

# GSM-2 description of communication

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## 1 Email-structure

|                |                                                                                |                                                                                                                                                                                                                                                          |
|----------------|--------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Header</b>  | 1. Received: from..                                                            | sending time determination, to compare with system time GSM-2 module                                                                                                                                                                                     |
| <b>Subject</b> | Tel-Nr [M,S]<br>Example:<br><b>+41793076790 M</b><br><br><b>+00111223344 S</b> | mobile phone number 13 characters<br>(International without blank) from GSM-2-module<br><b>M : to Datamanager</b> (=measurement)<br><b>S : to GSM-2-module</b> (=settings)<br><br><b>Broadcast</b><br>(Message for all participators, not yet supported) |
| <b>Body</b>    |                                                                                | List of commands that are consecutively ranked                                                                                                                                                                                                           |

## 2 Command

general structure of a command:

**#** [Command] / [variable name 1] = [+,-] [variable value 1] / [variable name 2] = [+,-] [variable value 2]

|                         |                                                            |
|-------------------------|------------------------------------------------------------|
| <b>#</b>                | Command start character                                    |
| <b>[command]</b>        | command consists one sign, (could be more signs in future) |
| <b>/</b>                | delimiters of different data containers                    |
| <b>[variable name]</b>  | variable that is communicated                              |
| <b>=</b>                | delimiters                                                 |
| <b>[+,-]</b>            | sign of the variable value (not required for strings)      |
| <b>[variable value]</b> | value of variable                                          |

Regular Expression for Validation:

$((\#B+/[a-z0-9]+\backslash=?[\wedge+\backslash=A-Za-z0-9@]^*)|(\#[A-Za-z]+(/[a-z0-9]+\backslash=?[\_ \backslash! \backslash? \backslash: \backslash; \backslash- \backslash+ \backslash. A-Za-z0-9@]^*)^*))(\#E/e)?(\#X/a\backslash= \{d\{5\})?$

## 3 Command table

### 3.1 #B Base64

|           |    |                  |                               |                                                                      |
|-----------|----|------------------|-------------------------------|----------------------------------------------------------------------|
| <b>#B</b> |    | Firmware Version |                               |                                                                      |
| <b>#B</b> | /a | 08.28            | #B/a=[Base64 encoded content] | The content (base-64 code) contains the control characters / = ... . |

### 3.2 #C Additional information about e-mail content

|           |    |                  |                  |                          |
|-----------|----|------------------|------------------|--------------------------|
| <b>#C</b> |    | Firmware Version |                  |                          |
|           | /a | 08.28            | Range 0 ... 4095 | Record-Data Page-start   |
|           | /b | 08.28            | Range 0 ... 30   | Record-Data Page-numbers |

### 3.3 #E End

| #E |    | Firmware Version |  |                           |
|----|----|------------------|--|---------------------------|
|    | /e | /e               |  | end of e-mail or ftp-file |

### 3.4 #F Message type

| #F |    | Firmware Version |                                                       |                                                                                                                                       |
|----|----|------------------|-------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
|    | /a | 12.20            | Example: /a=0                                         | measurement-E-Mail/FTP-File                                                                                                           |
|    | /b | 09.49            | value 0 = periodic Mail<br>value 1 = unsolicited Mail | Configuration -E-Mail without ACK<br>(sending by config button or periodically sent) From version 09.45 only periodically INFO-E-Mail |
|    | /c | 12.20            |                                                       | Alarm-E-Mail /FTP-File                                                                                                                |
|    | /d | 12.20            |                                                       | Configuration-E-Mail /FTP-File with ACK (response to configuration changes)<br>From version 09.45 config button Ack = 0               |
|    | /e | 12.20            |                                                       | Record-Data /FTP-File                                                                                                                 |
|    | /f | 12.20            |                                                       | requested Record-Data /FTP-File                                                                                                       |

### 3.5 #G Text

| #G |    |  |                          |
|----|----|--|--------------------------|
|    | /a |  | Text to measuring values |
|    | /b |  | Text to alarm            |
|    | /c |  | Text to answer           |

### 3.6 #I Info

| #I |    | Firmware Version |                        |                                           |
|----|----|------------------|------------------------|-------------------------------------------|
|    | /n | 08.28            | N=12345678 [max 8 CHR] | Serial number GSM-2-module                |
|    | /s | 08.28            | /s=24 [0...31]         | Signal quality GSM-Network                |
|    | /b | 08.28            | /b=99 [0...100]        | calculated Battery capacity [%]           |
|    | /f | 08.28            | /f=08.04 [YY.KW]       | Software version GSM-Module               |
|    | /v | 09.49            | V=3.912 [x.xxx]        | measured battery voltage GSM-2-module [V] |

### 3.7 #M Measurement

| #M |    | Firmware Version |                   |                                            |
|----|----|------------------|-------------------|--------------------------------------------|
|    | /a | 09.49            | +0.12-14.25+25.15 | current values<br>(only selected channels) |

|  |    |       |                                                                                          |                                             |
|--|----|-------|------------------------------------------------------------------------------------------|---------------------------------------------|
|  | /b | 09.49 | +0.12-14.25+25.15                                                                        | recorded values<br>(only selected channels) |
|  | /c | 08.28 | +0+1                                                                                     | State of digital-Inputs (0 or 1)            |
|  | /d | 09.49 | +0.0004080+0.9559831+0.0000000<br>+0.0000000+24.482742+0.0000000<br>+0.9555750+25.100002 | current values<br>(All available channels)  |

### 3.8 #O Ack (16Bit value)

| #O |    | Firmware Version |          |                                                       |
|----|----|------------------|----------|-------------------------------------------------------|
|    | /f | 08.28            | /f=23423 | <b>PC to GSM</b><br>Request Ack from receiver (GSM-2) |
|    | /g | 08.28            | /g=23423 | <b>GSM to PC</b><br>return Ack (answer GSM to PC)     |
|    | /h | 08.28            | /h=23423 | <b>return NotAck</b><br>(GSM do not accept ack)       |

### 3.9 #T Time

| #T |    | Firmware Version |                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----|----|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|    | /s | 08.28            | GSM-Time                                                                                                                                                                                                                           | s for seconds, beginning<br>1.1.2000 0:0:0 [ 0...2^32]                                                                                                                                                                                                                                                                                                                                                                                                  |
|    | /p | 08.28            | GSM-Provider time<br>If network operator does not support System Clock Update Message, the initial date, time and time zone, displayed could be invalid<br><br><b>when function is not supported, GSM-2 returns date ~1.1.2000</b> | Example: 08.02.06,16:12:21+04<br>ASCII string of format:<br>yy.MM.dd,hh:mm:ss±zz<br>or<br>yy.MM.dd,hh:mm:ss<br>yy - 2-digit year [2000-2069]<br>MM - 2-digit month [01-12]<br>dd - 2-digit day of month [00-31]<br>hh - 2-digit hour [00-23]<br>mm - 2-digit minute [00-59]<br>ss - 2-digit seconds [00-59]<br>zz - (optional) time zone offset from GMT, in quarter-hours [-47...+48]. If this value is not specified, the time zone offset will be 0. |
|    | /m | 08.28            | same format as second (s) from year 2000                                                                                                                                                                                           | Time, last measured value was stored                                                                                                                                                                                                                                                                                                                                                                                                                    |
|    | /d | 08.28            | /d=354221.21234 (for manual Parser)                                                                                                                                                                                                | Time as float<br>Integer : days since 30.12.1899<br>decimal places: Time                                                                                                                                                                                                                                                                                                                                                                                |

### 3.10#X CRC16

| #X |    | Firmware Version |                   |                                                                                                                            |
|----|----|------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------|
|    | /a | 08.28            | Example: /a=05473 | CRC as decimal number 0-2^16 always 5-digits<br>Can be appended at the end of message<br>(in unencrypted state = readable) |

## 4 Configuration

### 4.1 #a GPRS settings (char max 50)

| #a |    | Firmware Version |    |                                 |
|----|----|------------------|----|---------------------------------|
|    | /a | 08.28            | 24 | GprsAPN                         |
|    | /b | 08.28            | 48 | GprsID                          |
|    | /c | 08.28            | 40 | GprsPassword                    |
|    | /d | 08.28            | 15 | GprsDNS                         |
|    | /e | 08.28            | 24 | Smtplib showed Name             |
|    | /f | 08.28            | 48 | PopUsername                     |
|    | /g | 08.28            | 40 | PopPassword                     |
|    | /h | 08.28            | 48 | OptSmtplibUsername              |
|    | /i | 08.28            | 40 | OptSmtplibPassword              |
|    | /j | 08.28            | 40 | Pop3Server                      |
|    | /k | 08.28            | 5  | Pop3Port                        |
|    | /l | 08.28            | 40 | SmtplibServer                   |
|    | /m | 08.28            | 50 | SmtplibPort                     |
|    | /n | 09.49            | 50 | ReturnAddress                   |
|    | /o |                  | 50 | OptReturnAddress (not existing) |

