Technical Information
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Flow measurement in open channel

Portable Area-Velocity Mainstream EH7000 P

Ultrasonic Area-Velocity Flow meter MAINSTREAM 7000

Endress + Hauser
The Power of Know How

Ultrasonic Area-Velocity Flow meter MAINSTREAM 7000

Permanent installations and portable unit

For liquids from 'clean' water to raw sewage, in channels from 150mm to 3m, Mainstream flow meters ensure accuracy, reliability and low cost of ownership

The importance of flow measurement in open channel applications is becoming more important with the ongoing need for accurate data in survey work for model clarification, network assessment, trade effluent discharges and simple hydraulic information of moving ground water such as rivers and treatment work discharges.

Applications

- ☑ Effluent Monitoring
- ☑ Waste Water Treatment
- ☑ Industrial Flow Measurement
- ☑ Irrigation Channels
- ☑ River/Stream Flow Measurement
- ☑ Water Distribution

Features and Benefits

- ➢ Quick to install - no weirs or flumes.
- ➢ Bi-directional flow measurement for forward and reverse velocities from 10 mm/s up to 5 m/s
- ➢ Streamlined velocity probe eliminates fouling and reduces flow disturbances.
- ➢ High sensitivity extends applications to 'clean' w ater.
- ➢ Powerful, easy to use PC software simplifies flowmeter commissioning.
- ➢ Sophisticated ultrasound processing ignores spurious signals.
- ➢ Ultrasound signal quality monitor confirms measurement integrity.
- ➢ High capacity data logger for long term records of level, velocity and flow rate.
- ➢ Opto-isolated switch outputs for alarms and controls.
- ➢ Optional four 4-20 mA outputs proportional to Level, Velocity, Flow and Signal quality (only for permanent installation).
- ➢ Optional modem for dial-up access and internet connectivity.
- ➢ Available in intrinsically safe format.

Measurement Technique

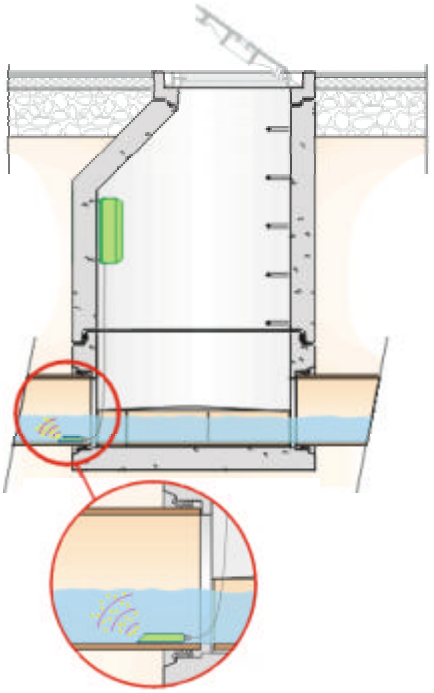
Mainstream uses the area-velocity method to give a continuous or time sampled measurement of fluid flow.

The use of Doppler techniques has been around for many years in many applications. In measuring liquid flows in open channel to achieve a volumetric measurement of flow.

Signals from the probe are analysed using Phase Coherence Processing (patents pending). Phase Coherence Processing only accepts signals containing verified velocity information. The percentage of signal accepted is the signal quality. A high signal quality confirms the integrity of the measurement. The verified velocity signals produce a histogram of the flow velocities. Analysing this histogram gives the mean flow velocity.

Due to the Phase Coherence Processing Mainstream is suitable for any liquid containing bubbles or suspended solids, even in minute quantities, the velocity probe detects reflected ultrasound. Mainstream is a Bi-directional Doppler flow meter that suits a diverse range of applications. Especially suited to surge-charge flows and reverse flow conditions in open channels and partial fill pipes. The unique Doppler technique used by Mainstream 7000 operates in certain turbulent conditions without a noticeable effect to the accuracy

The liquid level is measured by a submerged pressure transmitter or ultrasonic sensor.



