State of California
Department of Food and Agriculture
Division of Measurement Standards

California Type Evaluation Program
Certificate of Approval
for Weighing and Measuring Devices

For:

Coriolis Mass Flow Meter
Digital Electronic
Sensor Model: RHM Series
Mass Flow Transmitter Model: RHE 08
Flow Rates: See Table Below

Submitted by:

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Standard Features and Options

Model Numbers and Flow Rates					
RHM	Meter Size in Millimeters XY	Process Connection (inch) Threaded	Flanged	Sanitary	Flow Rate (lb/min)
	12	3/4	1	3/4	7 - 70
	15	3/4	1	3/4	14 - 140
	20	1	2	1	63 - 706
	30	1-1/2	2 or 3	1-1/4	125 - 1412
	40	N/A	3	1-1/2	250 - 2825
Model numbers may be followed by suffixes indicating various non-metrological options provided.					

Tubes constructed of stainless steel
NEMA 4X transmitter and sensor
Pulse output*
Transmitter is Class I; Div. 2; Groups A, B, C, or D
Sensor is Class I; Div. 1 and 2; Groups A, B, C, or D
LCD display: 2 lines, 16 characters per line
Displays total mass and flow rate

Options: RS 422/485/232 interface
Secondary display Model LCR E2640 Series display for printing or batch control
Volume display in gallons or liters. **This feature has not been evaluated for approval for commercial (legal for trade) use**.

* NTEP has not verified the above feature or option

This device was evaluated under the California Type Evaluation Program (CTEP) and was found to comply with the applicable technical requirements of California Code of Regulations for "Weighing and Measuring Devices." Evaluation results and device characteristics necessary for inspection and use in commerce are on the following pages.

Effective Date: August 26, 2002

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Mike Cleary, Director

Liquid Controls Inc.
Coriolis Mass Flow Meter
Sensor Model: RHM Series

Application: For use in vehicle-mounted or stationary installations. This meter must be calibrated and sealed in the mass mode. The mass flow meters Sizes RHM12 and RHM15 may be used to measure cooking oil. The mass flow meters Sizes RHM20, RHM30 and RHM40 may be used to measure normal liquids with specific gravities of 0.7 to 1.0. These meters may be used to measure multiple normal liquids with specific gravities between 0.7 and 1.0; otherwise, this Certificate of Approval ***does not*** cover the use of a specific meter to measure multiple products where the ***variation*** in specific gravity exceeds 0.1 specific gravity units without a change to zero or calibration.

Product:

Product Group	Typical Product*	Specific Gravity
Cooking Oil	Corn Oil, Creamy Soy Oil, McDonalds Oil, Canola Oil	0.914 – 0.925
Normal Liquids	Water, Alcohols, Glycols, Water and Mixes thereof, Agricultural Liquids, Food Products, Fertilizers, Chemicals, Petroleum Products, Solvents, Herbicides and Suspensions	0.7 to 1.0

* **NOTE:** Not all "typical products" listed in this table are covered by this certificate. Only those products falling within the specific gravity range listed in the last column are covered. Some products may have a specific gravity that falls into more than one product group. Only products which fall into the product groups ***and*** specific gravity ranges listed in this table are covered by this certificate.

Identification: The identification badge for the flow meter is located on the meter's main body. The indicator identification badge is located on the front panel below the indication.

Sealing: The flow meter tubes are completely enclosed in welded stainless steel housing. The transmitter door is sealed with a physical seal to prevent access to the transmitter's metrological functions. To access the calibration mode, the seal to the transmitter door must be broken, a switch inside the transmitter door located on the back of the MM03 micro controller board (processor board) must be actuated, then a password entered into the (transmitter) keypad. The unit cannot be sealed when viewing calibration parameters. The unit must be unsealed to view and/or change calibration parameters.

The LCR base may be sealed with wire security seals. A sealable cover plate on the base of the LCR prevents access to the calibration switch.

