Hydromast Near bed current velocity sensing



Contact: asko.ristolainen@taltech.ee, +372 5268094

Measurement capability:

- Flow Velocity: 0.15 1.0 ± 0.1 m/s (range be adjusted depending on the mast length)
- Directionality: 0 360° ± 5°
- **Pressure**: 0 3 Bar ± 0.5 % FS

Working principle (Pat.US10215601B2, Pat. application P202300028):

- Buoyant mast, connected to a base with a flexible membrane, allows for free movement of the mast.
- Mast instantaneous location tracked with a 3D Hall sensor, giving X and Y direction and tilt.
- Two velocity detection modes:
 - 1. Based on mast tilt
 - 2. Based on vortex induced vibration

Application examples:

- **Rivers** fish habitat or long period flow
- **Coastline** ship traffic, waves and tidal flows
- Harbors current monitoring for traffic safety
- Seabed thermocline, tidal currents
- Fish farms distributed flow-sensing





Properties:

- **Total Height**: 100 350 mm (changing according to velocity range), depending on desired velocity range (base 50mm + mast)
- Width: base 80 mm, mast 15 mm
- Data Rate: interval saving or continuous internal sampling rate 50 Hz
- Input Voltage: 5 12 V (possible to extend to 30V)
- Material: POM, stainless steel, mast covered with Cu against biofouling, silicone based flexible membrane
- Data logging: RS485 serial, USB serial or stand-alone logging with additional battery back
- Fixation: Upright, bottom mounted or side mounted (depending on mast used)

Communication overview

Possible communication protocols on the hardware side:

- Direct connection to Hydromast sensor RS-485
- Connection via a sensor hub (based on a minicomputer, such as Beaglebone Black or Raspberry Pi 3):
 - Ethernet
 - GSM (2G, 3G, 4G)
 - WiFi
 - LoRa (LoRaWAN)
 - Serial: RS-485 (possible to add RS-232)

Energy consumption

- Sensor only (Hydromast): <150 mW (5V max 30 mA), up to 500 mW with voltage converter
- Ethernet: <3W
- GSM: always online using 4G: average 6.5W (13V 0.5A)
- **WiFi:** <5W
- LoRa: with sensor hub 2W, direct connection to sensor <500mW
- RS-232: with sensor hub 2W, direct connection to sensor <300 mW

Installation options

The hydromast has 4 x M6 mounting holes underneath the sensor as shown below:



Figure 1 Hydromast installation

The hydromast should be placed away from any obstructions to avoid disturbances due to vortices from nearby objects. The hydromast should be installed rigidly to structures or should be fixed to an anchor to avoid movement of the device during measurements.

Example installation options below: (Upper row) installation to a harbor pier posts with metal brackets. (Lower row) installation of separate sensors on concrete blocks and with a metal frame.



Figure 2 Hydromast installation options