MAINSTREAM MEASUREMENTS

PRODUCT GUIDE

flowmeters for open channels & partfilled pipes

- Velocity Transmitter
- AV-Flow Transmitter
- Compact Fixed AV-FlowMeter
- Premier Fixed AV-FlowMeter
- Portable AV-FlowMeter

mainstream™ MEASUREMENTS LTD

WORLD CLASS FLOWMETERS

LEADERS IN OPEN CHANNEL FLOW MEASUREMENT

about mainstream

We are leaders in open channel flow measurement, using ultrasonic technology. The Mainstream flowmeter product range was borne out of the R & D company Croma Developments, a company founded in 1986. Croma was developed as a vehicle for transferring academic research results into commercial applications. The company is now concerned with research, development and design of instrumentation with a heavy emphasis on embedded microprocessors.

The Mainstream product range is noted for high performance, reliability and above all else is cost competitive. Mainstream flowmeters feature a self monitoring capability which simplifies installation and reduces maintenance by detecting any variation in performance. Ideal for a wide variety of water distribution and wastewater applications.

expertise

A key feature of our approach to sensor design is recognizing the need for builtin sensor integrity monitoring or selfdiagnostics. Areas of particular expertise are: low-power electronics; signal processing; novel algorithms and ultrasonics.

A key feature of our approach to sensor design is recognizing the need for built-in sensor integrity monitoring or self-diagnostics

measurement principle

Mainstream uses the area-velocity method to give a continuous or time sample measurement of fluid flow. Mainstream uses a streamlined probe that operates immersed in the flowing liquid. The velocity probe transmits ultrasound into the liquid to create a zone of inspection. Bubbles and solid particles carried through this zone by the flow, even when present in only minute quantities, reflect ultrasound back to the probe.

The received ultrasound signal is processed to produce a histogram of the flow velocities. Analysing this histogram gives the mean flow velocity. Only signals containing verified velocity information are used, thereby ensuring measurement integrity.

Liquid level is measured by a submerged pressure transmitter or ultrasonic sensor. The flow crosssectional area is deduced from the liquid level measurement and the stored description of the channel or pipe cross section. The flow rate is the flow velocity multiplied by the flow crosssectional area.

mainstream™
MEASUREMENTS LTD
WORLD CLASS FLOWMETERS

the mainstream difference

- High sensitivity extends applications to “clean” water
- Sophisticated ultrasound processing ignores spurious signals
- Ultrasound signal quality monitor confirms measurement integrity
- Bidirectional flow velocity measurement, 10 mm/s to 5 m/s forward and 10 mm/s to 5 m/s reverse
- Channels or pipes from 150 mm to 3 m wide
- Guaranteed no zero offset or drift
- Probe may be located up to 500 metres from the system unit
- Easy to use PC software simplifies commissioning and product support
- Quick to install – no weirs or flumes

A unique feature for the Mainstream is its signal quality reading. It calculates the percentage of the total signal that contains useful velocity information. This is an invaluable metric for flowmeter condition monitoring.

SIMPLE TO CUSTOMISE FOR YOUR APPLICATIONS

For flow measurement in open channels and partfilled pipes, with liquids from clean water to raw sewage, Mainstream flowmeters provide the highest quality performance at the most competitive price.

The velocity sensor may be located up to 500 metres from the system unit and measures flow velocities from less than 10 mm/s up to 5 m/s.

The system unit displays liquid level, flow velocity, flow rate and totalized flow. Analog outputs transmit flow information and opto-isolated switches can activate alarms or operate samplers. An integral data logger stores measured and calculated information for graphing or analysis.

Easy to use PC software simplifies commissioning and product support. Features include a pointandclick graphical interface to specify predefined or nonstandard pipe and channel crosssections and remote flowmeter diagnostics via email.

Reliable, high performance and quick to install, Mainstream ultrasonic areavelocity flowmeters have found wide application internationally.

benefits and features

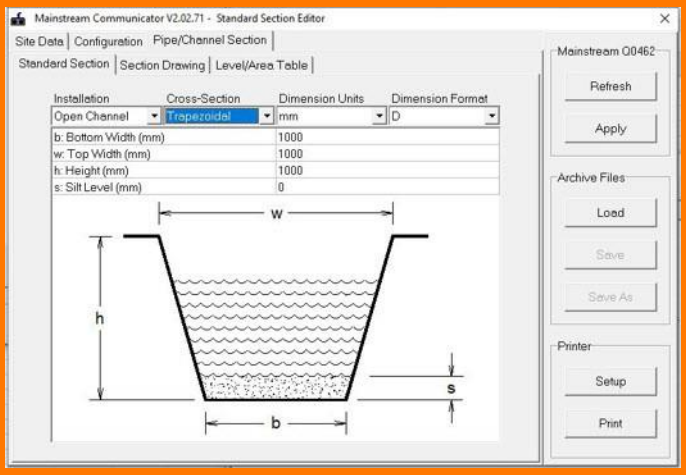
- High sensitivity extends applications to 'clean' water
- Sophisticated ultrasound processing ignores spurious signals
- Ultrasound signal quality monitor confirms measurement integrity
- Real-time processing of velocity signals thereby reducing power consumption
- Smart power saving mode - intelligent use of power saving which automatically reduces the measurement time for high flow velocities and high signal qualities and increases the measurement time for low velocities and low signal qualities
- Quick to install no weirs or flumes
- Powerful, easy to use PC software simplifies transmitter commissioning
- Streamlined velocity probe eliminates fouling and reduces flow disturbances
- Distances up to 500 meters from system unit to velocity sensor
- ATEX Zone 0 velocity sensor, options available

