SumiMet SMT-80300

SumiMet

Intelligent Digital Thermometer

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1 Introduction

The SPMK361 smart digital thermometer is a powerful portable precision digital temperature measuring instrument,which suitable for temperature measurement in a variety of touchable measuring temperature fields. With its high accuracy, easy to use, intuitive reading, easy to carry, safety and environmental protection, powerful features are very suitable for laboratory and field use. It integrates the general application of the majority of users, but also provides a variety of additional functions, such as: temperature peak record, temperature file record, temperature change rate, average and other auxiliary display, temperature display lock, resolution, unit main interface switch, flexible choice of communication mode, etc.. In addition, it adopts large-capacity rechargeable lithium battery and external universal mobile phone adapter, charging bank, PC USB port and other power supply technology, to solve the problem of long time use and convenient charging. Built-in ZigBee module, together with ZigBee coordinator to facilitate on-site networking, communication security, also can be extended to external Wi-Fi module network convenient remote data collection. Widely used in aviation, aerospace, military, metallurgy, electric power, petroleum, chemical, food, pharmaceutical, measurement institutions and instrument manufacturing enterprises and other units of the measurement department of the calibration of instruments and meters.

2 Specifications:

Model	Temperature Measurement Range	Sensor	Accuracy	Calibrating Period
SPMK361 – 160A/B	-80℃~160℃	Pt100（385）	±0.05℃/±0.1℃	One Year
SPMK361 - 300 A/B	-60℃~320℃	Pt100（385）	±0.05℃/±0.1℃	One Year
SPMK361 - 600 A/B	-30℃~600℃	Pt100（385）	±0.05℃/±0.1℃	One Year
SPMK361 - 1200 A/B	Room Temperature~1200℃	Pt385、TC-S/TC-K	（Room Temperature + 20 ℃ to upper limit）±3℃/±3℃	One Year
SPMK361 – 60A/B	-10℃~50℃	Pt1000（385）	±0.010℃/±0.020℃	One Year

3 Safety Instructions

Comply with the safety regulations for all electronic equipment.

Do not use in dangerous environment such as explosive gas, steam or dust.

External power supply, charging voltage is not higher than DC10V, the ambient temperature is not higher than 40℃.

The non-contact part of the instrument and temperature field shall not be placed in a high temperature environment (Lower than 60 ℃).

Do not frequently switch between large temperature fields.

Please pay attention to probe temperature, avoid scald frostbite, safe placement, standard use.

Please do not disassemble or assemble this instrument without permission.

4 Technique Data

4.1 Operational Environment

Ambient temperature :(-10~50) ℃, charging should be lower than 40℃;

Relative humidity: ≤90%RH;

Air pressure :(86~101) kPa.

4.2 Storage Environment

Ambient temperature :(-10～60) ℃;

Relative humidity: ≤90%RH;

Air pressure :(86～101) kPa.

4.3 Technical Parameters

1）Power:

Built-in 3.7V-3000mah Li-ion battery,safe and pollution-free,cycle life of more than 1000 times,4000h power-off state, wireless communication and backlight, closed state battery can be used continuously: 1500h (sampling period 3S), 1200h (sampling period 2S), 1000h (sampling period 1S).

Specific functions are switched on and off in different situations during use, and the duration of single battery use varies. The average peak current of ZigBee module transmission is 30mA, and the overall average current varies according to the hibernation time. The average current of Wi-Fi communication is 110mA, and the backlight current is 10-20mA.

Please recharge in time before using the product for a long time. USB Type-C interface is used for convenient charging. The charging voltage is DC5V, not lower than DC4.5V, not higher than DC10V, and the charging time is 2.5-6 hours (depending on the power supply current of the USB port, it is recommended to use the output current of the adapter to be greater than or equal to 1000mA).

2）Sensors：

Thermal resistance indexing Pt100 (385), stability 0.010 Ω/year, diameter 6mm, length 350mm/450mm/480mm.

Thermocouple model S or K.

Under the strict quality control of materials and process, the product has excellent long-term stability, ensuring the accuracy of temperature measurement from 1 year (long-term limit temperature measurement state) to longer calibration cycle.

3）Accuracy：

Refer to product specifications.

4）Overtemperature:

With overtemperature alarm function (display).

Negative temperature part of thermal resistance -85℃（SPMK361 -- 160A/B), -65℃（SPMK361 -- 300A/B), -35℃（SPMK361 -- 600A/B).

The positive temperature part is 190℃（SPMK361 -- 160A/B), 330℃（SPMK361 -- 300A/B), 630℃（SPMK361 -- 600A/B).

Thermocouple low temperature -30℃, high temperature 1250℃.

5）Communications:

Built-in ZigBee module to achieve secure and controllable communication.

USB to UART and communication with the host computer, or USB port connected to wi-fi module to achieve wireless communication.

The baud rate of the UART serial port ranges from 2400 to 115200. The address range is from 1 to 120. The data format is 8/N/1.

6) Calibration Method:

Support CVD calibration and ITS-90 calibration, or direct temperature point correction method calibration, provide not less than 2 correction points (2-38 points).

7) Documentation:

Time files attached to data can be stored in 248 groups (each group contains 22 files), and files without time can be stored in 248 groups (each group contains 40 files).

Table number, measuring range, unit and temperature accuracy level can be set for each group, which can be automatically stored according to the set recording interval (2S -- 60min).

Temperature curve can also be recorded by upper computer or server through communication.

8) Temperature Display:

℃/K/℉ units,Resolution 1/0.1/0.01/0.001 freely switch

9) Calendar Time:

Provide the time of the file record to ensure the accurate history of the file. Please check the time after the shutdown and restart.

10) Range and Alarm:

User adjustable range and alarm range (adjusted within the factory range and alarm range).

