V.0.09

Delta_MU_xx USER MANUAL

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Delta MU_xx

Types
Delta_MU_BG96: LTE Cat M1/Cat NB1/EGPRS/LoRa/Sigfox
Delta_MU_M95: GPRS/LoRa/Sigfox
Delta_MU_XX: LoRa/Sigfox
Delta_XX_BG96: LTE Cat.M1/Cat.NB1/EGPRS
Delta_XX_M95: GPRS

1 General

1.1 Picture

1.2 Variants

There are 5 variants defined from the same PCB. The variants are different in what RF communication modules are mounted. There are 3 hardware pins which can be used to select the proper variant.

Variant name	GSM module	Murata module	ID2	ID1	ID0
KIDL_MU_XX	NO	YES	1	0	0
KIDL_XX_M95	M95	NO	0	0	1
KIDL_MU_M95	M95	YES	1	0	1
KIDL_XX_BG96	BG96	NO	0	1	0
KIDL_MU_BG96	BG96	YES	1	1	0

1.3 Major specifications

1.3.1 Controller

Low power ARM microcontroller

Dual Bank Program Flash 512K x 2

8 Mbyte Data flash

Real Time Clock 3ppm

Micro USB port for configuration and programming

Remote configurable and programmable

1.3.2 Power supply

WARNING:

- Reverse connected power supply can destroy the KIDL device.
- Power supply > 3.8V can destroy the KIDL device

The KIDL is designed to operate form a 3.6V Lithium Thionyl Cloride ($LiSOCL_2$) battery supported by a supercap.

The supercap is necessary to support current peaks during rf transmission.

There several alternative ways to connect battery and supercap.

For proper operation in all conditions, the battery voltage should be > 3.25 V

Below 3.25 V, the GSM cannot operate reliable.

Below 3.00 V, datalogger function and USB cannot operate.

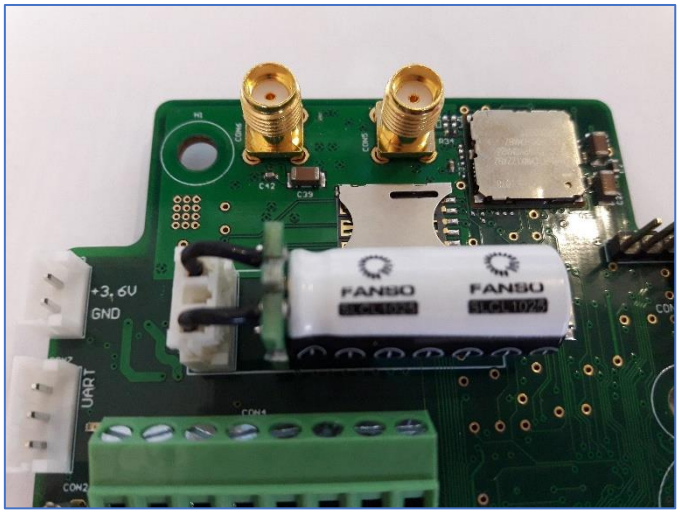
1.3.2.1 Supercap SLC1025

A supercapacitor is necessary to support current peaks during RF communication.

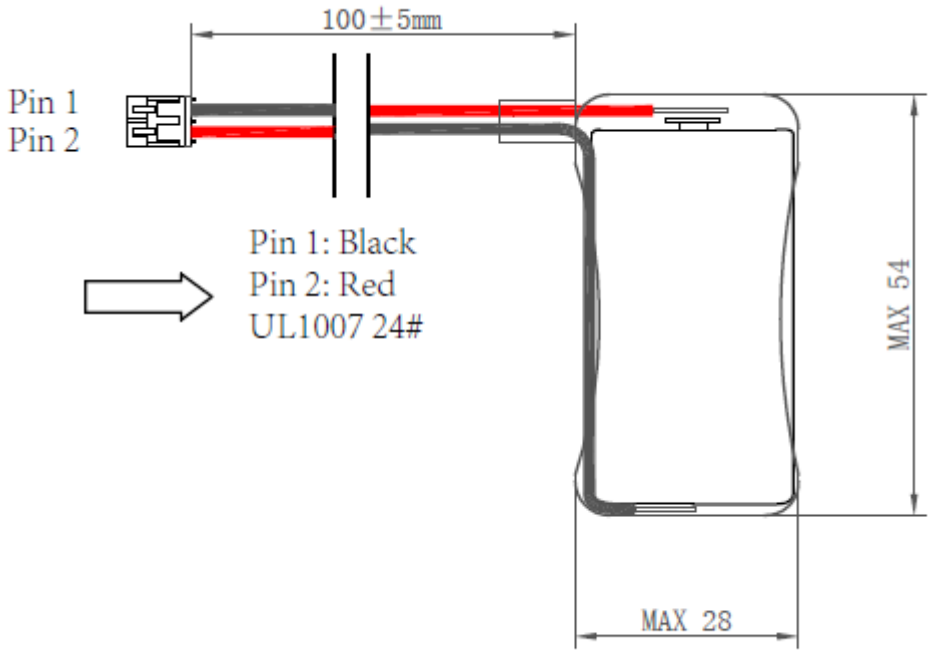
Default a SLC1025 Capacitor is provided. This capacitor is connected to the board via CON8.

