ROC800L Liquid Flow Measurement Computer
Measurement and Control for Hydrocarbon and Petrochemical Liquids

EMERSON
Process Management

Precision, reliability, and integrity of measurement.

The ROC800L model delivers you an exceptional level of functionality along with a new software application capable of computing liquid flow for up to six meter runs for most hydrocarbon or petrochemical liquids.
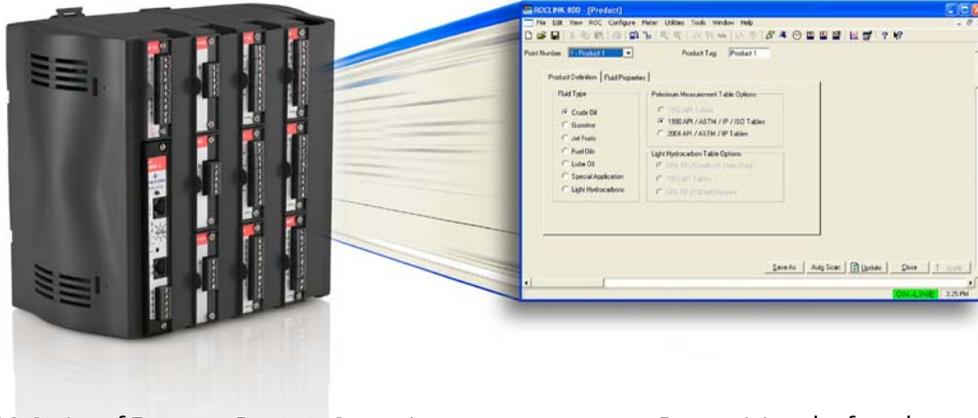
The ROC800-Series of Emerson Remote Operation Controllers is a popular workhorse in the upstream hydrocarbon industry for measuring gas flow. Now we have added the ability to measure hydrocarbon liquids. As a flow computer, the ROC800's precision is second to none with integrity of measurement reinforced by audit trails and history files. The ROC800 flow computer is rugged, has low power consumption, and is easy to use and very reliable. These RTU-like features have made the ROC800 a leader in remote automation applications. The ROC800 can also be configured to perform Proportional, Integral, and Derivative (PID) loops, making it well-suited for logical control applications. The ROC800L model delivers you an exceptional level of functionality along with a new software application capable of computing liquid flow for up to six meter runs for most hydrocarbon or petrochemical liquids. This liquid application program performs the necessary corrections for temperature, pressure, and density changes to report flow at standard conditions (60°F, 15°C, or 20°C) in accordance with API 2004 or 1980 tables and other standards recommended by API, ASTM, EI, & ISO. It makes the Emerson ROC800-Series the ideal choice for all of your remote field installations for measurement and control, regardless of what fluid is flowing.

The ROC800L comes from the factory with software fully installed and has been acclaimed as the easiest flow computer to set up and configure. You can take the ROC800L from its box and—using ROCLINK™ 800 software's simple "fill-in-the-blank" configuration process—place the ROC800L into operation in matter of hours. Neither programming nor engineering is required: we have done that for you. The factoryinstalled programs include liquid flow calculations, volume corrections, batch control, proving, reporting, and printing functions.

Recognizing the fact that your ROC800L may be installed in a tough environment, we have designed the ROC to:

- Operate over a very wide temperature range

- Provide isolation from field side surges and protect against short circuits

- Consume low power

- Sense all process parameters (flow, temperature, pressure, and density)

- Accept liquid flow measurement signals from turbine, positive displacement, coriolis, and ultrasonic flow meters

- Control motors, pumps and valves with up to 16 PID control loops, incorporating overrides that can be used with flow control

- Enable meter proving with large and small volume provers and master meters

- Provide multiple point linearization of K-factors and Meter Factors

You can add custom programming with Function Sequence Tables (FST) or use DS800 Development Suite software to provide more extensive programmability with IEC-61131-3-defined languages.

No task is too tough for the ROC800L.