11) Sampling time:

AD sampling 0.5s - 3s this parameter is configurable.

ZigBee data is sent within 0S to 250s.

USB communication data can be collected in real time, and the automatic transmission time is 1s.

12) Backlight:

Backlight level 7 (including off) is adjustable, backlight time 5s-10min can be set.

Key operation on the main interface will reset the backlight time.

13) Sleep and Shutdown:

Optional hibernation and auto shutdown Settings.

The sleep time can be set 10s-60min, and the automatic shutdown time can be set 5min-8h.

14) Auxiliary display of peak value, average value and rate value:

Optional auxiliary display, display interval 10s-30min can be set.

When the auxiliary display is enabled, the maximum value, minimum value, average value within 15S and current rate value will be displayed in turn in the main display area when the interval is up.

Rotation time: 1.25s.

15) Trend Indicator:

The trend indicator is always on, and the temperature mutation, change trend and stability have a good visual embodiment.

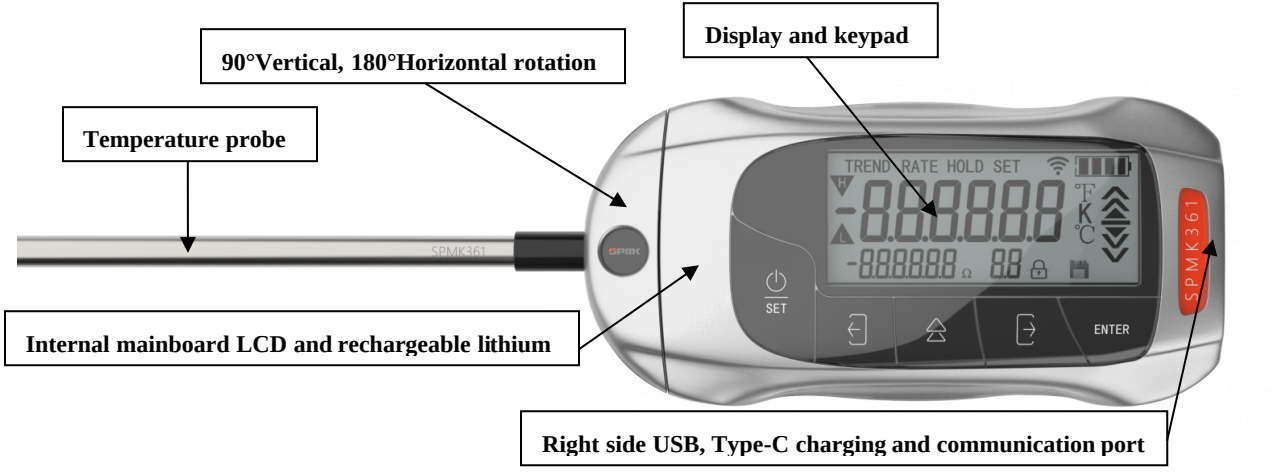
16) Display:

LCD broken code display, display more rich content.

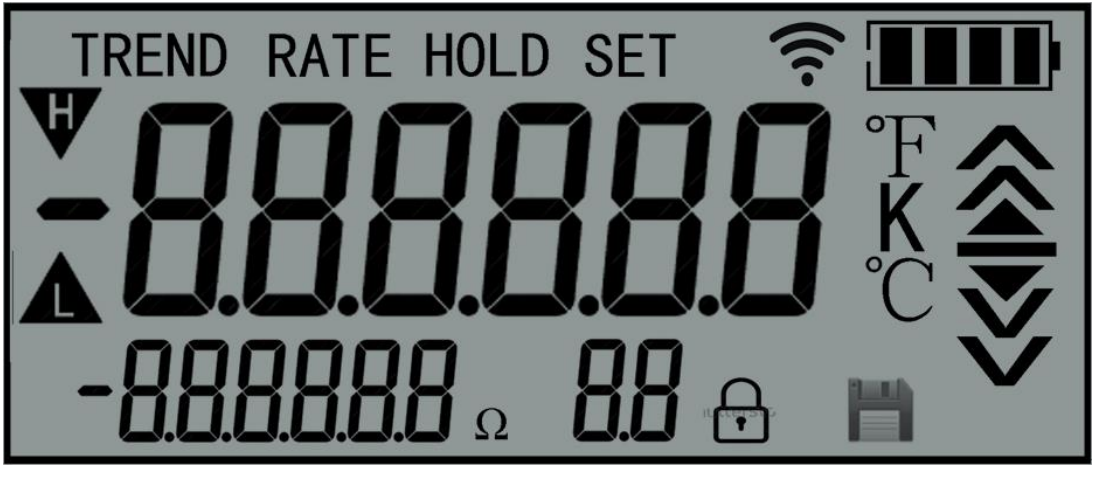
5 Structure and Function

5.1 Basic Structure

It is a temperature measuring instrument with LCD display,key operation,data storage,communication and other functions after digital processing of the sensor probe and analog to digital conversion circuit by single chip microcomputer.



5.2 LCD



5.3 Key

5 touch keys:

Switch on/off (menu key, exit key), left key, up key, right key, OK key, excellent touch, easy to operate.

