CALYPSO instruments

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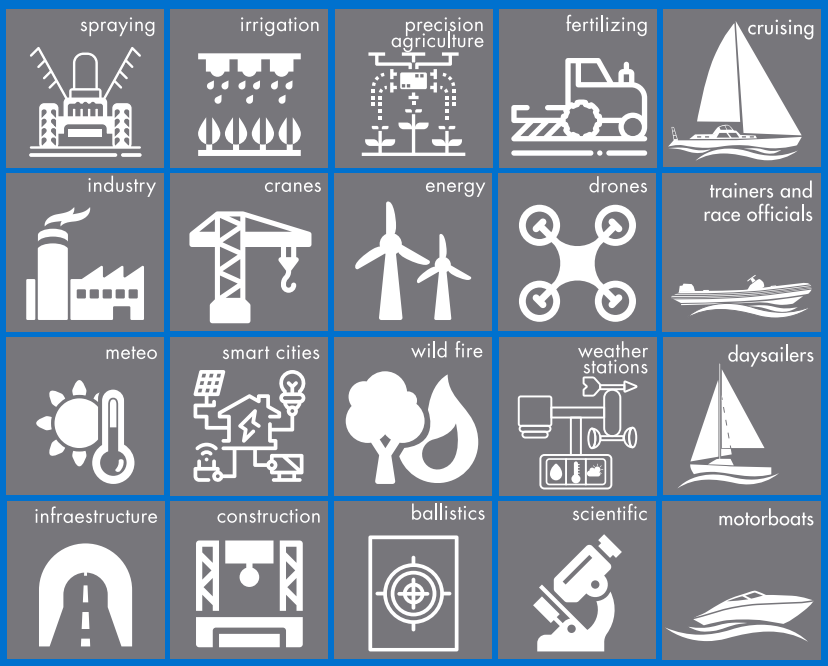
CALYPSO INSTRUMENTS
ULTRA-LOW-POWER ULTRASONIC STD (ULP STD) WIND METER
User manual

English version 3.0
15.05.2023

CE FC 0809



If you want to know more about our new ULP STD wind meter, please keep reading or visit our website www.calypsoinstruments.com

0. Index

1. Product overview

Thank you for choosing the ULP STD wind meter from Calypso Instruments. This is the first model or our generation II, representing an important technology breakthrough condensing an extensive R+D investment:

· Both shape and firmware have been enhanced for an improved rain performance. This is key for static applications such as weather stations.

· Mechanical design has been revamped making the unit more robust and dependable.

· We feel very proud to release a unit that requires under 0.4 mA of power at 5V, sampling at 1Hz.

· Different output options available: RS485, UART/TTL, MODBUS and NMEA 2000.

Applications for the ULP STD are the following:
Weather Stations | Drones
Temporary Scaffolding and construction | Infrastructures and building | Cranes
Spraying | Irrigation | Fertilizing | Precision Agriculture
Smart Cities | Wild fires | Shooting | Scientific
Sailing.

2. Package content

The package contains the following:
· Ultrasonic ULP STD Wind Instrument plus 2 meter (6.5 ft) cable for connection*
· Serial number reference on the side of the packaging.

· A quick user guide on the back of the packaging and some more useful information for the customer.

· M4 headless screw (x6) *

· M4 screw (x3)*

*Non applicable to the ULP NMEA 2000 model.

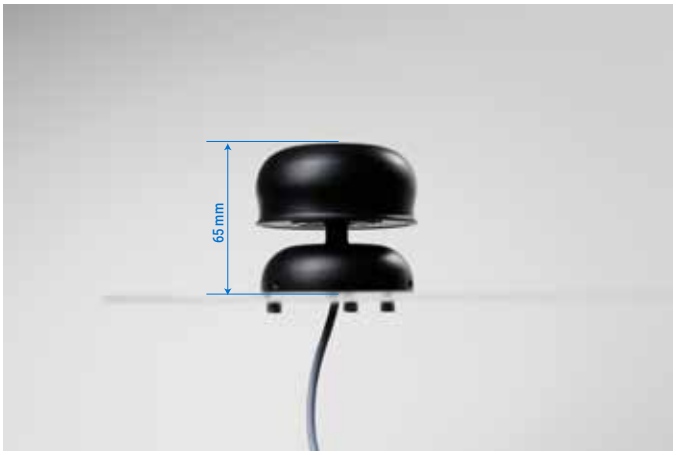
3. Technical specifications

The ULP has the following technical specifications:

3.1. Dimensions

· Diameter: 68 mm (2.68 in.)