### 4.2 #b TEXT E-Mail-adr. & SMS-Tel.N° & Inst.Dat. (char 10-50)

| #b |    | Firmware Version |                                          |                                                 |
|----|----|------------------|------------------------------------------|-------------------------------------------------|
|    | /a | 08.28            | 50                                       | EmailAddress1                                   |
|    | /b | 08.28            | 50                                       | EmailAddress2                                   |
|    | /c | 08.28            | 50                                       | EmailAddress3                                   |
|    | /d |                  |                                          | Reserve(EmailAddress4)                          |
|    | /e |                  |                                          | Reserve(EmailAddress5)                          |
|    | /f |                  |                                          |                                                 |
|    | /g | 08.28            | 10                                       | password for query SMS                          |
|    | /h |                  | previously serial number, but never used |                                                 |
|    | /i |                  |                                          |                                                 |
|    | /j | 08.28            | 10                                       | SimPin                                          |
|    | /k | 08.28            | 30                                       | recall for data connection (not used for GSM-2) |
|    | /l |                  |                                          |                                                 |
|    | /m | 08.28            | 30                                       | SmsNumber1 Measure                              |
|    | /n | 08.28            | 30                                       | SmsNumber2 Alarm                                |
|    | /o | 08.28            | 30                                       | SmsNumber3 Info                                 |
|    | /p |                  |                                          | Reserve(SmsNumber4)                             |
|    | /q | 09.09            |                                          | SMS-Service center nr.                          |
|    | /r | 08.28            | 20                                       | NetworkName                                     |
|    | /s | 08.28            | 30                                       | OwnTelNumber                                    |
|    | /t | 08.28            | 20                                       | LocationName                                    |
|    | /u | 09.01            | 50 (new 160)                             | SmsText1 Measure                                |
|    | /v | 09.01            | 50 (new 160)                             | SmsText2 Alarm                                  |
|    | /w | 09.01            | 50 (new 160)                             | SmsText3 Answer Check                           |
|    | /x |                  |                                          | Reserve(SmsText4)                               |
|    | /y |                  |                                          | Reserve(SmsText5)                               |

|  |    |       |    |               |
|--|----|-------|----|---------------|
|  | /z |       |    |               |
|  | /0 | 09.01 | 20 | LongitudeText |
|  | /1 | 09.01 | 20 | LatitudeText  |
|  | /2 | 09.01 | 20 | AltitudeText  |

### 4.3 #k TEXT FTP Settings (char 10-50)

| #k |    | Firmware Version |                                                          |                                |
|----|----|------------------|----------------------------------------------------------|--------------------------------|
|    | /a | 12.20            | 50                                                       | FTP Server Name                |
|    | /b | 12.20            | 50                                                       | FTP Username                   |
|    | /c | 12.20            | 50                                                       | FTP Password                   |
|    | /d | 12.20            | 50 (not used in GSM, but supervised)                     | FTP Account                    |
|    | /e | 12.20            | (Max 5 letters range 0...65535)                          | FTP source control (Port)      |
|    | /f | 12.20            | (Max 5 letters range 0...65535)                          | FTP destination control (Port) |
|    | /g | 12.20            | (Max 5 letters range 0...65535) (is fixed 2000 into GSM) | FTP source data (Port)         |
|    | /h | 12.20            | 50                                                       | FTP Server Path                |
|    | /i |                  |                                                          |                                |
|    | /j |                  |                                                          |                                |
|    | /k |                  |                                                          |                                |
|    | /l |                  |                                                          |                                |
|    | /m |                  |                                                          |                                |
|    | /n |                  |                                                          |                                |
|    | /o |                  |                                                          |                                |
|    | /p |                  |                                                          |                                |
|    | /q |                  |                                                          |                                |
|    | /r |                  |                                                          |                                |
|    | /s |                  |                                                          |                                |
|    | /t |                  |                                                          |                                |
|    | /u |                  |                                                          |                                |
|    | /v |                  |                                                          |                                |
|    | /w |                  |                                                          |                                |
|    | /x |                  |                                                          |                                |
|    | /y |                  |                                                          |                                |
|    | /z |                  |                                                          |                                |
|    | /0 |                  |                                                          |                                |
|    | /1 |                  |                                                          |                                |
|    | /2 |                  |                                                          |                                |

#### 4.4 #c measurement settings (byte/integer)

| #c        |    | Firmware Version |                                                                                                                                                                |                                                                                                      |
|-----------|----|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| F100/1    | /a | 08.28            | _U32(start measurement date = now (GSM clock) + 60 days. If start measurement date < now (GSM clock) then start measurement date = now (GSM clock)             | Timer 0 Measure                                                                                      |
| F100/2    | /b | 08.28            | _U32(start alarm date = now (GSM clock) + 60 days. If start alarm date < now (GSM clock) then start alarm date = now (GSM clock)                               | Timer 1 Alarm                                                                                        |
| F100/3    | /c | 08.28            | _U32(start info date = now (GSM clock) + 60 days. If start info date < now (GSM clock) then start info date = now (GSM clock)                                  | Timer 2 Info                                                                                         |
| F100/4    | /d | 08.28            | _U32(start check date = now (GSM clock) + 60 days. If start check date < now (GSM clock) then start check date = now (GSM clock)                               | Timer 3 Check                                                                                        |
| F100/5    | /e | 08.28            | _U32(start data connection date = now (GSM clock) + 60 days. If start data connection date < now (GSM clock) then start data connection date = now (GSM clock) | Timer 4 Data connection                                                                              |
|           | /f |                  |                                                                                                                                                                |                                                                                                      |
| F100/6    | /g | 08.28            | _U32 (smallest measurement interval: 1 second, biggest interval: 30days                                                                                        | Interval 0 Measure                                                                                   |
| F100/7    | /h | 08.28            | _U32 maximal now (GSM clock) + 30 days                                                                                                                         | Interval 1 Alarm                                                                                     |
| F100/8    | /i | 08.28            | _U32 maximal now (GSM clock) + 30 days                                                                                                                         | Interval 2 Info                                                                                      |
| F100/9    | /j | 08.28            | _U32 maximal now (GSM clock) + 30 days                                                                                                                         | Interval 3 Check                                                                                     |
| F100/10   | /k | 08.28            | _U32 maximal now (GSM clock) + 30 days                                                                                                                         | Interval 4 Data connection                                                                           |
|           | /l |                  |                                                                                                                                                                |                                                                                                      |
| F100/11-0 | /m | 08.28            | (1 Byte) If channel0 is active, Bit0 = 1                                                                                                                       | measure / save CH 0...7<br>CH0= Bit0, CH1=Bit1....                                                   |
| F100/11-1 | /n | 08.28            | (1 Byte)                                                                                                                                                       | (SaveMethode)                                                                                        |
| F100/11-2 | /o | 08.28            | (1 Byte)                                                                                                                                                       | SendSmsAfterXMeas                                                                                    |
| F100/11-3 | /p | 09.01            | (1 Byte) If channel0 is active, Bit0 = 1                                                                                                                       | measure / save CH 8...15<br>CH8= Bit1, CH9=Bit2....                                                  |
| F100/11-4 | /q | 08.28            | (1 Byte)                                                                                                                                                       | SendMailAfterXMeas                                                                                   |
| F100/12-0 | /r | 08.28            | (1 Byte)                                                                                                                                                       | AlarmCH-Nr.                                                                                          |
| F100/12-1 | /s | 08.28            | (1 Byte)                                                                                                                                                       | Alarm Type<br>1 = On / Off<br>2 = Delta<br>3 = Digital Input                                         |
| F100/12-2 | /t | 08.28            | (1 Byte)                                                                                                                                                       | SendAlarmXTimes                                                                                      |
|           | /u |                  |                                                                                                                                                                |                                                                                                      |
| F100/14-0 | /v | 08.28            | (1 Byte) Min is 2, Max is 9                                                                                                                                    | Resolution pressure channels                                                                         |
| F100/15-0 | /w | 08.28            | (1 Byte) Min is 2, Max is 9                                                                                                                                    | Resolution temperature channels                                                                      |
| F100/16-0 | /x | 08.28            | (1 Byte) only bit 3 is set / read                                                                                                                              | LockTimer only Check<br>BitPos 3 Check                                                               |
| F100/16-0 | /y | 08.28            | (1 Byte) Bit 3 can not be set                                                                                                                                  | Lock_Timers (without Check)<br>BitPos 0 Measure<br>BitPos 1 Alarm<br>BitPos 2 Info<br>BitPos 3 Check |