applications

- Effluent Monitoring
- Waste Water Treatment
- Industrial Flow Measurement
- Irrigation Channels & Canals
- River/Stream Flow Measurement
- Water Distribution
- Sewer Flow Measurement (Inflow & Infiltration; CSO Monitoring)
- Portable and Fixed-site Flow Measurement without Weirs or Flumes

mainstream's communicator data

- Intuitive pointandclick user interface with pulldown menus and Communicator's dynamic/distinctive button bar for flowmeter configuration, diagnostics and real-time displays
- Real time display of measurements and velocity histogram
- Backup and restore of the Mainstream configuration



PRODUCT OVERVIEW

MAINSTREAM VELOCITY TRANSMITTER

High reliability velocity transmitter designed for use as a system component within larger applications

MAINSTREAM AV-FLOW TRANSMITTER

High performance flow transmitter for flow measurement

MAINSTREAM COMPACT FIXED AV-FLOWMETER

Designed for basic operations and competitively priced

MAINSTREAM PREMIER FIXED AV-FLOWMETER

Superior performance with extended feature set for complex applications

MAINSTREAM PORTABLE AV-FLOWMETER

Perfect for short term and extended field studies

PRODUCT COMPARISON CHART

Product	24V power	12V low power	12V charger	Level sensor	Velocity sensor	Data Logger	LCD	Switch output	420mA output	COMMS RS232/USB	Package
Velocity Transmitter	✓	✓	X	X	1	X	X	X	1	✓	220x120x80
Flow Transmitter	✓	✓	X	1	1	X	X	X	1	✓	220x120x80
Compact Fixed AV-Flowmeter	✓	✓	X	1	1	✓	✓	2	1	✓	220x120x80
Premier Fixed AV-Flowmeter	12-28V	✓	✓	2	1	✓	✓	2	3	✓	260x160x90
Portable Flowmeter	✓	✓	✓	1	1	✓	✓	2	X	✓	PELI 1200 Orange

MAINSTREAM MODBUS ADAPTER

The Modbus Adapter is a device that is external to the Mainstream and works by connecting to the Mainstream communications port, allowing the customer to read measurement data using the Modbus RTU protocol. The Adapter can operate using Modbus RTU over RS232 or RS485 (half and full duplex), it can accept external power supplies and is currently available for use with fixed units.

Relays single or multiple measurements from the Mainstream.

Configurable for fast operation or power saving operation.

Builtin self diagnostics.

Many popular products such as telemetry units and dataloggers incorporate Modbus communications. Many of these devices are already embedded throughout the water industry infrastructure, the Modbus Adapter bridges the gap between the Mainstream and these devices.

The Mainstream Modbus Adapter makes the reliability, accuracy and affordability of the Mainstream, available to anyone who already has this technology in place or is looking to upgrade their communications capabilities.

MAINSTREAM SDI ADAPTER

The SDI12 Adapter connects to the Mainstream RS232 communications port and is mounted externally to the Mainstream system unit. The SDI12 Adapter, can be used to interface the Mainstream with other devices using the SDI12 protocol and is a readonly device, allowing the user to read measurements from the Mainstream over a 3wire interface. Devices suitable for interfacing can include wireless telemetry units and larger industrial SCADA systems. This allows the Mainstream to be utilised in a wide variety of applications.

OPTIONAL EXTRAS

ATEX ZONE 0 VELOCITY SENSOR

For use in Zone 0 and Zone 1. SIRAapproved as ATEX Group II category 1G equipment (ATEX Directive 94/9/EC). Cable length no longer than 300 metres.

VELOCITY AND LEVEL SIMULATOR

An important instrument for eliminating velocity sensor failure when fault finding on site by simulating flow and for eliminating level sensor failure when fault finding on site by simulating level.

STAINLESS STEEL PROBE COVER & DIPPING STICK (Fixed and Portable)

Robust and ideal for use in difficult flow conditions. The stainless steel cover protects the probe from damage and the dipping stick is available in measured 1 metre lengths up to 3 metres only.

Compatible with:
All units

MOUNTING PLATE (Fixed and Portable)

This stainless steel plate allows the velocity probe to be screwed onto the plate and inserted into the flow.

BATTERY CHARGER (Portable)

The battery charger charges all lead acid batteries, with fully automatic charging; LED indication of short circuit, reverse polarity & open circuit and with a 1.8 m long output lead fitted with crocodile clips

Compatible with:
Portable Unit

POWER SUPPLY (Portable)

For use with the Mainstream Portable AVflowmeter, a 24V, 2A single output AC/DC Switch Mode Desktop Power Supply with a standard IEC 320 C14 input connector and Hirschmann connector.

Compatible with:
Portable Unit

BATTERY CONNECTOR CABLE (Portable)

Binder connector with up to 2 metre length cable, secured by adhesive cable clips.

