XF700
Compact Weather Station

Manual

Catalog

XF700 Compact Weather Station

- **Product Introduction**

  XF700 compact weather station integrates seven meteorological parameters, Ambient Temperature, Relative Humidity, Atmospheric Pressure, Wind Speed, Wind Direction, Optical Rainfall and Illuminance, in one structure. It realizes 24 hours continuous online monitoring of outdoor meteorological parameters, and output these data to users through digital communication interface all at once.

- **Application**

  · Meteorological Monitoring
  · Micro Environmental Monitoring
  · Grid Environment Monitoring
  · Agricultural Meteorological Monitoring
  · Meteorological Traffic Monitoring
  · Photovoltaic Environment Monitoring
  · Meteorological Monitoring of Wind Power Generation

- **Features**

  · Small in size
  · Integrated design
  · High integration
  · Compact structure with no moving parts
  · Easy to install
  · One year warranty
  · Protective cover with special process heat insulation treatment
  · Support extended parameter measurement
  · Free testing software XF_PcSoftV1.0 (ask your salesperson for it)

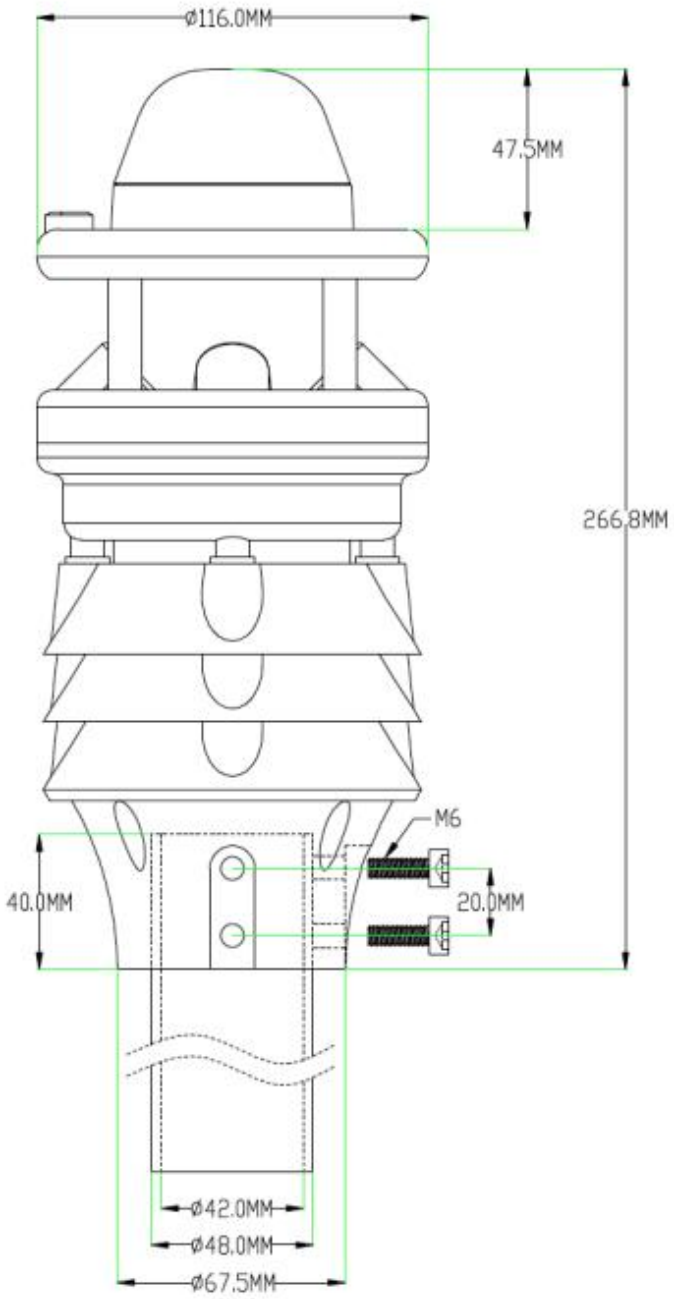
- **Technical Paramters**

Parameters	Measuring Range	Accuracy	Resolution	Sampling Frequency
Ambient Temperature	-40-85℃	±0.3℃@25℃	0.01℃	1HZ
Relative Humidity	0-100%RH	±3%RH (10%-90%RH, No Condensation)	0.01%RH	1HZ
Wind Speed	0-60m/s (0-75m/s can be customized)	±（0.3+0.03V）m/s；V≤30m/s ±（0.3+0.05V）m/s; V≥30m/s (V stands for standard wind speed in a wind tunnel)	0.01m/s	4HZ
Wind Direction	0-359.9°	±3° (Wind Speed ＜10m/s)	0.1°	4HZ
Atmospheric Pressure	500-1100hPa	±0.5hPa（25℃，950-1100hPa）	0.1hPa	1HZ
Rainfall	Measurement form: optical; Measuring range: 0-200mm/h; Resolution: 0.2mm; Sampling frequency: 1HZ			
Illuminance	0-100KLux	±3% Or 1%F.S	10Lux	1HZ
Operating Temperature	-40℃—80℃			
Output	Standard product with RS485 interface, ModbusRTU; Customized option SDI-12(additional purchased)			
Maximum Output Frequency	Passive Mode: 1/S　Active Mode: 1/min			
Power Supply	DC9-30V			
Protection Level	IP65			
Fixed Method	Standard Product is sleeve fixed ,see product size drawing (Optional flange fixing or bending plate fixing method)			
Fixed Bracket (additional purchased)	Optional: 1.5 meter or 1.8 meter bracket			