Key Symbol	Function	Note
	On/off button, menu/Exit button	
	Left Key	Trend-opening indicator
	Up Key	
	Right Key	Trend-opening indicator
	OK Key	

6 Operation and Settings

6.1 Basic Operation

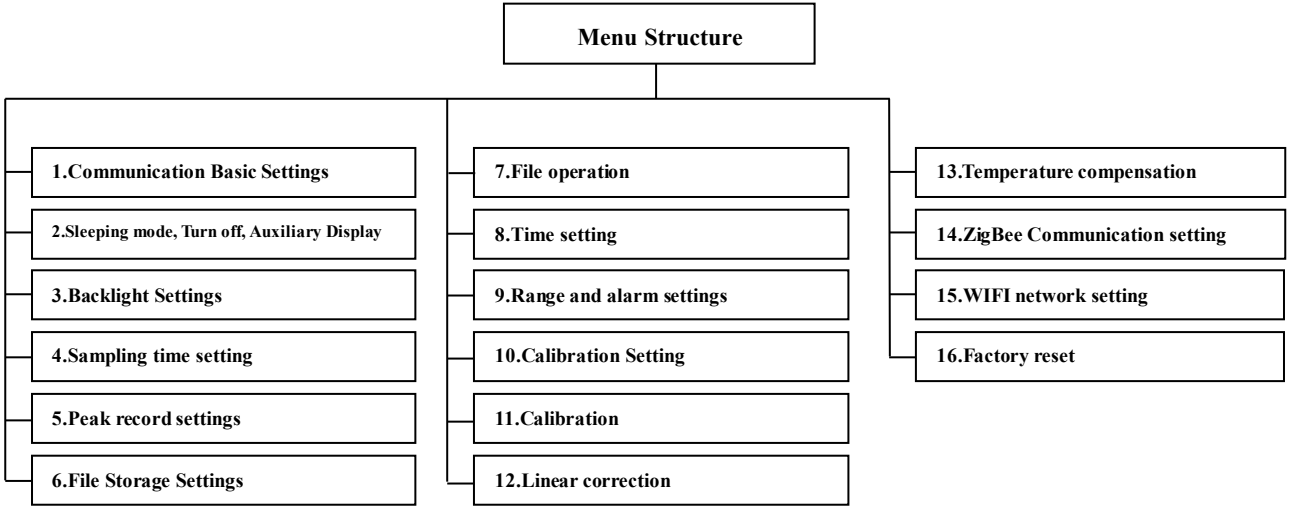
1）When the power is off, press the power button to turn it on, full screen display, display range for 2.5S, display battery voltage (main display twice within 3S, if the value is lower than 1700, please charge in time), PA voltage (auxiliary display twice within 3S, the value is greater than 1500 is the normal charging state), enter the temperature measurement interface.

2）The temperature measurement interface displays the trend (TREND) open mark, the right side shows the trend change, and the stable (HOLD) mark is displayed when the measured temperature tends to be stable; the main display is the current measured temperature and unit (℃/K/℉), the auxiliary display area displays the mainboard temperature (the unit is fixed at °C, only used as a reference for the board temperature, with an error of ±2°C), and the auxiliary display area displays the ZigBee module status in two digits. the wireless icon flashes when searching the network; the floppy disk icon is displayed when the file timing storage is turned on; the upper right corner shows the battery level and charging status. Press the left key for 1S to change the display digits, press the right key for 1S to change the main display unit. When the file storage function is on, press the up key for 1S to store the current measurement value as a file, press the OK key for 1S to lock the screen (the main display is locked, the auxiliary display is displayed for temperature measurement value, in this state, press the OK key for 1S to unlock the screen), press the switch key for 1S to enter the menu, and pressure it for longer than 4S to turn off.

3)The double-digit display area of the menu interface displays the main menu, the auxiliary display area displays the secondary menu, and the main display area displays the contents and options of the third-level menu or the secondary menu. The up key switches menu, the

left and right keys switch the main and sub menus, enter and exit the main and sub menus, the confirm key is the selection key, and the turn on and off key is the exit key. During numerical input: long press the left button to shift the decimal point, long press the right button to switch the positive and negative signs.

6.2 Menu Structure



6.3 Communication Basic Settings (menu 1) (Expandable)

6.3.1 Communication setting

Press for 3 S，enter the communication setting state 1-PAtH. Press to confirm，The communication method can be selected and set by pressing .

oFF ：Communication turn off

PC-Con：Serial communication

2I 9bEE：zigbee Communication

WI FI ：WIFI Communication

PC--2b：Serial ZIGBEE

2b-WFI ：WIFI and ZIGBEE

6.3.2 Serial port baud rate setting

Enter the serial port baud rate setting state 2-bAUd,baud rate can be set of 2400、4800、9600、14400、19200、38400、43000、57600、76800、115200。

6.3.3 Local address setting -this instrument 3-AddY

Local address setting range 1~120

6.4 Sleeping mode, Turn off, Auxiliary Display (Menu 2)

1） Sleeping mode setting： by pressing and to sleep mode SLEEP。

2） Turn off：Switch to shutdown setting state SHUtd。

3） Auxiliary display setting: 3dI SPL

In the above three setting states, the turing on, off and waiting time of related functions can be set.

oPtI on on，oPtI on off;

oPtI on waiting time setting S-tI ME：

oPtI on Sleeping waiting time（10~3600）S;

oPtI on Turn off waiting time（300～28800）S;

oPtI on Auxiliary display waiting time setting（10～1800）S.

6.5 Backlight Settings (Menu 3)

1） Backlight level setting bLLEv Backlight Off（0）、Level 1、 … 、Level 6

2） Backlight time setting 2tI ME Backlight time range：（5～600）S

6.6 Sampling time setting（Menu 4）

Backlight time setting SAMPLE：range（0.5～3）S。

Note: The timing period is 0.125S, please set it as an integer multiple of 0.125S, other values have errors.

6.7 Peak record settings（Menu 5）

Peak record PEEKSW， You can choose ON or OFF

Lowest peak recorded PEEK-L

Highest peak recorded PEEK-H

Left and right keys reset the peak value to the current measured value

6.8 File Storage Settings（Menu 6）

Enter the sixth menu, file storage

1） File storage FILESW, You can choose to turn on and off the file storage function.

ON file storage function turn on, Automatic storage according to storage interval.

OFF file storage function turns off.

2） Storage area for file settings F-TYPE, file storage format is optional.

