

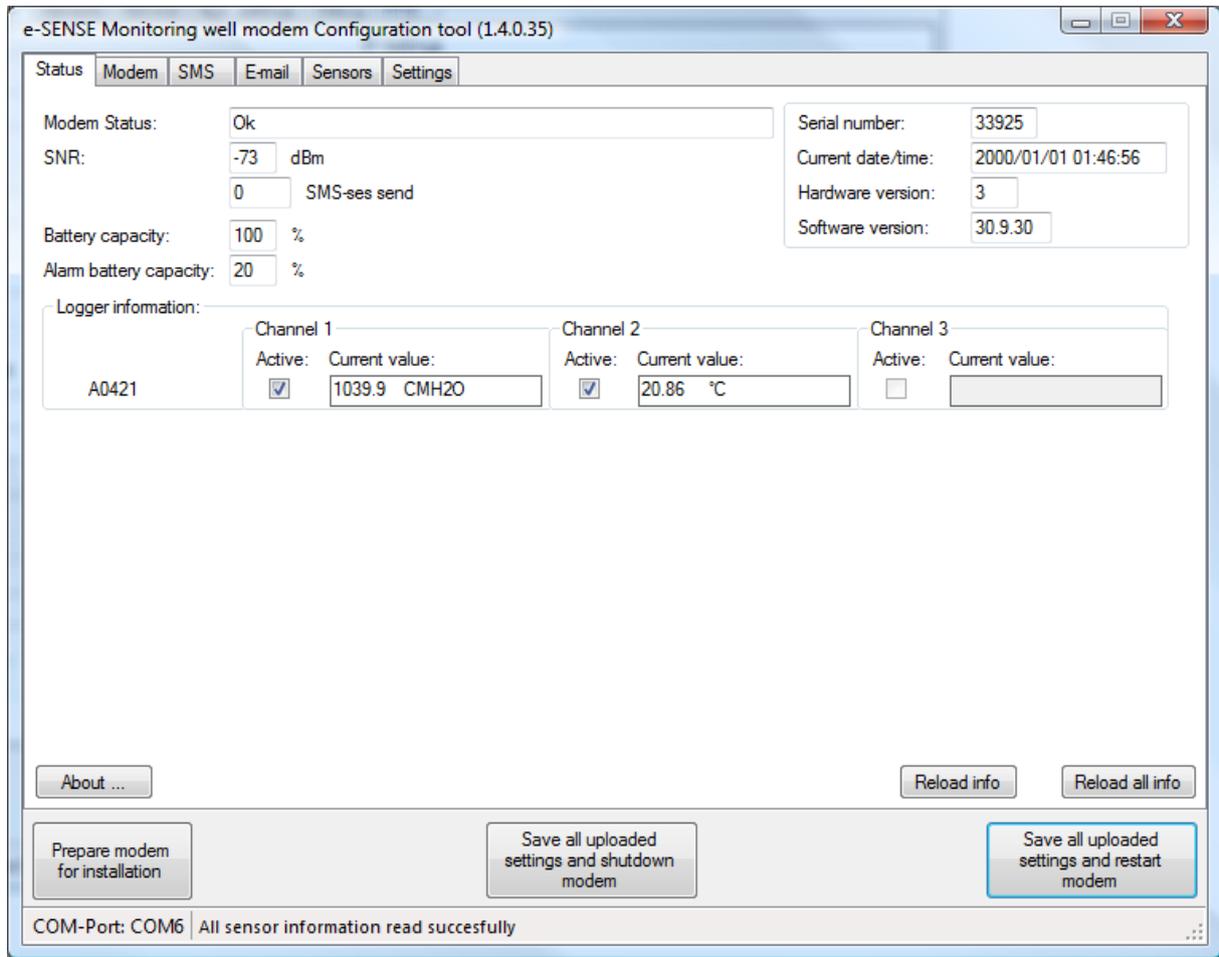
2.4.2 Status Tab

In the *Status* tab we can see the status of the system at a glance:

- Modem Status:* (status of the monitoring well modem)
- SNR: ... dBm* (signal quality).
- SMS-ses send ...* (the number of SMSs send up to now).
- Battery capacity ...* (The current battery capacity).
- Alarm battery capacity* (The entered percentage at which a battery 'low' alarm SMS must be sent).
- Serial number ...* (the monitoring well modem serial number).
- Current date/time* (The current internal date and time).
- Hardware version ...* (Hardware version of the monitoring well modem).
- Software version ...* (installed Firmware software version in the monitoring well modem).
- Logger information:* (serial number + the last logged measuring values of the connected logger).



In this tab no changes are possible!



The **About...** button is used to give information on the software used (version, copyright, etc.)

The **Reload all info** button is used to refresh all the information on all tabs.

2.4.2 Modem Tab

In the *Modem* tab, the various settings of the monitoring well modem can be changed:

- Location* (the location of this monitoring well modem).
- GPS coordinates* (GPS coordinates of this location).
- Wake-up interval ... minutes* (Every ... minutes the monitoring well modem wakes up to check whether update messages have been sent by e-SENSE direct. Minimum 5 minutes).
- Enable daytime saving* (By ticking this option, the monitoring well modem will automatically adjust its internal clock at the transition between summer and winter time and winter and summer time. This does not result in the clock being synchronised with the e-SENSE direct server, the monitoring well modem however will send all data gathered till this transition)
- Synchronise date/ time with the server, every ... days* (Tick and set the number of days after which the monitoring well modem will synchronise its internal clock with the e-SENSE direct server).
- Data redundancy ...* (Optional. Three options are possible here: 0, 1 and 2. For option 0, only the current measuring data are sent, for option 1 the measuring data of the current and the previous send interval are sent, for option 2 the measuring data for the current and the previous two send intervals are sent).
- Battery capacity alarm* (The entered percentage at which a battery 'low' alarm SMS must be sent).
- Current battery capacity* (Current battery capacity, field cannot be changed).
- The **New battery** button resets the battery capacity measurement after a new battery has been installed.
- Do not send below ... degrees Celcius* (The set temperature threshold under which the modem must no longer send messages due to the limited battery capacity at low temperatures).
- Wait max. ... wake-up intervals* (The number of wake-up intervals that may be waited before sending at the set temperature threshold. After the number of wake-up intervals has expired, the modem can send the data).
- SIM PIN* (If the SIM card is protected with a PIN code, enter the PIN code here)



Current battery capacity, Serial number, Current date/ time, Hardware and software version cannot be changed!

The screenshot shows the 'e-SENSE Monitoring well modem Configuration tool (1.4.0.35)' with the 'Modem' tab selected. The interface includes several input fields and checkboxes for configuring the modem. The 'Location' is set to 'Eijkelkamp Giesbeek' and 'GPS coordinates' to '52.189583, 5.295244'. The 'Wakeup interval' is 120 minutes, and 'Synchronise date/time with server, every 120 days' is checked. 'Data redundancy' is set to 0. 'Battery capacity alarm' is 20%, and 'current battery capacity' is 100%. 'Don't send below' is 0 degrees Celsius, and 'Wait max.' is 5 wakeup intervals. The 'Serial number' is 33925, 'Current date/time' is 2000/01/01 00:50:45, 'Hardware version' is 3, and 'Software version' is 2.8.0. The 'SIM PIN' is 0000. Under 'Commercial options', 'Internal baro', 'Analogue port', 'Redundancy', and 'Email' are unchecked, and 'Use email as media' is also unchecked. At the bottom, there are buttons for 'Prepare modem for installation', 'Save all uploaded settings and shutdown modem', and 'Save all uploaded settings and restart modem'. A checkbox at the bottom left is checked, stating 'I hereby permit Eijkelkamp Agrisearch Equipment to be able to perform remote (over-the-air) service'. There are also 'Reload info' and 'Send to modem' buttons.

2.4.4 Sensors Tab

In the *Sensors* tab, the settings of the connected and activated (internal) sensors can be viewed and updated. We will explain the most important settings on this tab. For the remaining sensor-related settings, we refer to the manuals of the e+ sensor or Diver concerned.

- Measuring interval ... minutes* (is the measuring frequency of the logger, every ... minutes a measurement is taken and saved)
- Send interval ... minutes* (is the sending frequency of the monitoring well modem. Every minutes the measuring data are sent. Note: The *Send interval* must always be a multiple of the *Wake-up interval* and a minimum of 15 minutes. See the modem tab !)
- Send start (hh:mm)* (The combination of send start and send interval determines when data is sent).



If '*Average measurement*' is activated, then the measuring interval must be a minimum of two minutes!

Note: *Average measurement* means that 10 measurements are taken during the measuring interval. The average of these measurements is stored and/or send. Always 10 measurements per measuring interval!



The measuring and send intervals of the internal baro sensor are equal to the measuring and send intervals of an external sensor.



If an external e+ sensor or Diver is connected it is not possible to set the measuring and send interval of the internal barometer and analog port.



When only an external analog sensor and internal barometer are used, only the measuring and send interval of the internal barometer can be set

The screenshot shows the 'e-SENSE Monitoring well modem Configuration tool (1.4.0.35)' with the 'Sensors' tab selected. The device 'EAE Giesbeek [A0421]' is selected in the left pane. The main area displays various configuration fields:

- Location:** EAE Giesbeek
- Altitude:** meters
- Offset:** 0.0 CMH2O
- Average measurement
- Internal compensation
- Sample interval:** 60 minutes
- Send interval:** 1440 minutes
- Send start:** 08:00 (hh:mm)
- Battery cap.:** 59

Below these are three channel configuration sections:

	Channel 1	Channel 2	Channel 3
Active	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Identification:	LEVEL	TEMPERATURE	
Minimum value:	0.0	-20.00	
Maximum value:	1000.0	80.00	
Unit:	CMH2O	°C	
Alarm high:	1000.0	80.00	
Hysteresis high:	1000.0	80.00	
Hysteresis low:	0.0	-20.00	
Alarm low:	0.0	-20.00	
Fluctuation alarm:	1000.0	100.00	

At the bottom, there are buttons for 'Download sensordata', 'Calibrate internal baro', 'Reload Info', and 'Send to sensor'. A footer bar contains 'COM-Port: COM8' and three large buttons: 'Prepare modem for installation', 'Save all uploaded settings and shutdown modem', and 'Save all uploaded settings and restart modem'.

Location (sensor site)

Altitude (height of the two-eye Diver, needed for compensating pressure difference)

Offset (displacement of zero-point sensor for channel 1)

The readings can be read off from the selected sensor with the **Download sensordata** button. The readings are not deleted.

Calibrate internal barometer button is only active if the option *Internal compensation* is ticked.

