NuSonics Division
MESA LABORATORIES, INC.

Model CM-800

Transit-Time Ultrasonic Flowmeter

- Accurate measurement of flow ±½-1% of reading
- No pressure drop, no moving parts
- Measure flow in lines from 2" to 200" (50mm-5080mm)
- Automatically compensates flow factor (K) values – reads accurately even in laminar flows
- Designed to work with clean liquids
- Remove transducers without process shutdown
- Bi-directional flow measurement capability
- Industry standard 4-20mA & RS-232 outputs
- Easy setup via hand-held configurator or PC

MESA LABS

MODEL CM-800

Figure 1 – STANDARD TRANSDUCERS

Over 25 years experience. The Mesa Laboratories, Inc., NuSonics Model CM-800 Transit-Time Ultrasonic Flowmeter can measure flow on a wide range of fluids including water, oil/fuel oil, and a large number of chemicals. The Model CM-800 Transit-Time Ultrasonic Flowmeter is the latest in a long series of high accuracy sonic flowmeters which NuSonics has been providing to industry for over 25 years.

Flowmeter Components. The ultrasonic flowmeter consists of two major elements: the transmitter electronics and a pair of transducers mounted on the pipe. The transmitter portion contains the circuitry and advanced microprocessor electronics which converts the transducer signals to an accurate flow measurement. These electronics are provided in a Nema 4X enclosure or an optional explosion proof Nema 7 enclosure. The transmitter assembly may also be equipped with a heater/thermostat, which permit operation of the flowmeter in cold ambient conditions as low as -60°C (-76°F).

The ultrasonic transducers are provided in three different wetted configurations. All wetted transducers are mounted recessed from the pipe wall to avoid obstruction or pressure drop in flow-stream.

Figure 2 – FACTORY-CALIBRATED FLOWTUBE

Transducers. Mesa Laboratories, Inc., NuSonics transducers are a unique, seal free design. They are available in three configurations: ½", 1" and 2", Figure 1. Transducer pairs are mounted via an integral flange to weld bosses which are aligned on opposite sides of the pipe. The standard material of construction for the 1" and 2" transducers is CPVC. Optional metal transducers are available for higher line temperatures and special conditions. Generally, ½" titanium transducers are utilized on pipes up to 6" (152mm), 1" CPVC transducers from 8"-24" (203mm-610mm), and 2" CPVC transducers for all lines larger than 24" (610mm).

All transducers, except ½", are available in a removable design. These sensors can be changed easily without system shutdown. All wetted transducers are provided in a kit form as standard. These kits are designed to economically install the sensors on existing pipeline. As an alternative, Mesa Laboratories, Inc., NuSonics Division can provide flowmeters in factory-calibrated flowtubes, Figure 2, with transducers installed, tested, and ready-to-go. These flowtubes can also be calibrated at a NIST flow laboratory as an option.

For pipes that do not allow easy welding of flowtube kit bosses, NuSonics offers a saddle mounted transducer assembly. This assembly is very useful for installing the sensor mounting hardware on concrete, cast iron, fiberglass and plastic pipes.

Microprocessor Control. The Model CM-800 Transit-Time Ultrasonic Flowmeter electronics are constructed on a single PC board for easy access and maintenance. The main microprocessor analyzes the flow parameters, calculates flow, and directs these results to the output section. The output section converts the digital signal to a standard analog 4-20mA current output and a factored pulse output for totalization.

The microprocessor accurately calculates the flowrate over a wide flow velocity range, from 0.3 to 50.0 ft/sec (0.09 to 15 m/sec). The microprocessor determines the Reynolds Number of the fluid and applies the proper K value to allow accurate measurement even in laminar flow, Figure 3.

Since the Model CM-800 Transit-Time Ultrasonic Flowmeter utilizes transit time technology, it does not depend on the presence of particles to make an accurate measurement. The Model CM-800 Transit-Time Ultrasonic Flowmeter will operate with high accuracy in a wide range of clean fluids. The flowmeter can tolerate up to 2% by volume of particle or bubbles in the process stream without affecting flowmeter performance. Excess particle or bubbles in the process are diagnosed by the microprocessor and a fault relay is activated when bubbles or particles exceed operational limits.

