OPERATING MANUAL GSM-2

Content

1.1 GSM-2 Overview

The GSM-2 modem is a GPRS modem with an integrated data logger and Email program. Connected to an external level sensor, the GSM-2 becomes a complete level modem logger. The user doesn't have to visit the measuring location anymore to receive the measured data.

This system eliminates the need for large installations such as poles for solar panels and antenna, because it fits into standard measuring points with 2" tubes. Just put the GSM-2 unit into the measuring point and cover it with the locking unit. A battery supplies the low-consumption GSM-2 unit with power (the battery lasts for years).

The built-in barometric sensor enables robust AA-measurements and takes care of real-time barometric compensation.

A unique feature is that the data is exchanged by Email. The KELLER Datamanager-software reads the Emails or SMS and stores the data in an SQL database. A measuring location is recognized by the cell-phone number the data comes from.
The open-source character of the SQL database makes it possible to capture data from it via 3rd party-software, so integration in existing data-acquisition systems is possible.
The data from all modem loggers can be visualized and exported (ASCII, WISKY, GWBASE, etc.) from the database. Also reports can be made directly from the database and even the location of the measurements can be displayed in Google Maps.
Other functionalities offered by the GSM-2 are alarm notification via SMS / Email or GSM-2 configuration by Email.

1.2 GSM-2 Features and Advantages

- GSM module and data logger in one device
- Easy installation (just drop it in a standard measuring point)
- Small size (only 48 mm in diameter)
- Low price
- Battery-powered / low power consumption (battery lasts for years)

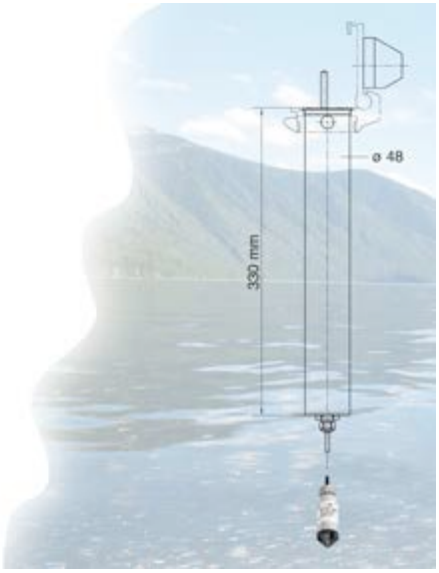
- Free software

- GSM Quad Band frequency module (covers the entire world)
- GPRS connection (low price connection to the Internet)

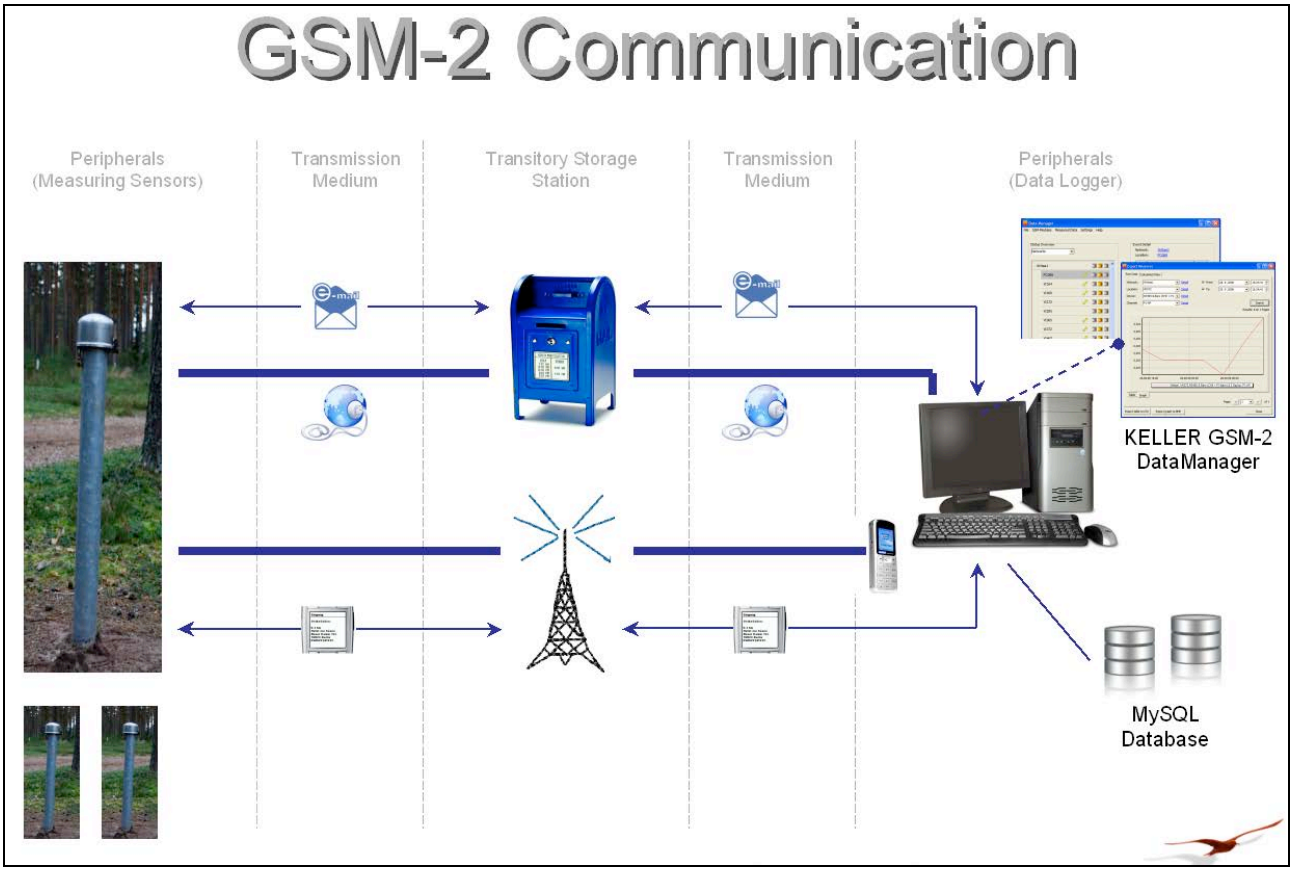
- Water resistant
- Smaller than 2" in diameter
- Built-in atmospheric pressure sensor (AA-Measurement)

- Remote configuration
- Interface for diagnostics and setup

- Different interfaces for sensors
- …….



2 General Description / GSM-2 Communication



2.1 GSM Datamanager

The GSM Datamanager is a software program that collects the transmitted measurements (from GSM-2 via Email or SMS) and stores it in a MySQL database. The functionality of the GSM Datamanager is described in the GSM Datamanager manual.

2.2 Data Transfer

- The data transfer takes place by Email or SMS.
- The GSM-2 sends the logged or measured data in a configurable interval.
- A complete message is sent within 10 seconds.
- Data transfer takes place into two directions: From and to (for configuration changes) the GSM-2.
- The Email box is used to store the data until the “GSM Datamanager” program or the GSM-2 has read it.
- The GSM-2 can send alarm notifications or measurements by SMS.
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2.3 Configuration

The initial configuration is carried out on site during installation by the GSM Setup program via a cable connection from the PC to the GSM. The settings are stored in the GSM-2 and sent to the “GSM Data-manager” by Email. The new unit is registered automatically.

Changes in the GSM-2 configuration are made remotely in the “GSM Datamanager” and transferred to the GSM-2 by Email. The GSM-2 checks its Email-box in a configurable interval and, if a new configuration is available, the configuration is stored.

2.4 Measurement / Data Logging

The GSM-2 measures in a configurable interval all sensors/channels and stores the data in an EEPROM. The data is transferred once a configurable amount of stored data has been accumulated. Alarm functions are configurable and messages are sent immediately if the alarm condition is true.

2.5 Power Management

The unit is in a sleep mode; only the real-time clock is active. For measurements, the supply to the sensors is switched on for a short time (~5 seconds) and, after the measurement is complete, the data is stored and the supply switched off.

To send a message, the GSM module is turned on and the messages are sent within a few seconds.
Even though this task consumes the most power, the battery will still last for many years due to its high capacity and low self-discharge. For example, if you measure every hour and send the data once per day, the battery will last for up to 10 years.

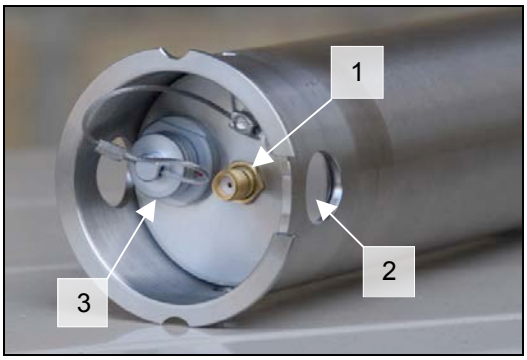
3 Minimum Equipment for GSM-Data-Logging

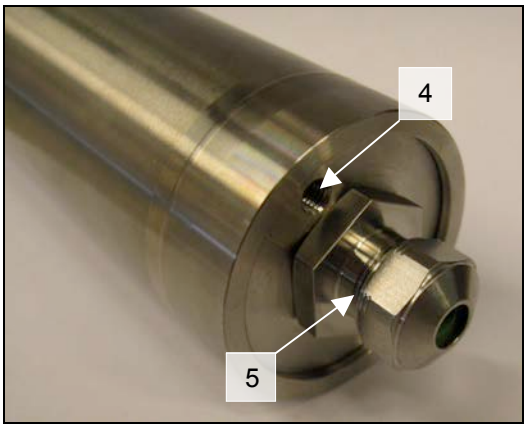
To run a data-logging system you need at least:

- GSM-2 unit including a water level sensor
- SIM card
- PC with GSM Datamanager software and Internet connection
- One Email account (accessible from a GSM network via SMTP/POP)
- GSM Setup software and data cable K103-A (RS232) or K104-A (USB)

4 GSM-2 Hardware

4.1 GSM-2 Housing





1. Antenna connector SMA (F)
2. Holes (for pull-out and water outlet)
3. Interface to PC with protection cap
4. Barometric pressure sensor hole/tube
5. PG adapter

4.2 GSM-2 Accessories (delivered with GSM-2)

1. Stub antenna with SMA plug (m)
2. Silica gel bag
3. 2 rubber seals with different diameters
4. PG connetor
5. Circlip

4.3 How to open and to close the GSM-2 Housing

To open

To open the GSM-2 housing, just push against the bottom of the housing/piston.

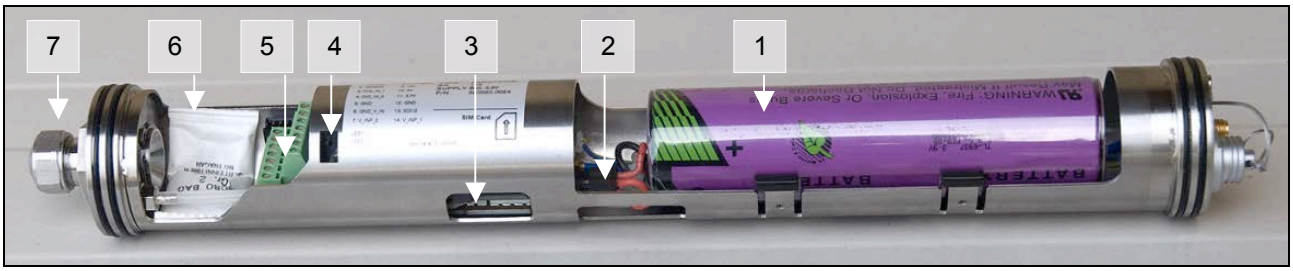
To close

To close the unit, push against the top of the housing/piston until it stops.
Be sure that that the piston is completely inserted.
Ensure that the holes on the top of the housing are completely visible. The holes allow water to drain off so that it does not remain inside the unit.

A bag containing silicate desiccant is used to protect the sensitive electronics from humidity. Push this bag together with the GSM module into the sleeve.

The module can now be installed at the measuring point together with the appropriate sensor.

4.4 The Inside of the GSM-2



1. Battery
2. Battery plug
3. SIM card holder
4. LEDs for diagnosis
5. Connector for sensors
6. Silica gel bag
7. PG adapter

4.5 Insert or Release the SIM Card

As with all mobile phones, a SIM card is required to transfer data. We recommend the use of a prepaid card. In this way, if the configuration is incorrect, only the amount of credit on the card will be used.
Before starting to use the SIM card, all SMS messages still on the card should be deleted (both sent and received SMS).

Ensure that there is always sufficient credit on your card. Your telephone provider will inform you about the various possibilities to recharge your credit.

Insert SIM Card

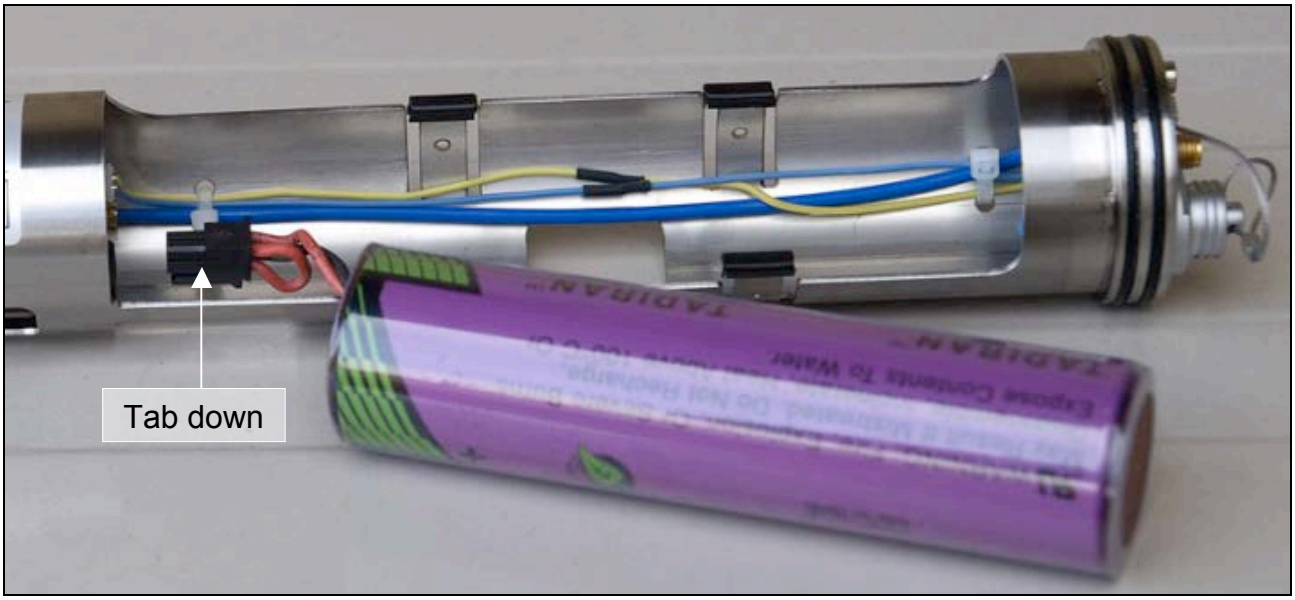
Disconnect the battery before inserting or removing the SIM card.