|           |    |       |                                                                                                                                                                                        | BitPos 4 Dial                                                                                                                                                                                         |
|-----------|----|-------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| F100/16-1 | /z | 08.28 | (1 Byte) At least minimal e-mail is set for GSM Configuration:<br>To ensure that a Check Function is always active, when CheckFTP switched off<br>CheckMail is automatically activated | SendSmsEmail<br>BitPos 0 Measure-SMS<br>BitPos 1 Alarm-SMS<br>BitPos 2 Info-SMS<br>BitPos 3 Check-SMS<br>BitPos 4 Measure-Mail<br>BitPos 5 Alarm- Mail<br>BitPos 6 Info- Mail<br>BitPos 7 Check- Mail |
| F100/16-2 | /0 | 08.28 | (1 Byte)                                                                                                                                                                               | Modem Protocol (V32, V34, V110)                                                                                                                                                                       |
|           | /1 | 09.01 | (1 Byte)                                                                                                                                                                               | AccountSetting<br>0 = off<br>Bit0 = send Ssl<br>Bit1=receive Ssl                                                                                                                                      |
| F100/16-4 | /2 | 08.28 | (1 Byte) 0 = same login<br>1 = different login for SMTP                                                                                                                                | ServerConfig                                                                                                                                                                                          |
| F100/28-3 | /3 | 09.01 | (1 Byte)                                                                                                                                                                               | ofl.Form-Type                                                                                                                                                                                         |
| F100/18-2 | /4 | 08.28 | (1 Byte)                                                                                                                                                                               | Power External Device                                                                                                                                                                                 |
| F100/18-3 | /5 | 08.28 | (1 Byte) (not writable!)                                                                                                                                                               | Supported Connection Types                                                                                                                                                                            |
| F100/18-4 | /6 | 08.28 | (1 Byte)                                                                                                                                                                               | Connection Type                                                                                                                                                                                       |
| F100/28-2 | /7 | 09.01 | (1 Byte) (get ignored from Datamanager version 2.3 or higher)                                                                                                                          | KonfigBytes0<br>0 = wlc.Sensortype = vg<br>1 = wlc.Sensortype = sg                                                                                                                                    |
| F100/28-0 | /8 | 09.01 | (1 Byte)                                                                                                                                                                               | calc.Channels<br>0 = P1-P2<br>1 = P1-Baro<br>2 = P1 relative<br>255 = not defined (YSI)                                                                                                               |
| F100/28-1 | /9 | 09.01 | (1 Byte)                                                                                                                                                                               | calc.conversionTo<br>0 = Height of Water<br>1 = Depth to Water<br>2 = Height of Water above Sea<br>3 = Overflow (Poleni)<br>4 = Overflow (Thomson)                                                    |

#### 4.5 #f measurement settings 2 (byte/integer)

| #f        |    | Firmware Version |                                                                                                                                                                         |                                                                                            |
|-----------|----|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| F100/31   | /a | 09.09            | _U32(start eventdetectmeasure date = now (GSM clock) + 60 days. If start eventdetectmeasure date < now (GSM clock) then start eventdetectmeasure date = now (GSM clock) | Timer 5<br>EventDetectMeasure                                                              |
|           | /b | 08.28            |                                                                                                                                                                         |                                                                                            |
|           | /c | 08.28            |                                                                                                                                                                         |                                                                                            |
|           | /d | 08.28            |                                                                                                                                                                         |                                                                                            |
|           | /e | 08.28            |                                                                                                                                                                         |                                                                                            |
|           | /f | 08.28            |                                                                                                                                                                         |                                                                                            |
| F100/32   | /g | 09.09            | _U32 maximal now (GSM clock) + 30 days                                                                                                                                  | Interval 5 DetectEvent                                                                     |
| F100/33   | /h | 09.09            | _U32 maximal now (GSM clock) + 30 days                                                                                                                                  | Interval 6 MeasureEvent                                                                    |
|           | /i | 08.28            |                                                                                                                                                                         |                                                                                            |
|           | /j | 08.28            |                                                                                                                                                                         |                                                                                            |
|           | /k | 08.28            |                                                                                                                                                                         |                                                                                            |
|           | /l | 08.28            |                                                                                                                                                                         |                                                                                            |
| F100/30-0 | /m | 09.09            | (1 Byte)                                                                                                                                                                | EventCH                                                                                    |
| F100/30-1 | /n | 09.09            | (1 Byte) change only when < 4                                                                                                                                           | EventType<br>0 = deactivated<br>1 = activated (data transmitted as record)<br>2 = On / Off |

|           |    |       |                                                                                                                                                         |                                                                                                  |
|-----------|----|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|           |    |       |                                                                                                                                                         | 3 = Delta                                                                                        |
| F100/30-2 | /o | 09.09 | (1 Byte) Max 30                                                                                                                                         | SendMailYTimes                                                                                   |
|           | /p |       |                                                                                                                                                         |                                                                                                  |
| F100/26-1 | /q | 12.20 |                                                                                                                                                         | SendFTPAfterXMeas                                                                                |
|           | /r |       |                                                                                                                                                         |                                                                                                  |
|           | /s |       |                                                                                                                                                         |                                                                                                  |
|           | /t |       |                                                                                                                                                         |                                                                                                  |
|           | /u |       |                                                                                                                                                         |                                                                                                  |
|           | /v |       |                                                                                                                                                         |                                                                                                  |
|           | /w |       |                                                                                                                                                         |                                                                                                  |
|           | /x |       |                                                                                                                                                         |                                                                                                  |
|           | /y |       |                                                                                                                                                         |                                                                                                  |
| F100/26-4 | /z | 12.20 | (1 Byte)<br>for GSM Configuration:<br>To ensure that a Check Function is always active, when CheckFTP switched off CheckMail is automatically activated | SendFTP<br>BitPos 0 Measure-FTP<br>BitPos 1 Alarm-FTP<br>BitPos 2 Info-FTP<br>BitPos 3 Check-FTP |
|           | /0 |       |                                                                                                                                                         |                                                                                                  |
|           | /1 |       |                                                                                                                                                         |                                                                                                  |
|           | /2 |       |                                                                                                                                                         |                                                                                                  |
| F100/18-1 | /3 | 12.41 |                                                                                                                                                         | ExtPowPreSetTime<br>0...254 255 = 0                                                              |
|           | /4 |       |                                                                                                                                                         |                                                                                                  |
|           | /5 |       |                                                                                                                                                         |                                                                                                  |
|           | /6 |       |                                                                                                                                                         |                                                                                                  |
|           | /7 |       |                                                                                                                                                         |                                                                                                  |
|           | /8 |       |                                                                                                                                                         |                                                                                                  |
|           | /9 |       |                                                                                                                                                         |                                                                                                  |

#### 4.6 #d floating-point values (single)

| #d     |    | Firmware Version |                                                                    |                                 |
|--------|----|------------------|--------------------------------------------------------------------|---------------------------------|
| F30/0  | /a | 08.28            |                                                                    | Alarm On                        |
| F30/1  | /b | 08.28            |                                                                    | Alarm Off                       |
| F30/2  | /c | 08.28            |                                                                    | Alarm Delta                     |
|        | /d |                  |                                                                    |                                 |
|        | /e |                  |                                                                    |                                 |
| F30/3  | /f | 08.28            | must not be 0 otherwise changed to 1, only positive value possible | Multiplier temperature channels |
| F30/4  | /g | 08.28            | must not be 0 otherwise changed to 1, only positive value possible | Multiplier pressure channels    |
|        | /h |                  |                                                                    |                                 |
| F30/6  | /i | 09.09            | Event_Val_1                                                        | Val 1 (On Val) Event-Logging    |
| F30/7  | /j | 09.09            | Event_Val_2                                                        | Val 2 (Off Val) Event-Logging   |
| F30/8  | /k | 09.09            | Event_Val_3                                                        | Val 3 (delta) Event-Logging     |
|        | /l |                  |                                                                    |                                 |
| F30/10 | /m | 09.01            | Floats for water-configuration etc.                                | Val 100 1 = WLC enabled         |
| F30/11 | /n | 08.28            |                                                                    | Val 101 wlc.length              |
| F30/12 | /o | 08.28            |                                                                    | Val 102 wlc.height              |
| F30/13 | /p | 08.28            |                                                                    | Val 103 calc.offset             |

|        |    |       |  |                              |
|--------|----|-------|--|------------------------------|
| F30/14 | /q | 08.28 |  | Val 104 wlc.density          |
| F30/15 | /r | 08.28 |  | Val 105 ofl.width            |
| F30/16 | /s | 08.28 |  | Val 106 ofl.angle            |
| F30/17 | /t | 08.28 |  | Val 107 ofl.form-Factor      |
| F30/18 | /u | 08.28 |  | Val 108 ofl.minCalc          |
| F30/19 | /v | 08.28 |  | Val 109 (Fu30/31 Index 19)   |
| F30/20 | /w | 08.28 |  | Val 110 (Fu30/31 Index 20)   |
|        | /x |       |  | (Fu30/31 Index 21)           |
|        | /y |       |  | (Fu30/31 Index 22)           |
|        | /z |       |  | (Fu30/31 Index 23)           |
| F30/24 | /0 | 08.28 |  | Longitude (Fu30/31 Index 24) |
| F30/25 | /1 | 08.28 |  | Latitude (Fu30/31 Index 25)  |
| F30/26 | /2 | 08.28 |  | Altitude (Fu30/31 Index 26)  |
|        | /3 |       |  |                              |
|        | /4 |       |  |                              |
|        | /5 |       |  |                              |
|        | /6 |       |  |                              |
|        | /7 |       |  |                              |
|        | /8 |       |  |                              |
|        | /9 |       |  |                              |

