Internet of Everything | Sensing First

Professional Provider of Intelligent IoT Sensors

Air Temperature and Humidity Sensor

RS485 Output | Standard Modbus-RTU Protocol

1. Introduction

1、 This manual aims to provide users with detailed information about the company's sensor, including product functions, features, parameters, wiring methods, and communication protocols. By reading this manual, users will be able to fully understand the product's performance and operation methods, ensuring correct installation, configuration, and use of the sensor to meet the application needs in fields such as industrial automation and environmental monitoring. In addition, this manual provides company information and contact details so that users can obtain technical support and business consulting in a timely manner when encountering any problems during use.

2、 This product adopts a high-precision sensor combined with the company's professional and leading high-quality low-power chip, ensuring high speed, high precision, high reliability, and industrial-grade performance of the product. The product supports RS485 communication, adopts the standard Modbus RTU protocol, and features flexible communication parameter setting functions, ensuring operational convenience and system stability. In addition, we provide supporting PC testing software to facilitate users' testing and parameter modification.

3、 The product is applicable to multiple fields such as power systems, intelligent transportation, industrial automation, the Internet of Things, mineral energy, security systems, and smart homes, meeting the strict requirements of different industries. The product design takes into account the complex environment of industrial-grade applications and is equipped with reverse connection protection, overcurrent protection, anti-static, and lightning surge protection functions to ensure the long-term stable operation of the product.

4、 This manual is intended to provide you with comprehensive product introduction, features, parameters, wiring methods, communication protocols, and company information to help you better

understand and use our product. If you have any questions during use, please feel free to contact our technical support team, and we will serve you wholeheartedly.

Abbreviation/Term	Explanation
Network Configuration	Refers to performing network configuration on the device, especially the setting of an IP address, which is a basic step before the device is officially put into use.
RS485	RS485 is a standard under the OSI model's physical layer that specifies electrical characteristics for 2-wire, half-duplex, multi-point communication. Its electrical characteristics are significantly different from RS-232. The transmitted signal is represented by the voltage difference between the two ends of the cable. RS485 only specifies the electrical characteristics of the receiving and transmitting ends and does not specify or recommend any data protocol.
Modbus-RTU	Modbus is a serial communication protocol published by Modicon (now Schneider Electric) in 1979 for communication with Programmable Logic Controllers (PLCs). Modbus has become an industry standard for communication protocols in the industrial field and is now a commonly used connection method between industrial electronic devices.

2. Product Introduction

2.1 Product Overview

(1) This product adopts a high-precision temperature and humidity sensor probe and a high-performance microprocessor, which can accurately measure the temperature and humidity in the air, meeting the application needs of customers in various industries.

(2) This product complies with the standard ModBus RTU protocol, and users can flexibly modify the address and baud rate using upper computer software. When used with a 485-to-network module, this product can transmit data to a cloud server.

2.2 Functional Features

(1) Adopts a high-precision digital temperature and humidity sensor, supporting wide voltage DC 5V-30V power supply with power consumption less than 1 watt.

(2) Uses imported well-known brand RS485 chip, with multiple protections for the interface, including surge protection, wrong wiring protection, and a hardware watchdog design, ensuring stable operation of the device and preventing system crashes.

(3) RS485 interface and standard Modbus RTU protocol, which can be converted with 485-to-4G/Ethernet modules.

(4) Provides upper computer debugging software, allowing users to modify the device address (range: 0 to 255), baud rate (range: 4800bps to 9600bps), and parity method by themselves, and these settings can be saved after power-off.

2.3 Product Parameters

Power supply	DC 5-28V
Output Signal	RS485
Detection Range	Temperature: -40~80℃ / Humidity: 0-100%RH
Resolution	Temperature: 0-1℃ / Humidity: 0.1%RH
Accuracy	Temperature: ±0.3℃ / Humidity: ±3%RH（@25℃environment）
Response Time	≤3S
Operating Pressure Range	90-110kpa

Operating Range	Temperature:-40~80℃ / Humidity:0-95%(no condensation)
Communication Protocol Parameters	Communication Protocol Parameters Baud Rate: 9600; Communication Address: 1 (modifiable by default)
Protocol Format	Protocol Format No parity, 8 data bits, 1 stop bit (N, 8, 1)
Product Dimensions	115*95*45 单位 mm (manual measurement, slight errors may occur)