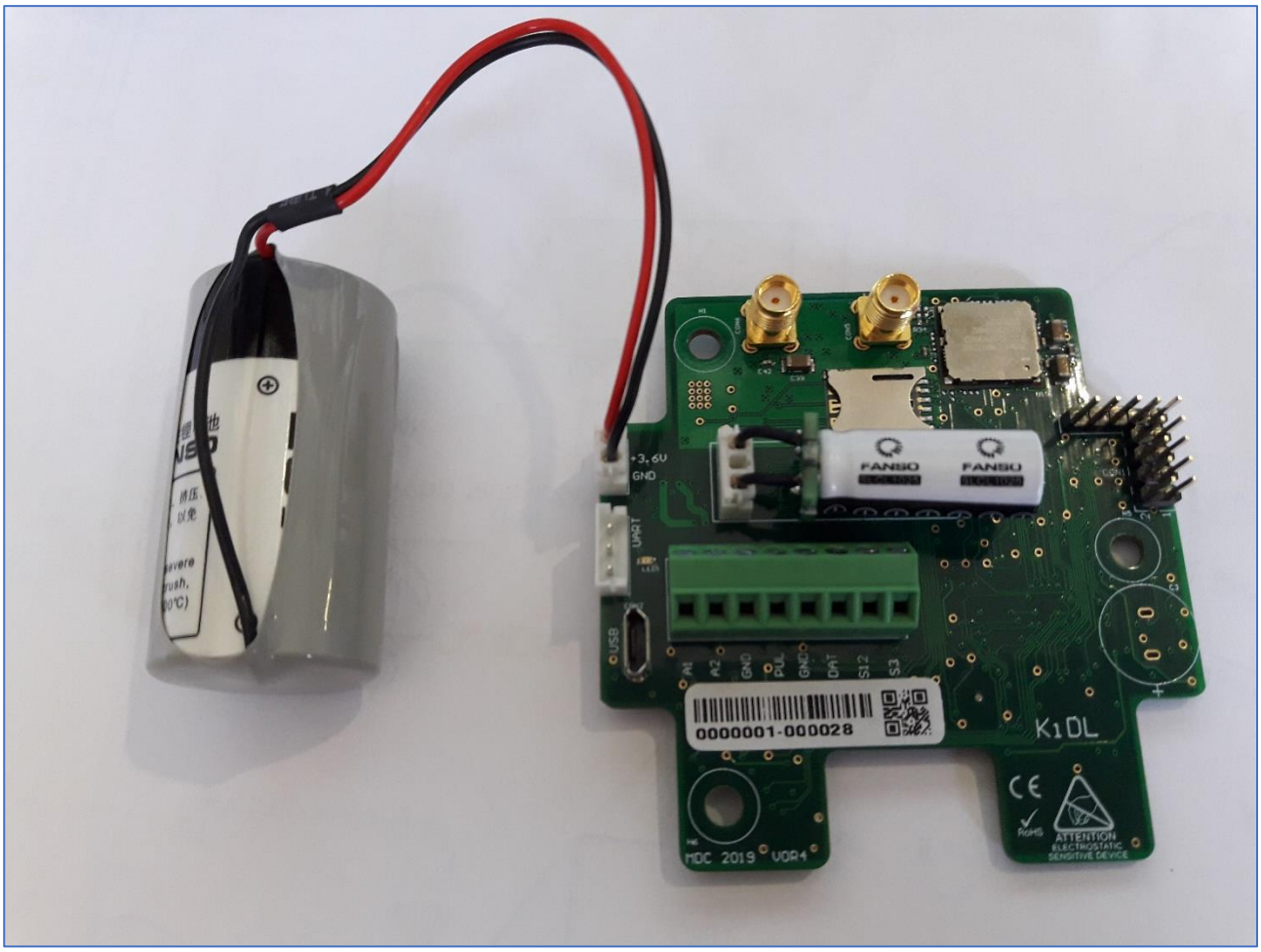
The capacitor SLC1025 is mounted on a small PCB provided with the suitable interface connector.

Below a picture of a properly connected supercap.

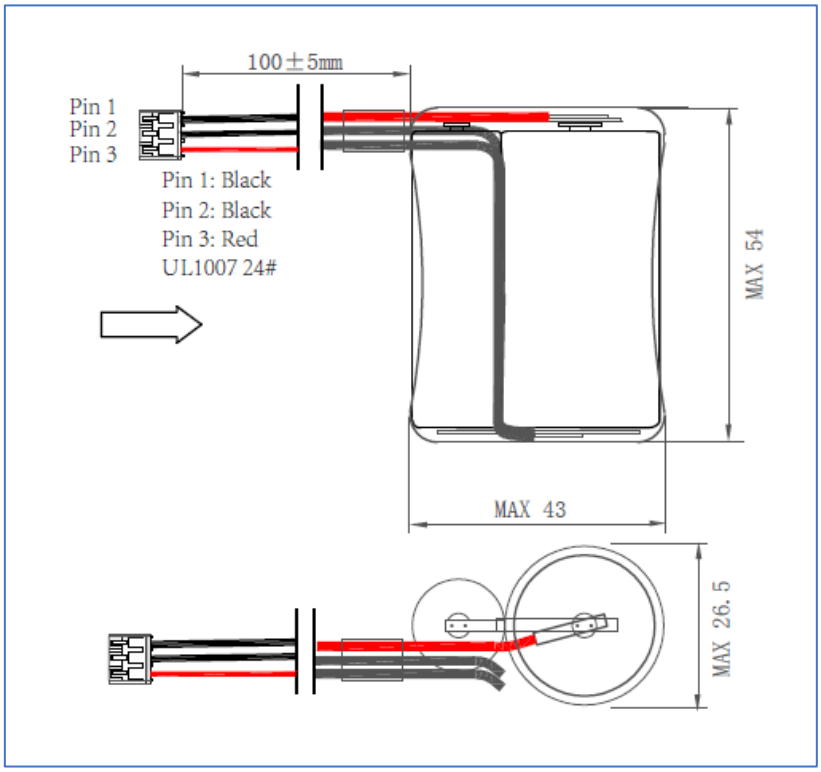


1.3.2.2 Battery ER26500H





1.3.2.3 Battery + Supercap ER26500H + SLC1550



1.3.3 Sensor interfaces

1 x SDI12 sensor interface max 4 devices - 20 readings per device

2 x Analog Interface

16bit ADC

input range -0.2 to 5 Vdc

input impedance > 2.5MOhm

1 x counter interface

Pull to GND

max frequency: 200Hz

pulse width > 1msec.

max count in measinterval: 16383 (at 200Hz measinterval < 81 sec)

for measinterval 1-day average frequency should be < 0.189 Hz or 1 pulse every 5.27 seconds

1.3.4 GSM

GSM in 2 variants:

M95: Quad-band GPRS

BG96: LTE Cat M1/Cat NB1/EGPRS

eSIM

SMA antenna connector

1.3.5 LPWAN

The KIDL has an on-board Murata CMWX1ZZABZ-078 module. In this manual this module is referenced as “murata” or “murata module”. The murata can run a specific firmware.

