

# FLO-CAL Liquid Calibration System

## FLEXIBLE DESIGN TO MEET YOUR LIQUID FLOW CALIBRATION REQUIREMENTS



**FLO-CAL**  
A portable Liquid Flow Standard



**FLO-CAL INSTRUMENT**  
Data acquisition and interface tool  
with flow meter frequency and analog  
signals.

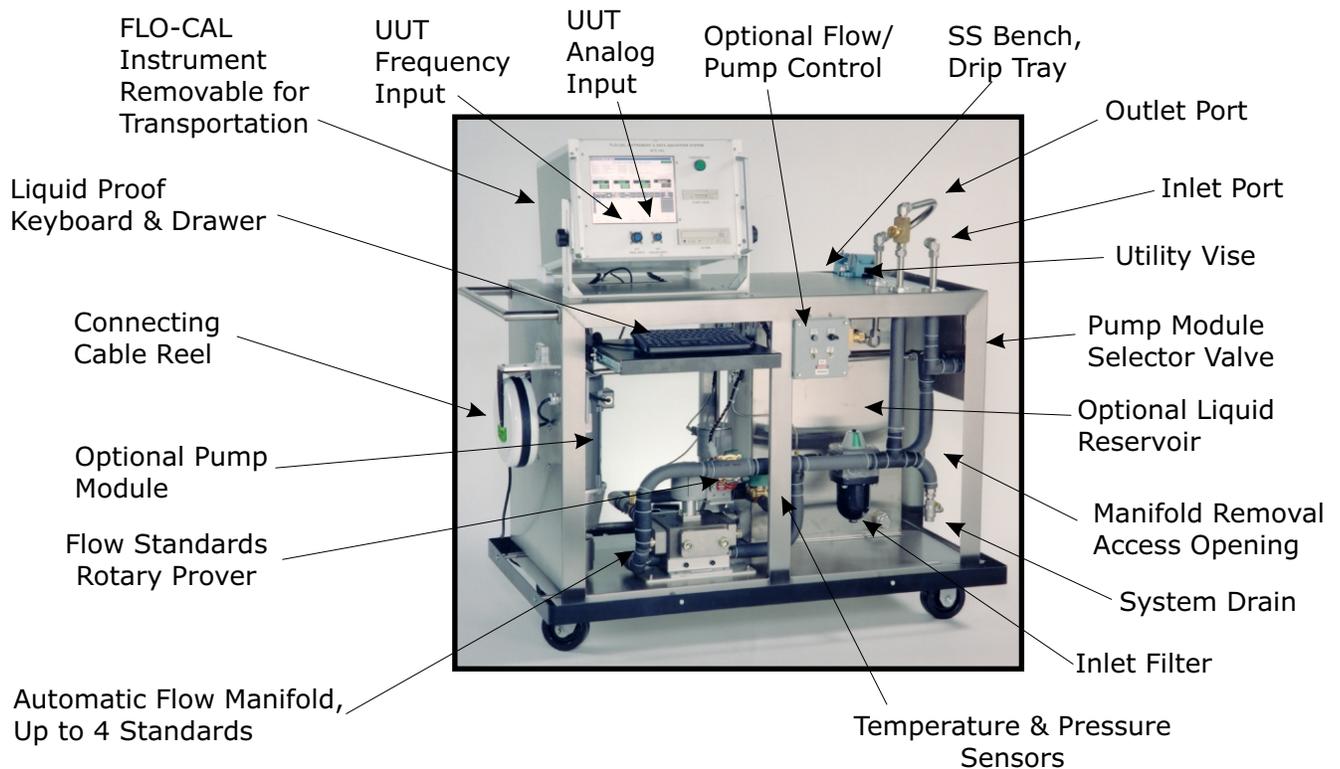


**Liquid Flow & Density Calibration System**  
For Class 1, Division 1 Hazardous Liquid Calibration.

# FLO-CAL Liquid Calibration System

## Portable Liquid FLO-CAL System

- Your complete Liquid Calibration solution in the production area or in your Lab.
- Rugged, Stainless Steel Mobile Liquid Flow Instrument
- 0.05% Repeatability, +/- 0.2% Uncertainty
- Up to four Flow Standards in automated Flow Manifold
- Range of Rotary Prover Standards for Hydrocarbon liquids
- Range of Coriolis and Rotary Prover Standards for water
- FLO-CAL Instrument for control and data acquisition
- Density Measurement and Temperature Compensation
- Optional PUMP module



