Instruction Manual

LOGBOX SE

V2020-06

Intended for firmware version 12_0 and above and LogboxSESetup software 1.10
as available on http://www.kippzonen.com/Downloads

Intended for LogboxSE original with 2G modem and the 2019 version with 4G modem.

This manual describes in detail the possibilities of the LOGBOX SE as manufactured by Physicus, Bratislava, Slovakia

Declaration of Conformity

Kipp & Zonen B.V.
Delftechpark 36, 2628 XH Delft
P.O. Box 507, 2600 AM Delft
The Netherlands

declares under our sole responsibility that the product

LOGBOX SE

to which this declaration relates, is in conformity with European Harmonised Standards as published in the Official Journal of the EU, based on the following standard

[EMC - Emissions] **EN 61326-1:2013** and **EN 61326-2-1:2013**
[EMC - Immunity] **EN 61326-1:2013** and **EN 61326-2-1:2013**
[Health and Safety] **EN 60950-1:2001**
[RF spectrum efficiency] **EN 301 511:v9.0.2**

following the provisions
EMC-directive **2014/30/EU**
LV-directive **2014/35/EU**
RED-directive **2014/35/EU**

also, this device complies to
[EMC - FCC] **Title 47CFR part 15**

Delft, 1 March 2017

E. Valks - CEO
Kipp & Zonen B.V.

This Declaration of Conformity is compliant with the European Standard EN 45014 General Criteria for supplier's Declaration of Conformity. The basis for the criteria has been found in international documentation, particularly in ISO/IEC, Guide 22, 1982, *Information on manufacturer's Declaration of Conformity with standards or other technical specifications*

2 TABLE OF CONTENTS

3 NOTES

Reading this entire manual is recommended for a full understanding of this product.

The exclamation mark within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance instructions in the literature accompanying the instrument.

Note: Useful information for the user.

Kipp & Zonen reserve the right to make changes in the specifications without prior notice.

WARRANTY AND LIABILITY

Kipp & Zonen guarantees that the product delivered has been thoroughly tested to ensure that it meets its published specifications. The warranty included in the conditions of delivery is valid only if the product has been installed and used according to the instructions supplied by Kipp & Zonen. This product is under warranty for 24 months from the date of purchase.
Modifications made by the customer or on customer request can affect the validity of the CE declaration.

Kipp & Zonen shall in no event be liable for incidental or consequential damages, including without limitation, lost profits, loss of income, loss of business opportunities, loss of use and other related exposures, however caused, arising from the faulty and incorrect use of the product.

In the case you have questions, comments or need technical support, please contact us at the following address:

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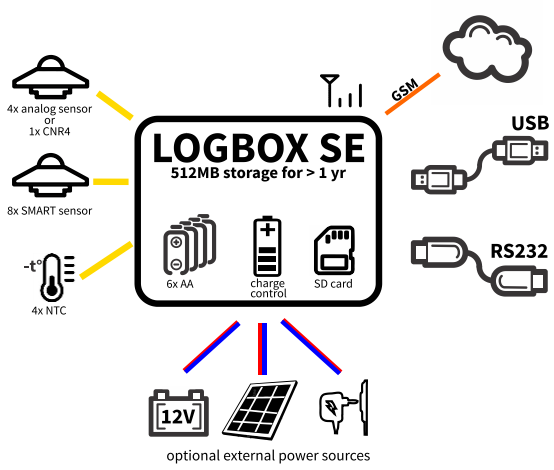
Note: in case technical support is required please add the configuration file of the Software interface, the log files in TXT or XLS format, add the serial number of the LOGBOX SE, and please describe your inquiry in as much detail as possible.



4 INTRODUCTION

The LOGBOX SE is a data logger for slow varying low voltage 0-3V signals and digital RS485 instruments using Modbus®. It features low noise, high resolution and low power consumption as well as a GSM modem for FTP or email upload.

The LOGBOX SE is a universal data logger, configurable by software, suitable for mobile as well as permanent installation and can be used in a laboratory and in the field. It can be used under all weather conditions. A mounting plate for installation on a mast or pole is provided.

4.1 Changes to manual

- Added DustIQ and Lufft WS weather station. Updated to LogboxSE Setup software 1.9 with added Set Default button, SMS request to modem, log file send intervals smaller than 1 hr. Also added are communication possibilities via the Serial2 RS232 port using ASCII or Modbus® commands.
- As of 2019 a new board with a new GSM modem is used, starting with serial number 180092. This modem supports 2,3 and 4G LTE communication.
- Added warning that USB power is not enough for GSM operation.
- Internal Vpwr measurement is ≈ 0.3V too low by design
- Added section 8.10 for more accurate Vpwr measurement
- 2020-01 Added cable gland specifications and installation drawing
- 2020-06 added BATT MNGT jumper notes to remove when POWER > 16V
  added power source and connections table

5 OVERVIEW

The LOGBOX SE is designed for measuring, processing and recording (data logging) measured data in real time for the needs of relatively slow signals analyses. It is designed for ultra-low power consumption and will run many weeks unattended on the internal AA batteries.

It offers four analog inputs, which can be configured by software as unipolar inputs or as bipolar differential inputs with 24 bit resolution as well as four single ended inputs with 12 bit resolution. With definition of polynomial coefficients (of the 3-rd order) measured values can be converted to engineering units on the fly.

Four digital inputs are configurable by software for measuring frequency, time or as counters. Again, with definition of polynomial coefficients (of the 3-rd order) the measured values can be converted to engineering units.

Internal values that can be logged are: V_{RTC}, V_{MAIN}, V_{POWER}, V_{OUT}, GSM signal and Atmospheric pressure.

All logged data will be stored on the internal SD card which comes with 512MB capacity and is enough for a few years of data logging.

For optional communication to a PC the LOGBOX SE uses either its RS-232 communication port, the internal USB port or the GSM modem. For longer physical data lines the RS-232 signals can be converted to RS-485 by using locally bought RS-232 to RS-485 converters.

A Real Time Clock circuit keeps track of time and date and is powered from a standard C2032 lithium battery. Operational life is more than 10.000 hours. The clock can be synchronised daily using the GSM modem with the right 2G GPRS SIM card.

For signalling and powering external devices the LOGBOX SE has a built-in output capable of handling a current up to 200mA.

Additionally, a precise reference voltage of $2.5V_{DC}$ is available of which the exact value is printed on the calibration sheet supplied with each unit and stored in non-volatile memory.

The LOGBOX SE offers 6 waterproof cable glands for feeding cables to the internal connectors. The equipment attached can be sensors, solar panel or external power supply or battery.

6 SPECIFICATIONS

6.1 Input and electrical

Differential inputs		
Number of analog inputs	4	A9 – A12
Input ranges	8	19, 38, 78,156, 312, 625, 1250, 2500mV
Max. number of instruments without temperature sensor	4	2-wire signal
Max. number of instruments with Pt100	1	2-wire signal & 4 wire Pt100 thermistor
Max. number of instruments with 10k NTC	4	2-wire signal & 2 wire 10k NTC to single ended
Max. voltage allowed on input	5V	
Resolution	24bit	
Single ended inputs		
Number of analog inputs	4	AIN1 – AIN4
Input ranges	2	0 – 2.5V on AIN1 & AIN2 0 – 3V on AIN3 & AIN4
Max. number of 10k thermistors	4	2-wire
Max. voltage allowed on input	5V	
Resolution	12bit	
Digital inputs		
Number of inputs	4	DIN1 – DIN4
Input selections	3	Time, Frequency, Counter
Max. voltage allowed	15V	
Max. input frequency	1500Hz	
Logic level	3V	CMOS, DIN4 0.5V for CDS3
Serial inputs		
Number of RS-485 inputs	8	Use one common RS-485 connection
Supported models	5	SMPxx, SGRxx, SHP1, SUVx, RT1, DustIQ, Lufft WSxxx UMB, IMT MB silicon sensor
General specifications		
Input offset differential max.	0.5µV	
Inaccuracy differential	0.05%	
Inaccuracy single ended	0.1%	
Memory	SD card	512MB included, 4GB max FAT formatted And 16GB FAT32 formatted
Internal power supply	6x AA battery	
Power connection (PWR)	4 – 24V_{DC}	General input for 6x AA batteries or other source
Solar power connection (SOLAR)	12 – 20V_{DC}	From optional solar panel
Battery power connection (BATT)	12V_{DC}	12V Pb battery, max. charge 750mA
Charger connection (CHARGER)	6 – 13V_{DC}	Used to charge the 12V Pb battery
Battery out (BATOUT)	12V -750mA	Constant power to drive instruments
Power out (PWROUT)	Follows PWR	Switched power max. 200mA
Power consumption	From 6x AA battery or PWR	1mA standby, 7mA short burst when storing data max. 100mA with GSM modem working Doesn't include powered instruments
Power via USB	Possible	Only with opened box, for logger setup
Temperature range	-40 to 60ºC	
Dimensions	170x145x50mm	
Protection	IP65	
Mounting	⌀ 45mm	Pole / mast mounting
RTC accuracy (without synchronization)	10ppm	
Time synchronization	once a day over internet	If ModemInterval is not zero
GSM modem specifications		
Model 2017-2018 2G GPRS only Model 2019 4G with 2, 3G fall back depending on operator	Cinterion MC75i Cinterion PLS62-W	www.gemalto.com/m2m/solutions/downloads www.gemalto.com/m2m/solutions/modules-terminals/industrial-plus/pls62-w

6.2 Power consumption estimates

For safe scenario's it is advised to calculate with 50-60% of the mAh capacity as indicated on the battery used. This takes into account the self-discharge of most batteries and the possibly needed peak current for the GSM modem.

Smart digital instrument need to remain powered all the time as the power-on sequence takes time and most instruments need to reach a temperature equilibrium. The switched on instruments will have a significant impact on the power consumption.

A Kipp & Zonen Smart instrument on average uses 8mA on low voltages (5-9V) and 4mA on higher voltages.

Tabel updated 20-03-2018 Valid for 12V power

Scenario	Instruments	Measurement interval seconds	GSM data transfer	LogboxSE and instrument current in mA	mAh per day LogboxSE and instruments
1	Analog	60	None	0.15	3.6
2	Analog	1	None	1.5	36
3	Analog	1	Every 24 hr	1.51	37.7
4	Analog	1	Every hr	3.2	76
5	Smart digital 1x	1	None	7	168
6	Smart digital 2x	1	None	11	264
7	Smart digital 4x	1	None	19	456
8	Smart digital 4x	1	Every 24 hr	19.07	457
9	Smart digital 4x	1	Every hr	20.7	496

Tabel updated 20-03-2018 Valid for power from 6x AA battery

Scenario	Instruments	Measurement interval seconds	GSM data transfer	LogboxSE and instrument current in mA	mAh per day LogboxSE and instruments
1	Analog	60	None	0.15	3.6
2	Analog	1	None	1.5	36
3	Analog	1	Every 24 hr	1.51	37.7
4	Analog	1	Every hr	3.2	76
5	Smart digital 1x	1	None	11	264
6	Smart digital 2x	1	None	16	456
7	Smart digital 4x	1	None	35	840
8	Smart digital 4x	1	Every 24 hr	35.07	841
9	Smart digital 4x	1	Every hr	36.7	880

Running Smart instruments on 6x AA battery is not practical.

Estimated days of working time = mAh of batteries *50% ÷ (mAh per day LogboxSE and instruments)

6.3 Power Connection options

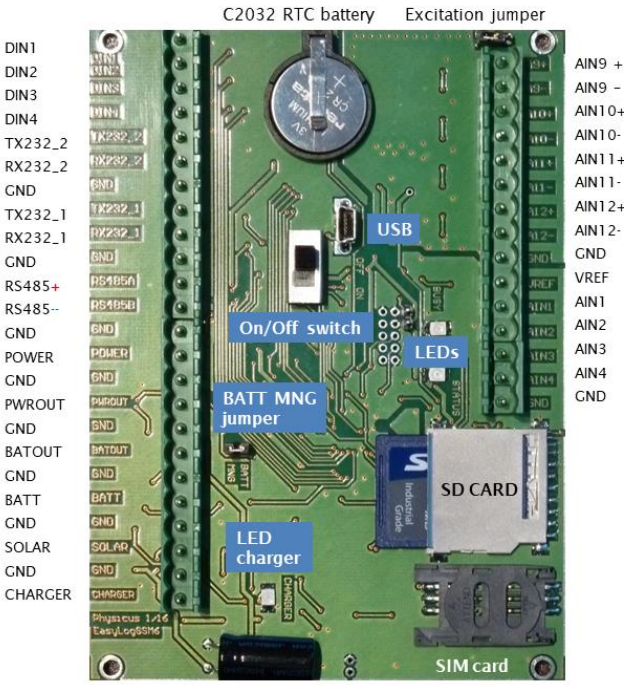
Power source is	Connect to	Note:
Internal power supply 6x AA battery	Power connection (POWER)	
4 – 24VDC	Power connection (POWER)	if >16Vdc is used, BATT MNG jumper MUST be open
Solar panel 12–20VDC for charging battery	Solar power connection (SOLAR)	only with 12V Pb battery
6 - 13VDC source for charging battery	Charger power connection (CHARGER)	max charge 750mA
12V Pb battery	Battery power connection (BATT)	BATT MNG jumper MUST be installed when battery connected. **Note:** Jumper must be removed when POWER > 16V
Power output used:		
Constant power to drive instruments	Battery out (BATOUT)	12V, max 750mA
Switched power max. 200mA	Power out (PWROUT)	Follows BATT or POWER (whichever is connected)

6.4 Hardware

The LOGBOX SE is based on single board design with minimal dimensions, weight and power consumption.

▲The original model with 2G GPRS modem

▲The 2019 model with 4G GSM modem



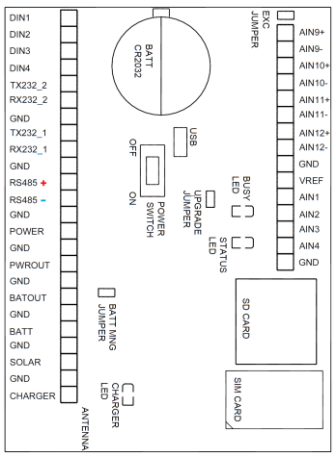
Thanks to clear layout the user can easily connect relatively large number of sensors. For better access to input connections, connectors are divided by two or three and removable.

The mounting plate can be used to connect the LOGBOX SE to a mast of 45 mm or smaller.

Unused cable glands are closed with a plug.

For permanent installation it is possible to use four screws Ø4mm for fixing, while retaining IP65 class protection.

The LOGBOX SE board has the following components and connectors:



Lithium battery, CR2032 - reserved for real time clock.
During normal operation the RTC is powered by the available power supply.

Off - On switch – small switch for turning the LOGBOX SE off (sleep except real time clock). It is used when exchanging the SD card or when the data logger is not used.

EXC jumper – this jumper offers excitation for Pt-100 sensors. It connects a 3.9kΩ resistor from the 2.5V reference voltage to AIN9+. If no Pt-100 is used, do not connect it.

BATT MNG jumper - this jumper is used when your power supply is a 12Vdc solar panel or charger input (5Vdc to 12Vdc). If this jumper is removed, the only power source input is POWER and the control circuitry of the charger is disconnected. This leads to minimum power consumption during operation. **Note:** jumper must be removed when Voltage on POWER is >16V to prevent damage to the LOGBOX SE.

Fig.3 Description of major parts

SD memory card – any SD memory card larger than 128MB can be used. The card is used only for data storage and is not intended for more manipulation (deleting or other operations). The unit comes with an industrial grade 512MB FAT formatted SD card.

GSM SIM card holder – this will take your full-size SIM card which must have appropriate internet data services.

STATUS LED – this RED LED flashes every 5 seconds to indicate data logger operation (switched on and powered). This feature is useful when long time between measurements is selected and the user needs indication that logger is operating.

BUSY LED - this GREEN LED is on when data is written to the SD card. Do not remove the card when this LED is on, as it will result in unwanted open files and data loss.

SOLAR LED – this BLUE LED indicates charging of your 12V Pb battery from the CHARGER input. When the battery voltage reaches its maximum value this indicator will flash, otherwise it will be on permanently. If there is no power on CHARGER or SOLAR this indicator will be off.

POWER – the user can connect any type of power source (ZnMn, alkaline, NiCd, NiMH, lithium, lead acid battery, solar panel, mains adapter) with output voltage in the range of 4Vdc – 24Vdc. The top lid can hold 6x AA battery.

PWROUT – switched power output for powering local sensors or instruments.

VREF – switched reference voltage of 2.5V for bridge or similar instruments. The exact voltage can be found on the calibration sheet that came with the unit.

AIN1 to AIN4 – analog single ended inputs with 12 bit resolution. Input range is 0V to 2.5V for AIN1, AIN2 and 0V to 3.0V for AIN3 and AIN4.

A9 + and - to A12 + and - – differential input pairs with 24 bit resolution. The inputs can set as unipolar or bipolar inputs with range from 0…19mV (-19mV … +19mV bipolar) to 0…2.5V (-2.5V … +2.5V bipolar) by software.

GND – ground pins. All GND pins are electrically connected on the board. For analog inputs GND pins are separately routed for best low noise performance.

DIN1 to DIN4 – digital inputs. Can be selected as frequency input, counter input or time of logical one input by software.

RX232_1 and TX232_1 – Serial line COM1 signals. Software configurable serial port for communication with serial sensors. This COM1 is shared with the RS-485 port for SMART serial devices.

RS-485+ and RS-485B- – Serial line COM1 signals used for RS-485. Software configurable serial port for communication with SMART serial devices (e.g. SMP-series).

RX232_2 and RX232_2 – Serial line COM2 signals. Software configurable serial port for sending reports with logged or measured data and for communicating with the LOGBOX SE to check and change settings or read data.

BATOUT – output of power supply backed up by connected battery. This output is used for powering devices or sensors which needs continuous power (e.g. wind speed sensor). It has deep discharge protection feature.

BATT – input for connecting 12Vdc lead acid battery. The battery is conditioned (charged by aprox. 350mA and protected from deep discharge condition at about 10.5V). BATT MNG jumper must be inserted for this to function.

SOLAR – input for solar panel with nominal 12Vdc output. BATT MNG jumper must be inserted.

CHARGER – input for charger source with 5Vdc to 12Vdc output. BATT MNG jumper must be inserted.

ANTENNA – GSM/GPRS antenna for remote data transfer.

The instrument is mounted in a plastic enclosure (IP65 protection class) allowing outdoor installations. For smaller measuring systems it is possible to use 6 pieces of AA battery (mignon) inside the battery compartment which is attached to the lid of the enclosure. This results in a compact and portable solution using the LOGBOX SE.

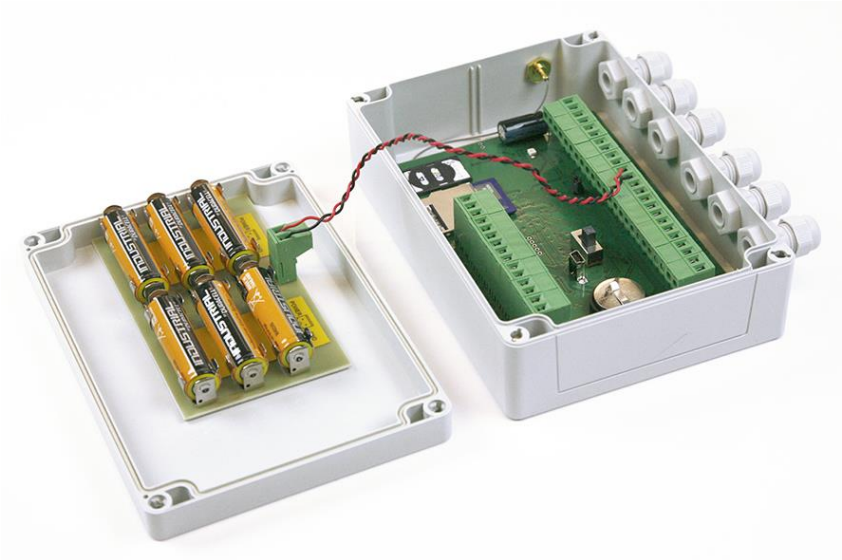
Note: The cable glands support cables with a diameter ranging from 3.5 to 7 mm. The cable gland nut should be tightened with 2Nm force.