There is firmware available for LoRaWan and for Sigfox functionality.

1.3.6 Environment

Temp range: -10 to +50 ^{o}C

1.3.7 Size

72x72 mm with cutouts and holes to fit Spelberg TG PC 88-6-O

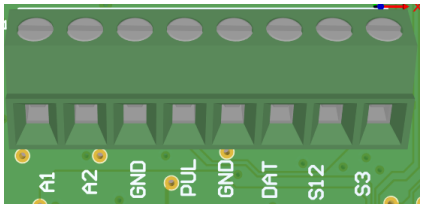
1.4 Battery connector

Wurth Electronic 68800211622

Pin 1: GND

Pin 2: +3.6V

1.5 Interface connector



Wurth Electronic 691221120008

3.50 mm 55° Entry with Rising Cage Clamp WR-TBL 8P

Pin Nr	Name	Description
1	A1	Analog input nr 1 range - 0.1 to 5.0Vdc
2	A2	Analog input nr 2 range - 0.1 to 5.0Vdc
3	GND	GND
4	PUL	Pulse input low active
5	GND	GND
6	DAT	SDI12 data line
7	S12	12Vdc controlled output 50mA max
8	S3	3.6Vdc controlled output 50mA max

1.6 Expansion connector

2x 5 PIN 0.254 mm header

Pin Nr	Name	Description
1	I2C1_SCL	I2C1 clock signal
2	SPI1_MISO	SPI1 Master In Slave Out
3	I2C1_SDA	I2C1 data signal
4	SPI1_MOSI	SPI1 Master Out Slave In
5	USART2_TX	Uart transmit (output from KIDL)
6	SPI1_SCK	SPI1 Clock
7	USART2_RX	Uart2 Receive (Input to KIDL)
8	SPI1_NSS	SPI1 Select
9	GND	
10	VBAT	Battery voltage (out)

1.7 Debug UART

The KIDL gives debug – test information on UART5_TX on CON7. 921600bps 8N1

Pin Nr	Name	Description
1	GND	GND reference

2	UART5_RX	Serial input to KIDL
3	UART5_TX	Serial output from KIDL

A FTDI 3.3V Serial to USB cable is recommended to see debug log.

2 Operation description

The datalogger measures data from its connected and configured sensors and transmits the data to a server at regular intervals. Between the measurements and transmissions, the device is in a low power state and consume as less energy as possible.

The measurement interval is set in minutes. The measurement time is synchronized with 00h:00m. This means there will always be a measurement at 00h:00m. The measurement interval must be a hole divider of 1440. 1440 is the number of minutes in 1 day.

The transmission interval is defined as a number of measurement interval.

When the measurement interval is set to 1440, the user can select a specific time at which the transmission of data to the server will take place.

Sensor data is kept in memory as 29-bit integers and 3 bits to indicate the number of decimals.

The data from the analog inputs and counter can be scaled using a factor and an offset. The number of decimals is defined by the number of decimals the offset is entered.

The data from the counter can be scaled using a factor. The number of decimals of the result is defined by the factor is entered.

At regular intervals, the datalogger memory will be sent to a dataserver.

The data can be sent in binary or ascii format to a ftpserver, to a socketserver in asciiformat or to a lorawan server.

The device can be configured over the USB interface. The USB emulates a serial port. Interface format is 8N1

When the USB interface is connected, the device automatically comes out of sleep mode.

Commands can be given to configure the device. Each command needs to be terminated with the CR character.

Commands are case sensitive.

3 Command interface

3.1 General commands

3.1.1 help

The help command returns help page on supported commands.

Help on a specific command can be show with help <command>

3.1.2 a

The a command returns an alive message. It can be used in an autodetect mechanism.

> a

KIDL

Remote: NO

3.1.3 echoon

Usage: echoon <onoff>
Enables or disabled echoing of characters when entering commands

<onof> 0: Echoing disabled.
1: Echoing enabled.

Remote: NO

3.1.4 prompt

Usage: prompt <prompt>
Specifies cli prompt to use

<prompt> Prompt to show. Maximum length is 6 characters.
With the prefix \x a hexadecimal character can be specified
Example: \x20 specifies the character with ascii value 32

Remote: NO

3.1.5 showsettings

Usage: showsettings [<conf>]

Shows the current settings

<conf> When given, show the settings as cli commands

Remote: NO

3.1.6 deviceid

Usage: deviceid <id>

Specifies the device identification string.

<id> Device id. Maximum 8 characters.

The deviceid is used in the data transmission to identify the device and used as part of the file names on the servers.

Remote: NO

3.1.7 sendsettingstoftpserver

Usage: sendsettingstoftpserver

Send the current settings to a file on the ftp server.

The ftpserver needs to be configured.

Two files will be created on the server.

<deviceid>.settings: the settings of the KIDL as a series of configuration commands (cli format)

<deviceid>.info: information file

Remote: YES

3.1.8 Firmware upgrade

WARNING: when a firmware upgrade is performed, the device logger memory (spiflash) will also be erased.

The main processor firmware can be upgraded via the flashfirmware command.

The murata module (used for LoRaWan or SigFox) can be upgraded using the flashspi and flashmurata commands.

3.1.8.1 flashfirmware

Usage: flashfirmware <size>

Upload new firmware into flash

<size> Size of firmware to be uploaded. Data needs to be sent after this command.