Cable	3 meter cable line (Optional: 10 meter cable　additional purchased)			
Customized Function	NMEA Communication Protocol, ASCII (ASCII compatible for Vaisala), CAN Port			

(extra costs apply)	(ASCII), Angle of tilt/electronic compass, Heating function, GPS Positioning, Built-in 4G (Data service free for 3 years)
Remarks	1. This Sensor with Ambient Temperature, Relative Humidity and Atmospheric Pressure integrated, is installed in a three-layer outdoor radiation shield. The radiation shield adopts PC+ fiber special proportion configuration, and the interior is sprayed with thermal insulation layer, to minimize the solar radiation influence. No moving parts,ensuring the accuracy of long-time measurement data. No moving parts,ensuring the accuracy of long-time measurement data. 2. Wind Speed, Wind Direction: The wind speed and wind direction is measured through ultrasonic principle, and the data of instantaneous wind speed, instantaneous wind direction, average wind speed and average wind direction can also output. The optional direction of the electronic compass measuring device to is used to correct the wind direction data, and the optional GPS is used to calculate the true wind speed and direction. 3. Optical Rainfall: automatically senses rain falling on its outer surface and calculates the amount of rainfall according to the size and number of raindrops. Compare with the traditional physical bucket rain gauge, the accuracy of the optical rain gauge is its weakness. Most of the time, the reading of the optical rain gauge will be close to the bucket rain gauge, but abnormal events will be significantly different (heavy rain). But it is an integrated design, more suitable for application in site where tipping bucket rainfall is hard to apply, not restricted by the installation situation. And when the rainfall is small and light, it is more sensitive. 4. Illuminance: Select high specification 400-1100nm wavelength range optical elements with filter to achieve measurement. 5. XF_PcSoftV1.0: the upper computer reading software, Nong-IoT developed for XF series compact weather station.

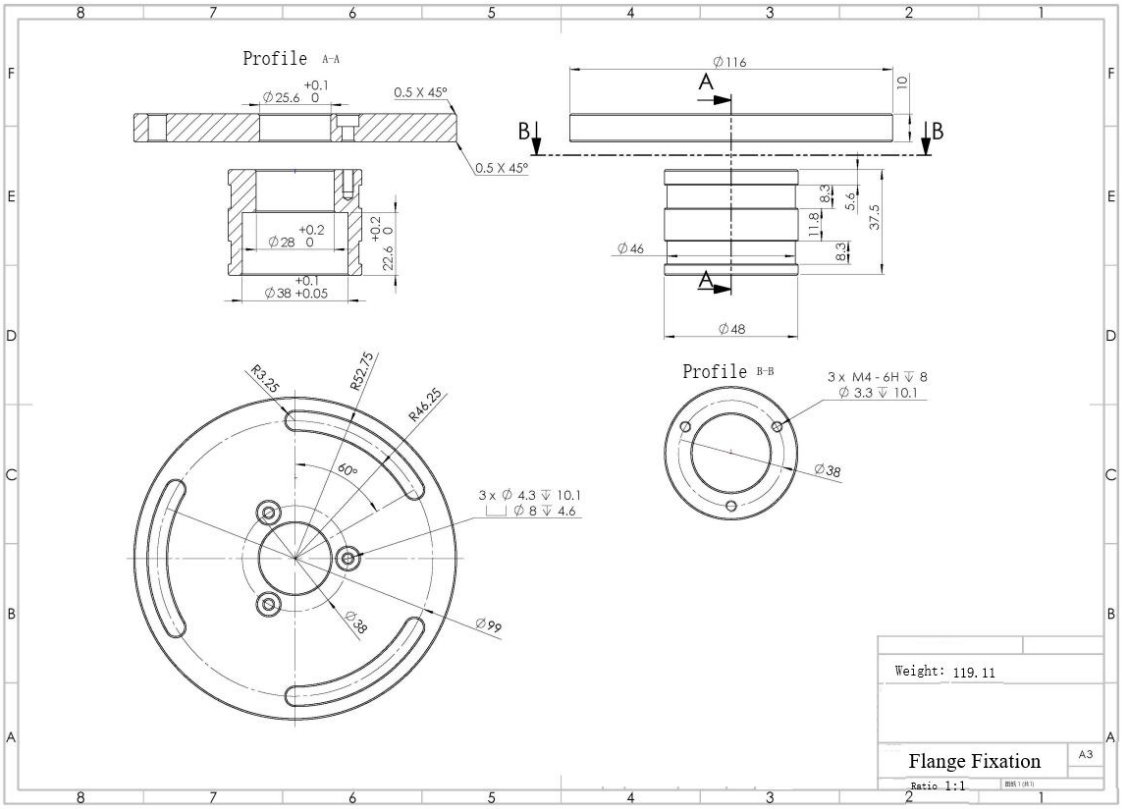
⭑ Specifications may be updated without prior notice.