Note: BATT MNGT jumper must be removed when Voltage on POWER is >16V

7 QUICK START

The LOGBOX SE is supplied ready for use. After unpacking it is necessary to open the case by unscrewing the four screws.

With the switch in Off position now connect a power supply in the range of 4...20Vdc to POWER or CHARGER or the lead acid battery to BATT. For mobile power supply there is the holder for six AA type batteries that needs to be connected to POWER with the BATT jumper removed for the lowest power consumption possible.



Last step is to connect the supplied USB cable with the computer. The LOGBOX SE Setup software can be used to setup the logger and related sensors. Do not switch the LOGBOX SE on yet. The USB connection or 6 AA batteries can both supply the board enough electrical power to perform the setup.

The screw terminals for wire connections can easily be removed from the printed circuit board. Thus making cable screw down easier and preventing the printed circuit board from being damaged.

8 USING THE LOGBOX SE

8.1 Connecting power

There are various power supply options. Simple battery management (controlled charging and protection from deep discharge) is provided.

For minimum power consumption there is the POWER input. It is connected directly before power stabilizer, without any charging or battery management option. Only PWROUT output is enabled.
POWER input is used in systems where very small power consumption is expected and there is no charging source available (neither wall adapter, nor solar panel). Jumper BATT MNG must be removed. In this scenario it is possible to use 6xAA batteries with GPRS data transfer.

Alkaline AA batteries can be used but if the GSM modem is used it is advised to use properly charged NiMh rechargeable batteries ≥2500mA. The LOGBOX SE does not charge the 6 batteries in the holder.

If there is mains power supply available, it is recommended to use the CHARGER input. The input voltage range is from 7Vdc to 13Vdc. In this configuration a 12V lead acid battery can be connected with power management. Jumper BAT MNG must be inserted. If correct CHARGER input is connected the SOLAR blue LED will light, indicating battery charging.

Very similar input is for solar panels on input SOLAR. It has the same features as CHARGER input. Maximum current from solar panel is approximately 1A. Jumper BAT MNG must be inserted. If a solar panel is connected SOLAR a constant blue LED will indicate charging. Once the battery is full, it will only flash.

Battery management cares for deep discharge condition of the attached 12V lead acid battery. If the voltage drops below approximately 10.5V the battery is disconnected.

BATOUT output is available for powering sensors that must be powered all of the time, like wind speed sensors, Kipp & Zonen SMART sensors or rain gauges.

Overall system operation is as follows: if main switch is in OFF position, only the real time clock is running. Most of other the tasks are disabled. The user can enter service mode and communicate with data logger using a USB service cable.

If main switch is in ON position, full functionality follows and measuring and logging is started, indicated by the flashing red and green LEDs.

Note: The cable glands support cables with a diameter ranging from 3.5 to 7 mm. The cable gland nut should be tightened with 2Nm force.

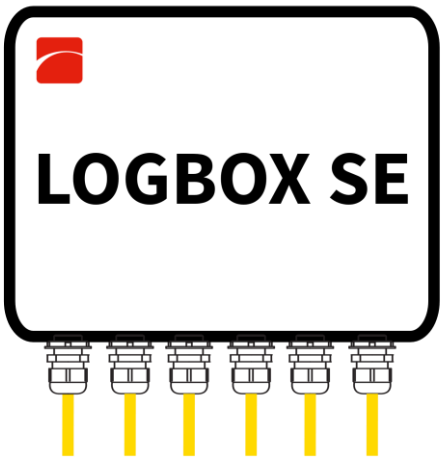


Figure 1 Proper installation orientation

The cable glands should be facing downwards to prevent moisture from entering.

8.2 Inserting the SIM and attaching GSM antenna

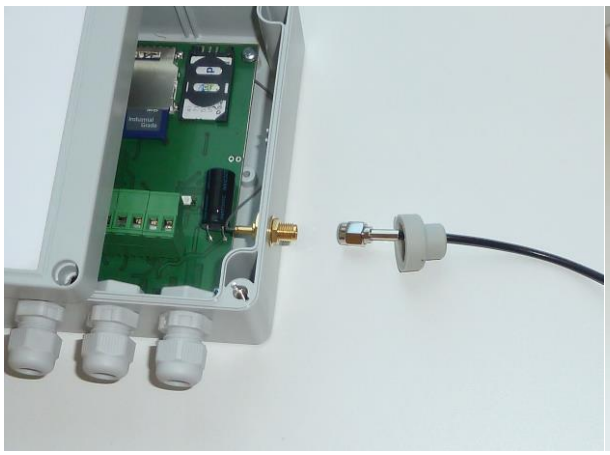
Before starting to send data over the internet you will need a SIM card with internet connection enabled. The SIM card holder is located on upper right corner.
Sending data via the GSM modem is optional and not needed when local data logging on the SD memory card is sufficient.

Location of the SIM card holder

Open the SIM card holder

Place the SIM card

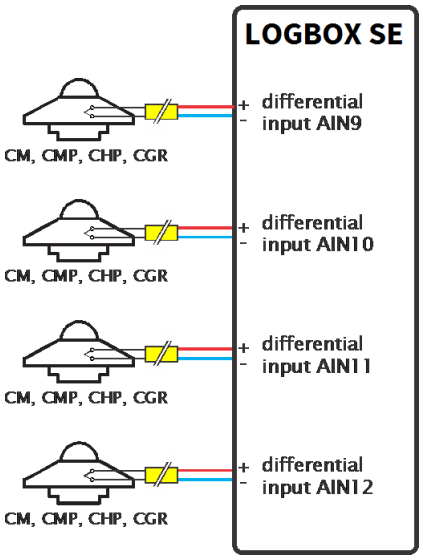
Close the SIM card holder



Now your data logger is ready for operation. For correct modem operation, you need to setup following parameters: ModemPIN, APN and EmailTo address as described in section 10.8. The 2,3 or 4G mode is selected automatically by the modem and depends on the SIM card, local GSM operator and signal strength.

Note: GSM operation requires a power source like 6x AA battery or external power source. USB power is not enough.

8.3 Connecting to differential inputs



The LOGBOX SE allows you to connect up to 4 sensors on the differential analog inputs AIN9 to AIN12 which have a selectable input from 19mV up to 2500mV.

-AIN9+ and AIN9- (first sensor)

-AIN10+ and AIN10- (second sensor)

-AIN11+ and AIN11- (third sensor)

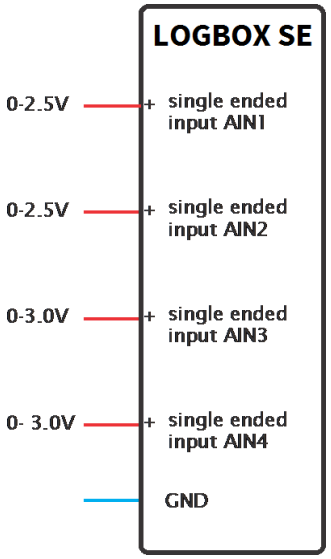
-AIN12+ and AIN12- (fourth sensor)

8.4 Connecting to single ended inputs

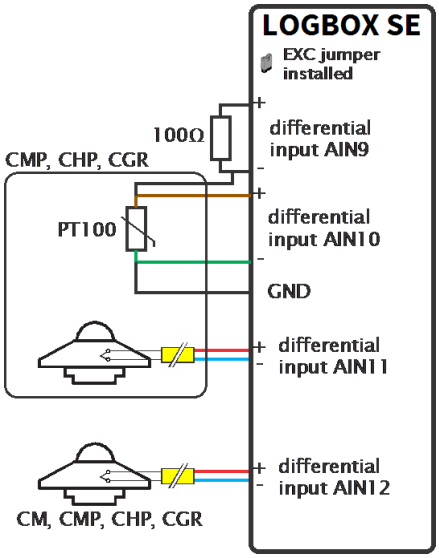
It's possible to connect up to four sensors on the analog single ended inputs AIN1 to AIN4.

Please note that AIN3 and AIN4 can be used to connect sensors which have a slightly higher voltage output up to 3Vdc (like Kipp & Zonen UVS or CSD3 sensors).

Since the ADC always uses 12 bit on the single ended input; the lowest bit on AIN1 & 2 equals 0,61035 mV and on AIN3 & 4 the lowest bit equal 0,73242 mV



8.5 Connecting a sensor with a Pt-100 thermistor



The LOGBOX SE allows you to connect one Pt-100 temperature sensor:

-AIN9+ & AIN9- voltage over 100Ω 0.05% 5ppm/ºC reference resistor

$I_{measure} = V_{AIN9} / 100$

-AIN10+ & AIN10- voltage over Pt-100 thermistor

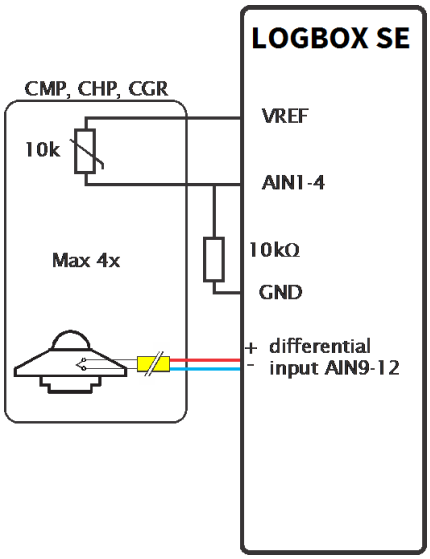
$R_{Pt-100} = V_{AIN10} / I_{measure}$ $R_{Pt-100} = 100 \times AIN10/AIN9$

The ratio selection in the analog setup page can take care of the calculations needed. Range should be 78mV.

After connecting the Pt-100 it's still possible to connect up to two sensors on the differential analog inputs AIN 11 and AIN12.

8.6 Connecting a thermistor.

It's possible to connect up to four thermistors on the analog single ended inputs AIN1 to AIN4.



In the illustration the 10K thermistor is connected to AIN 1 but in practice it can be connected to any of the four analog single ended inputs AIN1 – AIN4.

The polynomials for AIN1&2 are different from the ones for AIN3&4 as these have a voltage divider and low 13.2kΩ input impedance.

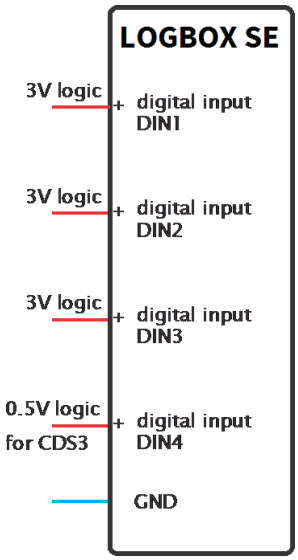
The thermistor can be connected to GND or VREF and polynomials change accordingly.

It`s common for a pyrgeometer, pyrheliometer and high-end pyranometer to have a 10K thermistor and four of these instruments in total can be connected.

8.7 Connecting digital inputs

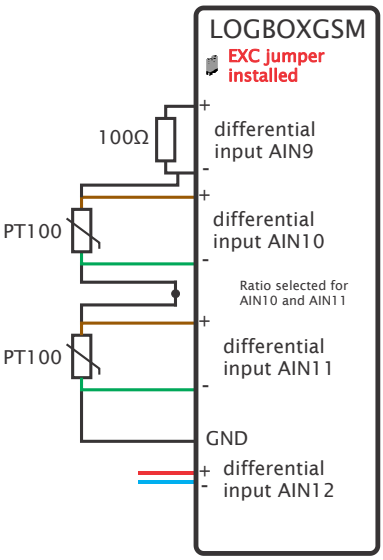
It's possible to connect up to four digital sensors or signals to DIN1 to DIN4.

The digital inputs can measure frequency, time logical high, or count Hi-Lo changes.



8.8 Connecting two Pt100 sensors

It's possible to connect two Pt100 sensors.

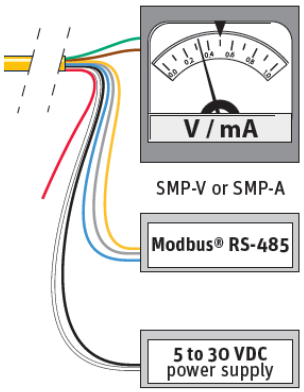


The ratio selection in the analog setup page can take care of the calculations needed. Range should be 78mV Select Ratio for **both** AIN10 and AIN11.

8.9 Connecting a SMART sensor via RS-485

Up to 8 Modbus® SMART sensors can be addressed by the LOGBOX SE. Each one needs a unique address. Instructions for setting the address are in section 10.9

All Kipp & Zonen **SMP- SGR- SUV - SHP sensors** have the following connections:



Radiometer Connection			
	Wire	Function	Connect with
3	Green	Analogue out	V+/4-20 mA(+)
6	Brown	Analogue ground	V–/4-20 mA(–)
4	Yellow	Modbus® RS-485	B/B'/+
5	Grey	Modbus® RS-485	A/A'/–
7	White	Power 5 to 30 VDC (12 V recommended)	
8	Black	Power ground / RS-485 Common	
1	Red	None	Not connected
2	Blue	Modbus® common / Ground	
	Shield	Housing	Ground *
* Connect to ground if radiometer not grounded			

The sensors need constant power to stabilise and to be able to provide fast response to irradiation level changes.

blue and black wire(s) → GND
white wire(s) → BATTOUT or parallel to POWER input

yellow Modbus® B/B'/+ wire(s) → RS-485B+ on LOGBOX SE board
grey Modbus® A/A'/- wire(s) → RS-485A- “”

The Kipp & Zonen **RT1 rooftop** sensor **with black data** cable uses:

The blue and green wire(s) → GND
The red wire → BATTOUT or parallel to POWER input

The grey Modbus® Data + wire(s) → RS-485B+ on LOGBOX SE board
The yellow Modbus® Data - wire(s) → RS-485A- “”

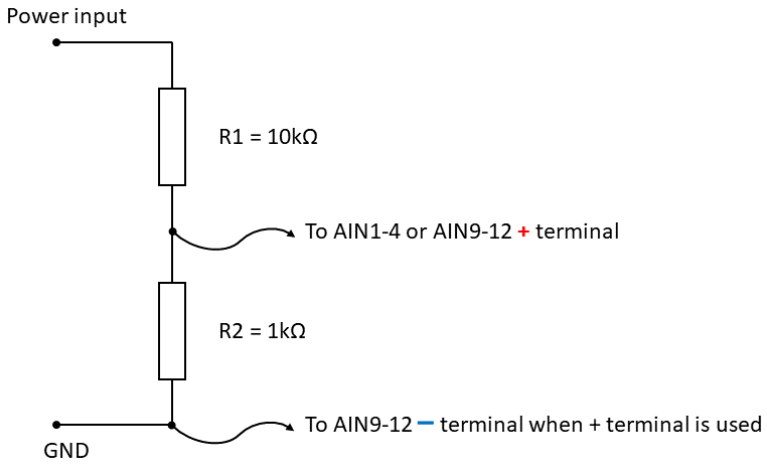
All remaining wires need to be isolated properly.

Typical power consumption SMP-V for maximum output (1 V)		
5 VDC	50 mW	approx. 10.0 mA
12 VDC	55 mW	approx. 4.5 mA
24 VDC	60 mW	approx. 2.5 mA
Typical power consumption SMP-A for maximum output (20mA)		
5 VDC	77 mW	approx. 28 mA with 100Ω load resistor
12 VDC	83 mW	approx. 24 mA with 100Ω load resistor
24 VDC	100 mW	approx. 6 mA with 100 Ω load resistor

8.10 Accurate supply voltage measurement

The internal value AIN4 Voltage on Power input is just an indication and will be between 0.3 and 0.5 below the real input voltage depending on temperature and load on Power Out.

When a more accurate measurement is needed the input should be connected to a divider built of two resistors and this output should go to one of the free analog inputs.



Input range 2500mV for the differential inputs.
The – input of the differential input must be connected to GND.

The Single ended input ranges are fixed.

Polynomials to be used:

A0, A2,A3 = 0

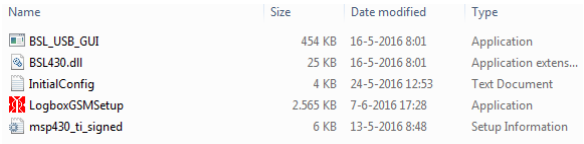
For differential inputs AIN9 – AIN12 A1 = 0.011

For Single Ended AIN1 and AIN2 A1 = 0.011 too

For Single Ended inputs AIN3 or AIN4 A1 = 0.011758

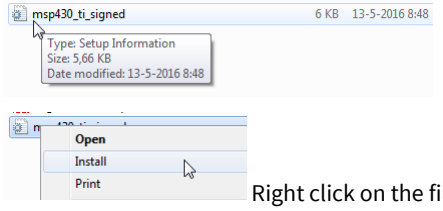
9 PC CONFIGURATION SOFTWARE

The LOGBOX SE Setup software is designed for easy set up of the LOGBOX SE. It is intuitive in use and a full configuration can be made in just a few minutes. The LOGBOX SE Setup software is a simple executable file, without the need for further installation. It is compatible with Windows™ 7, 8 and 10 operating systems 32 and 64 bit.



First of all it is necessary to download the files to your computer. Please visit the www.kippzonen.com website, navigate to Data Loggers and the LOGBOX SE, click on Downloads and select LOGBOX SE - Software. Download the ZIP file and unzip the files to the directory on your local computer where you want to store LOGBOX SE Setup files. There is no need for further program installation. For maximum comfort it is advisable to create a shortcut on your desktop.

When the LOGBOX SE is attached via USB the driver will need installation. It is advised to stop the Windows installation of the driver and perform the installation manually.

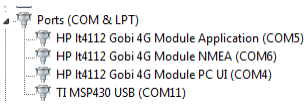


Right click on the file “msp430_ti_signed” and select Install.

In only a few seconds the driver should be installed.

Now when the LOGBOX SE is attached via the USB cable a COM port will be created. For the software to operate you will need to know the COM port.

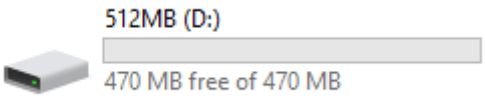
Open Device Manager by clicking on the Windows logo and typing Device Manager and Enter. Or Open the "Run" dialog box by pressing and holding the Windows key, then press the R key ("Run"). Type devmgmt.msc and Enter

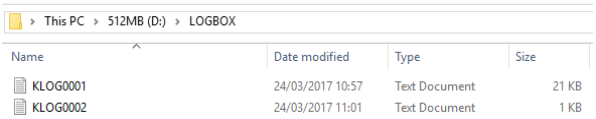


Note the new COM port with TI MSP430 in its name. Any extra LOGBOX SE attached later can get a new and higher COM port. TI MSP430 is only shown when the driver was manually installed. Otherwise a generic driver will be used.