New firmware can be uploaded via USB port. A python script example is available

Remote: NO

3.1.8.2 Remote

New firmware for the main processor can be uploaded via FTP.

When the device is online and an ftpservername is configured and a file <deviceid>.firmware file is present on the server , the file will be loaded in to the flash bank that is currently not in use. If the loading is successful, the device will be rebooted from the bank where the firmware was loaded.

WARNING: when a remote firmware upgrade is performed , the device logger memory will also be erased.

3.1.9 Parameter update

3.1.9.1 Local

New parameter set can be uploaded via USB port

3.1.9.2 Remote

GSM: New parameter set can be uploaded via FTP site.

Check for new parameter set is checked each time data is uploaded.

In LoRa or Sigfox mode, no remote configuration is possible.

3.1.10 Murata Module application

The KIDL has 8 Mbyte of spi flash memory on board. 7 Mbyte is used for data logging.

1M byte is reserved to keep application program images for the murata module.

There are 4 images possible images, numbered 0 to 3. An image can be loaded into the spi flash using the flashspi command. An image can be loaded from spi flash to the murata module using the flashmurata command.

By default, image 0 (LoRaWan application) is loaded .

3.1.10.1 flashspi

Remote: NO

Usage: flashspi <image> <size> <description>

Upload new Murata firmware into spi flash

<image> Image number (0-3)

<size> Size of firmware to be uploaded. Data needs to be sent after this command. (max 196608))

<description> description of this image (maximum 15 characters)

3.1.10.2 flashmurata

Remote: NO

Usage: flashmurata <image>

Upload new firmware from spi flash into murata module

<image> the image number to load (0-3)

3.1.10.3 readmuratainfo

Remote: NO

Usage: readmuratainfo

Prints out information about the Murata module.

Typical response

>readmuratainfo

POWER ON RESPONSE:

IMAGE 0: 63720 Lora_V1_2_2

IMAGE 1: 104700 SigFox

IMAGE 2: 94392 Signature

IMAGE 3: 64 Spare

3.2 Sensor commands

3.2.1 Analog Inputs

The analog inputs can measure DC voltages in the range of -100mV to +5000mV

The analog inputs need to be calibrated for offset and gain.

There are 2 analog channels, 1 and 2

3.2.1.1 enableanalogchannels

Usage: enableanalogchannels <channels>

Enables/Disables measuring the voltage on the analog inputs

<channels> 0: Channel 1 and channel 2 disabled.

1: Channel 1 enabled and channel 2 disabled.

2: Channel 1 disabled and channel 2 enabled.

3: Channel 1 and channel 2 enabled.

Remote: YES

3.2.1.2 readanalogchannels

Usage: readanalogchannels

Reads out the enabled analog channels.

Example response:

Channel 1: 0.603179 Volt

Channel 2: 0.602131 Volt

Remote: NO

3.2.1.3 calibrate

Usage: calibrate <point> <voltage>

Measures the calibration factors needed to convert the AD7792 measurements to Volts.

The measurement needs to be done on 2 different voltages(points).

The same voltage needs to be applied to the 2 channels.

The calibration is finished when this command is executed 2 times, each with a different point and voltage.

<point> Identifies the calibration point (1 or 2).

<voltage> Voltage (floating point) applied to both inputs at the same time.

Remote: NO

The calibration voltages need to be between 0 and 5.5V

3.2.1.4 conversionfactor

Usage: conversionfactor <channel> <factor>

Conversion factor used for the analog measurement to get the result in the correct units.

<channel> Analog channel number (1 or 2)

<factor> Floating point value specifying the factor to multiply the output of the adc with.

Remote: YES

3.2.1.5 conversionoffset

Usage: conversionoffset <channel> <offset>

Conversion offset used for the analog measurement to get the result in the correct units.

<channel> Analog channel number (1 or 2)

<offset> Floating point value specifying the offset to add to the output of the adc (after multiplication).

The result will have the same accuracy (number of decimals) as given here.

Remote: YES

3.2.1.6 conversionunits

Usage: conversionunits <channel> <units>

Conversion Unit String identifying the units of the sensor data.

<channel> Analog channel number (1 or 2)

<units> Unit string (maximum 16 characters).

Remote: YES

3.2.2 SDI12

The SDI12 interface can support up to 4 sensors.

The KIDL 12V power supply can supply max 50 mA.

3.2.2.1 sdi12

Usage: sdi12 [<enable>|<disable>]

Enables/Disables the sdi12 measurements reading during the periodic measurement cycle

<enable> Enable the sdi12 reading (1)

<disable> Disable the sdi12 reading (0)

Remote: YES

When the sdi12 interface is enabled, the S12 and S3 voltage outputs are activated during measurement

When the sdi12 is enabled without configuring sdi12 sensors, the voltage can be used to power other devices, like analog sensors, during the measurement period.

3.2.2.2 sdi12addressadd

Usage: sdi12addressadd <address> <command> <cmdnr> <nbrmeas>

Adds a new sdi12 connected

<address> Address of the device to add (value between 0 and 9, A and Z, a and z)

<command> Command to issue to the sdi12: M, C or R

<cmdnr> Command number: 0 to 9

<nbrmeas> Number of values given by the sensor (max 20). When less values are received,

the result will be appended with NaN (not a number, 0x80000007) values

Remote: YES

3.2.2.3 sdi12addressremove

Usage: sdi12addressremoves <address> <command> <cmdnr>

Removes a sdi12 device from the current list of connected devices

(Current list can be shown by showsettings)

<address> Address of the currently added device to add (value between 0 and 9, A and Z, a and z)

<command> Active Command: M, C or R

<cmdnr> Active Command number: 0 to 9

Remote: YES

3.2.2.4 sdi12idread

Usage: sdi12idread

Reads the identification strings of the connected devices

(Current list can be shown by showsettings)

Remote: NO

3.2.2.5 sdi12read

Usage: sdi12read

Starts and reads measurement on currently connected sdi12 devices

(Current list can be shown by showsettings)

Remote: NO

3.2.2.6 sdi12loopback

For testing purposes only

Usage: sdi12loopback

perform loopback test on sdi12

Remote: NO

3.2.3 Pulse counter

The pulse counter counts maximum 16384 pulses in one measinterval.

