

WS-MOD/AN-250 Modbus/Analogue Wind Sensor Interface

The WS-MOD/AN-250 is the WS-SEN-WIND wind sensor (7911 anemometer) monitoring and alarming interface. It allows the wind speed and direction to be measured with a Davis Instruments DS7911 Anemometer, without the need for the entire weather station.

Monitoring of the wind speed and direction can be done via the analog retransmission channels with 0-5V, 1-5V, 0-20mA or 4-20mA outputs. As well as monitoring the speed and direction, 2 alarm relays can be programmed to activate at a certain speed or wind direction range, or combination of the two. Wind speed and direction can also be monitored using the Modbus protocol with either a USB or 2-wire RS485 connection. Settings are set using the DIP switches, via Modbus or via the configuration software.

Features

- Connects to WS-SEN-WIND wind sensor (DS7911 anemometer)
- Monitors both Wind Speed and Direction
- Modbus protocol interface
- 0..5Vdc or 4..20mA interface for analogue signals
- Alarm generation based on wind speed and direction
- DIN rail or screw mounting enclosure



| Model Type | Model | Description |
|-----------------------|-----------------------------------|--|
| | WS-MOD/AN-250 | Wind Speed and Direction Anemometer Interface Module |
| Technical Data | Power Supply | 24Vdc |
| | Inputs (RJ11) | 1 x Anemometer (Wind Speed and Direction Sensor) |
| | Outputs (Analogue) | 1 x AO 0..5Vdc / 0..20mA / 4..20mA (wind speed) 1 x AO 0..5Vdc / 0..20mA / 4..20mA (wind direction) |
| | Outputs (Relay) | 2 x Alarm Relay Contacts (for wind speed and direction alarms) |
| | RS485 MODBUS COMMUNICATION | |
| | General | RS485 Modbus RTU |
| | Speed | 2400 / 4800 / 9600 / 19k2 / 38k4 / 57k6 bps |
| | Address | 1..243 |
| | Modbus | 8 Data Bits, Parity None-Odd-Even, 1 Stop Bit |
| | ENVIRONMENTAL CONDITIONS | |
| | Ambient Temperature | 0..50°C |
| | Humidity | 0..90 % rH non-condensing |
| | Connections | Screw Terminals for Wire Up To 2.5mm ² RJ11 Anemometer Connection USB Connection for Configuration Software |
| | Mounting | DIN-rail, or Screw Mounting |
| | Housing | White Plastics |
| Protection Class | IP20 (terminals) | |

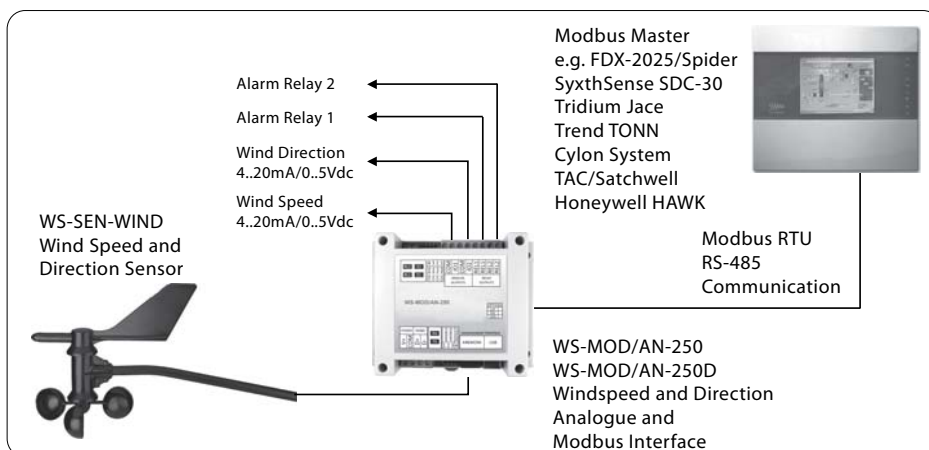
Wiring Connections

The table below shows the wiring connections of the interface.

| Connection | Description | Connection | Description |
|------------|--------------------------|------------|---|
| +4 | DC Power Input | IO1 | Wind Speed 0-20mA / 4-20mA / 0-5V / 1-5V Re-Transmission Output |
| COM | Common Ground Connection | IO2 | Wind Direction 0-20mA / 4-20mA / 0-5V / 1-5V Re-Transmission Output |
| 4 | RS485 Data + | REL1 | Alarm Relay 1 Contacts |
| \$ | RS485 Data - | REL2 | Alarm Relay 2 Contacts |
| USB | USB Connector | | |
| ANEMOM | Anemometer Connector | | |

Example Diagram

The diagram below illustrates the use of the WS-MOD/AN0250 interface unit...