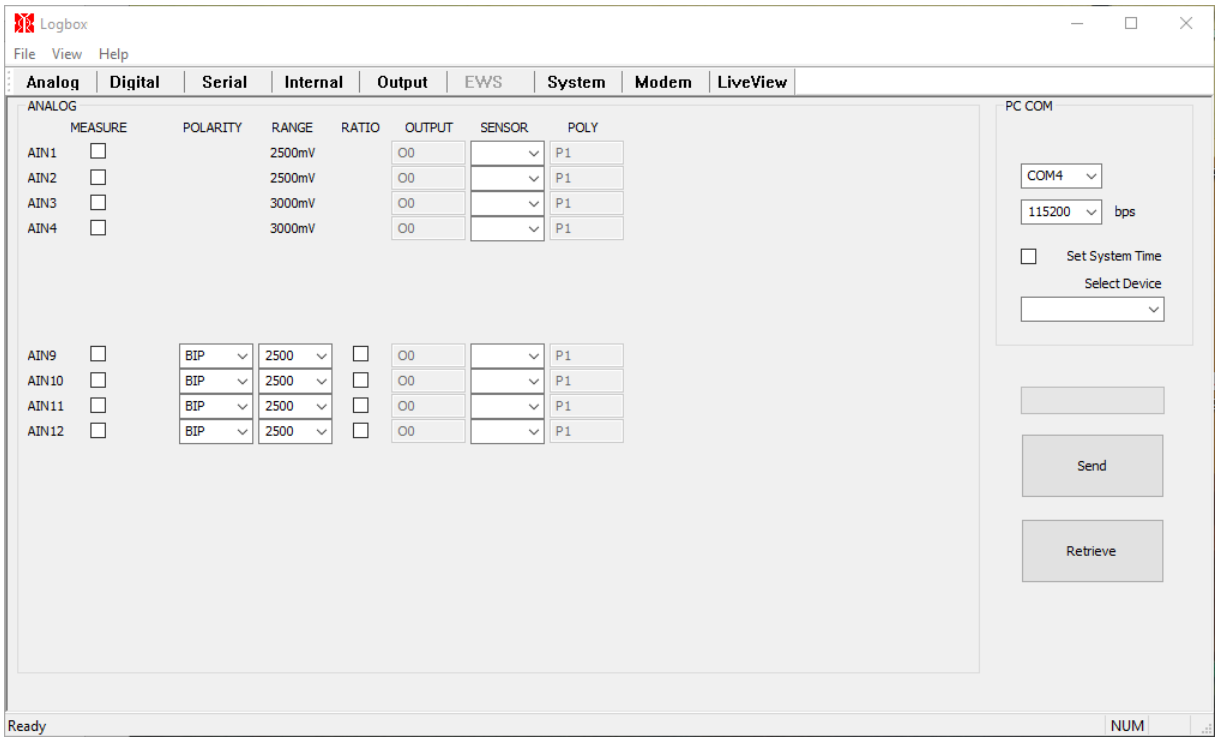
The files starting with BSL are for future use when a new firmware may be made available.

When the USB is connected also a new removable disk will appear. This allows for easy file management like copy and removal. The SD contents visible in the Windows Explorer will be updated when files are removed but will **not** be updated when the logger produces new log files. Then the USB cable must be unplugged and plugged in again.





After starting the software, the following window will appear.



If the software hasn't been able to detect the right COM port please select it in the first dropdown menu under PC COM. No other settings are needed right now.

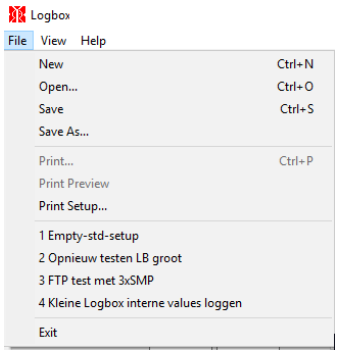
Now click **Retrieve** to get the current settings from the LOGBOX SE.
After program start **always** click Retrieve to load the program with your current settings and the capabilities of your Logbox SE. Potentially save the settings for future reference.

Do not click Send unless you are very certain that the settings in the software are correct. After program start all settings are off or zero and Send would reset your LOGBOX SE completely.

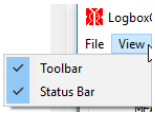
If by accident the LOGBOX SE is messed up it is possible to go back to the original settings by using the Set Default Config button explained later in this manual.

9.1 Toolbar

The File menu offers the following:



In this menu you can create new configurations (New) and save them (Save / Save As…), or you can open existing configuration (Open…). Print, Print Preview and Printer Setup are also possible to allow you to have a hardcopy of the settings at hand when changing some settings.
Last four configurations are directly accessible. With Exit you can close the application.

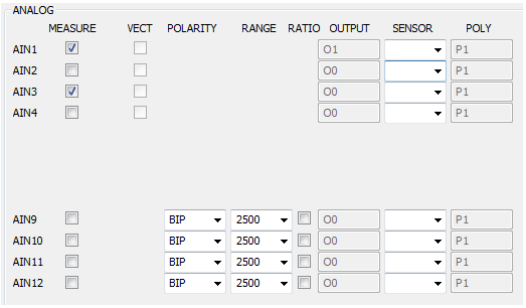


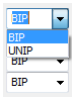
The View menu turns on or off the toolbar and status bars. It's best to leave these on.

9.2 Analog configuration.

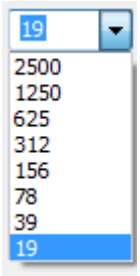
After clicking **Analog** you can select all parameters of the analog inputs. Analog inputs, which should be logged, must be checked in the Measure column.

Any UVS or CDS3 sensor needs to be attached to AIN3 or AIN4 because of their higher output voltage.





For the differential input AIN9 to AIN11 one needs to select Bipolar (BIP) and the input voltage range (19 – 2500mV). E.g. a CMP pyranometer will produce max. around 20mV so the 38mV range would be the right selection. A SP Lite2 or equivalent needs the 156mV setting for normal outdoor use.



Inputs AIN9 - AIN12 offer ratio measurements by checking RATIO box. It is designed for Pt-100 measurements, where AIN9 is connected to a high precision 100Ω reference resistor and AIN10 is connected to the Pt-100 sensor. This way the user can measure temperature with the 4 wire method (for highest precision). See section 9.5

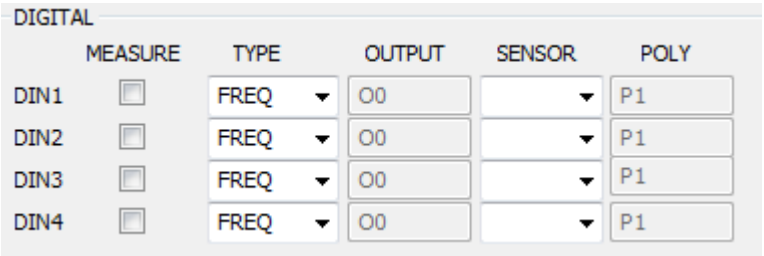
When you select RATIO AIN10, the logger will make the following calculation:

Value = 100Ω * Uin10/Uin9 = resistance of the Pt-100

78mV would be the right voltage range for Pt-100 measurements.

9.3 Digital configuration

After clicking **Digital** you can select the parameters of the digital inputs.



Digital inputs, which should be logged, must be checked in the Measure column.

The digital inputs can measure Frequency, Time or Count.

The logic level is CMOS at 3V and max. voltage is 15V, max. frequency is 1500Hz.

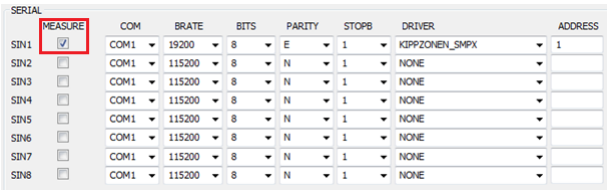
DIN4 is for CDS3 sunshine duration sensor and has a 0.5V logic level.

Time (when digital input is in high logical state) is measured in seconds.
Count will count the amount of Hi-Low transitions in the programmed measurement period.

Using polynomial coefficients of the 3-rd order the logged values can be converted to engineering units

9.4 Serial configuration

After clicking **Serial** you can select the parameters of the RS-485 serial inputs.

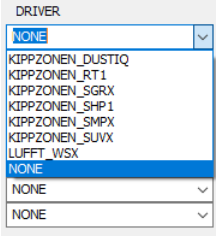


Serial inputs, which should be logged, must be checked in the Measure column.

The COM port used is COM1 as that is shared with the RS-485 port that is used for communication with Kipp & Zonen SMART sensors.

Kipp & Zonen SMART device standard settings are baudrate 19200, 8 bits, even parity and 1 stopbit.

The appropriate driver for the sensor model is selected under Driver. This only works after **Retrieving** the setup from the Logbox SE.

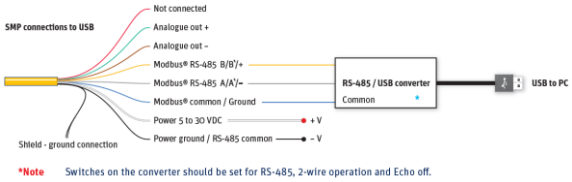


Currently supported are: SMPxx, SGRx, SPHx, RT1, SUVx, DustIQ, IMT Si-RS485TC-T-Tm -MB and Lufft WSxxx. More devices might be added in the future.

Note: Each SMART sensor needs to have a unique Modbus® address programmed **in advance** when there is more than one sensor. Otherwise, the standard address 1 is fine.

Modbus® address programming can be done with Kipp & Zonen SmartExplorer software that is available for download for free and a separately bought widely available USB – RS-485 converter like Kipp & Zonen UPM485 or B&B Ulinx.

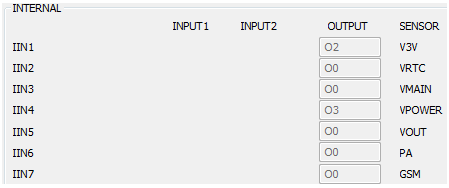
Use Lufft or IMT software and manuals for these instruments.



Other devices need their own, manufacturer supplied, setup software.

9.5 Internal values

After clicking **Internal** you can see the internal values that are linked to internal sensors that can be logged.



V3V – system voltage 3.3V

VRTC – voltage of the CR2032 lithium battery

VMAIN – voltage on CHARGER or SOLAR input

VPOWER – voltage on POWER input minus ≈ 0.3-0.5V

VOUT – voltage on PWROUT output (power supply for sensors)

Note: All voltages are reported in mV.

PA – atmospheric pressure. On the board there is a simple barometer. If the box is closed and pressure needs to be measured, it is necessary to place a pressure port in one position of the cable glands.

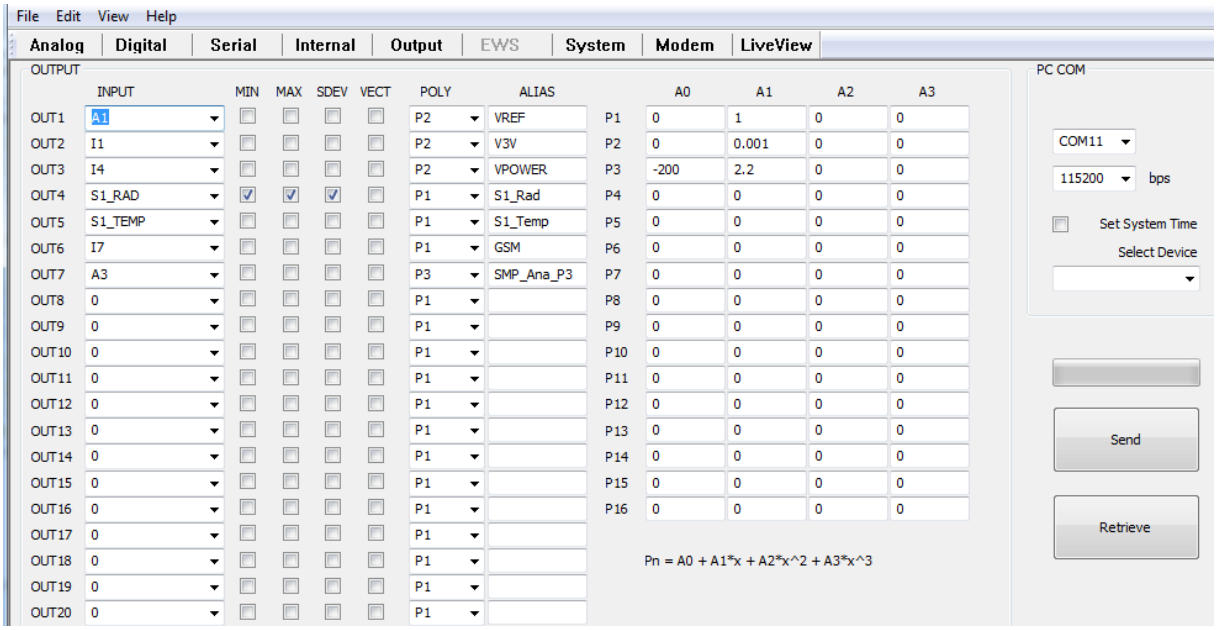
PA is reported in Pascal and for millibar needs to be divided by 100.

GSM – signal strength of GSM network. It is directly proportional to dBm value.

The polynomial to get dB is given in the next section.

9.6 Output

After clicking **Output** you can connect a measured input or internal value to an output, decide to log the average value, the min and max and standard deviation for your output and optionally vector if it is related to wind direction.



For easier reading of the logged values the outputs can be given an alias that will be reported in the logs and in the LiveView window.

The Kipp & Zonen SMART instruments (SMP, SHP, RT1 etc.) offer the choice of logging the radiation W/m² (Sx_RAD) , the instruments temperature (Sx_TEMP) and the raw not linearised, not temperature compensated radiation from the sensor (Sx_RAW). For the pyrgeometers there's also the calculated downward atmospheric long-wave radiation Sx_DOWNRAD and the raw sensor data (Sx_RAW1) and the raw log wave down (Sx-RAW2) data both not linearised, not temperature compensated

The DustIQ offers: Soiling ratio 1 & 2, Transmission Loss 1 & 2 , Tilt X and Y (future enhancement), PV panel temperature in Kelvin (future enhancement).

The Lufft WSxxx weather stations offer: Temperature in °C and Fahrenheit, Relative humidity, Dewpoint in °C and Fahrenheit, Wind speed in m/s and MPH, Wind direction, Air pressure in kPa, Solar irradiation W/m², Precipitation in mm and inches, Precipitation in mm and inches per hour, Precipitation type and External temperature.

Note: Each logged measured output **must** be converted using a 3rd power polynomial. **At least A1 = 1** is needed for logging without conversion. Sixteen polynomials can be setup and assigned.

$$Pn = A0 + A1 * x + A2 * x^2 + A3 * x^3$$

In the above example, P1 gives just the original millivolt value and **must** be used if no conversion is needed. P2 will convert millivolts to volts for easier reading or when needed when processing the logged data. P3 is for converting the **analog** voltage output of a SMART-V pyranometer to W/m² and is hardly ever used.

The logged digital SMART sensor reading needs no further action as the readings are in W/m², thus A1 = 1.
The temperature is in 0.1°C (see SMP manual) and needs to be divided by 10 thus giving a A1 value of 0.1.

For converting the internal GSM signal IIN7 to dBm A0 = -113, A1 = 2, A2 = 0, A3 = 0.

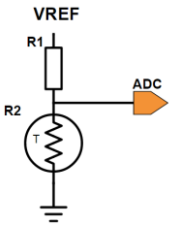
9.6.1 Polynomials for CMP, CHP, CGR etc

The sensitivity of the instrument (e.g. 10.60 µV/W/m2) can be transformed to a simple polynomial: $A1 = \frac{1000}{sensitivity}$ in µV/W/m² as indicated on the calibration certificate of the instrument.

For this example where the sensitivity is 10.60 µV/W/m2:
A0 = 0
A1 = 94.33962
A2 = 0
A3 = 0

9.6.2 Polynomials for Thermistors

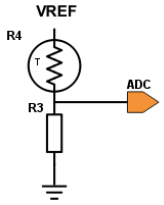
This section will explain how to use standard or create your own polynomials to be applied when you are using Pt-100 or TH10K components with given specifications.



Standard polynomials for 10k thermistor to GND, 10k resistor to V_{REF}

For AIN1 and 2:
$y = -1.52813E\text{-}08x^3 + 6.29616E\text{-}05x^2 - 1.23747E\text{-}01x + 1.11104E+02$

For AIN3 and 4:
$y = -1.39006E\text{-}07x^3 + 3.42417E\text{-}04x^2 - 3.47914E\text{-}01x + 1.63139E+02$



Standard polynomials for 10k thermistor to VREF, 10k resistor to GND

For AIN1 and 2:
$y = 1.52813E\text{-}08x^3 - 5.16481E\text{-}05x^2 + 9.54629E\text{-}02x - 4.35227E+01$

For AIN3 and 4:
$y = 1.39006E\text{-}07x^3 - 7.00125E\text{-}04x^2 + 1.24218E+00x - 7.38502E+02$

$y = A3\,x^3 + A2\,x^2 + A1\,x + A0$ as used in the LOGBOX SE

9.6.3 Polynomials for Pt-100

With the excitation jumper placed there will be a current of approximately 600µA available to flow through the 100Ω series precision resistor and Pt100 thermistor. (see section 9.5 for connections)

AIN9 is used to measure $U_{RESISTOR}$.

Expected voltage is in the range of 60mV and always positive and unipolar.

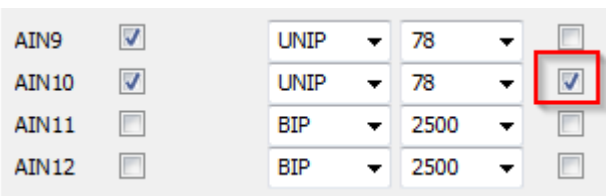
$I_{MEASURE} = U_{RESISTOR} / 100$

AIN10 is used for measuring the Pt-100 voltage $U_{Pt\text{-}100}$ and again the expected voltage is in the range of 60mV and unipolar.

$R_{Pt\text{-}100} = U_{Pt\text{-}100} / I_{MEASURE} = 100 * U_{Pt\text{-}100} / U_{RESISTOR}$

Calculation of the temperature can be done on the computer after receiving the logged data.
or the RATIO function in the Analog setup can be used.

Inputs AIN9 - AIN12 offer ratio measurements by checking the RATIO box in the Analog window



It's designed for Pt-100 measurements, where AIN9 is connected to a high precision 100ohm reference resistor and AIN10 is connected to Pt-100 sensor. This way the user can measure temperature with 4 wire method (for highest precision).

When you select RATIO for AIN10 the, logger will make the following calculation:

Logged value OUTx = $R_{Pt\text{-}100} = 100 * U_{Pt\text{-}100} / U_{RESISTOR} = 100*Uin10/Uin9$

A usable polynomial is calculated for °C and Fahrenheit in the Excel file that came with the downloaded software package.

$T_{Celcius} = -3.89779E\text{-}06x^3 + 2.20939E\text{-}03x^2 + 2.23389E+00x - 241.600$

$T_{Kelvin} = -3.89779E\text{-}06x^3 + 2.20939E\text{-}03x^2 + 2.23389E+00x + 31.55$

$T_{Fahrenheit} = -7.01601E\text{-}06x^3 + 3.97691E\text{-}03x^2 + 4.02100E+00x - 4.02880E+02$

You can apply the above polynomials to OUTx to convert resistance to temperature in degrees Celcius, Kelvin or Fahrenheit.