The SIM card is pushed into the slot until it locks.
See picture for SIM card orientation before inserting (the card will only lock if inserted properly).

Release SIM Card

To release the SIM card, slip the lock of the SIM card holder to the left.

4.6 Connect / Exchange Battery



To power the unit, the black 4-pole battery-plug must be connected to the corresponding socket on the circuit board. Ensure that the plug tab is pointing down (see picture).

After plugging in the battery plug, push the battery into the battery holder.

4.7 Antenna Connection

Stub Antenna

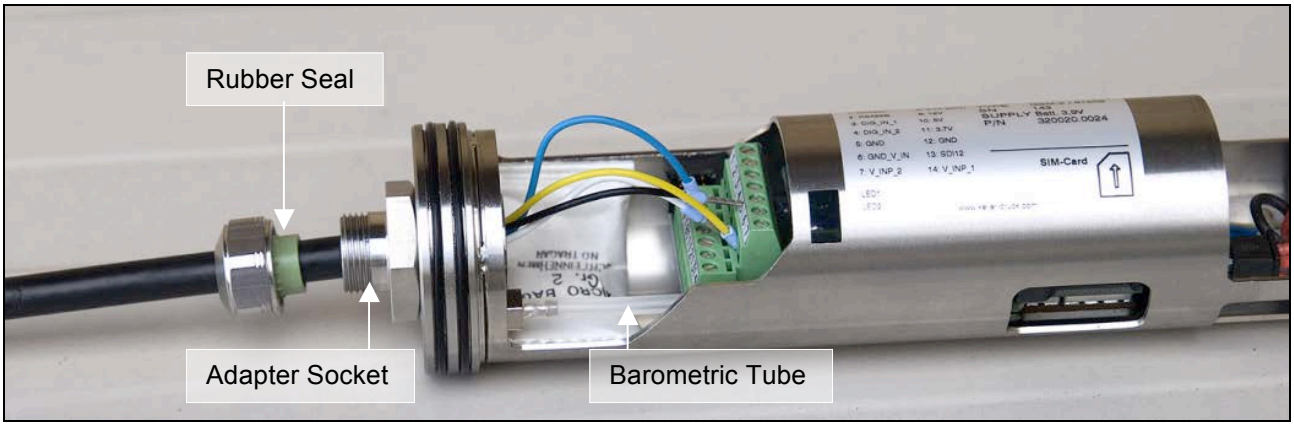
Screw the stub antenna onto the corresponding SMA plug located at the top of the GSM-2. Make sure it is tight enough.

The antenna is provided with a seal. If you use other antennas or connectors, make sure that they are equipped with a seal.

4.8 Adapter Socket / Level Sensor Connection

The plug to connect several sensors is located at the end of the GSM.

The adapter socket is required to connect a level sensor. Feed the sensor cable through the adapter socket and connect the cable ends to the corresponding terminal strip.

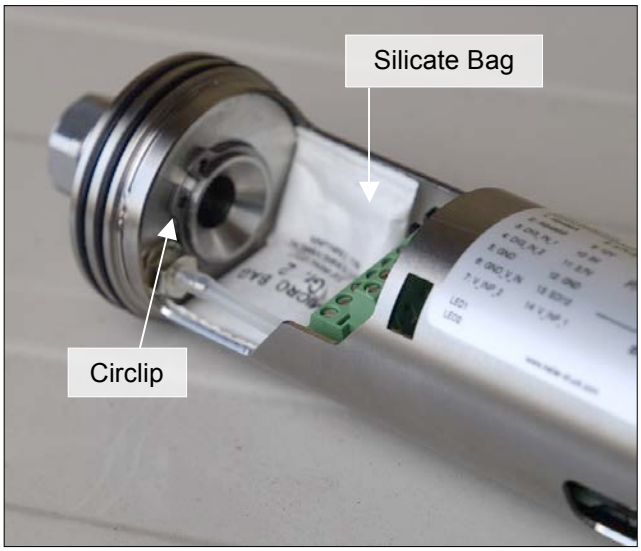


Note: The entire weight of the level sensor has to be carried by the adapter socket. Make sure you tighten it well.

There are two rubber seals available with different diameters for different cable sizes.

If a level sensor with a reference tube is used, the tube should be connected to the barometric tube inside by a T-piece which leads to the outside of the GSM-2 housing to guarantee pressure equalisation.

Make sure the GSM-2 housing is still sealed.

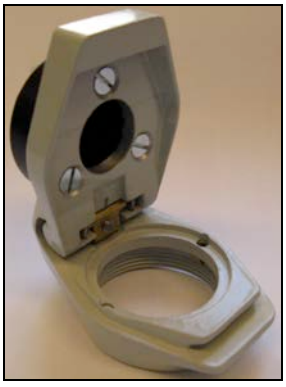


A bag containing silicate desiccant is used to protect the sensitive electronics from humidity. Put this bag into the GSM-2 housing (see left picture).

The circlip is mounted at the inside of the adapter socket to prevent the thread from loosening.

5 LockingUnit

The locking unit for the GSM-2 with antenna cover fits standard size 2 inch measuring points.
It is an accessory.



6 Battery Lifetime

The value displayed in GSM Setup and the Datamanager is the battery capacity calculated by the GSM-2 as a percentage of remaining capacity. It is recommendable to change the battery if the value is less than 15%. Once the battery has been changed the value is once again shown as 99%.
Please note that a battery change or disconnection of the battery always results in resetting the capacity indication to 99%! For this reason, the battery should be disconnected for battery replacement only.

The calculated lifetime in the table below indicates how long the battery can last in different conditions. This gives you an idea of how to configure the GSM-2 and how long the battery can last.

The calculation is based on the following conditions:
Temperature profile: Switzerland with peak temperature -20°C / 40°C
GSM connection: Good signal quality / GPRS connection

Case	Measurement Interval	Email Data Transfer Interval	Calculated Lifetime
A	---	24 h	> 10 years
B	1 h	24 h	> 5 years
C	---	1 h	3 years
D	1 min.	1 h	1,6 years

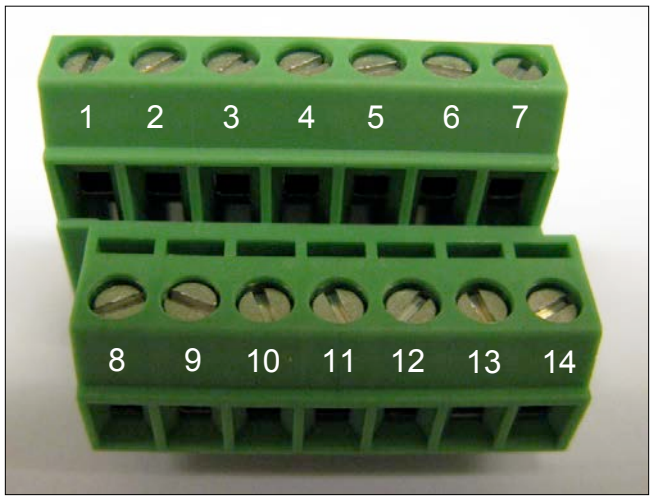
The calculated lifetime values in the table are merely calculations. External conditions (like temperature and storage time) have an influence on the battery capacity and its lifetime.

Batteries are also self-discharging. We therefore recommend replacing the battery every 5 years!

7 Connection Terminal for Sensors

7.1 Pin Table

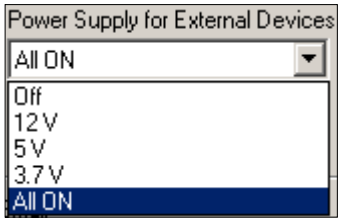
1. RS485-A
2. RS485-B
3. Switch Input 1
4. Switch Input 2
5. GND
6. GND Voltage Input
7. Voltage Input 2 (0…2,5V)
8. Supply 3,7 Volt (always on)
9. Supply 12 Volt (switched) max. 20 mA
10. Supply 5 Volt (switched) max. 10 mA
11. Supply 3,7 Volt (switched) max. 60 mA
12. GND
13. SDI12 Communication Interface
14. Voltage Input 1 (0…2,5V)



7.2 Supply

External devices can be supplied with different voltages. The supply is turned on while the GSM-2 reads the connected devices. You can select different voltage sources in the GSM Setup program.

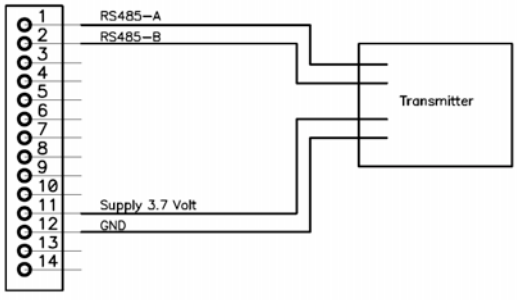
OFF	No supply during measurements
12 V	12 Volt output active during measurements (**Pin 9**)
5 V	5 Volt output active during measurements (**Pin 10**)
3.7 V	3,7 Volt (battery) output active when measuring (**Pin 11**)
ALL ON	All supplies are switched on when measuring



Devices requiring a permanent supply from the GSM-2 battery (always on) can be connected to **Pin 8**.

7.3 RS485 Interface for Sensors

The RS485 interface enables communication with Keller digital instruments (transmitters, data loggers…).



Connect RS485 A (**Pin 1**) and RS485 B (**Pin 2**) with the instrument. The measurement takes place at the selected interval. The supply is turned on 1 second before measurement. The values (channels 0…5) are read out and processed in the GSM-2.
The supply is switched off when the measurements have been taken.

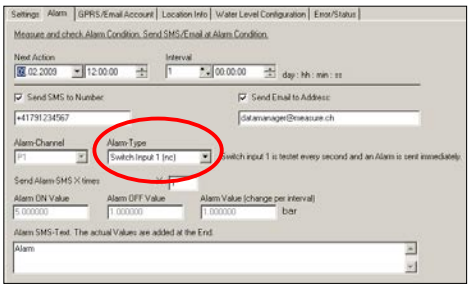
Up to 5 Series 30 transmitters can be connected to the GSM-2 if you select “Type 6” in Hardware-settings (GSM Setup). In this case you have to configure each transmitter separately with an address in the range of 1 to 5.

We recommend using Series 30 transmitters from Keller with low power and low voltage option to keep the battery consumption low (in this case select 3,7 V power supply)**.**

7.4 Voltage Input

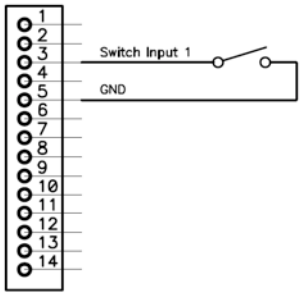
The voltage inputs (**Pin 7 & 14**) measure signals from sensors in the range of 0 … 2,5 Volt.
Use the corresponding GND voltage input (**Pin 6**)

7.5 **Switch Input 1** (Alarm Input)

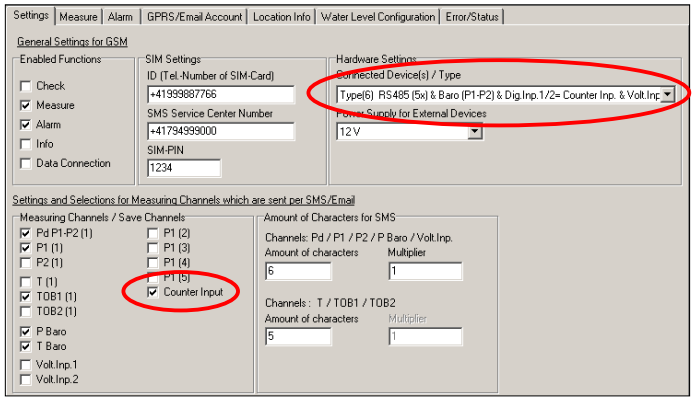


Switch 1 input (**Pin 3**) is a normally closed input (nc) for monitoring a switch. If the switch alarm function is enabled, the GSM-2 tests the input every second and, if the switch is open, an alarm message is sent immediately. After this alarm message, the switch state is tested (and an alarm message sent) at the selected alarm interval.

The alarm is sent a maximum of X times (X is a selectable value). If the input status is tested and it has turned from open (alarm) to closed (no alarm), the test interval reverts back from alarm interval to once per second; if the alarm condition is detected again the alarm is sent again a maximum of X times.



7.6 Switch Input 2 (Count Input)



Configuration

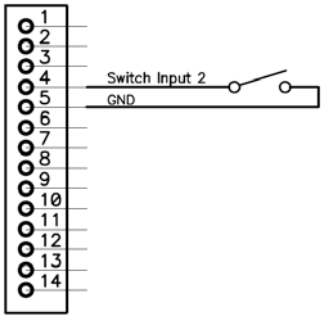
To enable the “Counter Input” function, select “Type 6” in Hardware settings.
Select “Counter Input” in “Measuring Channels”.

Connection

Connect the relay output to the switch input 2 (Pin 4) and GND (Pin 5).

Function

The counter starts counting if the externally connected switch closes. Please note that the counter function is limited to one count per second. If more counts are triggered within a second, the counter will only increase by one.
The counter value is saved at the measuring interval. After saving the counter value the counter is reset to zero. This gives the user an opportunity to measure the amount of counts within the defined (measuring interval) time.



7.7 SDI12 Communication Interface to YSI 6 Series Sonde

The SDI12 interface is designed to communicate with a 6 Series sonde from YSI via the SDI12 interface. Make sure that the YSI sonde is configured before it is connected to the GSM-2!