LonG long format file area; SHoRt short format file area

3） File auto-storage interval F-TIME, time range set（3～3600）S

4） File storage table number setting STABLE ,the setting number should be≥100000。

5） File storage accuracy setting SPRdE， range 0.01 to 2.50.

Two decimal places, excess digits rounded.

6） File storage unit setting S-UNIT，

UNIT-C is ℃；UNIT-K is K； UNIT-F is ℉。

7） File storage range lower limit setting S--LMT, setting range (-200℃ ~ 3200) ℃.

8） File storage range Higher limit setting S--HMT, setting range (-200℃ ~ 3200) ℃.

9） Effective settings APPLY , 2-8 setting，Store according to the settings in the new format area and new group number。

10） Current file area, number, storage number SEENOW。

Long short format LONG SHORT , Group number XXX , storage qty XX.

11） Current number change NTABLE

12） Current accuracy change NOWRDE

13） Current unit change N-UNIT

UNIT-C ： ℃；UNIT-K： K； UNIT-F：℉.

14） Current range lower limit change N--LMT

15） Current range higher limit change N--HMT

6.9 File operation（Menu 7）

Enter the seventh menu, file operation

6.9.1 Set view/Action mode F--SET

1）Current storage method OPTNOW

2）Short format file number SHoRtn

3）Long format file number Long-n

4）Short file area table number method SHoRtt

5） Long file area table number method Long-t

6.9.2 Set file start number F-SnUn

Start number of setting mode 2/3.

6.9.3 Set the end number of the file F-EnUn

Same way as 6.9.2

6.9.4 Set the number of the table

Table number for setting mode 4/5.

6.9.5 Send file F-tSEt

Send the selected and existing files according to the method selected in submenu 1.

6.9.6 Send all files F-tALL**send all existing files.**

6.9.7 Delete file F-dSEt

Delete the selected file according to the method selected in submenu 1.

6.9.8 Delete all files F-dALL

delete all files clear storage

6.9.9 View file storage F-SAVE

To view the file storage status, press the upper key to switch the long and short storage areas and set the group number to 1, the main display is 248.XXX, 248 is the total number of groups, XXX is the statistics of the number of groups used, and the auxiliary display is in the storage area. Left and right keys to switch the group number, auxiliary display L-XXX (group XXX in long format area) or S-XXX (group XXX in short format area), main display 22.XX or 40.XX (the number that can be stored in 22/40 group) , XX to store the quantity)

6.9.10 View file contents F-SEES

Set by action if a file exists：

Up key to change the group number (the main display shows the group number, the auxiliary display NUMBER)。

Left and right keys to switch the display content (group number, long and short format area, meter number, usage, level, unit, lower limit of range, upper limit of range), and the auxiliary display area corresponds to the display NUMBER, L--S , TABLE, USED , GRADE, UNIT , LRG , HRG .

Enter to view the specific data by the OK key, switch the data number with the up key, switch the display content (data, year, month, day, hour, minute, and second) by the left and right keys, and the main display area displays the temperature value (XXX.XX), year, month, and day (XX.XX. XX), hours, minutes and seconds (XX.XX.XX), the auxiliary display corresponds to the display. In this interface, press the OK or power button to exit.

6.9.11 View all file details

File view menu F-SEEA

- Up key to change the group number is the same as the submenu 10.
- Left key to switch the long and short format areas, and reset the group number to 1.
- Right key to switch the display content with submenu 10.
- Confirm key to enter to view specific data with submenu 10.

6.10 Time setting（Menu 8）

Time proofreading in the state of menu 8 (Please proofread the time after turning on and off the machine, and provide a time stamp for long format files.)

Restore default time 2020-01-31 09-29-29 2E-FtY

***Note**: The following menus 9 to 16 require password operation.*

The initial password of menu 14 / 15 is 336791, and the customer can modify it in submenu 7 of menu 14.

Menus 9 to 13, menu 16 passwords 361, 3610, 36100, 361000.

Menu 14 / 15 passwords are lost and forgotten, only factory reset 336791

(please operate with caution! All customer settings and data will be lost after factory reset!).

6.11 Range and alarm settings（Menu 9）

- **Range lower limit setting** RANGEL：The setting range is not less than the lower limit of the factory range, not higher than 20℃
- **Range upper limit setting** RANGEH：The setting range is not higher than the upper limit of the factory range, not lower than 50℃
- **Lower limit alarm value setting** ALARML：Minimum alarm value factory lower limit of range - 5℃，Maximum lower limit alarm20℃
- **Upper limit alarm value setting** ALARMH：The highest alarm value is the upper limit of the manufacturer's range +30°C, and the lowest upper limit alarm value is 50°C

6.12 Calibration Setting（Menu 10）

6.12.1 Way of Calibration CALWAY

- CVD C--Cvd
- ITS-90 ITS-90
- Resistance calibration CAL--r
- Voltage calibration CAL--v

6.12.2 Calibration method of calibration point PC-TYP

- Fixed point method FIXEdP
- Comparative method COMPAr

6.12.3 CVD parameter options SELCUd

- Standard CVD parameter SELCAL
- Customized CVD parameter SELSEt

6.12.4 ITS-90 parameter options SELS90

- Standard ITS-90 parameter SELCAL
- Customized ITS-90 parameter SELSEt

6.12.5 Thermal resistance conversion method (PT100/1000)

- CVD-385
- CVD CoSCUd
- ITS-90 1tS-90

6.12.6 Select Thermocouple Type tCtYPE

1）TC-S tC-S　2）TC-R tC-r　3）TC-B tC-b　4）TC-K tC-K　5）TC-N tC-n　6）TC-E tC-E

7）TC-J tC-J　8）TC-T tC-t　9）TC-C tC-C　10）TC-D tC-d　11）TC-G tC-9　12）TC-L tC-L　13）TC-U tC-U