#### 4.7 #e correct time / miscellaneous / commands

| #e |    | Firmware Version |                                                   |                           |
|----|----|------------------|---------------------------------------------------|---------------------------|
|    | /a | 09.01            | _U32 (Time in seconds, from 1.1.2000)             | Data-request start - time |
|    | /b | 09.01            | _U32 (Time in seconds, from 1.1.2000)             | Data-request end - time   |
|    | /t | 08.28            | /t=+30<br>maximal +/- 172800 seconds = +/- 2 days | Time                      |

#### water level configuration with float

(Firmware >= 09.01: replaced by 3 bytes #c/7/8/9)

##### 1. Installation / Calculation:

transfer array of 4 Bytes as Float :

Byte 0 : sensor type  
0 : relative VG  
1 : absolute SG

Byte 1 : calculation rule:  
0 : Level over level probe(e)  
1 : depth to water surface (f)  
2 : height of water to sea level(g)

Byte 2 : Installation: (On GSM always B)  
0 : Installation depth (B)  
1 : depth to water surface(C)

Byte 3: 0

## encryption

Cipher = Plain\*2 – key[x mod 64]

Plain = (Cipher + key[x mod 64])/2

key : phone-nr: [+41793945311]

x : running variable that takes one character after the other

## 5 RECORD

### 5.1 Memory-Map

The total memory is divided in pages. The number of pages may vary depending on the device type. GSM-2 currently contain 4096 pages (2MBit memory). Each page consists of 64 bytes. The first 8 byte are used as header. All following bytes are actual data. A data set consists of four byte. These include the measured variable / channel and the corresponding measured value.

**total memory: 4096 pages (2MBit)**

| Page | description       |
|------|-------------------|
| 0    | start data memory |
| 1    |                   |
| 2    |                   |
| ...  |                   |
| ...  |                   |
| ...  |                   |
| X-1  | end data memory   |
| X    | start record-text |
| ...  |                   |
| ...  |                   |
| ...  |                   |
| 4095 | end record-text   |

**1 page with 64 byte :**

| Byte | description |
|------|-------------|
| 0    | Header      |
| 1    |             |
| 2    |             |
| 3    |             |
| 4    |             |
| 5    |             |
| 6    |             |
| 7    |             |
| 8    | Data 1      |
| 9    |             |
| 10   |             |
| 11   |             |
| 12   | Data 2      |
| 13   |             |
| 14   |             |
| 15   |             |
| ...  | ...         |
| ...  | ...         |
| ...  | ...         |
| 60   | Data 14     |
| 61   |             |
| 62   |             |
| 63   |             |

## 5.2 Header

The header consists out of 8 byte.

| Byte | header description                                 | remark                                                                                                                                                               |
|------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0    | start detection / overflow counter / start pointer | "unimportant on GSM-2"                                                                                                                                               |
| 1    | remaining 8 bits of the start pointer              | start pointer<br>absolute time in seconds since<br>01.01.2000<br>( $2^{24} \cdot \text{Byte1} + 2^{16} \cdot \text{Byte2} + 2^8 \cdot \text{Byte3} + \text{Byte4}$ ) |
| 2    | absolute Time 1. Byte1                             |                                                                                                                                                                      |
| 3    | absolute Time 2. Byte2                             |                                                                                                                                                                      |
| 4    | absolute Time 3. Byte3                             |                                                                                                                                                                      |
| 5    | absolute Time 4. Byte4                             |                                                                                                                                                                      |
| 6    | reserved                                           |                                                                                                                                                                      |
| 7    | reserved                                           |                                                                                                                                                                      |

### Byte 0:

|            |                                                                                                                                                                             |
|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bit 7      | <b>Start detection</b> – if this bit is set, this means that this page is the beginning of a record.                                                                        |
| Bit 5 + 6  | <b>Overflow counter</b> – is incremented when the last page has been reached and it begins again at the first page.                                                         |
| Bit 0 .. 4 | Together with the whole second byte of the header, this represents the <b>start pointer</b> . He displays the page, where the record was started.<br>5 Bit + 8 Bit = 13 Bit |

## 5.3 Data packet

### Data 1 ... 14

A data packet consists of 4 bytes. There are four types of data packets:

#### a) Data packet with variable / channel / time delay to last measurement / value

| Byte | description                                            |                                                                |
|------|--------------------------------------------------------|----------------------------------------------------------------|
| 0    | Bit 7..4: variable/channel<br>,0000' to ,1110' (0..14) | Bit 3..0: time interval to the previous<br>data packet(0..15s) |
| 1    | measuring value 3. Byte                                |                                                                |
| 2    | measuring value 2. Byte                                |                                                                |
| 3    | measuring value 1. Byte                                |                                                                |

The measuring value is a 4 byte float, where the last byte is omitted

#### b) Data packet time delay

| Byte | description                            |                  |
|------|----------------------------------------|------------------|
| 0    | Bit 7..4: ,1111'                       | Bit 3..0: ,0000' |
| 1    | time delay to the previous data packet | 3. Byte          |
| 2    | time delay to the previous data packet | 2. Byte          |
| 3    | time delay to the previous data packet | 1. Byte          |

A data packet with time delay get saved, when time delay to previous data packet is higher than 15 seconds.

time delay =  $2^{16} \cdot \text{Byte1} + 2^8 \cdot \text{Byte2} + \text{Byte3}$  = range (0.. 16'777'215 s)

**c) data packet with text content** „unimportant on GSM-2“

| Byte | description             |                  |
|------|-------------------------|------------------|
| 0    | Bit 7..4: ,1111'        | Bit 3..0: ,0100' |
| 1    | 8-Bit-ASCII- characters |                  |
| 2    | 8-Bit-ASCII- characters |                  |
| 3    | 8-Bit-ASCII- characters |                  |

It is possible to store a text packet with 3 characters (3byte)

→ this function is not used into GSM-2. This function is a preparation for may future customer requests and cannot be used by the user at this moment.

**d) empty data packet** „unimportant on GSM-2“

| Byte | description        |                    |
|------|--------------------|--------------------|
| 0    | Bit 7 .. 4: ,1111' | Bit 3 .. 0: ,1111' |
| 1    | ,xxxx xxxx'        |                    |
| 2    | ,xxxx xxxx'        |                    |
| 3    | ,xxxx xxxx'        |                    |

An empty data packet indicates an empty data packet or the end of a record.

A new record always starts on a new page.

## 6 Examples configuration

measurement:

#F/a=1#T/s=1028646345#M/a=-1.1+2.2+3.3+4.4+5.5+6.6/c=+1+0#E/e#X/a=60770

configuration (correct time +43 seconds)

#C/t=+43#X/a=48542

## 7 SMS Messages from GSM-2

### 7.1 General

The messages from and to the GSM-2 are in TEXT – Mode (PDU-Mode is not supported).  
A message contains maximum 160 letters.

### 7.2 Messages/Functions

The GSM-2 can send different Short-Messages:

- **Measurement-Message**  
The GSM-2 measure in a defined interval all selected channels and transfer them together in 1 message.
- **Info-Message**  
All useful information about the GSM-2 are sent in a defined interval in 1 message.
- **Alarm Message**  
An alarm message will be sent if an alarm condition is true
- **CHECK message (Answer to a command)**  
The GSM-2 will answer to a SMS command if a message is sent to it.

The functions are activated by enabling the corresponding functions in General Settings by the GSM Setup program (Please note the Manual for more information).

### 7.3 Data format of a SMS

#### 7.3.1 Description of Message format

The GSM-2's short message format can be set according the users need.

##### Identifier

Mainly the sender is identified by its telephone number. The telephone number is included in the short message.

