

Bluetooth Optical Probe User Manual

1. Overview

Front View: KMK119 & KMK139



1. Power Button: Push to open and push to close
2. Charge LED Group: When connected to charge and Voltage is ok for probe, "VIN" LED will be ON. "CHARGE" LED will also be ON during charge and OFF once battery is fully charged.
3. Bluetooth Activity LED Group: Those LEDs show the activity during Bluetooth communication. When the Bluetooth Module is Powered the "BT POW" LED will be ON. This LED is ON when the device is ON and will be OFF when the device is OFF. When the battery is low (device needs to be charged), the same LED will be ON and it will light in RED Color.
"BT LINK" LED can be in 1 of 2 states
 - Will blink slow when Bluetooth connection is available but there is no client connected to device
 - Will be ON when a client is connected to probe. For example if the Bluetooth Virtual COM port is opened by the meter reading software from PC side, this LED will be ON. "TX" and "RX" LEDs will flash during sending data to meter and receiving data from meter.
4. Speed LED Group: This group shows the operating modes of probe which can be changed via switches on the device (check relevant section for how to use switches)

There are 4 operating modes of probe for KMK119:

- Mode 1: 300-7E1 IEC auto Mode C.
- Mode 2: 300-7E1 IEC start and change to DLMS/COSEM (300-8N1 IEC start version also available which is needed for some meter applications)
- Mode 3: Fixed 9600-8N1 communication
- Mode 4: Custom command mode. In this mode the device will work transparently and gets some commands from user. The upmost LED will turn ON when the probe is working in Mode 1 and lowermost LED will turn on when the probe works in Mode 4. The other LEDs will turn ON in turn when Mode 2 or Mode 3 is active.

There are also 4 operating modes of probe for KMK139:

- Mode 1: Fixed 4800-8N1 communication
- Mode 2: Fixed 9600-8N1 communication
- Mode 3: Fixed 19200-8N1 communication (Fixed 28800-8N1 communication is available based on customer request)
- Mode 4: Custom command mode. In this mode the device will work transparently and gets some commands from user. The upmost LED will turn ON when the probe is working in Mode 1 and lowermost LED will turn on when the probe works in Mode 4. The other LEDs will turn ON in turn when Mode 2 or Mode 3 is active.

Front View: KMK118 & KMK119



1. Power Button: Push to open and push to close
2. Torch Button: Push to open and push to close the built-in torch and lighten up the display of meter (if needed)
3. Charge LED: When connected to charge and Voltage is ok for probe, "Battery/Charge" LED will be ON. "Battery/Charge" LED will also be ON during charge and OFF once battery is fully charged.
4. Power LED: When the Bluetooth Module is Powered the "Power" LED will be ON. This LED is ON when the device is ON

and will be OFF when the device is OFF. When the battery is low (device needs to be charged), the same LED will be ON and it will light in RED Color.

5. Bluetooth LED: It can be in 1 of 2 states

- Will blink slow when Bluetooth connection is available but there is no client connected to device
- Will be ON when a client is connected to probe. For example if the Bluetooth Virtual COM port is opened by the meter reading software from PC side, this LED will be ON. "TX" and "RX" LEDs will flash during sending data to meter and receiving data from meter.



NOTE: Device Functionality may change based on pre installed firmware

There are 4 main firmware for KMK118:

- Mode 1: 300-7E1 IEC auto Mode C.
- Mode 2: 300-7E1 IEC start and change to DLMS/COSEM (300-8N1 IEC start version also availabel which is needed for some meter applications)
- Mode 3: Fixed 9600-8N1 communication
- Mode 4: Custom command mode. In this mode the device will work transparently and gets some commands from user.

There are also 4 main firmware for KMK138:

- Mode 1: Fixed 4800-8N1 communication
- Mode 2: Fixed 9600-8N1 communication
- Mode 3: Fixed 19200-8N1 communication (Fixed 28800-8N1 communication is available based on customer request)
- Mode 4: Custom command mode. In this mode the device will work transparently and gets some commands from user.

Firmware change can be doen in field via using abcZ software and firmware supplied from our company. Check relevant section for firmware change procedure.

Side View: KMK119 & KMK139

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1. Micro USB or USB Type C Connector: Depending on the hardware version the probe comes with USB C or micro USB conenctor along with charge cable. Any cell phone charger can be used to charge device.
2. Switches: Switches are used to select the working mode of Probe. It is described as printing as well.

Switch 1	Switch 2	Mode	Mode Function for KMK119	Mode Function for KMK139
OFF	OFF	Mode 1	300-7E1 IEC auto Mode C. Auto baud change based on protocol	Fixed 4800-8N1 communication
ON	OFF	Mode 2	300-7E1 IEC start and change to DLMS/COSEM (300-8N1 IEC start version also availabel which is needed for some meter applications) Auto baud change based on protocol	Fixed 9600-8N1 communication
OFF	ON	Mode 3	Fixed 9600-8N1 communication	Fixed 19200-8N1 communication (Fixed 28800-8N1 communication is available based on customer request)
ON	ON	Mode 4	Custom command mode. In this mode the device will work transparently and gets some commands from user.	Custom command mode. In this mode the device will work transparently and gets some commands from user.



NOTE: Switch change will be aplied on next Power ON of the device. So in order to change working mode, user has to turn off the probe first.



NOTE: Project specific firmware available based on customer specific needs. Please contact our company for your needs.

Probe Interface View: KMK119 & KMK139



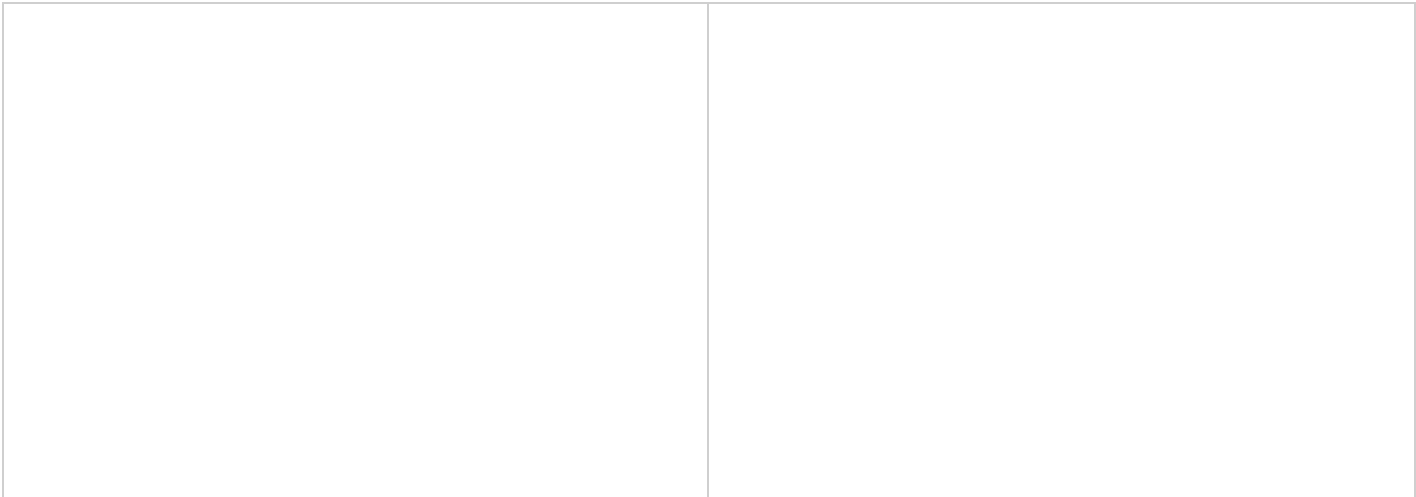
Probe comes with relavant interface

KMK119 is an IEC probe: it has flat interface to be placed on the meter probe interface
KMK139 is an ANSI probe: it has cavity in probe interface part to fit the meter probe interface