Compatible with:
Portable Unit

GEL BATTERY (Portable)

Sealed, deep discharge gel lead acid battery, 7.5Ah capacity with nominal 12V voltage. Contains a thixotropic gel electrolyte and is ideal for repeated deep discharge and recharge.

Compatible with:
Portable Unit

USB COMMS CABLE (Fixed and Portable)

PC Communication cable with USB connector for use with all Mainstream transmitters and flowmeters.

Compatible with:
All units

RS232 COMMS CABLE (Fixed and Portable)

PC Communication cable with RS232 connector for use with all Mainstream transmitters and flowmeters.

Compatible with:
All units

AUXILIARY CABLE (Portable)

For use with the Mainstream Portable AVflowmeter this cable will allow for connection for external power input compatible with solar panels and industrial 12V and 24V supplies. It includes two switch outputs for remote connection.

Compatible with:
Portable Unit

PRODUCT DATASHEETS

MAINSTREAM VELOCITY TRANSMITTER

velocity measurement

Transducer Type :	Submerged ultrasonic sensor containing signal generator, transmitter, receiver and decoder electronics
Method :	Phase Coherence time delay measurement determines the time for tracers carried by the flow to travel a fixed distance (~ 0.75 mm)
Velocity Range :	5 m/s to 10 mm/s and 10 mm/s to 5 m/s
Resolution :	Better than 1 mm/s
Measurement Integrity :	Ultrasound signal quality monitor gives the percentage of the measurement time that the received ultrasound signal contains useful velocity information
Smart Power Saving :	Each velocity measurement is based on the same quantity of information. Automatically reduces the measurement time for high flow velocities and high signal qualities and increases the measurement time for low velocities and low signal qualities

power supplies

Power Inputs :	Terminals for external 12V and 24V supplies
External 12V supply :	12V input for low power battery operation
External 24V supply :	24V input for industrial power supplies
Power Supply Monitor :	Power monitoring circuits track supply status. Supply voltages can be viewed via the UI

communications

Local :	RS232 and USB compatible interface with automatic baud rate detection. Supports 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600 and 115200 baud
Remote :	Optional external SDI or MODBUS device
Software :	Mainstream Communicator UI software for system configuration, diagnostics, real time measurement. Display and data retrieval. Mainstream Communicator runs on PC platforms under Windows 2000, XP, Vista, 7, 8, 8.1 and 10 with data transmission from device to PC, for data control, processing and export

measurands units and formats

Power Supply Voltage :	V
Signal Quality :	%
Velocity :	Selectable from mm/s, cm/s, m/s, in/s, ft/s, ft/min
Display Format :	Independently configurable display format for each measurement. Options are integer, fixed point with 1 to 6 decimal places, and scientific (Eformat). Display defaults to scientific format if data cannot be correctly represented in selected format

420mA output

Hardware :	One optoisolated passive 420mA output configurable to transmit any selected measurand Isolated 12V supply derived from 24V power input for active 420mA output operation

PRODUCT HARDWARE

velocity sensor

Materials :	Streamlined µPVC moulding and polyurethane cable
Dimensions :	105 mm long x 50 mm wide x 20 mm high
Cable :	8 mm diameter polyurethane cable with Aramid strain cord. Breaking load 45 kg. Minimum static bend radius 52 mm
Weight :	1 kg including standard 10 m cable length
Maximum Cable Length :	500 m
Environmental Protection :	Totally encapsulated to IP68
Operating Temperature :	10°C to 80°C
Minimum Operating Depth :	30 mm

system unit

Materials :	Ultra pure cast aluminium
Dimensions :	220 mm wide x 120 mm deep x 80 mm high
Weight :	1.5 kg
Environmental Protection :	Enclosure is IP67. Electronic assembly is encapsulated to IP68
Operating Temperature :	10°C to 70°C

MAINSTREAM AV-FLOW TRANSMITTER

level measurement

Transducer Type :	Any 420mA current loop level sensor
Method :	Pulse activation with configurable sensor warmup time. Loop current measurement by selfcalibrating 16 bit delta-sigma A-D converter
Current Range :	030mA
Resolution :	Better than 1µA
Transducer Calibration :	Calibration table (maximum 23 points) with builtin interpolator converts loop current into level measurement. Simple transducer calibration tool included in UI software
Interchangability :	Transducers and calibration data directly interchangeable between Mainstream system units

velocity measurement

Transducer Type :	Submerged ultrasonic sensor containing signal generator, transmitter, receiver and decoder electronics
Method :	Phase Coherence time delay measurement determines the time for tracers carried by the flow to travel a fixed distance (~ 0.75 mm)
Velocity Range :	5 m/s to 10 mm/s and 10 mm/s to 5 m/s
Resolution :	Better than 1 mm/s
Measurement Integrity :	Ultrasound signal quality monitor gives the percentage of the measurement time that the received ultrasound signal contains useful velocity information
Smart Power Saving :	Each velocity measurement is based on the same quantity of information. Automatically reduces the measurement time for high flow velocities and high signal qualities and increases the measurement time for low velocities and low signal qualities

