Mobrey liquid flow computers

for the oil and refined products industry

mobrey

EMERSON
Process Management

For complete metering control: Single and Multi-stream liqui

The Mobrey Liquid Flow Computer range is suitable for metering a variety of hydrocarbon liquids in demanding fiscal and custody transfer applications. Two versions are available and build on the success of the previous Solartron Flow Computers.

- The Mobrey 2510 Liquid Flow Computer Software - is suitable for single stream applications, with or without proving, and runs on the MObrey 7951 hardware platform (see IP7951 for details)

- The Mobrey 2540 Multistream Liquid Flow Computer Software - can measure upt to 4 streams (meter runs) and a prover and reuns on the Mobrey 7955 hardware platform (see IP7955 for details)

For ordering details see page 8.

Both the above versions include the features listed in the brochure and incorporate :-

- All common engineering units for parameters such as temperature, pressure, density, viscosity, flow, etc.
- These options cover metric units, imperial / English units or S.I. units. All are user selectable, including both US and UK gallons
- Displayed units and units used over communications ports are site selectable
- The conditions to which base or reference volumes and densities are referred to are also site configurable e.g. 1013.25mBar, 14.7 psi, 0°c, 15°c, 20°C or 60°F etc.
- Support for turbine, ultrasonic, positive displacement (PD), Coriolis, orifice and Venturi flow meters
- Support for uni-directional, bi-directional pipe provers, compact provers and master meter provers

All other features are built in to the standard 25X0 liquid software, including hot duty standby, viscosity measurement, batching, reports, PID control, product detection.

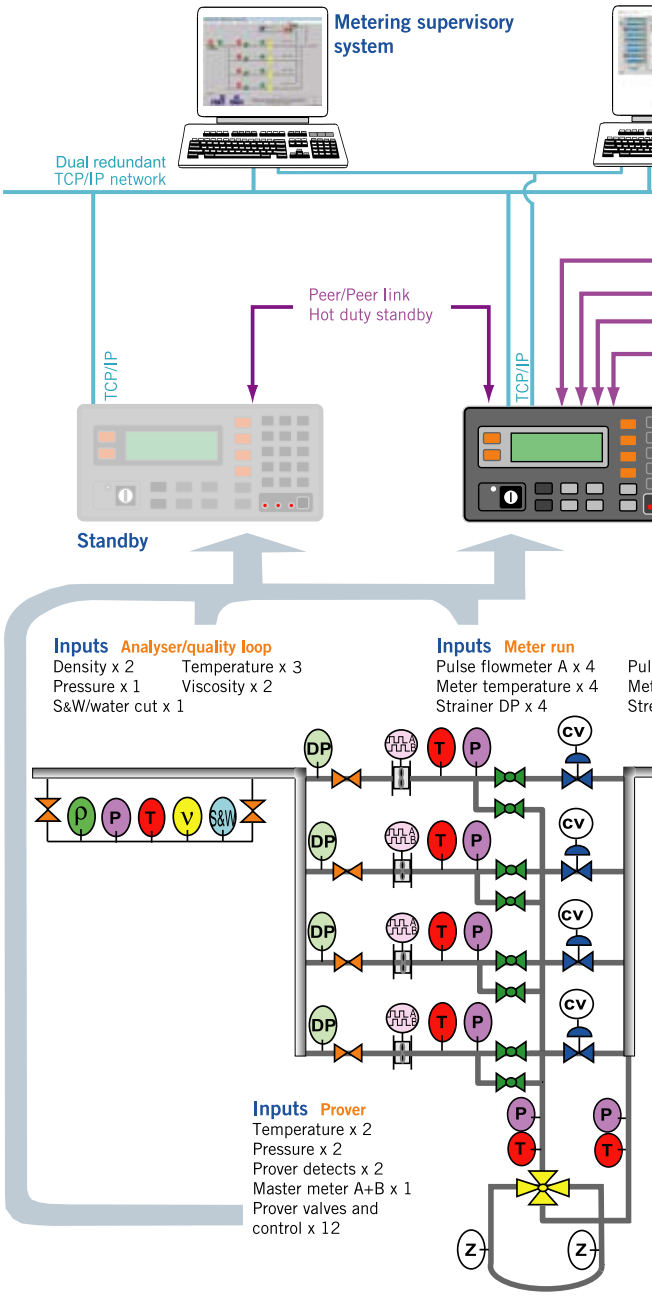
Should gas measurement be required please ask for data sheet IP1248.