NOTE: All KMK probes uses N38 magnet in order to to better attach to meter

Probe Interface View: KMK118 & KMK138





Probe comes with relevant interface

KMK118 is an IEC probe: it has flat interface to be placed on the meter probe interface

KMK138 is an ANSI probe: it has cavity in probe interface part to fit the meter probe interface



NOTE: KMK118 and KMK138 has built in torch. It can be used to light up the display of meters during manual reading in the field.



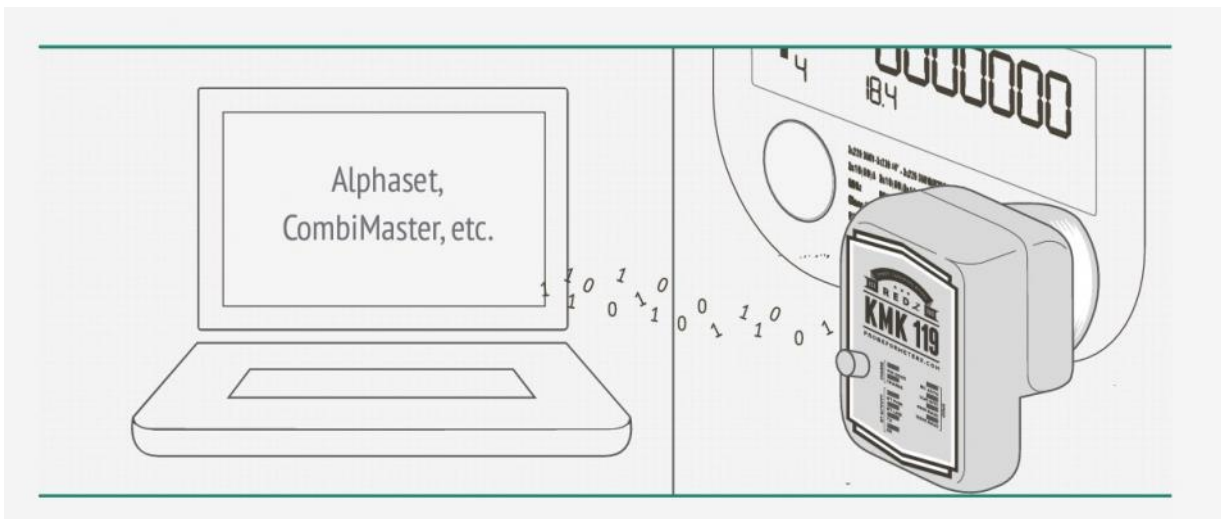
NOTE: All KMK probes uses N38 magnet in order to to better attach to meter

2. Working Modes

KMK118 & KMK119 Working Modes

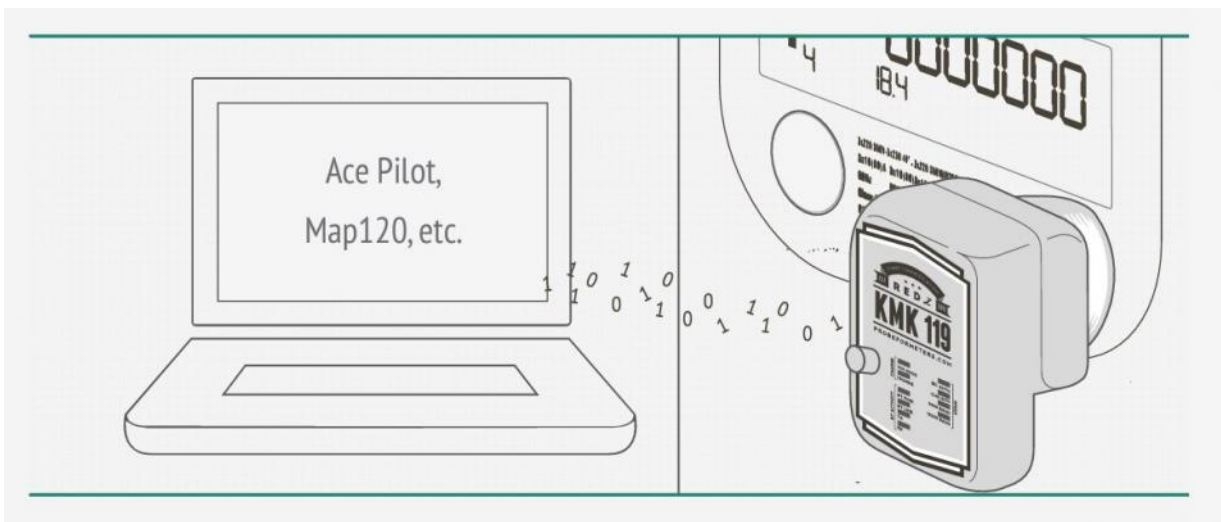
MODE 1: 300-7E1 IEC AUTO MODE C.

In this mode the probe can automatically detect IEC 62056-21 Mode C (formerly known as IEC1107) protocol and make necessary baud change overs automatically. This mode is designed so that any software that can read IEC62056-21 meters with cable version of optical probe can instantly use Bluetooth version of probe. After pairing the probe the already available software can instantly use this mode to read meters such as Elster, EMH, L&Gyr etc.



MODE 2: 300-7E1 IEC START AND CHANGE TO DLMS/COSEM

In this mode the probe can automatically detect IEC 62056-21 Mode C (formerly known as IEC1107) opening on DLMS/COSEM protocol make necessary baud and data type change overs automatically. This mode is designed so that any software that can read DLMS/COSEM meters with IEC opening mode with cable version of optical probe can instantly use Bluetooth version of probe. After pairing the probe the already available software can instantly use this mode to read meters such as Itron, L&Gyr etc.



MODE 3: FIXED 9600-8N1 COMMUNICATION

This is fixed speed and data type communication mode. This can be used in IEC870-5-102 standard or in any standard that is necessary to communicate in this data type and baud rate.

