

Manual for LORA self-organizing network explosion-proof pressure/temperature and liquid level sensors

I: Overview

The LoRa wireless pressure/temperature sensor uses high-precision and highly sensitive pressure/temperature sensitive components and ultra-low power microprocessors to process the pressure/temperature signal of the tested medium into a digital signal. It can display temperature values on site and wirelessly transmit measurement data through the LoRa protocol. It has the advantages of easy installation and use, longer transmission distance, stable and reliable performance. Widely used in fluid temperature detection and control in industries such as smart firefighting, smart water, smart factories, petroleum, chemical, power, hydrology, and environmental protection. The data transmission protocol of the LORA self-organizing network series monitoring system supports both host mode and slave mode. External commands can be sent to the device through the LORA gateway to access the device, read or modify relevant detection parameters; At the same time, the equipment regularly sends detection data and other related instructions to the outside;

II: Technical parameters

Display mode: Five digit LCD display

Test medium: liquid or gas compatible with the material

Range: Any range within -0.1~60MPa

Accuracy level: 0.1% FS, 0.2% FS, 0.5% FS Stability: $\pm 0.2\%$ FS/year, $\pm 0.5\%$ FS/year

Operating frequency: CN470MHz~510MHz

Working voltage: 3.6VDC battery

Battery capacity: 19000mAh (send data per minute, battery lifespan is 1 year; send data every 2 minutes, battery lifespan is 2 years)

Sleep current:<30uA

Sending current:<140mA

Receiving current:<15mA Protection level: IP68

Working temperature: -20~60 °C

Working humidity: 10%~95% RH (no condensation phenomenon)

Zero temperature coefficient: $\pm 0.1\%$ FS/°C ($\leq 100\text{kPa}$); $\pm 0.05\%$ FS/°C ($>100\text{kPa}$)

Full temperature coefficient: $\pm 0.1\%$ FS/°C ($\leq 100\text{kPa}$); $\pm 0.05\%$ FS/°C ($>100\text{kPa}$)

Overload capacity: 300%

Service life: > 9 million temperature cycles

Thread interface: M20 * 1.5, G1/2, etc

Data transmission rate: 300bps~5.4Kbps

Maximum transmission power: 25dB

Receiving sensitivity: -150dBm (SF= 12)



III : Operating instructions

Left button : Backlight switch / Shift M button : Menu settings / Confirm

Right button : Power voltage /AD value /Value modification

Long press the M key for 3 seconds to enter the menu password setting ;

The password for the first group menu is 0001

NO	Symbol	Menu	Value range	Menu description
1	UN	Unit selection	MPa ;KPa ;Bar , etc.	Pressure, liquid level and other units
2	DOT	Decimal number	0~4	Up to four decimal places can be set
3	U-R	lower limit range	-19999~99999	Factory Settings, do not change
4	F-R	Maximum range	-19999~99999	Factory Settings, do not change
5	DSP	Display value switching	DSP/PRESS	Display AD value/display pressure value
6	OFF	Zero compensation	-9.999~9.999	Negative compensation can be set for zero deviation
7	CUT	Zero remove	YES/NO	Zero small signal cut on/off , 0.5%FS Removal
8	FLTR	filter constant	1~9	Display value refresh frequency , 1 fastest
9	ADSP	Sampling interval	1~9999sec	Default 10min
10	-UP-	Upload interval	1~9999min	Default 10min
11	LGHT	Backlight time	1~99sec	Default 5s
12	DPOF	Screen time	1~9999sec	Default 0
13	BAT	Operating voltage alarm	3.0~3.6VDC	Default 3.0VDC
14	SAVE	Save Settings	YES/NO	Modify the parameters to save the Settings, otherwise invalid
15	END	Exit menu	EXIT	Exit menu Settings

Group 2 Menu password 0002;(This set of parameters is the factory calibration Settings, non-professional personnel do not modify)

NO	Symbol	Menu	Value range	Menu description
1	SNR	Input signal selection	IIC/ADC	Sensor signal selection
2	CAL1	Zero AD value calibration	0~9999	Press M to confirm the pressure value at zero to calibrate
3	CAL2	Full AD value calibration	0~9999	When the pressure value is full, press M to confirm the calibration
4	BAT	Supply voltage calibration	3.000~3.600	When the power supply voltage is full, press M to confirm the calibration
5	SAVE	Save Settings	YES/NO	Modify the parameters to save the Settings, otherwise invalid
6	END	Exit menu	EXIT	Exit menu Settings

Group 3 Menu password 0003;