With this button, the offset of the internal baro with respect to the Diver in the air is determined. In this way the absolute deviation in the reading from both the internal baro sensor and from the Diver is eliminated.

Fluctuation alarm: the fluctuation alarm is active for all loggers on all channels, with the exception of Diver channel 1. Here the modem can only generate fluctuation alarms for internally compensated Divers.
(applies to all e+sensors, internal baro, analog port and internally compensated Divers)

The **Reload info** button is used to refresh the information in this modem tab.

The **Send to sensor** button is used to update the settings in the sensor. After a restart of the monitoring well modem, the settings will be definitively updated.

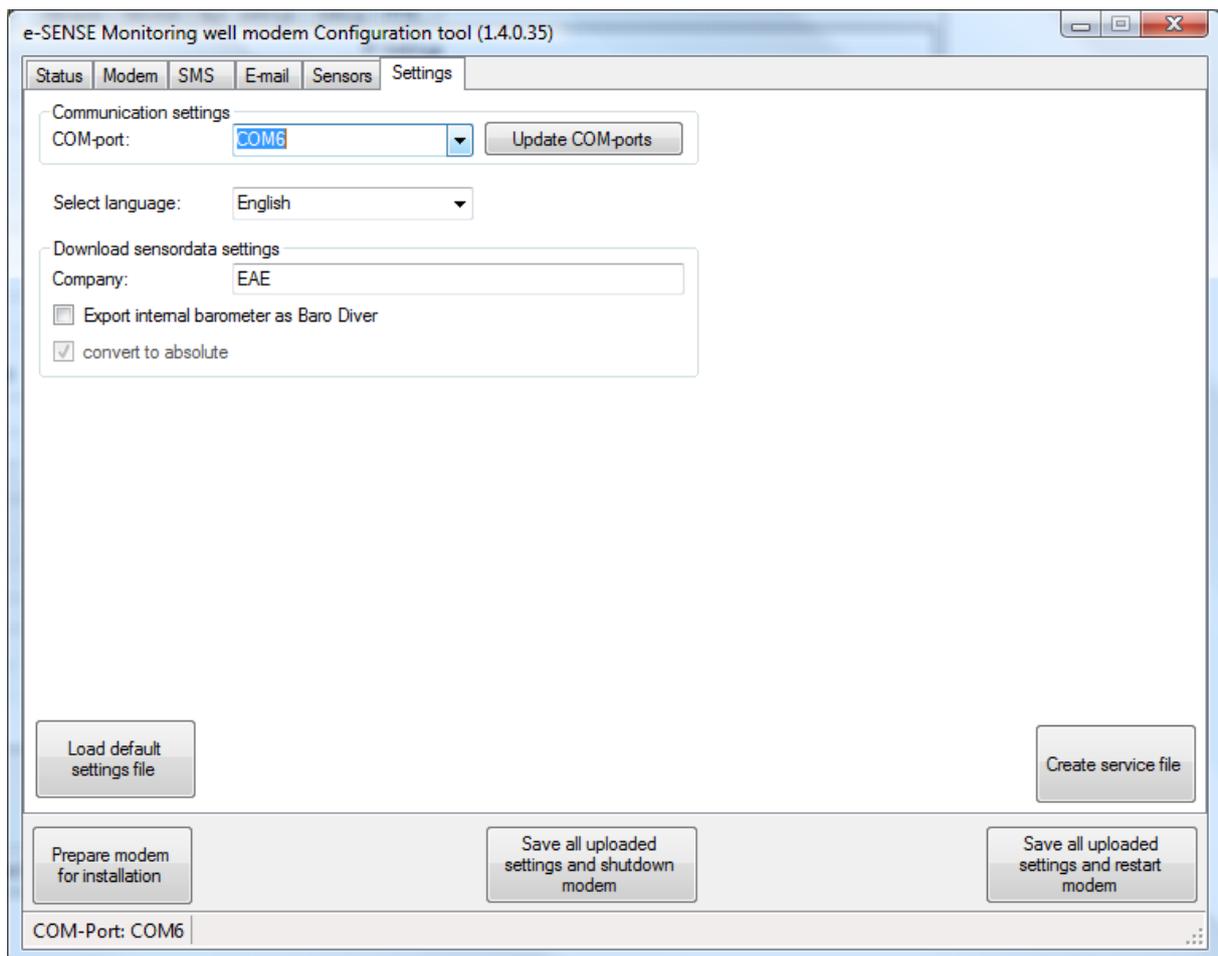


The logger is restarted after the monitoring well modem has successfully logged on to e-SENSE direct, the home base (R(eal)T(ime)C(lock)-synchronisation) and / or after 10,000 readings. (Readings sent to e-SENSE direct)

2.4.5 Settings tab

The settings of the e+ infrared communicator can be seen and can be updated in the *Settings* tab. The language of the configuration tool can also be set in this tab. Below we briefly explain the various settings;

- COM-port* (Provides the opportunity to choose the PC communication port to which the e+ infrared communicator is connected on the PC. Also when using an RS232 – USB convertor cable).
- Select language* (this is used to set the language of the configuration tool. Either Dutch or English can be selected).
- Download sensordata settings*
- Company*: the name that is filled in in the MON file when reading off the logger via the modem locally.
- Export internal barometer as Baro Diver*: tick when reading off from the internal baro, so that the internal baro is regarded as a Baro Diver when creating a MON file. The data can then be read off in Diver Office.
- Convert to absolute*: when this option is ticked, readings from two-eye Divers are converted to one-eye Diver readings, so that they can be used in Diver Office.



The ***Load default settings file*** button makes it possible to reset the monitoring well modem to the factory settings. It resets amongst others: serial number, destination numbers and wake-up interval.

The Default settings file is monitoring well modem dependent and is available from Eijkelkamp

Using the ***Create service file*** button, all settings are captured in a text file. Eijkelkamp is able to use this file for service purposes.

2.5 Switching on

As standard, a monitoring well modem is non active, even after the battery has been replaced.

After connecting the battery, the internal modem software must be launched by pressing the service key for 5 seconds. Depending on a number of factors, the modem will:

- launch configuration mode immediately
- indicate its status by means of a flashing LED. Press the service key until the modem enters configuration mode (one of the two LEDs is on).
- launch the log on procedure.

If the modem is in configuration mode, the following situations can arise:

If the green LED is on continuously, the log on procedure can be launched by pressing the service key until the LED goes out.

If the red LED is on, the error must be corrected before the log on procedure can be launched. Once the log on procedure has successfully been completed, both LEDs will go out.

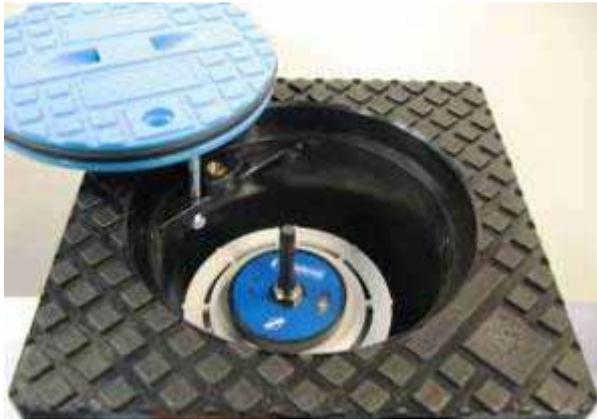
2.6 Installation

After the previous preparations have been completed, the monitoring well modem can be installed in the field. We distinguish two installation methods, namely;

- Directly in the monitoring well or
- In a monitoring well that is installed in a 'protective cylinder'

As standard, the modem is fitted with a fixed whip aerial, but an external aerial is also available. The external aerial is intended to be installed on the cover of the protective cylinder.

Adjust the universal monitoring well adapter ring to your monitoring well so that the modem hangs correctly in the monitoring well. Then connect the sensor cable to the monitoring well modem. Allow the monitoring well modem to drop into the monitoring well.



Above: Monitoring well modem installed in a street cover
Below: Monitoring well adapter ring



The monitoring well modem installed in a protective cylinder, fitted with an external aerial, that is mounted in the cover of the cylinder

2.7 Alarm system

It is possible to generate alarms if there are compensated measurement data available. This can preferably be arranged via the internal barometer (when internal compensation is active) in the monitoring well modem. Monitoring well modem with internal barometer: at every measurement interval (standard value: 1 hour) an alarm can be sent (of course only if the alarm level has been reached or exceeded). Alarms are always indicated via e-SENSE direct. e-SENSE direct sends the alarm message straight through to the GSM number (alarm number), that has been entered into e-SENSE direct (see instructions for use e-SENSE direct).

Via e-SENSE direct: as soon as the measurement data of the external barometer and the related data from the modem have been received, an alarm can be sent.

Therefore:

- e+ sensor (e.g. e+ WATER L): compensated data: if the alarm value is exceeded, a signal is sent to the modem and an alarm is given (e+ sensor operates synchronously with the modem, therefore the alarm is immediate).
- Diver with internal barometer and internal compensation active (via monitoring well modem): if the alarm value is exceeded, a signal is sent to the modem and an alarm is raised (Diver with internal barometer operates synchronously with the modem, therefore the alarm is immediate).
- Diver with (external) Baro Diver (or internal barometer with internal compensation not active): only when data from the Diver and Baro Diver have been received, can e-SENSE direct transmit an alarm. It is possible for this to take (up to) 24 hours.

