MAC500L
Compact Weather Station

User Guide

Catalog

MAC500L Compact Weather Station

- Product Brief

  MAC500L is a XF500 scalable product , adding another meteorological or environmental parameter-Solar Radiation to be a six elements compact weather station. It integrates the six parameters, Ambient Temperature, Relative Humidity, Atmospheric Pressure, Wind Speed, Wind Direction and Solar Radiation, in one structure.

- 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)

- Product Technical Data

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%-80%RH, No Condensation)	0.01%RH	1HZ
Wind Speed (Third Generation)	0-40m/s	±(0.5+0.05V)M/S	0.01m/s	10HZ
Wind Direction (Third Generation)	0-359.9°	±5° (when Wind Speed ＜10m/s)	0.1°	10HZ
Atmospheric Pressure	500-1100hPa	±0.5hPa（25℃，950-1100hPa）	0.1hPa	1HZ
Solar Radiation	0-2000W/㎡	±5%	1W	1HZ
Operating Temperature	-30℃—70℃			
Output	Standard product with RS485 interface, ModbusRTU; Customizable option SDI-12(Extra costs apply)			
Maximum Output Frequency	Passive Mode: 1/S Active Mode: 1/min			
Power Supply	DC9-24V			
Level of Protection	IP65			
Mounting Manner	Standard Product is sleeve fixed (Optional: matching parts, extra costs apply, see Accessory and Parts)			
Fixed Trestle	Optional: 1.5 meter, or 1.8 meter bracket (extra cost apply)			
Cable	3 meter cable line (Optional: 10 meter cable line available for extra cost)			
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 a thermal insulation layer, to minimize the solar radiation influence. 2. Supplementary Description on 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 may be part of the output. The optional electronic compass is used to measure apparent wind speed and direction data, and the optional GPS is used to calculate the true wind speed and direction. 3. Solar Radiation: Select high specification optical heat element with filter to achieve measurement. 4. XF_PcSoftV1.0: the upper computer reading software, Nong-IoT developed for the XF series compact weather station.			

