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

Certificate Number: 5652-11

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

For:
Meter Indicating Volume
Cryogenic Liquid Flow Meter, Turbine Meter
Model: TMXXXXX-X-X-X-X
Flow Rate: (see below)

Submitted by:
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Standard Features and Options

- Lightweight hydraulically balanced rotor
- Standard end fittings
- Standard pick-up coil (temperature range –430 ° to +450 °F)
- Constructed of stainless steel

Flow Meter Size	(GPM)			lbs/min		
TMC0075	7.5	to	38	55	to	300
TMC0100	7.5	to	60	55	to	500
TMC0150	8	to	130	60	to	1000
TMC0200	15	to	225	115	to	1700
TMC0300	40	to	380	300	to	3000

NOTE: All meters must be permanently marked to show the designated maximum and minimum discharge rates.

This device was evaluated under the California Type Evaluation Program (CTEP) and was found to comply with the applicable 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: April 8, 2011

Kristin J. Macey, Director

Turbines, Inc.
Cryogenic Liquid Flow Meter, Turbine Meter
Model: TMXXXXX-X-X-X-X

Application: These meters are suitable for stationary and vehicle tank meter applications. This meter may be used with approved and compatible electronic indicating registers.

Identification: The required information is stamped on the metal body of the meter.

Model Designation:

Basic Model	Product Family	XXXX (Flow Meter Size)	X (End Fitting Type)	X (Bearing Type)	X (Rotor Type)	X (Pick-up Coils)
TM	**Blank =** Standard **C=** Cryogenics	**0075** = 3/4" **0100** = 1" **0150** = 1 ½" **0200** = 2" **0300** = 3"	**Blank** = 37° AN Flare **NPT** = Male National Pipe Thread **F150** = 150# Flanges **F300** = 300# Flanges **F600** = 600# Flanges **F900** = 900# Flanges **F1500** = 1500# Flanges **F2500** = 2500# Flanges **W** = Wafer Style **VIC** = Grooved Victaulic **HP** = Weco Detachable Nut **GR** = Grayloc Flanges	**Blank** = Ball Bearing Self-Lubricating **T** = Tungsten Carbide **S** = Special, Consult Factory	**Blank** = Nickel 200 **PH** = 17-4 PH **DS** = Duplex Stainless Steel	**Blank** = One Magnetic Coil **2Mag** = Two Magnetic Coils **1Hub** = One Coil, 1" MNPT Riser **2Hub** = One Coil, 1" MNPT Riser

Sealing: The pick-up coil and temperature probe are secured individually by a wire security seal threaded through holes in the respective connector backshell and threaded coupling nut.

Operation: As product flows through a turbine flowmeter, rotor blades inside the flowmeter rotate through the magnetic field of the magnetic pick-up coil, thereby generating electrical pulses. The number and frequency of these pulses corresponds to the amount of product and flow rate respectively. The compensator corrects the value for temperature/density changes and sends the information to the register/ticket printer.

Test Conditions: A two inch and a three-quarter inch meters with a CDS1000 electronic indicator were installed on a liquid carbon dioxide trailer and a two inch meter installed on a liquid nitrogen trailer. Five tests at each of four flow rates were performed and a required throughput was approximately 1,069,518 gallons. The turbine meters were tested volumetrically and by mass. All initial and permanence test results were within the applicable tolerances of 1.5% and repeatability requirements.

Results of the evaluations indicate the devices comply with applicable requirements.

Type Evaluation Criteria Used: Title 4, California Code of Regulations, 2011 Edition

Tested By: A. Katalinic (NC), C. Nelson (CA)

Example of Device:

Model TMC0200