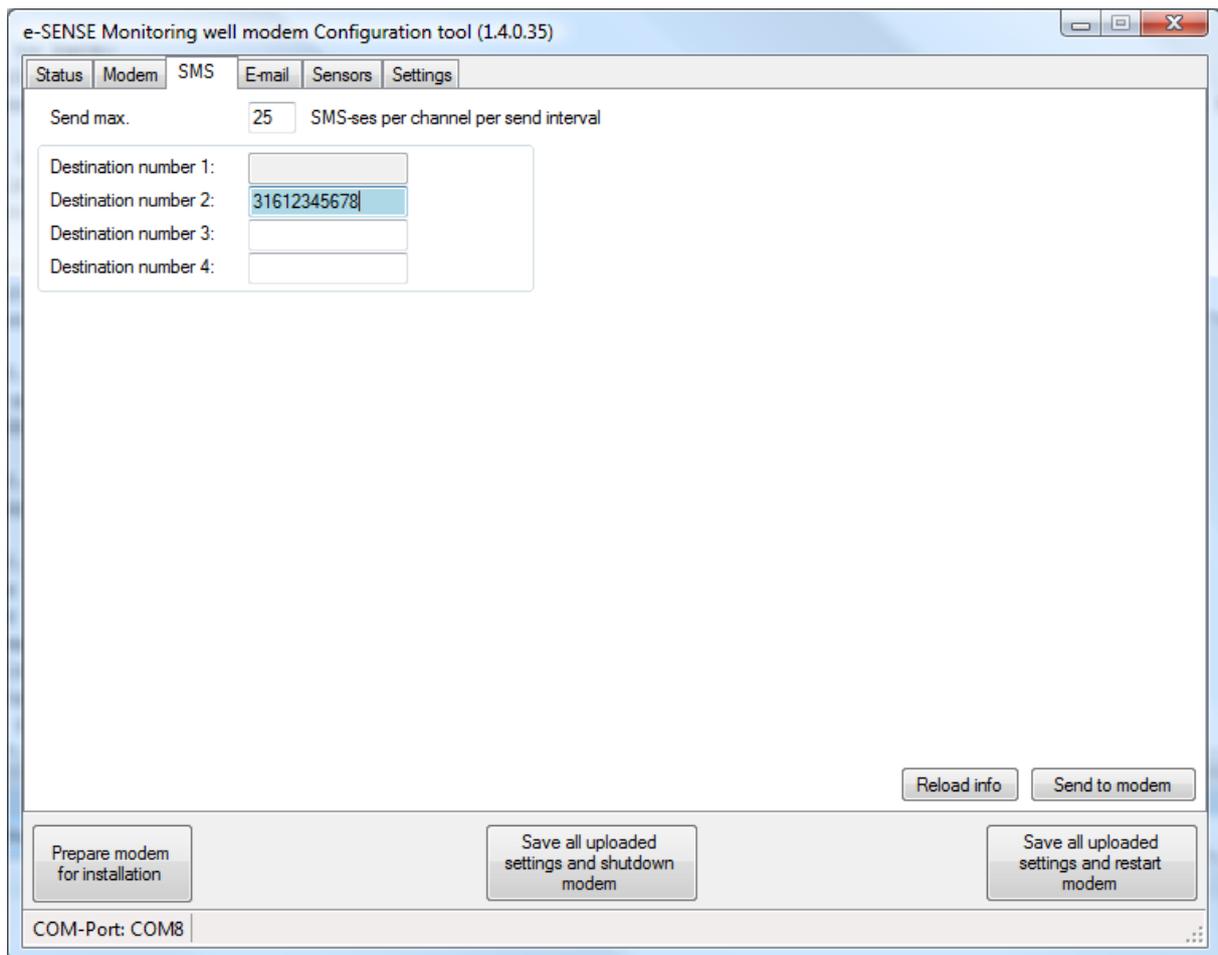
3. SMS functionality

3.1 SMS tab

The various SMS settings can be set and changed in the SMS tab.

- Send max. ... SMS-ses per channel per send interval* (The maximum number of SMSs that may be send per send interval per channel).
- Dial-up number 1/2/3/4: ...* (dial-up number / dial-up numbers for e-SENSE direct) *Dial-up number 1* cannot be changed but is configured by Eijkelkamp, the remaining three can be freely configured. A minimum of one dial-up number must be filled in.

 ***Dial-up number 1*** cannot be changed!



e-SENSE Monitoring well modem Configuration tool (1.4.0.35)

Status Modem **SMS** E-mail Sensors Settings

Send max. 25 SMS-ses per channel per send interval

Destination number 1:

Destination number 2:

Destination number 3:

Destination number 4:

Reload info Send to modem

Prepare modem for installation Save all uploaded settings and shutdown modem Save all uploaded settings and restart modem

COM-Port: COM8

The ***Reload info*** button is used to refresh the information in this modem tab.

The ***Send to modem*** button is used to send the changes to the monitoring well modem. Note: the new settings are only accepted after ***Save all changed settings and restart the modem*** button has been clicked.

3.2 Questions and answers

3.2.1 During the installation

The following tips give more information about how to act if an error condition occurs during the installation. Based on the status LEDs on the panel and the configuration tool, you can determine what the problem is and correct it.

Question / problem:

The status LED does not light after five seconds when I press the service key.

Possible solution / answer:

Press the service key for five seconds again or keep it pressed for 15 seconds to enter the configuration mode. If still nothing happens, try to use a laptop running the configuration tool to make contact with the monitoring well modem. If it is still impossible to make contact, the monitoring well modem must be removed from the monitoring well. Disconnect the battery, wait at least 10 seconds, reconnect the battery and try again to make contact with the monitoring well modem. Contact Eijkelkamp, if disconnecting the battery does not help.

3.2.2 During use

If the installation and the start up of the monitoring well modem are successfully completed, it is possible that an error could occur some time. Based on the following tips and instructions, you can try to determine what the possible error is and how to correct it.

Question / problem:

The monitoring well modem always functioned well, but the measuring values are received at the central database with increasingly more interruptions.

Possible solution / answer:

The GSM signal is possibly too weak. Check the GSM signal strength on site using the configuration tool. The signal strength must be a minimum of -95 dBm. If the measured signal strength is too low (between -95 dBm and -113 dBm) then probably the variations in the signal strength are the reason that the SMS messages are not received by the central server. A possible option is to install the monitoring well modem in a protective cylinder with an external aerial. In the most extreme cases, a new location must be found for the monitoring well modem.

If the external temperature drops below the '*Do not send below ... degrees Centigrade*' setting, then the modem waits before sending the messages until the outside temperature has risen sufficiently or the maximum number of *Wake-up intervals* has passed.

Question / problem:

After the monitoring well modem has operated correctly for some time, suddenly, no new measuring values are received for a certain sensor.

Possible solution / answer:

It is possible that the monitoring well modem's GSM connection is temporarily unavailable. The measuring values will then be re-sent later. If the error does not go away, it is possible that the sensor cable has been damaged, the sensor's battery is flat or the sensor has developed an error. In that case, an alarm SMS is sent and the sensor is deactivated in e-SENSE direct. In e-SENSE direct, try to re-activate the sensor. If this does not work, check the sensor in the field using the configuration tool and if possible replace its battery (this is not possible for a Diver®). Contact Eijkelkamp if the sensor is broken or the error cannot be corrected.

Question / problem:

How can I turn off the monitoring well modem?

Possible solution / answer:

The monitoring well modem is turned off as follows; set the monitoring well modem in configuration mode and disconnect the battery.

Question / problem:

The monitoring well modem operates well, but after some time the measuring values do not correspond to the correct times.

Possible solution / answer:

During a monitoring well modem re-start, both the clock of the internal monitoring well modem and the internal clock of the connected logger will be synchronised with e-SENSE direct. The monitoring well modem can be re-started by putting the monitoring well modem into configuration mode (press the service key for 15 seconds until the green LED lights) and then pressing the service key again to leave the configuration mode. After leaving the configuration mode, the monitoring well modem saves its settings which takes ten seconds. During this period, both LEDs are off. After ten seconds, the monitoring well modem starts the log on procedure.

Question / problem:

When re-starting after changing the SIM card, the red LED is lit continually.

Possible solution / answer:

Check whether the dial-up numbers are still correct. Is the PIN code of the SIM card turned off or set to another value. Check all of the settings of the monitoring well modem. Check whether the SIM card subscription is active. If the SIM card is a prepaid card, check whether there is still sufficient credit on the card account.

Question / problem:

What is the best time to disconnect the battery?

Possible solution / answer:

When the modem is in configuration mode.

Question / problem:

How many SMSs can be saved in the monitoring well modem if there are problems with reception quality or if the prepaid credit is exhausted?

Possible solution / answer:

The SMSs will be saved if they cannot be sent within the send interval. The cause can be poor reception, exhausted prepaid credit*, or a provider fault. A maximum of 99 SMSs can be saved in this way. In the case of log messages, the maximum is 6534 log values.

After the monitoring well modem has saved 6534 log messages, any subsequent messages will be lost. The monitoring well modem will continue to run and periodically try to send the log messages. The monitoring well modem starts to send messages automatically when the prepaid credit has been topped up. This is also the case when the monitoring well modem is moved due to poor reception quality.

Therefore, the measuring data remain intact, but new measurements will no longer be saved.

Question:

Configuration mode will not start!?

Possible solution / answer:

Release the service key and press the service key again for 15 seconds. If configuration mode will not launch after several attempts, disconnect the battery for 10 seconds.

Question:

The modem will not log on!?

Possible solution / answer:

A weak signal could be the cause. Return the modem to configuration mode and check the signal strength several times (*Reload info* in the *Status tab*). If the signal strength (after several readings) is -171 dBm, the link between the modem and the antenna is cut. Check the connection.

If the signal strength is < -95 dBm, the location chosen is unsuitable or there are provider problems.



Eijkelpamp recommends that prepaid SIM cards should not be used because of the difficulty in checking the credit and the consequences of the credit being exhausted!

3.3 Specifications monitoring well modem with SMS functionality

Technical specifications:

Message mode	: SMS (GSM Quad band) / e-mail (GPRS)
Number of external sensor ports	: 2
Description of sensor ports	: Port 1 e+ sensor / Diver® (extern) : Port 2 internal Baro sensor (internal) : Port 3 Analog (4...20 mA or 0...5 V) (external)
Operational temperature range	: -20...+50 °C
Memory capacity	: Max. 15.000 log intervals
Measuring frequency	: 1 min to 99 hrs.
Integrated barometer	: Optional. For barometric Diver® compensation : Measuring range 400...1150 mbar (≈ cm H ₂ O) : Accuracy baro sensor max. 0.5 cm * : Resolution baro sensor 0.1 mbar (cm) typical : Data storage in monitoring well modem
Integrated temperature sensor	: Measuring range -40°C...125 °C : Resolution 0.01 °C : Accuracy temperature 2 °C **
Aerial	: Quad band (900-1800 / 950-1950 MHz) : Connector: Bulkhead : Dimensions: 55 mm x 9.65 mm : Other antenna available on request

Functional specifications

Time synchronisation	: Modem clock synchronisation on the initiative of the monitoring well modem with e-SENSE direct
Real time clock (RTC)	: Summer/ winter time can be set
Accuracy of the external logger	: Equivalent to the logger
Accuracy of the internal baro	: Equivalent to an integrated barometer
Accuracy of the analog input	: 10 uA/2.5 Mv
Alarms	: Direct e+ sensor alarm if alarm value exceeded (optional Diver alarm when integrated barometer is used)

Power supply

Supply voltage	: 3.6 V
Battery	: Article number 11.31.25 (user replaceable)
Battery life time	: With SMS > 2 years***

Housing

Dimensions	: Diameter housing = 48.3 / Diameter cap = 60 / Length tube = app. 340 mm
Protection class	: IP67
Material	: Housing SS 304, Cap POM
Weight	: App. 1750 gram

Special details

SIM card replaceable by user

* = At 25 °C

** = Meant for temperature compensation of the baro sensor measurement and the "don't send bellow" functionality.

*** + Wake-up interval 1x per day, send interval 1 x per day, log interval 1 x per hour

4. E-mail functionality

4.1 Introduction

In the recent past, the best option for sending data from the field to a back office was the Short Message Service (SMS). Even when the General Packet Radio Service (GPRS) became available, it was not really an option as it was prohibitively expensive early on. But times have changed. Nowadays, SMS is useful in areas where there is no GPRS service, e-mail is the new communication standard for this purpose. There are several advantages to using e-mail. If you choose your contract carefully, the costs are lower than those for SMS, the battery lasts longer and you no longer need a back office (as you would need e-SENSE direct, for example, if you wanted to send data by SMS).

