WS6820 – Pollution & Weather Sensor

Compact air quality & metrological sensor with Modbus RTU communication

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WS6820	▪ CO, NO_2, SO_2, O_3
	▪ PM2.5, PM10
	▪ Temperature
	▪ Relative humidity
	▪ Atmospheric pressure
	▪ Wind speed
	▪ Wind direction
	▪ Precipitation (rain fall)
WS6899	▪ Optional accessory: Wall mount adapter bracket for WS6820

Applications

- Air quality monitoring for health protection HVAC control
- Common outdoor conditions data for HVAC comfort control
- Fresh air louvre control based on wind speed and/or direction, and rain presence
- Agricultural use such as greenhouse ventilation and outdoor irrigation demand
- Road / bridge condition monitoring

Design

Compact, with high precision and reliable performance, suitable for harsh outdoor environments. Ultrasonic wind status sensing and optical rain level monitoring.
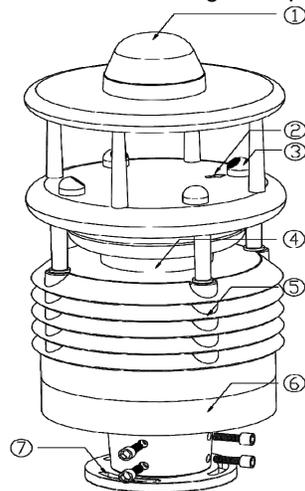
Modbus RTU comms allow real time data gathering with the minimum of wiring considerations; 2-wire comms + 2-wire power supply via the supplied 4-pole cable (3m) with DIN plug

1. Rainfall sensor
2. North alignment arrow
3. Ultrasonic probe (1 of 4)
4. Electronics housing
5. Thermometer shelter (temperature, humidity, air pressure sensor location)
6. Pollutants monitoring
7. Mounting flange for pole or wall mount adapter bracket

Measured Quantities

Attribute	Principle	Range	Accuracy	Resolution
PM2.5		0… 1000µg/m^3	±10 ±10%	1µg/m^3
PM10		0… 1000µg/m^3	±10 ±10%	1µg/m^3
CO		0… 10PPM	±5% FS	≤10PPB
SO^2		0… 5000PPB	±5% FS	≤10PPB
NO^2		0… 5000PPB	±5% FS	≤10PPB
O^3		0… 5000PPB	±5% FS	≤10PPB
Temperature	Energy gap method	-40… 60℃	±0.01℃	±0.3℃（V=25℃）
Humidity	Capacitance method	0… 100% rH	±0.01%	±3%RH（10%-80%, non- condensing）
Atmospheric Pressure	Piezoresistive	500… 1,100 hPa	±0.5 hPa (0… 30℃) (950… 1,100 hPa）	0.1hPa
Wind Speed	Ultrasonic	0… 60 m/s	±（0.3+0.03V）M/S；V≤30M/S ±（0.3+0.05V）M/S;V≥30M/S	0.01m/s
Wind Direction	Ultrasonic	0… 359.9°	±3° @ 10m/s	0.1°
Rainfall	Optical	0… 200 mm/h	±15%	0.1mm

Note: The four pollutant gases may be converted from PPB to µg/m^3 using the following factors, where PPB * N = µg/m^3

Gas	NO^2	SO^2	CO	O^3
Factor (N)	2.054	2.857	1.25	2.143

Modbus Protocol

Defaults	• Baud rate	9600
	• Data configuration	8N1
	• Device address	247

Register format
- Holding Register (F03)
- Integer, unsigned
- 1 Word (2 byte, 16 bit)

Address setting

If required to change the default address 247 then send the new address value to the device System Address 0, Register 0, using Function 6 (F06 / Write single register).

For example to change the device address to 12 (HEX 0C), then the following write command is sent (where xx xx = the message Checksum):

