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# CALYPSO ULP STD Wind Meter User Manual

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**CALYPSO** instruments

**CALYPSO ULP STD Wind Meter**

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

The ULP STD Wind Meter is a portable ultrasonic device that provides information about wind direction and speed. It has an ultra-low-power consumption and can be connected to different data interfaces such as RS485, MODBUS RTU, UART/I2C, 4-20 mA ANALOG, and NMEA 2000.

## Product Overview

The ULP STD Wind Meter is a portable ultrasonic device that provides accurate information about wind direction and speed. It is designed to be reliable and easy to use.

### Package Content

- ULP STD User Manual

### Technical Specifications

- **Dimensions**

  65 mm
- **Weight**

  210 grams (7.4 ounces)

### Power
The ULP STD Wind Meter can be connected to different data interfaces such as RS485, MODBUS RTU, UART/I2C, 4-20 mA ANALOG, and NMEA 2000. It has an ultra-low-power consumption that ranges from 0.15 mA to 20 mA depending on the data interface and baudrate used.

### Sensors
The ULP STD Wind Meter has four ultrasonic transducers that communicate between themselves using ultrasonic range waves. Each pair of transductors calculates the signal delay and provides information about both wind direction and wind speed.

### Mounting Accessories
The ULP STD Wind Meter can be mounted on a flat surface or screwed on to different sizes of poles. It can also be used with an adaptor for poles of 39 mm. A wide range of accessories can be used with the device.

### Firmware
The ULP STD Wind Meter firmware can be upgraded via RS485, MODBUS RTU, UART/TTL, or NMEA 2000.

### Product Material
The ULP STD Wind Meter is engineered to be a robust device with minimal downtime.

## Usage Instructions

1. Mount the ULP STD Wind Meter on a flat surface or a pole using the mounting accessories.
2. Connect the ULP STD Wind Meter to a data interface such as RS485, MODBUS RTU, UART/I2C, 4-20 mA ANALOG, or NMEA 2000.
3. Make sure that the north mark is perfectly aligned to the north.
4. Check the ULP STD Wind Meter user manual for configuration options and communication protocols.
5. The ULP STD Wind Meter provides accurate information about wind direction and speed. Use this information for outdoor activities or professional purposes.
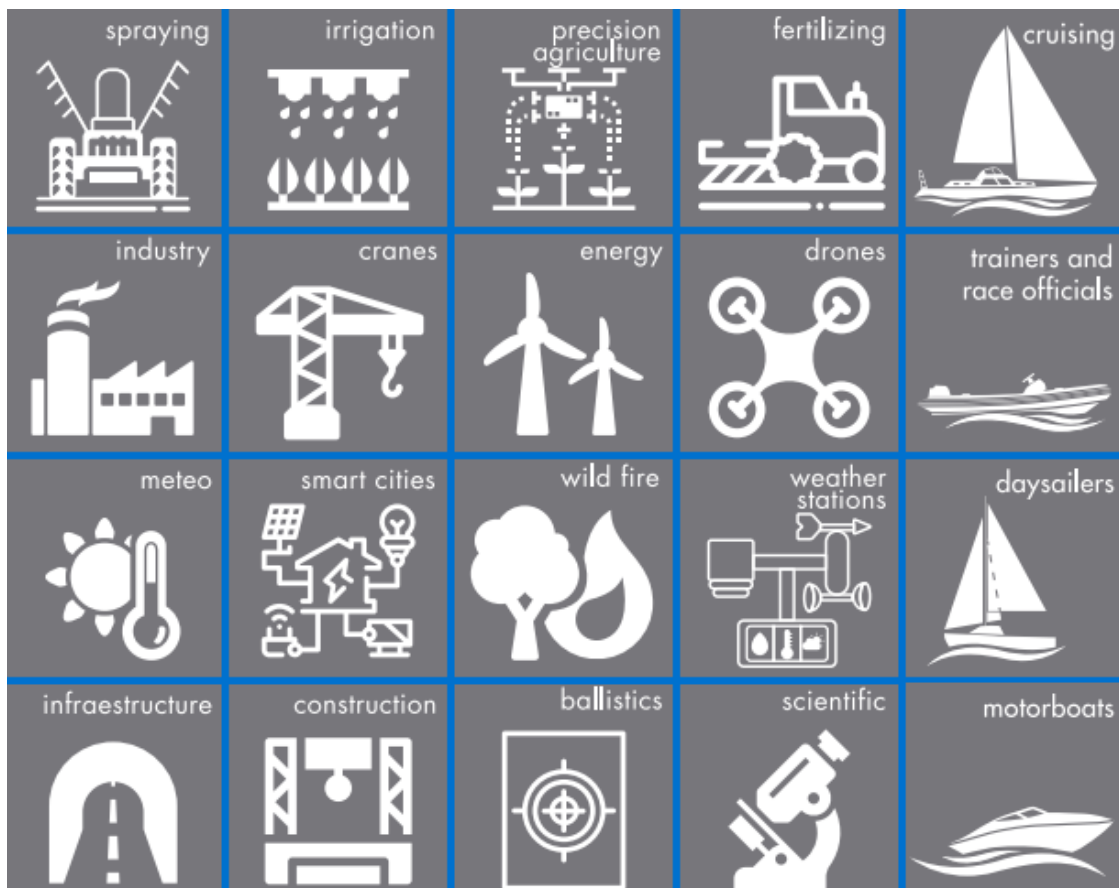
If you want to know more about our new ULP STD wind meter, please keep reading or visit our website
**www.calypsoinstruments.com**

**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 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.

## 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.

## Technical specifications

The ULP has the following technical specifications:

### Dimensions

- Diameter: 68 mm (2.68 in.)
- Height: 65 mm (2.56 in.)