Flow cross-sectional area is deduced from the liquid level measurement and a stored description of the pipe or channel cross-section. The flow velocity is multiplied by the flow cross-sectional area to give the flow rate, as from the following relation:

Flow (f)= Velocity (v) x Area (a)

Technical Features

MAINSTREAM 7000

Display:	Large character LCD configurable for most engineering units. Display sequence is user selectable from date, time, level, flow cross-sectional area, signal quality, flow velocity, flow rate, quantity of flow in last hour and total flow quantity. LCD legend available in various languages.
Outputs: (optional)	Digital: 2 opto-isolated switch outputs, each rated at 60V ac/dc and 250 mA Analog: 4 x 4÷20 mA max. 500
Modem (optional):	Integrated modem gives access to all Mainstream Communicator software features via dial-up connection. Automatic dial-out and delivery of logged data to any specified email address without user intervention. Warns if the liquid level, velocity or flow rate is outside user specified operating limits. Generates a request for service should the integrated diagnostics detect a reduction in flowmeter performance.
Data Logger:	Integral data logger with recording rate configurable for 30 seconds, 1, 2, 3, 5, 6, 10, 12, 15, 20, 30 or 60 minute intervals. Facility to organise logged data into daily records with user selectable start time. Logger capacity approximately 250,000 measurements corresponding to more than 6 months data at 2 minute intervals. Logger incorporates data compression for rapid data retrieval using Mainstream Communicator software. Recorded measurements output in spreadsheet compatible format.
Inputs:	Ultrasonic Velocity Sensor, Level measurement from Pressure Transducer, Ultrasonic or any 4-20 mA
Measuring range:	Depend on sensors
Temperature:	- 20 … + 60 °C
Accuracy:	Typical from laboratory test better than 2% Typical from various on site installation experience better than 5%
Power Supply:	12 / 24V DC, max consumption less than 200 mA
Dimensions:	Permanent installation 185 × 240 × 115 mm (h × w × d) Portable 270 x 250 x 180 mm (h × w × d)
Protection:	Permanent installation IP65 Portable IP67
Certified:	CE (EN50081-1, EN50082-1),

Velocity Sensor

The velocity probe is supplied with every unit and as standard is equipped with 10 meters of coaxial reinforced cable
The sensor is streamlined µPVC moulding with cable exit and pressure sensor mounting at rear.
The Mainstream velocity prove incorporates a highly sophisticated microprocessor electronic therefore eliminating spourious signal pickup and admitting long cable extent up to 500 metres.
If required an intrinsically safe option is available to EEx ia IIC T5 (-20°C to +40°C)/T4(-20°C to +80°C).

Technical Features

Ultrasonic Velocity Sensor

Measuring range:	Bi-directional from 10 mm/s to 5 m/s
Resolution:	1 mm/s
Temperature range:	-20...+60 °C
Drift:	Guaranteed no zero offset or drift
Materials:	Streamlined µPVC moulding
Cable:	Shielded high resistent in standard measure of 10 m (Max. 500 m.)
Protection:	IP68, resistent to continuous immersion, max. 1 bar
CE:	EN50081-1, EN50082-1

Level Measurement by Pressure Transducer

Stainless steel pressure transmitter with protected atmospheric reference. Sensor interface fully compatible with alternative level sensors providing 4:20 mA signals.
If required an intrinsically safe option is available to EEx ia IIC T5 (-20÷ +50 °C) – T4 (-20÷ +80 °C)

Technical Features

Immersion Pressure Transducer

Measuring range:	0÷2000 mm (Standard)
Resolution:	1 mm
Temperature range:	-20...+60 °C
Materials:	AISI 316L
Cable:	Shielded high resistent in standard measure of 10 m (Max. 200 m.)
Protection:	IP68, resistent to continuous immersion, max. 2 x meas. range
CE:	EN50081-1, EN50082-1

Level Measurement by Ultrasonics

As an alternative system for level measurement in permanent installations we supply an ultrasonic non contact sensor.