· Height: 65 mm (2.56 in.)



3.2. Weight

210 grams (7.4 ounces)

3.3 Power

· 3.3-1 VDC

· 6-15VDC (NMEA 2000)

The ULP STD has to be connected as shown in this section.

RS485/MODBUS RTU Output:

White GND (Power -)	Yellow DATA (B -)
Brown VCC (Power +)	Green DATA (A +)

UART/TTL Output:

White GND (Power -)	Yellow DATA Rx
Brown VCC (Power +)	Green DATA Tx

4-20 Analog Output:

White V+ (Channel 1)	Yellow V+ (Channel 2)
Brown V- (Channel 1)	Green V- (Channel 2)

Data interface	1Autotransmit 2-POLL telegram 3-MODBUS
Data format	NMEA0183
Baudrate	2400 to 115200 bauds
Voltage range	3.3-18V

Power consumption:

Ultra-Low-Power (RS485 NMEA0183) : 0,25mA @5V, 1Hz / (MODBUS) : 1 mA @5V,1 Hz.

Ultra-Low-Power (UART / I2C): 0,15 mA @5V, 1Hz.

Ultra-Low-Power NMEA 2000: 20 mA @115.200 bauds, 12V.

Ultra-Low-Power 4-20 analog: 4-20 mA, @12-24V, 1Hz.

3.4. Sensors

Ultrasonic transducers (4x)

Sample rate: 0.1 Hz to 10 Hz

The ULP has been designed to avoid any mechanical parts to maximize reliability and minimize maintenance.

The transducers communicate between themselves two by two using ultrasonic range waves. Each pair of transductors calculates the signal delay and get information about both wind direction and wind speed.

3. Technical specifications

3.5 Wind Information

- Wind speed
- Wind direction

Sample rate: 1 Hz

Wind Speed
Range : Range: 0 to 45 m/s (1.12 to 100 mph)
Accuracy: ±0.1 m/s at 10m/s (0.22 at 22.4 mph)
Threshold: 1 m/s (2.24 mph)

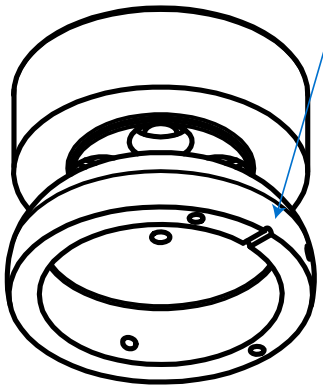
Wind direction
Range: 0 - 359º
Accuracy: ±1º

3.6. Easy mount

- 3 x M4 lateral female tripod thread
- 3 x M4 base female tripod thread UNC 1/4" - 20

It can be mounted either on a plate (inferior screws) or on a tube (lateral screws).

Noth mark position
Make sure the north mark is perfectly aligned to the north.



3.7. Mounting accessories

A wide range of accessories can be used with the device. The ULP STD can be mounted on a flat service and screwed on to different sizes of poles. It can also be used with an adaptor for poles of 39 mm.

* Please, visit our website and check all the accessories available and their possible combinations.

*Non applicable to the ULP NMEA 2000 model.

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*Non applicable to the ULP NMEA 2000 model.

3.8. Firmware Upgradable via RS485, MODBUS , UART/TTL or NMEA 2000.

3.9 Product Material

The ULP STD is engineered to be a robust device with minimal downtime. This new shape has been designed for optimum water spillage which implies lower probability of ice formation. Frost might affect measurements if it blocks the wave path. The input wires are protected by Transient Voltage Suppression (TVS) diodes. The instrument body is built with Polyamide.

3.10 Quality Control

Every single unit is calibrated with accuracy, following the same calibration standards for each one in a wind tunnel.

A Q/C report for both wind speed and direction is generated and kept in our files. Standard deviation is checked to guarantee that each unit has been calibrated to the highest standards.