Specifications may be updated without prior notice.
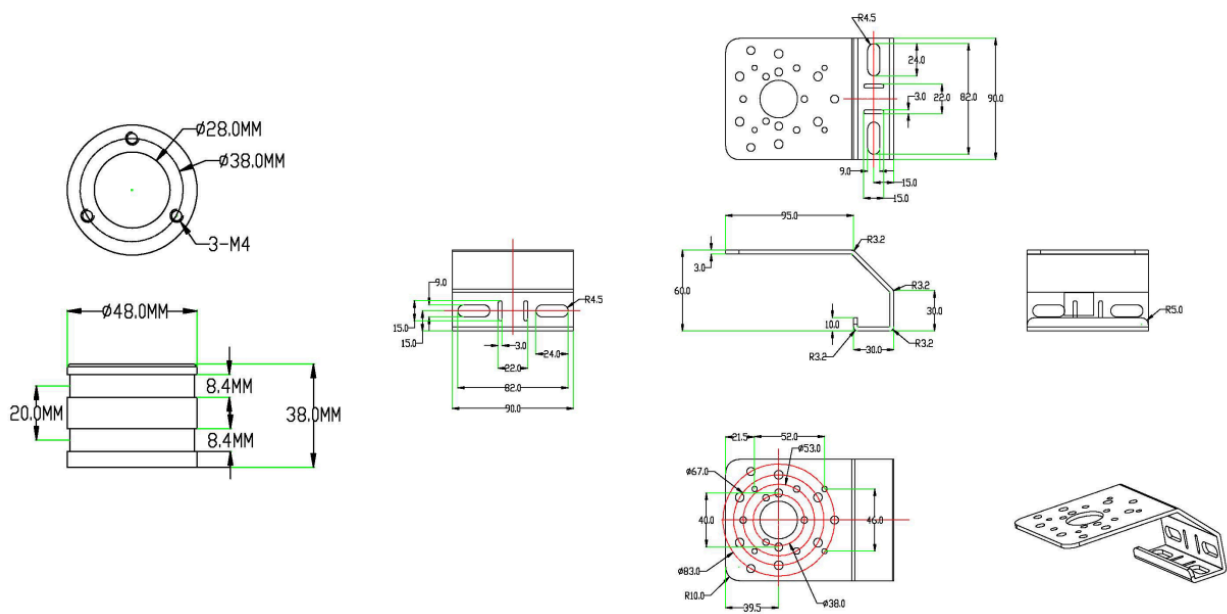
• Product Dimension
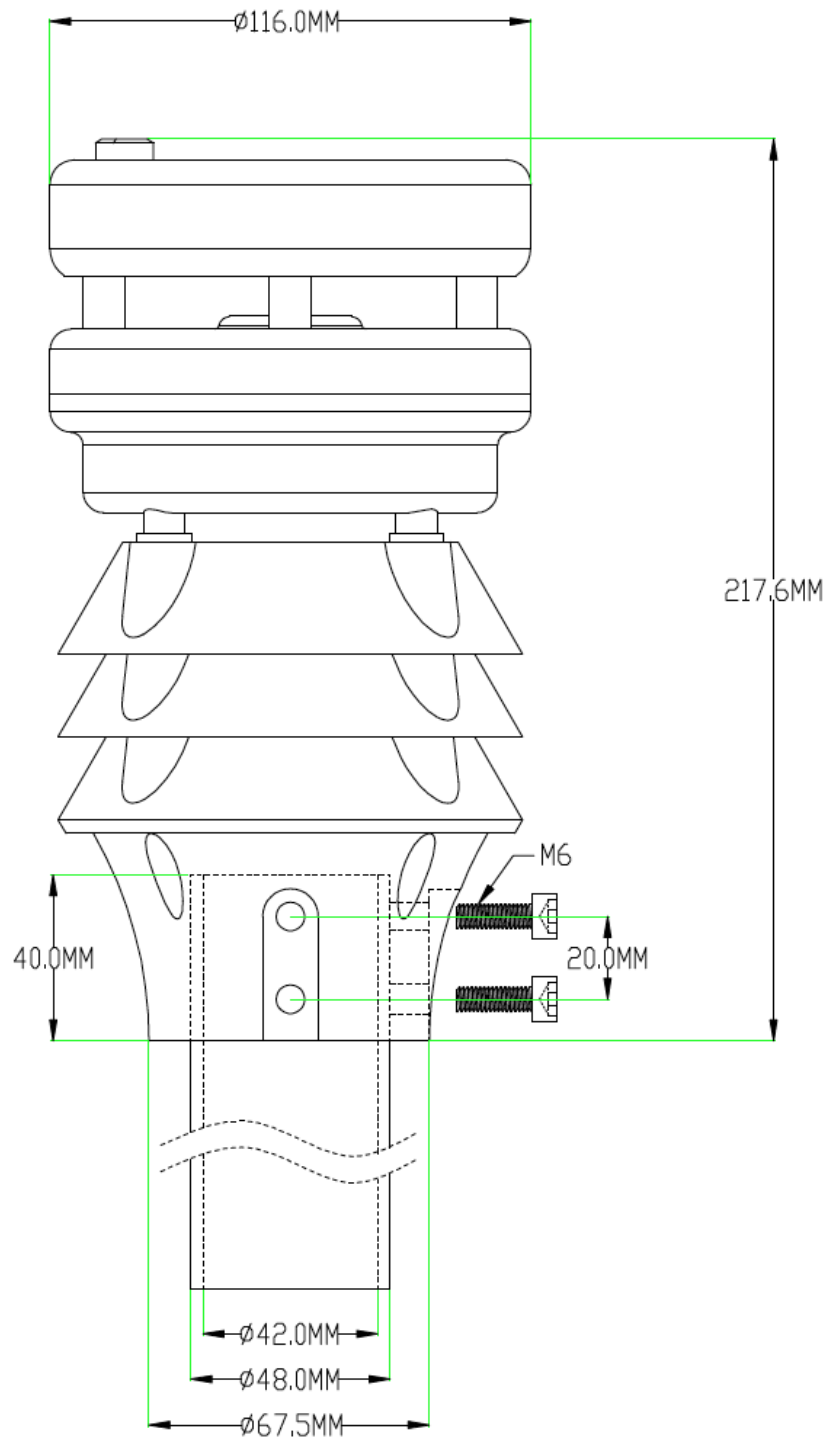
◆ Accessory and Parts