The number of pulses can be converted to a measurement unit using a pulseconversionfactor (PCF) and a pulseconversionoffset (PCO).

Result = <measured pulses> x PCF + PCO

For the result , the number of decimals used as specified by the PCO

3.2.3.1 enablepulsecounter

Enables/Disables the pulse counter

<enable> 0: disable pulse counter. Goes into standby when going to sleep.

1: enables pulse counter. Goes into stop2 mode when going to sleep.

Power consumption is higher than in standby mode

Remote: YES

3.2.3.2 pulseconversionfactor

Usage: pulseconversionfactor <factor>

Conversion factor used for the pulse counter measurement to get the result in the correct units.

<factor> Floating point value specifying the factor to multiply the output of the pulse counter.

Remote: YES

3.2.3.3 Pulseconversionoffset

Usage: pulseconversionoffset <offset>

Conversion factor used for the pulse counter measurement to get the result in the correct units.

<offset> Floating point value specifying the offset to add to the output of the pulse counter.

The result will have the same accuracy (number of decimals) as given here.

Remote: YES

3.2.3.4 Pulseconversionunits

Usage: pulseconversionunits <units>

Conversion Unit String identifying the units of the pulse counter.

<units> Unit string (maximum 16 characters).

Remote: YES

3.2.3.5 readpulsecounter

Usage: readpulsecounter

Reads out the pulse counter. The pulse counter needs to be enabled for this command to work.

Remote: NO

Example readout:

> readpulsecounter

1.200 ml

3.2.4 Battery voltage

In the KIDL, the system battery voltage is always monitored. But it can also be considered as a sensor. When it is enabled, the battery voltage is included in the data log.

3.2.4.1 enablebatvoltage

Usage: enablebatvoltage <enable>

Enables/Disables sending of the bat voltage measurement to the server

<enable> 0: disable No bat voltage is sent to the server.

1: enables Bat voltage is sent to the server

Remote: YES

3.2.4.2 batlowthresholdsystem

Usage: batlowthresholdsystem <threshold>

Sets the system threshold on the measured battery voltage. When the battery voltage is below this level, no measurements will be made.

<threshold> Floating point value specifying the threshold in Volts.

Default: 3.00
Remote: YES

3.2.4.3 batlowthresholdgsm

Usage: batlowthresholdgsm <threshold>
Sets the GSM threshold on the measured battery voltage. When below this threshold, GSM will not be used.
When below this threshold, the batlowbit will be set

<threshold> Floating point value specifying the threshold in Volts.

Default: 3.25
Remote: YES

It is highly recommended not to set this threshold below 3.25V. It can cause system reset due to voltage drops during GSM transmission.

3.2.4.4 readbatvoltage

Usage: readbatvoltage

Reads out the battery voltage.

Example response:

Voltage: 3.604889 V

Remote: NO

3.2.5 stopstartmeasurement

Usage: stopstartmeasurement <start>

Stops doing measurements or starts doing measurements while USB is connected

Stopping the measurements only has effect when the usb is connected.

<start> 0-> stops the measurements

1-> restarts the measurements

Remote: YES

3.3 Timing and clock

3.3.1 settime

Usage: settime <date> <time>

Changes the current time

<date> Date in format dd-mm-yy

<time> Time in format hh:mm:ss

Remote: NO

3.3.2 correcttime

Usage: correcttime <correction>
Corrects the time with the number of seconds specified

<correction> correction in seconds

Remote:YES

This command can be used to correct the time remotely in LoRaWan download message.

Note:
Be aware that the timestamp in a measurement message is the wakeup time and different from the time the loRawan package is received by the gateway.

Example:

Powerup delay sensors = 2
2 analog channels enabled

In this case the delay between wake up and start of lora transmission will be about 10 seconds.
Additionally, the time on air need to be considered.

3.3.3 timezone

Usage: timezone <minutes>

Changes the timezone that is used to convert the NTP time to the local time. DST is not taking into account.

<minutes> Number of minutes that is added to the NTP time to get the local time.

Remote: YES

3.3.4 Time synchronisation

The KIDL RTC can be synchronized via NTP server.

When a synchronization takes place the KIDL RTC is corrected with the time zone.

ntpserver

Usage: ntpserver <servername>

Name of ntp server to use for time synchronisation

<servername> Name of the server

When servername is left blank, no ntp sync will be done

Remote: YES

3.3.4.1 ntpport

Usage: ntpport <port>

Number of the ntp port to use for time synchronisation

<port> Ntp port to use (value between 0 and 65535, default is 123

Remote: YES

3.3.4.2 ntpsync

Usage: ntpsync

Synchronize the RTC time with a NTP server using the GSM module.

Remote: FALSE

3.3.5 measinterval

Usage: measinterval <interval>

Number of minutes between 2 measurements. When set to 1440, the meassampletime is used.

<interval> Time between 2 measurements. Value must be between 1 and 1440 (1 day)

Remote: YES

Sets the measurement interval at which measurements from the sensors are taken. The interval is the same for all sensors and expressed in minutes.

When a measurement is taken the results are stored in binary format in the flash memory in following order:

Pulse Counter

SDI12

Analog input1

Analog input2

Battery

When a sensor is disabled, it is not measured and not stored.

The time stamp at the measurement record is the KIDL wake-up or interrupt time.

3.3.6 meassampletime

Usage: meassampletime <hours> <minutes>

Sets the time of measurement when the measurement interval is set to 1440 (1 day)

<hours> Hours (0-23)

<minutes> Minutes (0-59)

Remote: YES

3.3.7 sensorspowerupdelay

Usage: sensorspowerupdelay <delay>

Specifies the delay between powering up the sensors and the first measurement.