Configuration:

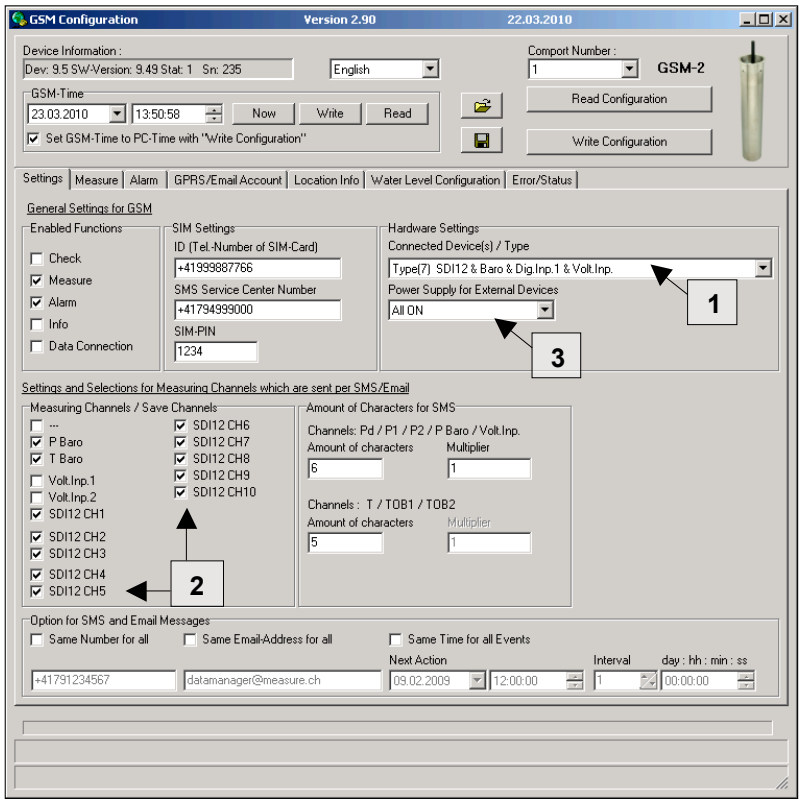
Description	Setting
Interface	1200 Baud / data bits / parity even / 1 stop bit
SDI12 Address	0
Channels / Values	10 (a maximum of 10 channels are read from YSI
Measuring time (Maximum time for measurements)	100 seconds
Time / Date	Disable time report in the sensors menu

Connection

GSM-2	YSI 6 Series
GND (12)	MS-8 Pin B
SDI12 communication interface (13)	MS-8 Pin F
The YSI sonde must be powered from its battery (do not connect the GSM-2 supply to the YSI)	

Settings in GSM Setup

1. Choose "Type 7" in Hardware settings
2. Select the channels that should be transferred. The channels are saved in the GSM-2 in the same order in which they are read/transferred from the YSI Sensor. The maximum amount of values is 10.
3. The GSM-2 will switch on the external power supply (5V) while communicating with the YSI Sensor (no matter what you have selected in the GSM Setup). If you need the power supply for other external devices, select the required supply; otherwise select OFF.



8 Measuring Process and Timing

Power Supply

- The power supply is switched on 1 second before the measurement takes place.
- Power is on during measurement.
- The supply is switched off one second after measurement.

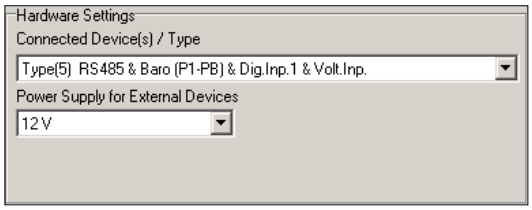
Read RS485

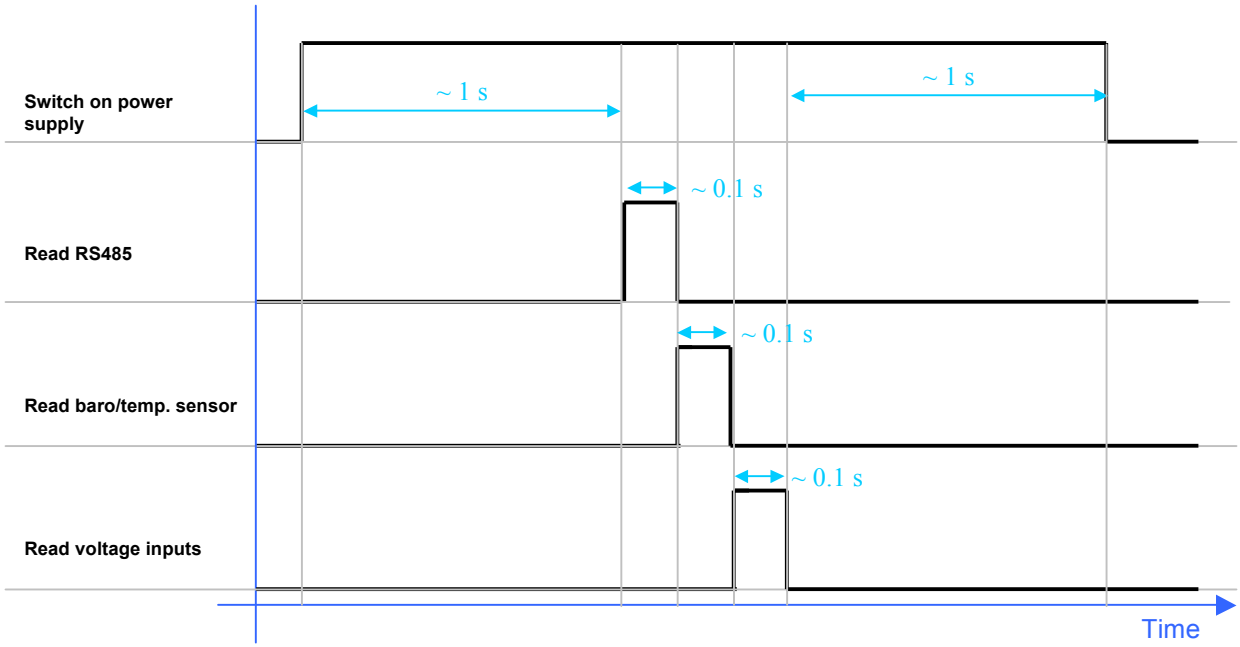
The values from the connected transmitter(s) are read within ~0,2 seconds. If there is a communication error, the command is repeated 5 times with a pause of 0,2 seconds between each command.
The communication address is 250 if only one transmitter is connected. For configuration with up to 5 transmitters, the communication address is 1…5.

SDI12

The measurement takes place after reading the voltage inputs. The measurement can take up to 100 seconds (depending on YSI sensor configuration/type).

Timing diagram with the following configuration:

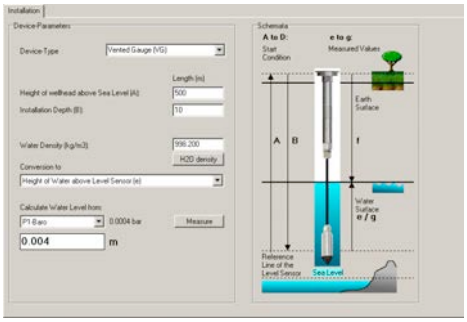




9 Installation at a Measuring Point with the Locking Unit

1. Attach the locking unit at the measuring point.

The locking unit with the antenna protection cap mounted to the upper part is suitable for 2 inch standard pipes.



2. Prepare the installation data

- Actual water level (to be measured by hand)
- Network name, location name
- Location position (longitude, latitude, altitude)
- Height of wellhead above sea level
- Installation depth of level sensor

This installation data is entered into the GSM Setup software and later transferred to the GSM Datamanager.

3. Insert the GSM-2

Insert the module at the measuring point together with the appropriate sensor.

4. Configure the GSM-2 with the GSM Setup program

Connect the GSM-2 to the PC and configure it with the GSM Setup program.
The configuration is sent by Email to the GSM-2 Datamanager, where the new location is automatically registered.

Make sure that the Email has been sent. Also check the signal quality and the actual measured values.

5. Close the cap

The antenna will fit into the plastic cover.

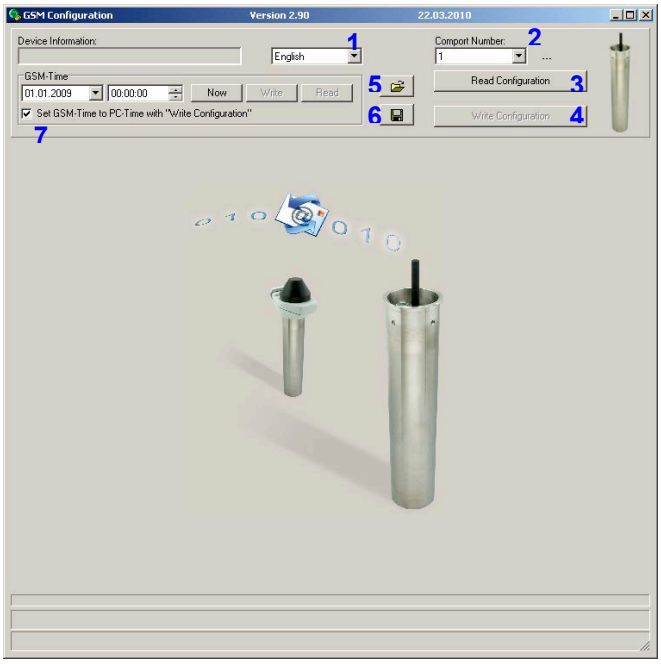
6. Lock the cover

Lock the unit as shown.

7. The installation is now complete.

10 GSM Setup Description

10.1 Overview

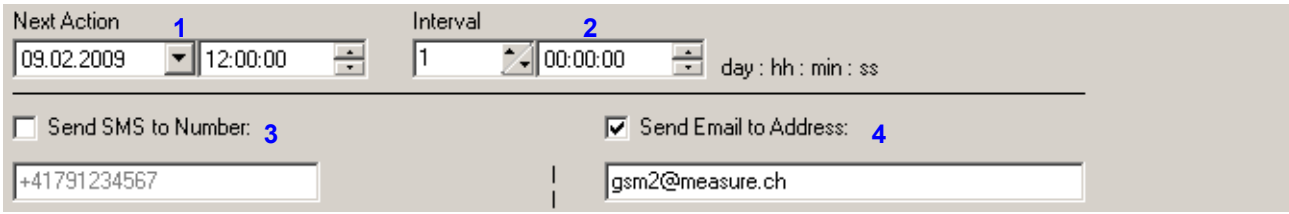


Number	Description	Explanation / Function
1	Language Selector	Select the preferred language
2	Serial Communication Port	Select the appropriate port number
3	Read Configuration Button	Press button to read configuration from connected device
4	Write Configuration Button	Press button to write configuration to connected device
5	Open Configuration File	Press button to open an existing (previously saved) configuration file
6	Save Configuration	Press button to save all settings to a configuration file
7	Checkbox “Set GSM time to PC time at write configuration”	Enable checkbox -> The GSM module clock will automatically be synchronized with PC clock if you press the “Write Configuration Button” -> see number #4
8	Date and Time Selector and Edit Field	You may manually set a date and time by selection or editing the fields
9	Now Button	Press button to set the GSM-2 time field to PC time.
10	Write Time Button	Press button to write time and date to the device. Please notice the button may be disabled according to the state of checkbox number #7
11	Read Time Button	Press button to read time and date from the device

10.2 Next Action / Interval

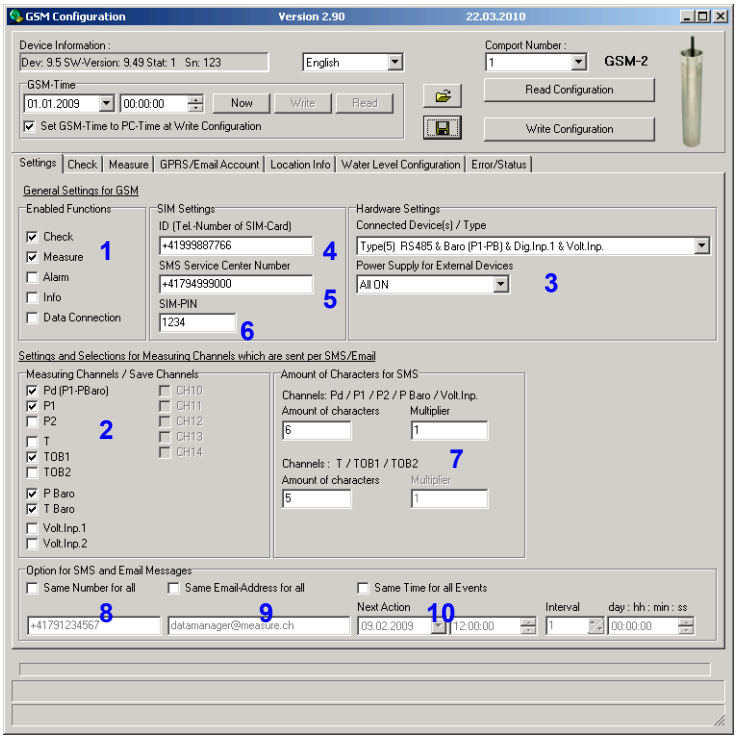
There are several selectable functions. Clicking them will make the corresponding register card appear. Most functions consist of a “Next Action” and “Interval” time information.

All functions can run at different time intervals and can take place at different times. Messages are sent by Email or by SMS (selectable). The recipient number (SMS) or Email (Email address) is selectable for each function.



Number	Description	Explanation / Function
1	Next Action	Select the date and the time when the task takes place the first (next) time.
2	Interval	Enter the time interval at which the task takes place.
3	Send SMS to Number	Checkbox “Send SMS to Number” enables SMS functionality. The edit field underneath shows the phone number where a SMS is sent to.
4	Send Email to Address	Checkbox “Send Email to Address” enables Email functionality. The edit field underneath shows the Email address where the message is sent to.

