Meskernel
量芯集成

User Manual
TCXX Serial

Laser Distance Sensor Version1.0

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Revision of Records

Version	Revision date	Revisionists	Revisions
R0	2021/8/30	kw	First edition
R1	2024/6/7	kw	1.Optimize the description of product performance parameters;
			2.Optimized module communication operation instructions;

1. Product Overview

TC XX series laser distance measurement module is the latest generation of outdoor long-distance laser radar module, with strong measurement capability, high measurement accuracy, compact size,light weight,simple installation and operation and other characteristics.

Product Features:

Measure distances up to 700m in outdoor sunlight;

Resistant to high and low temperatures-10~+50℃;

Compact in size, 43 mm long and 22 mm in diameter;

Light in weight;

UART TTL level outputs the distance value of the measured object, easy to use.

Please read the installation and operation section carefully before installing and using the module to prevent damage to the module.

Product number

Product category	Product number	Light source	Operating temperature	Power supply	Communication interface
TC22	TC22-700	905nm	-10~50℃	3.3V	TTL 3.3V, compatible with TTL 5V

2. Performance Parameters

Table 1-1 Performance specifications

Model	Parameter Values
Lens size	22mm
Range	3-700m@70% reflectivity(1)
Single Max Measuring time	~1s
Absolute accuracy	+/-1m
Blind Zone	3m
Resolution	0.1m
Light source	905nm laser
Operating voltage	Typical value DC +3.3V, operating range (+2.5V~+3.5V)
Operating Current	100mA
Power consumption	330mW@3.3V
Operating temperature	-20~50℃
Communication interface	UART, Default baud rate 115200bps
Serial port level	TTL 3.3V, compatible with TTL 5V
Dimension	43*ϕ22mm
Weight	~15 g

