

WINDMETER®

USER MANUAL

fw ver. 81.00-00.00 / hw rev. RGB103

GENERAL DESCRIPTION

The WindMeter® (WM) is a high technology electronic device primary designed to accurately measure the wind speed and make it available to the user in the best suitable way for its applications.

It's mainly intended, but not limited, to be used in wind energy applications for preliminary studies, for commissioning testing and for continuous performance checking and monitoring.

It's based on a 3 cup anemometer that through an internal CPU give values of wind speed available in Serial Modbus RTU open protocol. Values are already filtered to give reliable values along the time.

It's equipped with an additional temperature sensor that through same Modbus protocol give the working temperature of cup anemometer.

The measures can be read by a powerful, versatile EIA/TIA-RS485 bus interface with the well known industry standard protocol Modbus RTU.

FEATURES

Inputs:

wind speed: 0 ÷ 50 m/s (0 ÷ 180 km/h)
temperature range: -30 ÷ +85 °C measurable with internal temp. sensor

Outputs:

serial: RS485, standard Modbus RTU protocol

Measurements precision:

resolution: 0.227 km/h
precision: < ± 2%
starting velocity > 0.5 m/s
temperature: < ± 0.6 °C

Supply: 5 ÷ 40 Vdc / 9 ÷ 28 Vac

Case: aluminium with screws to fix it on one end of a pole

Wiring: 3 m cable UV resistant, 4 conductor

Connectors: M8 4 pin, IP67 code, UV resistant

Dimensions: rotor diameter : Ø 166mm
body diameter: Ø 44 ext., Ø 36 int. mm
height: 223 mm

Operating temperature: -30 ÷ +85 °C (transport and storage -35°C ÷ +95 °C)

Every WM is factory calibrated.

PIECE'S LIST

- WM with screws for end pole positioning
- instruction manual
- calibration report
- transportation box

FINAL TEST AND CALIBRATION REPORT:

S/N

OPER.....

DATE.....

Important : Do not try to open the case of Windmeter: warranty will be void.

ASSEMBLY

WM is provided with screws to be applied in end pole of a 12 - 36mm diameter. For applications in other locations (i.e. in an arm) it is necessary a mounting bracket

CONNECTIONS

[without connector]

Correspondence colour wires - signals

colour	Name	Description
black	SUPPLY 1	power supply pin1
red	SUPPLY 2	power supply pin2
green	RS485+/B	communication bus non inverting signal (note 1)
white/green	RS485-/A	communication bus inverting bus signal (note 1)

Tab.1

[with connector]

Pin Correspondence table:

Conn.pin		
#	Cable colour	Description
1	Green	RS485+/B, communication bus non inverting signal
2	Red	Power supply +12 ÷ 30Vdc
3	Green/White	RS485-/A, communication bus inverting bus signal
4	Black	Power supply / Signal 0 Vdc