The Model CM-800 Transit-Time Ultrasonic Flowmeter advanced microprocessor allows for dynamic zeroing of the flowmeter. In addition, the Model CM-800 Transit-Time Ultrasonic Flowmeter has a range of other diagnostic tools to monitor both your flow process and the status of the flowmeter system. If a fault is detected, the flowmeter will activate a fault mode relay. When such a condition occurs, the Model CM-800 Transit-Time Ultrasonic Flowmeter holds the last valid flow measurement for up to 60 seconds. After this initial period, the analog output drives to zero or full scale (user configurable).

Hand-Held CM-800 Configurator.

The Model CM-800 Transit-Time Ultrasonic Flowmeter is setup quickly and easily via either a hand-held configurator, Figure 4, or an external personal computer (PC). The hand-held configurator allows instantaneous reading of flowrate and totalization. Setup is as easy as stepping through a menu and filling in the blanks with data such as pipe diameter and fluid type. The hand-held configurator is also capable of monitoring the status of the flow sensors and the electronics. Any faults found are immediately displayed on its 4 line LCD display.

Mesa Laboratories, Inc., NuSonics Division also offers a simple software package and connector set that allows a standard PC to perform all the flow measurement, setup and diagnostic functions as the hand-held configurator.

Output and Display.

The Model CM-800 Transit-Time Ultrasonic Flowmeter provides three basic outputs: 4-20 mA analog output, factored pulse for totalizer, and RS-232/RS-485. Also available with the The Model CM-800 Transit-Time Ultrasonic Flowmeter are fail-safe relay or high/low alarm relay.

LCD rate and total display may be built into the enclosure and viewed through a window in the cover.

As an option the Model ALP-R can be attached to the flowmeter to allow remote readout of flowrate and total. The Model ALP-R is an independently scalable meter with $3\frac{1}{2}$ digit LCD display of flowrate. The Model ALP-RT has a two line LCD display allowing readout of flowrate and total. The totalizer has an 8 digit LCD display and integral battery backup for data retention.

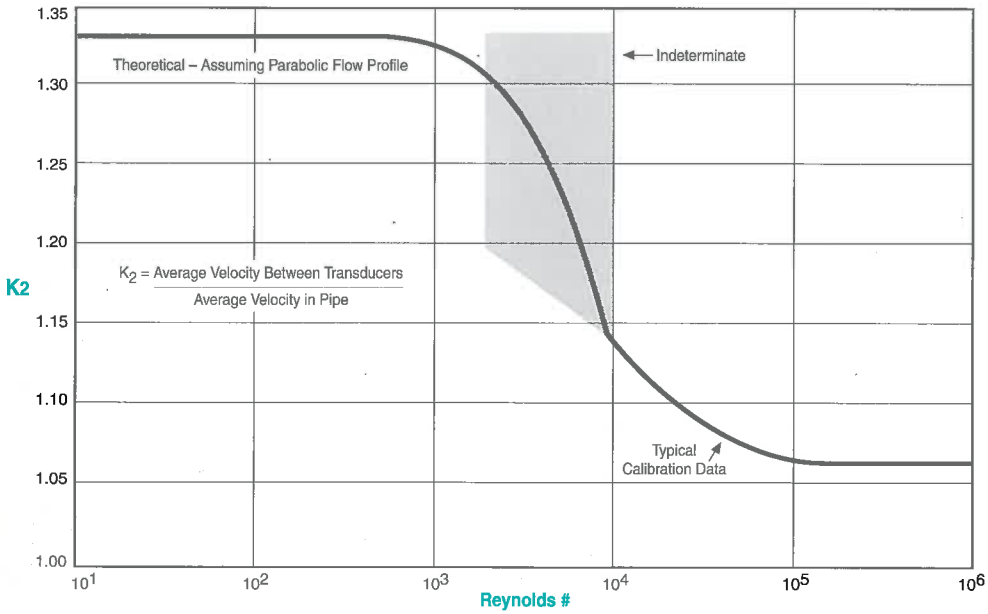
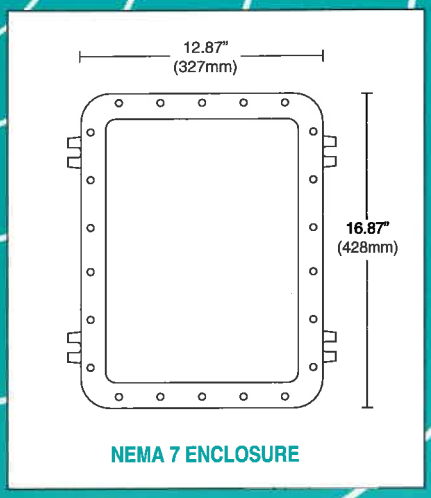
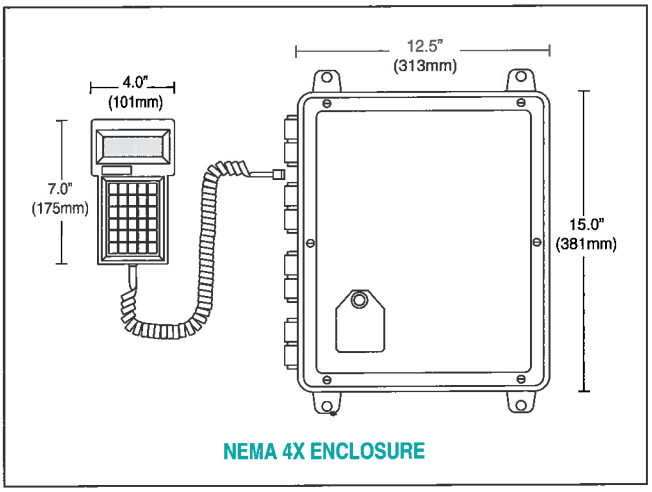