##### Time information

The time information, when the short message is sent is included in each short message, that is the time when the last measurement took place. You can use that time information to assign a time to the last values in the text message. The time information of the other values are calculated (the measure interval is known, it is a setting).

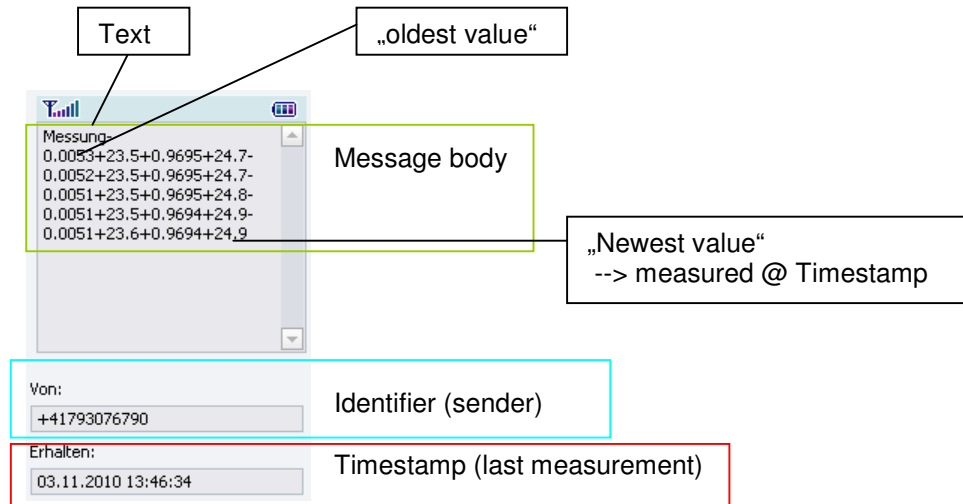
##### Text

At the beginning of the message you can set an individual text for example to identify the message.

##### Data

The measurements follow direct after the "text" and each value is separated by a + or – sign.  
All values are in that order how they are listed in the "Measuring channels / Save channels" setting and in that order how they are measured. That means the first value is the oldest, the last value is the newest.

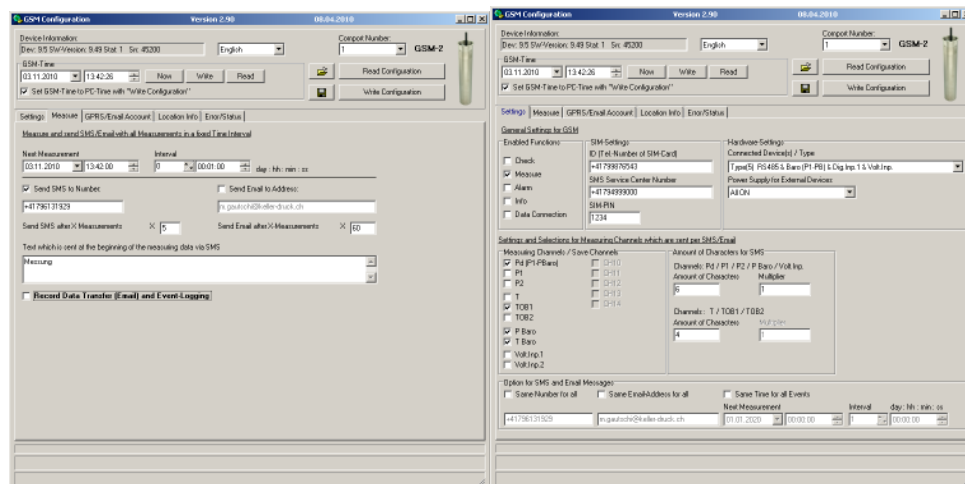
## Short message containing measurements



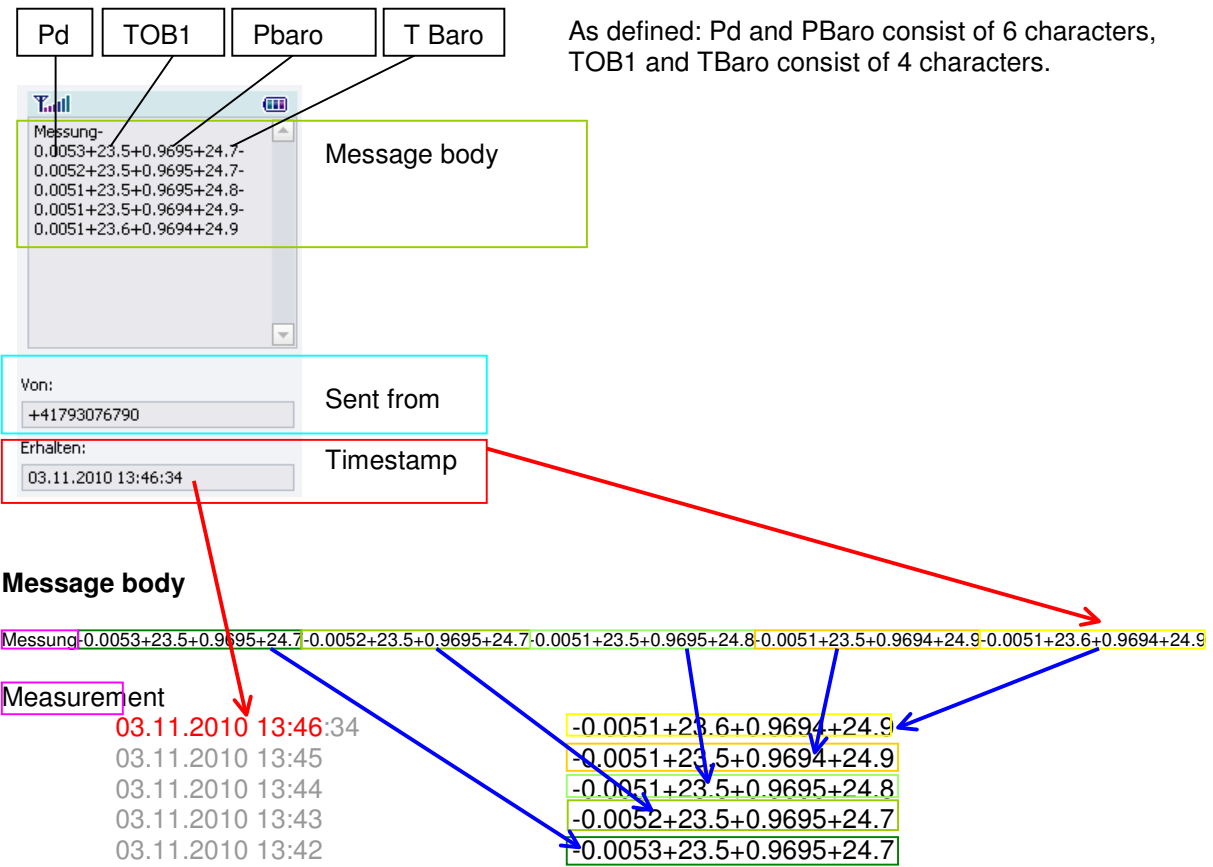
## 7.3.2 Sample for Measure-Function/Message

This is a sample of a Measure-short message sent from the GSM-2. The GSM-2 is set up like in the picture below.

| Settings                                                          | Settings for the sample   | Description                                                                                |
|-------------------------------------------------------------------|---------------------------|--------------------------------------------------------------------------------------------|
| Measuring channels / Save channels                                | Pd ; TOB1 ; PBaro ; TBaro | The selected channels will be transferred by SMS                                           |
| Amount of characters for data transfer (Pd / P1 / P2 / Volt.Inp.) | 6                         | The values will be transferred with this amount of characters                              |
| Amount of characters for data transfer (temperature values).      | 4                         | The values will be transferred with this amount of characters                              |
| Measure interval                                                  | 1 Minute                  | All selected are measured in this interval                                                 |
| Amount of measurements (sent in 1 SMS)                            | 5                         | The SMS message is sent after X measurements                                               |
| Text at the beginning of the message                              | measurement               | Individual text at the beginning of the message could be used to identify the message type |