Tab. 2



Fig.1 Front male connector

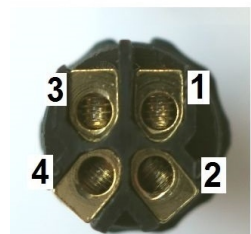


Fig.2 Back female connector

WM

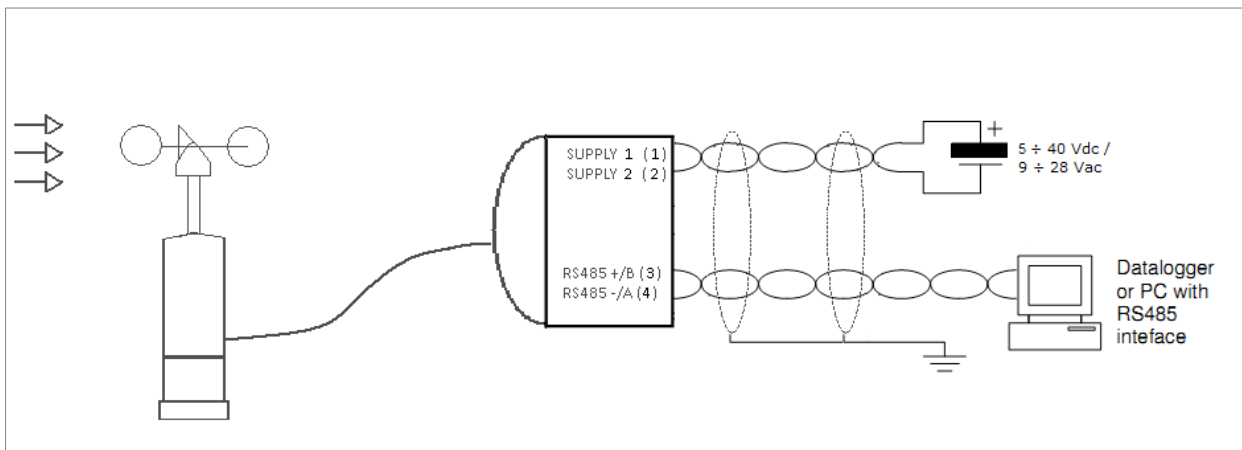


Fig. 3: typical connections/usage

We strongly suggest to use a shielded connection cable with twisted pairs, AWG22 / 0.32mm²

Notes:

- 1) balanced differential bus RS485 needs to be terminated, at the extremities of the bus, by a 100-120 Ω resistor (1/4 W) between RS485+/RS485- lines in order to avoid signal's reflections. In the case that SM is the device at one extremity, place the resistor into the supplied female connector. Even if RS485 have -7/+12Vdc common mode rejection range, normally sufficient to compensate ground potential difference between connected devices, it is strongly recommended to always carry a ground reference among the bus signals and to connect it to the SM's Signal GND.
- 2) the digital input needs to be activated by shorting to GROUND (either supply or signal, latter preferably). Do not attempt to supply voltage to this input.

MODBUS PROTOCOL

Modbus is a Master-Slave protocol, widely used as an industry standard. Simple, efficient and reliable, can be easily used to access and collect data or exchange information between digital systems over a serial line local bus (and with its TCP/IP extension through a LAN or World Wide Web).

Please refer to specific detailed documentation and implementations freely available at www.modbus.org

WM is a Modbus RTU slave that implements the following standard access functions:

Function code	Description
0x03	READ HOLDING REGISTERS
0x04	READ INPUT REGISTERS
0x06	WRITE SINGLE REGISTER
0x10	WRITE MULTIPLE REGISTERS

Tab. 3

Please note that in the current implementation of WM function codes 0x03 and 0x04 are equivalent and address the same data area.

Data is accessible through Modbus's functions by 16 bits units called "registers". In the current implementation of WM these registers are available:

Register #	Description	Access	NV save																
0x0101	Current speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x0102	Current temperature [°C], 2-complement value, fixed point 14.2 format (14 bits integer, 2 bits fractional)	R																	
0x0103	Status , bit coded <table border="1"> <thead> <tr> <th>Bit</th> <th>Description</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>Factory calibration/configuration 1 = OK; 0 = need recalibration</td> </tr> <tr> <td>1</td> <td>Not volatile parameters 1 = OK; 0 = default loaded, need to be changed/saved</td> </tr> <tr> <td>2</td> <td>Digital input monitor 1 = not active (open); 0 = active (shorted to GND)</td> </tr> <tr> <td>3</td> <td>DIP switch 1 1 = electrical contact open; 0 = electrical contact shorted</td> </tr> <tr> <td>4</td> <td>DIP switch 2 1 = electrical contact open; 0 = electrical contact shorted</td> </tr> <tr> <td>5</td> <td>Watchdog 1 = reset by watchdog timeout occurred; 0 = normal operation</td> </tr> <tr> <td></td> <td>all undefined bits read as 0</td> </tr> </tbody> </table>	Bit	Description	0	Factory calibration/configuration 1 = OK; 0 = need recalibration	1	Not volatile parameters 1 = OK; 0 = default loaded, need to be changed/saved	2	Digital input monitor 1 = not active (open); 0 = active (shorted to GND)	3	DIP switch 1 1 = electrical contact open; 0 = electrical contact shorted	4	DIP switch 2 1 = electrical contact open; 0 = electrical contact shorted	5	Watchdog 1 = reset by watchdog timeout occurred; 0 = normal operation		all undefined bits read as 0	R	
Bit	Description																		
0	Factory calibration/configuration 1 = OK; 0 = need recalibration																		
1	Not volatile parameters 1 = OK; 0 = default loaded, need to be changed/saved																		
2	Digital input monitor 1 = not active (open); 0 = active (shorted to GND)																		
3	DIP switch 1 1 = electrical contact open; 0 = electrical contact shorted																		
4	DIP switch 2 1 = electrical contact open; 0 = electrical contact shorted																		
5	Watchdog 1 = reset by watchdog timeout occurred; 0 = normal operation																		
	all undefined bits read as 0																		
0x0104	Last minute average speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x0105	Last minute maximum speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x0106	Last 2 minutes average speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x0107	Last 2 minutes maximum speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x0108	Last 5 minutes average speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x0109	Last 5 minutes maximum speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x010A	Last 10 minutes average speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x010B	Last 10 minutes maximum speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R																	
0x010C	Highest speed [speed unit], 2-complement value, fixed point 10.6 format (10 bits integer, 6 bits fractional)	R/W*																	

0x8001	Serial number , least significant word	R	
0x8002	Serial number , most significant word	R	
0x8003	Firmware main version , hexadecimal	R	
0x8004	Firmware minor version , hexadecimal	R	
0x8005	Node address , range 1 ÷ 247, decimal, default 1	R/W	Y
0x8006	Bitrate , coded, range 0 ÷ 4, decimal, default 1 0 – 9600 bps 1 – 19200 bps 2 – 38400 bps 3 – 57600 bps 4 – 115200 bps	R/W	Y
0x8007	Serial configuration , coded, range 0 ÷ 3, decimal, default 0 0 – 8N1 (8 bit / no parity / 1 stop bit) 1 – 8E1 (8 bit / even parity / 1 stop bit) 2 – 8O1 (8 bit / odd parity / 1 stop bit) 3 – 8N2 (8 bit / no parity / 2 stop bit)	R/W	Y
0x8008	Serial reply delay [ms] , range 0 ÷ 100, decimal, default 1	R/W	Y
0x8009	Speed unit , coded, range 0 ÷ 4, decimal, default 0 0 – m/s 1 – km/h 2 – ft/s 3 – knot 4 – mph	R/W	Y
0x8101	Not volatile params save command , write 1 to execute (then wait 1 s before to send next message)	W	
0x8102	Software reset command , write 1 to execute (then wait 6 s before to send next message)	W	
0x8201	Analog output level [] , range 0 ÷ 65535, decimal, fixed point 0.16 format (16 bits fractional)	W	

Tab. 4

Please note that, conventionally, Modbus register's numbering starts from 1 but register's addressing start from 0 so, to obtain the register's address you had simply to subtract 1 from its number. That's meaningful depending on, as a master, you are using a high level Modbus utility/program (that normally refers to the registers' number) or a low level driver (that normally directly works with addresses).

(*) Write access is allowed only for reset, i.e. zero value.

CALIBRATION

Windmeter can be calibrated in MEASNET laboratory. However, if calibration is made by our factory, we have developed wind conditions and procedure able to insert corrective parameters into firmware, by direct comparison of a MEASNET calibrated Windmeter.

OPTIONALS

Available upon request:

- Wind Vane device. Can be wired to 0 - 100mV input range

CONTACTS

Software utilities (for MS Windows systems) and other solar products can be requested to the following address:

Soluzione Solare

Tel. +39.0444.530234 - Fax +39.0444.1830563 Vicenza – Italy E-mail: support@soluzionesolare.it