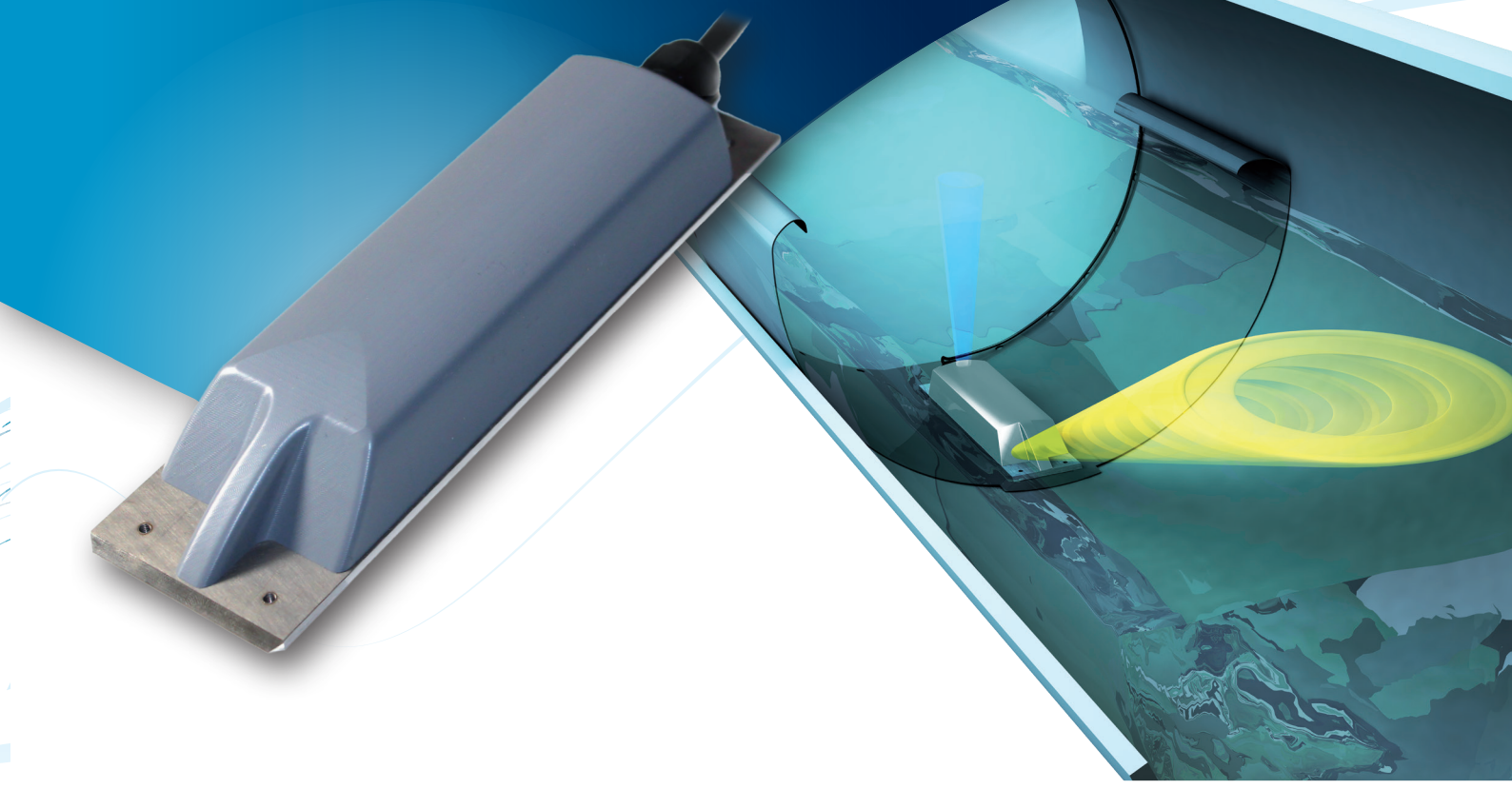
BELUGA™

ULTRASONIC AREA/VELOCITY FLOW METER

POWERFUL DIGITAL ACOUSTIC FLOW SENSOR!



FLOW-TRONIC nv

BELUGA™

ULTRASONIC AREA/VELOCITY FLOW METER

How does it work?

The BELUGA™ sensor measures the velocity of the flow in partially filled pipes and surcharged pipes. It uses the Doppler Effect to measure the individual velocities of the flow stream.

FLOW-TRONIC is using a **CONTINUOUS WAVE** (CW) digital Doppler with **SPECTRAL ANALYSIS**.

The BELUGA™ is sending out a continuous acoustic signal at a frequency of 1 MHz. The separate receiver is located in the same sensor housing and samples thousands of frequency signals for one measurement.

The result of each of those frequencies gives the complete spectrum with individual energy levels. By reading the spectrum from the returned frequencies, the BELUGA™ sensor analyses the **VELOCITY DISTRIBUTION** of the flow.

This new technology **DOES NOT SUFFER FROM DEAD ZONE NOR BLANK DISTANCE** in which no velocity measurements can be taken, such as encountered by pulsed acoustic transducers looking at velocities in windows within the wetted cross section, but measures water velocities as soon as water raises over 10-15 mm.

