



TP-BT-Plus User Manual

Dear Customers,

Thank you for your purchase, and congratulations on choosing our product.

This patented Bluetooth Optical Probe has been designed to meet your expectations for compatibility with electricity, water, gas, and heat meters in compliance with IEC62056-21, ANSI, and ANSI-Type2 standards. It is manufactured using high-quality materials and undergoes strict quality control throughout the entire production process.

This user manual is provided to guide you in using and programming the device.

To ensure optimal performance and efficiency, we highly recommend that you read the entire user manual carefully before using the product. Please retain this manual for future reference. If you pass the product on to another user, kindly ensure the manual is included.

About TP-BT-Plus

TP-BT-Plus Bluetooth optical probe supports Classic Bluetooth and Bluetooth LE 5.4, with a low-power chip, the battery life is extended multiple times, lasting up to a month on a single charge. It features 30-minutes PD fastcharging, a Type-C port, an LED flashlight, and IP65 durability. With a silicone protective case and Bluetooth OTA updates, it is compatible with IEC, ANSI, and DL/T-645 protocols for global use. Certified by the Bluetooth SIG, our product ensures high quality and reliability.



Android



IOS



Bluetooth SPP+BLE



Identification



Protection IP65

Fig.1 Standard Support

Items in package

The package includes 5 configured accessories, which are also available as separate spare parts. For additional spare parts, please contact Tespro China. As these accessories are custom-designed, they cannot be supplied by other manufacturers.



(1)USB Charger Adapter



(2)Charger Cable



(3)Safety Strap



(4)USB Cable(Optional)



(5)Protective Case

Fig.2 Accessories

1. Charger Adapter

To charge the Bluetooth optical probe

2. Charger-Cable

Work as a charging cable

3. Safety Strap

To easily carry and to prevent accidental fall

4. USB Data Cable (Option)

To communicate when TP-BT-Plus works as an USB probe

5. Protective Case

Silicone protective cover, shockproof and drop-resistant, provides enhanced protection for the Bluetooth optical probe.

Overview

The TP-BT-Plus is a high-performance optical probe for smart metering, offering seamless data communication and calibration. Compact and user-friendly, it supports both USB and Bluetooth connectivity, featuring dual modes with BLE (Bluetooth Low Energy) for extended battery life and SPP (Classic Bluetooth) for versatile communication. Key features include long battery life, fast charging, IP65 waterproof rating with a Type-C charging port, built-in flashlight, and OTA wireless firmware upgrades. The device is equipped with a durable silicone protective cover for shock resistance, ensuring reliable performance. The TP-BT-Plus is the ideal tool for efficient meter testing, data management, and long-lasting performance.