When designing the ROC800L, we focused on your needs and industry requirements to measure:

Liquids Measured

- Crude Oils (API Goup A)
- Refined products such as gasoline, jet fuel, and diesel fuel (API Group B)
- Specialty products such as ethanol and bio-diesel
  with user-approved standards (API Group C)
- Lubricating oils (API Group D)
- Light hydrocarbons such as LPGs and NGLs (API Group E)

Exceptional precision in flow calculations — a critical component to both your daily operation and bottom line.

Calculations

To bring credibility and improved accuracy to measurement technology, organizations like the American Petroleum Institute (API) have provided detailed and exacting recommendations on how to calculate the flow of liquid hydrocarbons. We have adopted those standards to provide outstanding value and to meet your quality and reliability needs in an electronic measuring device. ROC800L features include:

Density Input
Density input offers the capability to correct the volume of flows delivered for varying densities. The ROC800L can accept 4–20 mA, pulsed, or frequency input signals from a density measuring device such as a Solartron 7835/7845, UGC, or other densitometers. The ROC800L corrects density in accordance with ASTM-D-1250-04; API MPMS Chapter 11.1, 2004; API 2540 (1980); GPA TP27 (2007); ISO 91.2 (20°C table), and the following API tables:
• 5A, 5B, 5D, 23A, 23B, 23D, 23E, 53A, 53B, 53D, 53E, 59A, 59B, 59D, and 59E

Temperature Compensation
Temperature compensation provides a flow calculation that compensates for variations in temperature from the selected reference temperature. The ROC800L can accept an input from an RTD or equivalent device and compensate flow calculations for changes in temperature in accordance with ASTM-D-1250-04; API MPMS Chapter 11.1, 2004; API 2540 (1980); GPA TP27 (2007); and ISO 91.2 (20°C table), including the following API tables:

- 6A, 6B, 6C, 6D, 24, 24A, 24B, 24C, 24D, 25E, 54A, 54B, 54C, 54D, 54E, 60A, 60B, 60C, 60D, 60E, SO 91.2, and GPA TP27 (2007)

Pressure Compensation
Pressure compensation provides a flow calculation that compensates for variations in pressure from the selected reference pressure. Alternatively, you can enable an Automatic Pressure Compensation feature and allow the ROC800L to select the flow calculation. The ROC800L can accept a 4–20 mA signal from a pressure transducer and compensate flow calculations for volumetric changes due to changes in pressure in accordance with the following standards and tables:

- API 2540 (1980) tables, API MPMS Chapter 11.1 (2004), 11.2.1, 11.2.2, 11.2.1(M), and 11.2.2(M)

Double Math Precision
In order to provide exceptional precision in flow calculations — a critical component to both your daily operation and bottom line — the ROC800L performs calculations in accordance with the double precision recommendations of the API MPMS, 2004 and GPA TP27 version as presented in IEEE Standard 754 (1985). This also extends the capacity of totalizers to prevent premature rollover.

Pulse Fidelity and Integrity
The ROC800L provides pulse fidelity and integrity monitoring of the pulse inputs and, to insure no pulse is missed, incorporates an error indication from the pulse transmission for a dual pulse turbine meter Through the APM module, the ROC800L senses pulse integrity in accordance with API, MPMS Chapter 5.5, and ISO 6551 for levels B, C, D, and E.

During configuration, you may select communication protocols, units of measure, and many other features. Complete it all in minutes with a few clicks of the mouse!

The ROC800L features

- The ROC809L can generate an EFM (Electronic Flow Meter) report in the same manner as the ROC809 and ROC827 for gas measurement

- Has the ability to calculate the vapor pressure-based on GPA TP-15 and water as a selectable fluid for volume corrections

- Can measure Ethanol as a recognized fluid for volume corrections

- Can account for product shrinkage per API chapter 20.1

Reporting and printing

Retrieving data and automating reports from the ROC800L is simple and easy. Using ROCLINK 800 software, you can create your own report format or modify the pre-defined reports. Save these reports to the ROC800L's Flash memory and retrieve them using ROCLINK 800 on demand or on a pre-defined schedule. You may print the reports as ASCII text on a local printer using the ROC800L's serial port, or on a network printer using the ROC800L's Ethernet port. Along with manual control, reports can be printed or saved automatically in a number of ways:

- At the end of a batch
- At the end of a prove
- Hourly
- After a set number of hours
- Daily
- Weekly
- Monthly

In the event of a power failure a report prints immediately on power restoration.