NO	Symbol	Menu	Value range	Menu description
1	AL-H	High alarm value	00.00~99.99	Default 0.5
2	AL-L	Low alarm value	00.00~99.99	Default 0.1
3	AL-A	Alarm way	HL/IN/CAPH/CAPL	Upper and lower alarm / Range alarm
4	AL-O	Alarm output mode	NO/NC	Normally open / Normally closed
5	ADLY	Display alarm sensitivity	0~9999	Display alarm delay , Default 5
6	DDL	Output alarm sensitivity	0~9999	Output alarm delay , Default 5
7	NADC	Alarm sampling rate	1~120min	Alarm sampling interval , Default 5min
8	N-UP	Alarm upload rate	1~120min	Alarm upload interval , Default 5min
9	SAVE	Save Settings	YES/NO	Modify the parameters to save the Settings, otherwise invalid
10	END	Exit menu	EXIT	Exit menu Settings

*

Replace the battery: When the battery symbol in the bottom left corner of the screen flashes, it indicates that the battery is low in power and the battery should be replaced in time;

* steps: The battery compartment can be opened by rotating the back cover anticlockwise. After replacing the battery, close the back cover and turn clockwise to lock the back cover to achieve waterproof effect;

IV. After-sales service

1. All orders of our products are guaranteed for one year;
2. If the product fails within the warranty period, it is a quality problem detected by the company, and the company shall bear all the maintenance costs;
3. Failure to follow this manual or disassemble of the product, resulting in damage to the components or pressure diaphragm, is not covered by the product warranty.
4. Please contact our company to confirm the repair after product failure. Please attach the following information:

- a. Product failure phenomenon;
- b. Description of the product using site environment;
- c. Delivery address and contact information;

V. Data communication format:

```
#define DATA_SIZE_MAX          10 // Datapool size
typedef struct {
    uint8_t  DataLength;          // Information frame size
    uint8_t   Dataserial;         // the total message sent
```

```

uint8_t DataUsed;           // data pool effective data volume
int16_t Pressure[DATA_SIZE_MAX]; // Pressure value data pool

uint8_t Dot;                // decimal point
uint16_t Unit;              // Unit
uint16_t BatV;              // Battery voltage
uint8_t Status;             // Sensor and dry contact status
uint16_t CollectionInterval; // sensor sampling rate,1-9999s
uint16_t UploadInterval;    // upload interval,1-9999min
uint16_t AlmCollectionInterval; // collection rate in alarm state,1-9999s
uint16_t AlmUploadInterval; // upload rate when alarming, 1-9999min
int16_t UploadHigh;         // high alarm threshold, -1999~9999
int16_t UploadLow;          // low alarm threshold, -1999~9999
uint8_t UploadThresholdMode; // alarm mode
uint8_t UploadInvert;       // alarm NO/NC
uint8_t UploadVerify;       // sensor alarm confirmation times
uint8_t DigInputVerify;     // dry contact alarm confirmation times
int8_t rssi;                // wireless signal strength
uint16_t crc;               // communication CRC check code
} SmartInstrumentData;

```

Unit : MPa,kPa,Pa,BAR,PSI,kgfcm2,kgfm2, °C, °F ,mm,cm,m,mV,V,mA,A,blank (0~16 in return, on behalf of MPa~blank)

Dot : "3.000", " 2.00", " 1.0", " 0"
(3~0 three decimal placed to no decimal places)

Status : 0x01,
sensor fault ;0x02,1#dry contact; 0x04,2#dry contact。

UploadThresholdMode:

// 0: High and low alarm >UploadHigh action , <UploadLow return
// 1: scope of alarm , >UploadLow And<UploadHigh action , return
// 2: Single point high alarm , >UploadHigh action , return
// 3: Single low alarm , <UploadHigh action , return

UploadInvert

// when UploadInvert = 1 , Actions and returns need to be understood in reverse(NO/NC)

Frame head	Total messages sent	Length of pressure value	Pressure value		Pressure value 10	Information frame size	Data pool effective data value	Pressure value data pool	Dot
5C	03	06	XXXX	XXXX	XXXX	XX	XX	XXXX	XX