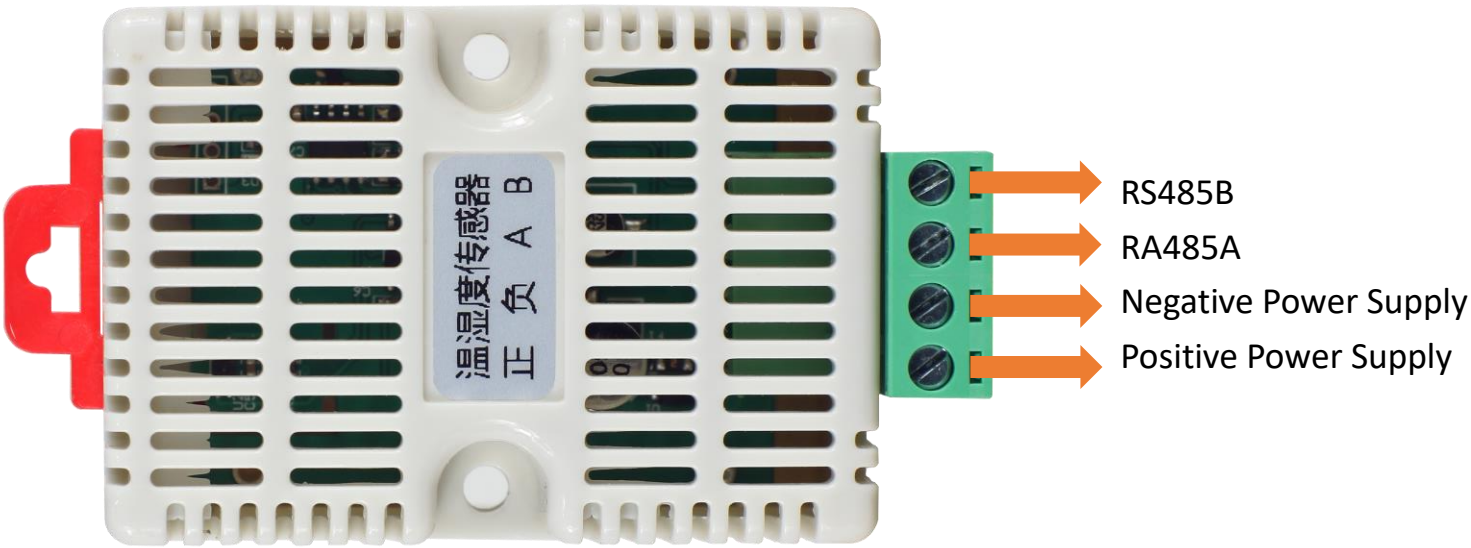
3. Power Supply and Wiring

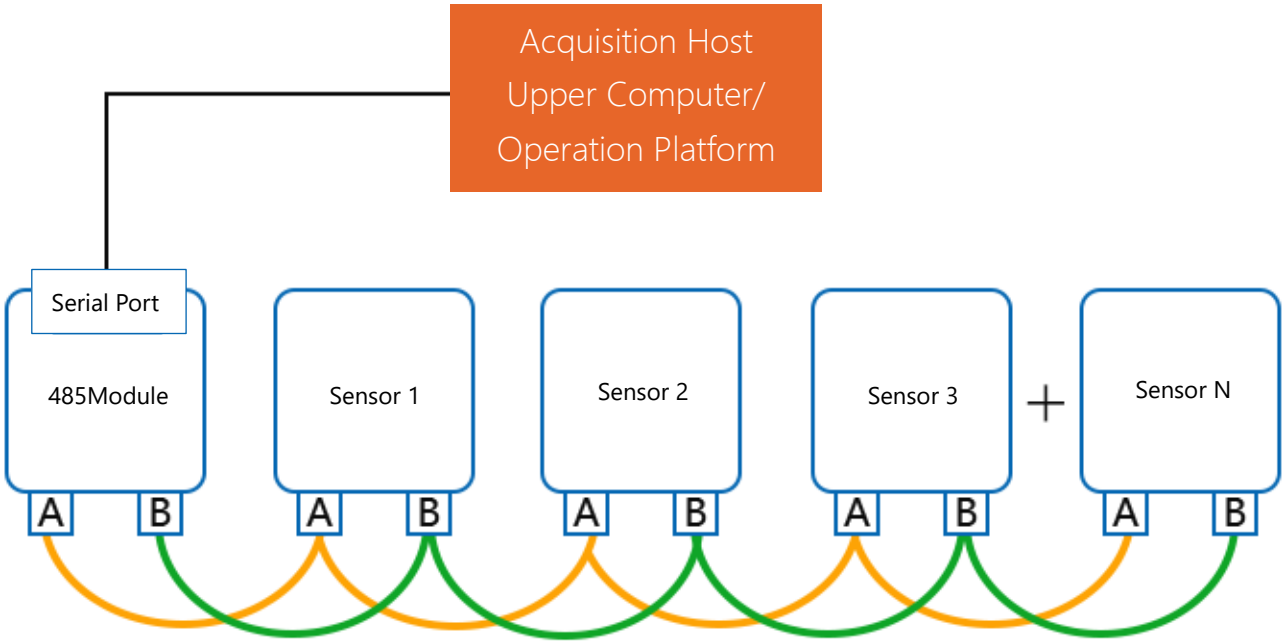
3.1 Working Power Supply

This product adopts wide-voltage DC power supply with a rated voltage of DC 5V-28V; the rated current is less than 0.1A, and the power is less than 1 watt. Customers generally use DC 5V or 28V power supply. For scenarios with long power supply lines, relevant considerations should be taken into account.

3.2 Wiring Method

(1) This product is equipped with a 4P terminal block, featuring RS485 signal output and standard ModBus-RTU