British Rototherm™

mainstream™ MEASUREMENTS LTD
WORLD CLASS FLOWMETERS

PREMIER FIXED AV-FLOWMETER

High performance fixed installation Area Velocity flowmeter with extended feature set for complex open channel and part-filled pipe applications.

benefits and features

Powerful, easy to use PC software simplifies flowmeter commissioning

Quick to install - no weirs or flumes

Flow measurement from 10mm/S up to 5m/S

High sensitivity extends applications to 'clean' water

Streamlined velocity probe eliminates fouling and reduces flow disturbances

High capacity data logger in excess of 1 year when recording at 1 minute intervals; emulates the familiar PC file system

4 M-byte data logger memory is non-volatile (FLASH) giving 20 years data retention without power

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.

Battery monitoring circuits and on-board battery charger hardware

Sophisticated ultrasound processing ignores spurious signals

Ultrasound signal quality monitor confirms measurement integrity

Specified (constant) silt level taken into account in area calculation

Velocity correction factor calibration

Automatic recording of velocity signals and histograms for use in performance monitoring or reports

Distances up to 500m from system unit to velocity and level sensor.

Opto-isolated switch outputs for alarms and controls

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. Only high quality signals containing verified velocity information is used, thereby ensuring measurement integrity.

This measured frequency shift in the ultrasound signals gives flow velocity. The verified velocity signals produce a histogram of the flow velocities. Analysing this histogram gives the mean flow velocity.

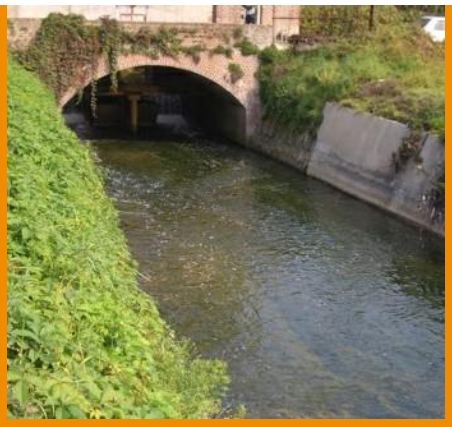
Liquid level is measured by a submerged pressure transmitter or ultrasonic sensor. The flow cross-sectional area is deduced from the liquid level measurement and the stored description of the channel or pipe cross section. The flow rate is the flow velocity multiplied by the flow cross-sectional area.

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 with Weirs & Flumes**
- **Velocity Probe Mounting Hardware**

mainstream's communicator data

- Intuitive point-and-click user interface with pull-down menus and Communicator's dynamic/distinctive button bar for flowmeter configuration, diagnostics and real-time displays
- Library of standard pipe/channel cross-sections
- Simple level sensor calibration procedure
- Real time display of measurements and velocity histogram
- Backup and restore of the Mainstream configuration
- Unique data logger based on 4Mbyte flash ICs with data retention of up to 20 years
- Any combination of measurements including power supply voltages and ultrasound signal quality can be logged
- New data files generated automatically every day at same start time or data can be logged into one large file
- Data files constructed to extract data covering specified time intervals or specific items e.g. velocity histograms; without retrieving the entire data file
- Communicator's logger behaves like the filing system on a PC with file system properties e.g. the ability to retrieve, synch and delete specified data files from the logger
- Data file transfer to a PC is organised in ~0.5 kbyte packets. Transmission errors require only a repeat transmission of the packet, not the entire data file.



MAINSTREAM PREMIER FIXED AV-FLOWMETER
communicator data

PRODUCT FEATURES

LEVEL MEASUREMENT

Transducer Type:	Any 4:20 mA current loop level sensor
Method :	Pulse activation with configurable sensor warm-up time. Loop current measurement by self-calibrating 16-bit delta-sigma A-D converter
Current Range :	0-30 mA
Resolution :	Better than 1 µA
Transducer Calibration :	Calibration table (maximum 23 points) with built-in 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 cross-sectional 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 cross-section specification tools included in UI software
Flow Rate :	Fluid flow rate calculated by multiplying cross-sectional area by flow velocity.
Flow Quantity :	Three independent flow totalisers calculate forward only, reverse only, and forward-reverse flow quantities. Each totaliser uses separate elements to accumulate hour quantity and total quantity to prevent round-off errors

POWER SUPPLIES

Power Inputs :	Connectors for external 12V and 24V supplies
Battery Charger :	Built-in battery charger maintains internal battery using power from external 24V source
External 12V supply :	Connection for external 12V battery pack for extended measurement period
External 24V supply :	Connection for external 15-28V power input compatible with all industrial 24V supplies (required if using 4:20mA output)
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. 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, 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

USER INTERFACES

Reset Switch : Push to Reset LCD display

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

MEASUREMENT UNITS AND FORMATS

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 (E-format). Display defaults to scientific format if data cannot be correctly represented in selected format

SWITCH OUTPUTS

Hardware : Two opto-isolated switches rated at 60V ac/dc and 200 mA 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. Flow totaliser an be forward only, reverse only, or forward- reverse. Applications include sampler control and remote flow totaliser operation

4:20mA Outputs : Three 4:20 mA outputs. Configurable to selected measurands

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 8m overrange

Resolution : Better than 1mm

Combined Accuracy : Combined effects of non-linearity, 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 IP 68

Operating Temperature : -10°C to 80°C

Minimum Operating Depth : 30 mm

SYSTEM UNIT

Materials : Ultra high 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