Notes: (1)Reflectivity of ordinary white wall/white paper is ~70%。

3. TC22-700 Specification Dimensions

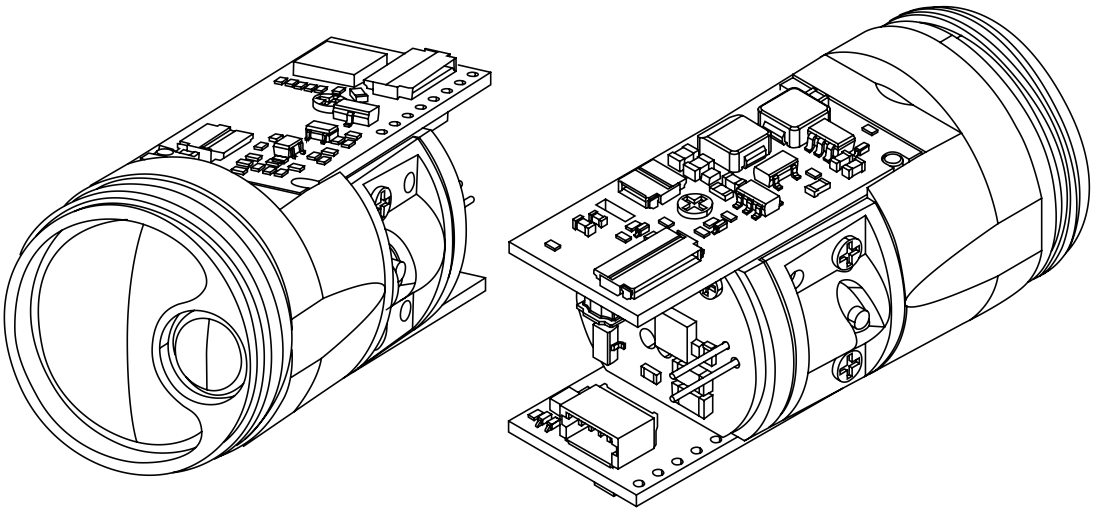

Figure 3-1 Module overview

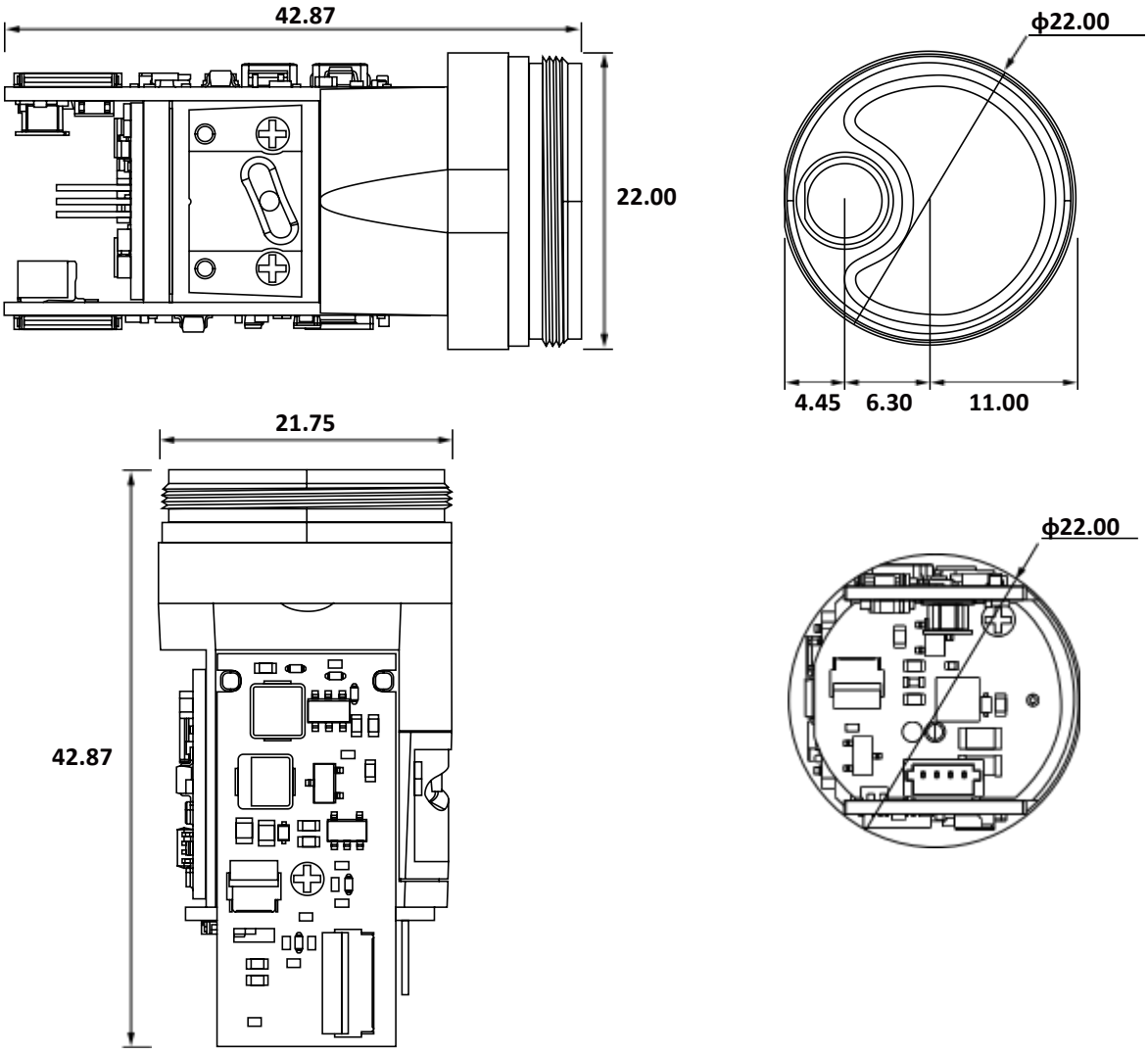

Figure 3-2 Module structure dimensions (unit: mm)