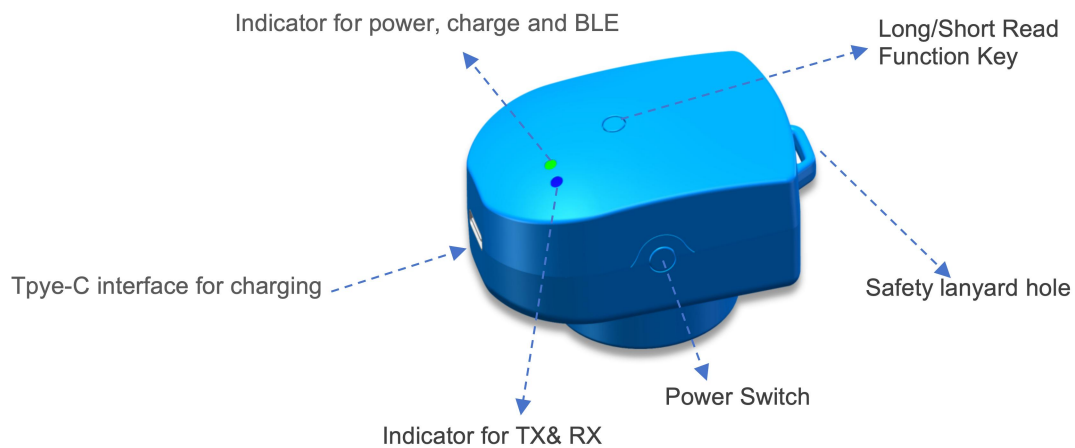


Fig.3 Component descriptions

Bluetooth Indicator Definitions

1. Probe States Indicator:

- Standby: When power-on the power indicator lights up in green.
When the device is powered on, a single green light flash indicates that the current operating mode is Classic Bluetooth (SPP). If there is no flash, the current operating mode is Low Energy Bluetooth (BLE).
- 5 seconds after startup, the green light enters the connection detection status. If the optical probe is not connected, the green light will flash at 1-second intervals. Once the Bluetooth connection is established, the green light will remain steadily on.
- Communication: During communication the green LED stays on.

2. Power Switch

- A short press and hold for 1 seconds will make the green light remain on, indicating that the device has finished powering on.
- A short press and hold for 10 seconds will cause the green light to turn off, indicating that the device has finished powering off.
- Automatic shutdown: The device will automatically power off if there is no communication for 5 minutes (shutdown time can be configured).

3. Flashlight Function:

- Double-click the power button to turn on the flashlight mode.
- Double-click the power button to turn off the flashlight.

4. Indicator for power & charging

- Charging: During charging the power indicator turns red.
- During charging, the green light will be off. Once charging is complete, the red light will turn off, and the green light will resume normal indication.

5. Indicator for communication

- The blue & yellow lights is the data transmission indicator, The blue light will flash when the optical probe is sending data, and the yellow light will flash when it is receiving data.

6. USB Type-C port for charging

- A. Interface for charging
- B. Interface to let TP-BT-Plus work as USB probe using data cable

7. Battery indication and charging

Power-on and battery states can be indicated by the red LED:

- When the probe power on the red LED lights up in different conditions to show the remains of energy in battery:
 1. If the battery level is above 30%, the red light will not be illuminated.
 2. If the battery level is between 20% and 30%, the red light will flash 3 times.
 3. If the battery level is between 10% and 20%, the red light will flash 2 times.
 4. If the battery level is between 0% and 10%, the red light will flash 1 time.

8. Charging

- The red light turns on, and the green light turns off.
- Once complete, the red light turns off, and the green light resumes its normal sampling state .

9. Two Different Bluetooth Modes at Startup:

- If the green LED remains on, the startup mode is BLE (Bluetooth Low Energy).
- If the green LED flashes once, the startup mode is SPP (Serial Port Profile, Classic Bluetooth).

10. Bluetooth Probe Pairing in BLE mode

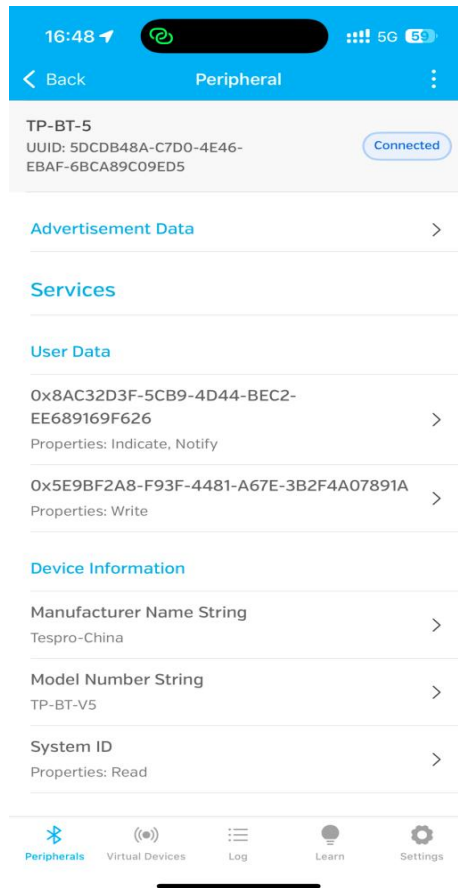


Fig.4 Bluetooth Probe Pairing in IOS System (BLE mode)