protocol. Multiple sensors can be connected in a daisy-chain series, with a maximum of 255 sensors in series. Each sensor is distinguished by the 485 device address.

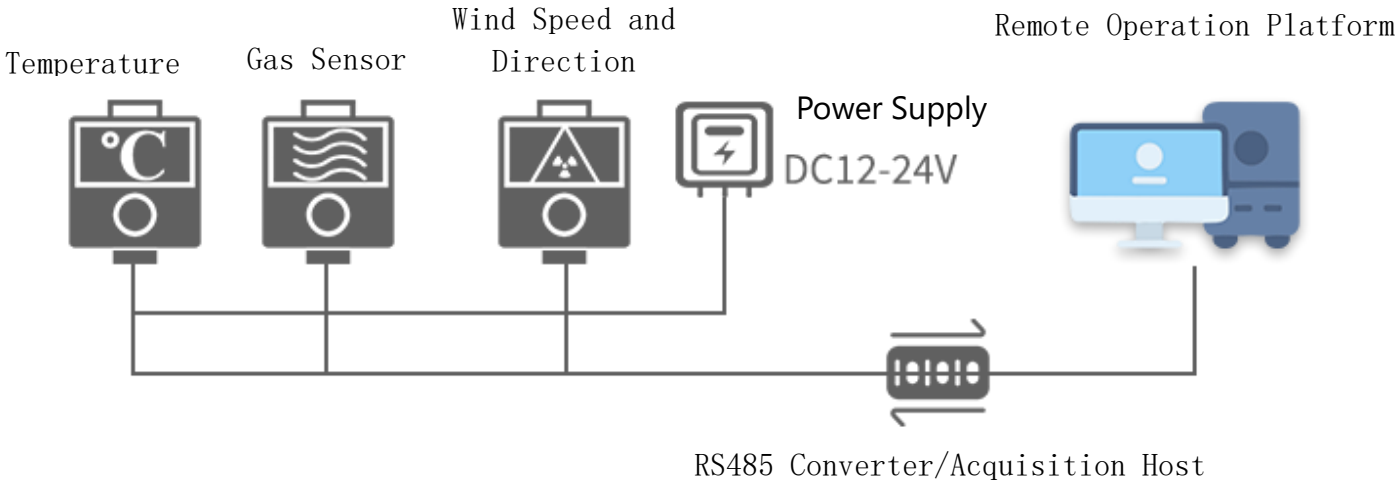




RS485 Bus Networking Series Wiring Diagram

3.3 Application Methods

(1) The product supports multiple application methods:Direct connection to PLC controllers or LCD displays.Connection to 485-to-Wifi/4G/Ethernet modules via the RS485 interface to transmit collected data to cloud databases.Direct connection to computers or microcontrollers for secondary development.