An e-mail is sent to the configured e-mail addresses and the data in question is sent as an attachment to the e-mail.

Attachment formats:

- MON Format: These files can be read in from Diver-Office and Essen LDM;
- CSV format: Comma-Separated Value files which can be read in in Microsoft Excel.

4.2 Functionality

The required monitoring well modem and logger settings are simply sent to the well modem by means of an e-mail. It is not possible to configure the well modem and the connected logger by SMS if you use the e-mail functionality.

Whenever settings in the well modem are changed, an e-mail will be sent to the e-mail addresses configured for outgoing e-mail to confirm this. A maximum of 4 outgoing e-mail addresses can be freely configured.

In the event of an alarm, an alarm e-mail will be sent directly to the e-mail addresses configured for outgoing e-mail.

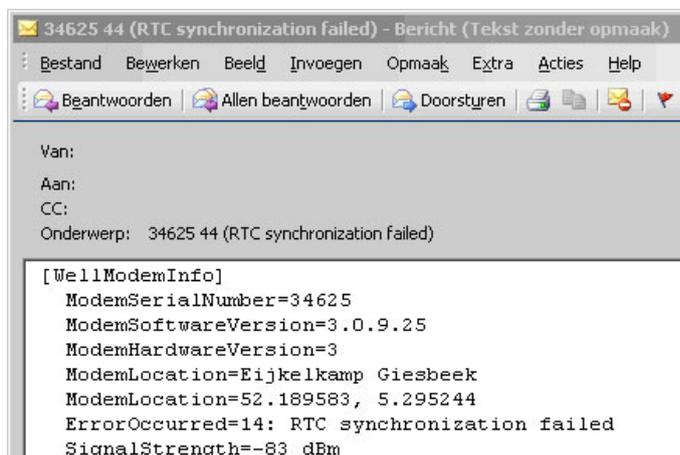
Other e-mail functionality:

- Storage of the 10 most recent changes received; these can be read out through the e-mail;
- Internal clock synchronisation with an NTP server;
- Password security can be set up.

4.3 Alarms and error messages (e-mail and SMS)

There is communication between the connected logger and the well modem at each log interval. In the event of an alarm or error message an e-mail is sent directly. In the event of an alarm, the alarm in question will be sent with a 'normal' status mail including data. In the event of an error message, an error message e-mail will be sent. Furthermore, it is also possible for the alarm to be sent as readable text or directly by SMS; you must, however, make sure that the data contract supports SMS functionality. The alarm or error message e-mail is sent to the 4 e-mail addresses configured. The SMS alarm messages are sent to the 4 numbers configured for outgoing calls.

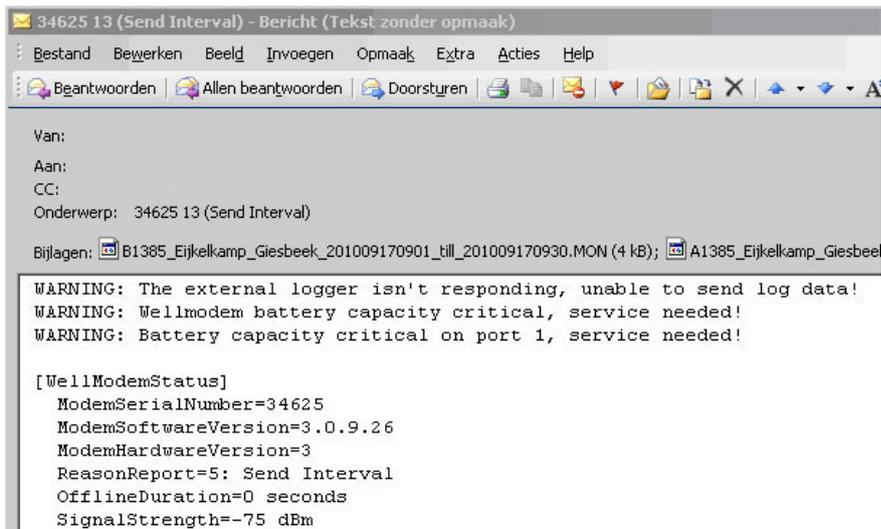
The error message is shown in the subject line of the error message e-mail received. This error message e-mail is sent *once*;



List of possible error messages

#	Error message (English)
8	Battery low modem detected
8	Battery low logger detected
10	Logger Communication Error
11	Logger Disabled because of failure
14	RTC synchronisation failed
15	Disabled Logger because it stopped by an unknown reason
16	Disabled Logger because of critical battery capacity
17	Could't connect to the POP3 server

If there is no response to the error message and it is not solved, every successive status e-mail will display the word 'Warning' in the e-mail text.



List of possible warnings:

- WARNING: The modem is currently roaming! Costs can be higher as usual! (*)
- WARNING: The external logger isn't responding, unable to send log data!
- WARNING: Well modem battery capacity critical, service needed!
- WARNING: Well modem battery capacity low, service needed!
- WARNING: Battery capacity critical on port 1, service needed!
- WARNING: Battery capacity low on port 1, service needed!

(*) The error message 'Roaming' is not on the error message list as e-mails cannot be sent during roaming (searching for a GPRS network).

Examples of error message e-mails:

Example: Error message e-mail	Explanation of error messages (see the table above)
<pre>[WellModemInfo] ModemSerialNumber=34400 ModemSoftwareVersion=3.0.9.27 ModemHardwareVersion=3 ModemLocation=Eijkelkamp Giesbeek ModemLocation=52.189583, 5.295244 ErrorOccurred=16: Disabled Logger because of critical battery capacity ErrorPort=1 SignalStrength=-77 dBm Temperature=26.3 degC BatteryCapacity=99% DateTimeSend=17-09-2010 15:55:20</pre>	<ul style="list-style-type: none"> 8 – Battery low logger detected 8 – Battery low modem detected 10 – Logger Communication Error 11 – Logger Disabled because of failure 13 – Roaming 14 – RTC synchronisation failed 15 – Disabled Logger because it stopped by an unknown reason 16 – Disabled Logger because of critical battery capacity 17 – Couldn't connect to the POP3 server
<pre>[LoggerInfoPort2] LoggerTypePort2=5 SerialNumberPort2=.B01-B1376_0252. LocationPort2=Eijkelkamp Giesbeek</pre>	

Example of a status e-mail (without alarm):

Status mail (including data and possible alarms)	Explanation of messages
<p>[WellModemStatus] ModemSerialNumber=30000 ModemSoftwareVersion=3.0.9.27 ModemHardwareVersion=3 ReasonReport=5: Send Interval OfflineDuration=0 seconds SignalStrength=-75 dBm Temperature=25.7 degC BatteryCapacity=99% BatteryCapacityAlarm=20% BatteryCapacityPort1=96% DateTimeSend=17-09-2010 14:30:55</p>	<p>Codes with reasons for messages 0 – adjustment carried out by remote control 1 – adjustment carried out locally 2 – RTC synchronisation 3 – New logger detected 4 – Wake-up interval 5 – Send interval 6 – Alarm situation changed</p>
<p>[WellModemSettings] ModemLocation=Eijkelkamp Giesbeek GpsCoordinates=52.189583, 5.295244 WakeUpInterval=5 minutes DoNotWakeUpBelow=0 degC SkipMaxWakeUp=5 wakeup intervals RtcSynchEnable=1 RtcSynchInterval=120 days DayLightSaving=0 NtpServer1=nl.pool.ntp.org NtpServer2= NtpServer3= Redundancy=1 send intervals</p>	
<p>[WellModemEmailSettings] EmailAddress1=backoffice@eijkelkamp.com EmailAddress2= EmailAddress3= EmailAddress4=</p>	
<p>[WellModemTelephoneSettings] DestinationNumber1=31612345678 DestinationNumber2= DestinationNumber3= DestinationNumber4=</p>	
<p>[WellModemAttachmentSettings] AttachmentType=MON ConvertToAbsoluteValue=1 ExportAsMiniDiver=0 CSVIncludeHeader=1 CSVDeactivatedChannels=1 CSVSeparator=; CSVDecimal=.</p>	
<p>[LoggerSettingsPort1] LoggerTypePort1=0 SerialNumberPort1=.N04-G5787 317. InstrumentNumberPort1= !LocationPort1=ctd-Diver OffsetPort1=0.0 CMH2O AltitudePort1=0 m InternalCompensationPort1=0 AverageMeasurementPort1=0</p>	<p>Possible logger type 0 – Diver 1 – internally compensated Diver 2 – e+ sensor 4 – analog port 5 – internal baro</p>
<p>[DataSettingsPort1] FileNamePort1=none NrOfLoggingsPort1=0 StartDateTimePort1=none SampleIntervalPort1=1 minutes SendIntervalPort1=15 minutes SendStartPort1=08:00</p>	

[ChannelSettingsPort1Channel1] ActivatedPort1Channel1=1 IdentificationPort1Channel1=PRESSURE MinimalValuePort1Channel1=400.0 CMH2O MaximumValuePort1Channel1=2150.0 CMH2O UnitPort1Channel1=CMH2O	
[AlarmSettingsPort1Channel1] AlarmHighPort1Channel1=n.a. HystHighPort1Channel1=n.a. HystLowPort1Channel1=n.a. AlarmLowPort1Channel1=n.a. FluctAlarmPort1Channel1=n.a.	
[AlarmStatesPort1] AlarmStateValuePort1Channel1=0 AlarmStateDescriptionPort1Channel1=No Alarm AlarmStateValuePort1Channel2=0 AlarmStateDescriptionPort1Channel2=No Alarm AlarmStateValuePort1Channel3=0 AlarmStateDescriptionPort1Channel3=No Alarm	Possible alarm values 0 – no alarm 1 – fluctuating alarm 2 – low alarm 3 – low, fluctuating alarm 4 – high alarm 5 – high, fluctuating alarm

4.4 Internal clock

Each well modem has an internal RTC (Real Time Clock). This clock has to be set to the actual time. We call this RTC synchronisation. The RTC synchronisation of a well modem with e-mail functionality takes place through the internet and NTP servers. Up to 3 NTP servers (NTP = Network Time Protocol) can be configured.