6.12.7 View current CVD parameter、TS-90 parameter PARAME

1） Custom-Rtd CUSrtd　2）Custom-A CUS--A　3）Custom-B CUS--b　4）Custom-C CUS--C

5）Custom-90Rtp CUSrtP　6）Custom-90a4 CUS-A4　7）Custom-90b4 CUS-b4　8）Custom-90a7 CUS-A7

9）Custom-90b7 CUS-b7　10）Custom-90c7 CUS-C7　11）Cal—Rtd CALYtd　12）Cal—A CAL--A

13） Cal—B CAL--b　14）Cal—C CAL--C　15）Cal---90Rtp CALYtP　16）Cal---90a4 CAL-A4

17） Cal—B CAL--b　18）Cal—C CAL--C　19）Cal---90Rtp CALYtP　20）Cal—A CAL--A

6.12.8 Select the cold compensation method YECāUP

- Internal automatic compensation IāLYEF
- Fixed cold junction temperature compensation EHLYEF

6.12.9 Set fixed cold temperature CōōL-t

The fixed cold temperature range is (-20 ~ 50) ℃

6.12.10 CVD Calibration point selection CALCōd

Provides multiple sets of CVD calibration ranges，Covering the temperature measurement range of Pt100/Pt1000 (-190 ~ 660) °C, manufacturer's authority.

6.12.11 ITS-90 Use temperature zone selection CI t590

1） -38.8344 –156.60　2）-38.8344 –231.928　3）-38.8344 –419.527　4）-38.8344 –660.323　5）-38.8344 –29.76

6） 0 –29.7646　7）0 - 156.5985　8）0 - 231.928　9）0 - 419.527　10） 0 –660.323

11） -189.3442- 0　12）-189.3442 - 29.7646　13）-189.344 - 156.60　14） -189.344 - 231.93　15）-189.344 – 419.53

16）-189.344 –660.323

6.12.12 Thermal resistance selection SEnSoR

- Pt100 SELPtd
- Pt1000 SELPtd

6.12.13 Main sensor type selection SEnSoR

- Thermal resistance SELPtd
- Thermocouple SEL-tC

6.13 Calibration（Menu 11）

- Press menu 10 to set the cali CAL-00

  Pay attention to the calibration item, calibration point, fixed point method in menu 10.
- Restoring Factory Calibration Data CALFtY

  Restoring the sensor index, CVD, ITS-90, Linear correction, cold junction correction
- Cold Junction Correction C-CooL.

  Left key, enter key to input the correct cold junction temperature, upper key to clear the correction.

6.14 Linear correction（Menu 12）

- Set the correction points L_CP-C

  Points (2 – 38)，After the points are changed, please modify the correction points and correction numbers in time
- Correction point setting L_CP-S

Pay attention to the sorting of correction points and correct the correction data in time

- Correction selection (correction takes effect) L_CSEL

  Linear correction on or off

- correction data, correction point L_CdAt

  The upper key switches the correction point, the OK key records the correction result (reasonable measurement value, otherwise an error will be reported), the left key switches the correction data and the real-time correction result, and the right key enters the correction result.

  Before correction, please make sure that the corresponding parameters such as sensor selection, parameter selection, temperature compensation and other calibration parameters are not changed; if the parameters are re-selected or calibrated, the correction data may not be correct.

6.15 Temperature compensation（Menu 13）

Manufacturer permission only. Not available.

t_CSEL

t_Ct-P

t_CL-P

t_CdAt

6.16 ZigBee Communication setting（Menu 14）（Scalable）

- Group number setting IGHGUP，range (1～99)

- Local number setting ZnUMbE，range(0～255)
- Channel settings 3SI 9CH，range(11～26)
- PANID setting 4PAnI d，2-byte PANID, input in hexadecimal.
- Network key settings SrEY ，16-byte network key, input in hexadecimal.
- Sleeping time setting 6SLEEP，range (1～250)S.
- ZigBee/ WIFI setting password 7PSSWd，0 is not allowed as a password.
- Factory mode on and off 8FtYSW，Configure instrument properties in factory mode, or customer networking parameters

6.17 WIFI network setting（Menu 15）（Scalable）

- Set up routing and server connection method S-LI nr （current setup connection ALLSEt ）
- Previously connected router and current server S-SAuEOpen routes and current servers S-oPEn ）
- Set router name S-SSI dCharacters with ASCII decimal values in the range 32 – 126）
- Set router password S-PASSCharacters with ASCII decimal values in the range 32 – 126）
- DHCP setting S-dHCP DHCP setting，Please set the static IP of the machine correctly when it is turned off.
- static IP setting S-MYI PPlease input in the range to prevent IP conflicts.
- Server port settings SSPoRt Enter the port number of the communication server
- Server IP Setting S-S-I PEnter server IP address
- Connection routing and server status StAtUSWIFI communication connection status, restart WIFI to re-plug and unplug。

- Current connect router name Router name when connected normally
- Current router password Router password when normal connection
- Current DHCP status A normal connection makes DHCP on and off
- Current local IP The unit when connected normally IP
- Current server port Server port number for normal connection
- Current server IP Server IP address when connecting normally

Characters whose ASCII decimal value ranges from 32 to 126: the first three digits of the main display are the character number and the dividing character '-' are always displayed, and the fourth digit is displayed alone as a single numerical character '0'-'9', The fifth digit is displayed as a single uppercase letter character 'A'-'Z', the sixth digit is displayed as a single lowercase letter character 'a'-'z', and the remaining characters are three The decimal value displays the ASCII serial number (eg: 032 -> ' ' space character; 126 -> '~'...), please refer to the ASCII code table, appendix 1. The upper key switches the character number, the left and right keys change characters, and the long press can quickly change the characters, and NUL is displayed to represent the end of the string, and the original input string will be truncated. At this time, press and hold the left and right keys for 2-3 seconds to add a character or restore the length of the input string. When changing, please make sure that the length of the string, the sequence of characters and each character are correct, and it will take effect.