10.3 Settings



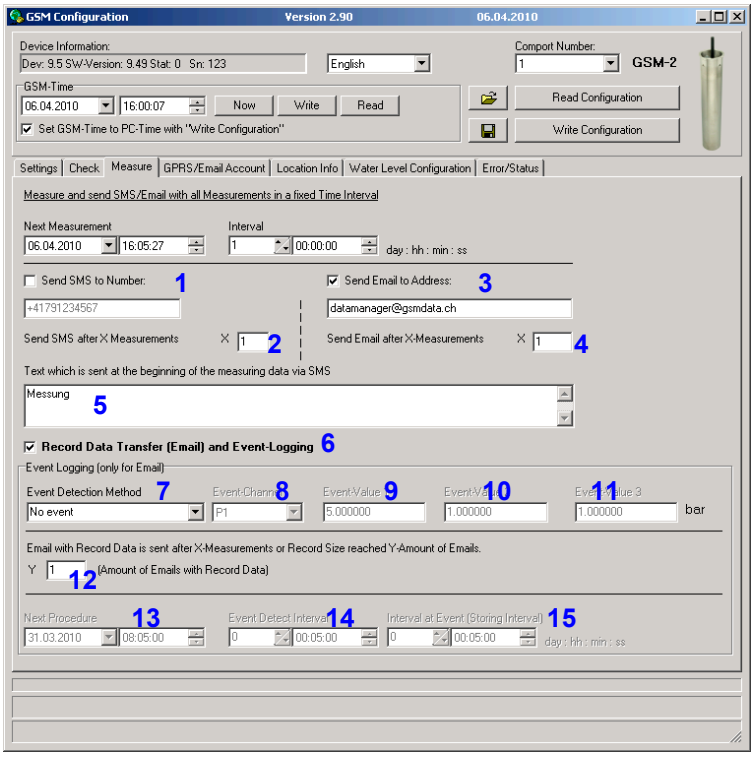
Number	Description	Explanation / Function
1	Enabled Functions	Activates the indicated function (i.e. “Measure” -> the GSM module sends data messages according to the set interval)
2	Measuring Channels	Activates the desired channels to be measured and saved. **P1-P Baro** -> Pressure difference between pressure gauge P1 in media and ambient pressure measured by onboard barometer (GSM-2 only) **P1** → Level sensor [pressure / bar] **P2** → Second pressure sensor [pressure / bar] (e.g. for AA devices as barometric sensor) **T** → Temp. of PT100/P1000 thermocouple [temperature / °C] (availability depends on design of pressure transmitter) **TOB1** → Temp. sensor of level sensor P1 [temperature / °C] (temperature over bridge pressure gauge 1) **TOB2** → Temp. sensor of pressure sensor 2 [temperature / °C] **P Baro** → Barometric pressure (GSM-2) [pressure / bar] **T Baro** → Air temperature (GSM-2) [temperature / °C] **Analog1** → Voltage Input 1 (0…2,5 Volt) [voltage / V] **Analog2** → Voltage Input 2 (0…2,5 Volt) [voltage / V] **P1 (X)** → Pressure (or Level) sensor with BUS-Address (**X**)

Number	Description	Explanation / Function
3	Hardware Settings	Select connected sensor types. Choose supply for the connected devices.
4	ID Phone Number	Enter the phone number of the SIM card used in the GSM module. The phone number is the identifier of the GSM module.
5	SMS Service Center	SMS service center phone number of your provider (SMS messages cannot be sent without this number)
6	Pin Code	Pin Code of the SIM Card. If PIN is deactivated, leave this box blank.
7	Amount of Chars used in SMS	SMS has a limitation of 160 characters. The number of characters used to transmit one measurement value can be adapted.
8	Options for SMS-Number	The module allows messages to be sent to independent phone numbers. The checkbox “Same number for all” synchronizes all edit fields to the phone number entered.
9	Options for Email Address	The module allows messages to be sent to independent Email addresses. The checkbox “Same Email-Address for all” synchronizes all edit fields to the Email address entered.
10	Same Time for all Events	The module allows to proceed sending the different functions at different times and time intervals. The checkbox “Same Time for all Events” synchronizes the time fields to the time entered.

10.4 Hardware Settings Connected Device

Connected Device(s) / Type	Explanation
Type(0) RS485	➢ One transmitter/level sensor with BUS address 250 is connected to the RS485 interface
Type(1) RS485 & 2 Dig.Inp	➢ One transmitter/level sensor with BUS address 250 is connected to the RS485 interface ➢ Digital input can be used for alarm
Type(2) RS485 & Baro (P1-P2) & Dig.Inp.1	➢ One transmitter/level sensor with BUS address 250 is connected to the RS485 interface ➢ Barometric and temperature sensor in GSM-2 available ➢ CH0 is calculated from P1-P2 ➢ Digital input 1 can be used for alarm
Type(3) RS485 & Baro (P1-PB) & Dig.Inp.1	➢ One transmitter/level sensor with BUS address 250 is connected to the RS485 interface ➢ Barometric and temperature sensor in GSM-2 available ➢ CH0 is calculated from P1-PB ➢ Digital input 1 can be used for alarm
Type(4) RS485 & Baro (P1-P2) & Dig.Inp.1 & Volt.Input	➢ One transmitter/level sensor with BUS address 250 is connected to the RS485 interface ➢ Barometric and temperature sensor in GSM-2 available ➢ CH0 is calculated from P1-P2 ➢ Digital input 1 can be used for alarm ➢ Voltage inputs are available
Type(5) RS485 & Baro (P1-PB) & Dig.Inp.1 & Volt.Input	➢ One transmitter/level sensor with BUS address 250 is connected to the RS485 interface ➢ Barometric and temperature sensor in GSM-2 available ➢ CH0 is calculated from P1-PB ➢ Digital input 1 can be used for alarm ➢ Voltage inputs are available
Type(6) RS485 (5x) & Baro (P1-P2) & Dig.Inp.1/2= Counter Input & Volt.Input	➢ Five transmitter/level sensors with BUS address 1…5 are connected to the RS485 interface ➢ Barometric and temperature sensor in GSM-2 available ➢ CH0 is P1-P2 from address 1 (if available) ➢ Digital input 1 can be used for alarm Digital input 2 can be used as a counter ➢ Voltage inputs are available
Type(7) SDI12 & Baro & Dig.Inp.1 & Volt.Input	➢ CH0 is not available ➢ Barometric and temperature sensor in GSM-2 available ➢ Voltage inputs are available ➢ SDI12 interface for YSI sensor

10.5 Measure



Number	Description	Explanation / Function
1	Send SMS to Number:	Enables SMS transfer. The edit field underneath shows the phone number where the SMS are sent to.
2	Send SMS after X Measurements	A single SMS message may contain several measurements carried out in the set time interval. The entered number specifies the amount of measurements per SMS message.
3	Send Email to Address:	Enables Email transfer. The edit field underneath shows the Email address where it is sent to.
4	Send Email after X Measurements	A single Email message may contain several measurements carried out in the set time interval. The entered number specifies the amount of measurements per Email message. *
5	User Text	Any text that is transferred with the measurements (could be used as an identification of the message type).
Option 6…15 only available with GSM-2 software version ≥ 09.48		
6	Record Data Transfer (Email) and Event Logging	If unchecked the data (values) is transferred in a text format. If checked the data is transferred in a binary (base64) format and event logging can take place.
7	Event Detection Method	Different methods to measure and save data.

Number	Description	Explanation / Function
8	Event Channel	Choose the channel to be used to test the event condition.
9	Event-Val 1	Event value 1
10	Event-Val 2	Event value 2
11	Event-Val 3	Event value 3
12	Y (amount of Emails with record data)	The Emails are sent if enough data is collected for Y amount Emails. *
13	Next action	Select the date and the time when the task takes place the first (next) time.
14	Event detect interval	Enter the time interval at which the measurement is made and the event condition is tested.
15	Interval at event (save interval)	Enter the time interval at which the measurement takes place and the values are stored.

- if record transfer is on, the transfer takes place if one of the conditions (#4 or #12) is true.

  That means:
  - the amount (X) measurements are made
  - the amount of data for (Y) Email(s) are available

10.6 Event Logging Description

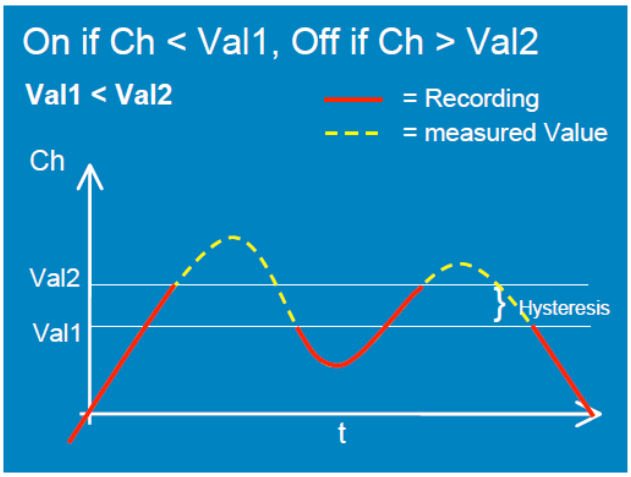
No event

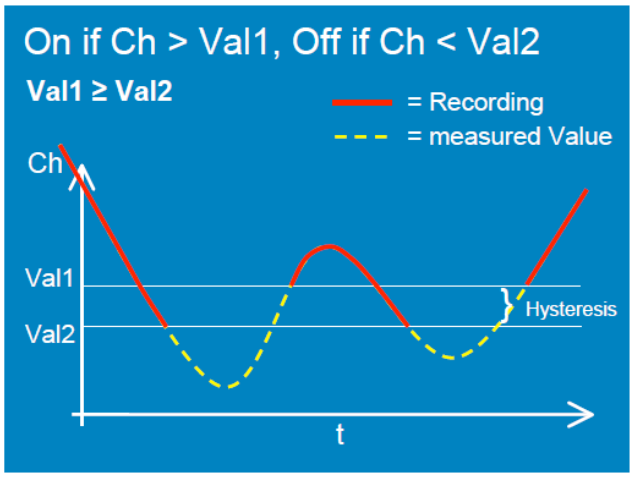
Record data transfer is on and data is collected at a fixed time interval.

On at Val 1, Off at Val 2

- If **Val1 ≥ Val2** then recording will take place above a certain level.
Recording takes place if the measured value of the selected channel (#8) is greater than Val1 until the measured value is less than Val2 (hysteresis = Val1-Val2).
If the condition is not true, the condition is checked in the “Event detect interval” (#14) and data is not saved. If the condition is true, the measurement interval changes to “Interval at event (save interval, #15)” and the data is also stored in this interval.

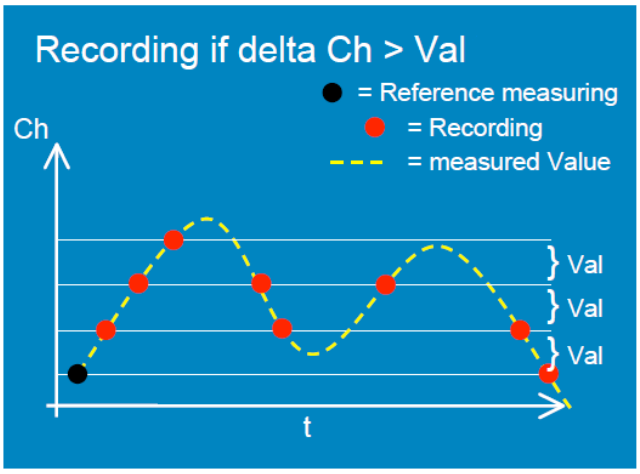
- If **Val1 < Val2** then recording will take place below a certain level.
Recording takes place if the measured value of the selected channel (#8) is less than Val1 until the measured value is greater than Val2 (hysteresis = Val2-Val1).
If the condition is not true, the condition is checked in the “Event detect interval” and data is not saved. If the condition is true, the measurement interval changes to “Interval at event (save interval, #15)” and the data is also stored in this interval.



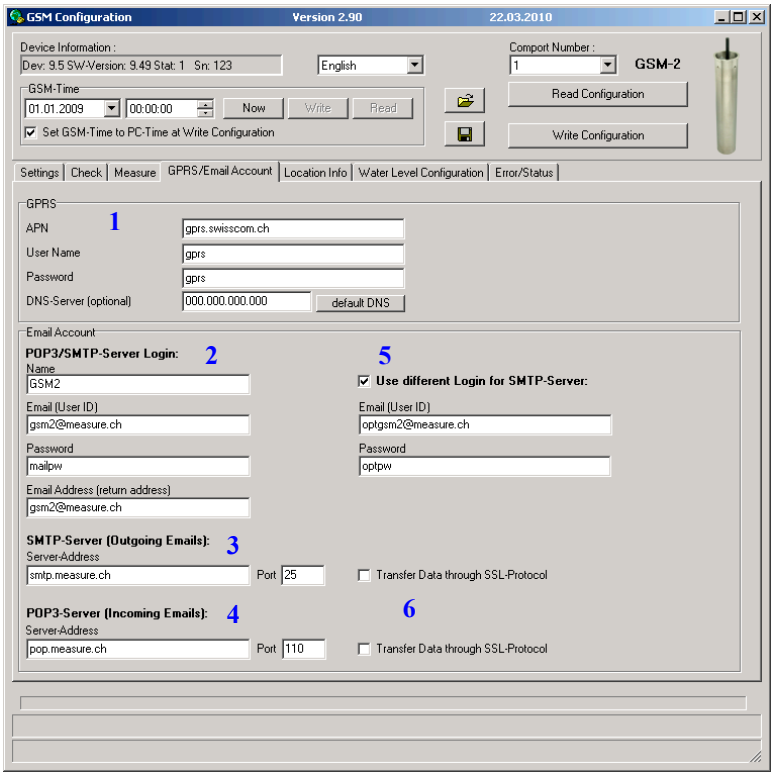


Save if delta CH > Val 3

The measurement takes place in the “Interval at event (save interval, #15)” and the data is stored if the measured “Event-Val 3” value is greater than the last recorded value.

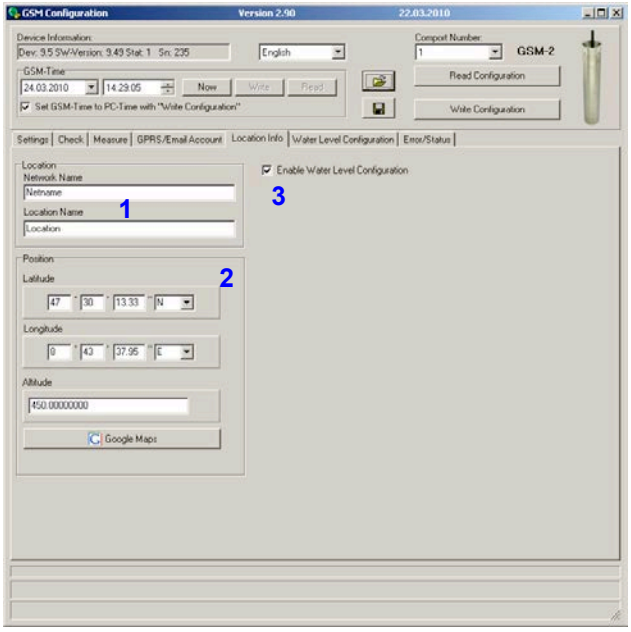


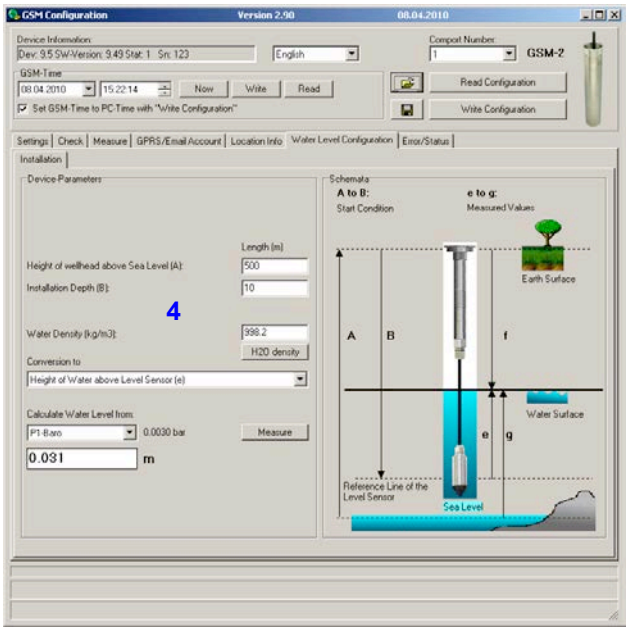
10.7 GPRS Settings



Number	Description	Explanation / Function
1	GPRS-Settings	APN = Access Point Name You need to enter the correct APN (Access Point Name) settings which differ based on your wireless carrier provider. Settings are available from your provider or can be found in the internet.
2	Email Account	In order to receive Emails, the GSM-2 needs a POP3 Email account. The two most important configuration items are the User ID and the corresponding password for proper authentication.
3	SMTP-Server	Outgoing mails are sent via an SMTP-server. You need a valid URL for the SMTP-server. Port 25 is commonly used for this purpose.
4	POP3-Server	Incoming mails are accessed via a POP3-server. You need a valid POP-server URL. Port 110 is the standard port.
5	Use different Login	Depending on your mail provider, you may need different authentication for the POP and the SMTP server. Activate the checkbox if two different login names and passwords are required.
6	Transfer Data through SSL-Protocol	Depending on your mail provider, you may need SSL protocol (transfer data through SSL protocol).