Short message containing measurements

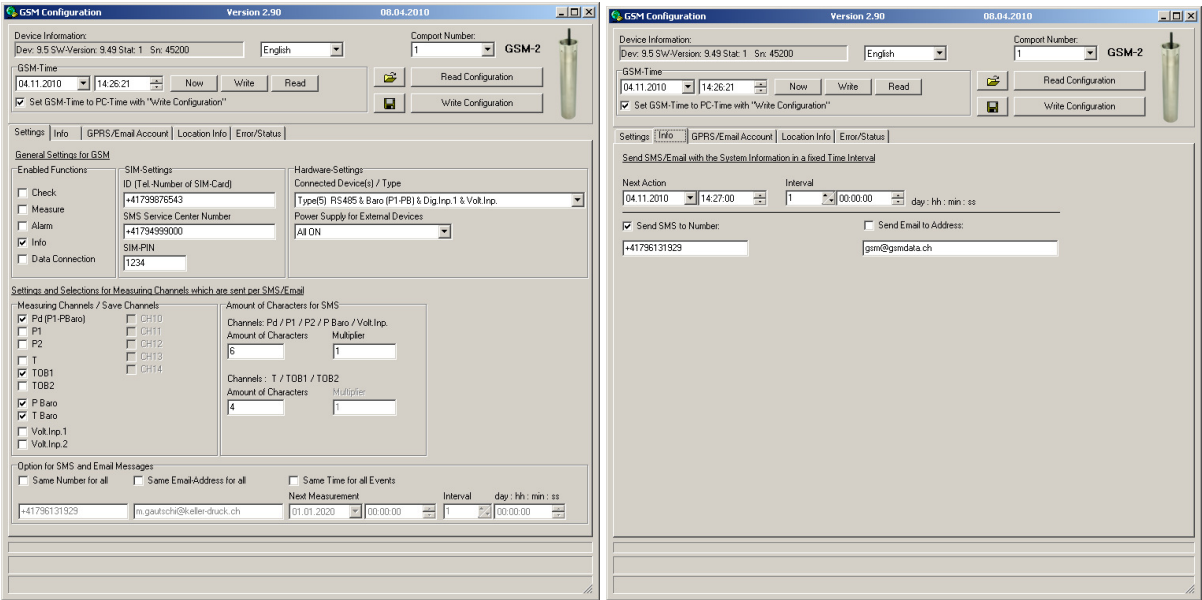


Message with calculated time information and sorted and separated measuring values

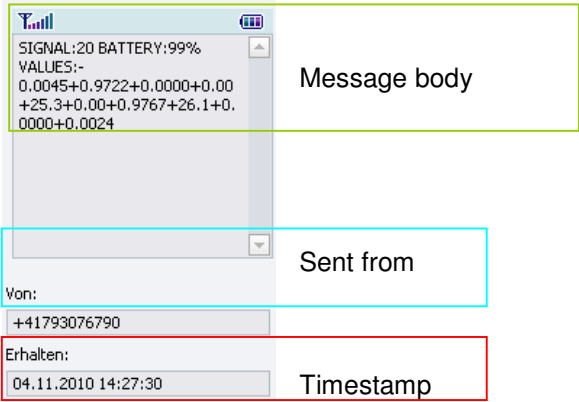
| Sender / Identifier | Type of Message | Time             | Pd      | TOB1  | PBaro   | TBaro |
|---------------------|-----------------|------------------|---------|-------|---------|-------|
| +41793076790        | measurement     | 03.11.2010 13:42 | -0.0053 | +23.5 | +0.9695 | +24.7 |
|                     |                 | 03.11.2010 13:43 | -0.0052 | +23.5 | +0.9695 | +24.7 |
|                     |                 | 03.11.2010 13:44 | -0.0051 | +23.5 | +0.9695 | +24.8 |
|                     |                 | 03.11.2010 13:45 | -0.0051 | +23.5 | +0.9694 | +24.9 |
|                     |                 | 03.11.2010 13:46 | -0.0051 | +23.6 | +0.9694 | +24.9 |

7.3.3 Example for Info-Function/Message

This is a sample of a Info-short message sent from the GSM-2.  
The GSM-2 is set up like below in the picture.



Info short message



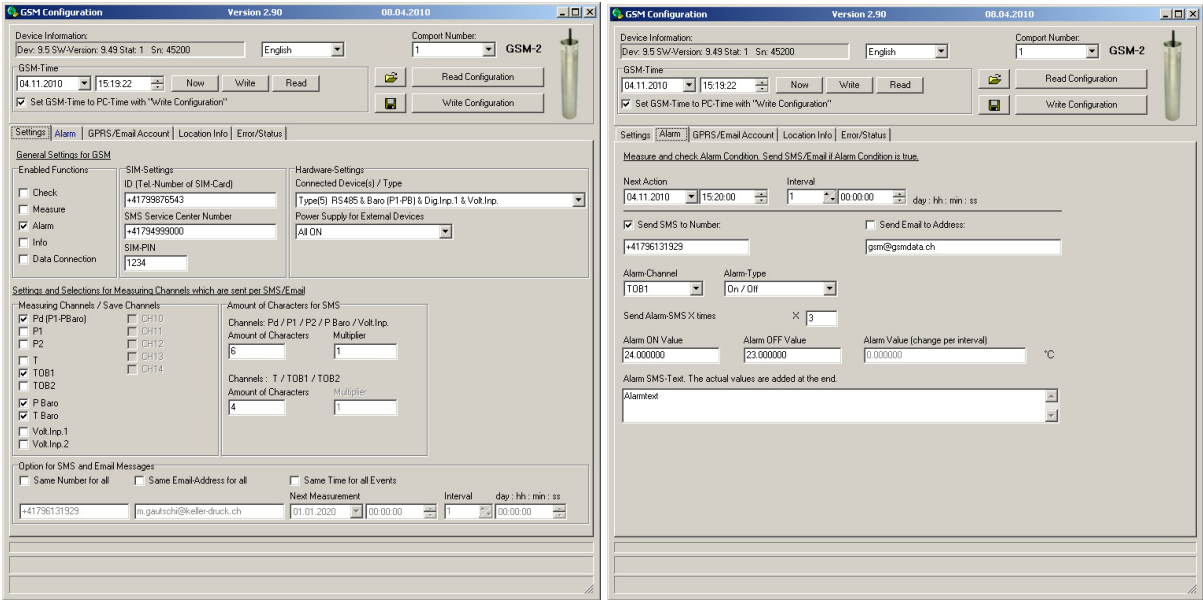
Message body

SIGNAL:20 BATTERY:99% VALUES:-0.0045+0.9722+0.0000+0.00+25.3+0.00+0.9767+26.1+0.0000+0.0024

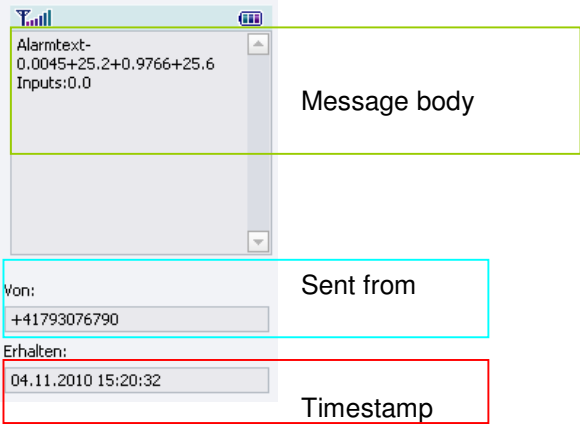
| Keyword  | Value / Meaning                                                                                                                                                            |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIGNAL:  | The value after the keyword SIGNAL shows the signal quality of the GSM-2 antenna. The value is 0 through 31 covers the range of -113 dbm (or less) to -51dbm (or greater). |
| BATTERY: | Indicates the calculated per cent of remaining battery capacity. Range 0...99                                                                                              |
| VALUES:  | All available actual values (measured at "Timestamp") are listed. Resolution defined in settings tab.                                                                      |

7.3.4 Example for Alarm-Function/Message

This is a sample of a Alarm-short message sent from the GSM-2.  
The GSM-2 is set up like below in the picture.