IP address change: Upper key to switch the 12 decimal numbers of address, gateway and subnet mask 192.168.0.101; 192.168.0.1; 255.255.0. Use the left and right keys to change the value, and the confirm key takes effect.

6.18 Factory reset（Menu 16）

Press ，Menu 16

- Factory reset SEtFtY
- Exit 91 uEUPPress

to confirm /restart or exit by
.

6.19 File function description

The storage of files is related to the settings in Menu 6. File storage on and off, automatic storage time interval, which file area (long format area with time stamp or short format area without time stamp), the main attribute table number setting of the file group and some auxiliary attributes (unit, precision) , range, and) are set in the first 8 items of the submenu. These settings will not take effect immediately if a certain file group is not full. When the file group is full, a new group number will be assigned according to the settings, and assign the set attributes to the file group. When you need to use these settings to store files immediately, enter the ninth submenu to apply the settings. At this time, the unfilled file group will be skipped and an empty file group will be allocated and the set attributes will be assigned to this file group. Submenu 10 View the long and short format area currently used for storage, the file group number and the number of files stored in the file group. Submenus 11 ~ 15 display the properties (table number, precision, range and unit) of the file group currently stored and used, and these properties can also be changed.

File sending, deletion, and content viewing are implemented in menu 7. Submenu 1 sets the way to send, delete, and view content (1 > press menu 6 to store the set properties to limit the operating conditions; 2 > limit to the start and end numbers of the file group in the short format area; 3 > limit to the file in the long format area Within the group start and end numbers; 4 > limited to the file group matching the table number in the short format area; 5 > limited to the file group matching the table number in the long format area), submenu 2 and 3 perfect operation mode is 2 and The setting of the start and end numbers of the file group of 3, the submenu 4 is to improve the matching table number of 4 and 5 in the operation mode. The operation mode setting is mainly to limit the scope of sending, deleting, and content

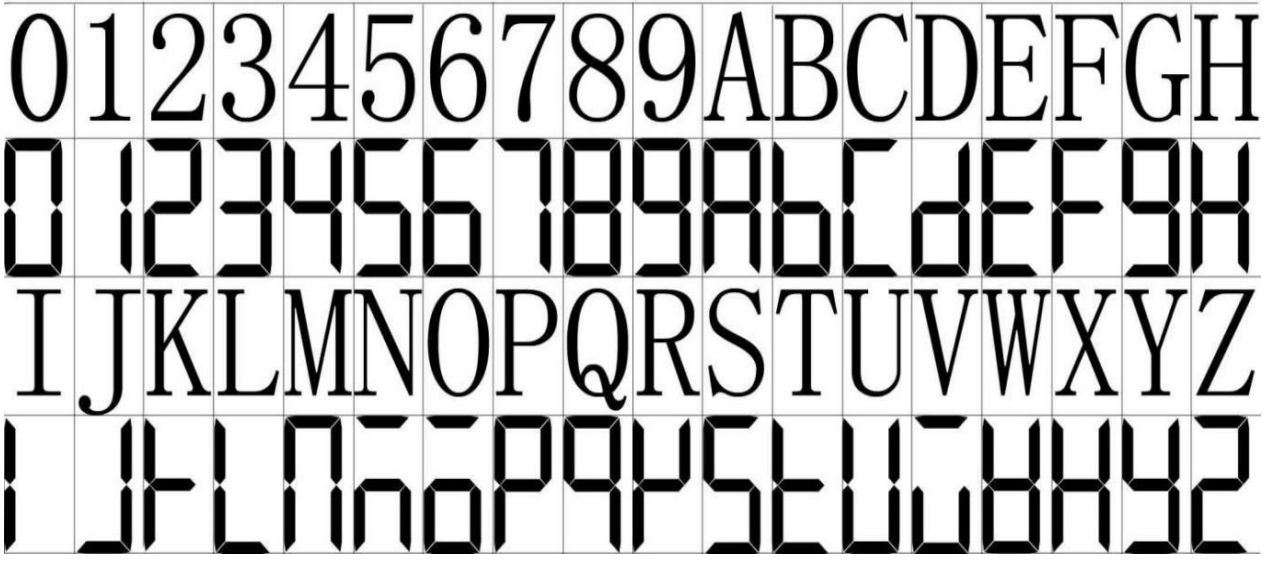
viewing operations. Submenu 5 sends files to the upper computer according to the above set range, submenu 7 deletes files according to the above set range, and submenu 10 checks specific files according to the above set range. Submenu 8 sends all existing files to the upper computer, submenu 8 deletes all files, and submenu 11 checks all files. Submenu 9 displays the usage of the file area (total number of groups, number of used groups, number of files stored in each group).

6.20 Calibration introduction

Calibration is divided into two menus, calibration setting menu 10 and calibration interface menu 11. First set the calibration items (CVD, ITS-90, ohm, mV), CVD or ITS-90 fixed point calibration method, ITS- 90 Select the calibration temperature zone, and then enter the calibration interface to calibrate. During CVD calibration, the fixed points are 0°C, 100°C (when the upper limit temperature is greater than 100°C) or 10°C (when the upper limit temperature is less than 100°C), the lower limit temperature point (negative temperature part), the upper limit temperature point (positive temperature part), For the specific calibration range and calibration points, please refer to the comparison table in Appendix 2. ITS-90 has fixed points of 0.01°C, -189.3442°C, -38.8344°C, 29.7646°C, 156.5985°C, 231.928°C, 419.527°C, 660.323°C for calibration in each temperature zone. Please refer to Appendix 3 for the calibration range and calibration points.