<delay> Delay in seconds (max 65535)

Remote: YES

If different from 0, the power will always be switched on

3.3.8 transinterval

Usage: transinterval <interval>

Specifies the time interval in number of measinterval ticks for sending the measurements to the server

<interval> Time between sending in number of measinterval ticks. When set to 1440, the transsampletime is used.

Remote: YES

3.3.9 Transsampletime

Usage: transsampletime <hours> <minutes>

Specifies the time for sending the measurements to the server. This time is used when the transinterval is set to 1440.

<hours> Hours (0-23)

<minutes> Minutes (0-59)

Remote: YES

3.4 GSM configuration

3.4.1 readgsminfo

Usage: readgsminfo

Prints out information about the gsm connection.

Remote: NO

It can take up to 120 second for the command to execute, depending on the network response.

Example return:

> readgsminfo

PIN: READY

IMSI: 240075811441003

ICCID: 89462038008000901657

Model identification: Quectel_M95

Revision: M95FAR02A08

IMEI: 868999033954813

Operator: "KPN Group Belgium", mode=0, format=0

RSSI=31

BER=0

3.4.2 apn

Usage: apn <apnname>

Specifies which APN to use to make a GSM connection

<apnname> Name of the apn (e.g. INTERNET.PROXIMUS.BE)

Remote: NO

3.4.3 apnusername

Usage: apnusername <apnusername>

Specifies which APN username to use to make a GSM connection

<apnusername> Username for the apn

Remote: NO

3.4.4 apnpassword

Usage: apnpassword <apnpassword>

Specifies which APN password to use to make a GSM connection

<apnpassword> Password for the apn

Remote: NO

3.4.5 alwayson

Usage: alwayson <onoff>

Switched on or off the always on mode. In this mode the processor never goes to sleep and the gsm connection is always open

<onoff> 1: always on mode on

0: always on mode off

Remote: YES

The GSM will be power cycled when the network registration is lost or each time the number of transmissions becomes equal to the gsmrecyclecounter.

3.4.6 gsmrecyclecounter

Usage: gsmrecyclecounter <counter>

Specifies the number of send intervals after which gsm power cycles is performed

<counter> Number of server transmissions after which a gsm power cycle is performed. 0 means never.

Remote: YES

only applicable in alwayson 1 mode

3.4.7 gsmmode

Usage: gsmmode

Switch to transparent gsm mode. In this mode all data entered over usb is send to the gsm module

and all data received from gsm module is send to the usb

Remote: NO

WARNING: this mode can only be left by a module reset. It is meant for diagnostics and debug only.

3.4.8 rat

This command allows you to make a quick selection of the Radio Access Technology (RAT) you want to use.

This command is only applicable to models with BG96 module.

Usage: rat <rat>

quickselect Radio Acces Technology

<rat>

0: auto

1: Europe 2G

2: Europe LTE Cat M1

3: Europe LTE Cat NB1

Remote: YES

3.4.9 ratiopmode

Usage: ratiotopmode <iotopmode>

configure the Network Category to be searched under LTE RAT

<iotopmode>CRLF 0 LTE Cat M1

1 LTE Cat NB1

2 LTE Cat M1 and LTE Cat NB1

Remote: YES

3.4.10 ratnwscanmode

Usage: ratnwscanmode <scanmode>

configure the RAT(s) to be searched

<scanmode>CRLF 0 Automatic

1 GSM Only

3 LTE Only

Remote: YES

3.4.11 ratnwscanseq

Usage: ratnwscanseq <scanseq>

configure the RAT searching sequence

<scanseq>

eg 020301 stands for LTE Cat M1-> LTE Cat NB1-> GSM

00 Automatic

01 GSM

02 LTE Cat M1

03 LTE Cat NB1

Remote: YES

3.4.12 ratcatm1band

Usage: ratcatm1band <catm1band>

configure the LTE Cat M1 band to be used

<catm1band>

a hexadecimal value that specifies the cat M1 bands to use

If set to 0 or 40000000, it means no change

eg 15= B1 + B3 +B5

eg 400A0E189F Any Frequency band

eg Europe : 80084

Remote: YES

3.4.13 ratcatnb1band

Usage: ratcatnb1band <catnb1band>

configure the LTE Cat NB1 band to be used

<catnb1band>

a hexadecimal value that specifies the cat M1 bands to use

If set to 0 or 40000000, it means no change

eg 15= B1 + B3 +B5

eg A0E189F Any Frequency band

eg Europe : 80084

Remote: YES

3.4.14 ratgsmband

Usage: ratgsmband <gsmband>

configure the GSM band to be used

<gsmband>

a hexadecimal value that specifies the GSM frequency band

00 No Change

01 GSM 900 MHz

02 GSM 1800 MHz

04 GSM 850 MHz

08 GSM 1900 MHz

0F Any Frequency band

Remote: YES

3.5 LoRaWan

LoRaWan can only be used when the LoRawan application is loaded into the Murata module (see flashspi, flashmurata , readmuratainfo commands)

In LoRaWan mode the payload is limited to 51 bytes.

This means that the number of sensors that can be used is limited. The KIDL will give a warning when the number of sensors exceeds the number that can be transmitted. In binary mode the maximum is 8 sensors, in ascii the maximum is 2 sensors.

Only the last measurement will be transmitted.

After lora packet transmission, it will be checked if a download package is received.

Remote commands can be send to the KIDL on Lora port 3. A remote command need to be terminated with a double point (':')

Example download command:

measinterval 10:correcttime -16:

This will set the measurement interval to 10 minutes and correct the KIDL time by-16 seconds.