4. Configuration Options

*Non applicable to the ULP NMEA 2000 model.

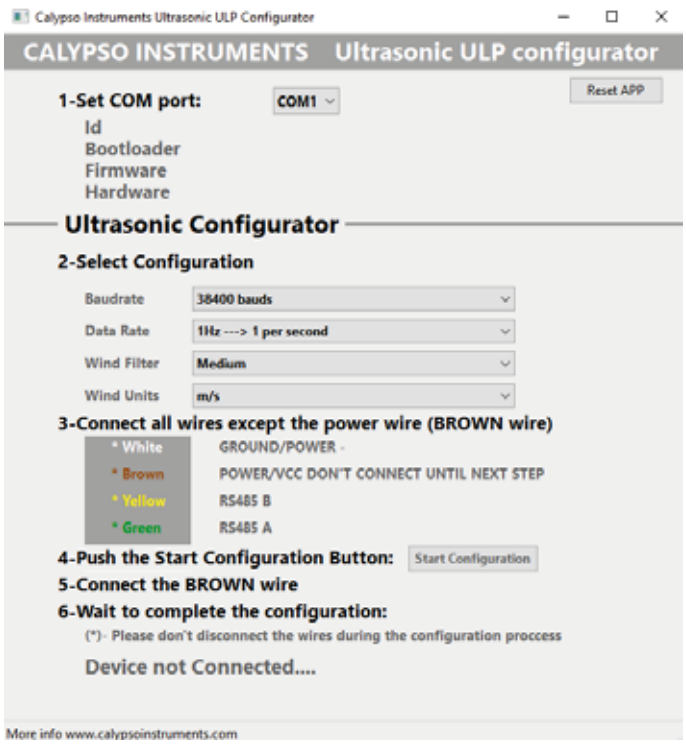
The ULP STD can be set up by using a special configuration app made by Calypso Instruments.
In order to use the app, you should download the configurator from our website at **www.calypsoinstruments.com**.

To configure your device, connect the ULP via either a USB to RS485 converter cable (in case of the ULP RS485 or the ULP Modbus) or via a USB to UART converter cable (in case of the ULP UART). Connect all the ULP cables except for the brown cable to the converter. Insert the USB into the computer, open the configurator app, select the configuration wanted and follow the instructions on the screen to finish the configuration.

For more information, please watch the following video.
https://bit.ly/3DuA7lM

*USB converter cables available on **calypsoinstruments.-com.**

baudrate: 2400 to 115200 (8n1) bauds
output rate: 0.1 to 10 Hertz
output units: m/sec., knots or km/h



5. Communication Protocols

5.1 Modbus Registers

DIR_BASE_LA1 30001
SYSTEM_STATUS DIR_BASE_LA1 + 200
WIND_SPEED DIR_BASE_LA1 + 201
WIND_DIRECTION DIR_BASE_LA1 + 202
TWO_MIN_AVG_WS DIR_BASE_LA1 + 203
TWO_MIN_AVG_WD DIR_BASE_LA1 + 204
TEN_MIN_AVG_WS DIR_BASE_LA1 + 205
TEN_MIN_AVG_WD DIR_BASE_LA1 + 206
WIND_GUST_SPEED DIR_BASE_LA1 + 207
WIND_GUST_DIR DIR_BASE_LA1 + 208
FIVE_MIN_AVG_WS DIR_BASE_LA1 + 210
FIVE_MIN_AVG_WD DIR_BASE_LA1 + 211
FIVE_WIND_GUST_SPEED DIR_BASE_LA1 + 212
FIVE_WIND_GUST_DIR DIR_BASE_LA1 + 213

5.2 RS485 and UART Sentences

MWV Wind Speed and Angle
 1 2 3 4 5
 | | | | |
$--MWV,x.x,a,x.x,a*hh
1) Wind Angle, 0 to 360 degrees
2) Reference, R = Relative, T = True
3) Wind Speed
4) Wind Speed Units, K/M/N
5) Status, A = Data Valid
6) Checksum

By default, the communication parameters are 38400bps, 8N1.
Some examples of sentences are:

$IIMWV,316,R,06.9,N,A*18
$IIMWV,316,R,06.8,N,A*19

The connection is straightforward with no configuration required in RAW mode configuration.