Sensor sampling rate	Upload interval	Collection rate in alarm state	Upload rate when alarming	High alarm threshold	Low alarm threshold	Alarm mode	Alarm NO/ NC	Sensor alarm confirmation times	Dry contact alarm confirmation times	Wireless signal strength	Communication CRC Check code
XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XX	XX	XX	XX	XX	XXXX

```

5C      // Total number of bytes
02      // the total messages sent
0d      // sampling frequency
ff 9 7 ff 9 7 ff 9 7 ff 9 7 ff 9 7 ff 9 7 ff 9 7 ff 9 7 ff 9 7
0 1      // dot
00 0 0    // unit
1c 4 1    // battery voltage
00      // sensor fault, switch input
00 0a     // sampling period          unit : second
00 0a     // transmit cycle           unit : minute
00 0 5    // alarm state sampling period unit : second
00 0 1    // upload cycle when alarming unit : minute
00 c 8    // High alarm setting AL - H
00 0 0    // Low alarm setting AL - L

02      // Alarm mode AL - A
01      // Alarm logic-reversal AL - O
05      // Alarm confirmation delay Ad ly
05      // Switch confirmation delay dd ly
00      // Signal strength
e5 0 5    // CRC communication check

```

IV The format of download data:

No.	Identity code	Number	Menu name	Value range	Menu remark
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1	A1	4	Upload interval	1~9999min	Default 10min
2	A2	4	Sampling interval	1~9999sec	Default 10sec
3	A3	4	High alarm value	-1999~9999	The default is 9999, followed by the decimal point.
4	A4	4		-1999~9999	The default is -1999, followed by the decimal point.
5	A5	4	Alarm mode	HL/IN/CAPH/CAPL	Upper and lower limit alarm / range alarm, default high alarm
6	A6	4	Alarm output	NO/NC	Normal open / normal close
7	A7	4	Sensor alarm delay	1~99	Sensor alarm delay, the default is 5 times
8	A8	4	Set cutting values	-1999~9999	Set cutting values
9	A9	4	Sampling rate when alarming	1~9999sec	In alarm state, the sampling rate is 5sec by default
10	AA	4	Uploading rate when alarming	1~9999min	In the alarm state, the upload rate is 5min by default
11	AB	4	Unit choice	MPa、KPa、Bar etc.	Pressure, liquid level and other units
12	AC	4	Decimal point	0~3	Up to 4 decimal points can be set

For example : (Command in hexadecimal) :

Change the upload time to 10 minutes : Write A1 00 0A ;

Simultaneously change the upload time to 10 minutes with 2 decimal places: write A1 00 0A AC 00 02 ;

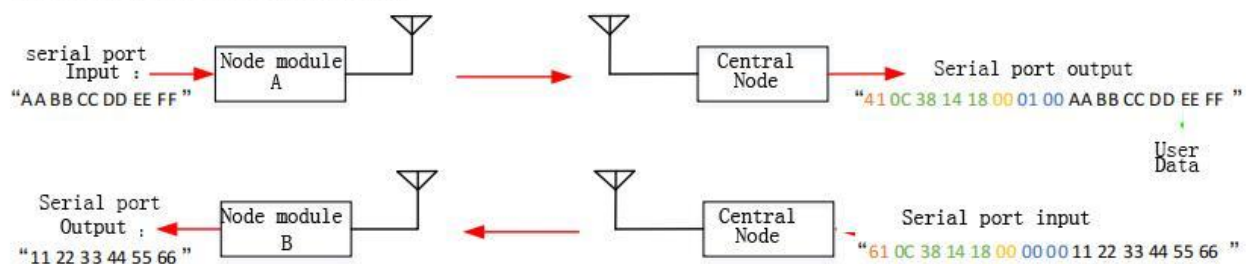
3. If a negative number is entered , the data is a signed integer, Example : To input a low alarm-5 ; Actual input FFFB ; Input : A4 FF FB ;

VII Slave access mode (i.e. passive access mode)

Communication parameters::

The module is equipped with a unique identification address, which can be used for node module identification. The central node can also send data separately to one of the nodes based on the address of the node module

COMMUNICATION EXAMPLE:



The format of the central module's transceiver protocol is as follows:

Frame	Address of data	Control byte	Serial number of data	User data
1 bit	4 bits	1 bit	2 bits	N bits
Upload: 0X41 Download: 0X61	High position in front Low position at back	0X00	High position in front Low position at back	Maximum bits is not More than 200 bits

The "Serial number of data" received by the central module is automatically accumulated internally by the sending node module. When the node module is reset, the serial number of data is reset to zero.

When the central module issues data, there is no requirement for the content of "control byte" and "serial number of data", so these two fields can be specified arbitrarily. The node module will compare the "Frame" and "data address" in the data sent by the central module. If the comparison is consistent, the serial port will output the user's load data. If it is inconsistent, the processing will be discarded. When sending data to a designated grouping node, simply set the "data address" in the central module data to the target group number. That's it, the low byte comes first and the high byte comes last. When the group number of the receiving module matches the group number in the received data, the serial port outputs the data content.