3.5.1 loraappeui

Usage: loraappeui <loraappeui>

Specifies the LoRa application identifier

<loraappeui> LoRa application identifier, must be exactly 16 hexdigits or empty

Remote: YES

3.5.2 loraappkey

Usage: loraappkey <loraappkey>

Specifies the LoRa application key

<loraappkey> LoRa application key, must be exactly 32 hexdigits or empty

Remote: YES

3.5.3 loraappskey

Usage: loraappskey <loraappskey>

Specifies the LoRa application session key

<loraappskey> LoRa application session key, must be exactly 32 hexdigits or empty

use for ABP only

Remote: YES

3.5.4 loradaddr

Usage: loradaddr <loradaddr>

Specifies the LoRa device address

<loradaddr> LoRa device address, must be exactly 8 hexdigits or empty

Remote: YES

use for ABP only

3.5.5 loranjm

Usage: loranjm <mode>

Select the Lora Network Join Mode

<mode> 0: ABP

1: OTAA

Remote: YES

3.5.6 loranwkskey

Usage: loranwkskey <loranwkskey>

Specifies the LoRa network session key

<loranwkskey> LoRa network session key, must be exactly 32 hexdigits or empty

use for ABP only

Remote: YES

3.5.7 loraport

Usage: loraport <port>

Specifies the LoRa port to use

<port> Port number, range 0 to 223

Remote: YES

3.5.8 loraadaptive

Usage: loraadaptive <mode>

Select Lora adaptive mode

<mode> 0: Not Adaptive

1: Adaptive

3.5.9 loradr

Usage: loradr <rate>

Select the Lora Data Rate

<rate> 0: SF12 BW125

1: SF11 BW125

2: SF10 BW125

3: SF9 BW125

4: SF8 BW125

5: SF7 BW125

6: SF7 BW250

7: FSK

3.5.10 loranwkid

Usage: loranwkid <networkid>

Set the LoRa Network ID

<network> LoRa Network ID, must be exactly 8 hexdigits or empty

3.5.11 lorapnm

Usage: lorapnm <mode>

Select the Lora Public network Mode

<mode> 0: Private

1: Public

3.5.12 loradcs

Usage: loradcs <mode>

Enable the Lora Duty Cycle Setting

<mode> 0: disable

1: enable (only for test)

3.5.13 loraclass

Usage: loraclass <class>

Select Lora Class

<mode> A,B or C

NOTE : only class A is implemented !

3.5.14 loraconfirmed

Usage: loraconfirmed <mode>

Select Lora confirmed mode

<mode> 0: Not Confirmed

1: Confirmed

3.5.15 loraretries

Usage: loraretries <retries>

Specifies the maximum message sent is retried if not confirmed

Only used when confirmed mode enabled

<retries> number, range 0 to 3

3.5.16 lorarx1dl

Usage: lorarx1dl <delay>

Set delay of the received window 1

<delay> range 0 to 10000 ms

3.5.17 lorarx2dl

Usage: lorarx2dl <delay>

Set delay of the received window 2

<delay> range 0 to 12000 ms

3.5.18 powermurata

The KIDL used a Murata CMWX1ZZABZ for Lora or Sigfox modulation. The power of the module is automatically controlled when selecting the Lora or Sigfox transmission method.

The powermurata command is used for testing and diagnostics.

Usage: powermurata [mode]

Power on or off the murata module

<mode> 0: power off

1: power on and join attempt

2: power on with boot0=1, for swd access

Remote: NO

3.6 Sigfox

SigFox can only be used when the Sigfox application is loaded into the Murata module (see flashspi, flashmurata, readmuratainfo commands)

The SigFox application is device specific.

Contact factory to obtain for a specific image and sigfox registration

In Sigfox mode the payload is limited to 12 bytes.

Sensor data is transmitted in binary format. This means that there can maximum 3 sensor values can be transmitted.

Date and time are not transmitted.

Only the last measurement will be transmitted.

3.7 Data handling

Data from the sensors will be stored in flash memory and on binary file (ftp server .bdata) in the following format:

Byte 0 : ESC (startbyte)

Byte 1 : status

Bit 0 0 : NTP synced

1: NTP not synced

Bit 1 0 : measured with battery ok

1: measured with low bat

Bit 2-7 : number of measurements (max 2^6= 64)

Byte 2-3 CRC 16 bit

Byte 4->7 : 32 bit time stamp

Byte 8->11 32 bit measurement number

Byte 12->xx : sensor data in 32 bit floating point

In following order : counter, sdi12,ain1,ain2,battery

3.7.1 Data Transfer

3.7.1.1 transmethod

Specifies the type of server that is used for sending the measurement data to

<method> 0: FTP Server (binary format)

1: SOCKET Server (ascii format)

2: FTP Server (ascii format)

3: MQTT Server

4: LoRaWan (binary)

5: LoRaWan (ascii)

6: SigFox

In case of ftp ascii format , data files will be named <deviceid>.adata

In case of ftp binary format, data files will be named <deviceid>.bdata

MQTT is not supported yet.

3.7.1.2 senddatatoserver

This command can be used to force the KIDL to send it's unsent data immediately to the server.

Usage: senddatatoserver

Send the unsent data to server.

Remote: NO

3.7.1.3 sendinforecords

Usage: sendinforecords <send>

Send the unsent data to server.

<send> 1: send info records

0: do not send info records (only active in ftp ASCII format)

Remote: NO

3.7.1.4 ftpserver

Usage: ftpserver <servername>

Specifies the name of the ftp server to use.

<servername> Name of the ftp server

Remote: YES

When the servername is left blank, no ftp connection will be attempted

3.7.1.5 ftpserverport

Usage: ftpserverport <port>

Number of the ftp server port

<port> Server port to use (value between 0 and 65535)

Remote: YES

3.7.1.6 ftpserverusername

Usage: ftpserverusername <serverusername>

Specifies which username to use for the ftp server

<serverusrname> Username for the server

Remote: YES

3.7.1.7 ftpserverpassword

Usage: ftpserverpassword <serverpassword>

Specifies which password to use for connectin to the ftp server

<serverpassword> Password for the ftp server

Remote: YESshowse

3.7.1.8 ftpservertimeout

Usage: ftpservertimeout <timeout>

Maximum time that is waited for a ftp server response

<timeout> Timeout value in seconds.