The ROC800L maintains a log of 450 alarms (such as high-high, high, low, and low-low) which you can print using ROCLINK 800. The ROC800L also maintains a 1000-entry log of changes that could affect measurements.

Reporting

With the ROC800L you can be certain your measuring devices are in top shape and are reporting the most accurate information any system can deliver

Proving

To ensure that your flow meters accurately and properly measure flow, the ROC800L manages your proving runs and keeps track of meter correction factors on a per meter, per product basis. The ROC800L can store up to 24 product meter factors. You can automatically start a meter proving run to verify that meter accuracy meets your requirements. You can configure the proving operations to include a selected number of successful sequential runs, incorporate various timing parameters, and function in accordance with desired repeatability standards. The liquid application records and displays all trial run data in an easy-to-understand tabular format, using color coding to identify acceptable results for a proving sequence.

You can compare the resulting meter factor for a sequence using both average data and average meter factor methods. You can also view the repeatability of a trial run based on these methods. Text alarms indicate the status of the proving sequence so you can monitor performance at all times.

During a prover run the RC800L monitors temperature and pressure to detect any unusual variation in operating conditions that could invalidate a run.

The proving feature requires the ROC800-Series Advance Pulse Module (APM) that interfaces the detector switches with the proving application. The detector inputs can be used with relays, open collector / open drain type solidstate switches, and other two-state devices. The APM has a dedicated on-board digital signal processor for extremely precise counting of pulses, time interval calculations, and API 4.6 pulse interpolation calculations. It supports uni-directional, bi-directional, small volume, and master meter proving. With the ROC800L, you can be certain your measuring devices are in top shape and are reporting the most accurate information any system can deliver.

Protocols and communications

Getting the information back to your host computer or SCADA system is also easy. ROC Plus protocol is the native communication protocol for the ROC800L. ROC Plus provides the most thorough interface to all aspects of the liquid application and provides access to all information in the ROC800 database. This includes reading and writing of real-time variables, supporting double floating-point IEEE data types, and retrieving measurement tickets and proving reports saved in the ROC's Flash file system. In addition, the protocol facilitates the retrieval of the ROC-based event and alarm logs and the periodic historical database. Standard ROC Plus OPC interfaces are readily available and provide great flexibility when designing a host system interface.

The ROC800L supports MODBUS protocol over both Ethernet and serial connections. Real-time and current variables can be polled from the ROC800L using MODBUS TCP / IP protocol. The Ethernet port also supports TCP / IP encapsulated MODBUS RTU protocol. MODBUS RTU is fully supported over serial ports. The ROC can automatically switch between ROC Plus and MODBUS protocol requests. It does not use a hard-coded MODBUS map but employs user-defined MODBUS tables.

HART® protocols in the ROC800L enable you to retrieve diagnostic and performance data from smart instruments and sensors.

The ROC800L can support up to six communications ports, of which two are fixed RS-232 interfaces and one is a dedicated Ethernet port. Optionally (depending on the hardware configuration), you can add up to three additional communication ports. Options for the additional ports include RS-232, RS-485, or dial-up modems.

Reconfigure the ROC800L to suit your changing requirements.

Customization

You can easily modify or upgrade the ROC800L in the field. By adding analog inputs or outputs, discrete DC control inputs or outputs, AC control input or outputs, RTD sensors, pulse inputs or outputs, displays, and / or communications ports, you can reconfigure the ROC800L to suit your changing requirements.

Custom programming expands functionality in the ROC800L.