9.6.4 Polynomials for UVS

Polynomial in mV:
To have the output values recorded in mV (millivolt) we will have to enter the following polynomial A1=1

If you are only interested in the UV values recorded by the instrument you would probably like to have these readings in W/m^2.

Polynomial for W/m^2:

To have the output values recorded in W/m^2 we will need to make some calculations using the mean sensitivity values of the UVS instruments. The mean sensitivity values can be found on the supplied calibration certificates.

Example:
The calibration certificates state that the mean sensitivity of the UVS-A = 30.083 $W/m^2/V$ and the mean sensitivity of the UVS-B =1.879 $W/m^2/V$.

In order to have the correct engineering units, W/m^2, we need to apply the following equation: A1=Mean sensitivity/1000

For this example UVS-A A1 =30.083/1000=0.030083
For this example UVS-B A1 =1.879/1000=0.001879

A0 = A2 = A3 = 0

	A0	A1	A2	A3
P1	0	1	0	0
P2	0	0.001	0	0
P3	-200	2.2	0	0
P4	111.104	-0.123747	6.29616e-00	-1.52813e-0(
P5	163.139	-0.347914	0.000342417	-1.39006e-0(
P6	-43.522	0.0954629	-5.16481e-0(	1.52813e-00
P7	-38.9862	0.123767	-8.11744e-0(	2.5603e-008
P8	-241.6	2.23389	0.00220939	-3.89779e-0(
P9	0	0	0	0
P10	0	0	0	0
P11	0	0	0	0
P12	0	0	0	0
P13	0	0	0	0
P14	0	0	0	0
P15	0	0	0	0
P16	0	0	0	0

Pn = A0 + A1*x + A2*x^2 + A3*x^3

Please note that this cannot be used in combination with the Kipp & Zonen Uviator software.
Uviator requires all logged outputs to be in Volt!

Polynomial for converting mV to Celsius:

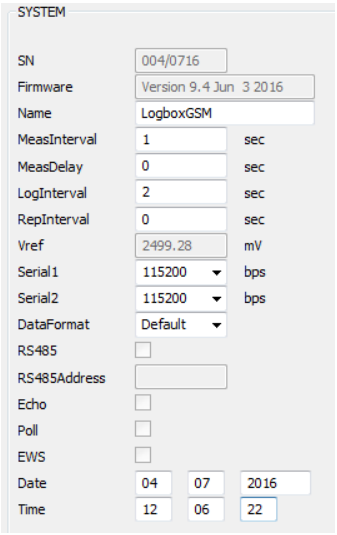
In your UVS manual you will find a table to convert the voltage output of the UVS into the temperature (°C). Using the described way to create polynomials this leads to:

$°C = 1.97893E\text{-}09x^3 - 1.25261E\text{-}05x^2 + 4.60569E\text{-}02x - 4.28345E+01$

These values can be entered in the polynomials section:

9.7 System

After clicking **System** the LOGBOX SE displays the settings related to measuring and logging.



The LOGBOX SE can be given a unique name in the Name box.

MeasInterval [1-3600s] is the time in seconds between each measurement period start.
The POWEROUT output is activated at the start of the measurement period and if needed a MeasDelay different from 0 can be entered to delay the actual measurement to let the instruments stabilise after POWEROUT has been applied.

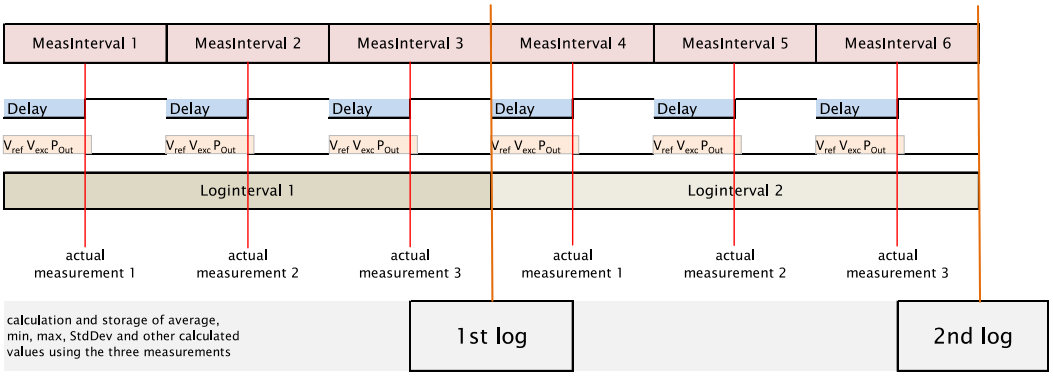
MeasInterval needs to be bigger than MeasDelay.

LogInterval [1-3600s] is the time between individual loggings of the gathered data. When this interval is finished the LOGBOX SE calculates average, min, max, std Dev and stores it on the SD card. On the SD card a new file is created for every day.

One second MeasInterval with 60 second LogInterval is often used

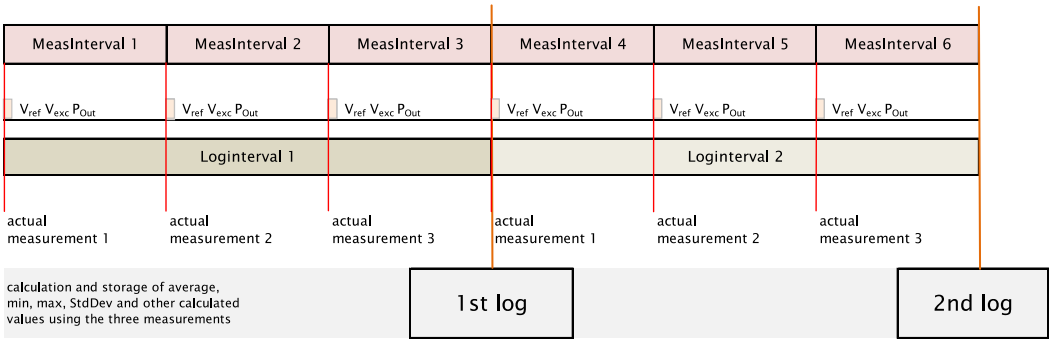
Logging with delay

MeasInterval = 2 sec
Delay = 1 sec
LogInterval = 6



Logging without delay

MeasInterval = 2 sec
Delay = 0
LogInterval = 6

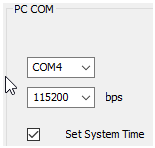


RepInterval [0…3600] – interval between reports in seconds on COM2 serial port. If RepInterval is zero, there is no report on COM2. If RepInterval is non zero and equal to LogInterval, reports on COM2 will be the same as logged data. If RepInterval is non zero and different from LogInterval, reports on COM2 are generated from last measured data (without min, max, stdev).

The amount of measurements taken for each log is LogInterval / MeasInterval.

Serial 1 setting is for potential future use.
Serial 2 is the baudrate for communication via the RX/TX232_2 port. Other setting are fixed and 8 bit, no parity and 1 stop bit (8N1).

DataFormat sets the way that data is continuously sent via the emulated COM port on the USB connection and TX232_2 output when the LOGBOX SE is switched on and logging and the way that data is stored. As TXT with spaces or CSV with comma's.
Default sends values separated by spaces: `03.08.2016 13:28:00 13.804 6.222 6.000 7.000 0.416 24.200 55.083 3.083 0.000 2.494`
Making them easy to read. When the data needs to be logged and processed a comma separated format CSV can be easier to process. CSV (format 1) will send: `03.08.2016,13:26:00,13.803,10.061,9.000,11.000,0.851,24.200,91.952,3.083,0.000,2.494.`
CSV also places the headers above the values.

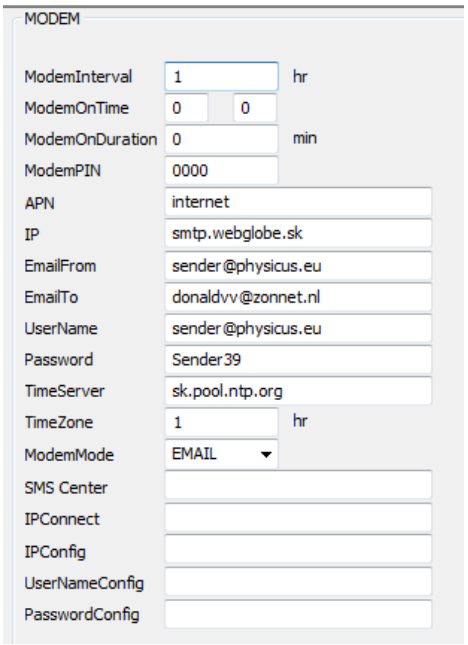


Date and Time will be shown when retrieved from the LOGBOX SE and can be updated when needed. When the Set System Time box is checked the date and time and all other setting are sent to the LOGBOX SE when Send is clicked.

Note: A new Set Default Config button has been added. If the LogboxSE has become unstable it is advised to use this button followed by Retrieve. Now the settings can be selected again or loaded from the saved settings file on the PC.

9.8 Modem

After clicking **Modem** the LOGBOX SE displays the settings related to the GSM modem, email and or FTP settings and time for communication.



ModemInterval [0 … 24] is the interval between sending data over modem in hours, starting with the first on 00:00 hr. Example: 8 means a logfile is send at 0:00 , 8:00 and 16:00 hr. Fractions are allowed and e.g. 0.25 means a logfile sent every 15 minutes. A setting of 0 means no sending via modem.

ModemOnTime] is the time at which modem will connect to GSM network and wait for an incoming call e.g. respond to an SMS request. Whole hours only e.g. 15 for 15:00 hr.

ModemOnDuration [0…1440min] – defines how long modem will be connected to GSM network for a call. 1440 means 24hr per day.

ModemPIN [number] PIN belonging to the installed SIM card (max 10 digits) and strongly advised to use.

APN [string]– access point of your GSM/GPRS provider.

IP [string]– address for sending emails or IP address of FTP server.
Note: Sometimes the local GSM operator or smtp / ftp service provider needs a secure smtp**s** or ftp**s** connection. Please consult your supplier for details. *Only valid for the new 4G model.*

EmailFrom [string]– your sender address for the email

EmailTo [string]– recipient address for the email. Here data will be sent to.

UserName [string]– user name for authorization on smtp server or FTP server. Minimum 5 characters. If less than 5 characters are used, access without authorization is activated (UserName and Password are then not used)

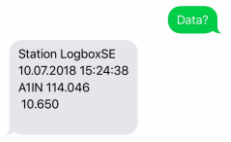
Password [string]– password for authorization on smtp server or FTP server. Minimum 4 characters. If less than 4 characters are used, access without authorization is activated

TimeServer [string]– time server for time synchronization. Synchronisation will take place at 00:00 hr using port 123 and is UTC/GMT time. Standard server to use is sk.pool.ntp.org .

TimeZone [-12…12]– your local time zone with regards to GMT/UTC. Best not to use daylight saving time.

ModemMode selects between sending the log files as email attachments or to an FTP server.
All other settings are for future use.

SMS Center is the number of your GSM provider and in international format. E.g. +31 6 5432 9876



When the modem is programmed to be on and the SMS Center is set and an SMS with 'Data?' is received, the last measured data is send back as an SMS.

The following settings are standard settings when you don't have your own SMTP email gateway.

APN internet is unique for your GSM provider but very often internet is used
IP smtp.webglobe.sk
EmailFrom sender@physicus.eu
EmailTo your.email@your-company.com
UserName sender@physicus.eu
Password Sender39

TimeServer sk.pool.ntp.org

If you do have your own smtp or ftp provider you have to change IP, UserName and Password to your login.

Note: The availability of the physicus.eu mail server is not guaranteed. It's only a handy site for testing.

The LOGBOX SE with 2G only does **not** allow for secure connection or secure authentication. The newer model does support it.

If your email provider doesn't even need user authentication for SMTP then leave UserName and Password empty.

If you want to send the log files to an FTP server than the IP, UserName and Password need to reflect your FTP server login. User settings on your FTP server need to be set correct and allow for writes for by the LOGBOX SE.

Note: Sometimes the local GSM operator or smtp / ftp service provider needs a secure smtp**s** or ftp**s** connection. Please consult your supplier for details. *Only valid for the new 4G model.*

9.9 Setup flow

When starting with a LOGBOX SE it is best to use the following sequence:

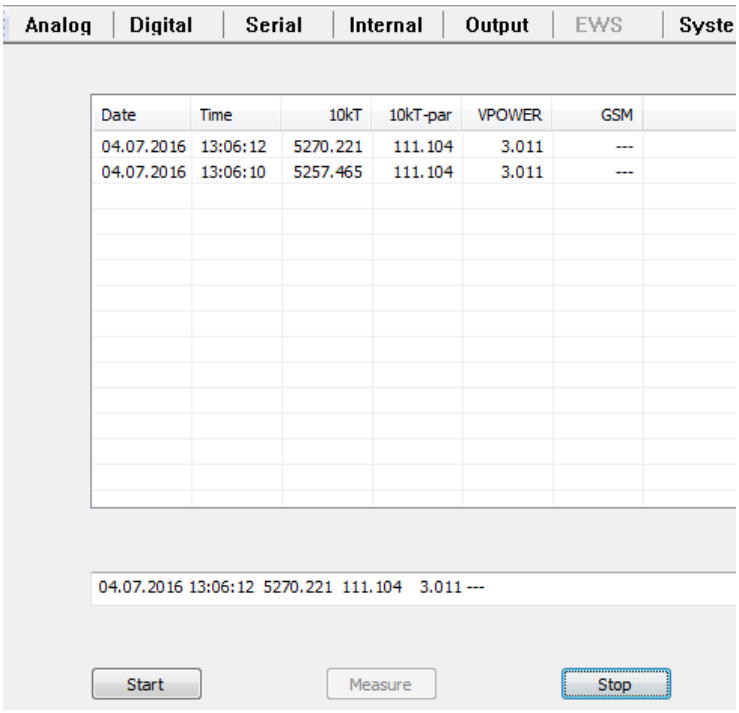
1. Write your equipment and attachments to the LOGBOX SE using e.g. Planned Setup on page 45.
2. Make the analog instruments known using the first tab called **Analog**. Don't forget to tick the Measure box.
3. Make the digital signals (On, Off, Frequency) known using the **Digital** tab
4. Make the RS-485 Modbus instruments known using the **Serial** tab
5. Select which input to log and in which order using the **Output** tab
   Select when needed the Min, Max and StdDev to be logged as well
   Select the right polynomials. At least A1 =1 is needed to log the value unprocessed.
6. Select the measurement and logging interval using the **System** tab
   DataFormat (Space delimited or Comma delimited CSV) can be selected
7. If you do have a SIM card and data capabilities the systems can be personalised using the Modem tab
8. To check if the logging is working the **LiveView** tab can be used.

For just checking it is advised to use short measurement and logging intervals and finally change them to the desired values when ready.

9.10 LIVEVIEW

Clicking **LiveView** opens the window where live logged data can be viewed.

The switch in the LOGBOX SE must in the On position for logging and Start will start the actual live view and as expected Stop will stop it.



Measure is for future use.

--- means: No data received or this input was not selected in the Measure box in the Analog, Digital or Serial tab

Leaving the LiveView window doesn't stop the logging and the LiveView will be resumed when the LiveView window is selected again.

Do not forget to click Stop as functions like Send are disabled when LiveView is active.

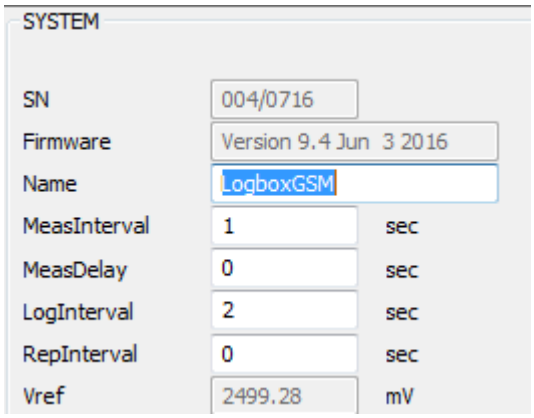
10 FIRMWARE UPDATE

Please print before performing this procedure

If needed to solve potential issues or enhance the functionality of the logger new firmware might be released on the Kipp & Zonen website under Downloads.
Download the software for performing the update and the actual firmware in TXT format.

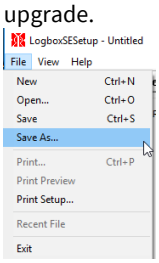
Note: Always retrieve and save the LogboxSE settings first.

BSL_USB_GUI.EXE
BSL430.DLL
LOGBOX SExxx.TXT

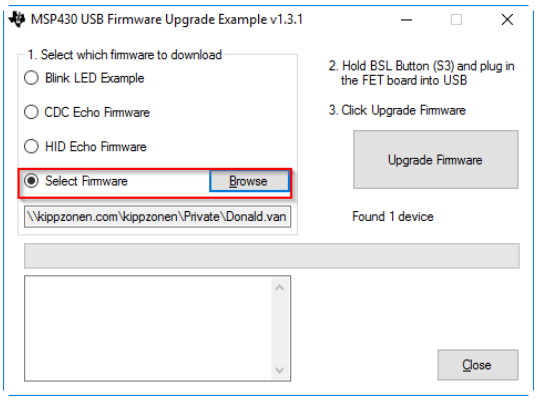


In order to check the current firmware start the LOGBOX SE Setup software, click **Retrieve** and navigate to the system tab where there is a Firmware box.

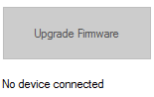
If there is a newer version available that you want to install then **save** the current settings so they can be restored after the upgrade.



- Disconnect **all** power supplies from the data logger **and** the USB service cable
- Place UPGRADE jumper on the circuit board (optionally borrow jumper from Batt or Exc)
- Connect power supply
- Reconnect USB service cable. You can check in DeviceManager that the COM port is gone
- Remove UPGRADE jumper. Do not forget this step otherwise the upgrade will fail.
- Start the BSL-USB_GUI program and click Next
- Accept the license agreement and click Next



Check **Select Firmware**, click **Browse**, navigate to the directory where you downloaded and unzipped the update and select the TXT file. Click **Upgrade Firmware**.
The logger will be restarted when the update has finished. Click **Close**.



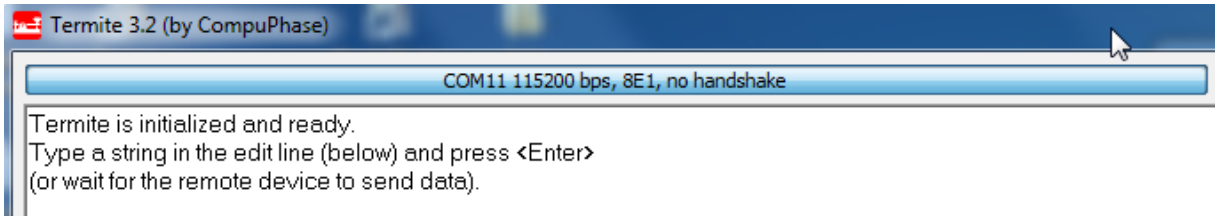
When there is a No device connected, please check if your USB connection is directly to your PC and that you followed above procedure and removed the jumper before starting the software.

Note: Depending on the newer firmware and the advice in the README file it might be needed to a) **install** newer LOGBOXSESetup software and b) **Start** LogboxSESetup software and click **Retrieve** followed by **Set Default Config** and **Load** the previously saved settings and **send** the settings back to the LogboxSE.