Cost effective multi-stream monitoring and control

The 2540 flow computer software can monitor up to four metering runs/streams on the 7955 platform and handles both types of commonly encountered flow schemes: 4x4x4 and 1x4x1.

In the 4x4x4 scheme the meter runs are completely independent, each with its own flowmeter and associated instrumentation (typically pressure, temperature, density and viscosity). The fluid can be common, or may be different in each meter run.

The 1x4x1 scheme shown opposite, has a single common inlet header which divides into 4 meter runs, each having its own flowmeter, pressure and temperature measurement. The common inlet header typically has on-line density and/or viscosity measurement, which can be referred to meter run conditions, using either API/ASTM or 4x5 matrix referral, all under the control of the flow computer.

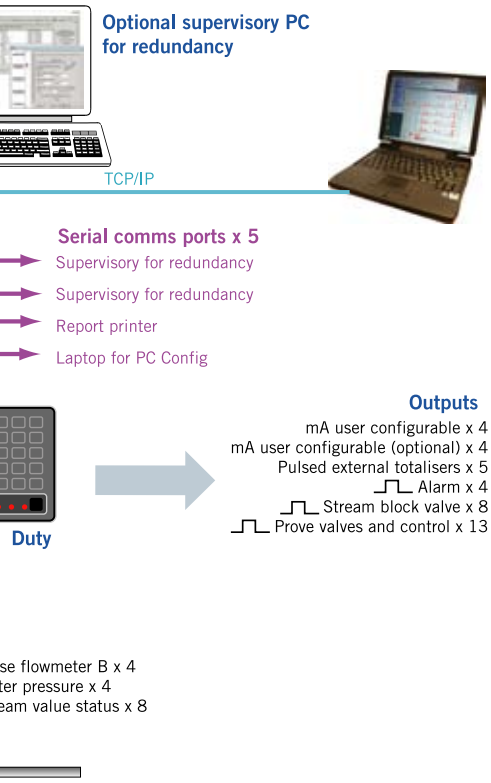


The schematic above shows a typical 4 meter run metering station. Here one flow computer could be used for all instrumentation including the prover. For critical applications the redundancy offered by hot duty/ standby is often preferred.

Applications

- Liquid metering to fiscal requirements
- Custody transfer
- Tanker loading
- Sales metering
- Pipeline distribution
- Allocation metering
- Product interface detection
- Meter proving

d flow computers



Automatic product detection
The 25X0 liquid software recognises - by density or specific gravity - up to 20 different fluid products flowing through any of the metering runs. On detection, products can be automatically diverted to the relevant line or tank in the plant.
Each named product has its own dedicated totalisers and unique flowmeter calibration data, which can be invoked automatically to ensure optimum accuracy and quality control.
The 25X0 software can generate individual product batch reports when the product flowing in the meter run changes. These reports log all operating parameters and flow totals for a particular product and provide an audit trail.

Imporved measurement uncertainty and Flowmeter performance enhancement
Built-in facilities in the 7951 and 7955 Flow Computers significantly improve flow measurement uncertainty (essential for custody transfer applications) and also give improved product quality and reduced wastage.

Pulse Integrity : With pulsed output type flow meters, e.g. turbine meters, PD meters and some Coriolis or ultrasonic meters, the integrity of pulses received by the flow computer is paramount. The 795X includes pulse integrity checking to the highest level achievable – it meets the standard of 'Level A' as specified in IP 252/76 & API Ch 5.5.

Analog Inputs : With flow meters or transmitters that use an analog output, the accuracy and resolution of the receiving flow computer's analog to digital (A/D) converter is critical to accurate measurement. The 795X incorporates a 20 Bit A/D converter for resolution of better than 1 part per million.

Intelligent Transmitter : The 25X0 software is also compatible with intelligent transmitters and flowmeters, differential pressures, pressures, temperatures and densities can be read using HART protocol or the flow computer can communicate with intelligent transmitters or flowmeters using Modbus commands to read process variables as well as valuable diagnostic data.

Linearisation : The 25X0 software stores a 10-point linearisation curve for correcting the inherent non-linearity of flowmeters, particularly turbines and Venturi tubes.

Universal calibration curve: as per ISO 4124. Allows the flow computer to continually update the K-factor of each flow meter depending upon the fluid viscosity and the meter frequency. This method is particularly suitable for turbine meters where the fluid viscosity is continually changing due to fluid composition and/or temperature.