derived measurements

Area :	Flow crosssectional area calculated from the level measurement and the dimensions of the pipe or channel. Calculation can take into account a specified (constant) silt level. Flow crosssection specification tools included in UI software
Flow Rate :	Fluid flow rate calculated by multiplying crosssectional area by flow velocity

power supplies

Power Inputs :	Terminals for external 12V and 24V supplies
External 12V supply :	12V input for low power battery operation
External 24V supply :	24V input for industrial power supplies
Power Supply Monitor :	Power monitoring circuits track supply status. Supply voltages can be viewed via the UI

communications

Local :	RS232 and USB compatible interface with automatic baud rate detection. Supports 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600 and 115200 baud
Remote :	Optional external SDI or MODBUS device
Software :	Mainstream Communicator UI software for system configuration, diagnostics, real time measurement display and data retrieval. Mainstream Communicator runs on PC platforms under Windows 2000, XP, Vista, 7, 8, 8.1 and 10 with data transmission from device to PC, for data control, processing and export

measurands units and formats

Power Supply Voltage :	V
Signal Quality :	%
Linear (pipe & channel dimensions) :	Selectable from mm, cm, m, in, ft
Level :	Selectable from mm, cm, m, in, ft
Area :	Selectable from m2, cm2, mm2, in2, ft2
Velocity :	Selectable from mm/s, cm/s, m/s, in/s, ft/s, ft/min
Flow Rate :	Selectable from l/s, m3/s, ft3/s, igals/s, USG/s, 1/min, M3/min, ft3/min
Display Format :	Independently configurable display format for each measurement. Options are integer, fixed point with 1 to 6 decimal places, and scientific (Eformat). Display defaults to scientific format if data cannot be correctly represented in selected format

420mA output

Hardware :	One optoisolated passive 420mA output configurable to transmit any selected measurand. Isolated 12V supply derived from 24V power input for active 420mA output operation.

PRODUCT HARDWARE

ptx level sensor

Materials :	Titanium, acetal and polyurethane
Dimensions :	185 mm long x 17.5 mm diameter
Cable :	8 mm diameter vented polyurethane cable with Kevlar strain cord
Weight :	1 kg including standard 10 m cable length
Level Range :	0 to 2 m working. Maximum 8 m overrange
Resolution :	Better than 1 mm
Combined Accuracy :	Combined effects of nonlinearity, hysterisis and repeatability better than 0.25% best straight line. Non- linearity and offsets removed by transducer calibration
Environmental Protection :	Fully encapsulated to IP68
Operating Temperature :	20°C to 60°C (temperature compensated 2°C to 30°C)

velocity sensor

Materials :	Streamlined µPVC moulding and polyurethane cable
Dimensions :	105 mm long x 50 mm wide x 20 mm high
Cable :	8 mm diameter polyurethane cable with Aramid strain cord. Breaking load 45 kg. Minimum static bend radius 52 mm
Weight :	1 kg including standard 10 m cable length
Maximum Cable Length :	500 m
Environmental Protection :	Totally encapsulated to IP68
Operating Temperature :	10°C to 80°C
Minimum Operating Depth :	30 mm

system unit

Materials :	Ultra pure cast aluminium
Dimensions :	220 mm wide x 120 mm deep x 80 mm high
Weight :	1.65 kg
Environmental Protection :	Enclosure is IP67. Electronic assembly is encapsulated to IP68
Operating Temperature :	10°C to 70°C

MAINSTREAM COMPACT FIXED AV-FLOWMETER

level measurement

Transducer Type :	Any 420mA current loop level sensors
Method :	Pulse activation with configurable sensor warmup time. Loop current measurement by selfcalibrating 16 bit delta-sigma A-D converter
Current Range :	030mA
Resolution :	Better than 1µA
Transducer Calibration :	Calibration table (maximum 23 points) with builtin interpolator converts loop current into level measurement. Simple transducer calibration tool included in UI software
Interchangeability :	Transducers and calibration data directly interchangeable between Mainstream system units

velocity measurement

Transducer Type :	Submerged ultrasonic sensor containing signal generator, transmitter, receiver and decoder electronics
Method :	Phase Coherence time delay measurement determines the time for tracers carried by the flow to travel a fixed distance (~ 0.75 mm)
Velocity Range :	5 m/s to 10 mm/s and 10 mm/s to 5 m/s
Resolution :	Better than 1 mm/s
Measurement Integrity :	Ultrasound signal quality monitor gives the percentage of the measurement time that the received ultrasound signal contains useful velocity information
Smart Power Saving :	Each velocity measurement is based on the same quantity of information. Automatically reduces the measurement time for high flow velocities and high signal qualities and increases the measurement time for low velocities and low signal qualities

derived measurements

Area :	Flow crosssectional area calculated from the level measurement and the dimensions of the pipe or channel. Calculation can take into account a specified (constant) silt level. Flow crosssection specification tools included in UI software
Flow Rate :	Fluid flow rate calculated by multiplying crosssectional area by flow velocity
Flow Quantity :	Three independent flow totalisers calculate forward only, reverse only, and forwardreverse flow quantities. Each totaliser uses separate elements to accumulate hour quantity and total quantity to prevent roundoff errors