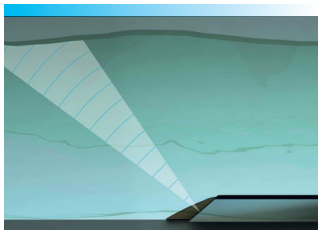
The depth from water is measured by an associated level sensor.

The two measurements are used to calculate the flow rate using the Continuity equation:

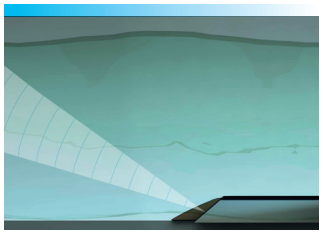
$$Q = \bar{v} \times A$$

The BELUGA™ converts the measured velocity to average velocity by analysing the velocity distribution within the measured spectrum using a powerful DSP processor technology. The spectral analysis does not require theoretical modules nor site calibration.

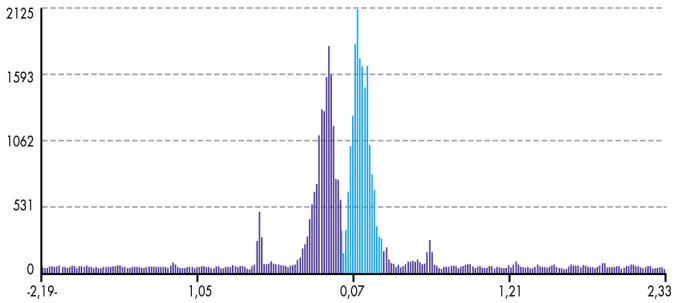
Then the water level and pipe size are converted into fluid area. Multiplication of fluid area by average velocity produces a volumetric flow rate.



BELUGA™ 45°



BELUGA™ 20°



General

Size (HxWxL)	190 x 48 x 28 mm
Weight	0.26 kg (without cable, level sensor and mounting accessories)
Materials	Enclosure: HIGH IMPACT PVC-C
Cable	Polyurethane jacketed
Cable Lengths	10, 20, 30 or length as needed up to 300 m
Protection	IP68
Certifications	CE
Temperature Range	Operating: -20°C to +50°C
	Storage: -30°C to +60°C
Supply Voltage Required	4 to 26 VDC (max. 130 mA at 12 VDC) or supplied by IFQ MONITOR™ or IFQ LOGGER™
Power Consumption	Sleep: 60 mA at 12 VDC
	Measuring: 120 mA at 12 VDC
Outputs (optional)	One 4-20 mA for validated velocity (vQP) or validated velocity including median filter (vQPMF)
Communication	RS-485 communication port with Modbus ASCII slave communication protocol

Flow Measurement Method

Conversion from measured velocity to average velocity based on integrated spectral analysis of the velocity distribution in the cross-sectional area. Conversion of water level and pipe size to fluid area. Multiplication of fluid area by average velocity to obtain the flow rate.

Velocity Measurement

Method	Ultrasonic Doppler
Frequency	1 MHz
Measurement Range	-2 m/s to +6 m/s
Measurement	Bi-directional
Accuracy	Better than 1% + zero stability (according to hydraulic and installation conditions compliance)
Zero Stability	±0.01 m/s
Resolution	0.001 m/s

Water Temperature Measurement

Method	Internal temperature sensor
Measurement Range	-40°C to +80°C

Optional Combined Level Measurement (Ultrasonic)

Method	Non-Contact Ultrasonic Pulsed Echo with temperature compensation
Measurement Range	0.00 to 1.75 m (with RAV-0002/ULS-02)
	0.00 to 5.75 m (with RAV-0006/ULS-06)
Accuracy	±0.3% of reading (with RAV-0002/ULS-02)
	±0.2% of reading (with RAV-0006/ULS-06)
	Includes non-linearity + hysteresis
Temperature Error	Max. 0,04 %/K
Resolution	1 mm

Optional Combined Level Measurement (Radar)

Method	Non-Contact Pulsed Radar
Range	0.00 to 15 m
Accuracy	±2 mm of reading
Resolution	1 mm

Optional Separate Level Measurement

Method	Any 4-20 mA loop powered sensor

Main benefits

- Accurate flow measurement
- Full digital sensor
- Bi-directional velocity measurement (-2 m/s to +6 m/s)
- Portable or stationary version available
- Easy installation without modification of the channel thanks to adapted mounting accessories
- Robust IP68 enclosure
- Resistant to fouling, corrosion and abrasion
- Velocity distribution analysis using spectral analysis
- For channels from 150 mm to 2500 mm
- Easy integration with SCADA, PLC or telemetry systems: the flow rate is calculated into the BELUGA™ sensor
- Integrated water temperature measurement

Applications

Sewer/Channel Networks Monitoring

- Sewer systems evaluation
- Capacity study
- Combined sewer overflow (CSO) studies
- Infiltration studies
- By pass/overflow
- Billing/custody transfer

Industry

- Plant effluent
- Process waste water

FLOW-TRONIC sa nv

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