Viscosity compensation: The 25X0 software can accept up to four calibration curves to compensate for the effect of different viscosities on flowmeter performance. Alternatively, unique calibration data for each product can be entered for each flow meter, optimising the performance for each product.

Hot duty/standby
A complete redundancy solution in multistream flow measurement applications, hot duty/standby allows two 7955 multistream flow computers to work together to give a fiscally secure measurement solution with in-built redundancy in the flow computers, with all of the advantages of multistream flow computers.

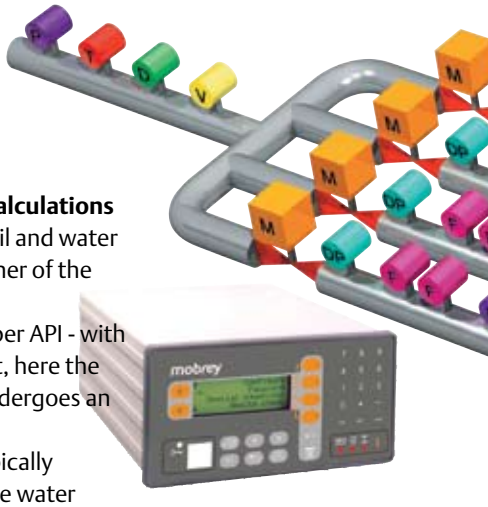
Hot duty standby allows full redundancy to be built in to the metering system using two 7955 flow computers for up to four meter runs, and is ideal for both fiscal and custody transfer metering applications.

The two 7955 flow computers work together to maintain traceable daily reports and batches, including PID control, even if one flow computer should malfunction or lose power.

Critical data such as batch ticket numbers, PID set points, valve status and batch quantities are frequently synchronised across the two flow computers using a Peer to Peer link. There is also an option to use an encrypted password to allow the totalisers of each flow computer to synchronise with each other, thus giving a seamless audit trail.

This practice is becoming more acceptable worldwide, particularly as even in the event of a flow computer failure, the accuracy and integrity of the flow data is maintained without losing any flow.

The system is highly efficient, accurate, and particularly cost effective for metering systems with many metering points.



Report generation & logging
Comprehensive report generation facilities are an integral part of the 25X0 liquid flow computer. Standard reports include a complete listing of configuration data; an alarm report; a prover report and a listing of auditable events, which shows any critical changes made to the operation of the flow computer, such as flow and calibration parameters.

In addition, user-defined reports can be created to generate listings of specified data manually or at pre-determined intervals. All 25X0 liquid flow computer reports can be printed or downloaded when required.

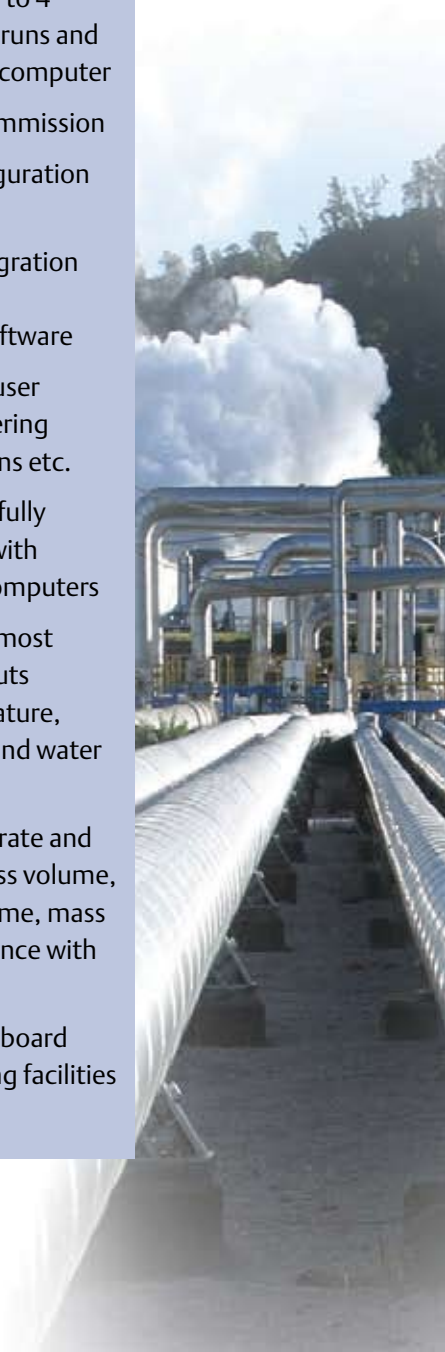
Transactions and batching
The 25X0 software generates and logs records - often known as batch records or quantity transaction records (QTRs) - of flow totals and other operating details. These can be initiated by a variety of methods, giving total control over their generation, and enabling flow total for each shift or day to be recorded. Flow of individual products can be tracked and even batched into defined quantities, if required.
Time: A new batch is triggered automatically, typically every hour, shift or day.
Manual: Batches are triggered and stopped manually on demand from the keypad or via a remote comms input.
Product: With automatic product detection enabled, whenever the product changes, the current batch is completed, and a new one started.
Quantity: Each time a batch quantity (set by the user) is reached, a batch report is produced and the flow can be stopped. This facility allows fluids to be batched by volume or mass.
Daily batch: a new batch is triggered automatically when the 'contract hour' is reached.