Alarm short message



Message body

Alarmtext-0.0045+25.2+0.9766+25.6 Inputs:0.0

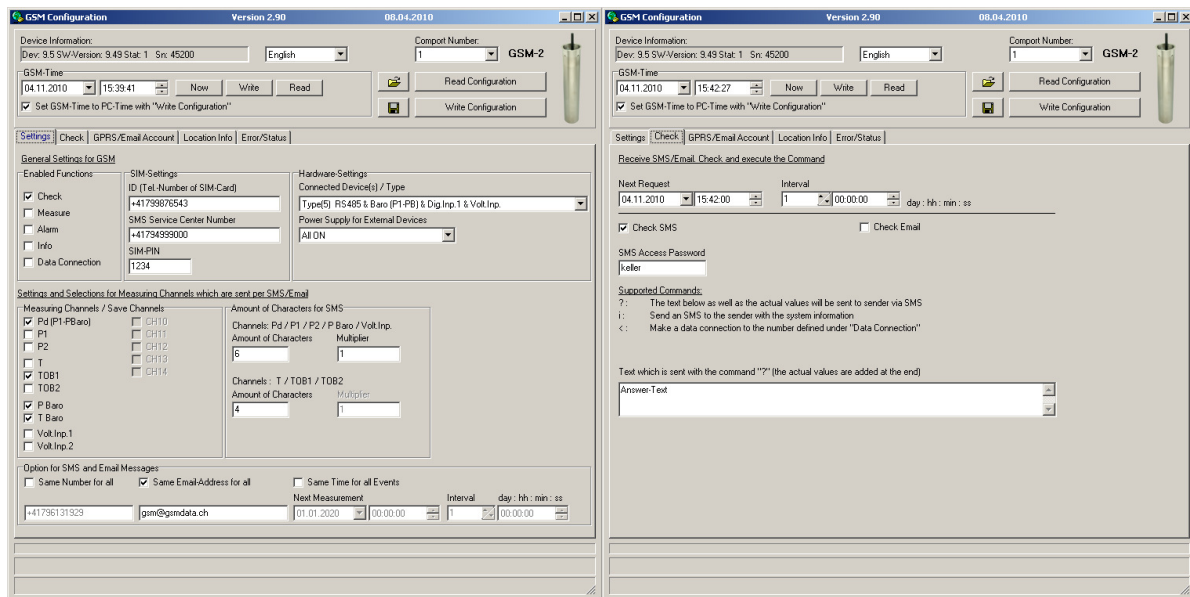
Individual text at the beginning of the message could be used to identify the message type

All available actual values (measured at "Timestamp") are listed.  
Resolution defined in settings tab

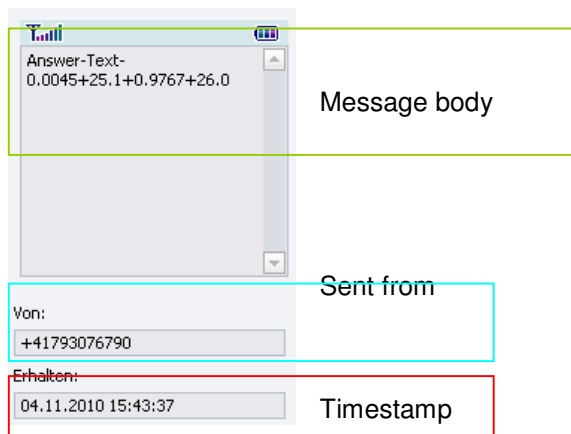
| Keyword | Value / Meaning                                    |
|---------|----------------------------------------------------|
| Inputs: | Status of the digital inputs (0 = open 1 = closed) |

## 7.3.5 Example for Check-Function/Message

This is a sample of a answer in the Check-short message, sent from the GSM-2. The GSM-2 is set up like below in the picture.



### Respos to the command “?”



Message body

Sent from

Timestamp

### Message body

Answer-Text-0.0045+25.1+0.9767+26.0

Individual text at the beginning of the message could be used to identify the message type

All enabled actual values (measured at “Timestamp”) are listed.  
Resolution defined in settings tab

Respons to the command “i”

SIGNAL:19 BATTERY:99%  
VALUES:-  
0.0044+0.9722+0.0000+0.00  
+25.0+0.00+0.9767+25.9+0.  
0000+0.0097

Message body

Von:  
+41793076790

Sent from

Erhalten:  
04.11.2010 15:51:19

Timestamp

Message body

SIGNAL:19 BATTERY:99% VALUES:-0.0044+0.9722+0.0000+0.00+25.0+0.00+0.9767+25.9+0.0000+0.0097

| Keyword  | Value / Meaning                                                                                                                                                            |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SIGNAL:  | The value after the keyword SIGNAL shows the signal quality of the GSM-2 antenna. The value is 0 through 31 covers the range of -113 dbm (or less) to -51dbm (or greater). |
| BATTERY: | Indicates the calculated per cent of remaining battery capacity. Range 0...99                                                                                              |
| VALUES:  | All available actual values (measured at "Timestamp") are listed. Resolution defined in settings tab.                                                                      |





## 9 FTP Messages (Example)

### 9.1 Configuration sent from GSM

```
#F/d=0#T/s=443025550/p=14.01.14,15:38:49+04#M/a=+0.0004080+0.9559831+0.0
000000+24.482742+0.9555750+25.100002/c=+1+1/d=+0.0004080+0.9559831+0.00
0000+0.0000000+24.482742+0.0000000+0.9555750+25.100002#l/n=1416/s=17/b=
99/f=12.40/v=+3.823#a/a=gprs.swisscom.ch/b=gprs/c=gprs/d=000.000.000.000/e=G
Demo/f=gsm_xx@gsmdata.ch/g=yourpassword/h=gsm_xx@gsmdata.ch/i=
yourpassword/j=pop.gsmdata.ch/k=110/l=smtp.gsmdata.ch/m=587/n=gsm_xx@gsm
data.ch#b/a=datamanager_xx@gsmdata.ch/b=demo@keller-
druck.ch/c=demo@keller-
druck.ch/g=/j=/k=/m=+41781234567/n=+41781234567/o=/q=+41794999000/r=KELL
ERDEMO/s=+41798101088/t=DemoStation/u=station keller/v=alarm message
body/w=/0=8.747837/1=47.497869/2=450.000#c/a=443027701/b=443025541/c=631
144800/d=442926000/e=631144800/g=3000/h=60/i=86400/j=86400/k=86400/m=215
/n=0/o=3/p=0/q=1/r=4/s=1/t=1/v=4/w=4/x=0/y=3/z=0/0=0/1=0/2=0/3=0/4=4/5=7/6=3/7
=0/8=1/9=0#f/a=431005483/g=3600/h=3600/m=1/n=1/o=1/q=1/z=15#d/a=+10.00000
0/b=+9.0000000/c=+0.0010000/f=+1.0000000/g=+1.0000000/i=+0.9000000/j=+1.200
0000/k=+5.0000000/m=+1.0000000/n=+9.1180000/o=+400.00000/p=+0.0000000/q=
+1000.0000/r=+1.0000000/s=+0.0000000/t=+1.0000000/u=+0.0000000/v=+10.00000
0/w=+11.000000/0=+8.7478370/1=+47.497869/2=+450.00000#k/a=ftp.gsmdata.ch/b
=datamanager_xx@gsmdata.ch/c=yourpassword/d=datamanager_xx/e=21/f=21/g=2
000/h=#O/g=43607#E/e
```

counsel: When working with plain text transmission, recognize first which GSM-2 device type is active (**#c/6=**) and check afterwards the activated channels (**#c/m=** and **#c/p=**) to know the measurement values order. These information only get transmitted with configuration files, but not with normal measurement files.

```
message:      #c/6=3      =      GSM-2 device type 3
               #c/m=215    =      11010111
               active channels → CH0, CH1, CH2, CH4, CH6, CH7
               #c/p=0      =      0

               #M/a=+0.0004080 (CH0) +0.9559831 (CH1) +0.0000000 (CH2)
               +24.482742 (CH4) +0.9555750 (CH6) +25.100002 (CH7)
```

### 9.2 Record data interpretation (Base64)

When "record function" is activated on GSM-2, the stored measurement data get compromised to base64 code and transferred by email or ftp file additional to the plain text. As each GSM-2 device type has its own channel assignment, the overview on page 29 shows for each GSM-2 type the related channel assignment.

The GSM-2 device type information is transmitted with the configuration file at the beginning (announcement) of a measuring task.

### 9.3 Example decoding Base64 from measurement file

#### original text file

```
#F/e=0#C/a=2347/b=5#T/s=443010632/p=14.01.14,11:31:02+04#M/a=+2.2168779+5.7929690+0.958
2375+25.549998+2.2195887+2.4568239+2.3946847/c=+1+1#l/n=1935/s=14/b=22/f=12.40/v=+4.189
#B/a=A+YaZ8X4AADAQBmN8AABlhBADdRAQK8UYD91V3BBz5mgQA3/sEAdf8BAGYTwAAE2E
EAN1UBAsgRgP3VRcEHQzAPmGmfIUAAAoEAN/7BAHXXAQB168AABlxBADdhAQLMAYD91TX
BBz5mgQA4BsEAdZsBAGWzwAAE1EEAN2EBAtfID5hpnYqgAAGA/dU1wQc4AoEAOA7BAHVn
AQB1g8AABlxBADdtAQLbuYD91TXBBzgCgQA4HsEAdUMBAGVb/Qc4AA+YaZ80BAAQQA3d
QEC5YGA/dVBwQcxmoEAOCrBAHUTAQBIL8AABIRBADeFAQLlgYD91T3BBzGagQA4NsEAdP
APmGmfOlGAAwEAZQv9BzgCgQBE2sEAfr8BAG53wAAE2EEATFUBAUqhgp3v2cEHOZqBAEU
SwQB+XwEAbhf9AF5U=#E/e#X/a=780
```