Figure 3 – K2 VERSES REYNOLDS NUMBER

Figure 4 – FLOWMETER SET-UP



NEMA 7 ENCLOSURE



NEMA 4X ENCLOSURE

SPECIFICATIONS

MEASUREMENT CAPABILITIES:

Range	0.3 to 50ft/sec 0.09 to 15m/sec
Pipe Diameter	2" to 200" (50mm to 5080mm)
Accuracy	±½ to 1% of flow reading above 1 ft/sec (0.3m/sec), ±1 to 2% of flow reading 0.3 to 1 ft/sec (0.09 to 0.3m/sec)
Repeatability	0.2%
Linearity	0.1%
Turndown	167:1

OPERATING SPECS – TRANSDUCERS:

Liquid Temperatures	Standard (½", 1" or 2") sensors: -40°F to 302°F (-40°C to 150°C)
Liquid Pressure	CPVC: 250 psig @ 27°C Metal: 1000 psig @ 150°C Metal: 3500 psig optional
Sensors	Nema 7 connection heads on standard sensors
Optional	Permanently submersible
Sensor Materials	1" & 2" CPVC; ½", 1", 2" titanium, optional other metals available
Cable length (Max)	1000ft. (310m)

TRANSMITTER:

Analog isolated current output 4-20mA forward and reverse into 1000 ohm load max.
Fault relay, SPST, 130 volt, 0.5A resistive max. 0-5 volt pulse output.
RS232 standard/RS485 opt.

ENVIRONMENT & POWER:

Enclosures	Nema 4X standard, 10 lb. (4.3kg) Optional: Nema 7 explosion proof, Class 1, Groups C&D
Power	115 or 230 VAC ±10%, 50-60Hz 24 VDC – optional
Consumption	12 watts standard with optional heater: 212 watts
Humidity	0-100%, non-condensing

HAND-HELD CONFIGURATOR:

30 position keypad
4x20 LCD display
Powered by the transmitter
Supplied with 7' coil cable and connector

COMPUTER MODE:

All functions for setup and measurement available through RS232/RS485 interface

OPTIONAL MODEL ALP-R & ALP-RT:

Rate Only Display	3-½ digit LCD, 0.5" character height with user selectable trailing zero rate. -1999 to 1999 span (-19990 to 19990 with trailing zero enabled).
Decimal Point	Adjustable
Rate & Total Display	8-digit LCD, 0.5" character height
Time Base	Selectable, battery backup of total, typical 8 month data retention
Reset	Push-button or remote contact. Optional alarms high/low, opto-isolated, open collector 30 VDC max.

PRINTED IN USA Specifications are subject to change without notice resulting from ongoing product improvements. **Form 382 Rev. A**

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