Fixed point calibration method. The difference between the fixed method and the comparison method: the fixed method is that when calibrating, the fixed temperature point is provided by the temperature field to provide an accurate fixed temperature, and the resistance value measured by the thermometer is directly recorded when it is determined. During the calibration by the comparison method, two stable temperatures are provided by the temperature field near the fixed point, and the calibrator right-clicks it and enters it into the thermometer for storage, and the OK key records the resistance value when the thermometer measures the corresponding temperature at this time, so as to obtain the temperature difference and the thermometer at the fixed point. The resistance change rate at the point is corrected to obtain the resistance value at the fixed point of the thermometer.

6.21 Display character comparison



7、SPMK361 Handheld thermometer application

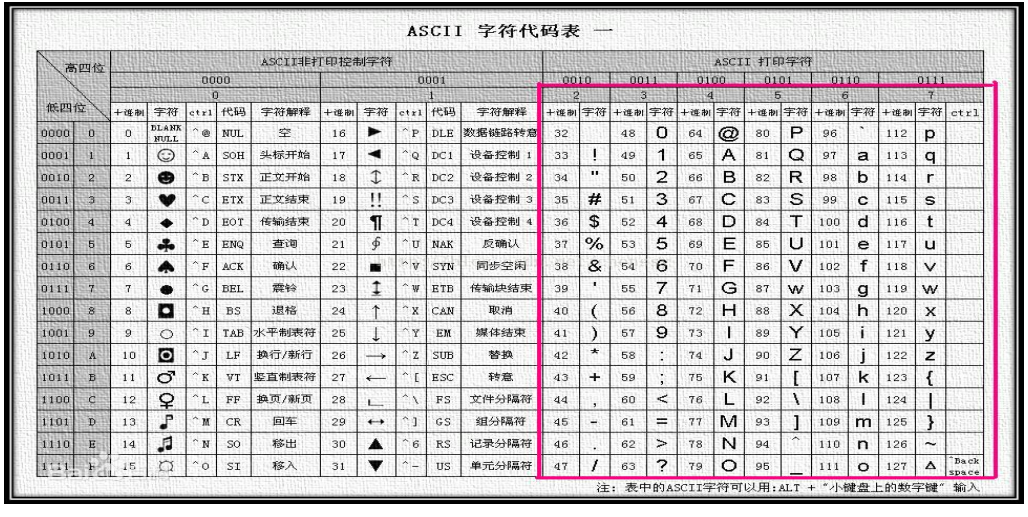
1）Insert the thermometer into the temperature field (as shown below) and wait until the temperature of the field stabilizes.The thermometer can accurately measure the temperature value of the temperature field.

2）It can also be connected to Spake software, through which the thermometer can be read directly the measured temperature value.

Accessory:

SPMK361 USB Type_C Mobile phone data cable (with shielding layer),instruction.

Appendix 1:



ASCII 字符代码表 一

高四位 / 低四位		ASCII非打印控制字符 0000					ASCII非打印控制字符 0001					ASCII 打印字符 0010		ASCII 打印字符 0011		ASCII 打印字符 0100		ASCII 打印字符 0101		ASCII 打印字符 0110		ASCII 打印字符 0111		
		0					1					2		3		4		5		6		7		
		+进制	字符	ctrl	代码	字符解释	+进制	字符	ctrl	代码	字符解释	+进制	字符	+进制	字符	+进制	字符	+进制	字符	+进制	字符	+进制	字符	ctrl
0000	0	0	BLANK NULL	^@	NUL	空	16	►	^P	DLE	数据链路转意	32		48	0	64	@	80	P	96	`	112	p	
0001	1	1	☺	^A	SOH	头标开始	17	◄	^Q	DC1	设备控制 1	33	!	49	1	65	A	81	Q	97	a	113	q	
0010	2	2	☻	^B	STX	正文开始	18	↕	^R	DC2	设备控制 2	34	"	50	2	66	B	82	R	98	b	114	r	
0011	3	3	♥	^C	ETX	正文结束	19	!!	^S	DC3	设备控制 3	35	#	51	3	67	C	83	S	99	c	115	s	
0100	4	4	♦	^D	EOT	传输结束	20	¶	^T	DC4	设备控制 4	36	$	52	4	68	D	84	T	100	d	116	t	
0101	5	5	♣	^E	ENQ	查询	21	§	^U	NAK	反确认	37	%	53	5	69	E	85	U	101	e	117	u	
0110	6	6	♠	^F	ACK	确认	22	▬	^V	SYN	同步空闲	38	&	54	6	70	F	86	V	102	f	118	v	
0111	7	7	•	^G	BEL	震铃	23	↨	^W	ETB	传输块结束	39	'	55	7	71	G	87	W	103	g	119	w	
1000	8	8	◘	^H	BS	退格	24	↑	^X	CAN	取消	40	(	56	8	72	H	88	X	104	h	120	x	
1001	9	9	○	^I	TAB	水平制表符	25	↓	^Y	EM	媒体结束	41	)	57	9	73	I	89	Y	105	i	121	y	
1010	A	10	◙	^J	LF	换行/新行	26	→	^Z	SUB	替换	42	*	58	:	74	J	90	Z	106	j	122	z	
1011	B	11	♂	^K	VT	竖直制表符	27	←	^[	ESC	转意	43	+	59	;	75	K	91	[	107	k	123	{	
1100	C	12	♀	^L	FF	换页/新页	28	∟	^\	FS	文件分隔符	44	,	60	<	76	L	92	\	108	l	124	|	
1101	D	13	♪	^M	CR	回车	29	↔	^]	GS	组分隔符	45	-	61	=	77	M	93	]	109	m	125	}	
1110	E	14	♫	^N	SO	移出	30	▲	^6	RS	记录分隔符	46	.	62	>	78	N	94	^	110	n	126	~	
1111	F	15	☼	^O	SI	移入	31	▼	^-	US	单元分隔符	47	/	63	?	79	O	95	_	111	o	127	⌂	Back space

注：表中的ASCII字符可以用：ALT + “小键盘上的数字键” 输入

Appendix 2：

CVD calibration range number comparison and calibration points within the range.