- Non contact and no moving parts in the measuring system.
- Ultrasonic beam of only 3°. The small ultrasonic beam ensures a high sensitivity signal and minimum sensibility to scum, grease or floating material
- Self configuration system with disturbances recognise

Technical Features

Shuttle® Ultrasonic Level Sensor

Measuring range:	0÷5000 mm (Standard)
Resolution:	1 mm
Ultrasonic beam:	3 °
Temperature range:	-20...+60 °C
Dead band:	35 cm
Materials:	PP green / POM black
Cable:	Shielded high resistent in standard measure of 12 m (Max. 100 m.)
Protection:	IP68, resistent to continuous immersion
CE:	EN50081-1, EN50082-1
EEx:	Zone 2 (EEx nA II T3)

Numeri di codice per tipologia di apparecchiatura

MAINSTREAM 7000

BM.M7000F:	Ultrasonic Area-Velocity Flowmeter for permanent installation with Velocity sensor
BM.M7000P	Portable Ultrasonic Area-Velocity Flowmeter with Velocity sensor

BM.PTX1730	Standard Pressure Transducer for level measurement in combination with Velocity Sensor
BM.Shuttle	Ultrasonic Level measurement system

Accessories and Optionals for Mainstream 7000

BM.M-mA-out	4 analog outputs 4-20 mA for BM.M7000F
BM.M-I.Mod	Integrated modem interface with Internet connectivity
BM.M-PWR	Switching Power Supply for DIN rail mounting - In 90/260VAC Out 24VDC - 800 mA
BM.PM-RC7	Auxiliary and external portable lead acid rechargeable battery pack 12VDC – 7.2 Ah
BM.PM-BCH	Battery charger for BM.PM-RC7 - In 240VAC Out 12VDC 2A
BM.PM-EPI	External power interface for portable unit - In 240VAC Out 12VDC

Optionals for Velocity sensor

200595	Velocity sensor with non standard cable (+ extra cable per meter)
BM.Vcable	Extra Cable for velocity sensor - State meters above standard
BM.MV-Eex-MTL	Intrinsically safe Velocity sensor Eex ia IIC T5 (-20°C a +40°C) / T4 (-20°C a +80°C) with MTL barriers

Hardware for sensor mounting

BM.F-P	Flate plate in stainless steel Aisi 304 for sensor support and mounting in flat bottom channels.
BM.RT	Compass mechanism for round pipe mounting rings
BM.ART25-30	with compass mechanism for sensor installation in round pipes with internal diameter 250 ÷ 300 mm, fully manufactured in stainless steel Aisi 304.
BM.ART30-40	Mounting ring as above for round pipes with internal diameter 300 ÷ 400 mm.
BM.ART40-60	Mounting ring as above for round pipes with internal diameter 400 ÷ 600 mm.
BM.ART60-80	Mounting ring as above for round pipes with internal diameter 600 ÷ 800 mm.
BM.ART80-100	Mounting ring as above for round pipes with internal diameter 800 ÷ 1000 mm.

Optionals for Pressure Transducers

200595	Pressure Transducer with non standard cable (+ extra cable per meter)
BM.PTCable	Extra Cable for Pressure Transducer - State meters above standard
BM.PT-Eex	Intrinsically safe Pressure Transducer Eex ia IIC T5 (-20°C a +40°C) / T4 (-20°C a +80°C)

Optionals for Ultrasonic Shuttle® Sensors

200590:	Junction box for sensor cable
200595:	Ultrasonic Sensor with non standard cable (+ extra cable per meter)
690010:	Extra Cable for ultrasonic sensor - State meters above standard
200220:	Standard bracket, for sensor, 300 mm from wall
200219:	Short bracket, for sensor, 90 mm from wall
200205:	Universal bracket support