- **Product Size**

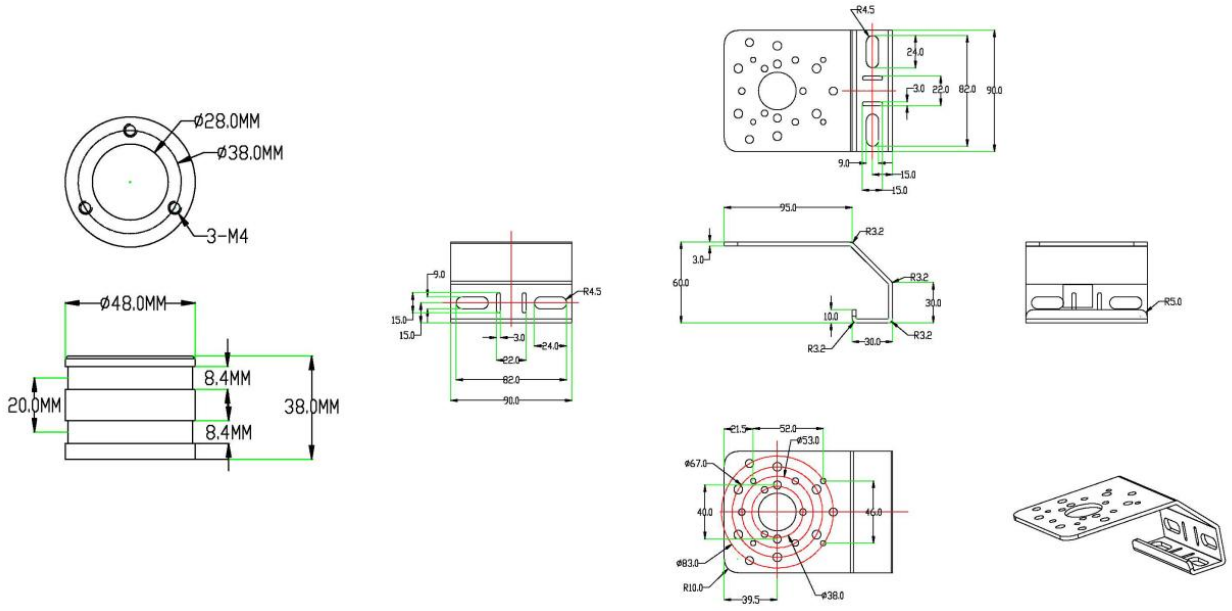


- **Accessories**

Flange Mounting Manner：



Bending Plate Mounting Manner:



MODBUS RTU Communication Protocol

（Apply to XF700 product）

Baud Rate: 9600
Data Bits: 8
Stop Bit: 1
Check Bit: None

1.1 CRC Description:

Among all the following instructions, the two bytes of CRC16 in MODBUS RTU protocol are as follows: the low byte comes before and the high byte comes after.

In the following instructions, the assumed sensor address is 0xFF (the default sensor address is FF).

1.2 Return Error Code Rule:

When receive error instruction (including CRC16 validation error), no error codes will be returned. It is considered to be a failure, when there is no return data in 200ms after the instruction is issued. Upper computer may resend instruction.