0 ： {0.00, -10.00, 10.000, 50.000}
1 ： {0.00, -10.00, 100.00, 120.00}
2 ： {0.00, -10.00, 100.00, 160.00}
3 ： {0.00, -10.00, 100.00, 230.00}
4 ： {0.00, -10.00, 100.00, 300.00}
5 ： {0.00, -10.00, 100.00, 420.00}
6 ： {0.00, -10.00, 100.00, 500.00}
7 ： {0.00, -10.00, 100.00, 600.00}
8 ： {0.00, -20.00, 10.000, 50.000}
9 ： {0.00, -20.00, 100.00, 120.00}
10： {0.00, -20.00, 100.00, 160.00}
11： {0.00, -20.00, 100.00, 230.00}
12： {0.00, -20.00, 100.00, 300.00}
13： {0.00, -20.00, 100.00, 420.00}
14： {0.00, -20.00, 100.00, 500.00}
15： {0.00, -20.00, 100.00, 600.00}
16： {0.00, -40.00, 10.000, 50.000}
17： {0.00, -40.00, 100.00, 120.00}
18： {0.00, -40.00, 100.00, 160.00}
19： {0.00, -40.00, 100.00, 230.00}
20： {0.00, -40.00, 100.00, 300.00}
21： {0.00, -40.00, 100.00, 420.00}
22： {0.00, -40.00, 100.00, 500.00}
23： {0.00, -40.00, 100.00, 600.00}
24： {0.00, -60.00, 10.000, 50.000}
25： {0.00, -60.00, 100.00, 120.00}
26： {0.00, -60.00, 100.00, 160.00}
27： {0.00, -60.00, 100.00, 230.00}
28： {0.00, -60.00, 100.00, 300.00}
29： {0.00, -60.00, 100.00, 420.00}
30： {0.00, -60.00, 100.00, 500.00}
31： {0.00, -60.00, 100.00, 600.00}
32： {0.00, -80.00, 10.000, 50.000}
33： {0.00, -80.00, 100.00, 120.00}
34： {0.00, -80.00, 100.00, 160.00}
35： {0.00, -80.00, 100.00, 230.00}
36： {0.00, -80.00, 100.00, 300.00}
37： {0.00, -80.00, 100.00, 420.00}
38： {0.00, -80.00, 100.00, 500.00}
39： {0.00, -80.00, 100.00, 600.00}
40： {0.00, -120.0, 10.000, 50.000}
41： {0.00, -120.0, 100.00, 120.00}

42：{0.00, -120.0, 100.00, 160.00}　43：{0.00, -120.0, 100.00, 230.00}　44：{0.00, -120.0, 100.00, 300.00}

45：{0.00, -120.0, 100.00, 420.00}　46：{0.00, -120.0, 100.00, 500.00}　47：{0.00, -120.0, 100.00, 600.00}

48：{0.00, -160.0, 10.000, 50.000}　49：{0.00, -160.0, 100.00, 120.00}　50：{0.00, -160.0, 100.00, 160.00},

51：{0.00, -160.0, 100.00, 230.00}　52：{0.00, -160.0, 100.00, 300.00}　53：{0.00, -160.0, 100.00, 420.00},

54：{0.00, -160.0, 100.00, 500.00}　55：{0.00, -160.0, 100.00, 600.00}

Appendix 3：

ITS90 temperature zone number comparison and temperature calibration points in temperature zone.

0	-38.8344℃ ~ 156.5985℃	0.01℃, -38.8344℃, 29.7646℃, 156.5985℃
1	-38.8344℃ ~ 231.928℃	0.01℃, -38.8344℃, 29.7646℃, 156.5985℃, 231.928℃
2	-38.8344℃ ~ 419.527℃	0.01℃, -38.8344℃, 29.7646℃, 231.928℃, 419.527℃
3	-38.8344℃ ~ 660.323℃	0.01℃, -38.8344℃, 29.7646℃, 231.928℃, 419.527℃, 660.323℃
4	-38.8344℃ ~ 29.7646℃	0.01℃, -38.8344℃, 29.7646℃
5	0℃ ~ 29.7646℃	0.01℃, 29.7646℃
6	0℃ ~ 156.5985℃	0.01℃, 156.5985℃
7	0℃ ~ 231.928℃	0.01℃, 156.5985℃, 231.928℃
8	0℃ ~ 419.527℃	0.01℃, 231.928℃, 419.527℃

9	0℃ ~ 660.323℃	0.01℃, 231.928℃, 419.527℃, 660.323℃
10	-189.3442℃ ~ 0℃	0.01℃, -189.3442℃, -38.8344℃
11	-189.3442℃ ~ 29.7646℃	0.01℃, -189.3442℃, -38.8344℃, 29.7646℃
12	-189.3442℃ ~ 156.5985℃	0.01℃, -189.3442℃, -38.8344℃, 156.5985℃
13	-189.3442℃ ~ 231.928℃	0.01℃, -189.3442℃, -38.8344℃, 156.5985℃, 231.928℃
14	-189.3442℃ ~ 419.527℃	0.01℃, -189.3442℃, -38.8344℃, 231.928℃, 419.527℃
15	-189.3442℃ ~ 660.323℃	0.01℃, -189.3442℃, -38.8344℃, 231.928℃, 419.527℃, 660.323℃