

## ***Positive Displacement Meters & Accessories***



# Liquid Controls Features

The LC Meter consists of a housing in which three rotors turn in synchronized relationship within three cylindrical bores with no metal-to-metal contact within the meter element. Each rotor is supported on either end by a bearing plate through which the rotor shafts protrude.

The bladed displacement rotors, alternately move through the two half-cylinder bores of the meter element, while the single blocking rotor rotates within its bore in such a way as to produce a continuous capillary seal between the unmetere, upstream product and the metered, downstream product.

At one end of each rotor shaft is a timing gear. The blocking rotor gear, having twice the number of teeth of each of the displacement rotor gears, rotates at half the RPM of the displacement rotors.

Throughout the meter element the mating surfaces are either flat surfaces or cylindrical faces and sections that are most accurately

machined. No oscillating or reciprocating motion within the device permits extremely close and consistent tolerances within the LC meter.

Because the dynamic force exerted by the product flowing through the meter is at right angles to the faces of the displacement rotors, and because the meter is designed so that the rotor shafts are always in horizontal plane, *there is no axial thrust*. Therefore, the rotors automatically seek the center of the stream between the two bearing plates thereby eliminating wear between the ends of the rotors and the bearing plates.

As a result the LC Meter provides unequalled accuracy, long operating life and exceptional dependability.



## Accuracy/Performance

### Mechanical Registration



REPEATABILITY: .05% of reading over entire range and beyond.

LINEARITY: Capable of  $\pm 0.125\%$  or better over a 5:1 range from maximum nominal meter capacity.

LINEARITY: Capable of  $\pm 0.22\%$  or better over a 10:1 range from maximum nominal meter capacity.

LINEARITY: Capable of  $\pm 0.5\%$  or better over a 40:1 range from maximum nominal meter capacity.

### Electronic Registration



REPEATABILITY: Capable of .03% of reading over entire range.

LINEARITY: Capable of  $\pm 0.10\%$  or better over a 5:1 range from maximum nominal meter capacity.

LINEARITY: Capable of  $\pm 0.10\%$  or better over a 10:1 range from maximum nominal meter capacity.

LINEARITY: Capable of  $\pm 0.15\%$  or better over a 40:1 range from maximum nominal meter capacity.

Due to the capabilities of multi-point calibration for meters equipped with LectroCount Electronic Registration, superior accuracy (linearity) can be provided as indicated above. For additional details ask for Bulletin #500045.

Note: Accuracy obtainable when all variables remain constant.

Reading/measurements must be equal to a minimum of one minute of flow at selected rate(s).

All accuracy statements based on metering Stoddard Solvent, approximate viscosity 1 CPS.

On higher viscosity products, the average deviation in accuracy will be even less.

- **Superior Accuracy at constant flow:** *With all other conditions being constant*, the LC Meter does not vary more than 0.05% in repeatability over entire range and beyond.
- **Accuracy over the widest range of flow:** The LC Meter has a most ideal *combination of minimum seal or slippage area with lowest pressure differential across this seal*. This results in better accuracy over a wide range of flow than available in any other commercially produced, positive displacement meter.
- **Sustained accuracy:** There is no metal-to-metal contact within the meter element...and *no contact means no wear*...no wear means no increase in clearances...no increase in clearances means no increase in slippage...and *no increase in slippage means no deterioration in accuracy*.
- **Accuracy regardless of pressure fluctuations:** Because of the LC Meter's unique dual-case design, the bearing surfaces of the meter element are internally and externally subjected to the same system pressure. Therefore, *the meter element cannot be*

*stretched or distorted*, causing changes in seal area that would adversely affect accuracy.

- **Accuracy regardless of temperature variation:** Due to the *common coefficients of expansion of the critical parts* of the LC Meter element, products can be metered accurately from  $-40^{\circ}\text{F}$  ( $-40^{\circ}\text{C}$ ) to  $+160^{\circ}\text{F}$  ( $+71^{\circ}\text{C}$ ).
- **Accuracy regardless of viscosity:** Due to the minimum area in shear and the smooth flowing characteristics of the LC Meter (no compression or vacuum exerted on the product), the standard LC design has accurately metered product from 150 SSU (25 centipoise) to 1,500,000 SSU (325,000 centipoise) *without calibration change*.
- **Regulatory:** Meets NIST and other international weights & measures accuracy requirements. Meets performance requirements of USA Military Specifications.