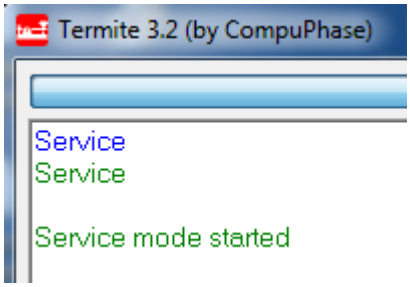
11 SERVICE MODE

To access service mode, you need to have a terminal program installed on your PC like e.g. Termite or the old Hyperterminal. Connect the LOGBOX SE via USB to the PC and connect your terminal program to the right COM port. The serial settings aren't really important.

Or attach the Serial2 port of the LOGBOX SE using RS-232 and when applicable an RS-232 – RS-485 converter. Then serial settings do matter of course.



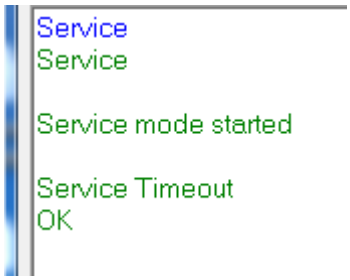
Type Service at the bottom of the Termite window.



Now a wide range of commands is possible. Normally one would not need them as they offer no advantages over the LOGBOXSESetup program apart from a forced Reset and switching on the GSM modem for testing and sending test emails.

Commands are Case sensitive.

After a few minutes Service Mode will be exited automatically.



11.1 Setup and check commands

11.1.1 Help

Help displays all available commands.

```
a 1..8, Measure         AIN1-4 are available
a 9..20, Measure, Gain, Unipolar, Ratio    AIN9-12 are available
d 1..8, Measure, Frequency, Counter, Time
s 1..8, Measure, Comport, bpS, Bits, Parity, sTop, Driver, Address
o 1..32, Input, miN, maX, Stdev, Vector, Polynome, Alias
e 1..16, Input, Type, Logint, Modemint, Alarm, Bitmask, Units                not used
p 1..16, 0..3=
Name StationName
Vref [mV]
Date 1.2.2016           to manually set the date        | can be overwritten automatically
Time 11:45:20           to manually set the time,       | when synchronisation via GSM is enabled
MeasInterval [sec]
MeasDelay [sec]
LogInterval [sec]
RepInterval [sec]
DataFormat 0...3
ModemInterval [hr]
ModemOnTime [09:00:00]
ModemOnDuration [min]
ModemPIN
APN
IP
EmailFrom
EmailTo
UserName
Password
TimeServer Server/GSMNetwork
TimeZone
Ftp 0/1
IPConnect
IPConfig
UserNameConfig
PasswordConfig
ModemDetail 0/1
SaveConfig - save configuration to Flash
ReadConfig - read configuration from Flash
? - show actual settings
Modem? - show actual modem settings
ModemDetail 1/0
Config? - show all acutal configuration
Config1?..5? - show parital actual configuration
SD? /prolog - show actual files on SD card
System? - show sw version
SerialDriver?
Serial1 300, 1200, 2400, 9600, 19200, 38400, 57600, 115200bps
Serial2 300, 1200, 2400, 9600, 19200, 38400, 57600, 115200bps
EWS 0/1 not used
SmsCenter +421905303303
SmsNumber 1..16 +421905123456
EarlyWarning?
LogVariables - show all logged variables with names
ReadData 10 - read last 10 records
ActualData - show actual measured data
Measure - execute one measurement
ReadFile /LOGBOX/KLOG0001.txt - read file from SD card
TestGprs
TestEmail
TestSync
TestSocket not used
TestSms not used
SetDefaultConfig
Service - enter service mode
Exit - exit from service mode
Help
Reset - reboot datalogger
```

11.1.2 Question mark command

Example: ?

SN 002/0115
Name PROlog
MeasInterval 5 sec
MeasDelay 0 sec
RepInterval 0 sec
Page 26 of 54
LogInterval 10 sec
Vref 2498.650 mV
Serial1 115200 bps
Serial2 115200 bps
RS-485 0
EWS 0
Date 01.02.2015
Time 08:12:26

11.1.3 Config

Config? displays all settings

a 1, M=1, V=0, P=3, O=1
a 2, M=0, V=0, P=1, O=0
a 3, M=1, V=0, P=4, O=2
a 4, M=0, V=0, P=1, O=0
a 5, M=0, V=0, P=1, O=0
a 6, M=0, V=0, P=1, O=0
a 7, M=0, V=0, P=1, O=0
a 8, M=0, V=0, P=1, O=0
a 9, M=0, U=0, G=1, R=0, P=1, O=0
a 10, M=0, U=0, G=1, R=0, P=1, O=0
a 11, M=0, U=0, G=1, R=0, P=1, O=0
a 12, M=0, U=0, G=1, R=0, P=1, O=0
a 13, M=0, U=0, G=1, R=0, P=1, O=0
a 14, M=0, U=0, G=1, R=0, P=1, O=0
a 15, M=0, U=0, G=1, R=0, P=1, O=0
a 16, M=0, U=0, G=1, R=0, P=1, O=0
a 17, M=0, U=0, G=1, R=0, P=1, O=0
a 18, M=0, U=0, G=1, R=0, P=1, O=0
a 19, M=0, U=0, G=1, R=0, P=1, O=0
a 20, M=0, U=0, G=1, R=0, P=1, O=0
d 1, M=0, F=1, C=0, T=0, P=1, O=0
d 2, M=0, F=1, C=0, T=0, P=1, O=0
d 3, M=0, F=1, C=0, T=0, P=1, O=0
d 4, M=0, F=1, C=0, T=0, P=1, O=0
d 5, M=0, F=1, C=0, T=0, P=1, O=0
d 6, M=0, F=1, C=0, T=0, P=1, O=0
d 7, M=0, F=1, C=0, T=0, P=1, O=0
d 8, M=0, F=1, C=0, T=0, P=1, O=0
i 1, P=2, O=0, A=V3V
i 2, P=1, O=0, A=VRTC
i 3, P=1, O=0, A=VMAIN
i 4, P=2, O=3, A=VPOWER
i 5, P=1, O=0, A=VOUT
i 6, P=1, O=0, A=PA
i 7, P=1, O=4, A=GSM
i 8, P=1, O=0, A=RG10M
i 9, P=1, O=0, A=RG1H
i 10, P=1, O=0, A=RG6H
i 11, P=1, O=0, A=RG24H
s 1, M=0, C=1, S=115200, B=8, P=N, T=1, D=NONE, A=
s 2, M=0, C=1, S=115200, B=8, P=N, T=1, D=NONE, A=
s 3, M=0, C=1, S=115200, B=8, P=N, T=1, D=NONE, A=
s 4, M=0, C=1, S=115200, B=8, P=N, T=1, D=NONE, A=
s 5, M=0, C=1, S=115200, B=8, P=N, T=1, D=NONE, A=
s 6, M=0, C=1, S=115200, B=8, P=N, T=1, D=NONE, A=
s 7, M=0, C=1, S=115200, B=8, P=N, T=1, D=NONE, A=
s 8, M=0, C=1, S=115200, B=8, P=N, T=1, D=NONE, A=
o 1, I=A1, L=1, N=0, X=0, S=0, V=0, P=3, A=10kT
o 2, I=A3, L=1, N=0, X=0, S=0, V=0, P=4, A=10kT-par
o 3, I=I4, L=1, N=0, X=0, S=0, V=0, P=2, A=VPOWER
o 4, I=I7, L=1, N=0, X=0, S=0, V=0, P=1, A=GSM
o 5, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 6, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 7, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 8, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 9, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 10, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 11, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 12, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 13, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 14, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 15, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 16, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 17, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 18, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 19, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 20, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 21, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 22, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 23, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 24, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 25, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 26, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 27, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 28, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 29, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 30, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 31, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
o 32, I=0, L=1, N=0, X=0, S=0, V=0, P=1, A=
p 1, 0=0, 1=1, 2=0, 3=0
p 2, 0=0, 1=0.001, 2=0, 3=0
p 3, 0=-200, 1=2.2, 2=0, 3=0
p 4, 0=111.104, 1=-0.123747, 2=6.29616e-05, 3=-1.52813e-08
p 5, 0=0, 1=0, 2=0, 3=0
p 6, 0=0, 1=0, 2=0, 3=0
p 7, 0=0, 1=0, 2=0, 3=0
p 8, 0=0, 1=0, 2=0, 3=0
p 9, 0=0, 1=0, 2=0, 3=0
p 10, 0=0, 1=0, 2=0, 3=0
p 11, 0=0, 1=0, 2=0, 3=0
p 12, 0=0, 1=0, 2=0, 3=0
p 13, 0=0, 1=0, 2=0, 3=0
p 14, 0=0, 1=0, 2=0, 3=0
p 15, 0=0, 1=0, 2=0, 3=0
p 16, 0=0, 1=0, 2=0, 3=0

11.1.4 Modem

Modem? displays all modem settings

```
Modem?
ModemInterval    1 hr
ModemDelay       0 min
ModemOnTime      00:00:00
ModemOnDuration  0 min
ModemPIN         0000
ModemNumber
APN              internet
IP               smtp.webglobe.sk
EmailFrom        sender@physicus.eu
EmailTo          your_name@email.com
UserName         sender@physicus.eu
Password         Sender39
TimeServer       sk.pool.ntp.org
TimeZone         1
Ftp              0
IPConnect
IPConfig
UserNameConfig
PasswordConfig
```

11.1.5 System

System? – displays actual firmware version

System?

```
LOGBOX SE Version 9.4 Jun  3 2016
SystemOnTime (126660)  0.1 Days
```

11.1.6 SaveConfig

SaveConfig saves current settings to non-volatile memory. Necessary after changing settings via the terminal session.

11.1.7 ReadConfig

ReadConfig – reads current settings from nonvolatile memory

11.1.8 ReadData

ReadData [1…200] – reads last 1…200 records from memory.

```
Example: ReadData 2
Searching data...
Current Write Flash page 10
16.07.2009 12:09:00 264.887 239.766 267.539 7.702 55.770 0.000 600.366 0
.061 13.743 0.320 0.000 161.728 0.029 258.572 0.078 258.574 0.079
16.07.2009 13:00:00 267.189 267.188 267.539 0.018 54.427 1.252 600.366 0
.051 13.753 0.320 0.000 161.728 0.028 258.573 0.078 258.573 0.078
```

11.1.9 ActualData

ActualData – displays actual data from measured inputs

(O8) Vbatt 20.053
(O9) Ref100 100.000
(O10) Pt-100 22.344
((O4) SD 0.000

11.1.10 SD

SD? – displays all data files in the root directory of the SD memory card.

Example: SD?
Directory listing...
  <dir> .
  <dir> ..
KLOG0001.TXT 51559 2016/08/11 00:00
KLOG0002.TXT 49890 2016/08/11 09:31
Total Space 481920 kB
Free Space 481784 kB
Actual File /LOGBOX/KLOG0002.txt
OK

11.1.11 RS-485

RS-485 [0…1] – configures if using RS-485 port. For future extension

Example RS-485 1

11.1.12 ReadFile

ReadFile KLOG0001.TXT – displays requested file saved on SD memory card

Example: ReadFile /LOGBOX/KLOG0020.TXT

#Name LOGBOX SE
#SN 004/0716
#(O1) 10kT Avg;
#(O2) 10kT-par Avg;
#(O3) VPOWER Avg;
#(O4) GSM Avg;

04.07.2016 10:54:32 5244.709 111.104 3.006 ---
04.07.2016 10:54:34 5270.221 111.104 3.006 ---
04.07.2016 10:54:36 5270.892 111.104 3.008 ---

11.1.13 Miscellaneous

TestEmail – start to send testing email or FTP file via GSM modem

TestGprs – start to test GPRS connection

TestSocket – start to test socket connection

Exit – exit from Service mode

Service – enter Service mode

Reset – software reset of EasyLogGSM

SetDefaultConfig clears all settings and then sets logging on AIN1, V3V and VPOWER. To save use SaveConfig command

11.1.14 Settings via terminal session

Analog and digital inputs

a x, M=y, G=y, U=y, R=y
where:

a x [1-4 , 9-12] – analog input number (AIN1-4 …AIN9-12)
M=y [0,1] – if M=1, activate measurements on this input
G=y [1…8] – ranGe for differential inputs (a 9 … a 12) 19, 38, 78,156, 312, 625, 1250, 2500mV
U=y [0,1] – unipolar setting (U=1) or bipolar setting (U=0) for differential inputs (a 9 … a 12)
R=y [0,1] – calculating ratio to a9 for inputs a10 … a12. a x becomes100* AINx / AIN9 for Pt-100

Example a 1,M=1 (analog input 1 is configured for measuring)
a 9,M=1, G=8, U=1, R=0 (analog input 9 is configured for measuring, input range 8, unipolar and no ratio calculation)

Command format for configuring **digital inputs**:
d x, M=y, F=y, T=y, C=y
where:
d x [1…4] – digital input number (d 1 … d 4)
M=y [0,1] – if M=1, activate measurements on this input
F=1 – frequency measurement
T=1 – time measurement
C=1 – counter

Example d 5, M=1, F=1 (digital input 5 is configured for measuring, input is frequency measuring)

Command format for configuring **serial inputs**:
s x, M=y, C=y, S=y, B=y, P=y, T=y, D=z, A=z
where:
s x [1…8] – serial input number (s 1 … s 8)
M=y [0,1] – if M=1, activate measurements on this input
C=y [1, 2] – COM port selection
S=y [300, 1200, 2400, 9600, 19200, 38400, 57600, 115200] – communication speed bps
B=y [7, 8] – number of bits
P=y [N, E, O] – parity None, Even, Odd
T=y [1, 2] – number of stop bits
D=z [KIPPZONEN_SMPX…] – serial driver name. This name identifies type of serial sensor connected
A=z [1, …]] – address of serial sensor (mostly used for sensors communicating on the RS-485 bus)

example
s 5, M=1, C=1, S=19200, B=8, P=E, T=1, D=KIPPZONEN_SMPX, A=1
(serial sensor 5, connected on COM1 with 19200bps 8E1 settings; type of sensor is SMPx
series and bus address is 1)

Command format for configuring **outputs**:
o x, I=y, L=y, N=y, X=y, S=y, V=y, P=y, A=z
where:
o x [1…32] – output number (o 1 … o 32)
I=z [A1…A20, D1…D8, S1…S8, I1…I14] – map to measured input
L=y [0, 1] – logging
N=y [0, 1] – logging minimum value
X=y [0, 1] – logging maximum value
S=y [0, 1] – logging standard deviation value
V=y [0, 1] – vector calculation
P=z [1 … 16] – polynomial number for calculation
A=z – alias – name of logged variable

Example o 1, I=A1, L=1, N=0, X=0, S=0, V=1, P=5, A=WD
(output 1 maps to AIN1 input channel with logging mean value, vector calculation is used with polynomial nr. 5. Variable alias is WD)

o 5, I=I1, L=1, N=1, X=0, S=0, V=0, P=16, A=VPOWER
(output 5 maps to internal input 1 – voltage on POWER terminal with logging mean and minimum value with polynome 16. Variable alias is VPOWER.)
o 9, I=S1_RAD, L=1, N=0, X=0, S=1, V=0, P=1, A=GlobalRadiation
(output 9 maps to serial input 1 with logging mean and standard deviation value with polynome 1. Variable alias is GlobalRadiation.)

Command format for configuring **polynomials**:
p x, 0=a, 1=a, 2=a, 3=a
where:
p x [1…16] polynomial number
0=a, coefficient a0
1=a, coefficient a1
2=a, coefficient a2
3=a, coefficient a3

Example p 2, 0=-0.035, 1=0.1, 2=0, 3=0 (coefficients to polynomials are: a = -0.035, b = 0.1, c = 0, d = 0)

Command format for **system settings**:
MeasInterval [1…3600] – interval between measurements in seconds
Example MeasInterval 60 (configuring measuring interval to 60 seconds)

MeasDelay [0…60] – delay after MeasInterval to start measurements in seconds
Example MeasDelay 5 (configuring delay between beginning of measuring interval and actual measurement to 5 seconds)

LogInterval [0…3600] – interval between logging in seconds
Example LogInterval 600 (configuring logging interval to 600 seconds)

RepInterval [0…3600] – interval between reports in seconds on COM2 serial port. If RepInterval is zero, there is no report on Serial2 and it can be used for communication with serial sensors. If RepInterval is non zero and equal to

LogInterval, reports on COM2 will be the same as logged data (averaged, min, max… according to configuration). If RepInterval is non zero and different from LogInterval, reports on COM2 are generated from last measured data
(without min, max, stdev).
Example RepInterval 600 (configuring report interval to 600 seconds)

Vref [2450…2550] – set reference voltage
Example Vref 2500.3 (setting reference voltage to 2500.3mV)

Serial2 [300,1200,2400,9600,19200,38400,57600,115200] – set communication speed on COM2 (report port)
Example Serial2 9600 (setting Serial2 baud rate to 9600 bps, 8 bit, no parity)

Date dd.mm.yyyy – set current date – day.month.year
Example Date 10.1.2011 (setting date to 10.1.2011)

Time hh:mm:ss – set current time - hours: minutes: seconds
Example Time 10:30:45 (setting time to 10:30:45)

Command format for modem settings:

- ModemInterval [0 … 24] – interval between sending data over modem in hours. Parameter 0 means no modem sending.
  Example ModemInterval 24 (configuring modem data transfer to every 24 hours)
- ModemDelay [0 … 1439] – delay after ModemInterval to start sending data.
  Example ModemDelay 5 (configuring modem delay to 5 minutes)
- ModemOnTime [hh:mm:ss] – time at which modem should connect to GSM network and waits for a call
  example ModemOnTime 09:00:00

- ModemOnDuration [0…30] – interval how long modem will wait connected to GSM network for a call; in minutes.
  Example ModemOnDuration 30
- ModemPIN [number] – modem PIN number (max 10 digits)
  Example ModemPIN 485351 (configuring PIN number of inserted SIM card into the GSM modem to 485351)
- ModemNumber [number] – number of remote modem where GSM data will be transferred (if ModemGPRS 0 was set)
  Example ModemNumber 0265428834
- APN [string]– access point of GSM/GPRS provider
  Example APN internet (configuring APN to string internet)
- IP [string]– IP address for sending emails or IP address of FTP server
  Example IP 213.151.208.170 (configuring IP to 213.151.208.170)
- EmailFrom [string]– sender address for the email
  Example EmailFrom Testing@physicus.eu (configuring sender address to Testing@physicus.eu)
- EmailTo [string]– recepient address for the email. Here data will be received.
  Example EmailTo physicus@physicus.eu (configuring recipient address to physicus@physicus.eu)
- UserName [string]– user name for authorization on smtp server or FTP server. Minimum 5 characters. If less than 5 characters are used, access without authorization is activated (UserName and Password are not used)
  Example UserName data@physicus.eu (configuring user name to data@physicus.eu)
- Password [string]– password for authorization on smtp server or FTP server. Minimum 4charactres.
- If less than 4 characters are used, access without authorization is activated
  Example Password data (configuring password to data)
- TimeServer [string]– time server for time synchronization.
  Example TimeServer time.nist.gov (configuring time server to time.nist.gov)
- TimeZone [-12…12]– local time zone.
  Example TimeZone -5 (configuring time zone to -5 hours from TimeServer)
- Ftp [0,1]- enable/disable FTP data transfer.
  Example Ftp 0 (configuring data transfer to email)
- ModemDetail [0,1] – enables detailed messages from modem. Used only for problem solving with remote data transfer.