4. Interface

4.1 TC-XX Interface Description

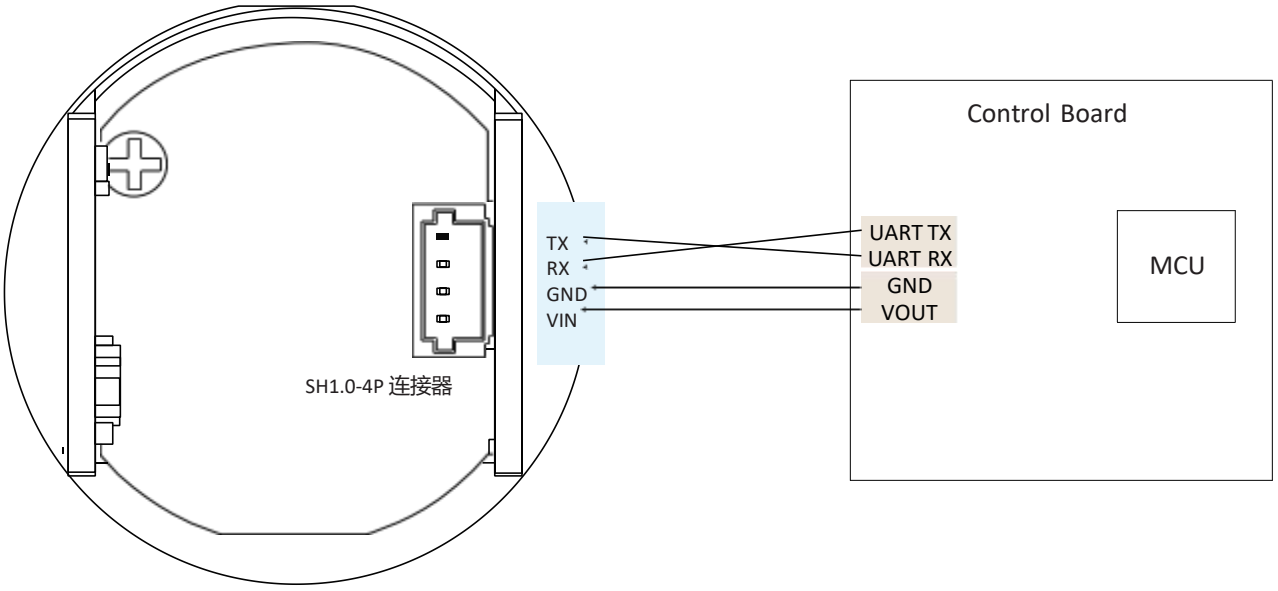

Figure 4-1 Module pins

Table 4-1 Pin definitions

P1/J1 serial number	Name	Function	Functional description
1	VIN	Power input	Input: 3~3.3V DC power supply, current>300mA+
2	GND	Power source	Input: power supply, Communication ground
3	UART RX	Communication input	Serial communication, the serial port receiving pin on the module side is connected to the sending pin on the controller side (compatible with TTL3.3V/TTL5V)
4	UART TX	Communication output	Serial communication, the serial port sending pin on the module side is connected to the receiving pin on the controller side (compatible with TTL3.3V/TTL5V)

5. Communication protocols

5.1 Serial port configuration

Controlling serial port basic configuration:

Baud rate：115200bps Start Bit:1bit Data Bit:8 bits

Stop Bit: 1 bit Parity Bit: None Flow Control: None

5.2 Control Commands

1)The communication bitstream of this system uses Little Endian mode.

2) After accumulating the whole message as a U8 array, take the lower 8 bits as the CRC correction value, please refer to"Appendix 1:CRC Code Stream Calculation & Usage" for detailed usage.

5.2.1 Start/Stop Measurement

After starting the measurement, the module continuously measures and returns the measurement data until the specified number of measurements is reached or a stop command is received; see 5.2.2"Measurement Reporting" for the measurement data format.