Note: BLE Service List:

User Data: UUID = 181C Includes:

- Data Subscription Reception Service: UUID = 0x8AC32D3F-5CB9-4D44-BEC2-EE689169F626
- Data Writing and Sending Service: UUID = 0x5E9BF2A8-F93F-4481-A67E-3B2F4A07891A

Device Information: UUID = 180A Includes:

- Manufacturer Name String: UUID = 2A29
- Model Number String: UUID = 2A24
- System ID: UUID = 2A23

Battery Service: UUID = 181C Includes:

- Battery Level: UUID = 2A19

OTA Service: UUID = AE5D1E47-5C13-43A0-8635-82AD38A1381F Includes:

- Data Subscription Reception Service: UUID = 0xA3DD50BF-F7A7-4E99-838E-570A086C661B
- Data Sending Service: UUID = 0xA2E86C7A-D961-4091-B74F-2409E72EFE26

Technical Specifications

Items	Features
Communication Interface	BLE and SPP dual-mode
Supported Standard	IEC-62056, ANSI, and DL/T-645 protocols, fitting global meter standards
Battery Feature	800 mAh (Optional)
Battery Charging Time	30 mins-2C PD Fast Charge
Computer Communication Port	Type C- USB 3.0/ OTG
Sensor Light Wave Length	~ 900 nm.
Number Of Keys	1 Keys (Power)
LED Indicators	4 LEDS (Power/ Communication/ Charg/ BLE)
Magnet Holding Power	N40 / N54 (Optional)
Maximum Data Rate	57600 in normal and max.115200 available
USB Connection Optical Probe Model	Supported(Add Data Cable)
Width & Height	31,5 mm / 33,5 mm
Weight	65 gr
Transparent Communication Mode	IEC 62056-21 Mode C / Mode E /User Mode
Smart Communication Mode	There is (IEC 62056-21 Mode C / Mode E)
Maximum Frame Length(MTU)	512 bytes
Silicone Protection	Yes (Included)
Safety Strap	Yes (Included)
Working Environment	-40 ° C - +70 ° C
Enclosure Material	PC
Protection Class	IP 65
Firmware And Configuration Update	OTA
Working Days	Max 100 hours
Standby Time	~ 1 Year
LED Flashlight	Yes (Include)
Auto power-off	Default auto power-off after 5 minutes (adjustable)

Bluetooth Device AT Commands

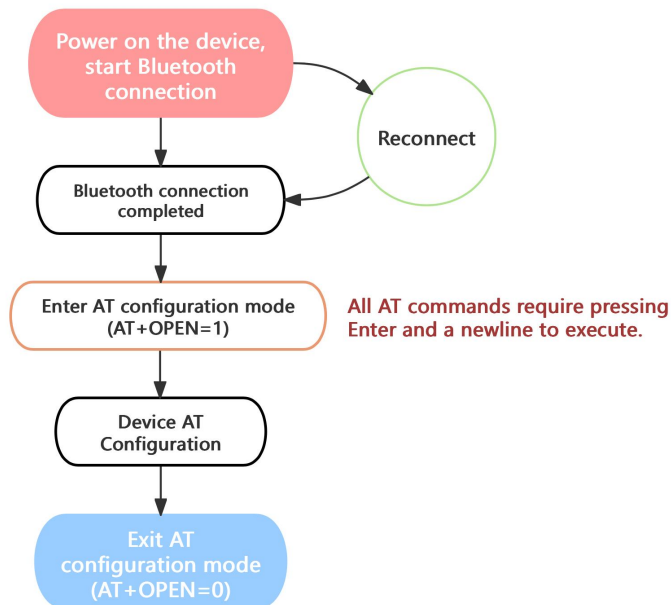


Fig.5 AT Mode

The TP-BT-Plus optical probe supports an integrated AT protocol stack for configuring internal parameters. By default, the AT command support is disabled. To enable the AT command support, you need to send the following command via Bluetooth: `at+open=1\r\n`. Once the probe receives this command, it will return: `ok`, This indicates that the AT command support has been enabled.