4.5 E-mail

In order to look at or change the settings of the well modem and/or connected logger, an e-mail is sent to the well modem requesting a change. The well modem reads the contents of the e-mail box stated and checks whether the 'subject' of every e-mail consists solely of the serial number of the well modem; the subject may, therefore, not begin with RE or FW, etc. If the serial number is correct, the e-mail is retrieved and processed by the well modem. After processing, a confirmation e-mail is sent back. If the serial number corresponds, but the content of the e-mail does not, the e-mail is automatically removed. If the serial number is not correct, the e-mail is not read and remains in the inbox. 'Spam' in the inbox is rejected on the basis of the subject and remains in the inbox. The maximum size of a change request e-mail is 6 kB; e-mails exceeding 6 kB are not processed and remain in the inbox. A change request e-mail must be sent as plain text or it will not be handled by the well modem.

It is advisable to check the well modem e-mail account regularly using an e-mail program or webmail (provided this is supported) for any incorrect messages and/or spam. These messages will not be removed automatically by the well modem.

4.6 Security

To make the system even more secure, the well modem checks the e-mail address of the sender. This e-mail address must be configured as one of the 4 e-mail addresses in the well modem or the message will be rejected. Password protection can also be set up in the well modem. This password is given on every e-mail message and ensures adequate security. The password option can be set up by the administrator using the configuration tool.

Summary of the security measures:

- The serial number in the subject is checked;
- The e-mail address of the sender is checked;
- The password in the text of the e-mail is checked (optional).

4.7 GPRS settings

The provider used must make the following details available (See Chapter 5.1):

- APN (Access Point Name). Note: there may be a difference between business and private contracts;
- User name;
- Password.

4.7.1 Getting to work

This chapter describes how to configure the e-mail in the well modem and the home base.

The basic necessities are as follows:

1. E-SENSE well modem (Article no. 11.31.15) with optional well modem e-mail (Article no. 11.31.15.03)
2. SIM card with GPRS contract
 - a. If the system has to send an alarm by means of SMS to a mobile telephone as well, the SIM card must also support SMS;
 - b. The provider details, such as APN (Access Point Name) details and passwords must be requested from the provider (See point 5 under configuration).
3. E-mail account (POP3)
 - a. E-mail address for the home base;
 - b. E-mail address for the well modem (write down this e-mail address because you will need it to configure the well modem and connected logger through the e-mail program).
4. e+ Infrared communicator (Art. no. 11.31.91) for the local well modem configuration tool.

4.7.2 E-mail tab

E-mail settings can be configured and altered using the e-mail tab of the well modem configuration tool. The individual settings are explained below:

GPRS settings

- *APN* (Access Point Name: Access point to the internet);
- *User name* (of the APN);
- *Password* (of the APN).

POP3 settings (well modem)

- *Server* (server name);
- *Port* (default 110);
- *User name* (of the POP3 server);
- *Password* (of the POP3 server).

SMTP settings

- *Server*;
- *Port* (ditto);
- *User name* (ditto);
- *Password* (ditto).

NTP settings

- *NTP server 1 through 3* (default: nl.pool.ntp.org);
 - *GMT offset* (is the GMT time correction needed for your region).
- Show passwords* (Option for making passwords legible when entering them).

E-mail addresses

- *Reply address* (is the address of the well modem sending the e-mail; this does not necessarily have to be the real e-mail address of the well modem to which the change requests are sent. For security reasons, the default here is: noreply@e-sensemail.nl);
- *E-mail addresses 1 through 4* (Outgoing e-mail addresses: Fill in at least 1 e-mail address).

Settings attachment

- *Use MON format as attachment* for settings appendix (the appendix is sent with the e-mail in MON or CSV format);
- *Export the internal barometer as Baro Diver* (the data from the internal barometer is interpreted by Diver Office as e+loggers and will not be accepted. If you tick this option, the data will be accepted by Diver Office);
- *Convert to absolute* (in cases where old 2-eye divers have been used. If this option is ticked, 950 mm will automatically be added to the test result).

CSV settings

- *Show header* (all the sensor details, such as the serial number, measuring and send intervals are displayed in the CSV file);
- *Hide deactivated channels* (Deactivated channels are not displayed in the CSV file);
- *Use 'TAB' as separating symbol* (Default = ; semicolon);
- *Use decimal point* (Default = , comma).

Select language for alarms (Language choice for standard alarms);

Authentication password (to provide extra security for the e-mail traffic between the well modem and the back office).

e-SENSE Monitoring well modem Configuration tool (1.5.0.2)

Status Modem SMS **E-mail** Sensors Settings

GPRS-settings
 APN: office.vodafone.nl
 Username: vodafone
 Password: *****

POP3-settings
 Server: mail.yourcompany.com
 Port: 110
 Username: wellmodem33925
 Password: *****

SMTP-settings
 Server: mail.yourcompany.com
 Port: 25
 Username: wellmodem33925
 Password: *****

NTP-settings
 NTP-Server 1: nl.pool.ntp.org
 NTP-Server 2:
 NTP-Server 3:
 GMT offset: 1

Show Passwords

E-mail addresses
 Reply address: noreply@yourcompany.com
 E-mail address 1: backoffice@yourcompany.com
 E-mail address 2:
 E-mail address 3:
 E-mail address 4:

Attachment settings
 Use Mon-format as attachment

MON-settings
 Export internal barometer as Baro Diver
 Convert to absolute

CSV-settings
 Include header
 Hide deactivated channels
 Use 'TAB' as separator character
 Use decimal point

Select language for alert SMS-ses: English

Authentication password

Reload info Send to modem

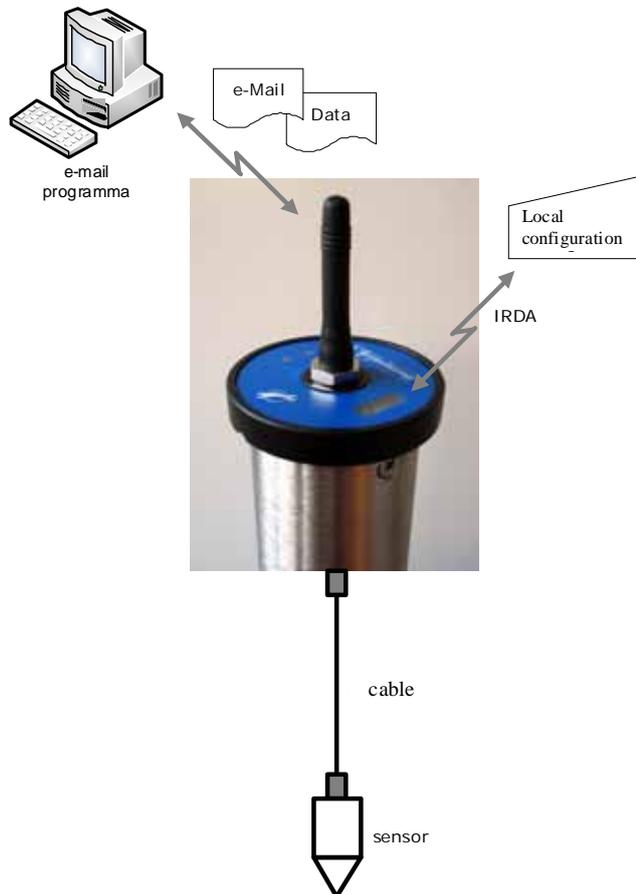
Prepare modem for installation Save all uploaded settings and shutdown modem Save all uploaded settings and restart modem

COM-Port: COM8 All modem information read succesfully

4.8 Configuration

We can split a configuration up into 3 components (see illustration); the settings for each element must be configured specifically for each client.

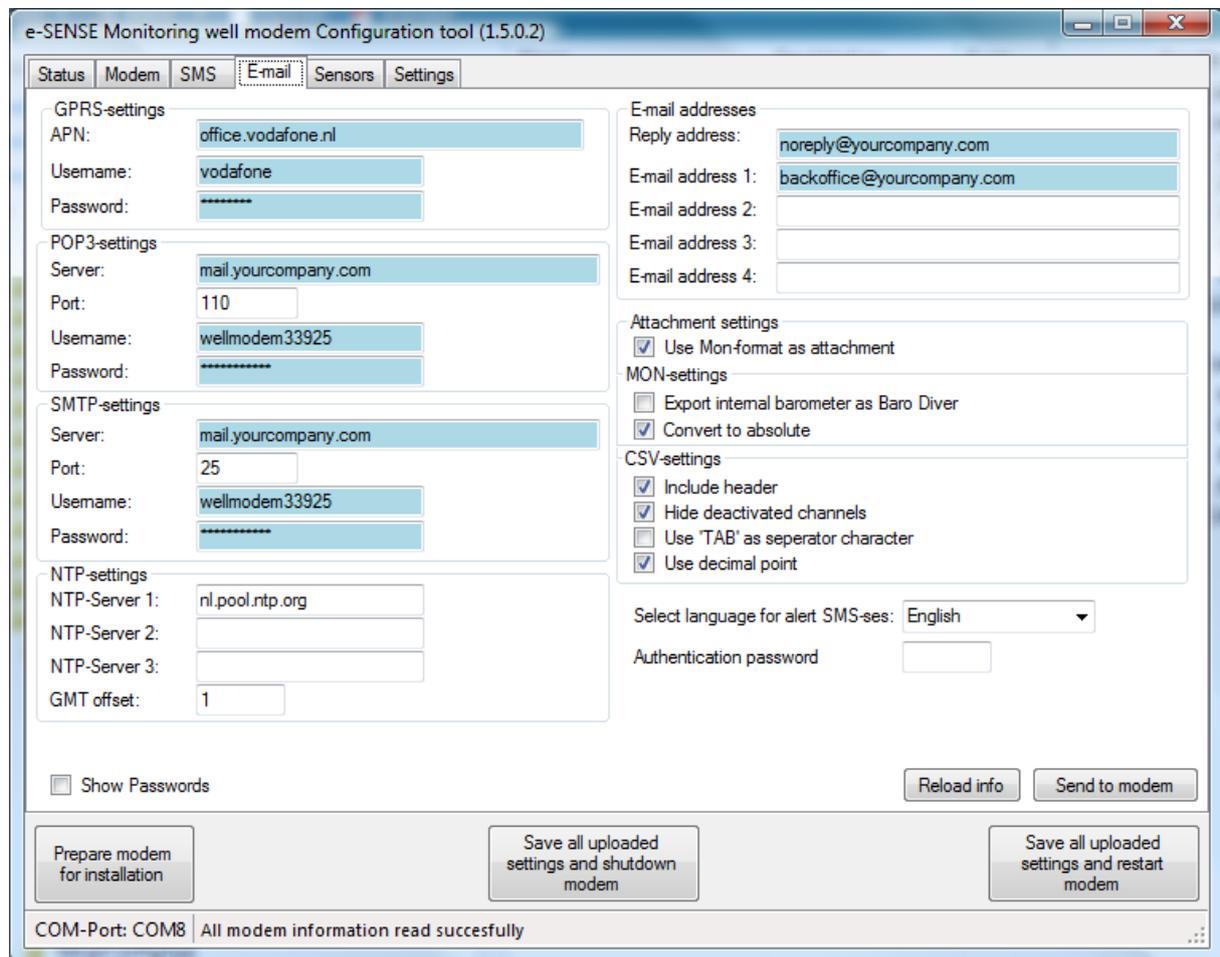
- The home base: e-mail program such as Microsoft Outlook, Outlook Express or Thunderbird;
- Configuration possibilities, locally with the e-SENSE configuration tool and from the home base using the e-mail program;
- e+ sensor/Diver® by Schlumberger Water Services' /analog sensor (optional)/Internal barometric sensor (Optional).