Table5-1Startup Measurements

Bytes	0	1	2	3	4-5	6-7	8
Name	MsgType	MsgCode	BrdId	PayLoadLen	MeaType	MeaTimes	CRC
Data	0xFA	0x01	0xXX	0x04	0xAAAA	0xBBBB	0xZZ

- BrdId = 0xXX 0xXX Used to specify the module ID for message reception（the default ID of the module is 0, 0xFF means broadcast message）
- MeaType = 0xAAAA indicates to start the measurement or to stop the measurement, where 1 means to start the measurement and 0 means to stop the measurement.
- MeaTimes = 0xBBBB indicates number of times of consecutive measurements,0 means unlimited times and 1 means a single measurement.
- Example of starting a single measurement：fa 01 ff 04 01 01 00 01 00 00
- Example of starting a continuous measurement：fa 01 ff 04 01 00 00 00 00 ff
- Stop Measurement Example：fa 01 ff 04 00 00 00 00 00 fe

5.2.2 Measuring reporting

After starting the measurement, the module will return the measured value after each measurement is completed (the maximum time for a single measurement is 1.5s) until the specified number of measurements is reached or a measurement stop message is received.

Table 5-2 Measurement report message

Bytes	0	1	2	3	4	5	6	7	8
Name	MsgType	MsgCode	BrdId	PayLoadLen	DataValidInd		Distance		CRC
Data	0xFB	0x03	0xXX	0x04	0xAAAA		0xBBBB		0xZZ
Unit							dm		

- BrdId = 0xXX Used to indicate the module ID sent
- DataValidInd = 0xAAAA indicates whether the data is valid or not, 1 indicates that the measurement data is valid, 0 indicates that measurement data is invalid.
- Distance = 0xBBBB Indicates the measured distance unit is dm

Example: Take the message fb 03 00 04 01 00 4c 00 4f as an example

Bytes	0	1	2	3	4	5	6	7	8
Name	MsgType	MsgCode	BrdId	PayLoadLen	DataValidInd		Distance		CRC
Data	0xFB	0x03	0xXX	0x04	0xAAAA		0xBBBB		0xZZ
Case	fb	03	00	04	0100		4c00		4f
					Valid data		76dm		

5.2.3 Setting module parameters

Table 5-4 setting module parameters

Bytes	0	1	2	3	4	5	6	7	8
Name	MsgType	MsgCode	BrdId	PayLoadLen	Type		Value		CRC
Data	0xFA	0x06	0xXX	0x04	0xAAAA		0xBBBB		0xZZ

- BrdId = 0xXX is used to specify the module ID to be received, where 0xFF indicates a broadcast message
- Type = 0xAAAA parameter type (see Table 5-6 for the parameter types that can be modified)
- Value = 0xBBBB New setting value (except module ID setting which takes effect immediately, all other parameters take effect after reset)

Example： fa 06 f 04 00 00 00 00 03

Table 5-5 Setting module parameter response

Bytes	0	1	2	3	4	5	6	7	8
Name	MsgType	MsgCode	BrdId	PayLoad	Err		Type		CRC
Data	0xFB	0x07	0xXX	0x04	0xAAAA		0xBBBB		0xZZ

- BrdId = 0xXX used to indicate the module ID of the sending.
- Err = 0xAAAAIndicates success or failure, where 0 indicates success and non-zero indicates failure
- Type = 0xBBBB parameter type（see table5-6 for modifiable parameter types）

Example： fb 07 00 04 00 00 00 00 06

Table 5-6 Module parameter type

Type	Name	Default	Range of values	Meaning
0	Module ID	0	0-254	1） The module ID is used in the request message to indicate the receiving module. 2） The module ID is used to indicate the source of the message in a response or escalation message. 3） When the message sender does not care about the module ID of the receiver or wants to broadcast the message, fill in 0xFF for the module ID
1	Baud Rate	1152	9216,1152, 384,192,96, 24,12	Unit： 100bps

5.2.4 Read module parameter

Table5-7 Module parameter read requests

Bytes	0	1	2	3	4	5	6
Name	MsgType	MsgCode	BrdId	PayLoadLen	Type		CRC
Data	0xFA	0x01	0xXX	0x02	0xAAAA		0xZZ

- BrdId = 0xXX is used to specify the received module ID,where 0xFF means broadcast message
- Type = 0xAAAA parameter type （see Table5-6for modifiable parameter types)