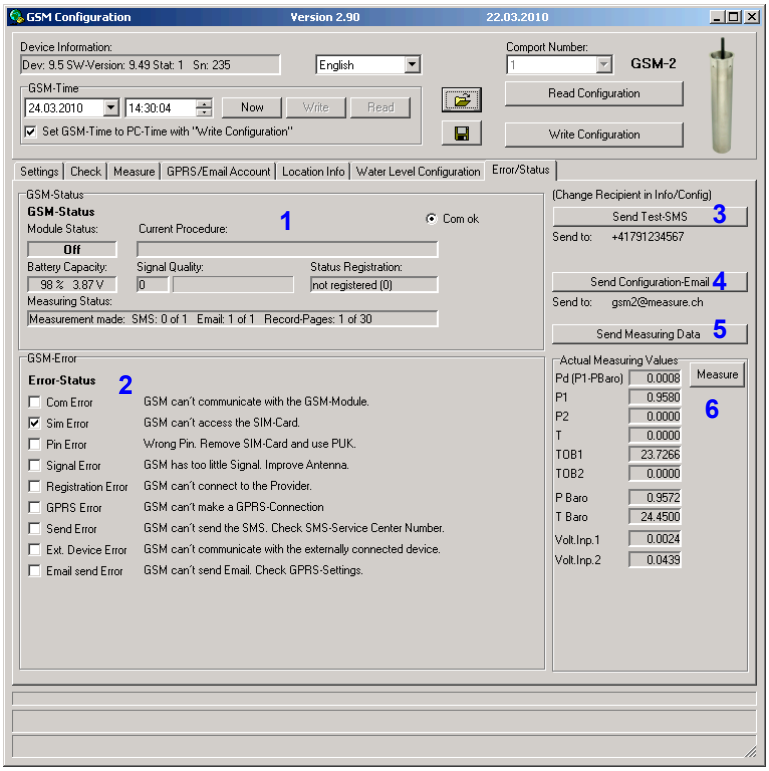
10.8 Location Info and Water Level Configuration





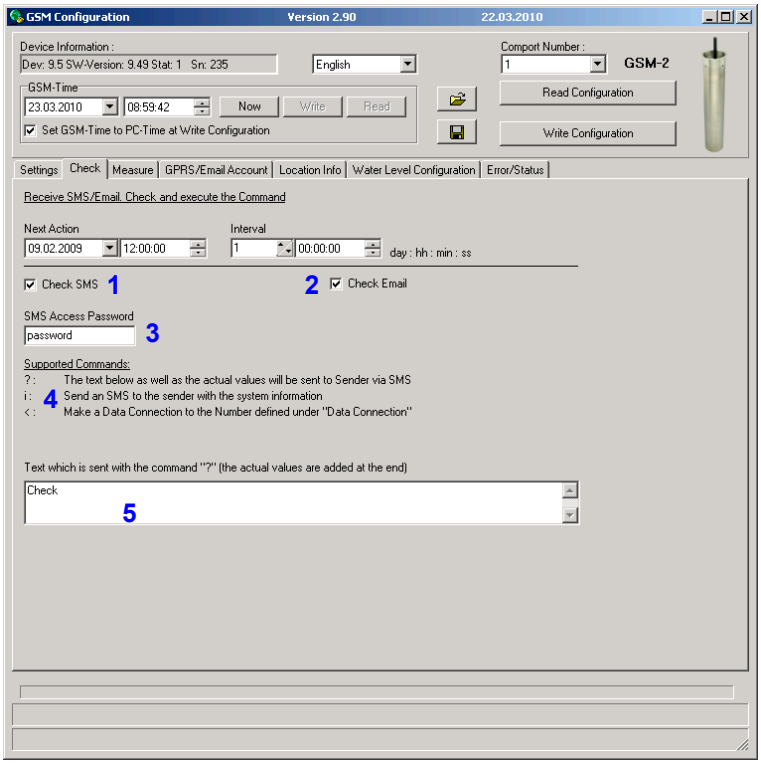
Number	Description	Explanation / Function
1	Location	You may define a network name. “Network” helps you to organize your measuring locations. “Location name” allows defining a name for the measuring location.
2	Position	Assigns the coordinates (longitude, latitude, altitude) to a measuring location.
3	Water Level Configuration	Enables the water level configuration. The graphical user interface will appear (4).
4	Water Level Configuration	These settings are required to calculate the water level (i.e. by the GSM Datamanager).

10.9 Error / Status



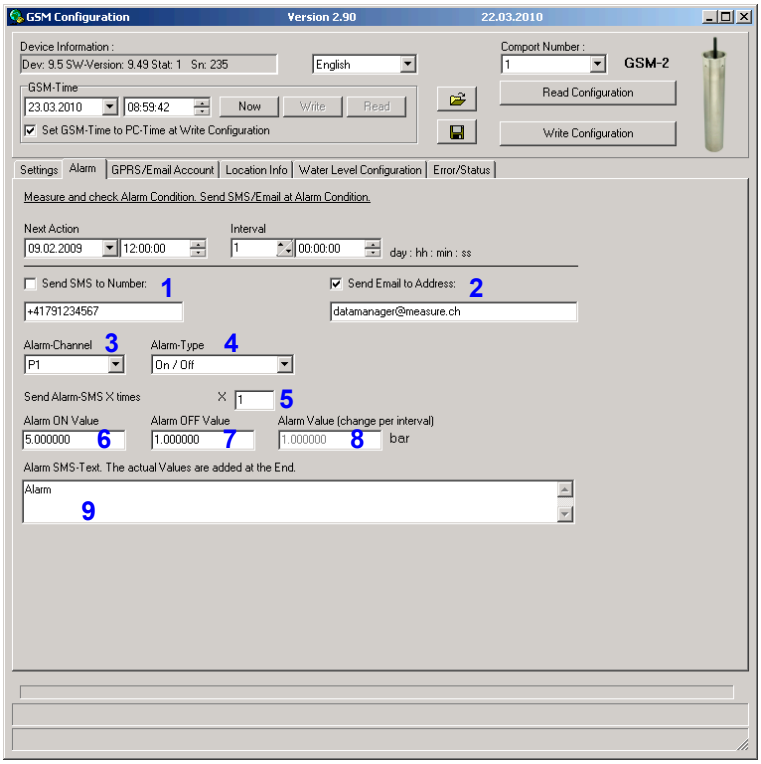
Number	Description	Explanation / Function
1	GSM Status	This window is updated every second and indicates the state of the GSM-2.
2	Error Status	Errors are listed in the error state window.
3	Send Test-SMS	To test the SMS transfer, click the button and check whether the message is sent without error.
4	Send Configuration Email	To test the Email transfer and to send the configuration via Email to the corresponding recipient, click the button and check whether the message is sent without error.
5	Send Measuring Data	Click this button to transfer the actual stored data in the GSM-2 (before you change a configuration).
6	Actual Values	All actual values are listed. If you want to initiate a measurement, click the “Measure” button.

10.10 Check Email / SMS



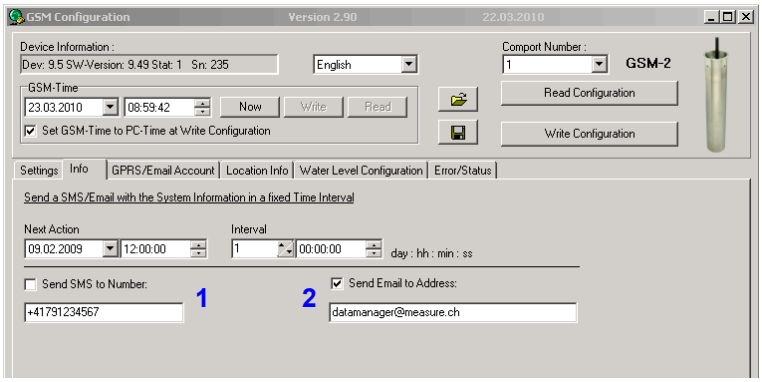
Number	Description	Explanation / Function
1	Check SMS	If activated, the SMS are checked at the set interval/time.
2	Check Email	If activated, the Email In-Box is checked (downloaded) at the set interval/time.
3	SMS Access Password	Enter a password. Only those messages (SMS) that begin with this password (case sensitive!) will trigger a function in the GSM-2.
4	Supported Commands	The listed characters support the described command. If this character is transmitted from any mobile phone to the GSM-2 it will carry out the corresponding task. For example, send an SMS with the text “password i” to the GSM-2. After checking the SMS, the GSM-2 will return an SMS to the sender with the current measured values.
5	Text	Any text that is transferred with the reply SMS to the command “?” (could be used as an identification of the message type).

10.11 Alarm



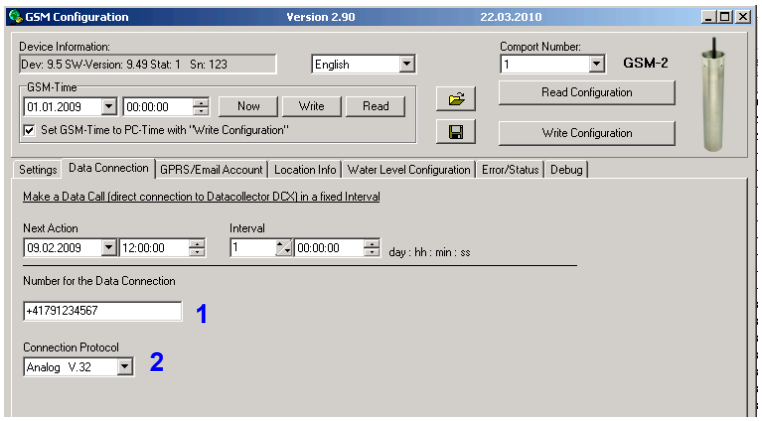
Number	Description	Explanation / Function
1	Send SMS to Number	If activated, an SMS with alarm content is sent.
2	Send Email to Number	If activated, an Email with alarm content is sent.
3	Alarm-Channel	Choose the channel to be checked.
4	Alarm-Type	On/Off hysteresis, value change (delta/time: pressure or temperature change between two measurements) or other functions.
5	Send Alarm-SMS X-Times	Determines how often an SMS message is sent when the alarm condition is true (only with On/Off alarm)
6	Alarm ON Value	Switch-on value (for alarm type On/Off)
7	Alarm OFF Value	Switch-off value (for alarm type On/Off)
8	Alarm Value (change per interval)	The minimum value by which a parameter must have changed since the last alarm measurement to trigger the alarm. The parameter must be specified as a positive value. This value then applies both to positive and negative changes by this amount.
9	Alarm Text	Any text that is transferred with the alarm message (could be used as an identification of the message type).

10.12 Info



Number	Description	Explanation / Function
1	Send SMS to Number	If activated, an SMS with the system information is sent.
2	Send Email to Address	If activated, an Email with the system configuration is sent.

10.13 Data Connection



The use of the Data Connection function assumes that you have connected a DCX-22 Datalogger to the GSM. This function is only provided for compatibility reason (GSM-1) and should not be used anymore.

Number	Description	Explanation / Function
1	Call-back Number	Enter the number of the modem you wish to contact.
2	Modem Protocol	The data protocol used by the called modem.

11 Record Data Storage

This option is available for GSM-2 devices with software version ≥ 09.48
Die record data storage resp. record data transfer is only available for GSM-2 devices with software version ≥ 09.48.
The record data storage offers the advantage that the measuring data doesn't get lost if the data transfer (connection to the internet) is temporarly out of function. In this case, the data which hasn't been transferred yet will automatically be transferred (along with the new data) with the next successful connection.
If for any reason the data transfer can't take place at all, the data can also be read out on site.

11.1 Data Security

All measured values are stored in the GSM-2's EEPROM and are automatically transferred by Email or SMS. The memory is organized as a circular memory. This means that always the latest data is available whilst the oldest data is overwritten.
As an option the user can read the data with Logger 5 software directly from the GSM-2 by connecting the PC to GSM-2's programming interface.

11.2 Storage Capacity

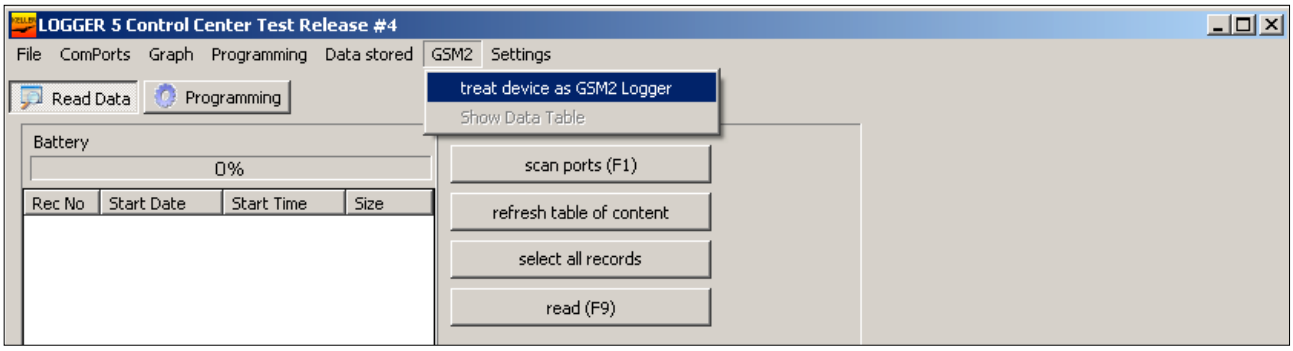
The table below gives an idea of how much data is stored in the GSM-2 memory.