MODE 4: CUSTOM COMMAND MODE

In this mode the device will work transparently and can be managed by special commands. Command mode is the best solution if the user is capable of editing or developing their own meter reading software so that user can use Bluetooth Probe for communication.



NOTE: The C# code example for sending command is as follows:

```

////=====
//Initialize Probe at baudrate 300
buffer = new byte[] { 0xFE, 0xFE, 0x42, 0x4C, 0x55, 0x45, 0x30, 0x38, 0x4E, 0x31, 0x30, 0xFF };
this.comport.Write(buffer, 0, buffer.Length);
Thread.Sleep(50);
//Sleep is important, also it is suggested to wait 1000ms after opening the TCP port.
////=====
This command will change baud rate or data type.
Second char from last can vary so that user can send different commands to probe:

```

Data Type Settings Commands:

0x30 : 300 baud
 0x31 : 600 baud
 0x32 : 1200 baud
 0x33: 2400 baud
 0x34: 4800 baud
 0x35: 9600 baud
 0x36:19200 baud
 0x37: 28800 baud
 0x38: 38400 baud
 0x40: 7E1 data type
 0x41: 8N1 data type
 0x42: 8E1 data type
 0x43: 8O1 data type

0x50: Break State: Enter

0x51: Break State: Exit

Other Commands:

0xA0: Firmware Version Query The firmware version information will be sent and data will be terminated with 0x00 character.

0xA1: Battery Voltage Query (mV) Battery voltage information will be sent and data will be terminated with 0x00 character.

0xA2: Close Sleep Timer (10 seconds) If there is no connection with the probe for more than 10 seconds, the port goes into sleep mode and power saving mode will be on. When the TCP connection is established, the sleep mode will be off and the port will work as usual and user operation is not affected by this process. Confirmation information will be sent and data will be terminated with 0x00 character.

0xC2: Shut Down The Probe Using this command, the power can be turned off as if the optical probe was closed by the power button.

0xC3: Auto Shutdown Timer Setting A time interval between 0 to 254 seconds should be set (in HEX format). If there is no communication with the probe after that time interval, the device will be turned off (probe shuts down). This can prevent the probes to be left forgotten with power on for long time and consume battery. The default value is 254 seconds. This feature can be disabled by setting value 255. After sending the command, confirmation information will be sent and data will be terminated with character 0x00. Then the time interval must be set. The next confirmation information will be terminated with character 0x00 again.

0xD0: Probe Reading Sensitivity Setting If user gets some meaningless or corrupted data while reading the meter, it is possible to change the reading accuracy of the probe and make special setting based on meter type to prevent reflections or light interferences. A value between 0 to 255 should be set (in HEX format). As this value increases, sensitivity of the probe decreases and light reception capacity falls. The default value is 26 (0x1A). After sending the command, confirmation information will be sent and data will be terminated with character 0x00. Then the sensitivity value must be set. The next confirmation information will be terminated with character 0x00 again. The user can transmit any data and command to the optical probe without any restrictions and can use the optical probe at any desired data type and communication speed at any time. The commands transmitted to the optical probe and the data transmitted to the meter is always separated.

0xE0: Save Settings. It is possible to save settings for following data Sleep Timer, Auto Power seconds, Reading Sensitivity, Baud Rate and Data type. After sending the command, confirmation information will be sent and data will be terminated with character 0x00. All listed values are saved as it is set and next time the device restarted they will be used based on saved values.

0xE1: Restore Factory Defaults (available with v3 designs and later) Command sets values as follows and saves them

- Sleep Timer: ON
- Auto Power Down Seconds : 254
- Reading Sensitivity: 26
- Baud Rate: 300
- Data Type: 7E1 After sending the command, confirmation information will be sent and data will be terminated with character 0x00.



NOTE: The modes can be changed via switch in KMK119. KMK118 needs firmware change to operate in different modes.

KMK138 & KMK139 Working Modes

MODE 1: FIXED 4800-8N1 COMMUNICATION

This is fixed speed and data type communication mode. This can be used in any standard that is necessary to communicate in this data type and baud rate.

MODE 2: FIXED 4800-8N1 COMMUNICATION

This is fixed speed and data type communication mode. This can be used in any standard that is necessary to communicate in this data type and baud rate.

MODE 3: FIXED 19200-8N1 COMMUNICATION

This is fixed speed and data type communication mode. This can be used in any standard that is necessary to communicate in this data type and baud rate.

This option can be selected to have 28800-8N1 data option.

MODE 4: CUSTOM COMMAND MODE

In this mode the device will work transparently and can be managed by special commands. Command mode is the best solution if the user is capable of editing or developing their own meter reading software so that user can use Bluetooth Probe for communication.

Please see KMK118 & KMK119 Command Mode for details and usage.



NOTE: The modes can be changed via switch in KMK139. KMK138 needs firmware change to operate in different modes.

3. Charge & Battery Status

Charge Port: KMK119 & KMK139



NOTE: Charge port can be Micro USB or USB Type C based on version of hardware. Probe comes with relevant charge cable and by using that cable probe can be charged with any PC or Phone charger that has USB Type A on it.

Charge Port: KMK118 & KMK138



NOTE: Charge port can be Micro USB or USB Type C based on version of hardware. Probe comes with relevant charge cable and by using that cable probe can be charged with any PC or Phone charger that has USB Type A on it.

Battery Status

The probe gives a low battery warning via LEDs to warn the low battery status and remind user to recharge. When battery is low, "POW" LED turns into RED light and remains until it's charged enough.

KMK119 and KMK139 uses a 1200mAh battery inside.

KMK118 and KMK138 uses a 600mAh battery inside.

Battery Usage Graph

Here is a test result for battery using

This test has been done with a meter reading device that read an IEC meter in every 10 seconds (after successful readings). KMK119 and KMK139 is expected to work 22 hours with full charge and on non stop operation. KMK118 and KMK138 is expected to work minimum 10-11 hours with full charge and on non stop operation.

Details of test can be shared upon request.



4. Firmware Change

The probe has capability to change firmware over wireless connection. This way the user can get latest updates of probe operation and also user may also ask for changes. Here are some examples:

- Firmware change for specific meter model and protocol
- Firmware change to disable switches and work only in command mode
- Firmware change to put any feature that user needs

Firmware change procedure needs specific firmware prepared by our company and the firmware upgrade software abcZ software also developed by our company. In order to use the software the specific firmware must be selected. After selecting the firmware path by clicking "Select Path" button the firmware can be loaded to probe.