Temperature
Gas Sensor
Wind Speed and Direction
Power Supply
DC12-24V
Remote Operation Platform
RS485 Converter/Acquisition Host


0.000
SET

4.Modification of Baud Rate and Communication Address

4.1 Upper Computer Debugging Software Interface

(1) We provide free upper computer debugging software. Users can connect the sensor to a computer via a 485-to-serial/USB module to view sensor readings on the computer. Most importantly, the debugging software allows one-click modification of the sensor's address and baud rate (see the figure below). Note: The testing software is subject to optimization and updates; please refer to the latest version.

4.1 **Modifying Address and Baud Rate via Debugging Software**

(1) After connecting all devices, click the "Auto Read Address" button. The current address and baud rate of the sensor will be displayed in the corresponding fields. Check the data reception box at the bottom of the software. If no time-stamped data frames are returned, a communication timeout will occur after 3 seconds, indicating a wiring issue or communication failure. Modifications to the address and baud rate can only be performed when communication is normal.

4.2 Connecting the Sensor via USB-to-RS485 Converter

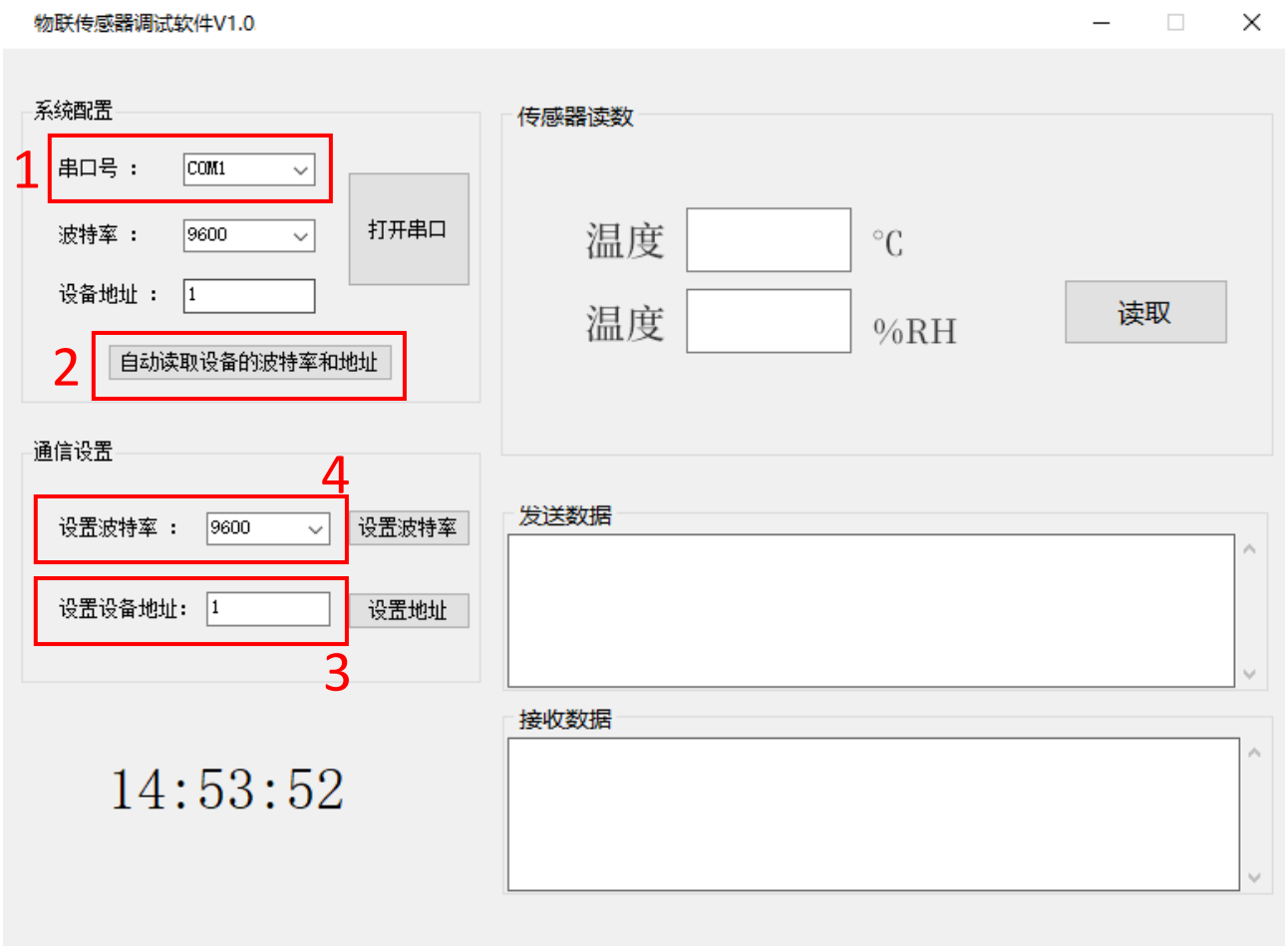
(1) After connection, select the correct USB port number.