Interval	Number of channels	Number of measured values per channel	Recording time
1 min.	1	28616	20 days
1 min.	4	12264	200 hours
10 min.	1	28616	200 days
10 min.	4	12264	86 days
1 hour	1	28616	3.2 years
1 hour	4	12264	1.4 years
8 hours	1	28616	26 years
8 hours	4	12264	11.4 years

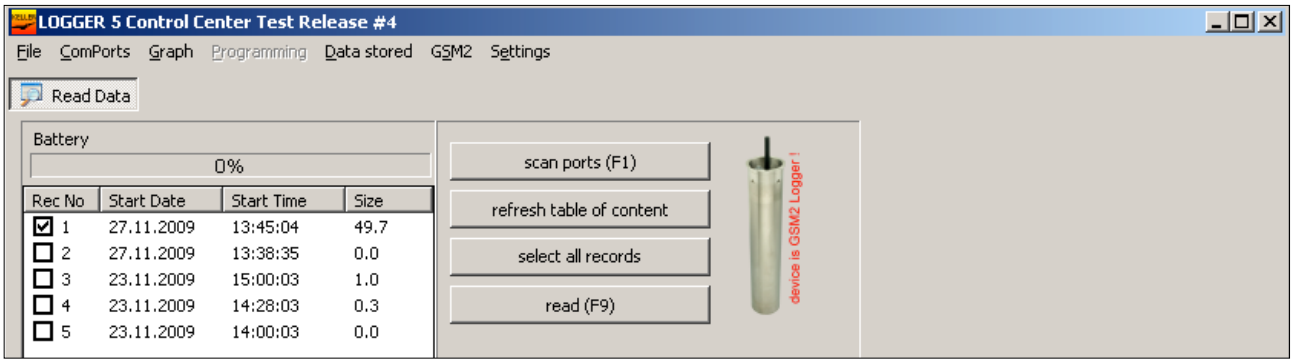
11.3 How to read Data directly from the GSM-2 with a Data Cable

1. Connect the GSM-2 to the interface and start Logger 5 PC-software

2. Select “Treat Device as GSM-2 Logger”



3. Click on the button “Scan Ports (F1)” and the available records appear



4. Select the desired record and click on the button “read”
   The recorded data will be read from the GSM-2 and automatically stored onto the PC's hard disk.
   This data file can be imported with the Datamanager (PC-Software).

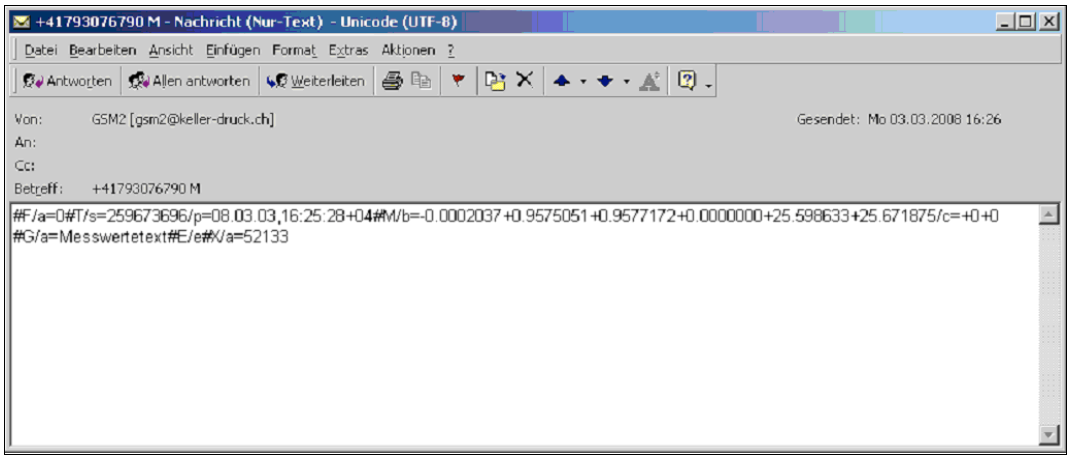
12 Message Format

12.1 Email

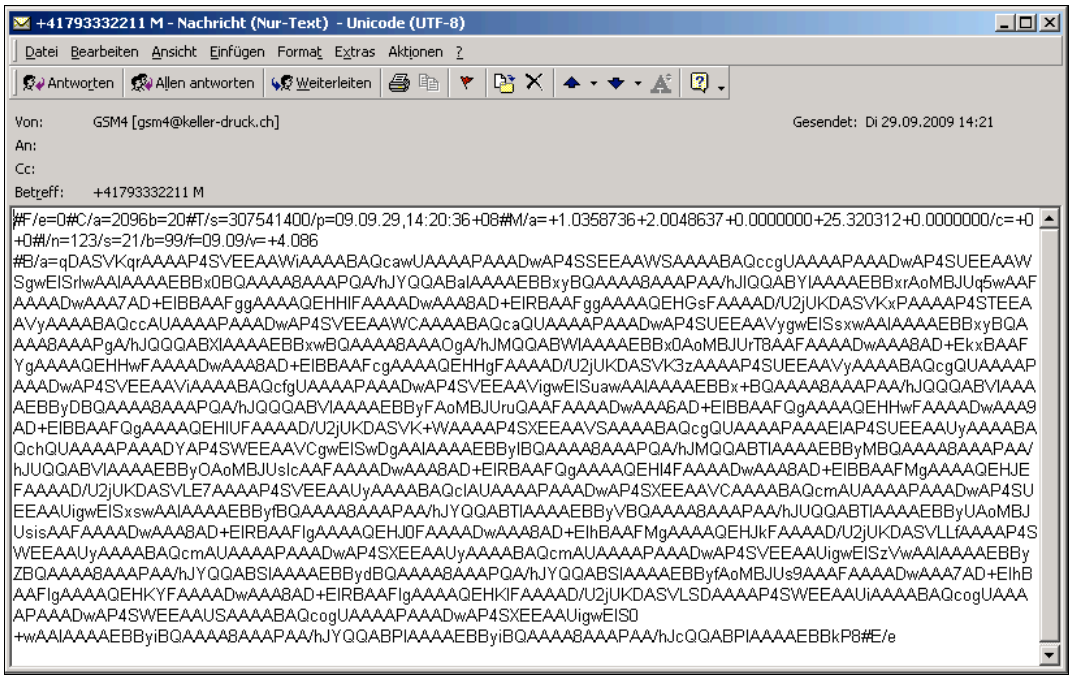
The Email messages are sent in a defined format that is parsed and interpreted by the GSM Datamanager program. **The description of this format is available on request.**

#	# Sign is used as a main command separator
/	/ Sign is used as a command separator

Sample message: Email with measurement data in text format.



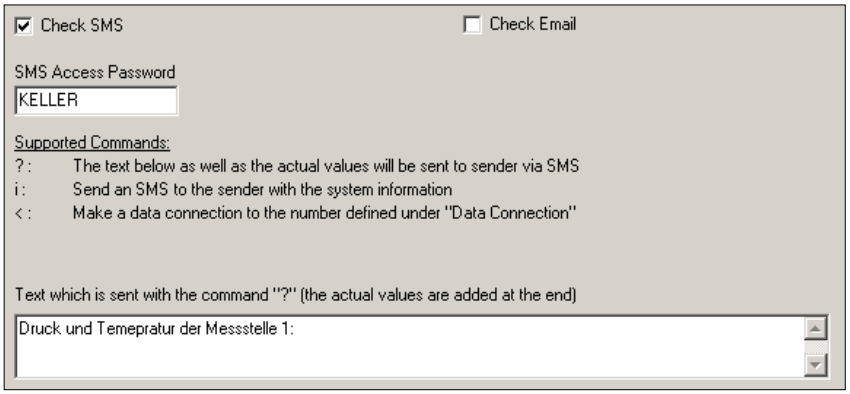
Sample message: Email with measurement data in binary (base64) format.



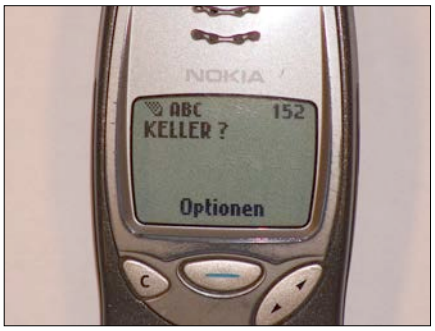
12.2 SMS

This sample shows how a message with a command is sent to the GSM-2 and how it responds to the command.

Configuration with password “KELLER” and reply text:



Query with password and command “?” is sent to GSM-2:



The GSM-2 replies to the query. Pressure (in mbar) and temperature with positive/negative sign separately:

13 Data Connection

This function was used in the GSM-1. For compatibility reasons, it is also supplied in the GSM-2. We do not recommend using this function in new projects. Use the Email function instead.

When a data connection is established, the data from the **Data Collector DCX connected to the GSM** can be accessed worldwide via modem. If a data logger is connected, the entire memory content can be read out. It is also possible to reconfigure the logger.

A data connection can be made only from the module to the PC. The user is always called from the GSM module. The call time can be specified in the configuration. An additional, more flexible possibility is to send an SMS to the module which then requests a data connection (with the command “<”). The next time the module checks incoming SMS messages, it recognises that a data connection has been requested. It immediately dials the relevant number and establishes the data connection with the user’s modem.
Preparation for connecting the call:
The call can be made either with an analogue or a digital (ISDN) modem. The use of an external modem is recommended.

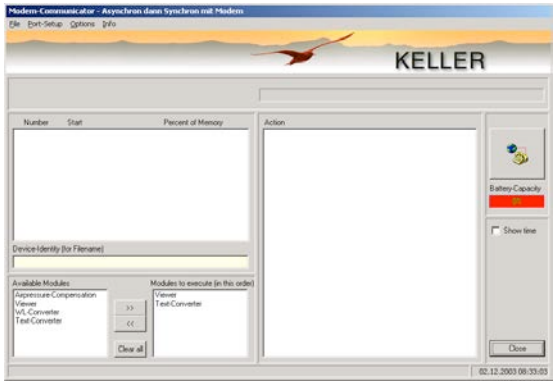
13.1 Using “Modem Reader” for automatic Read-Out

The “Modem Reader” software allows calls to be received automatically from the GSM.
The stored values from the data logger are transferred and saved on the PC's hard disk.
All these activities run in the background.

Once the program has started it will wait until the modem is called.

After establishing the connection the program starts to read out the values from the data logger.

Once the record has been read and saved the line between the GSM and the modem is disconnected and the program waits for the next call.



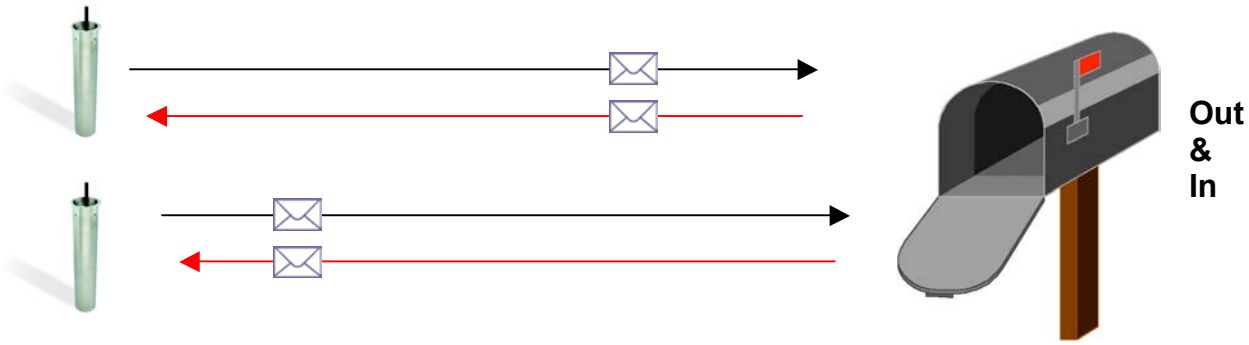
14 Email Configuration

We recommend using at least two Email accounts in conjunction with the GSM Datamanager: one Email account where the GSM-2 modules send the measurements and the configurations to. The other Email account is for configurations that are sent from the GSM Datamanager to the GSM-2 modules. The GSM-2 then only downloads configurations. This helps to save battery power and data transfer cost.

14.1 One Email Account (for outgoing and incoming messages)

Advantage: Only one Email account for incoming and outgoing messages

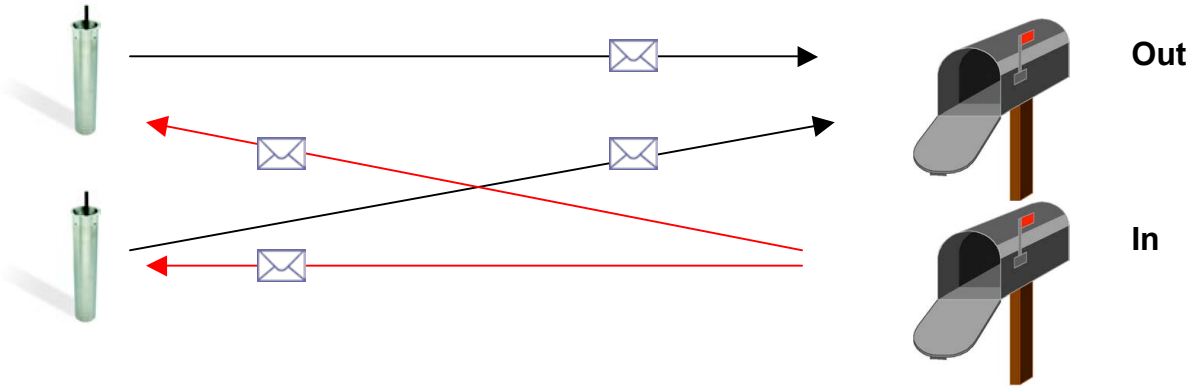
Disadvantage: All messages (configuration and measurements) are downloaded to each GSM-2 module in use.
This produces a lot of traffic and higher costs; it also limits battery life.



14.2 Two Email Accounts (one for outgoing and one for incoming messages)

Advantage: Separate Email account for incoming and outgoing messages.
All measurements are sent to the same Email account.
All configuration mails are downloaded from a separate mailbox.

Disadvantage: The configuration messages are downloaded to each used GSM-2 module. This means more traffic, additional costs and reduced battery life.