Analogue Outputs

The WS-MOD/AN can transmit the wind speed and direction as an analog voltage or current signal. The maximum and minimum wind speeds to transmit are set using holding registers 31 and 32 and the transmission format (0-20mA / 0-5V or 4-20mA / 1-5V) is set using DIP Switches S1-1 and S1-3. By default the WS-MOD/AN will transmit from 0 to 100 in km/h.

| SW1-1 | SW1-3 | Wind Speed Format |
|-------|-------|-------------------|
| OFF | OFF | 0..20mA |
| OFF | ON | 4..20mA |
| ON | OFF | 0..5V |
| ON | ON | 1..5V |

Wind direction is output on channel 2, and DIP Switches S1-2 and S1-4 control the format.

| SW1-2 | SW1-4 | Wind Direction Format |
|-------|-------|-----------------------|
| OFF | OFF | 0..20mA |
| OFF | ON | 4..20mA |
| ON | OFF | 0..5V |
| ON | ON | 1..5V |

Current Calibration and Direction Offset

If the anemometer can not be mounted so that the sensor is facing north, or the user does not wish to manually adjust the sensor, a direction offset can entered to holding register 34 and then this value is added to all direction readings.

If the user wishes to check the calibration of the current loop transmission a value of 1 should be written to holding register 36. This will output the 20mA level to both current channels. If it needs to be adjusted, remove the lid of the WS-MOD/AN case and then a current sensor should be connected to each output and the trimpots near U1 (Channel 1) and U2 (Channel 2) can be adjusted until exactly 20mA is displayed on the current sensor. Once a satisfactory calibration has been achieved, holding register 36 should be written back to 0.

Alarms

There are two alarm relays on the WS-MOD/AN, each relay can be activated by either the wind speed going over a certain limit or the direction being within a certain range, or a combination of the two.

The levels and time limits that control the alarms are set using the software or through the Modbus holding registers. Alarm 1 settings begin at holding register 10 and alarm 2 settings begin at holding register 20. Holding register 10 enables alarming on wind speed, register 11 is the speed above which the alarm will become active if it has been above that point for the number of seconds defined by register 12. Register 13 enables alarming on wind direction. The direction must be less than register

14 and greater than register 15 for the time defined by register 16, to activate the alarm. If register 17 is 0, either speed or direction will activate the relay when the limit is reached, but when register 17 is 1, both the speed and direction alarms must be active for the relay to turn on.

Alarm relay 2 has the same functionality as alarm relay 1, except the registers associated with it are 20-27 as opposed to 10-17 for Alarm 1.