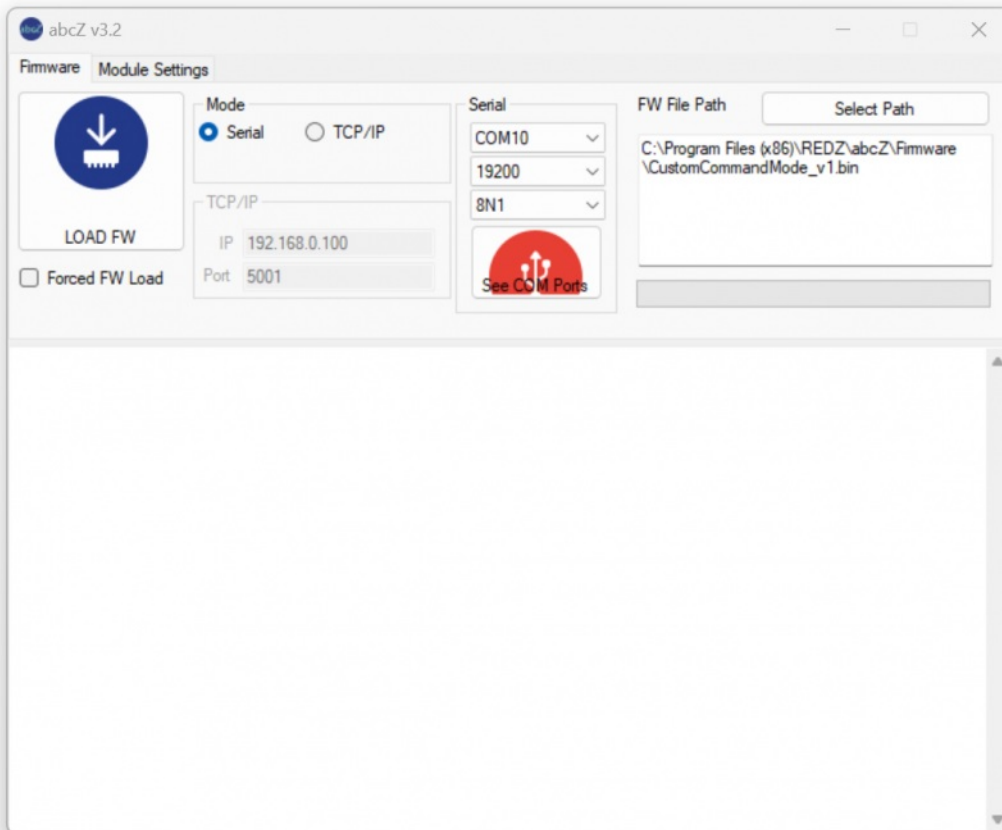


NOTE: The probe has protection time window 10 seconds after the powered up so the process must be started within 10 seconds after probe powered up.

User should make serial connection with probe and click "LOAD FW" button using abcZ Software. The software will show the percentage of process visually in terms of number of sent data packages and that process can also be monitored by LEDs (work mode LEDs) on probe. Also power LED will blink RED during operation. (once %25 of process finished LED1 will be on and continue with LED2, LED3 and finish with LED4 after %100 finished). The process will take less than a minute and the probe will restart itself. Device should not be powered off during update process.

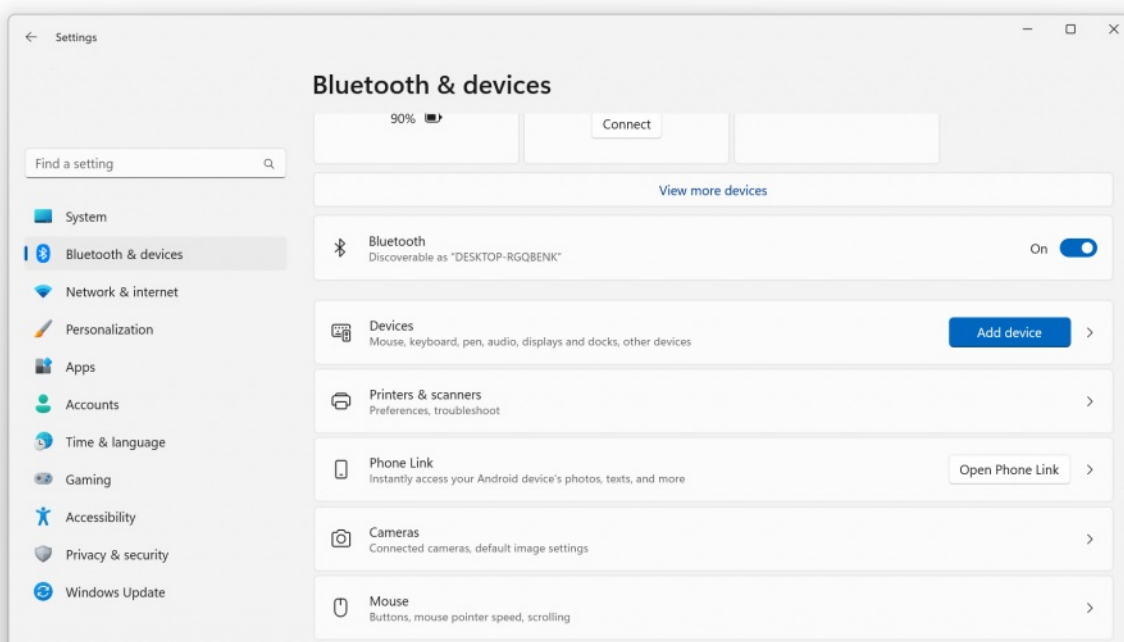


NOTE: If somehow the firmware upgrade process is interrupted and upload file has failed, the probe will lose firmware and stay in bootloader mode. In that case user can try upgrading the firmware again and this time should mark the "Forced FW Load" check box.