Note:

Each AT command must end with a carriage return and newline (`\r\n`: 0x0D 0x0A). If you're unsure how to use the commands, simply enter: `at+help\r\n`

The device will return help information.

Help Command: `at+help\r\n`

Return: [Help Information]

1. Enable/Disable AT Configuration Mode

When this expression is sent, the device enters or exits the AT configuration mode. When enabled, the device is ready to accept and execute AT commands for configuration. When disabled, the device stops accepting AT commands.

- ✧ Expression: `CMD("AT+OPEN=1")`
- ✧ Positive Feedback: `RESPONSE:"OK"`

2. AT Command Help

When this expression is sent, the device will display a list of available AT commands.

- ✧ Expression: CMD("AT+HELP")
- ✧ Positive Feedback: RESPONSE:"[list of commands]"

3. AT Test Command

This expression checks if the device is responsive.

- ✧ Expression: CMD("AT")
- ✧ Positive Feedback: RESPONSE:"OK"

4. Current Parameter Query

When this expression is sent, the device returns the current sleep time setting.

- ✧ Expression: CMD("AT+SLEEPTIME=?")
- ✧ Positive Feedback: RESPONSE:"AT+SLEEPTIME=3000"

5. Enable/Disable Logs

When this expression is sent, it either enables or disables the logging on the device.

- ✧ Expression: CMD("AT+TRACE=1")
- ✧ Positive Feedback: RESPONSE:"OK"
- ✧ Expression: CMD("AT+TRACE=0")
- ✧ Positive Feedback: RESPONSE:"OK"

6. Enable/Disable BLE Mode

When this expression is sent, it either enables or disables Bluetooth Low Energy (BLE) mode.

- ✧ Expression: CMD("AT+BLEOPEN=1")
- ✧ Positive Feedback: RESPONSE:"OK"
- ✧ Expression: CMD("AT+BLEOPEN=0")
- ✧ Positive Feedback: RESPONSE:"OK"

7. Enable/Disable SPP Mode

When this expression is sent, it either enables or disables the Serial Port Profile (SPP) mode.

- ✧ Expression: `CMD("AT+SPPOPEN=1")`
- ✧ Positive Feedback: `RESPONSE:"OK"`
- ✧ Expression: `CMD("AT+SPPOPEN=0")`
- ✧ Positive Feedback: `RESPONSE:"OK"`

8. Query/Modify BLE Name

When this expression is sent, it queries or sets the Bluetooth name of the device.

- ✧ Expression: `CMD("AT+BLENAME=?")`
- ✧ Positive Feedback: `RESPONSE:"AT+BLENAME=TP-BT-5"`
- ✧ Expression: `CMD("AT+BLENAME=TP-BT-5")`
- ✧ Positive Feedback: `RESPONSE:"OK"`

9. Query/Modify SPP Name

When this expression is sent, it queries or sets the SPP name of the device.

- ✧ Expression: `CMD("AT+SPPNAME=?")`
- ✧ Positive Feedback: `RESPONSE:"AT+SPPNAME=TP-BT-3"`
- ✧ Expression: `CMD("AT+SPPNAME=TP-BT-3")`
- ✧ Positive Feedback: `RESPONSE:"OK"`

10. Enable/Disable/Query/Set BLE Password

When this expression is sent, it enables, disables, queries, or sets the BLE password.