In case of ON DEMAND configuration mode, the sentence received is almost the same, but there is a need of this sentence for requesting data every time you ask for data:

$ULPI*00\r\n //I=id node by default
$ULPA*08\r\n
$ULPB*0B\r\n
 P1*78\r\n

The received sentence has this structure, slightly modified: $IiMWV,x.x,a,x.x,a*hh, being i the node (I,A,B,C,....) configured.

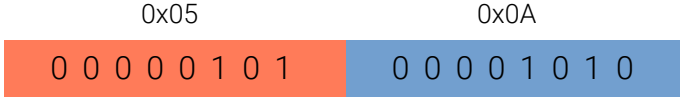
5.3 I2C Sentences

General Options
Address I2C- 0x15 (21 decimal)
Frecuency -100kHz – 400kHz
SDA -TX (Yellow)
SCL - RX (Green)

Write Register
In order to write about the register it is necessary to write 2 bytes, the I2C bus direction and the register you need to check.
I2C Address (1 Byte) + Register Address (1 Byte)
Address -0x15 (21 decimal)
Available Registers:
Wind Raw Stat - 0x10
Wind 2 Min Stat - 0x12
Wind 5 Min Stat - 0x15
Wind 10 Min Stat - 0x1A
Wind Full Stats - 0x1F

Read Register
For the read register we need to take into account how many bytes is the system giving us back and what bytes we need to read in order to obtain the value we need.

Data are under big-endian criteria. The first byte, the more valuable one to be represented.
E.g. If 2 bytes are read, byte 0 and byte 1, we will read the first byte as 0x05 and second byte 0x0A.



The first byte is marked in orange. The more valuable one. The second byte is marked in blue (less significant one LSB).

Write Wind Raw Register Return 7 Bytes
Bytes 0 – 1 - Unused
Bytes 2 – 3 - Wind Speed * 100
Bytes 4 – 5 - Wind Direction * 100
Byte 6 - Checksum

Write Wind 2 Min Stat Register Return 11 Bytes
Bytes 0 – 1 - Unused
Bytes 2 – 3 - Wind Speed * 100
Bytes 4 – 5 - Wind Direction * 100
Bytes 6 – 7 - Wind Speed Gust * 100
Bytes 8 – 9 - Wind Direction Gust * 100
Byte 10 - Checksum

6.3. I2C Sentences
(continuation)

Write Wind 5 Min Stat Register Return 11 Bytes
Bytes 0 – 1 - Unused
Bytes 2 – 3 - Wind Speed * 100
Bytes 4 – 5 - Wind Direction * 100
Bytes 6 – 7 - Wind Speed Gust * 100
Bytes 8 – 9 - Wind Direction Gust * 100
Byte 10 - Checksum

Write Wind 10 Min Stat Register Return 11 Bytes
Bytes 0 – 1 - Unused
Bytes 2 – 3 - Wind Speed * 100
Bytes 4 – 5 - Wind Direction * 100
Bytes 6 – 7 - Wind Speed Gust * 100
Bytes 8 – 9 - Wind Direction Gust * 100
Byte 10 - Checksum

Write Wind Full Stat Register Return 31 Bytes
Bytes 0 – 1 - Unused
Bytes 2 – 3 - Wind Speed Raw * 100
Bytes 4 – 5 - Wind Direction Raw * 100
Bytes 6 – 7 - Wind Speed 2 Min Stat * 100
Bytes 8 – 9 - Wind Direction 2 Min Stat * 100
Bytes 10 – 11 - Wind Speed Gust 2 Min Stat * 100
Bytes 12 – 13 - Wind Direction Gust 2 Min Stat * 100
Bytes 14 – 15 - Wind Speed 5 Min Stat * 100
Bytes 16 – 17 - Wind Direction 5 Min Stat * 100
Bytes 18 – 19 - Wind Speed Gust 5 Min Stat * 100
Bytes 20 – 21 - Wind Direction Gust 5 Min Stat * 100
Bytes 22 – 23 - Wind Speed 10 Min Stat * 100
Bytes 24 – 25 - Wind Direction 10 Min Stat * 100
Bytes 26 – 27 - Wind Speed Gust 10 Min Stat * 100
Bytes 28 – 29 - Wind Direction Gust 10 Min Stat * 100
Byte 30 - Checksum