11.1.15 Retrieving the IMEI number

In case you need to know the GSM modem EMEI (International Mobile Equipment Identity) number:

- Provide power to the LogboxSE otherwise it will not work.
- Connect USB cable between LogboxSE and PC or laptop
- Start terminal software (Hyperterminal, Termite …)
- Type command “Service” to enter service mode
- Type command “ModemOn” and wait for about 20 second. This will turn on modem. After a command you need to wait for the response.
- Type ModemOff – to turn off modem.

Service
Service

Service mode started
ModemOn
ModemOn

^SYSSTART No need to type anything, just wait.
AT+GSN

353227027675398 ← This is the EMEI number
OK
OK
AT^SCFG? Data from a LogboxSE 2G GPRS model

^SCFG: "AutoExec","0","0","0","0",""
^SCFG: "AutoExec","0","1","0","0","","000:00:00","000:00:00"
^SCFG: "AutoExec","0","1","1","0","","000:00:00","000:00:00"
^SCFG: "AutoExec","0","1","2","0","","000:00:00","000:00:00"
^SCFG: "Call/ECC","0"
^SCFG: "GPRS/ATS0/withAttach","on"

^SCFG: "GPRS/AutoAttach","disabled"
^SCFG: "GPRS/PersistentContexts","0"
^SCFG: "GPRS/RingOnIncomingData","off"
^SCFG: "MEopMode/Airplane","off"
^SCFG: "MEopMode/Airplane/OnStart","off"
^SCFG: "MEopMode/CregRoam","0"
^SCFG: "MEShutdown/OnIgnition","off"
^SCFG: "PowerSaver/Mode9/Timeout","20"
^SCFG: "Radio/Band","3","15"
^SCFG: "Radio/CNS","0"
^SCFG: "Radio/OutputPowerReduction","3"
^SCFG: "Serial/Ifc","0"
^SCFG: "Serial/USB/DDD","0","0","0409","1E2D","004F","Cinterion","MC75i",""
^SCFG: "Tcp/BufSize","5200"
^SCFG: "Tcp/IRT","3"
^SCFG: "Tcp/MR","10"
^SCFG: "Tcp/OT","6000"
^SCFG: "Tcp/SAck","1"
^SCFG: "Tcp/TTcp","0"
^SCFG: "Tcp/WithURCs","on"
^SCFG: "URC/CallStatus/CIEV","restricted"
^SCFG: "URC/CallStatus/SLCC","verbose"
^SCFG: "URC/Datamode/Ringline","off"
^SCFG: "URC/Ringline","local"
^SCFG: "URC/Ringline/ActiveTime","2"
OK

If you want to see the EMEI again just type AT+CGSN before you type ModemOff

AT+CGSN
AT+CGSN

OK
AT+CGSN

353227027675398
OK

Always end with ModemOff.

ModemOff
ModemOff

OK

12 COMMUNITION VIA RS232 WITH AND WITHOUT SERVICE MODE

Once Serial2 has been setup using the USB connection and procedure to use Service Mode the Serial2 port can be used to get last logged data form the LogboxSE.

Service Mode command: Serial2 [300,1200,2400,9600,19200,38400,57600,115200] – set communication speed on COM2 (report port)

Example: *Serial2 9600* sets Serial2 baud rate to 9600 bps, 8 bit, no parity.

The Serial2 port is capable of sending and receiving data over a Tx,Rx,Gnd connection.

12.1 Automatically with RepInterval >0

With RepInterval = xx and xx > 0 , data is sent automatically every xx seconds.

```
24.09.2018,16:24:40,3.034,3.298,7.539,0.000
24.09.2018,16:24:50,3.034,3.298,7.539,0.000
24.09.2018,16:25:00,3.036,3.298,7.534,0.000
24.09.2018,16:25:10,3.034,3.298,7.534,0.000
24.09.2018,16:25:20,3.034,3.298,7.534,0.000
24.09.2018,16:25:30,3.034,3.298,7.534,0.000
24.09.2018,16:25:40,3.034,3.298,7.534,0.000
```

Last logged data. Measurement values only, no Min, Max or StdDev.
This example: Date, time ,measurement_1, measurement_2, measurement_3

With RepInterval = 0 no data is sent automatically.

12.2 Using Service Mode

Using the Service Mode as described before, data can be retrieved via the RS232 port. Last logged data as well as larger portions of logged data. And Min, Max, StdDev.

Example using the terminal emulator program Termite:

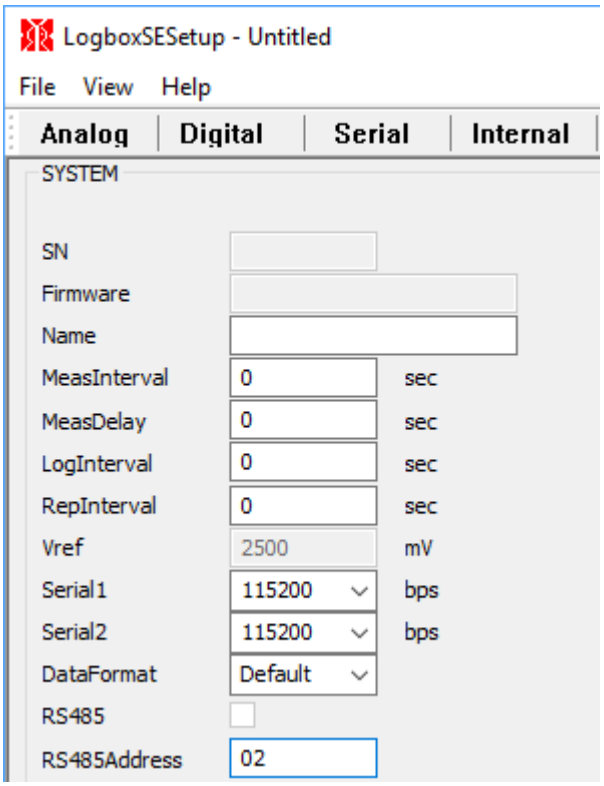
```
Service
Service mode started
SD?
Directory listing...
  <dir>  .
  <dir>  ..
KLOG0001.CSV    18272 2017/11/27 09:22
KLOG0002.CSV    38224 2017/11/27 09:56
KLOG0003.CSV    77139 2017/11/27 11:08

ReadFile KLOG0001.CSV
#Name LogboxSE
#SN 004/0716
Date,Time,Vrtc_Avg,Vrtc_Min,V3V_Avg,Vpow_Avg,GSM_dB_Avg
24.09.2018,16:24:00,3.034,3.034,3.298,7.545,---
24.09.2018,16:25:00,3.034,3.034,3.298,7.541,---
24.09.2018,16:26:00,3.034,3.032,3.298,7.534,---
24.09.2018,16:27:00,3.034,3.034,3.298,7.535,---
24.09.2018,16:28:00,3.034,3.032,3.298,7.534,---
24.09.2018,16:29:00,3.034,3.034,3.298,7.534,---
24.09.2018,16:30:00,3.033,3.032,3.298,7.534,---
24.09.2018,16:31:00,3.034,3.034,3.298,7.534,---
24.09.2018,16:32:00,3.033,3.032,3.298,7.534,---
24.09.2018,16:33:00,3.034,3.034,3.298,7.534,---
```

This example: Date, time ,measurement_1 , measurement_1_minimum , measurement_2 , measurement_3 , instrument_4 not attached gives ---

12.3 Without Service mode using the xxData? command

Without using the Service Mode it is still possible to retrieve data using xxData?



Using LogboxSESetup 1.9 and above the RS485 address was set to 2.

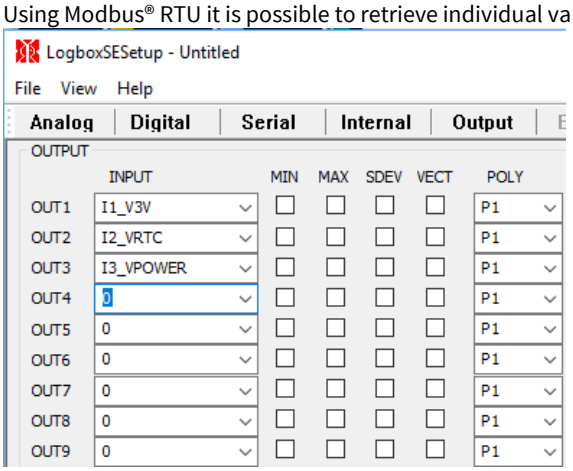
Sending in ASCII 02Data? returns the last logged measurement data with the Alias names but no Min, Max or StdDev in one line.

02Data?

02,Vrtc=3.032,V3V=3.297,Vpow=7.529,GSM_dB=---

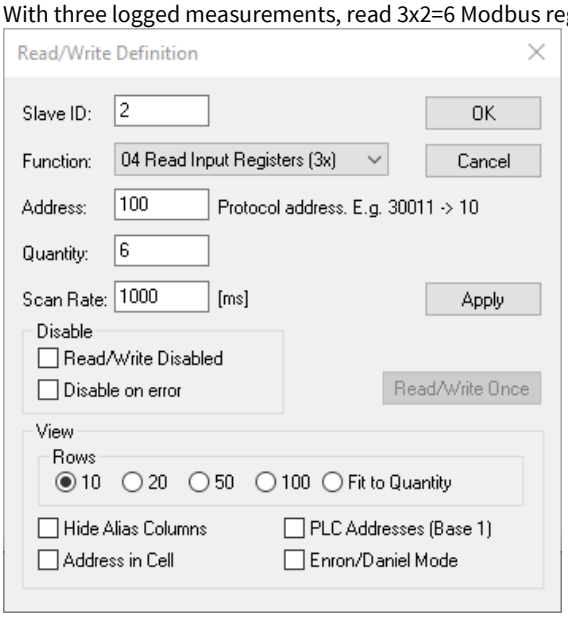
12.4 Without Service Mode using Modbus® RTU

Using Modbus® RTU it is possible to retrieve individual values logged in Outputs Out1 to OUT32

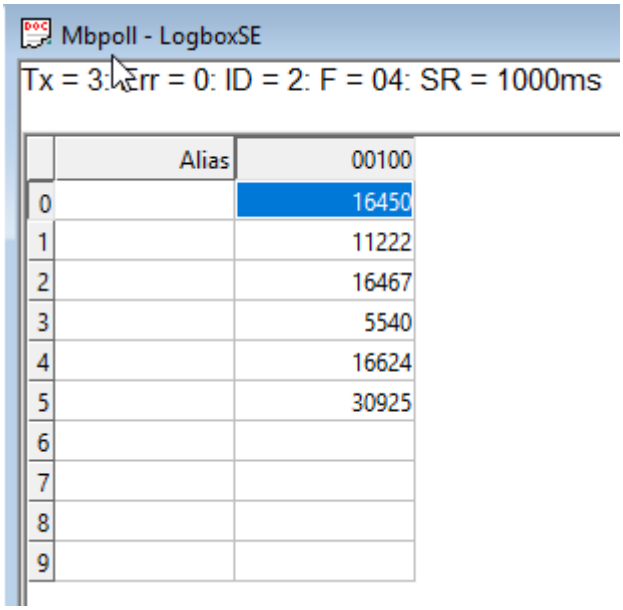


Using the Modbus® RTU protocol and function 4 “Read Input Registers” one can retrieve actual data from the registers.
The registers start at 100 and with 32 two byte registers it goes to 163.

Example:
With three logged measurements, read 3x2=6 Modbus registers to form three 4 byte Float values in AB CD order.

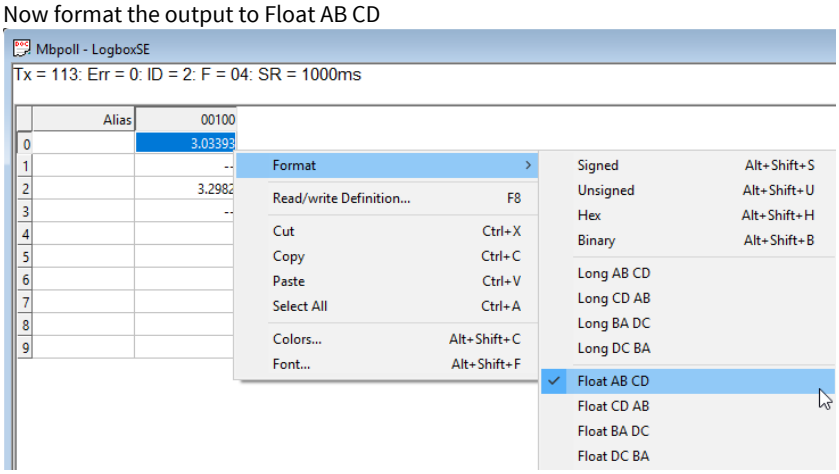


Slave ID is the LogboxSE RS485Address and is 2 in this example.

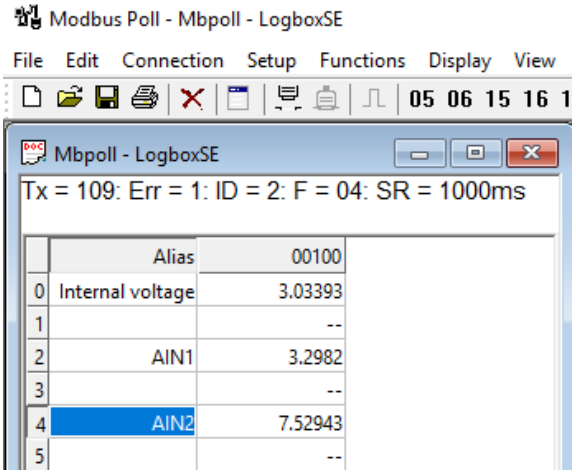


Raw register output

Now format the output to Float AB CD



And see the actual logged measurements.



These too are the last logged measurements without Min, Max and StdDev.

13 QUICK REFERENCE

Commands summary

Command	parameter	description
A	see text	analog inputs setup
D	see text	digital inputs setup
S	see text	serial inputs setup
O	see text	output setup
MeasInterval	1…3600	measuring interval in seconds
MeasDealy	1…60	measuring delay in seconds
LogInterval	0…3600	logging interval in seconds
RepInterval	0…3600	report interval on COM2
DataFormat	0, 1, 2, 3	0=default spaces, 1 is CSV, 2 and 3 equal to 0
Vref	2450…2550	reference voltage in mV
Serial1	300, 1200, ---,115200	baud rate for Serial1 in bps, future use
Serial2	idem	baud rate for Serial2 in bps, 115200 not advisable
Date	dd.mm.yyyy	
Time	hh:mm:ss	
ModemInterval	0…24	period for modem to send data in hours
ModemDelay	0…1434	delay from modem period in seconds
ModemOnTime	hh:mm:ss	time, when modem will wake up and wait for a call every day
ModemOnDuration	0…1440	duration of modem on, waiting for a call in minutes
ModemPIN	number	
APN	string	GPRS provider access point
IP	string	smtp server IP address or FTP server IP address
EmailFrom	string	
EmailTo	string	
UserName	string	user name for authorized access to smtp server or FTP server
Password	string	password for authorized access to smtp server or FTP server
TimeServer	string	
TimeZone	-12…12	time shift from UTC in hours
Ftp	0..1	modem mode email (0) or FTP (1)
RS-485	0..1	using RS-485 line
TestGprs		start GPRS session for testing purposes
TestSync		start time synchronization over modem
TestEmail		start sending test email
TestSocket		start socket session
?		show system parameters
Config?		show full inputs configuration
Modem?		show modem parameter
SD?		show files on SD card
System?		show actual firmware version
SerialDriver?		show supported serial sensors
ReadFile	klog0001.txt	type one file from SD card via serial port
LogVariables		show format of logged variables
ReadData	1…200	read last nr. of records in memory
ActualData		show last measured data
SaveConfig		save current configuration to nonvolatile memory
ReadConfig		read configuration from nonvolatile memory
Help		print all commands
Exit		exit from Service mode
Reset		reboot datalogger
SetDefaultConfig		clears all settings and then sets logging on AIN1, V3V and VPOWER

14 LOGBOX SE POSSIBILITIES AND EXAMPLES

The LOGBOX SE can handle simultaneously:

- 4 sensors on the **differential** inputs AIN9 – AIN12
- 4 sensors on the **single ended** inputs AIN1-4
- 4 **digital** sensors (freq, count, time) on the digital inputs DIN1-4
- 8 **SMART** sensors on RS-485

Kipp & Zonen sensors need:

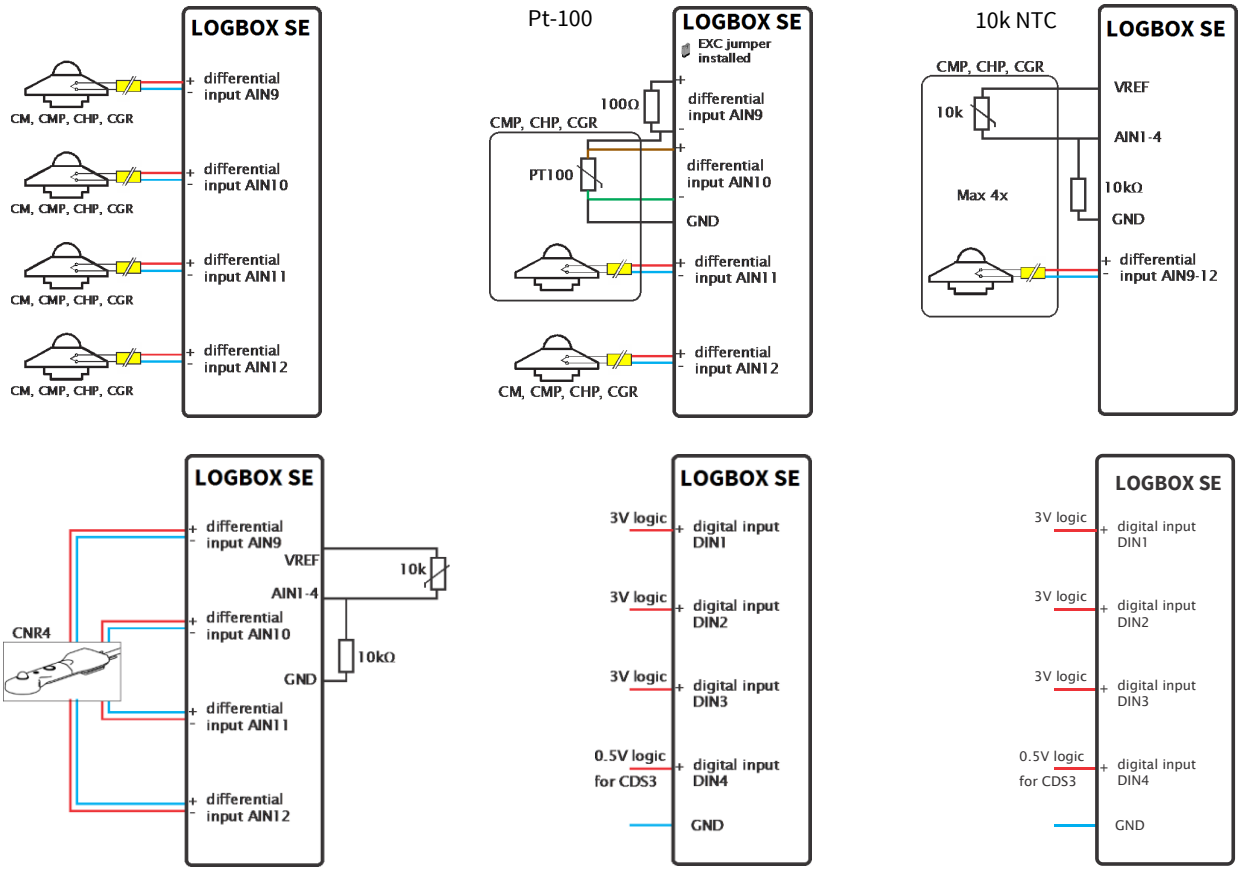
Sensor model	Always needed	Optional	Remark
CMP3, CMP6, CMP10, CMP11	1x differential		
CMP21 , CMP22 with 10k thermistor	1x differential	1x single ended temperature measurement	
CMP21 , CMP22 with Pt-100	1x differential	2x differential temperature measurement	Only 1x differential left
CGR3 , CGR4 with 10k thermistor	1x differential	1x single ended temperature measurement	
CGR3 , CGR4 with Pt-100	1x differential	2x differential temperature measurement	Only 1x differential left
CHP1 with 10k thermistor used	1x differential	1x single ended temperature measurement	
CHP1 with Pt-100 used	1x differential	2x differential temperature measurement	Only 1x differential left
CMA6 , CMA11	2x differential		
Albedometers with 2x CMP	2x differential		
CUV5	1x differential		Up to 2V output signal
UVS A, B and E	1x single ended Input AIN3 or AIN4	1x single ended temperature measurement	Radiation & temperature use AIN3 & 4. One sensor possible
NR2 Lite	1x differential		
CNR4	4x differential	1x single ended temperature measurement	Pt-100 not possible
PQS1	1x differential		
CSD3	1x digital for sunshine signal	1x single ended for DNI is optional	Max 1x sunshine duration on input DIN4
SMART SMP, SHP , SGR , SUV	Unique Modbus® address		Max. 8 sensors supported
CVF4, CNF4 ventilation unit (fan)		1x digital	Max. 3 supported, 4th digital input is for CSD3

Your requirements:

Differential	....+....+....+....	Max 4
Single ended	....+....+....+....	Max 4
Digital	....+....+....+....	Max 4

Continued on next page

Examples.
All inputs can be used at the same time.