- ✧ Expression: `CMD("AT+BLEPINOPEN=1")`
- ✧ Positive Feedback: `RESPONSE:"OK"`
- ✧ Expression: `CMD("AT+BLEPINOPEN=0")`
- ✧ Positive Feedback: `RESPONSE:"OK"`
- ✧ Expression: `CMD("AT+BLEPIN=?")`
- ✧ Positive Feedback: `RESPONSE:"AT+BLEPIN=123456"`
- ✧ Expression: `CMD("AT+BLEPIN=123456")`
- ✧ Positive Feedback: `RESPONSE:"OK"`

11. Enable/Disable/Query/Set SPP Password

When this expression is sent, it enables, disables, queries, or sets the SPP password.

- ✧ Expression: CMD("AT+SPPPINOPEN=1")
- ✧ Positive Feedback: RESPONSE:"OK"
- ✧ Expression: CMD("AT+SPPPINOPEN=0")
- ✧ Positive Feedback: RESPONSE:"OK"
- ✧ Expression: CMD("AT+SPPPIN=?")
- ✧ Positive Feedback: RESPONSE:"AT+SPPPIN=1234"
- ✧ Expression: CMD("AT+SPPPIN=1234")
- ✧ Positive Feedback: RESPONSE:"OK"

12. Query/Set Transmit Power Level (0/1/2/3/4)

When this expression is sent, it queries or sets the transmit power level of the device.

- ✧ Expression: CMD("AT+TXPOWER=?")
- ✧ Positive Feedback: RESPONSE:"AT+TXPOWER=4"
- ✧ Expression: CMD("AT+TXPOWER=4")
- ✧ Positive Feedback: RESPONSE:"OK"

13. Query/Set Broadcast Power Level (0/1/2/3/4)

When this expression is sent, it queries or sets the broadcast power level of the device.

- ✧ Expression: CMD("AT+ADVTXPOWER=?")
- ✧ Positive Feedback: RESPONSE:"AT+ADVTXPOWER=4"
- ✧ Expression: CMD("AT+ADVTXPOWER=4")
- ✧ Positive Feedback: RESPONSE:"OK"

14. Query/Set UART Communication Parameters

When this expression is sent, it queries or sets the UART (Universal Asynchronous Receiver/Transmitter) communication parameters.

- ✧ Expression: CMD("AT+SETUART=?")
- ✧ Positive Feedback: RESPONSE:"AT+SETUART=9600,N,8,0"
- ✧ Expression: CMD("AT+SETUART=9600,N,8,0")
- ✧ Positive Feedback: RESPONSE:"OK"

15. Query/Set Broadcast Time

When this expression is sent, it queries or sets the broadcast time.

- ✧ Expression: CMD("AT+BROADCASTTIME=?")
- ✧ Positive Feedback: RESPONSE:"AT+BROADCASTTIME=300"
- ✧ Expression: CMD("AT+BROADCASTTIME=300")
- ✧ Positive Feedback: RESPONSE:"OK"

16. Query/Set Sleep Time

When this expression is sent, it queries or sets the sleep time parameter.

- ✧ Expression: CMD("AT+SLEEPTIME=?")
- ✧ Positive Feedback: RESPONSE:"AT+SLEEPTIME=300"
- ✧ Expression: CMD("AT+SLEEPTIME=300")
- ✧ Positive Feedback: RESPONSE:"OK"

17. Query/Enable/Disable Stop Broadcasting After Connection

When this expression is sent, it queries or enables/disables the automatic stopping of broadcasting after a connection is established.

- ✧ Expression: CMD("AT+CNTSTOPADV=?")
- ✧ Positive Feedback: RESPONSE:"AT+CNTSTOPADV=1"
- ✧ Expression: CMD("AT+CNTSTOPADV=1")
- ✧ Positive Feedback: RESPONSE:"OK"
- ✧ Expression: CMD("AT+CNTSTOPADV=0")
- ✧ Positive Feedback: RESPONSE:"OK"

18. Enable/Disable LANDIS+GYR Protocol

When this expression is sent, it enables or disables the LANDIS+GYR protocol.