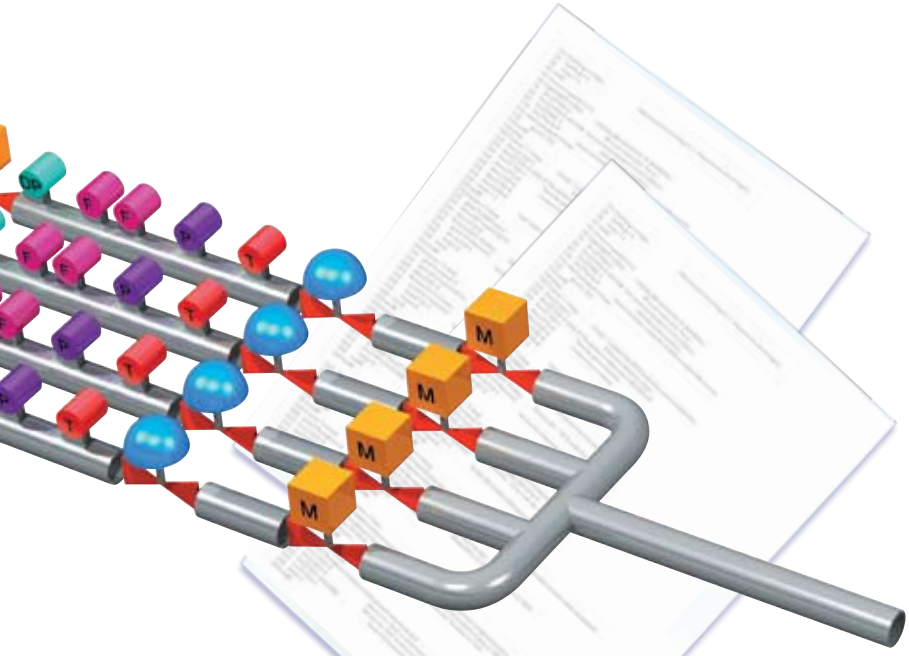
PID flow delivery control: this is available to either control the flow delivery rate on each individual stream, or it can be used to maintain the flow rate across the metering station, balancing the flow across the optimum number of meter runs.

Nett oil and water calculations
Net calculations for oil and water can be handled in either of the following ways:
Simple method: - as per API - with an input for water cut, here the complete mixture undergoes an API referral.
Detailed method: typically with knowledge of the water base density - the oil and water components are split and each undergoes separate density referrals.

Features

- Measurement of up to 4 independent meter runs and proving in one flow computer
- Easy to set-up & commission
- Intelligent PC configuration tool
- Simple system integration with adaptable communications software
- Flexible software - user selection of engineering units, base conditions etc.
- Hot duty standby - fully redundant system with multistream flow computers
- Compatibility with most flowmeters and inputs for density, temperature, pressure, viscosity and water cut
- Compensated flow rate and totals including gross volume, gross standard volume, mass & net oil (in accordance with API 21.2)
- Comprehensive on board logging and batching facilities





Proving
To complement its outstanding flow measurement capabilities, each 795X can provide full prover control for most common types of prover, including uni & bi-directional pipe provers, compact provers and even master meter provers. The flexible software allows flow meters, particularly Coriolis meters, to be proved on a volume or mass basis.