#### converted base64 code (green marked) to ASCII Char

```
3 230 26 103 197 248 0 0 192 64 25 141 240 0 1 34 16 64 13 212 64 64 175 20 96 63 117 87 112 65
207 153 160 64 13 255 176 64 29 127 192 64 25 132 240 0 1 54 16 64 13 213 64 64 178 4 96 63 117
81 112 65 208 204 3 230 26 103 200 80 0 0 160 64 13 255 176 64 29 117 192 64 25 122 240 0 1 35
16 64 13 216 64 64 179 0 96 63 117 77 112 65 207 153 160 64 14 1 176 64 29 102 192 64 25 108
240 0 1 53 16 64 13 216 64 64 181 242 3 230 26 103 202 168 0 0 96 63 117 77 112 65 206 0 160 64
14 3 176 64 29 89 192 64 25 96 240 0 1 35 16 64 13 219 64 64 182 238 96 63 117 77 112 65 206 0
160 64 14 7 176 64 29 80 192 64 25 86 255 65 206 0 3 230 26 103 205 1 0 0 16 64 13 221 64 64 185
96 96 63 117 80 112 65 204 102 160 64 14 10 176 64 29 68 192 64 25 75 240 0 1 33 16 64 13 225 64
64 185 96 96 63 117 79 112 65 204 102 160 64 14 13 176 64 29 60 3 230 26 103 206 34 0 0 192 64
25 66 255 65 206 0 160 64 17 54 176 64 31 175 192 64 27 157 240 0 1 54 16 64 19 21 64 64 82 168
96 63 123 246 112 65 206 102 160 64 17 68 176 64 31 151 192 64 27 133 255 64 23 149
```

#### interpret data

// Header (consists of 7 Bytes)

3 230 26 103 197 248 0 0

start pointer record : Byte0 = 3 = 00000011, Byte1 = 230 = 11100110, start pointer = 000111100110

start pointer absolute time [s] from 01.01.2000 =  $2^{24} \cdot \text{Byte1} + 2^{16} \cdot \text{Byte2} + 2^8 \cdot \text{Byte3} + \text{Byte4}$   
 =  $(26 \cdot 16777216) + (103 \cdot 65536) + (197 \cdot 256) + 248 = 443008504 \text{ seconds from 01.01.2000}$   
 = 10:56:05 / 14.01.2014

// first data package (consists of 4 Bytes)

192 64 25 141

Byte0 = 192 = 11000000

= selected channel = 1100 = 12

converting Bytes to IEEE754 (Byte0 = 255 (default))

measuring value of channel 12 = 2.399291

// second data package (consists of 4 Bytes)

240 0 1 34

Byte0 = 240 = 11110000

When Byte0 = 240 = 11110000 then data package information is about data packet time delay

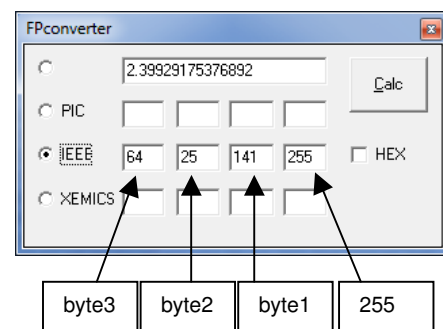
data package time delay (to last data package) =  $2^{16} \cdot \text{Byte3}(0) + 2^8 \cdot \text{Byte2}(1) + \text{Byte3}(34) = 290$   
seconds (4min 50s) =

// end of record or empty data package

255 0-15-7

Byte0 = 255 = 11111111 = represents empty package or end of record.

Byte1 + Byte2 + Byte3 getting ignored. A new record starts always on a new page.



## 10 Hardware Information's

### 10.1 general information about configuration GSM-2

Variable values are scanned and only ASCII characters in the range > 31...< 123 get processed. Remaining characters get ignored! Commands are only processed in range 0...9 as a...z as A...Z. Anything else get ignored.

### 10.2 GSM-2 device type overview

| GSM device type                                              | channels                                                                                                                                                                           |
|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Type (0)</b> RS485                                        | 1: Pd (P1-P2) [bar]<br>2: P1 [bar]<br>3: P2 [bar]<br>4: T [°C]<br>5: TOB1 [°C]<br>6: TOB2 [°C]                                                                                     |
| <b>Type (1)</b> RS485 & 2 Dig.Inp                            | 1: Pd (P1-P2) [bar]<br>2: P1 [bar]<br>3: P2 [bar]<br>4: T [°C]<br>5: TOB1 [°C]<br>6: TOB2 [°C]                                                                                     |
| <b>Type (2)</b> RS485 & Baro (P1-P2) & Dig.Inp.1             | 1: Pd (P1-PBaro) [bar]<br>2: P1 [bar]<br>3: P2 [bar]<br>4: T [°C]<br>5: TOB1 [°C]<br>6: TOB2 [°C]<br>7: PBaro [bar]<br>8: TBaro [°C]                                               |
| <b>Type (3)</b> RS485 & Baro (P1-PB) & Dig.Inp.1             | 1: Pd (P1-P2) [bar]<br>2: P1 [bar]<br>3: P2 [bar]<br>4: T [°C]<br>5: TOB1 [°C]<br>6: TOB2 [°C]<br>7: PBaro [bar]<br>8: TBaro [°C]<br>9: Volt. Inp. 1 [V]<br>10: Volt Inp. 2 [V]    |
| <b>Type (4)</b> RS485 & Baro (P1-P2) & Dig.Inp.1 & Volt Inp. | 1: Pd (P1-PBaro) [bar]<br>2: P1 [bar]<br>3: P2 [bar]<br>4: T [°C]<br>5: TOB1 [°C]<br>6: TOB2 [°C]<br>7: PBaro [bar]<br>8: TBaro [°C]<br>9: Volt. Inp. 1 [V]<br>10: Volt Inp. 2 [V] |

|                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                              |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Type (5)</b> RS485 & Baro (P1-PB) & Dig.Inp.1 & Volt Inp.                                                                                                                                                                                                                                              | 1: Pd P1-P2 (1) [bar]<br>2: P1 (1) [bar]<br>3: P2 (1) [bar]<br>4: T (1) [°C]<br>5: TOB1 (1) [°C]<br>6: TOB2 (1) [°C]<br>7: PBaro [bar]<br>8: TBaro [°C]<br>9: Volt. Inp. 1 [V]<br>10: Volt Inp. 2 [V]                                                                                                                        |
| <b>Type (6)</b> RS485(x5) & Baro (P1-P2) & Dig.Inp1/2 = Counter Inp. & Volt Inp.<br><br>* The <u>state</u> of both digital inputs (0 or 1) is transmitted as plain text (#M/a= ....c=+1+1) in addition to the counter input number which is transmitted in plain text and additional, as record in base64 | 1: Pd P1-P2 (1) [bar]<br>2: P1 (1) [bar]<br>3: P2 (1) [bar]<br>4: T (1) [°C]<br>5: TOB1 (1) [°C]<br>6: TOB2 (1) [°C]<br>7: PBaro [bar]<br>8: TBaro [°C]<br>9: Volt. Inp. 1 [V]<br>10: Volt Inp. 2 [V]<br>11: P1 (2) [bar]<br>12: P1 (3) [bar]<br>13: P1 (4) [bar]<br>14: P1 (5) [bar]<br>15: Counter input * [dimensionless] |
| <b>Type (7)</b> SDI12 & Baro & Digital Inp.1 & Volt Inp                                                                                                                                                                                                                                                   | 1: not used<br>2: PBaro [bar]<br>3: TBaro [°C]<br>4: Volt Inp.1 [V]<br>5: Volt Inp.2 [V]<br>6: SDI12 CH1<br>7: SDI12 CH2<br>8: SDI12 CH3<br>9: SDI12 CH4<br>10: SDI12 CH5<br>11: SDI12 CH6<br>12: SDI12 CH7<br>13: SDI12 CH8<br>14: SDI12 CH9<br>15: SDI12 CH10                                                              |

### 10.3 Evolution of GSM-2 firmware

| Firmware Number | implemented functions / comments                                      | published  |
|-----------------|-----------------------------------------------------------------------|------------|
| 08.28           | First release                                                         | 22.07.2008 |
| 09.48           | adaption for battery D                                                | 27.11.2009 |
| 09.49           | adaption for battery DD                                               | 27.11.2009 |
| 12.20           | FTP communication                                                     | 31.05.2012 |
| 12.29           | Function barometric sensor offset correction (PBaro)                  | 17.01.2012 |
| 12.32           | extension to use 4MBit memory                                         | 11.02.2013 |
| 12.40           | transmit measurement data if channel value change (delta) immediately | 17.06.2013 |