**The COMPLETE Solution For Your Most Challenging Automatic Leak Flow Testing**

# FLO-CAL Liquid Calibration System

## FLO-CAL<sup>®</sup> Software

### Unit Under Test (UUT) Calibration

Once the operator has entered or selected the UUT to be calibrated, the main calibration screen is available to review or enter new calibration data. Each calibration screen supports up to 32 flow calibration points. The software literally prompts the operator through each configuration sequence. The screen displays flow, temperature, density, and UUT input readings. Flow stability is calculated and displayed to minimize calibration errors. When fluid flow has reached a steady state and is appropriate to record a reading, the flow rate is electronically captured by pressing a key, eliminating errors caused by manual transcription and visual interpretation.

### Automatic Error Compensation

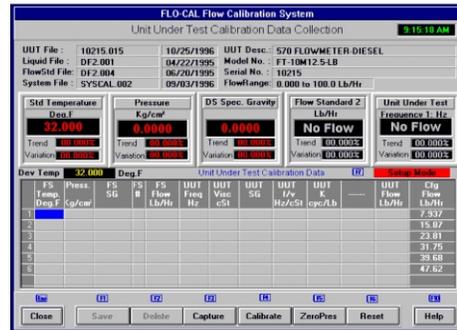
The FLO-CAL system is a powerful tool to analyze and calibrate complete flow systems. Errors due to test fluid variability, density and viscosity variations, and temperature and pressure effects are automatically corrected. Errors due to flow instability are monitored and displayed.

### Automatic Flow Standards Selection

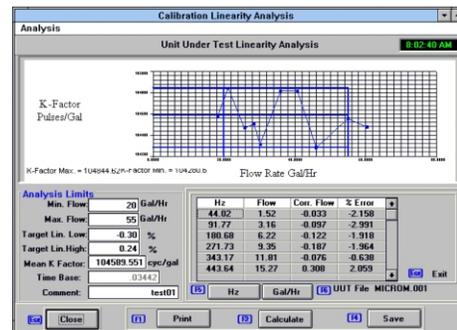
The FLO-CAL can support up to 4 flow meter standards, which are used to evaluate the UUT. Each flow meter standard covers a different range of flow values, providing effective coverage across the total flow calibration range of the FLO-CAL. At calibration time, only one flow standard is used to capture the steady-state flow, and is automatically selected by the software based upon the current flow rate of the liquid. As the liquid flow rates change, the software makes necessary adjustments to the flow meter standard selection without operator intervention. This feature allows the maximum possible accuracy available from the FLO-CAL.

### Reports and Analysis

Standard reports include on-screen and printed graphical analysis and data (including calibration data and error vs. actual flow) and universal K-charts. A powerful analysis screen enables the operator to determine average K-Factor, linearity errors, best fit of slope, and offset. Other intelligent flow meter programs can be accessed from the FLO-CAL instrument and be setup. All data is stored ready for export into other calibration databases or spreadsheets. If the PC running FLO-CAL is a part of a network, the program allows the operator to save reports on a network folder for remote accessibility.



Calibration Screen



Analysis Screen

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# FLO-CAL Liquid Calibration System

## FLO-CAL<sup>®</sup> Software

### Calibration History

The FLO-CAL software maintains the complete calibration history of each device tested. Any historical calibration sequence can be recalled upon demand, and can be reported or analyzed immediately. This feature is very important when considering device certification requirements.

### UUT Configuration

The FLO-CAL software provides storage and retrieval for information on each flow metering device in your facility. This includes device ID, units of measurement, type, manufacturer, model, built-in calibration procedure, previous calibration dates, and other pertinent information necessary to maintain proper records.

### Liquid Configuration

Because the FLO-CAL is capable of supporting a variety of fluids, and each flow meter is calibrated with a specific type of fluid, the FLO-CAL software supports the storage and retrieval of different fluid types, and their temperature and viscosity properties.

### System Maintenance and Diagnostics

Complete diagnostics screens, manual operation of the equipment, and the evaluation of system performance, are standard and greatly assist with long-term maintenance of equipment.



UUT Configuration Screen

## FLO-CAL System Specifications

### GENERAL CONSTRUCTION:

- Stainless steel cart with 4 casters (2 fixed, 2 swivel) and handle for mobility.
- Work surface with small vise and fluid inlet/outlet ports.
- Removable FLO-CAL instrument with view angle adjustment
- Splash proof keyboard/mouse on a sliding shelf.
- Open frame, lower shelf for mounting the automatic flow manifold system.
- Removable liquid flow manifold system for ease of shipping for off-site calibration.
- Protective bumper around the base of the cart.
- Stainless steel tubing and thermal insulation.