4.8.1 The well modem

Ask your e-mail administrator to create an e-mail account for the well modem. It is advisable to create separate e-mail addresses for the various well modems.

The following obligatory e-mail settings must be configured using the well modem configuration tool:



Note: The e-mail addresses used in the example are fictitious and have only been used to clarify the procedure.

Note: It is possible that not all user names and passwords are obligatory. This will depend on the provider.

4.8.2 The connected logger

The connected logger (e+sensor or Diver) must be configured prior to use. This can be realised using the well modem configuration tool sensor tab, but also using LDM or, in the case of a Diver, with Diver Office.

Note: All the data present in the logger is sent when the well modem is registered.

4.8.3 The e-mail receiver

In fact, the e-mail receiver is configured simply by creating an e-mail account to receive the well modem status mails and data.

4.8.4 Starting up/testing

As soon as all the settings have been configured we can start up and test the system.

- Ensure that the receiving e-mail system (PC) is on, is connected to the internet and that the well modem e-mail account is activated.
- Go into the configuration mode of the well modem (see the explanation of the status LEDs) and press again, for 1 second on the service button to go through the registration procedure.

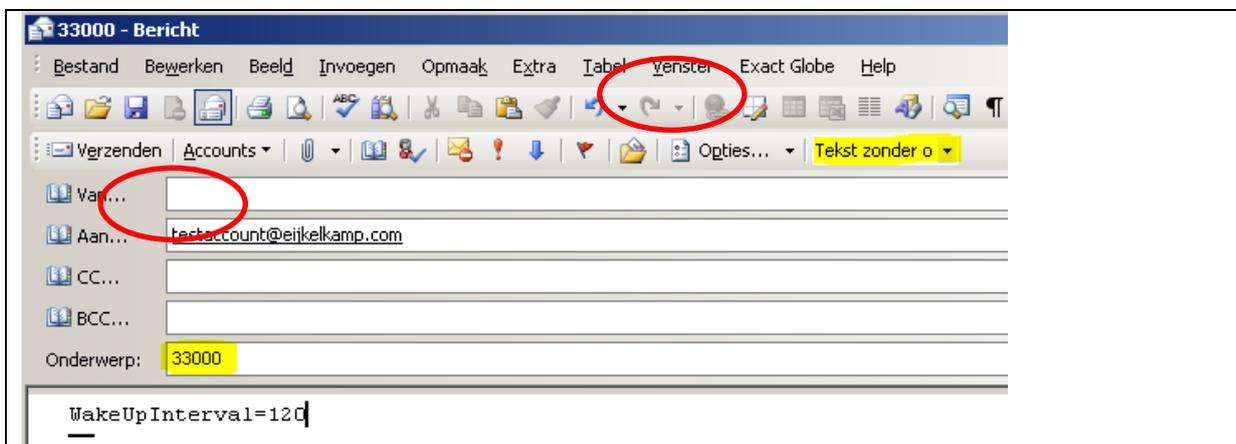
- You will receive a registration e-mail from the well modem with the configured well modem and logger settings (and possibly data).
- The well modem 'goes to sleep' when it receives the RTC setting from the NTP server and no errors have taken place.

4.8.5 Realising configuration changes using the e-mail program

It is possible to send configuration changes from the e-mail program to the well modem:

- Start a new e-mail.
- Adjust the parameters you want to change: change the wake-up interval from 5 minutes to 120 minutes, for example. Type only the serial number of the well modem in the subject line, without adding anything else (in our case, this is 33000).
- Type the e-mail address of the well modem in question in the 'To' field, (in our case, testaccount@eijkelp.com).
- Select 'Plain text' in the message format.
- Press 'send' to send the change to the well modem.

The change will be accepted at the next wake-up interval and a confirmation e-mail will be sent back.



It is possible to give instructions for more than one change in a single e-mail. However, make sure that the various settings do not contradict one another. For example, the send interval is a multiple of the wake-up interval and it has a duration of at least 15 minutes. A list of the configuration settings usually used is given below.

Table of the most important configuration changes:

Change request	Description	Possible values
BatteryCapacityAlarm	Capacity at which the well modem has to send a warning	5 - 98 % Default = 20%
ModemLocation	Location of the well modem	20 characters (no punctuation marks)
GpsCoordinates	GPS coordinates of the location	20 characters (no punctuation marks)
WakeUpInterval	Wake-up interval in minutes	5-65535 minutes; default = 120
DoNotWakeUpBelow	The well modem will not wake up below the temperature values configured	-40 to 85 degrees Celsius Default = 0
SkipMaxWakeUp	Max. successive number of times that the well modem will not wake up	0-255 wake-up intervals Default = 5
RtcSynchEnable	RTC internal clock synchronisation	0 = off 1 = on (default)
RtcSynchInterval	Interval in days between the RTC synchronisations	1 through 255 days default = 120 days
DayLightSaving	Deactivate summer/winter time	0 = off (default) 1 = on
GMTOffset	GMT offset (not adjustable on distance)	-12 to 12 Default = +1

NtpServer1..3*	IP address or URL of an NTP time server Max. 32 characters	If all fields are empty, there will be no time synchronisation
Redundancy	Setting data redundancy (provided article number 11.31.15.04 has been purchased)	0 = off (default) 1 = 1 redundancy send interval 2 = 2 redundancy send intervals
EmailAddress1..4*	E-mail address with which communication takes place; max. 55 characters	E-mail address 1 is not changeable
DestinationNumber1..4*	SMS number to which alarm SMSs have to be sent (max. 14 figures)	Telephone number beginning with country code without '+' or '00' Destination number 1 cannot be changed
SMSAlertsLanguage	The language in which the SMS alerts must be given; (not adjustable on distance)	NL, ENG, GER, FR Default = NL
AttachmentType	Attach data in MON or CSV format	MON (default) CSV
ConvertToAbsoluteValue	Convert old 2-eye diver data from channel 1 formula : value + 950 – (height/10)	0 = off 1 = on (default)
ExportAsMiniDiver	Export internal baro as a mini-diver	0 = off (default) 1 = on
CSVIncludeHeader	Add header information to CSV file	0 = off 1 = on (default)
CSVDeactivatedChannels	How deactivated channels are displayed	0 = 0 1 = <empty> (default)
CSVSeparator	Configuration of CSV separating symbol	0 = ; (default) 1 = TAB
CSVDecimal	The decimal point	, (default)
LocationPort<x>	Location of the logger port x	20 characters (no punctuation marks)
OffsetPort<x>	Master level logger port x	16 characters (no punctuation marks)
AltitudePort<x>	Height in metres	0 through 30000
InternalCompensationPort<x>	Internal port compensation x	0 = off (default) 1 = on
AverageMeasurementPort<x>	Average port value x	0 = off (default) 1 = on
SampleIntervalPort<x>	Measure every x minutes	- from 1 through 60 minutes as average port measurement<x>=0 - from 2 through 60 minutes as average port measurement<x>=1 - Whole hours up to a max. of 99 hours in minutes
SendIntervalPort<x>	Interval between sending times in minutes	Send interval is a multiple of the wake-up interval of the modem Default = 1440
SendStartPort<x>	Start send format hh:mm	applicable time Default = 08:00
ActivatedPort<x>Channel<y>	Is log data sent for this port on channel<y>? Y = Channel (1-3)	0 = off 1 = on (default)
AlarmHighPort<x>Channel<y>		Default) value max. measurement value of the logger

* = To delete the setting the value " none" must be send.

HystHighPort<x>Channel<y>		Default) value max. measurement value of the logger
HystLowPort<x>Channel<y>		Default) value min. measurement value of the logger
AlarmLowPort<x>Channel<y>		Default) value min. measurement value of the logger
FluctAlarmPort<x>Channel<y>		Default) value max. measurement value of the logger

Examples

SampleIntervalPort<x> → SampleIntervalPort1=60

(The measuring interval of the logger connected to port 1 is configured to 60 minutes)

ActivatedPort<x>Channel<y> → ActivatedPort1Channel2=1

(Switching the different channels of the connected logger on or off)

4.8.6 Questions and answers (FAQ)

Question:

Why doesn't the well modem accept my change?

Possible solution:

Check whether the change request e-mail was correctly drawn up. A change request e-mail has to be drawn up as follows:

- The correct serial number must be entered in the subject line without any additions such as RE or FW, etc;
- The correct well modem e-mail address must be entered in the 'To' field;
- The message format must be configured to 'Plain text';
- The change request must be drawn up correctly in accordance with the configuration table.

Question:

The system worked for a while but is no longer receiving e-mails and data; what is the problem?

Possible solution:

Has the modem sent a low battery alarm or error message e-mail or SMS? If so, it could simply be a case of the battery being empty. If not, it is advisable to first send a change request to the well modem and wait and see whether a confirmation e-mail is sent back. If no confirmation e-mail is sent back, you will have to check the well modem in the field to find out why the system is no longer functioning.