Flange Mounting Manner：
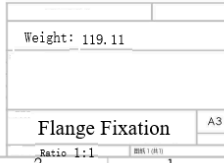
Bending Plate Mounting Manner:

MODBUS RTU Communication Protocol （Apply to MAC500L product）

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

1.1 CRC Instruction:

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

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

1.2 Return error code rule:

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

1.3 Standard MODBUS register declaration

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.

Users shall ensure in command, the address and quantity of register, are 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, such as 0x0193, 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 370 ppb.	
0x0004	Read-only	NO2 concentration,a hexadecimal number. For example, 0x0036 indicates that NO2 concentration is 54 ppb.	
0x0005	Read-only	CO concentration,a hexadecimal number. For example, 0x0A00 indicates that CO concentration is 2560 ppb.	
0x0006	Read-only	O3 concentration, a hexadecimal number. For example, 0x0123 indicates that O3 concentration is 291 ppb.	
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 added to 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	CO_2, a hexadecimal number. For example, 0x01F4 indicates 500ppm.	
0x0013	Read-only	Negative Oxygen Ion, a hexadecimal number shrinked by a factor of 10. 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	Custom-made
0x0022	Read-only	Pitch angle 2	Custom-made
0x0023	Read-only	Pitch angle 3	Custom-made
0x0024	Read-only	longitude-1	Custom-made
0x0025	Read-only	longitude-2	Custom-made
0x0026	Read-only	latitude-1	Custom-made
0x0027	Read-only	latitude-2	Custom-made
0x0028	Read-only	Altitude	Custom-made

1.4 Example

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

1.   Read multiple input registers (5 real time data) command

Send: FF 03 00 09 00 05 40 15

FF	03	00 09	00 05	40 15
System Address	Function Code	Register Address	Number of Registers	CRC16 check digit automatically generated by software

Answer: FF 03 0A 1A 57 0C 5F 27 83 00 11 0C 14 30 1C

FF	03	0A	1A 57 0C 5F 27 83 00 11 0C 14	30 1C
System Address	Function Code	The number of bytes in a data segment	Segment Data	CRC16 check bit

Data parse:

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°

2.   Read a single input register command

Send: FF 03 00 01 00 01 C0 14

FF	03	00 01	00 01	C0 14
System Address	Function Code	Register Address	Number of Registers	CRC16 check digit automatically generated by software

Answer: FF 03 02 02 1C 91 39

FF	03	02	02 1C	91 39
System Address	Function Code	The number of bytes in a data segment	Segment Data	CRC16 check bit

Data parse:

0x021C= 0x02 * 256 + 0x1C= 540

Noise = 540/10=54.0dB

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   System address 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
	Functio n 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
	Functio n 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	Cumulative 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	Cumulative 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, regularly)

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 represents positive correction, 0x01 represents 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 shall not change it by themselves)

Quality Assurance and After-sales Services:

Warranty: the warranty period of the product is 12 months from the delivery date (product

problems caused by failure to operate in accordance with the corresponding technical

requirements or other human actions are excluded).

After- sales: users can consult about technical matters and get clear solutions. If it is due to product quality problems can return for maintenance or replacement.

Service Email: info@macnman.com