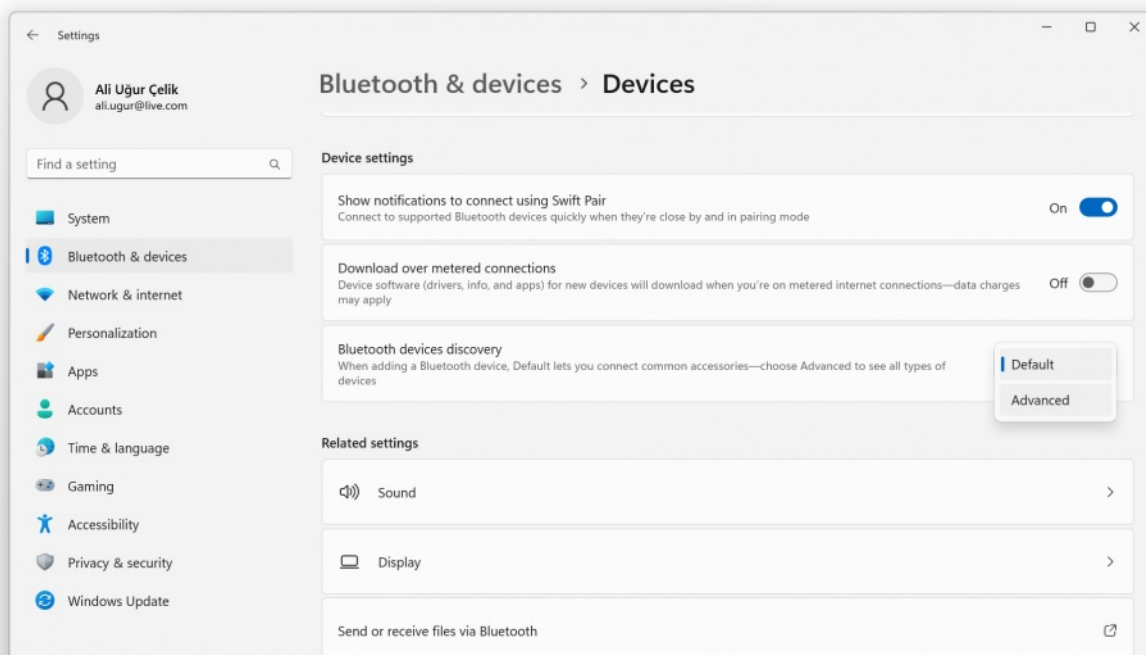


5. Setting Up Bluetooth Connection and Serial Connection to Probe

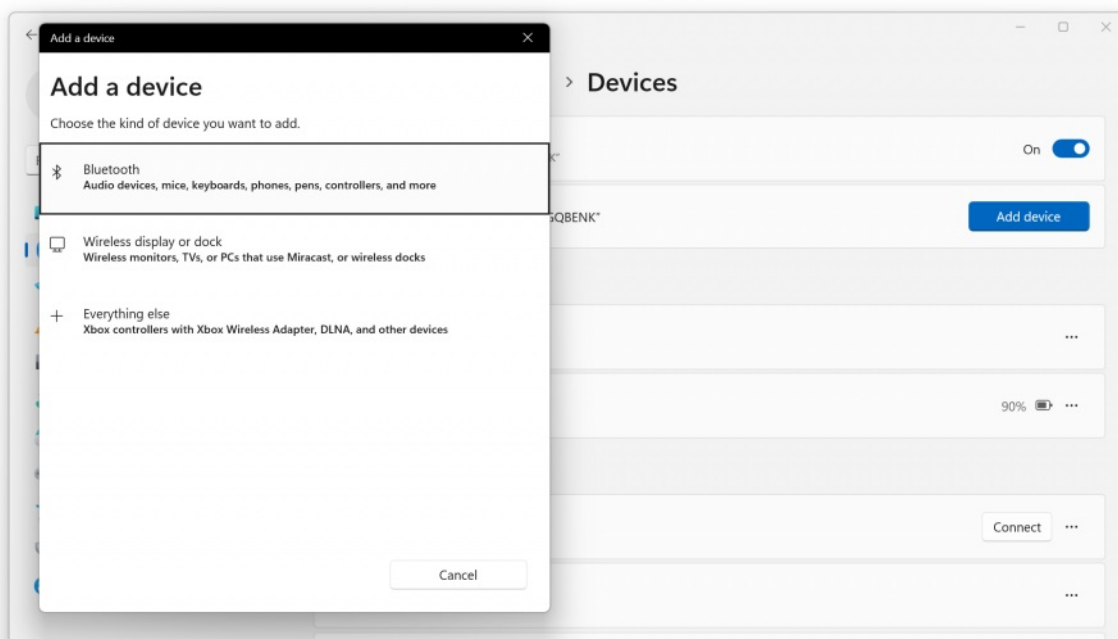
Enable Bluetooth feature of your PC. Then push the power button of Bluetooth Probe to power the device. Enter "Bluetooth & devices" setting on your PC.



Click "Device" option and if not set, select "Advanced" for "Bluetooth Discovery Option".



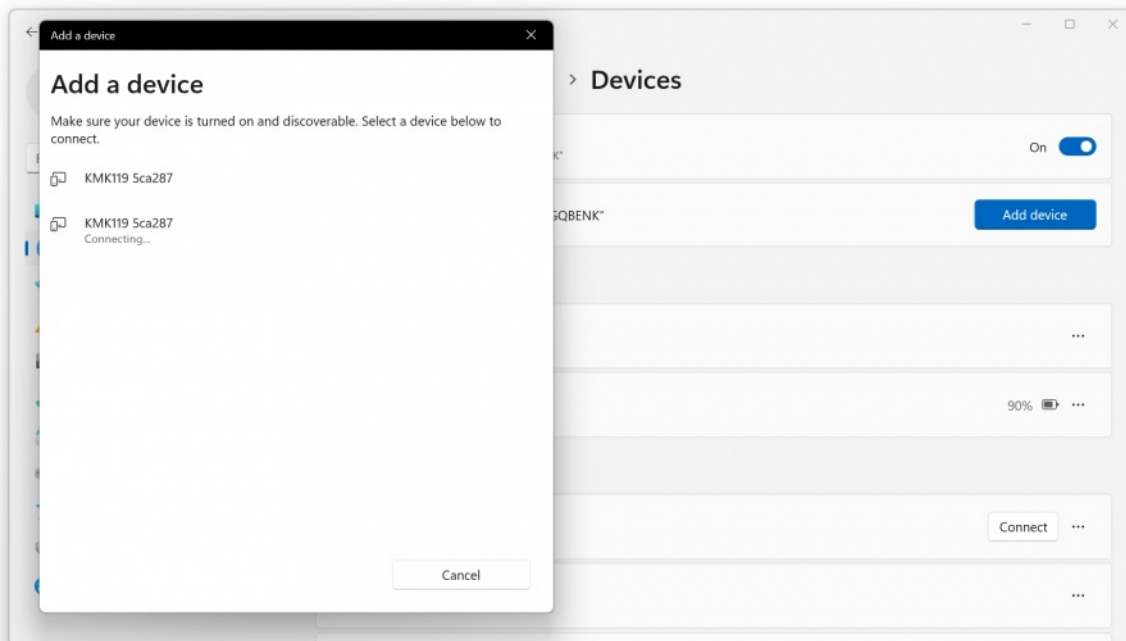
Go back to top of the page and click "Add Device" and select "Bluetooth".