Built-in reliability
The 25X0 software internal database is continually updated from input channels. Measurement critical data is stored in non-volatile memory, and is triplicated and cross-validated cycle to ensure data remains uncorrupted.

FC_BASIC
FC_BASIC is a powerful tool that allows the standard application software to be customized to satisfy the individual site requirements, without the need to issue special application software.

'BASIC' routines can be quickly written to interface to the flow computer database and carry out a selection of special logic functions or scientific calculations.

FC_BASIC routines are exercised every machine cycle, so can be used for deterministic functions.

Typical uses of FC_BASIC are :-

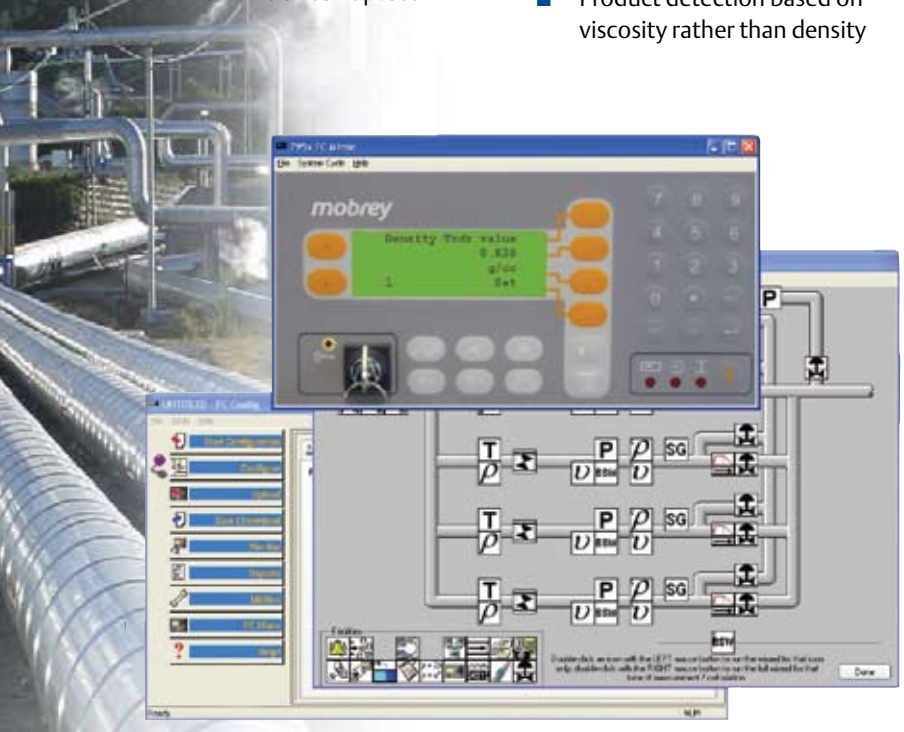
- Tank prover control
- Grab sampler control
- Product detection based on viscosity rather than density

Configuration and operation
The ease and simplicity of configuration with any flow computer is often equally as important as the functionality of the software. With the Mobrey range of flow computers there are several options.

The basic menu structure: this is laid out to allow quick and logical access to all operational and diagnostic parameters, with navigation between streams. There are also dedicated menus for configuration and datalogging and archives.

The Multiview facility: allows the setup of user defined display pages. These can be configured to group together all information required on a regular basis for simple operator access. These parameters and the text can be modified by the user to their own preference.

PC _Config: is an intelligent windows based configuration tool, please see following page for details.