Remote: YES

3.7.1.9 ftpserverretries

Usage: ftpserverretries <nbrretries>

Maximum number of retries upon ftp failure

<nbrretries> Maximum number of retries.

Remote: YES

3.7.1.10 socketserver

Usage: socketserver <servername>

Specifies the name of the socket server to use.

<servername> Name of the socket server

Remote: YES

When the servername is left blank, no socket connection will be attempted

3.7.1.11 socketserverport

Usage: socketserverport <port>

Number of the socket server port

<port> Server port to use (value between 0 and 65535)

Remote: YES

3.7.1.12 socketservertimeout

Usage: socketservertimeout <timeout>

Maximum time that is waited for a socket server response

<timeout> Timeout value in seconds.

Remote: YES

3.7.1.13 socketserverretries

Usage: socketserverretries <nbrretries>

Maximum number of retries upon socket failure

<nbrretries> Maximum number of retries.

Remote: YES

3.7.1.14 mqttserver

Usage: mqttserver <servername>

Specifies the name of the mqtt server to use.

<servername> Name of the mqtt server

When the servername is left blank, no mqtt connection will be attempted

Remote: NO

3.7.1.15 mqttserverport

Usage: mqttserverport <port>

Number of the mqtt server port

<port> Server port to use (value between 0 and 65535)

Remote: NO

3.7.1.16 mqttserverusername

Usage: mqttserverusername <serverusername>

Specifies which username to use for the mqtt server

<serverusername> Username for the server

Remote: NO

3.7.1.17 mqttserverpassword

Usage: mqttserverpassword <serverpassword>

Specifies which password to use for connection to the mqtt server

<serverpassword> Password for the mqtt server

Remote: NO

3.7.1.18 mqttservertimeout

Usage: mqttservertimeout <timeout>

Maximum time that is waited for a mqtt server response

<timeout> Timeout value in seconds.

Remote: NO

3.7.1.19 mqttserverretries

Usage: mqttserverretries <nbrretries>

Maximum number of retries upon mqtt failure

<nbrretries> Maximum number of retries.

Remote: NO

3.7.2 readflash

Usage: readflash <starttime> <endtime> <options> [<format>]

Reads the measured data stored in flash between the <starttime> end <endtime>

<starttime> Epoch time in seconds (Local time, GMT+timezone)

<endtime> Epoch time in seconds (Local time, GMT+timezone)

<options> all: read all data

nt: read only not transmitted data

<format> 0 (default): write the binary data

1: write the data in ascii

Remote: NO

3.7.3 spiflasherase

Usage: spiflasherase

Completely erase the spi flash

Remote: NO

WARNING : this configuration can not be undone.

3.7.4 spiflashstatus

Usage: spiflashstatus

Gives the current status of the spi-flash. How much data is present and how much is sent

Remote: NO

>spiflashstatus

Example response:

Flash size: 7340032 bytes

Total data: 548 bytes

Total data not sent: 140 bytes

Address oldest data: 0x00000000

Address data next to send: 0x00000198

Address data next to write: 0x00000224

3.7.5 framerase

This command can be used to erase the KIDL FRAM. In FRAM, system parameters are kept.
After executing this command, you should hardware reset or power cycle the device to load the KIDL default settings.

Usage: framerase
Erases the fram ,need reset after to load default parameters
Remote: NO

4 Data Information

4.1 Sensor Data representation

Sensor data is represented in a 32bit format existing of two-bit fields: a 29-bit integer value, and a 3-bit value indication the digits after the decimal point.

Example: 3.1515 becomes 0x3D8DC = 0x7B1B << 3 | 4 = 31515 << 3 | 4-> 31515 / 10^4 = 3.1515

It means that all float values need to be between -268435456 and 26843545, or-26843545.6 and 26843545.5 (1 digit after the point, or ...-26.8435456 and 26.8435455 (7 digits after the point)

4.2 Data Binary format

The sensor data records are kept in the logger memory in the following binary format.

The same format is uses on a server when a binary protocol is selected.

Header	Byte 0		0x1b	
	Byte 1	Bit 0	Ntp Synced	When 1 a ntp sync has occured since the previous measurement
		Bit 1	Low Battery	When 1 the battery is lower than batlowthresholdgsm
		Bit 2	Info	When 1 this record is an info record
		Bit 3-7	Reserved	Currently set to 0
	Byte 2		NbrOfValues	Number of 32-bit words in data section (format dependent on Info or not)
	Byte 3		Reserved	Currently set to 0
	Byte 4->7		CRC	crc-32-mpeg CRC calculated over all data except the CRC itself, little endian
	Byte 8->11		Time	seconds since 1-1-1970 in localtime, 32-bit integer in little endian
	Byte 12->15		MeasNbr	32-bit little endian
	Byte 16-		Data	Format below (Measurent or Info)
Measurement Data		Array of 'NbrOfValues' 32-bit (29 bits value + 3 bit exponent) containing the measurement results		
Info Data	Byte 0	Bit 0	Counter	1 when counter value is present in measurement data
		Bit 1	ain1	1 when analog input 1 is present in measurement data

		Bit 2	ain2	1 when analog input 2 is present in measurement data
		Bit 3	battery	1 when battery level is present in measurement data
		Bit 4-7	Reserved	Currently set to 0
	Byte 1->3		Reserved	Currently set to 0
	Byte 4->7		Addresses	Addresses of the 4 connected sdi12 sensors (ascii value of address)
	Byte 8->11		Commands	Commands of the 4 connected sdi12 sensors (ascii value of command)
	Byte 12->15		Commands Numbers	Command number of the 4 connected sdi12 sensors
	Byte 16 -> 16+(NbrOfValues-4)*4		Array of 32-bits containing bit-fields identifying presence of sdi12 measurements	
			Little Endian, Lsb first	
			Containing 4 sensors	
			Bit 1 when corresponding measurement in present	