Your planned setup:

Instrument model	Instrument number	Inputs needed (diff, single ended, digital)	Input used	Serial number	Sensitivity
	Nr.				
	Nr.				
	Nr.				
	Nr.				
	Nr.				
	Nr.				
	Nr.				
	Nr.				
	Nr.				

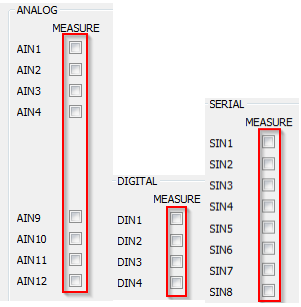
Examples:

Instrument model	Instrument number	**Inputs needed** (diff, single ended, digital, RS-485)	Input used	Serial number	Sensitivity
CMP10	Nr 1	Differential	AIN12	16005231	9.56
CMP22 Pt100	Nr 2	3x Differential	AIN9/10 and 11	16006354	9.78
Small BSRN					
CMP10 GHI	Nr 1	Differential	AIN9	16005231	9.56
CMP10 DHI	Nr 2	Differential	AIN10	16005232	9.58
CHP1 DNI	Nr 3	Differential	AIN11	16009835	9.47
CGR4 10k	Nr 4	Differential + SE	AIN12 + AIN1	15006893	9.86
Optional					
fan1 CMP10 tacho	Nr 1F	Digital	DIN1	15689542	n.a.
fan2 CMP10 tacho	Nr 2F	Digital	DIN2	15689544	n.a.
fan3 CGR4 tacho	Nr 3F	Digital	DIN3	15689546	n.a.
SMART only setup					
SMP10	Nr 1	RS-485	Address 2	16003569	n.a.
SMP10	Nr 2	RS-485	Address 3	16003540	n.a.
SHP1	Nr 3	RS-485	Address 5	15012398	n.a.
SGR4	Nr 4	RS-485	Address 4	16005874	n.a.
Optional					
fan1 SMP10 tacho	Nr 1F	Digital	DIN1	15689542	n.a.
fan2 SMP10 tacho	Nr 2F	Digital	DIN1	15689542	n.a.
fan3 SGR4 tacho	Nr 4F	Digital	DIN3	15689546	n.a.
Optional					
SMP10 reflected	Nr 8	RS-485	Address 6	16003549	n.a.
SGR4 up welling	Nr 9	RS-485	Address 7	16005878	n.a.
No tacho possible					

15 PROBLEM SOLVING

15.1 Common issues

15.1.1 When the results in LiveView remain "---"

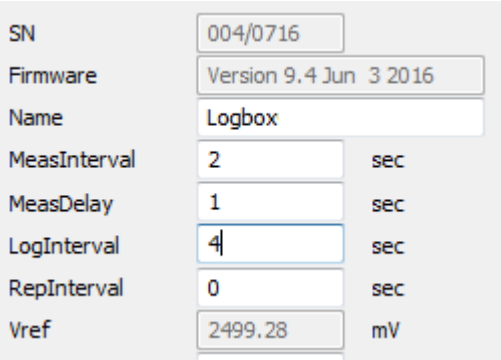


please check if Measure has been selected in the Analog, Digital or Serial window:and that in the Output window the correct INPUT is chosen, with optionally Min, Max, SDev and that the right Poly is selected.

When in doubt about the POLY we suggest to select one with A1=1 and recheck in LiveView.

When there is still not the expected result please check the wiring and if possible use a digital multimeter to measure the input voltages on AIN1-4 and GND or across AINx + and –
The instruction sheets of our products will give you an indication of the normal amount of irradiation to expect and by multiplying this by the given sensitivity one has an estimated voltage to be measured.
Indoor all readings will always be very low and sometimes even negative due to warming and cooling as a result of holding the instrument.

15.1.2 Several intervals, I'm confused



The settings to the left are save settings for diagnosis.
Every 2 seconds (MeasInterval) a measurement is started. VREF, Pt-100 excitation and POWER are switched on and after a 1 second wait (MeasDelay) the actual measurement is performed.

Two measurement periods of 2 seconds each fit the selected 4 seconds LogInterval. These measurements are averaged and used for Min, Max, SDev.

In LiveView every 4 seconds there will be a line with the selected outputs

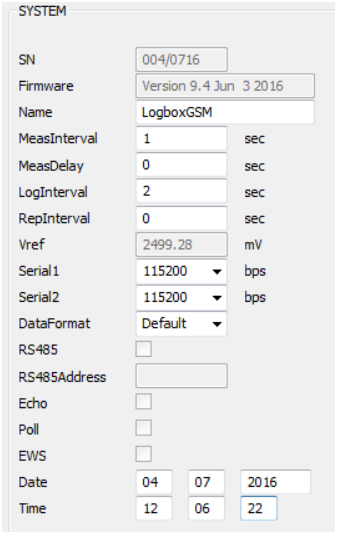
15.1.3 My modem doesn't work

There are many possible reasons for a failure in this inherently difficult area.

1) Check if the SIM card has working internet capabilities by temporarily putting it in a smartphone and perform internet browsing or social media updates.
2) Make sure it has a PIN
3) The settings given in section 10.8 are a good starting point to have the LOGBOX SE sent e-mail log files using the Physicus emailbox and server. Once this works you can change to your own server and try again.
4) Often the GSM signal in the office or building can be to weak or unstable to work properly. Try to put the small antenna outside for a better signal.
5) When a TimeServer and TimeZonehave been selected, at midnight the internal clock will be synchronised. Logged data afterwards could have a different time stamp but a big difference is only to be expected the first time there is a synchronisation and only when the time and or date weren't set properly.

15.1.4 I get no reports on the second RS-232 port

Please check your settings for COM2 on the System tab.



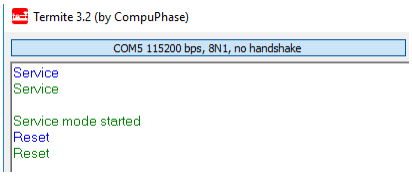
If RepInterval = 0, there is no activity on COM2

If RepInterval = LogInterval, then you will see logged data in real time sent via COM2.. All statistical values will appear and the baudrate set voor Serial2 is used. Other settings are fixed and 8 bit, no parity and 1 stopbit.

If RepInterval is different from LogInterval, on COM2 you will see actual last measured data without statistical processing. Values for min, max, stdev values, they will be **not** on the output

15.1.5 Resetting the LOGBOX SE

When in doubt or when the red or green LED stays on for more than 5 minutes it is possible to issue a Reset command via a terminal session.



Or fully power down the unit by disconnecting any power supply or battery and the USB cable and reconnecting.

15.1.6 I can't install the driver on Windows 8 or 10

How can I install drivers that are not digitally signed?

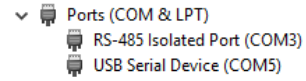
Windows 10 enforces driver signatures by default. This can be disabled to install drivers that are not digitally signed. Use the following steps to disable driver signature enforcement.

Click the **Start** menu and select **Settings**.
Click Update and Security.
Click on **Recovery**.
Click Restart now under Advanced Startup.
Click Troubleshoot.
Click **Advanced** options.
Click **Startup** Settings.
Click on **Restart**.

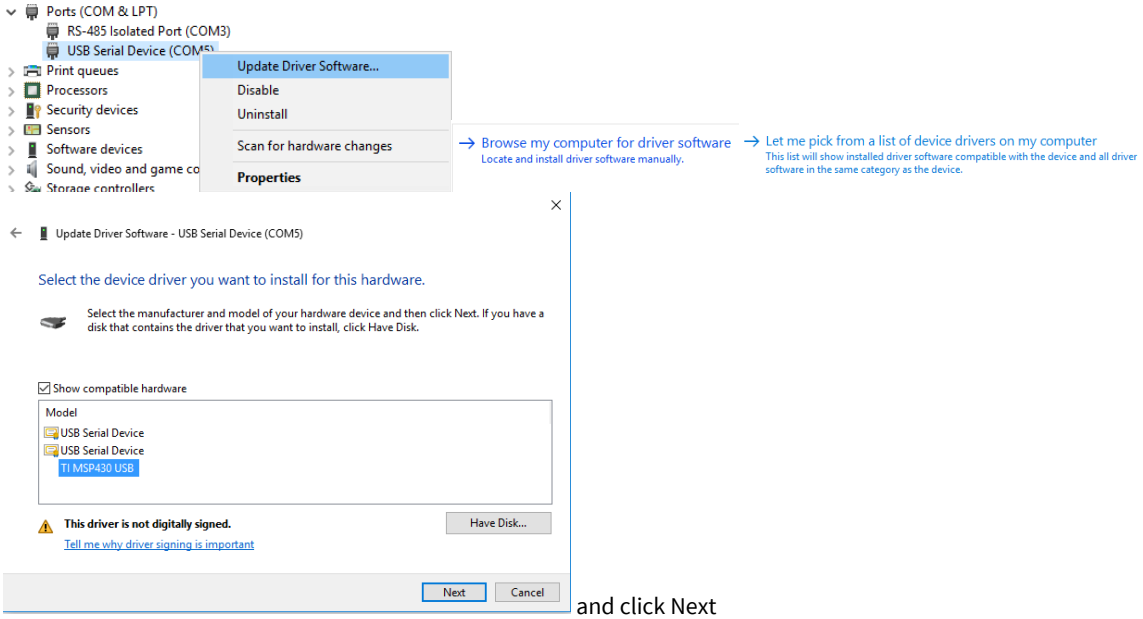
On the Startup Settings screen press 7 or F7 to disable driver signature enforcement.

Your computer will restart and you will be able to install non-digitally signed drivers. If you restart your computer again the driver signature enforcement will be re-enabled.

Now install the msp430_ti_signed driver. Probably nothing will have changed and you still see the standard Windows USB Serial Device in Windows Device Manager.

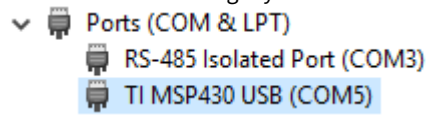


We'll force the driver to the msp430 version:



and click Next

Now in the Device Mnager you should see



16 APPENDICES

16.1 Polynomials

Nonstandard polynomials

Kipp & Zonen uses a particular Pt-100 or TH10K in specific classes, behaving well documented to temperature changes. Therefore, it's vital to create a perfect polynomial for temperature sensors.

The tables below, taken from the manuals, show the values for a Kipp & Zonen 10k thermistor YSI 44031 and Pt-100

YSI Thermistor 44031 - Resistance versus Temperature in °C and °F

Temperature [°C]	Temperature [°F]	Resistance [Ohm]	Temperature [°C]	Temperature [°F]	Resistance [Ohm]	Temperature [°C]	Temperature [°F]	Resistance [Ohm]
-30	-22.0	135,200	0	32.0	29,490	30	86.0	8,194
-29	-20.2	127,900	1	33.8	28,150	31	87.8	7,880
-28	-18.4	121,100	2	35.6	26,890	32	89.6	7,579
-27	-16.6	114,600	3	37.4	25,690	33	91.4	7,291
-26	-14.8	108,600	4	39.2	24,550	34	93.2	7,016
-25	-13.0	102,900	5	41.0	23,460	35	95.0	6,752
-24	-11.2	97,490	6	42.8	22,430	36	96.8	6,500
-23	-9.4	92,430	7	44.6	21,450	37	98.6	6,258
-22	-7.6	87,660	8	46.4	20,520	38	100.4	6,026
-21	-5.8	83,160	9	48.2	19,630	39	102.2	5,805
-20	-4.0	78,910	10	50.0	18,790	40	104.0	5,592
-19	-2.2	74,910	11	51.8	17,980	41	105.8	5,389
-18	-0.4	71,130	12	53.6	17,220	42	107.6	5,193
-17	1.4	67,570	13	55.4	16,490	43	109.4	5,006
-16	3.2	64,200	14	57.2	15,790	44	111.2	4,827
-15	5.0	61,020	15	59.0	15,130	45	113.0	4,655
-14	6.8	58,010	16	60.8	14,500	46	114.8	4,489
-13	8.6	55,170	17	62.6	13,900	47	116.6	4,331
-12	10.4	52,480	18	64.4	13,330	48	118.4	4,179
-11	12.2	49,940	19	66.2	12,790	49	120.2	4,033
-10	14.0	47,540	20	68.0	12,260	50	122.0	3,893
-9	15.8	45,270	21	69.8	11,770	51	123.8	3,758
-8	17.6	43,100	22	71.6	11,290	52	125.6	3,629
-7	19.4	41,070	23	73.4	10,840	53	127.4	3,504
-6	21.2	39,140	24	75.2	10,410	54	129.2	3,385
-5	23.0	37,310	25	77.0	10,000	55	131.0	3,270
-4	24.8	35,570	26	78.8	9,605	56	132.8	3,160
-3	26.6	33,930	27	80.6	9,227	57	134.6	3,054
-2	28.4	32,370	28	82.4	8,867	58	136.4	2,952
-1	30.2	30,890	29	84.2	8,523	59	138.2	2,854

Pt-100 Temperature vs. Resistance

Temperature [°C]	Temperature [°F]	Resistance [Ohm]	Temperature [°C]	Temperature [°F]	Resistance [Ohm]	Temperature [°C]	Temperature [°F]	Resistance [Ohm]
-30	-22.0	88.2	0	32.0	100.0	30	86.0	111.7
-29	-20.2	88.6	1	33.8	100.4	31	87.8	112.1
-28	-18.4	89.0	2	35.6	100.8	32	89.6	112.5
-27	-16.6	89.4	3	37.4	101.2	33	91.4	112.8
-26	-14.8	89.8	4	39.2	101.6	34	93.2	113.2
-25	-13.0	90.2	5	41.0	102.0	35	95.0	113.6
-24	-11.2	90.6	6	42.8	102.3	36	96.8	114.0
-23	-9.4	91.0	7	44.6	102.7	37	98.6	114.4
-22	-7.6	91.4	8	46.4	103.1	38	100.4	114.8
-21	-5.8	91.8	9	48.2	103.5	39	102.2	115.2
-20	-4.0	92.2	10	50.0	103.9	40	104.0	115.5
-19	-2.2	92.6	11	51.8	104.3	41	105.8	115.9
-18	-0.4	93.0	12	53.6	104.7	42	107.6	116.3
-17	1.4	93.3	13	55.4	105.1	43	109.4	116.7
-16	3.2	93.7	14	57.2	105.5	44	111.2	117.1
-15	5.0	94.1	15	59.0	105.9	45	113.0	117.5
-14	6.8	94.5	16	60.8	106.2	46	114.8	117.9
-13	8.6	94.9	17	62.6	106.6	47	116.6	118.2
-12	10.4	95.3	18	64.4	107.0	48	118.4	118.6
-11	12.2	95.7	19	66.2	107.4	49	120.2	119.0
-10	14.0	96.1	20	68.0	107.8	50	122.0	119.4
-9	15.8	96.5	21	69.8	108.2	51	123.8	119.8
-8	17.6	96.9	22	71.6	108.6	52	125.6	120.2
-7	19.4	97.3	23	73.4	109.0	53	127.4	120.6
-6	21.2	97.7	24	75.2	109.4	54	129.2	120.9
-5	23.0	98.0	25	77.0	109.7	55	131.0	121.3
-4	24.8	98.4	26	78.8	110.1	56	132.8	121.7
-3	26.6	98.8	27	80.6	110.5	57	134.6	122.1
-2	28.4	99.2	28	82.4	110.9	58	136.4	122.5
-1	30.2	99.6	29	84.2	110.3	59	138.2	122.9

Let's begin to create your polynomials:

Step 1: Collect the information as shown in figure 1 and 2. The values for the Kipp & Zonen thermistors came with the software package downloaded earlier in the file "Table with 10k and Pt-100 thermistors"

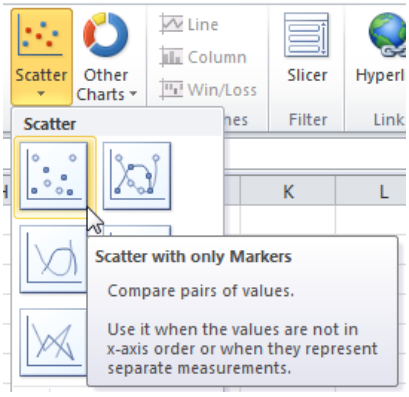
Step 2: Open the Excel file or insert all your NTC thermistor information in the excel sheet.

10k thermistor YSI 44031	
Temp °C	Resistance kΩ
-30	135,2
-29	127,9
-28	121,1
-27	114,6
-26	108,6
-25	102,9

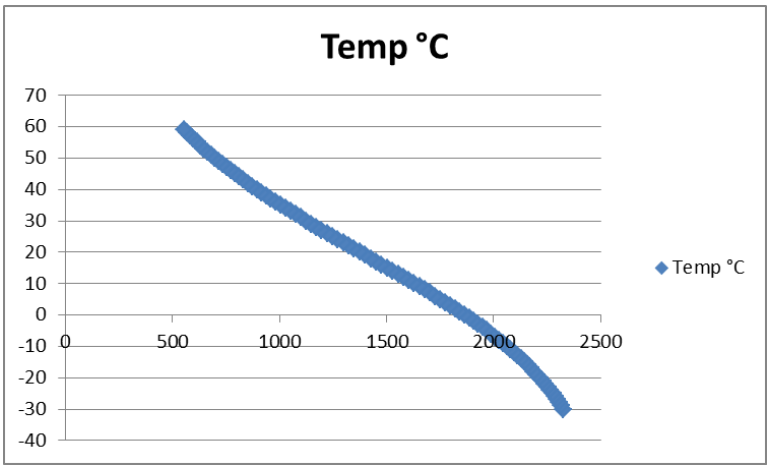
Input the V_{REF} value (close to 2.5V) as indicated on the calibration sheet and the series resistor used. The column V_{IN} will be recalculated

Step 3: Translate this information into a graphical chart.