5.4 NMEA 2000 PGN information

Transmit and receive:

059392- ISO Acknowledgment
059904- ISO Request
060928- ISO Address Claim
065240- ISO Commanded Address
126208- NMEA - Request group function
126208- NMEA - Command group function
126208- NMEA - Acknowledge group function
126208- NMEA - Read Fields - group function
126464- PGN List - Transmit PGNs group function
126464- PGN List - Received PGNs group function
126993- Heartbeat
126996- Product Information
126998- Configuration Information
130306- Wind Data

5.5 Analog 4-20 mA

The Analog 4-20 mA is an analog protocol that has no sentences.

6. General information

6.1. General recommendations

Wind Speed Gust is that value that measures abrupt and sudden change in wind speed.
Regarding mounting the unit, align the north mark of the ULP towards the north.
Regarding mounting the unit, the mast head has to be prepared for the mechanical installation. Align the North mark of the Ultrasonic Ultra-Low-Power to the north. Make sure to install the sensor in a location free from wind perturbation, usually on the mast head.

Make sure to install the sensor in a location **free from anything that obstructs the flow of wind to the sensors within a 2 meter radius**, for example, the mast head on a boat.

Other important aspects:

- Do not attempt to access the transducers area with your fingers;
- Do not attempt any modification to the unit;
- Never paint any part of the unit or alter its surface in any way.
- NOT allow to be submerged fully or partially in water.

If you have any questions or doubts, please contact us directly.

6.2. Maintenance and repair
The ULP does not require great maintenance thanks to the lack of the moving parts in this new design.

Transducers must be kept clean and aligned. Impacts or incorrect impulsive handling may lead to transducers misalignment.

The space around the transducers must be empty and clean. Dust, frost, water, etc... will make the unit s top working.
The ULP can be wiped clean with a damp cloth being careful to not touch the transducers.

3. Warranty

This warranty covers the defects resulting from defective parts, materials and manufacturing, if such defects are revealed during the 24 months after the purchase date.

Warranty is void in case of non-following the instructions of use, repair or maintenance without written authorisation.

Any wrongful use given by the user will not incur in any responsibility on part of Calypso Instruments. Therefore, any harm caused to the ULP by a mistake will not be covered by the warantee. Using assembly elements different from those delivered with the product will void the guarantee.

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Changes on transducers position/alignment will avoid any warranty.

For further information please contact Calypso Technical Support through **sales@calypsoinstruments.com** or visit **www.calypsoinstruments.com**.

MODBUS Sensor Data Requests

Measurements all have a resolution of 0.1 but are reported as 10*.
8.2 m/s is returned as a value 82. The user must /10 in order to reinsert the decimal precision.

Address	Register	Access Type	Response Range	Data Type	Description
200	201	Read	0 to 15†	16-bit Signed Int	System Status†
201	202	Read	0 to 500*	16-bit Signed Int	Wind speed (m/s) (3 second moving average)
202	203	Read	0 to 3599*	16-bit Signed Int	Wind direction (°) (3 second moving average)
203	204	Read	0 to 500*	16-bit Signed Int	2 min avg wind speed
204	205	Read	0 to 3599*	16-bit Signed Int	2 min avg wind direction
205	206	Read	0 to 500*	16-bit Signed Int	10 min avg wind speed
206	207	Read	0 to 3599*	16-bit Signed Int	10 min avg wind direction
207	208	Read	0 to 500*	16-bit Signed Int	Wind gust speed
208	209	Read	0 to 3599*	16-bit Signed Int	Wind gust direction
210	211	Read	0 to 500*	16-bit Signed Int	5 min avg wind speed
211	212	Read	0 to 3599*	16-bit Signed Int	5 min avg wind direction
212	213	Read	0 to 500*	16-bit Signed Int	5 min Wind gust speed
213	214	Read	0 to 3599*	16-bit Signed Int	5 min Wind gust direction

† If not applicable to ULP-M, the register should report a value of zero (0).
* See Data Format section for numeric conversions.

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