4.8.7 Specifications monitoring well modem with e-mail functionality

Technical specifications

Message mode	: E-mail GSM / GRPS Quad band (900-1800/950-1950 MHz)
Number of external sensor ports	: 2
Description of sensor ports	: Port 1 e+ sensor/Diver (external) : Port 2 internal Baro sensor (internal, optional) : Port 3 Analog (4...20 mA or 0...5 V) (external, optional)
Temperature range	: -20...+50 °C
Memory capacity	: Max. 15000 log intervals
Measuring frequency	: 1 min to 99 hr
Integrated barometer	: Optional. For barometric Diver compensation : Measuring range 400...1150 mbar (\approx cm H ₂ O) : Accuracy of baro sensor max. 0.5 cm (*) : Resolution of baro sensor 0.1 mbar typical : Data storage in the well modem
Integrated temperature sensor	: Measuring range -40 °C...125 °C : Resolution 0.01 °C : Temperature accurate to 2 °C (**)
Antenna	: Quad band (900-1800/950-1950 MHz) : Connector: Bulkhead : Dimensions: 55 mm x 9.65 mm : Alternative antenna available on request

Functional specifications

Time synchronisation	: Synchronisation with NTP server on the initiative of the well modem
Real time clock (RTC)	: Summer/ winter time can be set
Accuracy of the external logger	: Equivalent to the logger
Accuracy of the internal baro	: Equivalent to an integrated barometer
Accuracy of the analog input	: 10 uA/2.5 Mv
Alarms	: Direct e+ sensor alarms if the alarm value is exceeded (optional direct Diver alarm on the use of the integrated barometer)

Power supply

Supply voltage	: 3.6 V
Battery	: Article number 11.31.25 (can be replaced by user)
Life	: > 10 years with the use of e-mail (***)

Housing

Dimensions	: Diameter of housing = 48.3/Diameter cap = 60/Length tube = approx. 340 mm
Protection class	: IP67
Materials	: Housing: stainless steel 304, Cap: Polyoxymethylene (POM)
Weight	: Approx. 1750 g

Particulars

SIM card can be changed by the user.

Battery can be changed by the user.

* : At 25 °C.

** : Intended for temperature compensation of the baro sensor measurement and the 'don't send below' functionality.

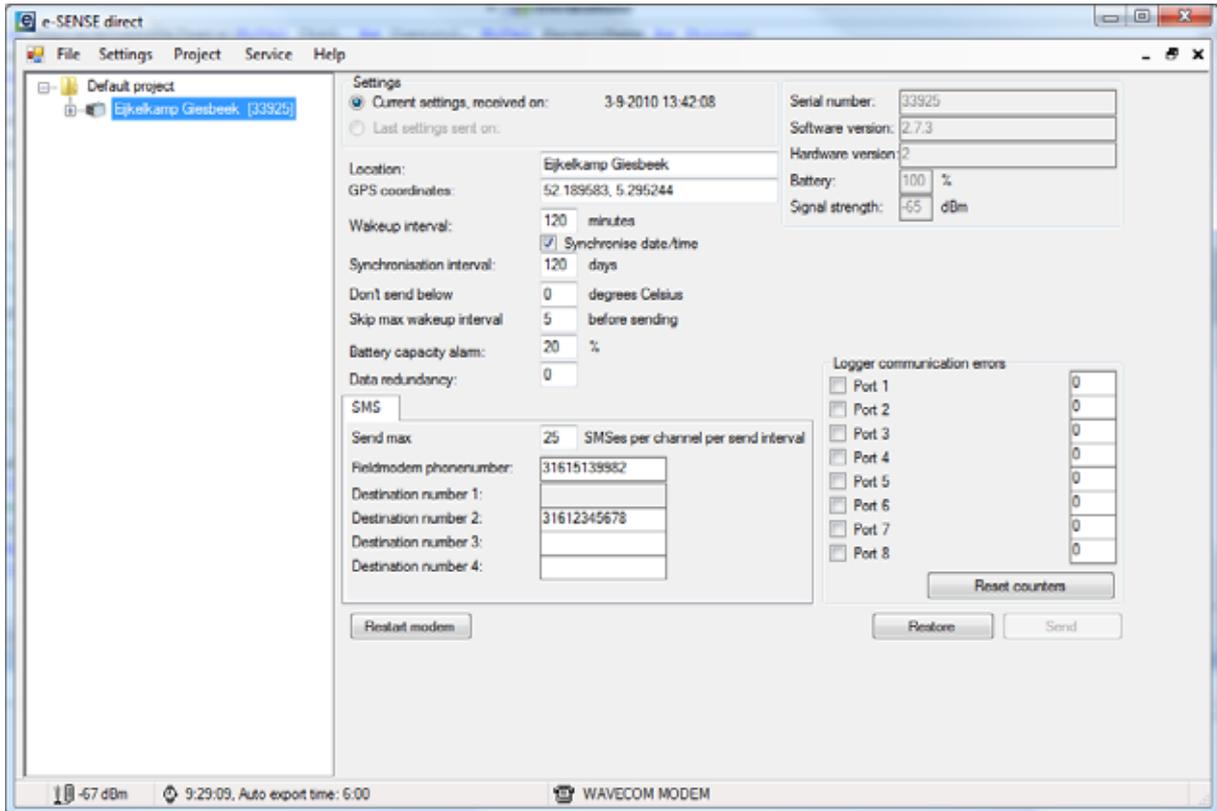
*** : With a wake-up interval of 3 x /d, send interval of 1x /d and log interval of 1 x /h, signal reach is better than -75 dB.

5. e-SENSE direct

e-SENSE direct is the central software used to remotely configure the monitoring well modem and where the sent data is collected and saved. Before the monitoring well modem is started, the e-SENSE direct system must be made operational. To achieve this, the e-SENSE direct software must be installed on a PC and the PC modem must be connected to the same PC.

For SMS communication, the e-SENSE direct PC modem must be connected to a 'free' serial port. For GPRS (e-mail) communication, the PC running the e-SENSE direct application must have access to the Internet and the firewall must be correctly configured for e-mail traffic.

For a detailed explanation, you are referred to the e-SENSE direct software manual.



6. Maintenance

- ❑ Regularly check the condition of all connection cables. Inspect the cables for wear or damage and replace where required.
- ❑ Replace the monitoring well modem battery and the e+loggers batteries in time. The minimum life expectancy of a monitoring well battery is two years in normal use. After a 'low battery' alarm SMS has been sent, SMS will continue to work but only for a limited period.
- ❑ Clean the panel of the monitoring well modem before starting to communicate with the laptop and the configuration tool. This is best done using a clean damp cloth. Do not use acetone, thinner, white spirit or any other corrosive cleaning agents. These can damage the panel and cause leaks!
- ❑ The monitoring well modem does not need servicing, as it is completely autonomous. The settings can be remotely changed via e-SENSE direct.
- ❑ When replacing the battery ALWAYS replace the desiccant bag included as well.

6.1 Replacing the battery

On receipt of a 'low battery' alarm SMS, the battery (art. 11.31.25) must be replaced along with the desiccant bag. Ensure that the modem is in configuration mode.



Work cleanly and in a way that eliminates any static discharge, use an anti-static mat and wrist strap!



Step 1: Unscrew the screws, just under the cap.



Step 2: Using your thumbs, carefully press the cap off.



Step 3: Slide the modem out of the housing carefully. Look out for the wiring. Work cleanly (for example, ensure that the greased O-rings do not become dirty, as this will inevitably lead to leakage) and prevent static.



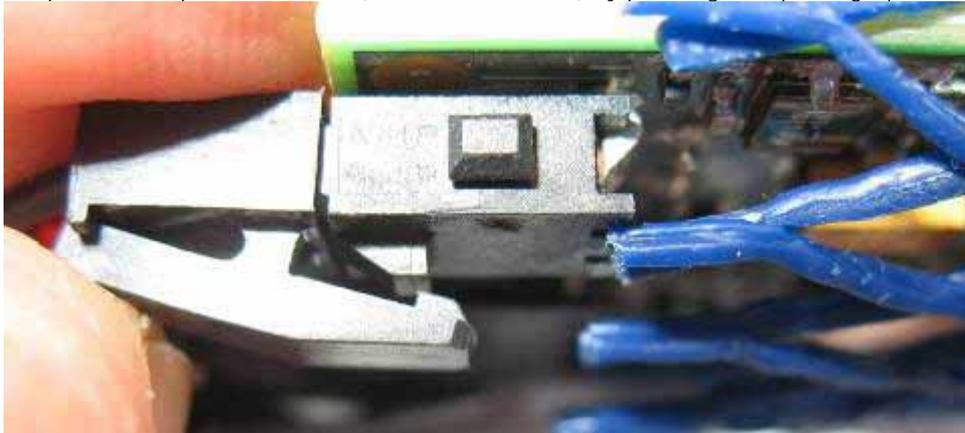
Depending on the work location, the greased O-rings may be protected by slipping a clean (sandwich) bag over the cover.

Step 4: Replacing the battery.

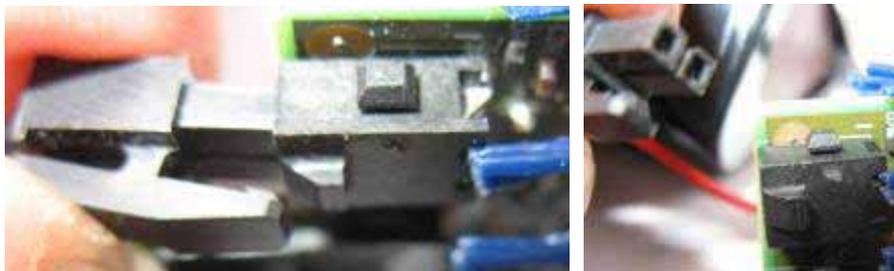
a) Slide battery completely out of the housing.



b) Open the clips of the 2-pole connector (black and red wire) by pressing, see photograph below.



c) Slide the battery cable connector carefully out from the cable connector on the printed circuit board, see photos below.



d) Install the new battery (in reverse order to the above). Ensure that the connector components are firmly pressed in to ensure that the connector components lock together.