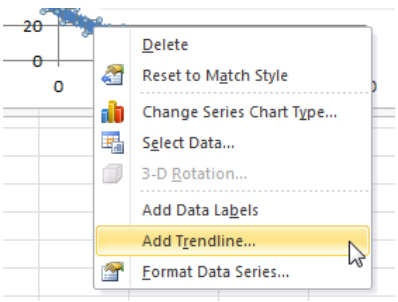
Temp °C	V_{in}
-30	2,496653
-29	2,496548
-28	2,496439
-27	2,496322



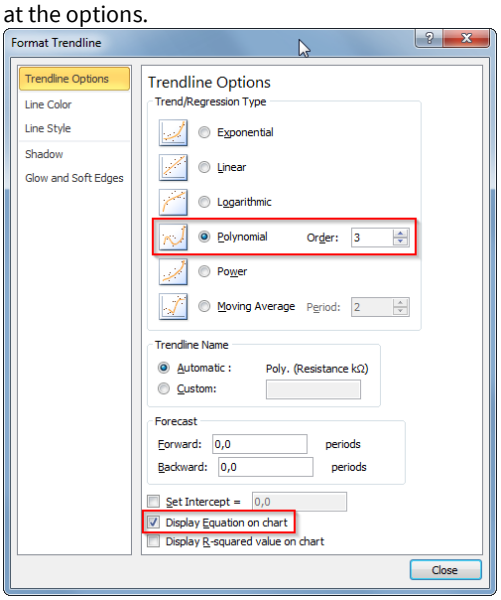
Select all of the Temp and V_{IN} values of interest to you and Insert, Scatter with only Markers



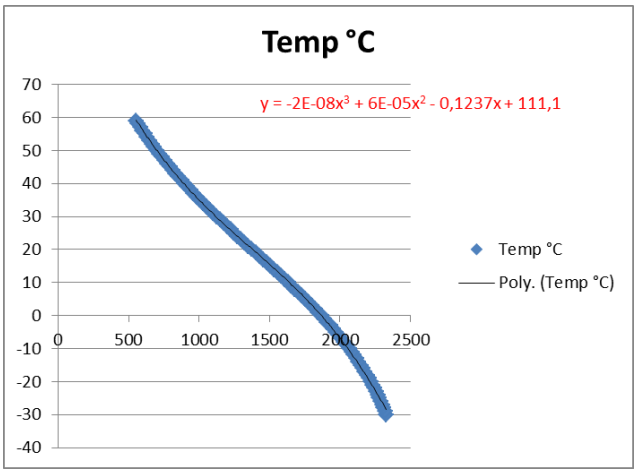
Step 4: Add a trendline by right clicking on the line inside the graphical chart and select “add trendline”



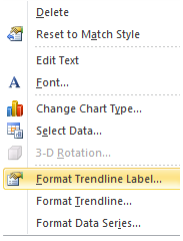
-Select the polynomial option, put it on 3rd degree , and do not forget to put a checkmark in the box “display equation on chart” at the options.



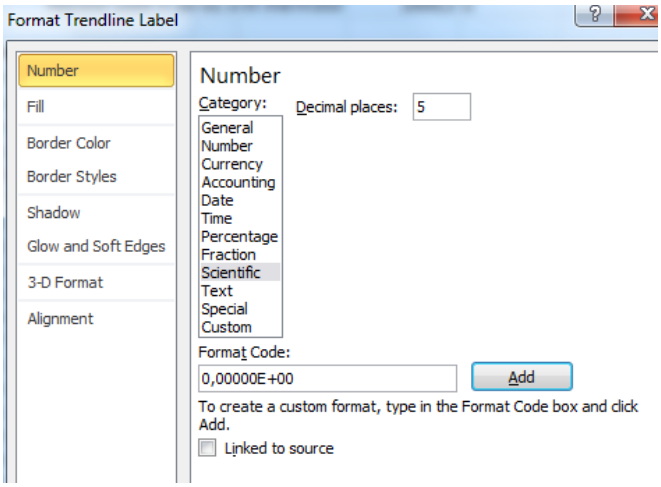
Step5 : The result will be as below with a text box with the polynomial as calculated by e.g. Excel. It has been moved and made red here to be better visible.



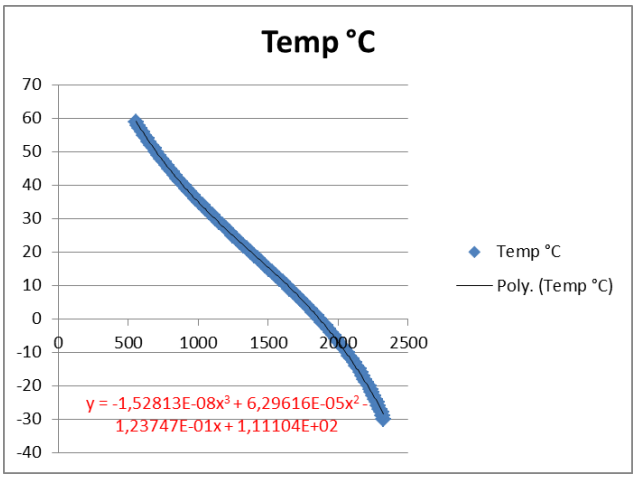
Now right click on the box with the polynomial and select



Format Trendline Label



Scientific, 5 decimal places and Add.



Now with 5 decimal places

16.2 Example output of TestGprs

```
TestGprs
TestGprs

OK
Modem On
^SYSSTART
at
at

OK
ate0
ate0

OK
at+cpin?
+CPIN: SIM PIN
OK
at+cpin=
at+cpin=
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,1
+CREG: 0,2
```

```
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
```

```
at+cgatt=1
at+cgatt=1
OK
at^sics=0,contype,gprs0
OK
at^sics=0,apn,
OK
at^sics=0,alphabet,1
OK
at^sics=0,user,
OK
at^sics=0,passwd,
OK
at^siss=0,srvtype,smtp
OK
at^siss=1,srvtype,socket
OK
at^siss=2,srvtype,http
OK
at^siss=3,srvtype,socket
OK
at^sico=0
OK
at^sici?
^SICI: 0,2,0,"10.248.103.102"
OK
at+csq
+CSQ: 30,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
```

```
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at+csq
+CSQ: 30,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at^sicc=0
OK
at^smso
^SMSO: MS OFF
OK
Modem Off
```

16.3 Example output of TestEmail with 2G GPRS modem

```
TestEmail
TestEmail

OK
Modem On
^SYSSTART
at
at

OK
ate0
ate0

OK
at+cpin?
+CPIN: SIM PIN
OK
at+cpin=
```

```
at+cpin=
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
```

```
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,1
OK
at+cgatt=1
at+cgatt=1
OK
at^sics=0,contype,gprs0
```

```
OK
at^sics=0,apn,
OK
at^sics=0,alphabet,1
OK
at^sics=0,user,
OK
at^sics=0,passwd,
OK
at^siss=0,srvtype,smtp
OK
at^siss=1,srvtype,socket
OK
at^siss=2,srvtype,http
OK
at^siss=3,srvtype,socket
OK
at^sico=0
```

```
OK
at^sici?
^SICI: 0,2,0,"100.121.202.228"
OK
at+csq
+CSQ: 28,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at^siss=0,conid,0
OK
at^siss=0,alphabet,1
OK
at^siss=0,srvtype,
OK
at^siss=0,address,
OK
at^siss=0,smfrom,
OK
at^siss=0,smrcpt,
OK
at^siss=0,smsubj,
OK
at^siss=0,user,
OK
at^siss=0,passwd,
OK
```

```
at^siss=0,smauth,
OK
at^siso=0
OK
^SISW: 0, 1
at+csq
+CSQ: 28,99
OK
at^sisi?
^SISI: 0,3,0,0,0,0
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","3","1","0","0","100.121.2
02.228:0","212.57.32.39:0"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at^sisw=0,127
^SISW: 0, 127, 0
OK
^SISW: 0, 1
at^sisw=0,134
^SISW: 0, 134, 0
OK
^SISW: 0, 1
at^sisw=0,0,1
^SISW: 0, 0, 0
OK
^SISW: 0, 2
at+csq
+CSQ: 28,99
OK
at^sisi?
^SISI: 0,6,0,261,0,0
```

```
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","6","1","0","261","100.121
.202.228:1024","212.57.32.39:25"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
OK
at^sisc=0
OK

134 Bytes sent
Data Transfer Finished
at+csq
+CSQ: 28,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
```

```
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at^sisc=0
OK
at^siss=0,srvtype,smtp
OK
at+csq
+CSQ: 28,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
at^sicc=0
OK
at^smso
^SMSO: MS OFF
OK
Modem Off
```

16.4 Example output of TestEmail with 2,3,4G modem

OK
TestEmail
OK
ModemOnturn on modem
^SYSLOADING *first response from modem after about 5 seconds*
^SYSSTART
…
ati
Cinterion *modem identification*
PLS62-W
REVISION02.000
OK
at+ctzu=1
OK
at+cpin?
+CPIN:SIMPIN
OK
at+cpin=
OK
at+cgdcont=1,
OK
at^sgauth=1,
OK
at^smoni
^SMONI:2G,SEARCH,SEARCH *preparing to search for network*
OK
at+creg?
+CREG:0,0
OK
……..
+PBREADY *modem initialized itself*
OK
at+creg?
+CREG:0,0
OK
at^smoni
^SMONI:2G,SEARCH,SEARCH
OK
at+creg?
+CREG:0,0
OK
at^smoni
^SMONI:2G,SEARCH,SEARCH
OK
at+creg?
+CREG:0,1 *registered to network*
OK
at+cgatt=1 *connecting to datanetwork. It can take several seconds*
OK
at+cgact=1,1 *internalinitialization (modem data and network data)*
at+cgact=1,1 *again,it takes several seconds*
ERROR
at+cgact=1,1
ERROR
at+cgact=1,1
OK
at^sica=1,1 *next settings*
OK
at^sica?
^SICA:1,1
OK
at^siss=0,srvtype,smtp
OK
at^siss=1,srvtype,socket
OK
at^siss=2,srvtype,http
OK
at^siss=3,srvtype,socket
OK
at^siss=4,srvtype,none

OK
at^siss=5,srvtype,none
OK
at+cgpaddr
+CGPADDR:1,"95.105.138.167"
OK
at+creg?
+CREG:0,1
OK
at
+CGPADDR:1,"95.105.138.167" *modem IPaddress*
OK
at^smoni
^SMONI:4G,2950,7,20,20,FDD,231,01,0BEC,02B0033,151,--,-99,-8.5,CONN *here it shows it is 4G network(first parameter)*
OK
at^sisi?
^SISI:0,2,0,0,0,0
^SISI:1,2,0,0,0,0
^SISI:2,2,0,0,0,0
^SISI:3,2,0,0,0,0
OK
at^siso?
^SISO:0,"Smtp",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"
^SISO:1,"socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"
^SISO:2,"Http",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"
^SISO:3,"socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"
^SISO:4,""
^SISO:5,""
^SISO:6,""
^SISO:7,""
^SISO:8,""
^SISO:9,""
OK
at^siss=0,conid, *setting FTP transfer*
OK
at^siss=0,alphabet,1
OK
at^siss=0,srvtype,
OK
at^siss=0,address,
OK
at^siss=0,user,
OK
at^siss=0,passwd,
OK
at^siss=0,cmd,
OK
at^siss=0,files,
OK
at^siss=0,smfrom,
OK
at^siss=0,smrcpt,
OK
at^siss=0,smsubj,
OK
at^siss=0,smauth,
OK
at^siso=0
OK
at+csca= *removed old SMS messages* in SIMcard *memory (no new messages)*
ERROR
^SIS:0,0,2100,"Ftpopen(ftp.physicus.eu:21)" *started FTP session*
^SIS:0,0,2100,"220Webglobes.r.o.FTP"
^SIS:0,0,2100,"FTPLoginOK"
at+creg?
+CREG:0,1
OK
at
+CGPADDR:1,"95.105.138.167"
OK
at^smoni
^SMONI:4G,2950,7,20,20,FDD,231,01,0BEC,02B0033,151,--,-99,-8.5,CONN
periodically checking connection state
OK
at^sisi?
^SISI:0,4,0,0,0,0
^SISI:1,2,0,0,0,0
^SISI:2,2,0,0,0,0
^SISI:3,2,0,0,0,0
OK
at^siso?
^SISO:0,"Ftp",4,2,0,0,"95.105.138.167:4097","212.57.32.45:21"
^SISO:1,"socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"
^SISO:2,"Http",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"
^SISO:3,"socket",2,1,0,0,"0.0.0.0:0","0.0.0.0:0"
^SISO:4,""
^SISO:5,""
^SISO:6,""
^SISO:7,""
^SISO:8,""
^SISO:9,""
OK
^SIS:0,0,2100,"putLogboxSE_20181127_1949.txt" *start to write data*
^SISW:0,1
at^sisw=0,146
^SISW:0,146,0
OK
at+csca=
ERROR
^SISW:0,1
at^sisw=0,110
^SISW:0,110,0
OK
^SISW:0,1
at^sisw=0,0,1
^SISW:0,0,0
OK
^SIS:0,0,2100,"226Transfercomplete." *Transfer complete*
^SISW:0,2
at^sisc=0
OK

110Bytessent *finish modem session*
DataTransferFinished
at^sisc=0

```
OK
at^siss=0,srvtype,smtp
OK

at+creg?
+CREG:0,1
OK
at
+CGPADDR:1,"95.105.138.167"
OK
at^smoni
^SMONI:4G,2950,7,20,20,FDD,231,01,0B
EC,02B0033,151,--,-99,-9.0,CONN
OK
```

```
at^sisi?
^SISI:1,2,0,0,0,0
^SISI:2,2,0,0,0,0
^SISI:3,2,0,0,0,0
OK
at^siso?
^SISO:0,""
^SISO:1,"socket",2,1,0,0,"0.0.0.0:0","0.0.
0.0:0"
^SISO:2,"Http",2,1,0,0,"0.0.0.0:0","0.0.0.
0:0"
^SISO:3,"socket",2,1,0,0,"0.0.0.0:0","0.0.
0.0:0"
^SISO:4,""
```

```
^SISO:5,""
^SISO:6,""
^SISO:7,""
^SISO:8,""
^SISO:9,""
OK
at
OK
at^smso
^SMSO:MSOFF          turn off modem
OK
ModemOff
```

16.5 Example output of TestSync

```
TestSync
TestSync

OK
Modem On
^SYSSTART
at
at

OK
ate0
ate0

OK
at+cpin?
+CPIN: SIM PIN
OK
at+cpin=
at+cpin=
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,2
OK
at+creg?
+CREG: 0,1
OK
at+cgatt=1
at+cgatt=1
```

```
OK
at^sics=0,contype,gprs0
OK
at^sics=0,apn,
OK
at^sics=0,alphabet,1
OK
at^sics=0,user,
OK
at^sics=0,passwd,
OK
at^siss=0,srvtype,smtp
OK
at^siss=1,srvtype,socket
OK
at^siss=2,srvtype,http
OK
at^siss=3,srvtype,socket
OK
at^sico=0
OK
at^sici?
^SICI: 0,2,0,"10.103.176.85"
OK
at+csq
+CSQ: 29,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
```

```
OK
at^siss=1,conid,0
OK
at^siss=1,alphabet,1
OK
at^siss=1,srvtype,socket
OK
at^siss=1,address,sockudp://
OK
at^siso=1
OK
^SISW: 1, 1
at+csq
+CSQ: 29,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,4,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","4","2","0","0","10.103.1
76.85:1025","193.87.160.18:123"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at^sisw=1,48
^SISW: 1, 48, 0
OK
^SISW: 1, 1
^SISR: 1, 1
at^sisr=1,128
^SISR: 1, 48
$[02][06]é[00][00][02]
        [00][00]
        û“ç[02][06]ÛaÀsƒ„¸î[00][
```

```
00][00][00][00][00][00]ÛaÄ‰U
#ûƒÛaÄ‰U%ÁÞOK
Time Received 19.08.2016 17:46:49
at+csq
at+csq
+CSQ: 29,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,4,48,48,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","4","2","48","48","10.103
.176.85:1025","193.87.160.18:123"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at^sisw=1,48
^SISW: 1, 48, 0
OK
^SISW: 1, 1
^SISR: 1, 1
at^sisr=1,128
^SISR: 1, 48
$[02][06]é[00][00][02][0B][00][00][
04]ñ“ç[02][06]ÛaÄŠƒƒni[00][00][00
][00][00][00][00][00]ÛaÄ‹@⊠?‘ÛaÄ‹
@Ž³WOK
Time Received 19.08.2016 17:46:51
at+csq
+CSQ: 29,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,4,96,96,0,0
^SISI: 2,2,0,0,0,0
```

```
^SISI: 3,2,0,0,0,0
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","4","2","96","96","10.103
.176.85:1025","193.87.160.18:123"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
```

```
^SISO: 5, ""
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at^sisc=1
OK
at+csq
+CSQ: 29,99
OK
at^sisi?
^SISI: 0,2,0,0,0,0
^SISI: 1,2,0,0,0,0
^SISI: 2,2,0,0,0,0
^SISI: 3,2,0,0,0,0
```

```
OK
at^siso?
^SISO: 0,
"Smtp","2","1","0","0","0.0.0.0:0",
"0.0.0.0:0"
^SISO: 1,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 2,
"Http","2","1","0","0","0.0.0.0:0","
0.0.0.0:0"
^SISO: 3,
"Socket","2","1","0","0","0.0.0.0:0
","0.0.0.0:0"
^SISO: 4, ""
^SISO: 5, ""
```

```
^SISO: 6, ""
^SISO: 7, ""
^SISO: 8, ""
^SISO: 9, ""
OK
at^sicc=0
OK
at^smso
^SMSO: MS OFF
OK
Modem Off
```

16.7 GPRS - GSM modem CREG result codes

As visible in the RS232 data dumps one of the command sent to modem is “at+creg?”

Depending on the connection that has been setup one the following responses can be seen:

+CREG: mode, status e.g. +CREG: 0,2

Mode
0 Disable network registration unsolicited result code (default)
1 Enable network registration result code
2 Enable network registration and location information unsolicited result code

Status
0 Not registered, Mobile Equipment is not currently searching for a new operator.
1 Registered, home network.
2 Not registered, Mobile Equipment currently searching for a new operator to register to.
3 Registration denied.
4 Unknown.
5 Registered, roaming.

In the TestGprs or TestEmail it is common to see a number of +CREG:0,2’s followed by a +CREG:0,1 when successful or +CREG:0,3 when the SIM card is denied or depending on the local operator the combination of SIM card and data modem is denied.

When in doubt it can help to put the SIM card in a smartphone and try to dial and get mobile data. This way you have also checked the PIN code.

In some countries standard SIM cards for voice and data are banned from working in data only equipment. Please consult your local operator for detailed information.

Describing all commands is not in the scope of this manual but an internet search on “AT Commands Reference Guide for Cellular Modems” will deliver useful results for in-depth research.

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Meteorology Division of OTT HydroMet