- ✧ Expression: CMD("AT+LG=1")
- ✧ Positive Feedback: RESPONSE:"OK"
- ✧ Expression: CMD("AT+LG=0")
- ✧ Positive Feedback: RESPONSE:"OK"

19. Enable/Disable IRDA Mode

When this expression is sent, it enables or disables IRDA (Infrared Data Association) mode. This feature requires special customization

- ✧ Expression: CMD("AT+IRDA=1")
- ✧ Positive Feedback: RESPONSE:"OK"
- ✧ Expression: CMD("AT+IRDA=0")
- ✧ Positive Feedback: RESPONSE:"OK"

20. Enable/Disable Bad Device Address

When this expression is sent, it enables or disables the mobile device serial number that the adapter can be paired to.

- ✧ Expression: CMD("AT+BDAOPEN=1")
- ✧ Positive Feedback: RESPONSE:"OK"
- ✧ Expression: CMD("AT+BDAOPEN=0")
- ✧ Positive Feedback: RESPONSE:"OK"

21. Query/Set Bad Device Address

When this expression is sent, it queries or sets the Bad Device Address (BDA).

- ✧ Expression: CMD("AT+BDA=?")
- ✧ Positive Feedback: RESPONSE:"AT+BDA=fffffffffff"
- ✧ Expression: CMD("AT+BDA=fffffffffff")
- ✧ Positive Feedback: RESPONSE:"OK"

22. Query/Set Maximum Frame Buffer Size

When this expression is sent, it queries or sets the maximum frame buffer size. This feature is not recommended for ordinary users.

- ✧ Expression: CMD("AT+FRAMEMAX")
- ✧ Positive Feedback: RESPONSE:"AT+FRAMEMAX=256"
- ✧ Expression: CMD("AT+FRAMEMAX=256")
- ✧ Positive Feedback: RESPONSE:"OK"

23. Query/Set Minimum Frame Buffer Size

When this expression is sent, it queries or sets the minimum frame buffer size. This feature is not recommended for ordinary users

- ✧ Expression: CMD("AT+FRAMEMIN=?")
- ✧ Positive Feedback: RESPONSE:"AT+FRAMEMIN=64"
- ✧ Expression: CMD("AT+FRAMEMIN=64")
- ✧ Positive Feedback: RESPONSE:"OK"

24. Restore factory settings

When this expression is sent, it restore the device.

- ✧ Expression: CMD("AT+RESET")
- ✧ Positive Feedback: RESPONSE:"OK"

25. Save Parameter settings

When this expression is sent, the device will write the modified parameters into Flash for permanent storage

- ✧ Expression: CMD("AT+SAVEPAR")
- ✧ Positive Feedback: RESPONSE:"OK"

26. Save Meter Info

When this expression is sent, the device will write the modified Meter info into Flash for permanent storage. (About Meter Info see the following introduction)

- ✧ Expression: CMD("AT+SAVEMETER")
- ✧ Positive Feedback: RESPONSE:"OK"

27. Save Data Point settings

When this expression is sent, the device will write the modified Data Point into Flash for permanent storage. (About Data Point see the following introduction)

- ✧ Expression: CMD("AT+SAVEDP")
- ✧ Positive Feedback: RESPONSE:"OK"

Meter Information Settings

TP-BT-Plus supports automatic meter reading via buttons, including data reading via protocols such as IEC-62056-21, DLMS, ANSI, and Modbus. In order to achieve automatic meter reading, TP-BT-Plus supports storage of protocol information, communication keys, and other parameters for 32 types of meters. When TP-BT-Plus reads meters, it can make judgments based on the stored meter information and use different communication keys for communication, achieving automatic meter reading.