Replace desiccant bag

There is a desiccant bag on the printed circuit board on the side of the SIM card. The bag is located between the printed circuit and a stocking. The desiccant bag should be replaced in the manner described below:



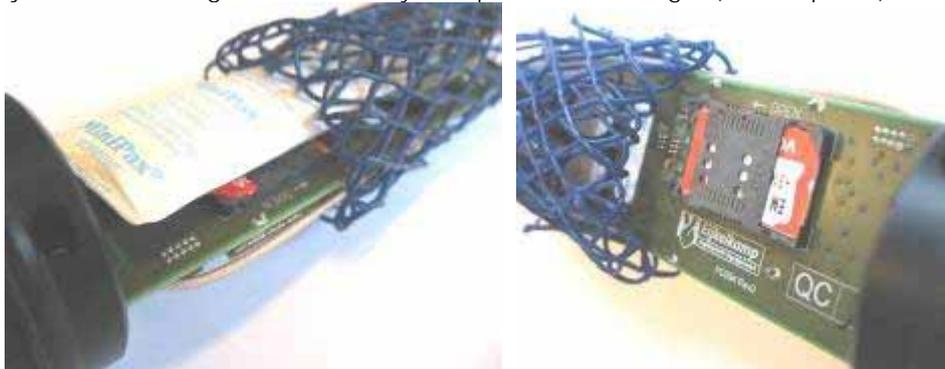
- **Work cleanly, anti-statically and in a dry environment.**
- **Remove the desiccant bag from its packaging at the last possible moment and avoid contact with damp!**
- **Carry out the steps set out below with the necessary care to ensure that the printed circuit board is not damaged.**



NEVER REMOVE THE STOCKING FROM THE PRINTED CIRCUIT BOARD!

Step 5: Steps for replacing the desiccant bag.

a) Carefully fold the stocking back sufficiently to expose half the length (see left photo).



b) Remove the old desiccant bag carefully (see right photo) and check whether this bag is excessively wet. If this is the case, this could be an indication of leakage. Please contact Eijkelkamp; service department.

c) Remove the new desiccant bag from its packaging and install in the same position as the old desiccant bag (on the SIM card).

d) Carefully fold the stocking back.

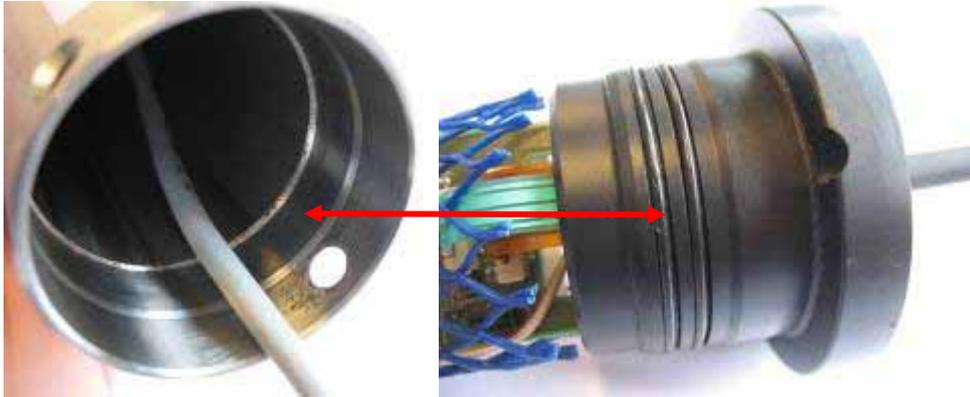


Closing the modem housing

Once the battery and the desiccant bag have been replaced/installed, the modem housing may be closed again.

Step 6: Closing the modem housing.

- a) Check whether the O-rings are damaged.
- b) Check whether the top with the O-rings is dirt-free, along with the sealing surface in the housing tube.



- c) If no grease is visible on the surfaces, apply a thin layer of acid-free vaseline.
- d) Turn the cover with the modem circuit and battery a half to a complete revolution to take up the coiled cable (if necessary). This may be done in either direction.
- e) Carefully slide the modem back into the housing tube and press the cover into the housing with a light turning movement. Take note of the holes for the screws.



- f) Turn the two screws in hand tight.

Start up

Press the service key for **15** to 20 seconds to enter the configuration mode, the green LED will light. Click the button *New battery* in the *Modem* tab. Then restart the modem using the configuration tool.

6.2 Replacing the SIM card

The SIM card is replaced in the same way as the battery. Ensure that the modem is in configuration mode. Carry out the steps 1 to 4c, as shown in section 6.1 (open housing; disconnect battery and remove desiccant bag).



Before installation, ensure that the SIM card pin code is turned off or set on the desired pin code, identical with that of the SIM card being replaced.



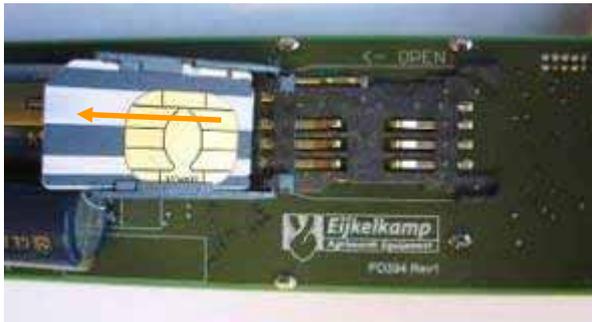
These steps apply only to changing the SIM card, not to a new configuration.



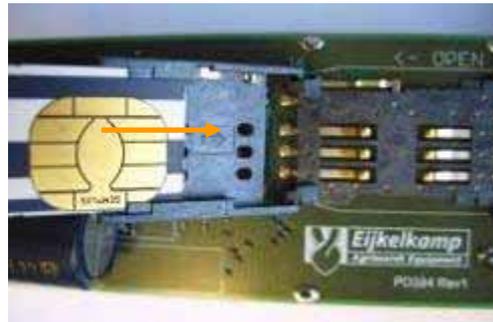
The SIM card holder with the *Eijkelkamp* logo below.



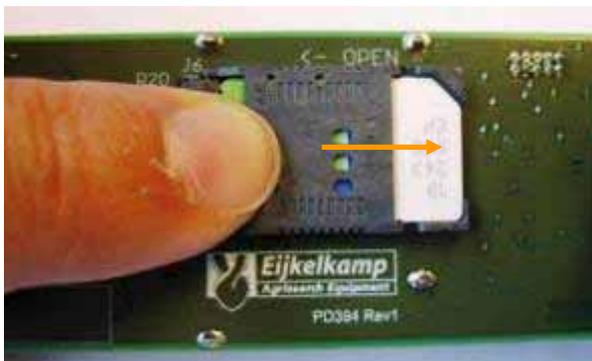
While gently pressing the cover of the holder, unlock it by sliding it to the left.



Open the holder and slide out the SIM card.



Slide the new SIM card into the holder and then close the holder.



Lock the holder by pressing the cover gently and sliding it to the right.

Install the desiccant bag and close the housing according to the procedure set out in section 6.1 (steps 5c to 6).

Start up

Press the service key for 15 to 20 seconds to enter the configuration mode, the green LED will light. Then press the service key again once for 1 second to switch the monitoring well modem on.

When re-configuring it is necessary to set the dial-out number for the home base (e-SENSE direct) in the monitoring well modem by means of the configuration tool.

When changing the SIM card of the e-SENSE direct modem, it is necessary to set the dial-out number for the e-SENSE direct modem in the monitoring well modem by means of the configuration tool.

6.3 Changing / replacing a sensor

- Ensure that:
 - the new sensor to be used is off and does not contain any data
 - the measuring interval on the new sensor has been correctly configured (this can also be done subsequently using e-SENSE direct or on-site using the monitoring well modem configuration tool).
- Ensure that the modem is in configuration mode.
- Disconnect the battery connector to power down the modem.
- Replace the sensor and, if necessary, the cable.
Note: make sure the correct type of cable is used for the new sensor.
- Reconnect the battery.
- Install the desiccant bag and close the housing in accordance with the procedure as set out in section 6.1 (steps 5c to 6).

Starting

Press the service key for 15 to 20 seconds to launch configuration mode. The green LED goes on. Press the service key once more for 1 second to start the monitoring well modem.

7. Parts of the e-SENSE monitoring well modem

The e-SENSE monitoring well modem (11.31.15) consists of;

A one port e-SENSE monitoring well modem (11.31.15) including battery (11.31.25) and whip aerial.

Independently available / spare parts;

- Monitoring well modem with internal barometric sensor (11.31.15.01).
- Monitoring well modem with analog input (11.31.15.02).
- Adapter plug for analogue sensor (11.31.15.02.01)
- Monitoring well modem with e-mail (11.31.15.03).
- Monitoring well modem with data redundancy (11.31.15.04).
- Battery for e-SENSE monitoring well modem, 3.6 V (11.31.25)
- External robust aerial for installation in a monitoring well protective cylinder (11.31.32).
- Adapter ring for installing a modem in tube diameters greater than 2 inches to max. 5 inches (125 mm) (11.31.35).
- One-eye DDC cable for communication with Diver, length 1 – 200 m (11.31.84.00 through 08).
- Two-eye DDC cable for communication with e+ sensor, two-eye Diver and CTD Diver, length 1 – 200 m (11.31.86.00 through 08).
- Installation of the SIM card in a monitoring well modem supplied by the customer, including the required SIM information (11.31.11.05).
- Protective cover for the above-ground installation of a monitoring well modem, with mounting hole for external aerial, internal Ø 77 mm, length 1 metre (10.02.18).
- Protective cover for the above-ground installation of a monitoring well modem, with mounting hole for external aerial, internal Ø 126 mm, length 1 metre (10.02.20).

For installation in the field various (customer specific) housings are available.

For processing the readings and configuring the monitoring well modem, the following items are necessary/available:

- Infrared communicator USB (11.31.91)
- Configuration software (11.31.15.05)
- e-SENSE direct software (11.51.10)
- e-SENSE pc modem set (11.51.20)



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**Declaration of Conformity
Déclaration de Conformité
Konformitätserklärung**

This corresponds to EN ISO/IEC 17050-1

We / Nous / Wir

Eijkelkamp Agrisearch Equipment, 6987 EM Giesbeek

declare under our sole responsibility that the product
déclarons sous notre seule responsabilité que le produit
erklären in alleiniger Verantwortung, dass das Produkt

11.31.15 e-SENSE monitoring well modem

to which this declaration relates is in conformity with the following standards
auquel se réfère cette déclaration est conforme aux normes
auf das sich diese Erklärung bezieht, mit den folgenden Normen übereinstimmt

**EN 61000-6-1 GENERIC IMMUNITY STANDARD
EN 61000-6-3 GENERIC EMISSION STANDARD**

following the provisions of Directive(s)
conformément aux dispositions de Directive(s)
gemäss den Bestimmungen der Richtlinie(n)

Electromagnetic compatibility 2004/108/EC

Eijkelkamp Agrisearch Equipment, June 15th, 2009
J. van Zuilen

General Manager

All it takes for environmental research