power supplies

Power Inputs :	Terminals for external 12V and 24V supplies
External 12V supply :	12V input for low power battery operation
External 24V supply :	24V input for industrial power supplies
Power Supply Monitor :	Power monitoring circuits track supply status. Supply voltages can be displayed on LCD, viewed via the UI, stored in the data logger, and used to control switch outputs

data logger

File System :	Flash file system with 4 Mbyte capacity and data retention of 20 years
File Content :	Configurable to record any combination of power supply voltages, level sensor loop current, level, area, ultrasound signal quality, velocity and flow rate, plus forward, reverse and total flow quantities
Recording Mode :	Proprietary data compression algorithm for extended logger capacity and rapid data retrieval
Recording Interval :	Configurable from 15 seconds to 1 hour
Data Capacity :	Logger holds more than one year of data when recording all available measurements at one minute intervals
Retrieval Time :	Less than 15 seconds to retrieve one month's data recorded at 1 minute intervals. File synchronization capability for fast update of previously retrieved data files
Retrieved Data Format :	Spreadsheet compatible .csv file with country specific caption text and date/time format for analysis and reports. Flash file image file including complete flowmeter configuration for data archives

communications

Local :	RS232 and USB compatible interface with automatic baud rate detection. Supports 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600 and 115200 baud
Remote :	Optional external SDI or MODBUS device
Software :	Mainstream Communicator UI software for system configuration, diagnostics, real time measurement display and data retrieval. Mainstream Communicator runs on PC platforms under Windows 2000, XP, Vista, 7, 8, 8.1 and 10 with data transmission from device to PC, for data control, processing and export

user interfaces

LCD :	Two line x 16 character LCD. Configurable display sequence includes date, time, and any combination of measurement data. Country specific caption text and date/time format. Configurable backlight operation. LCD always on or activated by front panel push switch

measurands units and formats

Power Supply Voltage :	V
Signal Quality :	%
Linear (pipe & channel dimensions) :	Selectable from mm, cm, m, in, ft
Level :	Selectable from mm, cm, m, in, ft
Area :	Selectable from m2, cm2, mm2, in2, ft2
Velocity :	Selectable from mm/s, cm/s, m/s, in/s, ft/s, ft/min
Flow Rate :	Selectable from l/s, m3/s, ft3/s, igal/s, USG/s, l/min, m3/min, ft3/min, igal/min, USG/min, m3/h, ft3/h, m3/d, Ml/d

Quantity :	Selectable from l, m3, Ml, ft3, igal, USG
Display Format :	Independently configurable display format for each measurement. Options are integer, fixed point with 1 to 6 decimal places, and scientific (Eformat). Display defaults to scientific format if data cannot be correctly represented in selected format

switch outputs

Hardware :	Two optoisolated switches rated at 60V ac/dc and 200mA maximum current. Each switch independently configurable for state output or pulse output operation
State Output :	Switch configurable to respond to any item of measured data with separate switch open and switch close settings to provide hysterisis. Applications include power supply monitoring and control, low ultrasound signal quality indication and level, velocity and flow alarms
Pulse Output :	Switch configurable to generate a 2.5 second duration switch closure to indicate a defined flow quantity. Applications include sampler control and remote flow totaliser operation

420mA output

Hardware :	One optoisolated passive 420mA output configurable to transmit any selected measurand Isolated 12V supply derived from 24V power input for active 420mA output operation

PRODUCT HARDWARE

ptx level sensor

Materials :	Titanium, acetal and polyurethane
Dimensions :	185 mm long x 17.5 mm diameter
Cable :	8 mm diameter vented polyurethane cable with Kevlar strain cord
Weight :	1 kg including standard 10 m cable length
Level Range :	0 to 2 m working. Maximum 8 m overrange
Resolution :	Better than 1 mm
Combined Accuracy :	Combined effects of nonlinearity, hysterisis and repeatability better than 0.25% best straight line. Non-linearity and offsets removed by transducer calibration
Environmental Protection :	Fully encapsulated to IP68
Operating Temperature :	20°C to 60°C (temperature compensated 2°C to 30°C)

velocity sensor

Materials :	Streamlined µPVC moulding and polyurethane cable
Dimensions :	105 mm long x 50 mm wide x 20 mm high
Cable :	8 mm diameter polyurethane cable with Aramid strain cord. Breaking load 45 kg. Minimum static bend radius 52 mm
Weight :	1 kg including standard 10 m cable length
Maximum Cable Length :	500 m; 300 m for ATEX
Environmental Protection :	Totally encapsulated to IP68
Operating Temperature :	10°C to 80°C
Minimum Operating Depth :	30 mm

system unit

Materials :	Ultra pure cast Aluminium housing
Dimensions :	220 mm wide x 120 mm deep x 80 mm high
Weight :	1.9 kg
Environmental Protection :	Enclosure is IP67. Electronic assembly is encapsulated to IP68
Operating Temperature :	10°C to 70°C