### Dimensions (approximately):

- 30" depth (including protective bumper) x 60" length (including handle and electrical cord reel) x 63" height (38" height of cart at work surface).

**Power Source:** Nominal 120 VAC, 6-Hz, 10 Amps (if pump module not included).

### FLO-CAL Instrument (minimum or similar specifications):

- Ergonomic 19" rack mounted enclosure, can be removed.
- Rugged industrial PC based system, with 11" Active Color Matrix LCD display.
- Industrial keyboard/mouse mounted inside sliding drawer.
- Ram, CD and FD drive, Network Card, printer port, serial port, Microsoft Windows 98™ or later.



**The COMPLETE Solution For Your Most Challenging Automatic Leak Flow Testing**

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## FLO-CAL System Specifications

### **FLO-CAL INSTRUMENT DATA ACQUISITION AND CONTROL SYSTEMS: Flow Meter Signal Conditioning and Timing System:**

- Flow meter standards and unit under test inputs compatible with turbine, quadrature encoder (TTL), modulated carrier, and analog signal flow meters.
- Total of 5 frequency input channels through a programmable FLO-CAL conditioning board 4 for flow standards (or 3 flow std. and 1 density std.), 1 for UUT.
- Input frequency range: 10 to 30,000 pulses per second.
- Input signal ranges: multiple standards, including 0 to 5 VDC, 0 to 10 VDC, 0 to 20 mA, and 4 to 20 mA.
- Timebase frequency: 1MHz, using on-board clock.
- Temp. and pressure sensors are part of the FLO-CAL instrument.

### **Analog input system for all signals (including temperature and pressure):**

- 16-bit resolution for analog to digital conversion.
- Uncertainty: +/- 0.01% of full scale.

### **Digital output system for liquid control valves:**

- Up to four AC valves, via Opto-isolated modules.

### **FLUID FLOW MEASUREMENT:**

#### **Maximum Flow Capacity of System: 200 GPM**

#### **Flow Standards Configuration:**

- Up to 4 calibrated flow measurement standards, or 3 density standards.
- Low/medium flow standards are piston rotary prover type, and range from 4 to 100,000 cc/min. (26.5 GPM), with fluid viscosity in the range of 0.8 to 3000 cps.
- High flow standards are positive displacement standards, from 25 to 200 GPM. Higher flow rate available, consult ATC.
- Selectable flow units of mass and volumetric measure: cc/min, liters/hr, GPM, cubic meters/hours, g/sec, kg/min, lb/min, kg/hr, lb/hr

**Repeatability:** 0.05% to a primary mass standard. Total uncertainty: +/- 0.2% of reading, per ANSI-Z540-2.

#### **Over Flow Range Condition:**

- Each flow standard has a protective solenoid valve, which is controlled by the FLO-CAL program.
- Should fluid that flows through the system exceed the maximum flow rate, all fluid control valves close and the operator will be prompted to take appropriate action.

**Maximum working pressure:** 150 psig. For higher pressure, consult ATC.

#### **Liquid Media:**

- Multiple liquid types are supported, typically oil and petroleum based fluids; consult ATC for other liquids.

#### **Pressure Measurement:**

- Full bridge strain gage pressure transducer with electrical output.
- Minimum accuracy: +/- 0.1% FS

#### **Temperature Measurement:**

- 100 Ohm platinum element RTD probe built in flow manifold.
- 304 stainless steel construction.

#### **Density (SG) Measurement:**

- Standard: based on liquid temp.
- Optional: In-Line Density Standard
- Range: 0-3000 kg/m
- Uncertainty: +/- 0.15 kg/m, Stability: 0.15 kg/m /year.
- Optional: Sampling Density Meter
- Range: 500-2000 kg/m
- Uncertainty: +/- 0.1 kg/m, stability: 0.3 kg/m /year.

#### **Environment:**

- Temperature: 0 to 50 °C, operating: -25 to 85 °C storage.
- Relative Humidity: 95% non-condensing.

#### **System Calibration:**

- Each unit is supplied complete with calibration certificates traceable to the National Institute of Standards and Technology (NIST), and comply with ISO 9000 ANSI Z540-1/2 requirements.