The software supports:

■ Function Sequence Tables (FSTs), which are easy-to-program functions that enable event-dependent tasks to command equipment operation. Incorporated into ROCLINK 800, the FST editor provides a workspace that accepts the entry of up to 500 functions in each of the six FSTs and up to 3000 lines total.

■ Writing control sequences using any of the languages defined by IEC standard 61131-3 (ladder logic, function block diagrams, structured text, instruction lists, or sequential function chart programming) using Emerson's DS800 programming software tool.

If you prefer your customizations pre-configured, we can help. Consult your local Emerson representative for information on additional configuration or customization. Whatever your remote measurement and control application problem, just look at the ROC800L and consider it solved!

ROCLINK 800

The ROC800L is easily configured using a simple fill-in-the-blank approach with ROCLINK 800 Configuration software that is compatible with all ROC and FloBoss™ products.

Batching

A flexible configuration allows you to easily define batches that record user-specified information; flow-weighted averages of the variable factors such as temperature, meter factor, and flowing density; starting and ending volumes; and total volumes and masses. You can start or stop a batch on demand; run a batch for a fixed quantity of fluid; or schedule batches on an hourly, daily, weekly, or monthly basis. Batches can also be controlled by sensor input. To account for all flow, batching is continuous: when one batch terminates, a new batch instantly starts

Total Masses
flow_weighted averages
temperature
Alarms
starting volumes

Expandable configuration options

As a part of the ROC800-Series, the ROC800L uses all of the common I / O modules available for the series. The unit is available in two models: the ROC809 with 9 fixed I / O slots or the ROC827 with 3, 9, 15, 21, or 27 expansion I / O slots. For more extensive applications, you can network multiple ROC800s using the DS800 programming suite software for distributed control.

The following input / output modules are available:

- **Advance Pulse Module (APM)**
  The APM provides four inputs. You can configure those inputs for two sets of paired pulses from a dual pulse turbine or positive displacement meter and provide pulse integrity measurements. Alternately, you can configure each input as a single pulse input from devices generating single pulse stream outputs such as single pulse turbine meters, positive displacement meters, Coriolis meters, or ultrasonic flow meters. You can designate channel 4 on the APM as a pulse input or a solid state pulse output for remote totalizing. The APM module is equipped to accept densitometer frequency or pulse inputs on the third pulse input from a densitometer to measure live density.

- **Analog Input (AI) Module**
  Provides four channels capable of accepting four 4–20 mA signals or four 1–5 Vdc signal from an analog sensor with either 12- or 16-bit resolution.

- **Analog Output (AO) Module**
  Provides up to four 4–20 mA or 1–5 Vdc control signals.

- **Discrete Input (DI) Module**
  Provides up to eight channels per module of discrete DC input sensing.

- **Discrete Output (DO) Module**
  Provides five channels per module of DC output control.

- **Resistance Temperature Detector (RTD) Module**
  Provides two channels, each capable of accepting a 3- or 4-wire RTD input.

- **Communications modules**
  The ROC800-Series family includes modules for RS-232, RS-422 / 485, and dial-up modem. The CPU module provides an integral Local Operator Interface (LOI) port, an RS-232 port and an Ethernet port for direct network access.

- **Power Options**
  Either a 240 / 120Vac or 24 Vdc or 12 Vdc input power.

What makes the ROC800L different from other flow computers?

- Designed for installation in tough remote environments requiring low power, but also control-room friendly, accepting 240 / 120Vac or 24 / 12 Vdc as a power source

- Pre-programmed standard set of approved API calculations

- Easy-to-use and quick to install with a fill-in-the-blank configuration process requiring no programming for installation

- Precision and accuracy second to none

- Programming flexibility using international standard IEC -61131 languages for control functions and unique applications

- Full control capability to execute a proving activity, sampling activity along with alarms for leak detection and other Emergency Shut Down systems for safety and environmental protection

- An intelligent measuring system with host connectivity using OPC / ODBC drivers, communication by serial ports, Ethernet ports, and radio

Many flow computers offer some of these features. Only ROC800L offers them all.

Find us around the corner or around the world

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