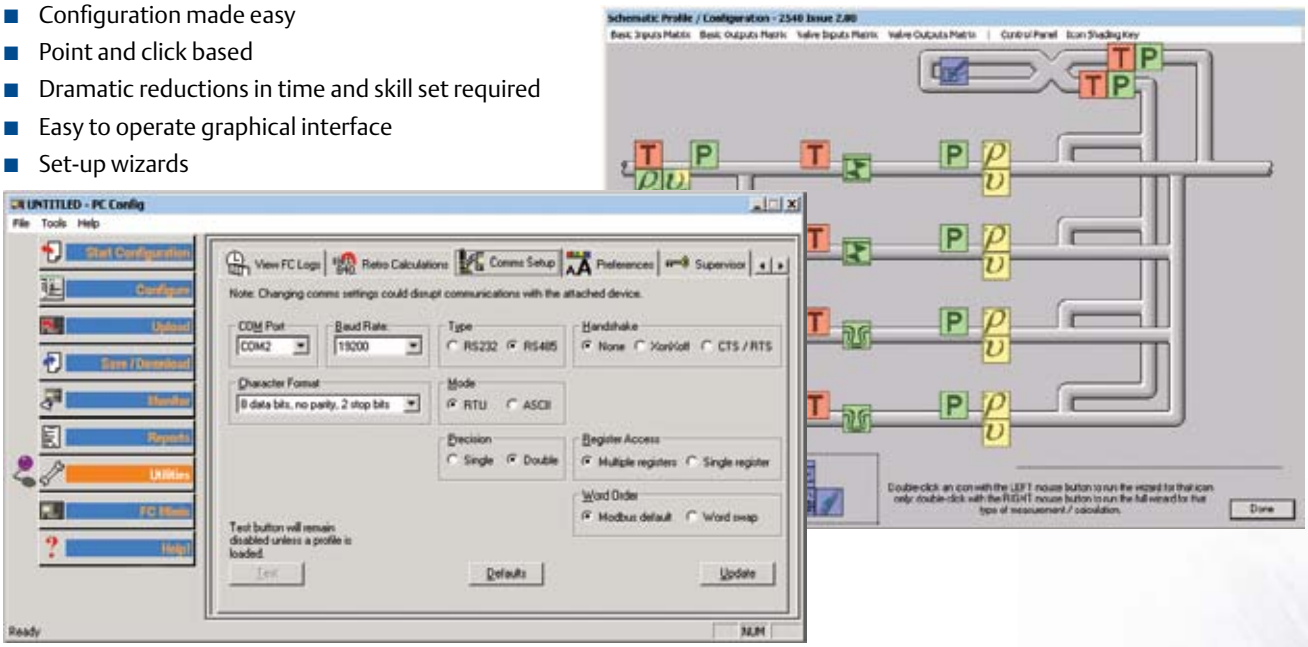


Compatible flow meters

- Turbines - single or dual pulse
- Positive displacement meters
- Coriolis - mass or volume
- Ultrasonic time of flight
- Differential pressure
  - Orifice
  - Venturi
  - Dall tube
  - V-Cone

Point and click PC based configuration

- Configuration made easy
- Point and click based
- Dramatic reductions in time and skill set required
- Easy to operate graphical interface
- Set-up wizards



PC_Config

PC_Config is an intelligent Windows PC based software tool that makes dramatic reductions in the time required for configuration of flow computers in fiscal and custody transfer applications. PC_Config allows engineers to set up complete flowmetering systems in a fraction of the time traditionally required for the task.

PC_Config makes the task of configuring both single and multistream flow computers much simpler and the graphical interface makes it easy to operate. 'Point-and-click' icons are used to assemble a measurement task diagram and to identify measurement and alarm points, batching, proving and logging functions. The software then calls on its built-in instrument set-up wizards to create a database showing exactly what information is required for the chosen measurement task: alarm limits, failure modes, communications options, prover details, batching, logging etc. With basic metering principles the engineer or technician simply fills in the blanks.

With PC_Config the configuration is typically completed in an office environment and simply downloaded on to the flow computer when it is ready. Edits are automatically time and date stamped to provide an audit trail and there is a built-in reports function for automatic documentation of the process.

In addition, the PC_Config features a virtual flow computer front panel which can be used on-line for live remote control of the flow computer, for trouble shooting and diagnostics, or off-line for training purposes.

Communications

The 795X has been specifically designed to simplify integration into supervisory systems and networks. It has up to five RS232 and RS485 serial ports supporting MODBUS (ASCII & RTU, IEEE 32 bit and IEEE 64 bit data) as well as an independent ethernet port supporting Modbus over TCP/IP. Any of the 5 serial communications ports can be configured on site to be a slave, master, printer driver or peer.

The 795X supports the following Modbus commands

- 03 Read holding registers
- 04 Read input registers
- 06 Write / preset single register
- 16 Write / preset multiple registers

The use of 'High Speed Lists' enables all critical parameters to be grouped together within single database lists, in any order. This grouping then allows the use of more efficient multiple read & multiple write commands, rather than individual locations. These High Speed Lists lists can be positioned anywhere within the 0001 to 65,000 Modbus range for maximum compatibility.

The process variables and other values that are transmitted via the communications ports can be in user defined engineering units, (metric, imperial/ English, US, SI, or a mixture) further simplifying integration.