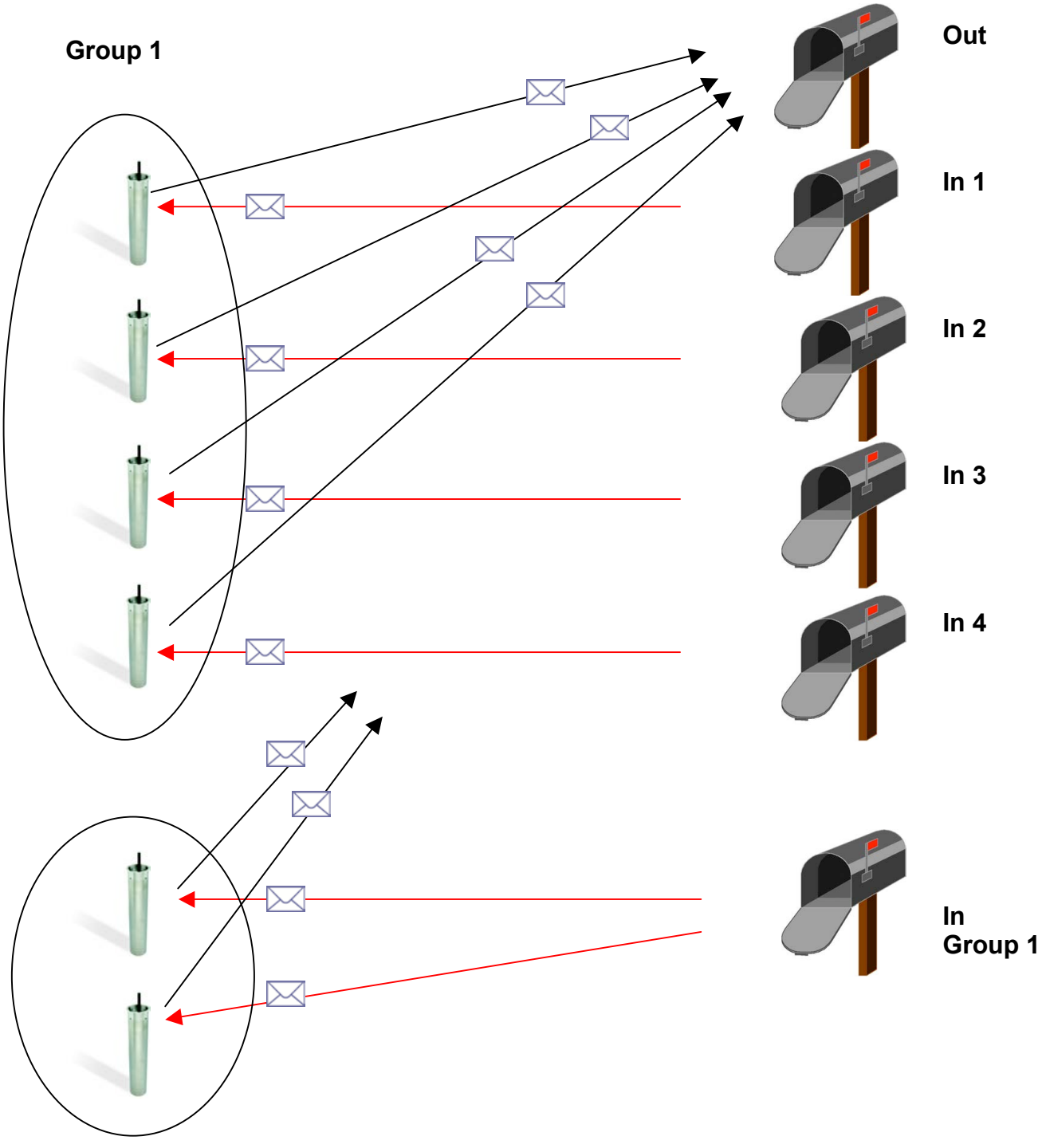


14.3 Many Email Accounts (one for outgoing and one for each GSM-2 for incoming messages)

Advantage: One Email account for outgoing messages and a separate Email account for each GSM-2 (incoming message).
All measurements are sent to the same Email account.
Only configuration mails for the corresponding GSM-2 are downloaded to GSM-2.

Disadvantage: You need many Email accounts

Hint: You can build groups (measurement networks), which use the same inbox.



15 APN / GPRS-Settings for different Providers

Source: http://www.webmessenger.com/support/APN.jsp

Sweden

Choose country

Carrier: **Tele2** (Sweden)
APN: **isplnk1.swip.net**
User name: **gprs**
Password: **internet**

Carrier: **Telia** (Sweden)
APN: **online.telia.se**
User name:
Password:

Carrier: **Vodafone SE** (Sweden)
APN: **internet.vodafone.net**
User name:
Password:

Carrier: **Telenor** (Sweden)
APN: **internet.telenor.se**
User name: **null**
Password: **null**

Carrier: **Tele2, Comviq** (Sweden)
APN: **isplnk1.swip.net**
User name: **gprs**
Password: **internet**

Carrier: **Tele2 (3G)** (Sweden)
APN: **internet.tele2.se**
User name: **wap**
Password: **wap**

Carrier: **Telenor** (Sweden)
APN: **internet.vodafone.net**
User name: **guest**
Password: **guest**

Carrier: **(GPRS)** (Sweden)
APN: **internet.vodafone.net**
User name: **guest**
Password: **guest**

Carrier: **Telenor** (Sweden)
APN: **services.vodafone.net**
User name: **guest**
Password: **guest**

Carrier: **(3G)** (Sweden)
APN: **services.vodafone.net**
User name: **guest**
Password: **guest**

Carrier: **Telia** (Sweden)
APN: **online.telia.se**
User name: **guest**
Password: **guest**

Carrier: **Tre (3G)** (Sweden)
APN: **data.tre.se**
User name: **void**
Password: **void**

Finland

Choose country

Carrier: **DNA** (Finland)
APN: **internet**
User name:
Password:

Carrier: **Radiolinja** (Finland)
APN: **internet**
User name:
Password:

Carrier: **Saunalahti** (Finland)
APN: **saunalahti**
User name:
Password:

Carrier: **Sonera** (Finland)
APN: **internet**
User name:
Password:

Carrier: **Telia Mobile** (Finland)
APN: **internet**
User name:
Password:

Carrier: **Dna** (Finland)
APN: **internet**
User name: **guest**
Password: **guest**

Carrier: **Elisa (Radiolinja)** (Finland)
APN: **internet**
User name: **rlnet**
Password: **internet**

Carrier: **Saunalahti** (Finland)
APN: **internet.saunalahti**
User name: **guest**
Password: **guest**

Carrier: **Sonera** (Finland)
APN: **internet**
User name: **[blank]**
Password: **[blank]**

Carrier: **Song** (Finland)
APN: **internet.song.fi**
User name: **song@internet**
Password: **songnet**

Switzerland

Choose country

Carrier: **Orange CH** (Switzerland)
APN: **internet**
User name:
Password:

Carrier: **sunrise** (Switzerland)
APN: **internet**
User name: **internet**
Password: **internet**

Carrier: **Swisscom** (Switzerland)
APN: **gprs.swisscom.ch**
User name:
Password:

Carrier: **UMC** (Switzerland)
APN: **www.umc.ua**
User name:
Password:

Carrier: **Orange** (Switzerland)
APN: **internet**
User name: **guest**
Password: **guest**

Carrier: **Sunrise** (Switzerland)
APN: **internet**
User name: **internet**
Password: **internet**

Carrier: **Swisscom** (Switzerland)
APN: **gprs.swisscom.ch**
User name: **guest**
Password: **guest**

Germany

Choose country

Carrier: **D2 Vodafone** (Germany)
APN: **web.vodafone.de**
User name:
Password:

Carrier: **E-Plus** (Germany)
APN: **internet.eplus.de**
User name: **eplus**
Password: **gprs**

Carrier: **O2** (Germany)
APN: **wap.viaginterkom.de**
User name:
Password:

Carrier: **O2** (Germany)
APN: **internet**
User name:
Password:

Carrier: **Quam** (Germany)
APN: **quam.de**
User name: **quam**
Password: **quam**

Carrier: **T-Mobile** (Germany)
APN: **wap.t-dl.de**
User name:
Password:

Carrier: **T-Mobile D1** (Germany)
APN: **internet.t-d1.de**
User name: **td1**
Password: **gprs**

Carrier: **D2 Vodafone** (Germany)
APN: **web.vodafone.de**
User name: **guest**
Password: **guest**

Carrier: **E-Plus** (Germany)
APN: **internet.eplus.de**
User name: **eplus**
Password: **gprs**

Carrier: **O2 (3G)** (Germany)
APN: **surfo2**
User name: **guest**
Password: **guest**

Carrier: **O2 (GPRS)** (Germany)
APN: **internet**
User name: **guest**
Password: **guest**

Carrier: **Quam** (Germany)
APN: **quam.de**
User name: **quam**
Password: **quam**

Carrier: **T-Mobile D1** (Germany)
APN: **internet.t-mobile**
User name: **internet.t-d1.de**
Password: **t-mobile**

Italy

Choose country

Carrier: **BLU Contratto** (Italy)
APN: **INTERNET**
User name:
Password:

Carrier: **BLU Prepagata** (Italy)
APN: **PINTERNET**
User name:
Password:

Carrier: **TIM** (Italy)
APN: **wap.tim.it**
User name:
Password:

Carrier: **TIM** (Italy)
APN: **uni.tim.it**
User name:
Password:

Carrier: **TIM** (Italy)
APN: **ibox.tim.it**
User name:
Password:

Carrier: **Vodafone Omnitel** (Italy)
APN: **web.omnitel.it**
User name:
Password:

Carrier: **Wind** (Italy)
APN: **internet.wind**
User name:
Password:

Carrier: **Blu** (Italy)
APN: **INTERNET**
User name: **guest**
Password: **guest**

Carrier: **H3G** (Italy)
APN: **tre.it**
User name: **guest**
Password: **guest**

Carrier: **TIM** (Italy)
APN: **ibox.tim.it**
User name: **guest**
Password: **guest**

Carrier: **Vodafone (contract)** (Italy)
APN: **web.omnitel.it**
User name: **guest**
Password: **guest**

Carrier: **(Omnitel)** (Italy)
APN: **web.omnitel.it**
User name: **guest**
Password: **guest**

Carrier: **Wind** (Italy)
APN: **internet.wind**
User name: **Wind**
Password: **Wind**

France

Choose country

Carrier: **Bouygues (B2Bouygtel)** (France)
APN: **b2bouygtel.com**
User name:
Password:

Carrier: **Bouygues Telecom** (France)
APN: **eBouygTel.com**
User name:
Password:

Carrier: **Orange MIB** (France)
APN: **orange-mib**
User name: **mportail**
Password: **mib**

Carrier: **Orange Perso** (France)
APN: **orange**
User name: **orange**
Password: **orange**

Carrier: **Orange Pro** (France)
APN: **orange.fr**
User name: **orange**
Password: **orange**

Carrier: **SFR** (France)
APN: **websfr**
User name:
Password:

Carrier: **Bouygues** (France)
APN: **ebouygtel.com**
User name: **guest**
Password: **guest**

Carrier: **Bouygues (B2Bouygtel)** (France)
APN: **b2bouygtel.com**
User name: **guest**
Password: **guest**

Carrier: **Orange (contract)** (France)
APN: **orange.fr**
User name: **orange**
Password: **orange**

Carrier: **Orange (business)** (France)
APN: **internet-entreprise**
User name: **orange**
Password: **orange**

Carrier: **Orange MIB** (France)
APN: **orange-mib**
User name: **mportail**
Password: **mib**

Carrier: **Orange Mobicarte** (France)
APN: **orange-acte**
User name: **orange**
Password: **orange**

Carrier: **SFR** (France)
APN: **websfr**
User name: **guest**
Password: **guest**

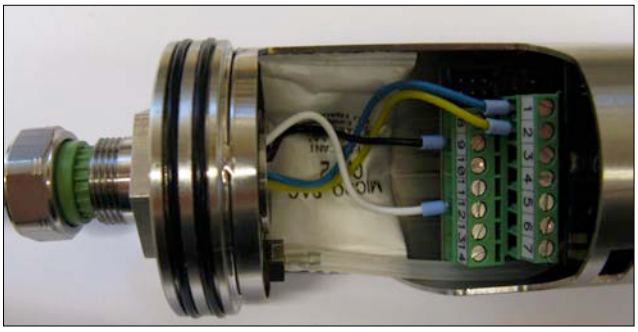
---

16 Initial Installation Step by Step

The configuration below shows how installation and configuration can take place. It is a standard configuration suitable for most applications:

- GSM-2 with level senor (Series 36 XW) connected. Connection RS485 and 12 Volt supply.
- Two Email accounts. Datamanager@measure.ch to send messages with measurements to the Datamanager, gsm2@measure.ch to send new configuration from the Datamanager to the GSM-2.
- Measuring interval is 1 hour, sending an Email with 24 measuring values every day (24 hours)
- Check interval for incoming Email (configuration from Datamanager to GSM-2) every day (24 hours), same time as for sending measurements to the Datamanager.

16.1 Connect Level Sensor



Feed the sensor cable through the sleeve and connect the cable ends to the terminal strip.

Connect the Series 36 XW level sensor as follows:

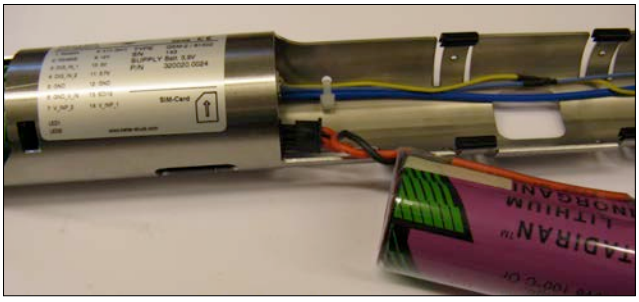
Blue:	RS485A
Yellow:	RS485B
Black:	+ 12 VDC
White:	GND

Tighten the cable gland.

16.2 Insert SIM Card

Insert the SIM card until it locks.

16.3 Insert Battery



Connect the battery and push it into the battery holder.