- **Weight** 210 grams (7.4 ounces)
- **Power** · 3.3-1 VDC

6-15VDC (NMEA 2000)

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



RS485 (NMEA 0183) / MODBUS RTU Output:

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

UART/ I2C Output:

| White | Yellow |
|---|---|
| GND (Power -) | DATA RX / SDA |
| Brown | Green |
| VCC (Power +) | DATA TX/ SCL |

4-20 mA ANALOG Output:

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

**NMEA 2000 Output:**
Add NMEA 2000 In-line terminator + NMEA 2000 cable

| 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.
- Ultrasonic NMEA 2000: 20 mA @115.200 bauds, 12V.
- Ultra-Low-Power 4-20 analog: 4-20 mA, @12-24V, 1Hz.

**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.

## Technical specifications

**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

**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.
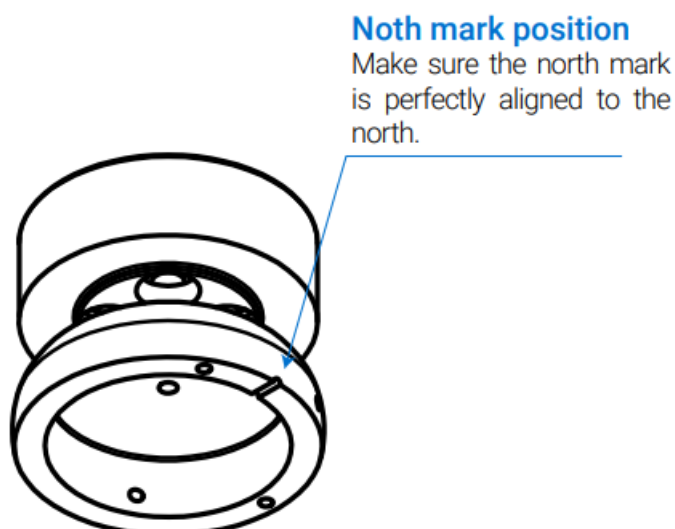
## Mounting accessories

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 ULTRASONIC NMEA 2000 model



Non applicable to the ULTRASONIC NMEA 2000 model.



*Non applicable to the ULTRASONIC NMEA 2000 model.

**Firmware**

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

**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.

**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

# Firmware

Firmware upgradable. Configurable via cable using the configuratior ( **https://calypsoinstruments.com/technical-information**). A USB converter cable is available as an accessory on **calypsoinstruments.com**.

# Configuration Options

*Non applicable to the ULTRASONIC 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/3DuA7IM**
*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
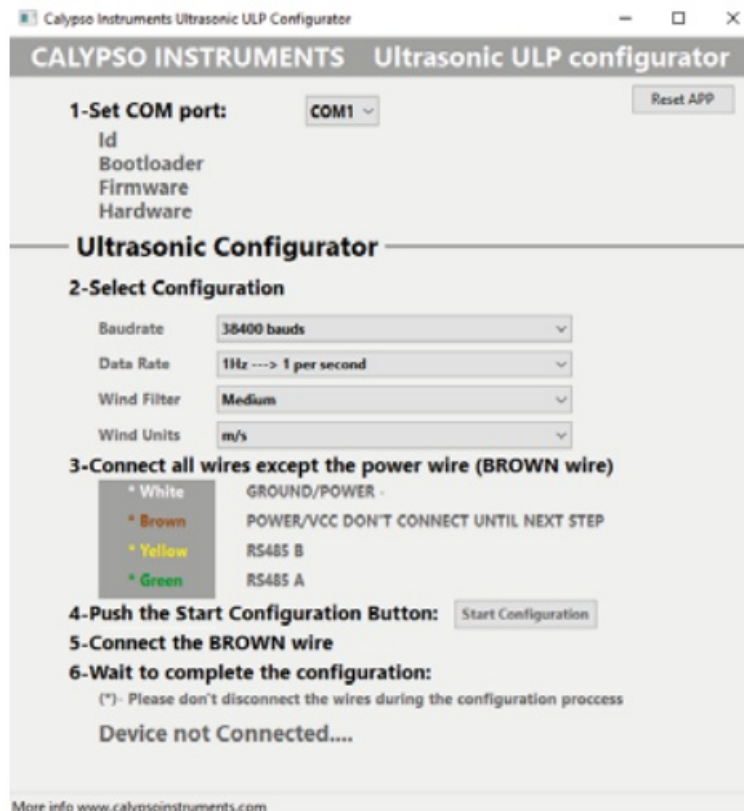
## Communication Protocols

### 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

### 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.

**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.
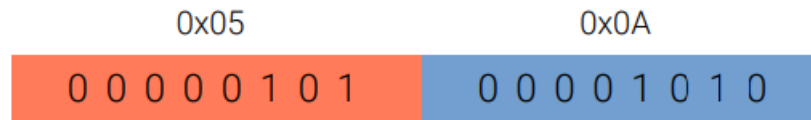


The first byte is marked in orange. The more valuable one.
The second byte is marked in blue ( less significant one LSB).

## 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

**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

**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 U

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

## General information

### 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.

## 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.

## 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. by the warantee. Using assembly elements different from those delivered with the product will void the guarantee. 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.

Ultra-Low-Power Ultrasonic wind meter STD (ULP STD)

## Documents / Resources

**CALYPSO ULP STD Wind Meter** [pdf] User Manual
23_EN_ULP_STD_Instruction_Manual, ULP STD Wind Meter, ULP STD, ULP STD Meter, Wind Meter, Meter

## References

- ▲ **Calypso Instruments**
- ▲ **Calypso Instruments**
- ⓑ **YouTube**