(2) Click "Auto Get Baud Rate and Communication Address" in the upper computer software to read the current device address information.

(3) Example: If the current sensor address is 01 and you want to change it to 02, enter "02" in the "Device Address" field under "Communication Settings" and click "Set Address". The device address will be updated to 02 (default factory address: 1).

(4) Example: If the current sensor baud rate is 4800 and you want to change it to 9600, enter "9600" in the "Baud Rate" field under "Communication Settings" and click "Set Baud Rate". The baud rate will be updated to 9600 (default factory baud rate: 9600).

(5) After modifying the communication address or baud rate, power off and restart the device for the changes to take effect.


物联传感器调试软件V1.0
系统配置
1
串口号 ：
COM1
波特率 ：
9600
设备地址 ：
1
打开串口
2
自动读取设备的波特率和地址
通信设置
4
设置波特率 ：
9600
设置波特率
设置设备地址：
1
设置地址
3
14:53:52
传感器读数
温度
℃
温度
%RH
读取
发送数据
接收数据

5. Communication Protocol

5.1 Serial Port Parameters (Factory Default Serial Port Parameters of This Product)

Device Address	1
Baud Rate	9600
Data Bits	8位
Stop Bit	1位
Parity Bit	None

Note:

The above parameters are the default settings at the factory. The device address can be 01-251, and the baud rate can be 2400-9600 (optional: 2400/4800/9600). To modify the baud rate and address, please contact customer service for modification before delivery or modify it by yourself. For modifying the baud rate and communication address, please refer to Chapter 4.2 above.

5.2 Basic Communication Parameters

Encoding	8-bit Binary
Data Bits	8 bits
Parity Bit	None
Stop Bit	1 bit
Error Checking	CRC (Cyclic Redundancy Check)
Baud Rate	Configurable: 2400, 4800, 9600; default at factory: 9600bit/s

5.3 Definition of Data Frame Format

Adopting Modbus-RTU communication protocol, the format is as follows:

Initial Structure: ≥4 bytes of time

Address Code: 1 byte

Function Code: 1 byte

Data Area: N bytes

Error Checking: 16-bit CRC code

End Structure: ≥4 bytes of time

Address Code: The address of the transmitter, unique in the communication network (see the label on the upper part of the sensor at the factory).

Function Code: Indicates the function of the command sent by the master. This transmitter only uses function code 0x03 (reading register data).

Data Area: Specific communication data; note that 16-bit data is sent with the high byte first!

CRC Code: Two-byte check code.

Master Inquiry Frame Structure:

Address Code	Function Code	Starting Register Address	Register Length	CRC Low Byte	CRC High Byte
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave Response Frame Structure:

Address Code	Function Code	Number of Valid Bytes	Data Area 1	Data Area 2	Data Area N	Check Code
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	2 bytes

5.4 Register Addresses

Register Address	PLC or Configuration Address	Content	Operation
0000 H	40001	Humidity	Read-only
0001 H	40002	Temperature	Read-only

5.5 Communication Protocol Example and Explanation

Example: Reading the temperature and humidity of the device with address 0x01.