# Meter Models

Listed in order of Maximum Nominal Flow Rates. Consult LC Publication #195 for product application and material class recommendations. Maximum Non-Shock Working Pressure (PSI) ratings are based on products at temperatures below 160°F (71°C).

Maximum Nominal Flow Rate	Standard Flange Size*	Primary Material	Material Classes Available	150 PSI 10.5 BAR 1034 kPa	275 PSI 19 BAR 1896 kPa	300 PSI 19 BAR 2068 kPa	350 PSI 21 BAR 2068 kPa	720 PSI 25 BAR 2413 kPa	1,440 PSI 100 BAR 9927 kPa
30 GPM (113 L/min.)	1 1/2" NPT	Aluminum	10				MA-4+		
60GPM (227 L/min.)	1 1/2"	Aluminum	1, 2, 3, 4, 10, 14, 16, & 30	M-5	M-5**		MA-5+		
	2" Optional	Stainless Steel	8	M-5					
100 GPM (380 L/min.)	2"	Aluminum	1, 2, 3, 4, 10, 14, 15 & 16	M-7	M-7**		MA-7+		
	1 1/2" Optional	Stainless Steel	8	M-7					
		Cast Iron	7, 27 & 37	M-7	M-7**				
	2"	Brass	20	M-7	M-7**				
	2"	Steel	1, 2, 7, 10, 14, 16 & 37	MS-7	MSAA-7	MSA-7		MSB-7	MSC-7
150 GPM (550 L/min.)	2"	Aluminum	1 & 2	M-10	M-10**				
200 GPM (757 L/min.)	3"	Aluminum	1, 2, 3, 4, 10, 14, 15 & 16	M-15	M-15**		MA-15+		
	3"	Steel	1, 2, 10, 14 & 16	MS-15	MSAA-15	MSA-15		MSB-15	MSC-15
	3"	Stainless Steel	8		MSAA-15				
300 GPM (1,136 L/min.)	3"	Aluminum	1 & 2	M-25	M-25**				
350 GPM (1,325 L/min.)	4"								
	3" Optional	Aluminum	1, 2, 3, 4, 14, 15 & 16	M-30					
	3"	Cast Iron	7, 27, 37 & 47	M-30					
	3"	Steel	1, 2, 10, 14 & 16	MS-30	MSAA-30	MSA-30		MSB-30	MSC-30
	3"	Stainless Steel	8		MSAA-30				
450 GPM (1,700 L/min.)	4"	Aluminum	1 & 2	M-40					
	3"	Steel	1 & 2	MS-40					
600 GPM (2,271 L/min.)	4"								
	6" Optional	Aluminum	1, 2, 3, 14 & 15	M-60	M-60**				
700 GPM (2,650 L/min.)	4"	Steel	1, 2, 10 & 14	MS-75	MSAA-75	MSA-75		MSB75	MSC-75
800 GPM (3,000 L/min.)	6"								
	4" Optional	Aluminum	2	M-80	M-80*				
1,000 GPM (3,785 L/min.)	6"	Steel	1, 2, 10 & 14	MS-120	MSAA-120	MSA-120		MSB-120	MSC-120
	6"	Stainless Steel	8		MSAA-120				

\*Flanges: All standard M-Series Meters are supplied with choice of threaded NPT and BSPT companion flanges...or slip-on welding companion flanges.  
MA-Series Meters are supplied with threaded NPT companion flanges.

\*\*275 PSI working pressure available for meter only.  
All MS-Series steel case Meters are supplied standard with ANSI flanged connections. DIN Optional. Reducing flanges are available for all steel case Meters.

+MA-Series Meters are all UL Listed for LPG.

## Material Of Construction Classes/Typical Application

**CLASS 1 METERS** For metering refined petroleum products such as leaded and unleaded gasoline, fuel oils, diesel fuel, kerosene, ethylene glycol (antifreeze) and propylene glycol at rated capacity. Also used on motor oils and rotogravure ink at reduced rates of flow.

**CLASS 2 METERS** For metering aviation gasolines and jet fuels when meter is installed downstream of the filter/separator. Non-ferrous construction...meters may be operated at rated capacity.