NOTE: When the device is in the sealed mode, the only options that can be viewed are the mass total and flow rate screen. It is possible during set-up to also set the display to toggle from the previously mentioned screen to the density and temperature screen. If you can view any other of the options the device is in an unsecured mode and should be sealed.

Operation: **General:** For detailed operating instructions, use the Operation Manual provided to prevent operating in the calibration mode. There are three keys on the front of the transmitter housing. These keys are used to calibrate the unit. Once the unit is sealed, the keys cannot be used except to view either Total Mass and Flow Rate, or Temperature and Density. Upon turning the transmitter on, the message "Parameter save lock on!" briefly appears indicating the unit is sealed.

Liquid Controls Inc.
Coriolis Mass Flow Meter
Sensor Model: RHM Series

Test Conditions: This Certificate supersedes Certificate of Approval Number 5104-00 and is issued to include the RHM12 and RHM15 size meters, vehicle-mounted application, and cooking oils. The emphasis of this evaluation was on the design, performance, and operation of the system. The Model RHM 15 was interfaced with a flow computer Model RHE-08 and the LCR Model E2640 with an Epson printer (Model M119D) and tested on a vehicle at the manufacturer's facility to demonstrate the operation of the system. The tests were performed using corn oil (specific gravity: 0.915 – 0.925) and creamy soy (specific gravity: 0.920 – 0.925) as the test liquids. The system was initially tested at a flow rate of 80 percent, 50 percent, 30 percent, and rated low flow for both liquids. Three split compartment tests using creamy soy oil were also performed. The system, after a 30 day permanence test, with a throughput of more than 280 000 lbs, was retested using the same oils over the same flow rates as on the initial test. Split compartment tests were also repeated. An acceptance tolerance of 0.2% (flow testing), repeatability tolerance of 0.12%, and special tolerance (split compartment) of 0.5% as specified in the Mass Flow Meter Code of the National Institute of Standards and Technology, Handbook 44, 2002 Edition, were applied.

This Certificate is also issued to include the LCR Series E2640 secondary display interface. The emphasis of this evaluation was on the design, performance, and operation of the system. The 2-inch flow meter Model RHM20 was interfaced with a flow computer Model RHE-08 and the LCR Model E2640 with an Epson printer (Model M119D) and tested in the manufacturer's facility to demonstrate the operation of the system. The tests were performed using water (specific gravity: 1) as the test liquid. The system was initially tested at flow rates of 90 percent, 50 percent, 30 percent, and rated low flow. The system, after a 20 day permanence test, was retested using water over the same flow rates as on the initial test. An acceptance tolerance of 0.2% as specified in the Mass Flow Meter Code of the National Institute of Standards and Technology, Handbook 44, 2001 Edition, was applied. Previous test conditions are listed below for reference.

Certificate of Approval Number 5104-00: The emphasis of this evaluation was on the performance and operation of the mass flow meter operating in a stationary-mounted application. The 2-inch flow meter (Model RHM30) was interfaced with a flow computer (Model RHE-08) and tested in the Liquid Controls laboratory. The tests were performed using water (specific gravity: 1) and varsol (specific gravity: 0.745) as the test liquids. The flow meter was initially tested on water and varsol at flow rates of 90 percent, 60 percent, 30 percent, and 10 percent The flow meter, after a throughput of 2.2 million pounds of water, was subsequently tested over the same flow rates as on the initial test. The flow meter after a throughput of 2.2 million pounds of varsol, was subsequently tested over the same flow rates as on the initial test. An acceptance tolerance of 0.2% as specified in the Mass Flow Meter Code of the National Institute of Standards and Technology, Handbook 44, 2000 Edition, was applied.

Type Evaluation Criteria Used: Title 4, California Code of Regulations, 2002 Edition

Tested By: R. W. Wotthlie (MD) 5104-00, R. W. Wotthlie (MD) and D. Reiswig (CA) 5104(a)-02