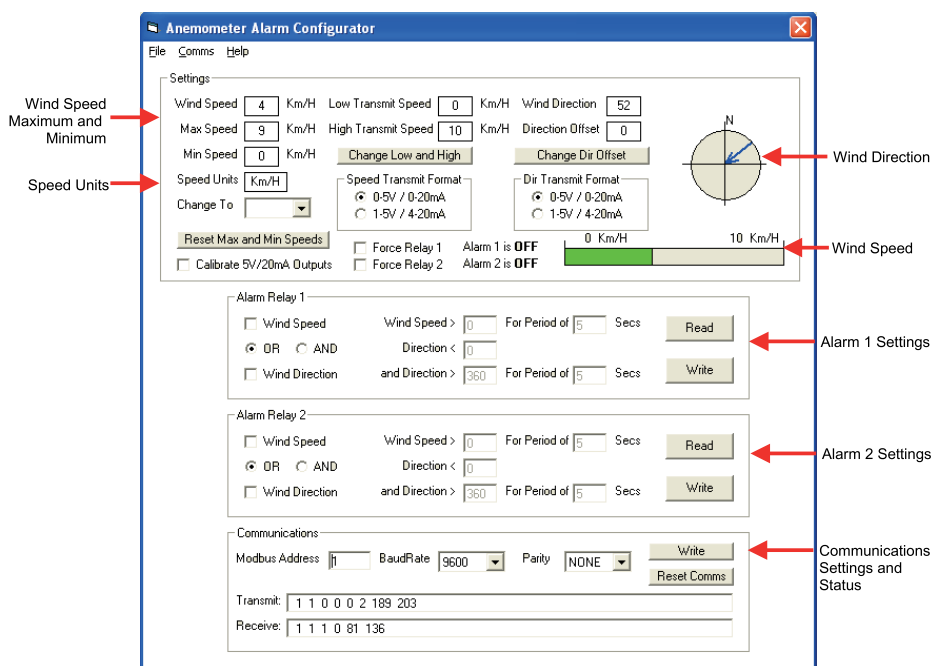
Saving Settings to Memory

WS-MOD/AN has an internal EEPROM memory to store settings even when the unit is not powered. If settings are changed they are automatically saved to memory. The memory save process occurs approximately 5 seconds after settings are changed. If settings are changed, wait 10 seconds before removing power from the unit.

Software

SyxtSense supply a software configuration package called Anemometer Configurator which is a simple to use program. The configuration software allows the user to monitor the wind speed and direction, as well as the maximum and minimum speeds, and allows the user to set all the available settings. Either through the software or writing to holding register 30 directly the wind speed units can be set. The value by default is Km/H, but can be changed to MPH with a value of 0, Knots with a value of 2 or m/sec with a value of 3, all other values are MPH.

When the units are set, all parameters to do with wind speed are displayed in these units and the maximum and minimum speeds are reset.



Anemometer Calibration (WS-SEN-WIND)

Holding Registers 29 and 30 relate to the way the pulses from the anemometer translate to wind speed.

If the value in Register 30 is any of the values 0, 1, 2 or 3 the wind speed units are set for for the Davis Instruments 7911 Anemometer for Mph, Km/h, Knots and m/s respectively.

A value of 4 or higher will allow for another anemometer to be used, provided it is wired to the connector correctly. Register 29 is the multiplier that is applied to the speed to allow for a greater resolution if a value of 10 is used then the resolution of the wind speed will be 0.1 of the unit, all the values relating to wind speed will now be a factor of 10 out. Ie, when Register 29 is 10 and Register 30 is 3 a value of 138 in Register 1 will relate to a wind speed of 13.8 m/s.

To create custom calibration units, the value in register 30 should be the number of pulses that the anemometer gives in one hour for that unit.

For the DS7911 anemometer the values used in the KTA-250 are 1602 for Mph, 995 for Km/h, 1843 for Knots and 3578 for m/s.

Indicator LEDs

Various LEDs are used for feedback on the WS-MOD/AN, their function is described in table below.

| LED | Description |
|-----|---|
| TX | Transmit LED |
| RX | Receive LED |
| RL1 | Relay 1 LED, Active when Alarm 1 and Relay 1 are ON |
| RL2 | Relay 2 LED, Active when Alarm 2 and Relay 2 are ON |
| E1 | Error 1 LED, Active when analog output 1 is in current mode and the current loop is disconnected or |

| LED | Description |
|-----|---|
| E2 | Error 2 LED, Active when analog output 2 is in current mode and the current loop is disconnected or |

Modbus Registers

The WS-MOD/AN interface supports the following Modbus registers. The unit is supports the following Function Codes

Code 1 : Read Multiple Coils

Code 3: Read Multiple Holding Registers

Code 5: Write a Single Coil

Code 6: Write a Single Holding Register

Code 15: Write to Multiple Coils

Code 16: Write to Multiple Holding Registers

Note: When reading multiple holding registers, a maximum of 20 holding registers can be read at one time from the WS-MOD/AN.

Communications settings of the unit are set by the 4-way DIP switch labelled S2 or Modbus holding registers. SW1-SW3 control the Modbus address of the unit, SW4 sets the default baud rate (57600) and parity (None). Table below shows the effect of the switches.r

| S2-1 | S2-2 | S2-3 | Address |
|------|------|------|----------------------------|
| OFF | OFF | OFF | Set By Holding Register 37 |
| OFF | OFF | ON | 1 |
| OFF | ON | OFF | 2 |
| OFF | ON | ON | 3 |
| ON | OFF | OFF | 4 |
| ON | OFF | ON | 5 |
| ON | ON | OFF | 6 |
| ON | ON | ON | 7 |

| S2-4 | Baud | Parity |
|------|----------------------------|----------------------------|
| OFF | Set By Holding Register 38 | Set By Holding Register 39 |
| OFF | 57600 | None |

If the switches are set to OFF, the communications settings are set via the Modbus holding registers, these default to Address = 1, Baud Rate = 9600 and Parity = None.