- 00 06 00 00 00 0C xx xx

Register Addresses

Address (Modicon / Dec. / HEX)	Attribute	Quantity / Units / Reading Factor		Note
40004 / 03 / 00 03	Read-only	SO2 concentration	PPM * 0.001	
40005 / 04 / 00 04	Read-only	NO2 concentration	PPM * 0.001	
40006 / 05 / 00 05	Read-only	CO concentration	PPM * 0.001	
40007 / 06 / 00 06	Read-only	O3 concentration	PPM * 0.001	
40008 / 07 / 00 07	Read-only	PM2.5 concentration	µg/m³	
40009 / 08 / 00 08	Read-only	PM10 concentration	µg/m³	
40010 / 09 / 00 09	Read-only	Temperature	℃ * 0.01 - 40	
40011 / 10 / 00 0A	Read-only	Relative humidity	%rH * 0.01	
40012 / 11 / 00 0B	Read-only	Atmospheric pressure	hPa * 0.1	
40013 / 12 / 00 0C	Read-only	Wind speed	m/s * 0.01	
40014 / 13 / 00 0D	Read-only	Wind direction	° * 0.1	0° = North
40015 / 14 / 00 0E	Read-only	Rainfall, last 10 minutes	mm * 0.1	
40017 / 16 / 00 10	Read-only	Illumination	kLux * 0.01	
40034 / 33 / 00 21	Read-only	Pitch angle 1		Only with Electronic Compass option: WS6820EC
40035 / 34 / 00 22	Read-only	Pitch angle 2		
40036 / 35 / 00 23	Read-only	Pitch angle 3		
40037 / 36 / 00 24	Read-only	Longitude 1		
40038 / 37 / 00 25	Read-only	Longitude 2		
40039 / 38 / 00 26	Read-only	Latitude1		
40040 / 39 / 00 27	Read-only	Latitude2		
40041 / 40 / 00 28	Read-only	Altitude		

System Registers (System Device Address 0)

Register 0 / Modbus network address

Modify network address to 33 (HEX 21)：00 06 00 00 00 21 xx xx

00	06	00 00	00 21	xx xx
System address	Function code	Register address	New address	CRC16 checksum

Response：00 06 00 00 00 21 xx xx   (Indicates successful modification)

Register 258 / Modbus Baudrate

Modify baud rate to 19200 (option 3 / HEX 03)：00 06 01 02 00 03 xx xx

00	06	01 02	00 03	xx xx
System address	Function code	Register address	New baud rate	CRC16 checksum

Response：00 06 01 02 00 03 xx xx (Indicates successful modification)

Register 263 / Set time of rainfall accumulation

Modify accumulation time period to 10 minutes： 00 06 01 07 00 0A xx xx

00	06	01 07	00 0A	xx xx
System address	function code	Start address	Time accumulation(min)	CRC16 check bit

Response： 00 06 01 07 00 0A xx xx (Indicates successful modification)

Note: The default immediate time is 10 mins. If the accumulation time of rainfall is set to 0, the value does not automatically reset, but accumulates continuously. In this case only a power reset will reset the rain value to zero

Register 262 / Set magnetic declination correction (only for optional electronic compass)

Modify correction angle to 5°: 00 06 01 06 00 05 xx xx

00	06	01 06	00 05	xx xx
System address	Function code	Register Address	Positive Correction angle	CRC16 check bit

Response： 00 06 01 06 00 05 xx xx   (Indicates successful modification)

Note: The high byte indicates the direction of correction; 00 represents positive correction / 01 represents negative correction. The low byte is the angle of correction. For example, 00 05 means that the output value needs to be increased by 5 degrees whereas 01 03 means that the output value needs to be reduced by 3 degrees

Connections

The sensor is supplied with a 4- pole cable, 3m long, with 4-pole DIN connector at sensor end and colour coded fly wires at remote end.

Power Supply:	1	Red		+ve	12…24Vdc
	2	Black		–ve	12…24Vdc
Modbus:	3	Yellow		+ / A	RS485
	4	Blue		– / B	RS485

Dimensions

182mm

50mm

100mm

145mm

50mm

50mm

Fixing screws: M6 x 15

49.8mm
70mm

WS6899
Wall Mounting Bracket Set:

Ø28.0MM
Ø38.0MM
3—M4

Ø48.0MM
8.4MM
20.0MM
8.4MM
38.0MM

Technical Data

Power Supply:	12… 24Vdc
Output (RS485):	Modbus RTU
Power Rating:	1.2W @ 12Vdc
Response time:	≤ 30 sec
Warmup time:	30 sec / 3 hrs for SO2, NO2, CO, O3
Operating Temperature range:	-40°C…+70°C
Storage Temperature range:	-40°C…+60°C
Operating Humidity range	5…90% rH
Housing material:	ASA engineering plastic
Housing protection:	IP65
Dimensions (mm):	395 H x 182 ∅
Mounting sleeve (mm):	49.8 ∅ internal