Inquiry Frame (Hexadecimal): （01 03 00 00 00 02 C4 0B）Sending Code Command

Address Code	Function Code	Starting Address	Data Length	Check Code Low Byte	Check Code High Byte
0x01	0x03	0x00 0x00	0x00 0x02	0xC4	0x0B

Response Frame (Hexadecimal): （01 03 04 00 92 FF 9B 5B 85）Received Return Code

Address Code	Function Code	Number of Returned Valid Bytes	Humidity Value	Temperature Value	Check Code Low Byte	Address Code
0x01	0x03	0x04	0x00 x0x92	0xFF 0x9B	0x5B	0X85

Temperature Data Conversion Method:

Temperature: FF98 H (hexadecimal) = -101 => Temperature = -10.1° C

(When the temperature is below 0 ° C, the temperature data is uploaded in the form of two's complement.)

Humidity Data Conversion Method:

Humidity: 292 H (hexadecimal) = 658 => Humidity = 65.8%RH

5.6 Modifying Address Through Serial Port Command (Please Power Off and Restart the Device After Modification)

(1) The sensor uses function code 06 to modify the sensor address.

(2) The register for storing the sensor address is256(0x01 0X00)

(3) Example:

If the current sensor address is 01 and you want to change it to 02, the command is:01 06 01 00 00 02 09 F7

01 is the address,06 is the function code,01 00 is the register 256 for storing the sensor address, 00 02 is the new address (2);09 F7 is the CRC check code.

Sensor Response:01 06 01 00 00 02 09 F7

The register for storing the sensor baud rate is 257(0x01 0X01)

5.7 Modifying Baud Rate Through Serial Port Command (Please Power Off and Restart the Device After Modification)

(1) Example:

If the current sensor baud rate is 4800，and you want to change it to 9600，the command is：01 06 01 01 00 02 58 37

01 is the address,06 is the function code,01 01is the register 257 for storing the sensor baud rate, 00 02 indicates changing the baud rate to 9600(00 = 2400, 01 =4800, 02

=9600);58 37 is the CRC check code.

Sensor Response: 01 06 01 01 00 02 58 37

Restart the sensor after modification for the change to take effect.

6. Common Problems and Solutions

6.1 No Data Transmission, Communication Timeout

This product is mass-produced and shipped after strict factory inspection. Generally speaking, there will be no basic 485 communication problems. When a communication failure occurs, you can connect the sensor to a computer through a 485-to-serial/USB module, use the provided upper computer debugging software, and click the "Auto Read Baud Rate and Address" button to view the current device address information and test whether the communication is normal.

(1) Check if the power supply is normal. If possible, use a multimeter to measure the supply voltage.

(2) Confirm whether the selected serial port number is correct (COM1, COM2...). The device address is incorrect or there are devices with duplicate addresses (see the label on the upper part of the sensor for the factory setting).

(3) The RS485 bus is disconnected, or the A and B communication lines are reversed. Unplug and reinsert the 485-to-USB/serial module to ensure it is properly connected.

(4) The baud rate, parity method, data bits, or stop bits are incorrect. You can try opening the "Data Sending/Data Receiving" section of the debugging software to check if the original data is normal.

(5) The USB-to-485 driver is not installed or is damaged.

6.2. PLC Communication Failure (PLC Communication Failures Generally Have the Following Possibilities)

As mentioned in Section 6.1 "No Data Transmission, Communication Timeout", connect the sensor to a computer through a 485-to-USB/serial module for troubleshooting.

(1) The line is not properly connected, the wiring is loose, or the power supply

is not connected.

(2) In the PLC parameter settings, the baud rate or parity bit is incorrect.

(3) In the PLC settings, the polling interval is too short during polling. The response to the previous poll has not been received yet, and the next poll command has already been sent. When this problem occurs, you can try setting the polling interval to 1 second for testing.

7. Product Warranty and Notes

The warranty period of this product is one year. Starting from the date of shipment, within twelve months, for failures caused by the sensor's own quality problems (non-human damage), our company is responsible for free repair or replacement. After the warranty period, only the cost price will be charged (the repair shipping fee shall be borne by the buyer).

（1）Upon receiving the product, please check if the packaging is intact and verify that the sensor model and specifications match the product you purchased.

（2）The installation location should be far from chemical corrosive environments.

（3）The sensor and wires should be kept away from high-voltage electricity, heat sources, etc.

（4） The sensor is a precision instrument and should be stored in a dry, ventilated, and normal-temperature indoor environment. Users are not allowed to disassemble it by themselves during use to avoid product damage.