Example： fa 08 f 02 00 00 03

Table5-8 Module parameter read response

Bytes	0	1	2	3	4	5	6	7	8
Name	MsgType	MsgCode	BrdId	PayLoad	Err		Type		CRC
Data	0xFB	0x09	0xXX	0x04	0xAAAA		0xBBBB		0xZZ

- BrdId = 0xXX used to indicate the module ID of the sending
- Type = 0xAAAA parameter type （see Talbe5-6 for modifiable types）
- Value = 0xBBBB parameter value

Example： fb 09 00 04 00 00 00 00 08

6. Attention

The PTFS-XXX is an optical instrument which operation is affected by environmental conditions. As a result, the range achievable in an application varies, while the range accuracy is not affected by such factors. The following conditions may affect the range.

6.1 Influencing Factors

6.1.1 Factors affecting range

Elements	Working temperature	factors that shorten the measurement range
target surface	1. Bright and reflective surfaces, such as reflective panels. 2. The light source of the measuring module is directed at the target.	1. dull and glossy table, black table, sponge / fabric and other light-absorbing materials. 2. Modular oblique targets
airborne particles	Clean air	Dust, fog, heavy rain, storms
sunlight intensity	low-light environments	Being brightly illuminated

6.1.2 Reasons affecting the accuracy of measurements

（1）Surface transparency

To avoid measurement errors, do not measure against the surface of transparent objects, such as colorless liquids (e.g. water) or glass (dust-free), and take a test measurement of unfamiliar materials or liquids first. Measurement errors will occur when aiming at a target through a glass window or when there are several target objects in the line of sight.

(2) Damp, high gloss & mirror surfaces

When the aiming angle is very small, the laser will be reflected. At this time, the signal received by the device will be too weak and affecting the accuracy or range; when the target is a mirror or other object, the laser signal will be reflected, resulting in a weak signal received by the device, and the distance from the device to the target may not be measured.

（3）Inclined surfaces, circular surfaces

Measurements can only be made when the target area is large enough to accommodate the laser spot.

（4）Multi-path reflection

When the laser light returned from other objects exceeds the reflected light from the target, erroneous measurement results may occur. Avoid all kinds of reflectors in the measurement light path.

6.2 safety precautions

The following instructions enable the person in charge of the PTFG and the user to be aware in advance of possible hazards in operation and to prevent them. The person in charge of the instrument should ensure that all users read and follow these instructions. If the PTFG is part of a system, the manufacturer of the system must be responsible for all safety-related issues, such as manuals, labeling, and instructions. Instrument use:

1、Permitted purpose: distance measurement

2、Scope of prohibition：Using the instrument without following instructions;Modifying or upgrading equipment by destroying safety systems; Removing instructions and hazard symbols; Aim directly at the sun.

WARNING: Prohibited methods of use may result in injury, instrument failure and damage if used. It is the responsibility of the person in of the instrument to inform the user of the dangers and how to prevent them. Do not operate the PTFG until you know how to use it. PTFG in conditions suitable for human survival. Do not use in flammable or explosive environments.

6.3 Scope of responsibility

Responsibility of the original equipment manufacturer: Provide the product, including this manual, software and original accessories, in a completely safe condition.

6.4 significant use hazards

WARNING: Do not point the PTFG laser directly at the sun, as this may damage the instrument; do not point the PTFG laser directly at the human eye, as this may cause damage to the human

Appendix 1:CRC Code Stream Calculation & Usage

Taking a single measurement message as an example, the message code stream is:

fa 01 f 04 01 00 01 00 00

1) Totalize the whole message by U8 array: 0xfa + 0x01 + 0xf + 0x04 + 0x01 + 0x00 +0x01 + 0x00 = 0x200

2) Take the lower 8 bits of the accumulated value as the CRC value：i.e. 0x00

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Unity| focus| integrity| progress together

Determined to become a leader in the field of laser detection!

Chengdu Meskernel Integrated Technology Co. Ltd