MAINSTREAM PREMIER FIXED AV-FLOWMETER

level measurement

Transducer Type :	Dual 420mA current loop level sensors
Method :	Pulse activation with configurable sensor warmup time. Loop current measurement by selfcalibrating 16bit delta-sigma A-D converter
Current Range :	030mA
Resolution :	Better than 1µA
Transducer Calibration :	Calibration tables (maximum 23 points) with builtin interpolator convert loop currents into level measurements. Simple transducer calibration tool included in UI software
Interchangeability :	Transducers and calibration data directly interchangeable between Mainstream system units

velocity measurement

Transducer Type :	Submerged ultrasonic sensor containing signal generator, transmitter, receiver and decoder electronics
Method :	Phase Coherence time delay measurement determines the time for tracers carried by the flow to travel a fixed distance (~ 0.75 mm)
Velocity Range :	5 m/s to 10 mm/s and 10 mm/s to 5 m/s
Resolution :	Better than 1 mm/s
Measurement Integrity :	Ultrasound signal quality monitor gives the percentage of the measurement time that the received ultrasound signal contains useful velocity information
Smart Power Saving :	Each velocity measurement is based on the same quantity of information. Automatically reduces the measurement time for high flow velocities and high signal qualities and increases the measurement time for low velocities and low signal qualities

derived measurements

Area :	Flow crosssectional area calculated from the level measurement and the dimensions of the pipe or channel. Calculation can take into account a specified (constant) silt level. Flow crosssection specification tools included in UI software
Flow Rate :	Fluid flow rate calculated by multiplying crosssectional area by flow velocity.
Flow Quantity :	Three independent flow totalisers calculate forward only, reverse only, and forwardreverse flow quantities. Each totaliser uses separate elements to accumulate hour quantity and total quantity to prevent roundoff errors

power supplies

Power Inputs :	Terminals for external 12V and 24V supplies
External 12V supply :	12V input for low power battery operation
External 24V supply :	Isolated 1528V input for industrial power supplies
Battery Charger :	Builtin battery charger maintains external 12V battery using power from the 1528V source creating an uninterruptable power supply for fail safe operation
Power Supply Monitor :	Power monitoring circuits track supply status. Supply voltages and charged current can be displayed on LCD, viewed via the UI, stored in the data logger, and used to control switch outputs.

data logger

File System :	Flash file system with 4 Mbyte capacity and data retention of 20 years
File Content :	Configurable to record any combination of power supply voltages, battery charge current, level sensor loop current, level, area, ultrasound signal quality, velocity and flow rate, plus forward, reverse and total flow quantities
Recording Mode :	Proprietary data compression algorithm for extended logger capacity and rapid data retrieval
Recording Interval :	Configurable from 15 seconds to 1 hour
Data Capacity :	Logger holds more than one year of data when recording all available measurements at one minute intervals
Retrieval Time :	Less than 15 seconds to retrieve one month's data recorded at 1 minute intervals. File synchronization capability for fast update of previously retrieved data files
Retrieved Data Format :	Spreadsheet compatible .csv file with country specific caption text and date/time format for analysis and reports. Flash file image file including complete flowmeter configuration for data archives

communications

Local :	RS232 and USB compatible interface with automatic baud rate detection. Supports 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600 and 115200 baud
Remote :	Optional external SDI or MODBUS device

user interfaces

Switch :	Push to start LCD display
LCD :	Two line x 16 character LCD. Configurable display sequence includes date, time, and any combination of measurement data. Country specific caption text and date/time format. Configurable backlight operation. LCD always on or activated by front panel push switch

measurands units and formats

Power Supply Voltage :	V
Signal Quality :	%
Linear (pipe & channel dimensions) :	Selectable from mm, cm, m, in, ft
Level :	Selectable from mm, cm, m, in, ft
Area :	Selectable from m2, cm2, mm2, in2, ft2
Velocity :	Selectable from mm/s, cm/s, m/s, in/s, ft/s, ft/min
Flow Rate :	Selectable from l/s, m3/s, ft3/s, igal/s, USG/s, l/min, m3/min, ft3/min, igal/min, USG/min, m3/h, ft3/h, m3/d, Ml/d

Quantity :	Selectable from l, m3, Ml, ft3, igal, USG
Display Format :	Independently configurable display format for each measurement. Options are integer, fixed point with 1 to 6 decimal places, and scientific (Eformat). Display defaults to scientific format if data cannot be correctly represented in selected format

switch outputs

Hardware :	Two optoisolated switches rated at 60V ac/dc and 200mA maximum current. Each switch independently configurable for state output or pulse output operation
State Output :	Switch configurable to respond to any item of measured data with separate switch open and switch close settings to provide hysterisis. Applications include power supply monitoring and control, low ultrasound signal quality indication and level, velocity and flow alarms
Pulse Output :	Switch configurable to generate a 2.5 second duration switch closure to indicate a defined flow quantity. Applications include sampler control and remote flow totaliser operation

420mA outputs

Hardware :	Three optoisolated passive 420mA outputs, each configurable to transmit any selected measurand Isolated 12V supply derived from 1528V power input for active 420mA output operation