1.3 Standard MODBUS register description

Special Notice:

The quantity or length of the register in Modbus is two bytes with 16 bits as a unit (the high byte comes first, and the low bytes follows), instead of one byte with 8 bits as a unit.

User shall ensure that the address and quantity of register in command are confined within the range specified by the system. Otherwise, the output of the sensor will be unpredictable. Users shall ensure that the MODBUS command complies with the requirements of this manual in the software design of the upper computer and the minimum query period supported is 1s/ time.

Input register: read with function code 03

Address	Operation	Contents	Note
0x0001	Read-only	Noise, a hexadecimal number amplified by 10 times. For example, 0x01193, means 403/10=40.3dB	
0x0002	Read-only	Hydrogen Sulfide/TVOC, a hexadecimal number.	
0x0003	Read-only	SO2 concentration, a hexadecimal. For example, 0x0172 indicates that SO2 concentration is 370ppb.	
0x0004	Read-only	NO2 concentration,a hexadecimal number. For example, 0x0036 indicates that NO2 concentration is 54ppb.	
0x0005	Read-only	CO concentration,a hexadecimal number. For example, 0x0A00 indicates that CO concentration is 2560ppb.	
0x0006	Read-only	O3 concentration, a hexadecimal number. For example, 0x0123 indicates that O3 concentration is 291ppb.	
0x0007	Read-only	PM2.5 concentration,a hexadecimal number. For example, 0x0172 indicates that PM2.5 concentration is 370ug/m³.	
0x0008	Read-only	PM10 concentration, a hexadecimal number. For example,0x0193 indicates that PM10 concentration is 403ug/m³.	
0x0009	Read-only	Ambient Temperature, a hexadecimal number add 40 then magnified 100 times. For example, 0x1B00 indicates 6912/100-40=29.12℃	
0x000A	Read-only	Relative Humidity, a hexadecimal number magnified by 100 times. For example, 0x1603 indicates 5635/100=56.35%RH.	
0x000B	Read-only	Atmospheric Pressure, a hexadecimal number magnified by 10 times. For example, 0x2784 indicates 10116/10=1011.6hPa.	
0x000C	Read-only	Wind Speed, a hexadecimal number magnified by 100 times. For example, 0x0125 indicates 293/100=2.93m/s	
0x000D	Read-only	Wind Direction, a hexadecimal number magnified by 10 times. For example, 0x0C14 indicates 3092/10=309.2°	The North points to the 0°
0x000E	Read-only	Continuous Rainfall, a hexadecimal number magnified by 10 times , For example,0x0016 indicates 2.2mm.	

0x000F	Read-only	Solar Radiation, a hexadecimal number. For example,0x0172 indicates 370W/㎡.	
0x0010	Read-only	Illumination, a hexadecimal number magnified by 100 times. For example, 0x0123 indicates 2.91.Klux.	
0x0011	Read-only	UV index	
0x0012	Read-only	CO2, a hexadecimal number. For example, 0x01F4 indicates 500ppm.	
0x0013	Read-only	Negative Oxygen Ion, a hexadecimal number reduced by 10 times. For example, 0x01F4 indicates Negative Oxygen Ion number is5000.	
0x0014-0x001f	Read-only	Keep	
0x0020	Read-only	Electronic compass, a hexadecimal number. For example,0x0036 indicates currently pointing to 54°	The North points to the 0°
0x0021	Read-only	Pitch angle 1	Customized
0x0022	Read-only	Pitch angle 2	Customized
0x0023	Read-only	Pitch angle 3	Customized
0x0024	Read-only	longitude-1	Customized
0x0025	Read-only	longitude-2	Customized
0x0026	Read-only	latitude-1	Customized
0x0027	Read-only	latitude-2	Customized
0x0028	Read-only	Altitude	Customized

1.4 Communication Example

The following is an example of how to use Modbus RTU commands to access system registers:

1. Read multiple input registers (7 real time data) command

Send: FF 03 00 09 00 08 81 D0

FF	03	00 09	00 08	81 D0
System Address	Function Code	Register Address	Number of Registers	CRC16 check digit automatically generated by software

Answer: FF 03 10 1A 57 0C 5F 27 83 00 11 0C 14 00 02 00 00 01 09 47 03

FF	03	10	1A 57 0C 5F 27 83 00 11 0C 14 00 02 00 00 01 09	47 03
System Address	Function Code	The number of bytes in a data segment	Segment Data	CRC16 check bit

Analytical Data:

0x1A57= 0x1A * 256 + 0x57= 6743

Ambient Temperature = 6743/100-40=27.43℃

0x0C5F= 0x0C * 256 + 0x5F= 3167

Relative Humidity=3167/100=31.67%RH

0x2783= 0x27 * 256 + 0x83= 10115

Atmospheric Pressure=10115/10=1011.5hPa

0x0011=17

Wind Speed =17/100=0.17m/s

0x0C14=0x0C * 256 + 0x14= 3092

Wind Direction=3092/10=309.2°

0x0002=2

Rainfall=2/10=0.2mm

0x0109=0x01*256+0x09=265

Illuminance=265/100=2.65klux=2650lux

2. Read a single input register command

Send: FF 03 00 09 00 01 41 D6

FF	03	00 09	00 01	41 D6
System Address	Function Code	Register Address	Number of Registers	CRC16 check digit automatically generated by software

Answer: FF 03 02 1A 57 DB 0E

FF	03	02	1A 57	DB 0E
System Address	Function Code	The number of bytes in a data segment	Segment Data	CRC16 check bit

Analytical Data:

0x1A57= 0x1A * 256 + 0x57= 6743

Ambient Temperature = 6743/100-40=27.43℃

3. Read address register command

Send: 00 03 00 00 00 01 85 DB

00	03	00 00	00 01	85 DB
	Function Code	Register Address	Number of Registers	CRC16 check digit automatically generated by software

Answer: 00 03 02 00 01 44 44

00	03	02	00 01	44 44
	Function Code	The number of bytes in a data segment	Segment Data	CRC16 check bit

Segment data 0x0001 =01 indicate system address is 01

4. Modify internal register (system address) command (change the address to 0x33)

Send: 00 06 00 00 00 33 C8 0E

00	06	00 00	00 33	C8 0E
	Function Code	Register Address	New Address	CRC16 check bit

Answer: 00 06 00 00 00 33 C8 0E (indicates that the modification is successful)

00	06	00 00	00 33	C8 0E
	Function Code	Starting Address	New Address	CRC16 check bit

5. Set the rainfall accumulation time

Send: 00 06 01 07 00 0A B8 21

00	06	01 07	00 0A	B8 21
	Function Code	Register Address	Accumulative Time (10 Minutes)	CRC16 check bit

Answer: 00 06 01 07 00 0A B8 21 (indicates that the modification is successful)

00	06	01 07	00 0A	B8 21
	Function Code	Starting Address	Accumulative Time (10 Minutes)	CRC16 check bit

Note：This device factory default setting is the continuous accumulation unclear 0 mode. When the rainfall accumulation time is set to 0, the device does not automatically clear the rainfall, and it has been accumulated continuously. The rainfall can be reset to zero by restarting the power or resetting the rainfall accumulation time (sending command 00 06 01 07 00 00 38 26 cleared to 0 timing)

6. Set magnetic decrement correction (only for electronic compass function)

Send: 00 06 01 06 00 05 A9 E5

00	06	01 06	00 05	A9 E5
Station Number	Function Code	Register Address	Correction Angle	CRC16 check bit

Answer: 00 06 01 06 00 05 A9 E5 (indicates that the modification is successful)

00	06	01 06	00 05	A9 E5
Station Number	Function Code	Register Address	Correction Angle	CRC16 check bit

Correction Angle Implication

The high eight digits indicate the direction of correction,0x00 represent positive correction, 0x01

represent negative correction.
The low eight digits indicate the angle of the correction
Example: 0x00 05 represent that require to add 5 degree to the output
0x01 03 represent that require to reduce 3 degree to the output

7. Read the latitude and longitude information
Send AT+GPS#
Answer
GPS:36.12345,N;114.12345,E;2019-01-01,D;10:20:00,T;0040.2,H#

Supplementary agreement: (the default device address is FF)

Active reporting period (Register Address 0x01 0A) Unit is min, 0 indicates no reporting
00 06 01 0A 00 0A 29 E2 (Set the active reporting period to 10 minutes)

Active reporting length (Register Address 0x01 0B)
00 06 01 0B 0C 02 7C E4 (Active reporting register address 0C-0D)

Baud Rate （Register Address 0X0102）
00-06 respectively represent 2400、4800、9600、19200、38400、57600、115200

00 06 01 02 00 02 A9 E6 (Set the baud rate to 9600, non-professionals do not change it)

Warranty and After-sales Service:

Warranty: The product warranty period is 12 months from the delivery date (except for the product problems caused by not operating in accordance with corresponding technical requirements or other artificial behavior).

After-sales commitment: Users can consult technical issues by phone and get clear solutions. If it is a quality problem of the product itself, it can be returned to the factory for repair or replacement.

After-sales telephone: 0310-8033736