The communications settings are only activated when the unit is first powered up or when a 1 is written to holding register 40.

If the WS-MOD will not respond to communications, power OFF the unit, set the communications settings to Address = 1, Baud Rate = 57600 and Parity = None, in the control software, then turn switches S2-3 and S2-4 ON and S2-1 and S2-2 OFF, after that, turn the power to the unit ON. The control software and the unit should then communicate..

| Register | Parameter Description | Data Type | Range |
|---|---------------------------------------|------------------|---------------|
| FUNCTION CODE 03 - READ HOLDING REGISTERS | | | |
| FUNCTION CODE 16 - WRITE MULTIPLE REGISTERS | | | |
| 1 | Wind Speed | Holding Register | |
| 2 | Wind Direction | Holding Register | |
| 3 | Maximum Wind Speed | Holding Register | |
| 4 | Minimum Wind Speed | Holding Register | |
| 10 | Relay 1 - Wind Speed Alarm On | Holding Register | |
| 11 | Relay 1 - Wind Speed Alarm Limit | Holding Register | |
| 12 | Relay 1 - Wind Speed Alarm Period | Holding Register | |
| 13 | Relay 1 - Wind Direction Alarm On | Holding Register | |
| 14 | Relay 1 - Wind Direction < Limit | Holding Register | |
| 15 | Relay 1 - Wind Direction > Limit | Holding Register | |
| 16 | Relay 1 - Wind Direction Alarm Period | Holding Register | |
| 17 | Relay 1 - Alarm Combination | Holding Register | 0 = OR, 1=AND |
| 20 | Relay 2 - Wind Speed Alarm On | Holding Register | |
| 21 | Relay 2- Wind Speed Alarm Limit | Holding Register | |

| Register | Parameter Description | Data Type | Range |
|----------|--|------------------|--|
| 22 | Relay 2 - Wind Speed Alarm Period | Holding Register | |
| 23 | Relay 2 - Wind Direction Alarm On | Holding Register | |
| 24 | Relay 1 - Wind Direction < Limit | Holding Register | |
| 25 | Relay 2 - Wind Direction > Limit | Holding Register | |
| 26 | Relay 2 - Wind Direction Alarm Period | Holding Register | |
| 27 | Relay 2 - Alarm Combination | Holding Register | 0 = OR, 1=AND |
| 29 | Calibration Multiplier | | |
| 30 | Speed Units | | 0 = Mph, 1=km/h, 2=Knots, 3=m/s, Other = Custom Anemometer Calibration |
| 31 | Speed Transmission Low Value | | |
| 32 | Speed Transmission High Value | | |
| 33 | Speed Transmission | | 0=0.5V/0.20mA, 1=1.5V/4.20mA |
| 34 | Direction Offset | | 0..360 |
| 35 | Direction Transmission | | 0=0.5V/0.20mA, 1=1.5V/4.20mA |
| 36 | Calibrate 1=5V/20mA out on both Channels | | |
| 37 | Modbus Address | | 1..243 |
| 38 | Baud Rate | | 0=9600, 1=2400, 2=4800, 3=9600, 4=19k2, 5=38k4, 6=57k6 |
| 39 | Parity | | 0=None, 1=Odd, 2=Even |
| 40 | Reset Comms | | 1=Reset |
| | FUNCTION CODE 01 - READ SINGLE COIL | | |
| | FUNCTION CODE 05 - WRITE SINGLE COIL | | |
| 1 | Relay Output 1 | | |
| 2 | Relay Output 2 | | |
| 3 | Force Relay 1 ON | | |
| 4 | Force Relay 2 ON | | |
| 5 | Reset Max and Min Speeds | | |
| 10 | SW2-1 State | | |
| 11 | SW2-2 State | | |
| 12 | SW2-1 State | | |
| 13 | SW2-3 State | | |
| 16 | SW1-3 State | | |
| 17 | SW1-4 State | | |