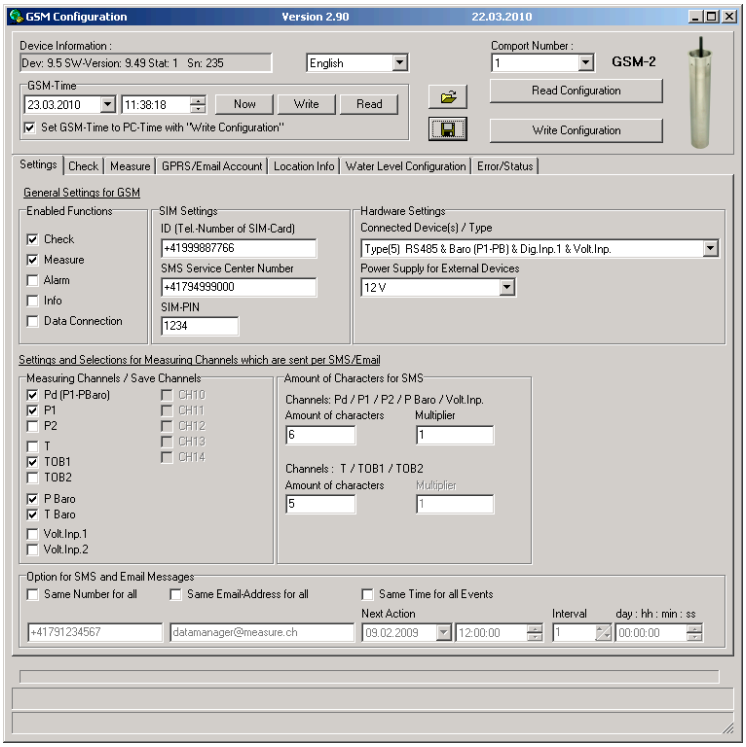
16.4 Close the GSM-2 Housing and connect Antenna

16.5 Insert GSM-2 into the Measuring Point and connect to PC

Insert the module into the measuring point and make a note of all required parameters.
--> Longitude / Latitude / Altitude / …

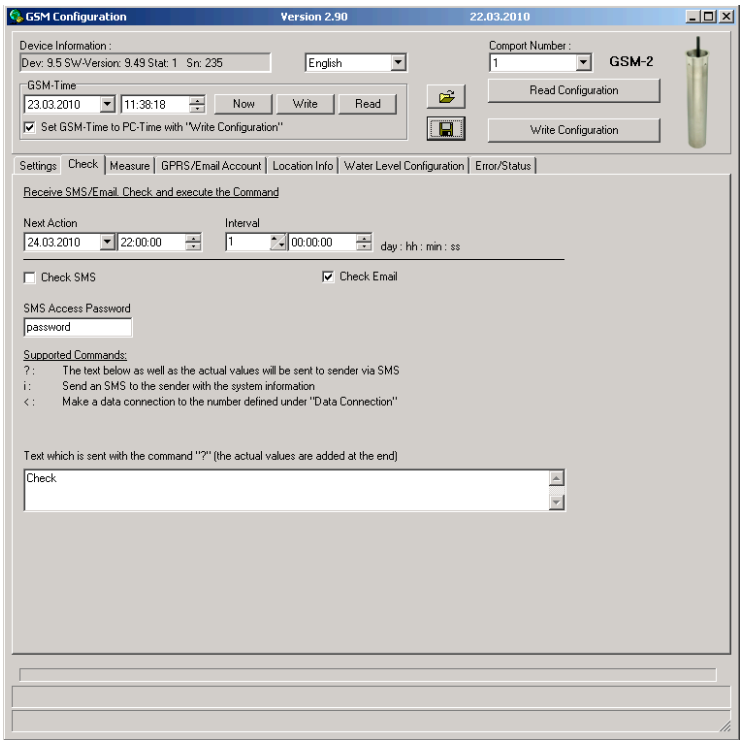
16.6 Configure the GSM-2 with GSM Setup Program

16.7 General Settings



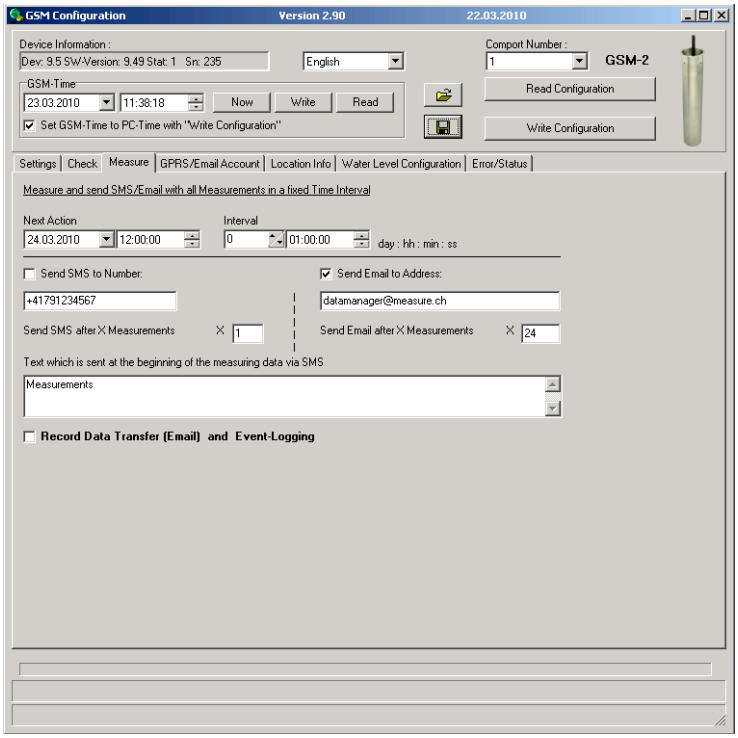
Make selections and settings as shown in the picture.

16.8 Check Time and Interval



Check interval: 1 (per day)
Check time: 22.00

16.9 Measure Interval and Email Send Time

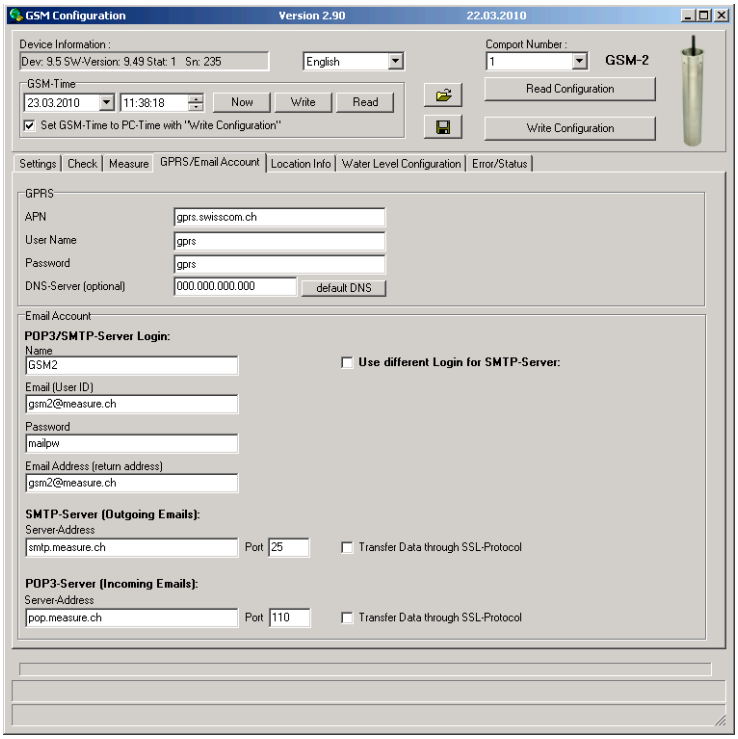


Measuring interval: 1 hour
Number of measurements: 24

Message will be sent every day at 11.00 to Datamanager@measure.ch.

No record transfer (→ text transfer)

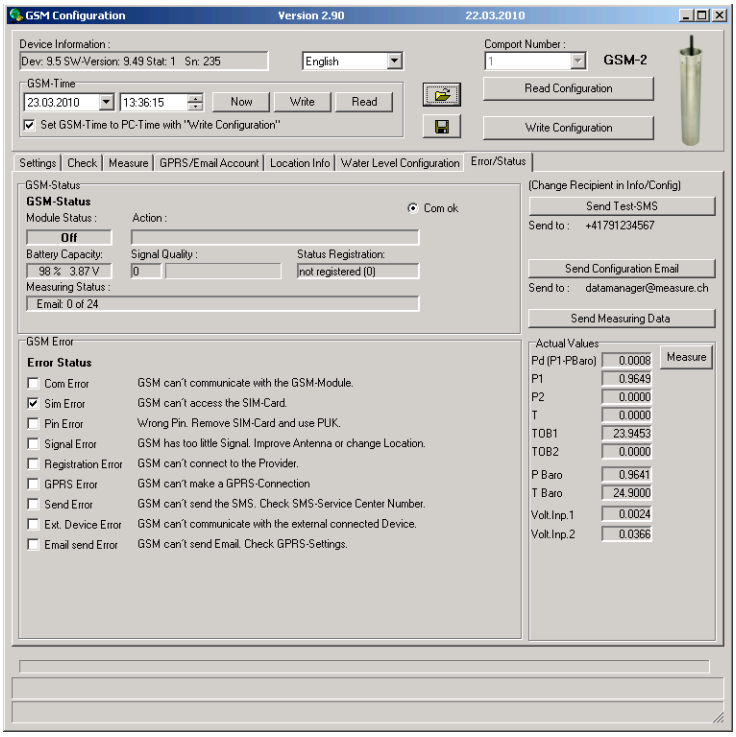
16.10 GPRS and Email Account Settings



This is the Email account from where the GSM-2 module sends mails and receives configurations (check).

After having changed the settings, proceed with the "Write Configuration" button to transfer the settings to the connected device!

16.11 Send Configuration Email



Now click on the “Send Configuration Email” button to transfer the settings and to register the device in the Datamanager.

Make sure that the transfer takes place without error.

After sending, disconnect the communication interface cable and protect the interface with the protection cap.

The GSM-2 is now configured and will send the measurements on a daily basis.

Close the lock unit and lock it.

17 EC Declaration of Conformity

KELLER

CE

EG-KONFORMITÄTS-ERKLÄRUNG	EC-DECLARATION OF CONFORMITY	DÉCLARATION CE DE CONFORMITÉ
Für das folgende Erzeugnis wird hiermit bestätigt,	Herewith we declare, that the following products or product range	Nous attestons que les produits ou gammes de produits :
GSM-2	**GSM-2**	**GSM-2**
dass es den wesentlichen Schutzanforderungen entspricht, die in der Richtlinie des Rates zur Angleichung der Rechtsvorschriften der Mitgliedstaaten über Funkanlagen und Telekommunikationsendeinrichtungen (1999/5/EG) festgelegt sind.	meet the basic requirements for radio equipment and telecommunications terminal equipment, which are established in the directive of the European Community (1999/5/EC).	répondent aux exigences de base en matière des équipements hertziens et les équipements terminaux de télécommunications prévus par la directive de la Communauté Européenne (1999/5/CE).
Diese Erklärung gilt für Produkte dieser Serie, die mit dem CE-Zeichen versehen und die Bestandteil dieser Erklärung sind.	This declaration is valid for products of this Series marked with the CE sign and which are part of this declaration.	La présente déclaration est valable pour les produits de cette série, marqués avec le sigle CE et faisant partie intégrante de la présente déclaration.
Es wurden folgende Normen herangezogen:	The following norms are:	Les normes appliquées sont les suivantes :

EN 301 489-1 v1.4.1	EN 301 489-7 v1.2.1	3GPP TS51.010-1 v6.2.1	EN 301 511 v9.0.2

Diese Erklärung wird verantwortlich für den Hersteller	This declaration is given for the manufacturer	La présente déclaration est fournie pour le fabricant

Keller AG für Druckmesstechnik, St. Gallerstrasse 119, CH-8404 Winterthur

abgegeben durch die	in full responsibility by	par

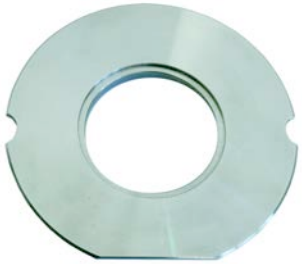
Keller GmbH, Schwarzwaldstrasse 17, D-79798 Jestetten

H. W. Keller Geschäftsführer mit rechtsgültiger Unterschrift	H. W. Keller General Manager with legally effective signature	H. W. Keller Président dûment autorisé à signer

Jestetten, 28.10. 2009

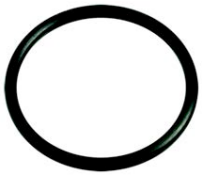
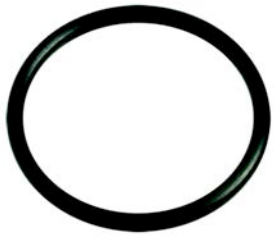
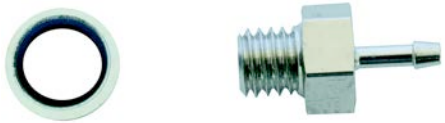
CE

18 GSM-2 Parts and Accessories

DESCRIPTION		PRODUCT NO.	Picture
GSM-2 with Accessories and Locking Unit		320020.0024	
GSM-2 with Accessories		320020.0035	
GSM-2		320020.0028	
GSM-2 Box		320020.0037	
GSM-2 Electronics		320020.0036	
Level Transmitter Series 36XW Only digital output (RS485) / low power PAA-36XW (0,8 bar … 1.8 bar) 5 mWC / 5 m cable (0,8 bar … 2.3 bar) 10 mWC / 10 m cable		 233610.0761 233610.0762	
Locking Unit	**2’’** **3’’** **4’’** **5’’** **6’’**	320020.0026 320020.0056 320020.0045 320020.0046 320020.0042	
Adapter ring suitable for the locking unit	**3’’** **4’’** **5’’** **6’’**	506810.0085 506810.0085 506810.0087 506810.0078	

DESCRIPTION	PRODUCT NO.	Picture
Battery 3,9 V with Plug Capacity: 35 Ah	557005.0019	
K-103A Interface Converter For communication between the PC and the GSM-2. Connection to serial port (RS232 – RS485 converter)	309010.0002	
K-114A Interface Converter For communication between the PC and the GSM-2. Connection to USB port (USB – RS 485 converter)	309010.0075	
KELLER Software CD CD includes: Configuration software: GSM Setup with operating manual, Data collecting software: Datamanager with operating manual Free download under: www.keller-druck.com (see “Products”–>“Software/Converters”)	750505.0001	
Stub Antenna (Quad Band) with SMA connection	320020.0003	
Antenna for Manhole Cover with SMA connection	320020.0030	
Antenna Cable with MMCX and SMA connection	320020.0038	

DESCRIPTION	PRODUCT NO.	Picture
Adapter LEMO Lemo Plug 70012	502620.0009	
Adapter Cable with Fischer Plug for datalogger “DCX” Connection	320020.0009	
Fischer Plug (configuration interface)	320020.0039	
Circlip DIN: 471 (BN: 682) ø 18 mm	508830.0002	
AGRO Set ø 3,5…6,5 mm Adapter, screw nut, seal, circlip	320020.0061	
AGRO Set ø 6,6…8 mm Adapter, screw nut, seal, circlip	320020.0062	

DESCRIPTION	PRODUCT NO.	Picture
Closure Cap for Fischer Plug Includes screw (M3 x 6 Inox)	508415.0004	
O-Ring ø 19 x 1,5 mm (Nitrile)	508610.0091	
O-Ring ø 40 x 1,5 mm (Nitrile)	508620.0007	
T-Piece Serto LO CV 3000-1.5	702505.0003	
Tube Adapter Incl. venting element, sealing ring	702505.0005	
Tube (Baro venting tube) Outer Ø: 3 mm / Inner Ø : 1 mm Length : 50 mm	702505.0004	
Silica Gel Bag Size 2	702515.0001