PRODUCT HARDWARE

ptx level sensor

Materials :	Titanium, acetal and polyurethane
Dimensions :	185 mm long x 17.5 mm diameter
Cable :	8 mm diameter vented polyurethane cable with Kevlar strain cord
Weight :	1 kg including standard 10 m cable length
Level Range :	0 to 2 m working. Maximum 8 m overrange
Resolution :	Better than 1 mm
Combined Accuracy :	Combined effects of nonlinearity, hysterisis and repeatability better than 0.25% best straight line. Non-linearity and offsets removed by transducer calibration
Environmental Protection :	Fully encapsulated to IP68
Operating Temperature :	20°C to 60°C (temperature compensated 2°C to 30°C)

velocity sensor

Materials :	Streamlined µPVC moulding and polyurethane cable
Dimensions :	105 mm long x 50 mm wide x 20 mm high
Cable :	8 mm diameter polyurethane cable with Aramid strain cord. Breaking load 45 kg. Minimum static bend radius 52 mm
Weight :	1 kg including standard 10 m cable length
Maximum Cable Length :	500 m; 300 m for ATEX Zone 0
Environmental Protection :	Totally encapsulated to IP68
Operating Temperature :	10°C to 80°C
Minimum Operating Depth :	30 mm

system unit

Materials :	Ultra pure cast Aluminium housing
Dimensions :	260 mm wide x 160 mm deep x 90 mm high
Weight :	2.95 kg
Environmental Protection :	Enclosure is IP67. Electronic assembly is encapsulated to IP68
Operating Temperature :	10°C to 70°C

MAINSTREAM PORTABLE AVFLOWMETER

level measurement

Transducer Type :	Any 420mA current loop level sensor
Method :	Pulse activation with configurable sensor warmup time. Loop current measurement by selfcalibrating 16bit delta-sigma A-D converter
Current Range :	030mA
Resolution :	Better than 1µA
Transducer Calibration :	Calibration table (maximum 23 points) with builtin interpolator converts loop current into level measurement Simple transducer calibration tool included in UI software
Interchangeability :	Transducers and calibration data directly interchangeable between Mainstream system units

velocity measurement

Transducer Type :	Submerged ultrasonic sensor containing signal generator, transmitter, receiver and decoder electronics
Method :	Phase Coherence time delay measurement determines the time for tracers carried by the flow to travel a fixed distance (~ 0.75 mm)
Velocity Range :	5 m/s to 10 mm/s and 10 mm/s to 5 m/s
Resolution :	Better than 1 mm/s
Measurement Integrity :	Ultrasound signal quality monitor gives the percentage of the measurement time that the received ultrasound signal contains useful velocity information
Smart Power Saving :	Each velocity measurement is based on the same quantity of information. Automatically reduces the measurement time for high flow velocities and high signal qualities and increases the measurement time for low velocities and low signal qualities

derived measurements

Area :	Flow crosssectional area calculated from the level measurement and the dimensions of the pipe or channel. Calculation can take into account a specified (constant) silt level. Flow crosssection specification tools included in UI software
Flow Rate :	Fluid flow rate calculated by multiplying crosssectional area by flow velocity
Flow Quantity :	Three independent flow totalisers calculate forward only, reverse only, and forwardreverse flow quantities. Each totaliser uses separate elements to accumulate hour quantity and total quantity to prevent roundoff errors

power supplies

Power Inputs :	Internal 12V battery. Connectors for external 12V and 24V DC supplies
Internal Battery :	Low cost exchangeable deep discharge 12V 7.5Ah rechargeable battery. One year endurance when operated at 1 measurement per minute. Weight 2.5 kg
External 12V supply :	Connection for external 12V battery pack for extended measurement period
External 24V supply :	Connection for external 1528V power input compatible with all industrial 24V supplies
Battery Charger :	Builtin battery charger maintains internal 12V battery using power from external 24V source, enabling power harvesting for indefinite endurance
Power Supply Monitor :	Power monitoring circuits track supply status. Supply voltages and charge currents can be displayed on LCD, viewed via the UI, stored in the data logger, and used to control switch outputs. Power supply condition visible on status LED

data logger

File System :	Flash file system with 4 Mbyte capacity and data retention of 20 years
File Content :	Configurable to record any combination of power supply voltages, battery charge current, level sensor loop current, level, area, ultrasound signal quality, velocity and flow rate, plus forward, reverse and total flow quantities
Recording Mode :	Proprietary data compression algorithm for extended logger capacity and rapid data retrieval
Recording Interval :	Configurable from 15 seconds to 1 hour
Data Capacity :	Logger holds more than one year of data when recording all available measurements at one minute intervals
Retrieval Time :	Less than 15 seconds to retrieve one month's data recorded at 1 minute intervals. File synchronization capability for fast update of previously retrieved data files
Retrieved Data Format :	Spreadsheet compatible .csv file with country specific caption text and date/time format for analysis and reports. Flash file image file including complete flowmeter configuration for data archives

communications

Local :	RS232 and USB compatible interface with automatic baud rate detection. Supports 1200, 2400, 4800, 9600, 14400, 19200, 38400, 57600 and 115200 baud
Remote :	Optional external SDI or MODBUS device
Software :	Mainstream Communicator UI software for system configuration, diagnostics, real time measurement display and data retrieval. Mainstream Communicator runs on PC platforms under Windows 2000, XP, Vista, 7, 8, 8.1 and 10 with data transmission from device to PC, for data control, processing and export

user interfaces

On/Off Switch :	Push to start push to stop. Requires 10 seconds continuous pressure to switch flowmeter off to prevent accidental de-activation
Status LED :	High intensity flashing LED indicates system operation and battery status without opening enclosure or entering manhole. LED also indicates activity on communications port
LCD :	Two line x 16 character LCD. Automatic activation when integral light sensor detects enclosure is open. Configurable display sequence includes date, time, and any combination of measurement data. Country specific caption text and date/time format