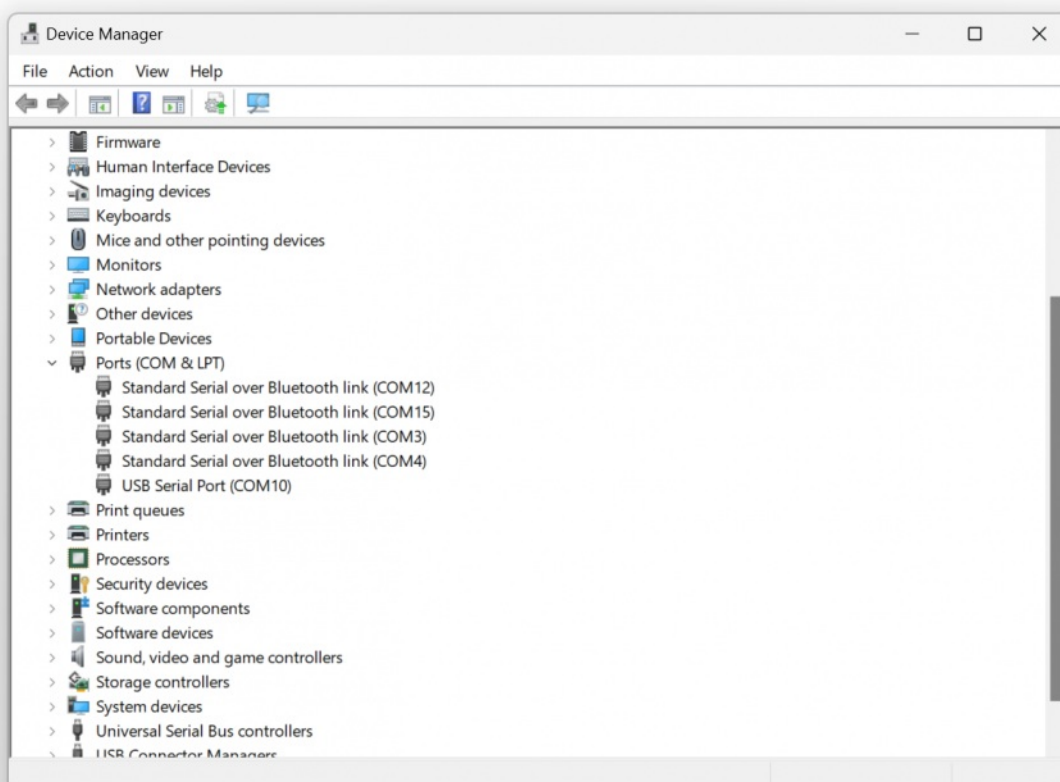
Select the Bluetooth probe from the list. Pc will connect and will create a Virtual COM port for this probe.



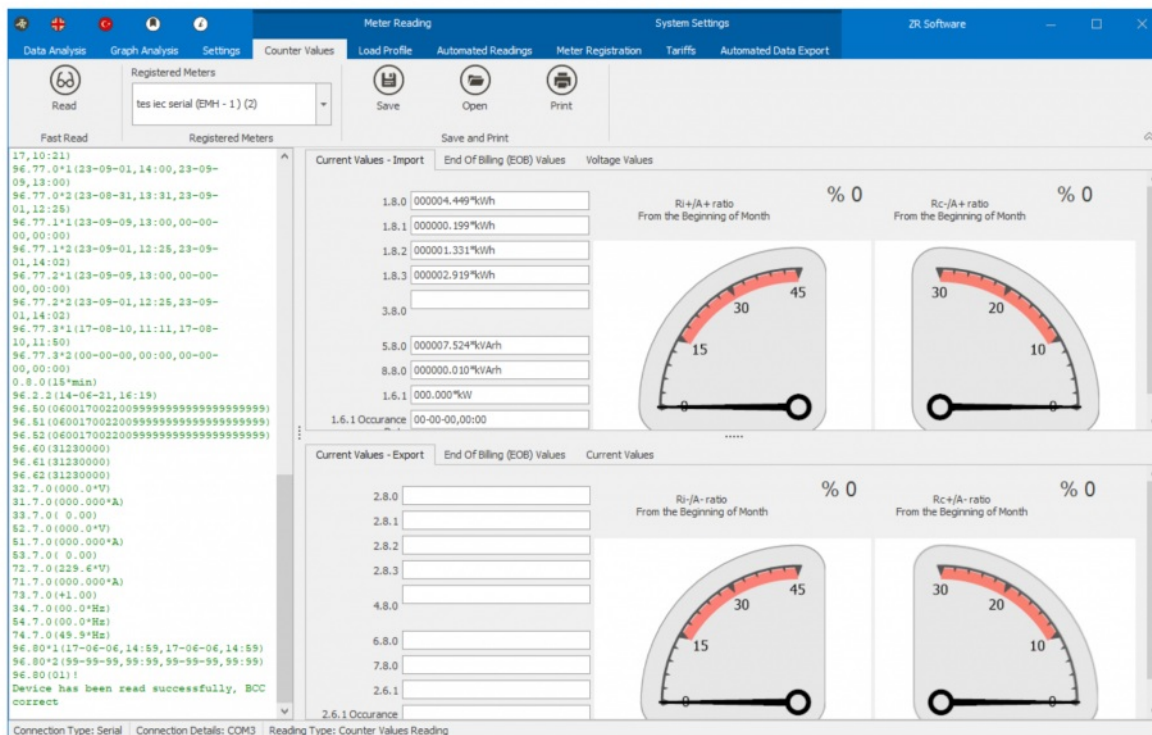
NOTE: If Bluetooth Low Energy (BLE) is enabled, you may see 2 devices in this list with same name. Please select the one that do not asks for PIN. Other one is for BLE.



Once the device is added to your computer, there will be 2 COM ports created. In this example COM3 and COM4 are created for PC. Please use COM port with smaller value which is COM3 in this example.



Here is an example reading via ZR Software with COM port 3.



6. Testing Command Mode

User can test Command mode of the probe with a terminal program. User should set the switch position to Mode 4 and power up probe before start testing.

In this example RealTerm (free open source terminal) software has been used. Open terminal, select COM port of probe and click connect.



NOTE: Connection is available only after the correct pairing of probe with your PC.

"Link" LED will turn ON continuously once the program connected to probe. Then user can communicate with the probe using different commands via terminal program.

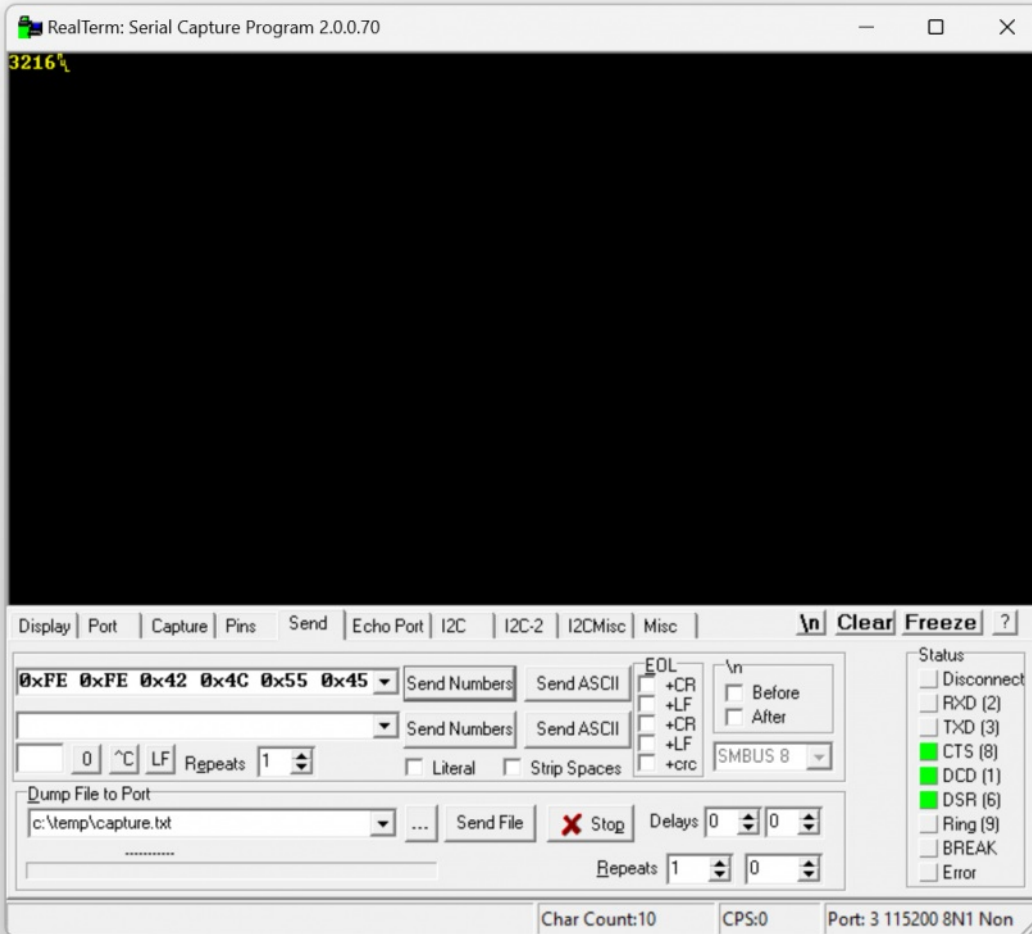
For example to read battery voltage of the probe user can send following byte Array to probe:

0xFE 0xFE 0x42 0x4C 0x55 0x45 0x30 0x38 0x4E 0x31 0xA1 0xFF

Copy and paste this command to terminal and click "Send Numbers", Probe will answer with battery voltage in mV.



NOTE: Command byte is last byte before 0xFF. Other bytes are fixed and do not change. To query the battery voltage, the command byte should be 0xA1.



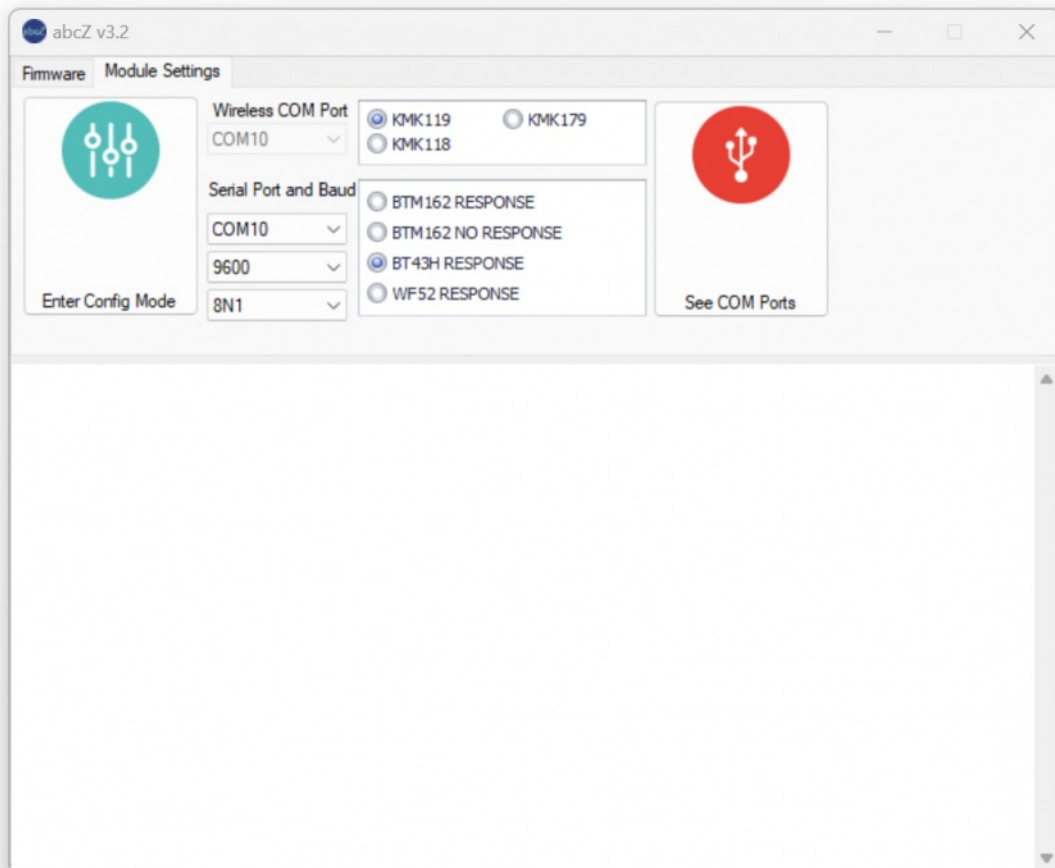
7. Enabling Bluetooth Low Energy (BLE)

In order to configure Bluetooth settings, additional optical probe is needed. So user should use USB service probe and place them against to each other



Steps for Preparation

1. Connect the USB optical probe to PC and detect the COM port
2. Set Bluetooth Probe to Mode 3: 9600 8N1 fixed baud rate
3. Power On the Bluetooth probe and place it on top of USB probe as shown in picture
4. Open abcZ Software



Steps for Configuration

1. Select USB probe com port and make sure with baud and data type settings: 9600 8N1
2. Select probe type "KMK119"
3. Select "BT43H Response"
4. Click "Enter Config Mode"
5. abcZ software will try to enter config mode through USB probe and it will show available settings

abcZ v3.2

Firmware

Module Settings



Enter Config Mode

Wireless COM Port

COM10

☒ KMK119

☐ KMK179

☐ KMK118

Serial Port and Baud

COM10

9600

8N1

☐ BTM162 RESPONSE

☐ BTM162 NO RESPONSE

☒ BT43H RESPONSE

☐ WF52 RESPONSE



See COM Ports

BT Device Address:
UART -> var02 BD_ADDR = 00043e5ca287
Valid values are: example -- 00043e241172