Ordering codes

7951 M	7951 Mobrey Flow Computer - for Single Stream and Signal Converter applications			
	AA	Klippon connector *note 1,3*	4 analog i/p's as standard	{8 analog inputs if option 8 below}
	AB	D-type connectors *note 1,3*	4 analog i/p's as standard	{10 analog inputs if option 8 below}

Code	Software Application *note 5*
G1	Gas applications - 1510 Single stream Flow Computer software
G2	Gas applications - 1520 Dual stream Flow Computer software
G0	Gas applications - 1020 Signal Converter software
L1	Liquid applications - 2510 Single stream Flow Computer software
L0	Liquid applications - 2010 Signal Converter software
X1	Special software - please specify full version and issue number with order

Code	Communications ports
3	Three serial comms ports

Code	Analog Inputs & Outputs *note 3*
4	4 analog inputs & 4 analog outputs
8	8 {Klippon} OR 10 {'D'-Type} analog inputs & 8 analog outputs

Code	Option boards
N	No OPTIONS required.
H	2 Channel Hart board required

Code	Connector Kits for use with 25 way D - Type connectors Note 4
9	No connector kits required
5	5 breakout cables / connectors required

Code	Configuration tool
A	Not required
B	PC Config Tool + Serial Communications cable
C	Factory configuration (signal converters only)

7951M	AA	G1	3	4	N	9	B

Note

1 Option 7951 M **AA** has 1 dual pulsed flowmeter input, for dual stream applications with pulsed flowmeter inputs use option **AB**

3 For liquid proving - 'D' -Type connectors and extra Analog I/O {option 8} must be specified

4 7951M AB has 5 off 25 way 'D'-type connectors, connector kits include a 1.8m cable and a din rail mounted connector block with screw terminals. Connector kits are not required with 7951M AA

5 Software supplied will be latest issue of Mobrey software, unless otherwise specified on order

Ordering codes

7955 M	7955 Mobrey Flow Computer - for multi stream applications
AB	D-type connectors (16 analog inputs)

Code	Software Application [note 5]
G4	Gas applications - Quad Stream 1540 Flow Computer software
L4	Liquid applications - Quad Stream 2540 Flow Computer software
X1	Special software - please specify full version and issue number with order

Code	Communications ports
3	Three serial comms ports
5	Five serial comms ports + NO Ethernet port
6	Five serial comms ports + 1 Ethernet port

Code	Analog Inputs & Outputs
4	4 analog outputs & 16 analog inputs
8	8 analog outputs & 16 analog inputs

Code	Option boards
N	No OPTIONS required.
H	4 channel Hart board Required

Code	Connector Kits for use with 50 way D - Type connectors [Note 4]
9	No connector kits required
3	3 connector kits required

Code	Configuration tool
A	Not required.
B	PC Config Tool + Serial Communications cable.

7955M	AB	G4	3	4	N	9	A

Note

4 7855 M AB has 3 off 50 way 'D' type connectors, connector kits include a 1.8m cable and a din rail mounted connector block with screw terminals.

5 Software supplied will be latest issue of Mobrey software, unless otherwise specified on order

Further information

The Mobrey liquid flow computer range is based on the successful 795X hardware platform, for specific details ask for technical bulletins:

IP7950	7950 Specification sheets
IP7951	7951 Specification sheets
IP7955	7955 Specification sheets
IP1248	795X Flow computer for gas applications

Outline functional specification

Calculates	Indicated volume rate & total Gross volume rate & total Net volume rate & total Indicated standard volume rate & total Net standard volume rate & total Mass rate & total Net mass rate & total Line density: - direct measurement or referral from header using API or matrix referral Base density: - API or matrix referral
Conforms to	API 11.2.1 API 11.2.2 API 2540/ASTM D1250: sections A, B, C of tables 5,6,23,24,53,54 API 21.2
Monitors, trends & alarm checks:	Temperature, pressure, density, base density, viscosity, base viscosity and BS&W
Batch transactions:	Manual, time-based, daily, product-based, or quantity-based
Alarms:	System; input; limit. All alarms and significant events are logged to facilitate an audit trail
Prover control:	Support for master meter, compact & uni- or bi-directional pipe provers
Security:	Via keyswitch or three password levels
Logging & reports:	Pre-formatted reports containing fixed and user selected data User-configurable reports
Approvals:	OIML R117 Certified by Nederlands Meetinstituut (NMi)

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