measurands units and formats

Power Supply Voltage :	V
Signal Quality :	%
Linear (pipe & channel dimensions) :	Selectable from mm, cm, m, in, ft
Level :	Selectable from mm, cm, m, in, ft
Area :	Selectable from m2, cm2, mm2, in2, ft2
Velocity :	Selectable from mm/s, cm/s, m/s, in/s, ft/s, ft/min
Flow Rate :	Selectable from l/s, m3/s, ft3/s, igal/s, USG/s, l/min, m3/min, ft3/min, igal/min, USG/min, m3/h, ft3/h, m3/d, Ml/d
Quantity :	Selectable from l, m3, Ml, ft3, igal, USG
Display Format :	Independently configurable display format for each measurement. Options are integer, fixed point with 1 to 6 decimal places, and scientific (Eformat). Display defaults to scientific format if data cannot be correctly represented in selected format

switch outputs

Hardware :	Two optoisolated switches rated at 60V ac/dc and 200mA maximum current. Each switch independently configurable for state output or pulse output operation
State Output :	Switch configurable to respond to any item of measured data with separate switch open and switch close settings to provide hysterisis. Applications include power supply monitoring and control, low ultrasound signal quality indication and level, velocity and flow alarms
Pulse Output :	Switch configurable to generate a 2.5 second duration switch closure to indicate a defined flow quantity. Applications include sampler control and remote flow totaliser operation

PRODUCT HARDWARE

ptx level sensor

Materials :	Titanium, acetal and polyurethane
Dimensions :	185 mm long x 17.5 mm diameter
Cable :	8 mm diameter vented polyurethane cable with Kevlar strain cord
Weight :	1 kg including standard 10 m cable length
Level Range :	0 to 2 m working. Maximum 8 m overrange
Resolution :	Better than 1 mm
Combined Accuracy :	Combined effects of nonlinearity, hysterisis and repeatability better than 0.25% best straight line. Non-linearity and offsets removed by transducer calibration
Environmental Protection :	Fully encapsulated to IP68
Operating Temperature :	20°C to 60°C (temperature compensated 2°C to 30°C)

velocity sensor

Materials :	Streamlined µPVC moulding and polyurethane cable
Dimensions :	105 mm long x 50 mm wide x 20 mm high
Cable :	8 mm diameter polyurethane cable with Aramid strain cord. Breaking load 45 kg. Minimum static bend radius 52 mm
Weight :	1 kg including standard 10 m cable length
Maximum Cable Length :	500 m; 300 m for ATEX Zone 0
Environmental Protection :	Totally encapsulated to IP68
Operating Temperature :	10°C to 80°C
Minimum Operating Depth :	30 mm

system unit

Materials :	Ultra high impact structural copolymer polypropylene
Dimensions :	280 mm wide x 250 mm deep x 125 mm high
Weight :	5 kg with 7.5Ah internal battery installed
Environmental Protection :	Enclosure is IP67. Electronic assembly is encapsulated to IP68 and can operate totally submerged with the enclosure lid open
Operating Temperature :	10°C to 70°C

MAINSTREAM MODBUS ADAPTER

power supplies

Mainstream : Mainstream units with appropriate firmware upgrade can power the Modbus adapter via the RS232 communications cable

Modbus : Terminals for 4.518V power input supplied via the Modbus master

Auxiliary : Terminals for 4.518V power input from an external power source

Isolation : Mainstream system unit is isolated from the Modbus/auxiliary power inputs

Power consumption : 50mA maximum operating current

communications

Mainstream : Male connector on 1m lead mates with Mainstream communications connector

Modbus : Terminals for digitallyisolated RS232 and RS485 connections

RS232 Communications : 1200, 2400, 4800, 9600, 19200 (default), 38400, 57600 and 115200 baud rates. None, odd or even parity.

RS485 Communications : Full or half duplex. 1200, 2400, 4800, 9600, 19200 (default), 38400, 57600 and 115200 baud rates. None, odd or even parity. Address range 1247. ¼ unit load (48Ω)

user interfaces

Modbus configuration : Two internal DIP switches to select RS232 or RS485 communication and full/half duplex when operating in RS485 mode

Address configuration : Three internal 10 position digital encoders to set adapter address

Diagnostics: Three external LEDs to indicate operating status

system unit

Materials : Ultra pure cast aluminium

Dimensions : 150 mm wide x 36 mm deep x 64 mm high

Weight : 500 g

Operating Temperature : 10ºC to 85ºC

MAINSTREAM SDI ADAPTER

power supplies

ADCON cable : Cable carries a 6V power supply

Power Consumption : Idle < 20µA, communicating over SDI < 2mA, Communicating with Mainstream < 10mA

communications

Mainstream : Male connector on 0.5m lead mates with Mainstream communications connector

SDI12 : ADCON connector on 0.5m lead communicates over Serial Data Interface at 1200 baud

system unit

Materials : Ultra pure cast aluminium

Dimensions : 98 mm wide X 34 mm deep X 64 mm high

Weight : 300 g

Operating temperature : 10°C to 85°C

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