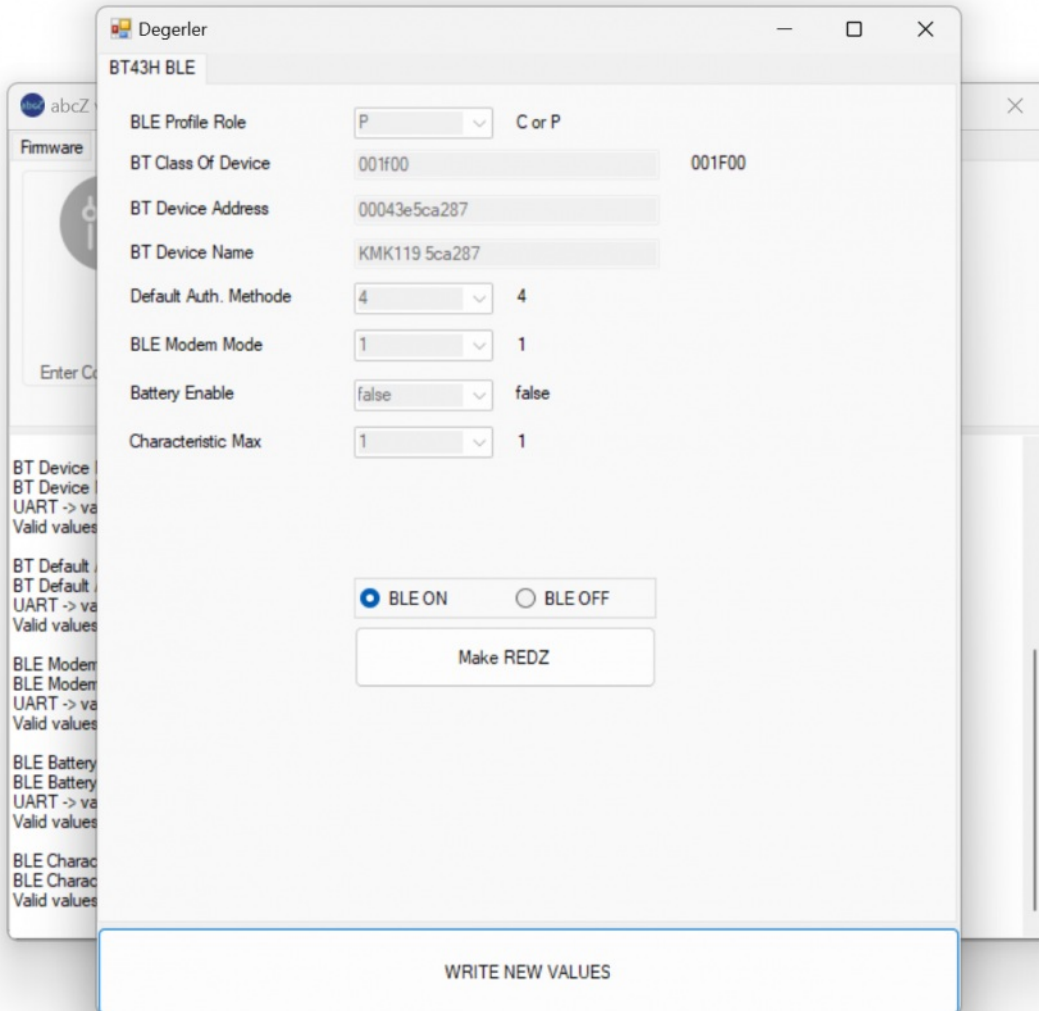
BT Device Name has been sent
BT Device Name:
UART -> var03 DeviceName = KMK119 5ca287
Valid values are: Any alphanumeric character string

BT Default Authentication has been sent
BT Default Authentication:
UART -> var29 DefaultAuth = 4
Valid values are: 0 - 255

BLE Modem Mode has been sent
BLE Modem Mode Authentication:
UART -> var61 BLEModemMode = 1
Valid values are: 0 - 255

BLE Battery Service Enable command has been sent
BLE Battery Service Enable:
UART -> var58 BatteryEnable = false
Valid values are: true, false, 1, or 0

BLE Characteristic Max command has been sent



NOTE: Device will be ready for configuration once the settings page opened

Device Settings

1. Simply select "BLE ON" and click "Write New Values".



NOTE: Click "Write New Values" when all settings are done. New settings will be written and device will restart. User can manually restart device as well.

After all settings done, user may use the probe as Bluetooth Low Energy Probe (BLE) in supported devices and applications.

(USB probe is still connected to PC and Bluetooth probe is still on top of it and set to Mode 3, no change until now with hardware and software setup)



NOTE: Please do not forget to set switch settings to desired position before using the probe in normal operation and after configuration.

Here is example reading via "LightBlue" app available on Google Play for BLE test on Android devices.

Enable Bluetooth of your device and Open app. Select KMK Bluetooth Low Energy (BLE) Probe from list and click connect.



PunchThrough

Enjoying LightBlue®?

Learn about our insights into BLE.

Email Address

SUBSCRIBE



-80dBm

LL D000 Q0 L010...

C8:7B:23:D4:54:18

CONNECT



-96dBm

Unnamed

2F:84:8A:06:03:CA

CONNECT



-99dBm

Unnamed

E4:C6:EF:D2:2A:5F

CONNECT



--- dBm

Unnamed

69:02:D0:C0:8B:19

CONNECT



-63dBm

KMK119 5ca287

00:04:3E:5C:A2:87

CONNECT



Scan



Bonded



Learn



Select the "Readable, Writable" service on bottom of screen.



KMK119 5ca287



Advertised name

KMK119 5ca287

Advertised service UUIDs

0000180f-0000-1000-8000-00805f9b34fb

Raw advertisement packet

0x02010203020F18020A000E094B4D4B313139203563
613238370E094B4D4B31313920356361323837000000
00

DEVICE INFORMATION

Device Address

00:04:3E:5C:A2:87

GENERIC ACCESS

Device Name

Readable



Appearance

Readable



26cc3fc0-6241-f5b4-5347-63a3097f6764

bf8796f1-64f7-70b5-1e41-09bb46d79100



Readable, Writable, Writable Without Response,
Notify

New window will be opened. Click "Subscribe" in this window and enter the command to send to meter. In this example we will send

/?!\\n

Which is opening command for IEC62056-21 Mode C.



bf8796f1-64f7-70b5-1e41-09bb4...



Writable

Able to be written to



Supports notifications/indications

Able to be subscribed to for notifications/indications on changes to the characteristic

Data format

UTF-8 String



READ/INDICATED VALUES

READ AGAIN

UNSUBSCRIBE

No value read recently

Tap on one of the buttons above — if available — to begin

WRITTEN VALUES

\b, \f, \n, \r, \t, \x00, \u0000 and \000 escape sequences are supported.

/?!\\r\\n|

WRITE

No value written recently

Input some data and tap on the "Write" button to begin

DESCRIPTORS

Client Characteristic Configuration

00002902-0000-1000-8000-00805f9b34fb

Place the probe on optical interface of meter and click "Write". Application will show meter response



bf8796f1-64f7-70b5-1e41-09bb4...

Tue Sep 12 15:26:33 GMT+03:00 2023

4

Tue Sep 12 15:26:33 GMT+03:00 2023

2

Tue Sep 12 15:26:33 GMT+03:00 2023

8

Tue Sep 12 15:26:33 GMT+03:00 2023

9

Tue Sep 12 15:26:33 GMT+03:00 2023

WRITTEN VALUES

`\b, \f, \n, \r, \t, \x00, \u0000` and `\000` escape sequences are supported.

`/?!\\r\\n`

WRITE

/?!

Tue Sep 12 15:26:32 GMT+03:00 2023

/?!

Tue Sep 12 15:26:17 GMT+03:00 2023

DESCRIPTORS