Command Format Explanation:

`AT+METER=[idx(1~32)]@[ID][Protocol][ReadType][PwdLevel][Password][AutoTaskList-1][AutoTaskList-2][Meter-Info]`

- Cmd: `AT+METER`
- Data Index: `idx` – up to 32 groups, numbered 1 to 32.
- Meter ID: meter address, eg:50875068
- Meter Protocol: `Protocol type`
 - ✧ 0: IEC-62056-21
 - ✧ 1: DLMS
- Read Type: `ReadType`
 - ✧ 1: IEC-62056-21-R5
 - ✧ 2: IEC-62056-21-R2
 - ✧ 3: IEC-62056-21-Readout
- Password Level: `PwdLevel`
 - ✧ 0: P0 password
 - ✧ 1: P1 password
 - ✧ 2: P2 password
- Communication Password: `Password` – 8-digit password, eg:12345678
- Task List 1: `AutoTaskList-1` – Each task corresponds to one OBIS data index. Please refer to the OBIS data settings for specific OBIS data.
- Task List 2: `AutoTaskList-2` – Each task corresponds to one OBIS data index. Please refer to the OBIS data settings for specific OBIS data.
- Meter Info: `Meter-Info` – The meter information returned by the meter after receiving `/?!`.
- Sample Command:

`AT+METER=1@50875068|0|1|1|00000000|1,2,3,4,5,6,7|1,2,3,4,5,6,7,8,9,10,11,12|ZMD4104407.B32`

Meter Data Point Settings

According to the IEC-62056 protocol standard, each meter manufacturer sets the meter data to different OBIS. A country usually has dozens of meters, so different data point configurations are required to collect different meters. TP-BT-Plus supports corresponding data collection for meters by configuring data point information, realizing unified collection of data from different meters. After setting up the meter data point settings, the task list within the meter data group needs to be associated with OBIS data. The device supports up to 32 OBIS data settings.

Command Format Explanation:

`AT+DP=[idx(1~32)]@[OBIS][UNIT][DataType][Factor][UploadID][Desc]`

- Cmd: `AT+DP`
- OBIS Index: `idx` – up to 32 groups, numbered 1 to 32. This index corresponds to the task list index in the meter data group.
- OBIS Data: `OBIS` – Defined by the meter manufacturer. Please refer to the meter datasheet for specific OBIS codes.
- Unit: `UNIT` – The unit of measurement for the OBIS data. For example, the unit for active energy might be kWh.
- Data Type: `DataType`
 - ✧ 0: String / STRING
 - ✧ 1: Hexadecimal / HEX
 - ✧ 99: Reserve
- Decimal Places: `Factor` – The number of decimal places for the data item.
- Upload ID: `UploadID` – The OBIS code definition, for example, OBIS code 0.9.0 represents meter time and could be defined as `TIME`.
- Upload ID Description: `Desc` – A description or explanation of the upload ID.
- Sample Command: `AT+DP=1@0.9.0|kwh|0|0|TIME|Meter Time`

Firmware Update

The TP-BT-Plus optical probe supports Over-the-Air (OTA) wireless firmware updates. If the customer requires adjustments or improvements to the probe's firmware, they can contact Tespro China for custom firmware solutions. Once the latest firmware is provided, customers can use the OTA method for upgrading. We offer professional OTA update tools, which support both Android and iOS platforms.

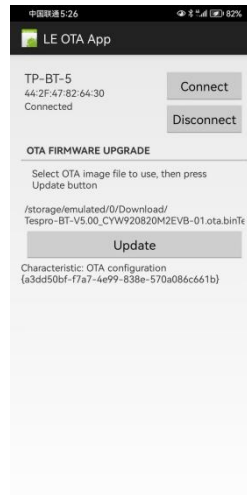


Fig. 5: Bluetooth Probe OTA Tools (BLE mode)

Application SDK

The TP-BT-Plus optical probe provides BLE SDK and OTA SDK examples for both Android and iOS. These are Java source code samples that allow customers to quickly integrate Bluetooth functionality into their own applications.