**CLASS 3 METERS** For metering a wide variety of products such as: liquid sugars, corn syrup, corn sweeteners, dextrose, fructose, sucrose, maltose, lactose, corn oil, soy bean oil, cotton seed oil, coconut oil, and shortening's etc. Rate of flow is based on viscosity to pressure loss relationship.

**CLASS 4 METERS** For metering treated waters (deionized, demineralized, and potable) and certain solvents where no red metals are allowed. Meters may be operated at rated capacity, except for continuous duty service. NOTE: Substitute for former class 6 and 17 applications. Anodized aluminum and stainless steel construction.

**CLASS 7 METERS** For metering chlorinated solvents such as: perchloroethylene, trichloroethylene, trichloroethane, and methylene chloride. Also used for general solvent service. Meters may be operated at rated capacity, except for continuous duty service. All ferrous construction.

**CLASS 8 METERS** For metering acid pH liquids such as: nitric, phosphoric and glacial acetic acids,

citric (fruit juices) and vinegars. All 316 stainless steel construction. Operation at up to 80% of maximum rated capacity is recommended.

**CLASS 10 METERS** For metering liquified petroleum gas (LPG) including butane, isobutane, pentane, ethane, freons and propane. NOTE: materials of construction (including seals) are UL approved for propane, modifications to materials of construction may be required for other liquids listed, including commercial grade NH<sub>3</sub>.

**CLASS 14 METERS** For metering crude oil (LACT and NOD). Also for heated and/or viscous liquids including animal fats, resins, #6 oil and non-abrasive asphalt emulsions. Rate of flow based on viscosity to pressure loss relationship. NOTE: Substitute for former class 5 applications.

**CLASS 15 METERS** For metering oil or water based latex products, polyester resins, and adhesives (neutral pH). Also available for metering herbicides and nitrogen fertilizer solutions (requires viton and teflon seals). Operation at 80% of rated capacity or less is recommended. Shear sensitive liquids must be operated at 1/3 of rated capacity or less.

**CLASS 16 METERS** For general solvent metering service such as: methanol, toluene, xylene, naphtha, acetone, MEK, MIBK, and alcohols including ethanol. Class 7 meters should be used if the application involves the use of chlorinated solvents. Meters may be operated at rated capacity except for continuous duty service.

**CLASS 20 METERS** For batch process water meter service. Not intended for use with deionized water or

demineralized water. May be used for solvents and other liquids compatible with brass. Meters may be operated at rated capacity. Not intended for continuous duty service. All brass construction with 300 series stainless steel trim.

**CLASS 27 METERS** For metering alkaline pH latex products and adhesives, and some clear liquid fertilizers (10-34-0). Operation at lower than rated capacity is recommended. Shear sensitive liquids must be operated at 1/3 of rated capacity or less. All ferrous construction.

**CLASS 30 METERS** For metering herbicides such as Aatrex, Atrazine, Bicep, Bladex, Dual, Lasso, Lasso ME, Treflan, Sutan, Sutazine, and Eradicine (required teflon seals). Operation at up to 80% of maximum rated capacity is recommended. Available in M-5 meter only. Use class 15 in all other meter sizes.

**CLASS 37 METERS** For metering sodium hydroxide (caustic) solutions, high sulfur crude oil (LACT and NOD) and other alkaline pH liquids including non-abrasive asphalt emulsions and liquid feed (molasses) supplement and some resins. Construction suitable for heated and/or viscous liquids. Rate of flow based on viscosity to pressure loss relationship. All ferrous construction.

**CLASS 47 METERS** For metering mildly abrasive liquids, all ferrous construction. Consult Customer Service at the factory for all applications.



# M™-Series Meters

## M-5™

- Capacity: 60 GPM ( 227 L/min.)
- Case made of aluminum with metering chamber components of various materials as required for Classes 1, 2, 3, 4, 14, 16 and 30 construction.
- Choice of companion flanges with 1 1/2" standard and 2" optional...NPT or BSPT threads. Also aluminum or steel welding flanges. ANSI and DIN adaptors available (consult factory).



**M-5-K-1**

## M-7™

- Capacity: 100 GPM (380 L/min.)
- Case made of aluminum with meter element components of various materials as required for Classes 1, 2, 3, 4, 14, 15 and 16 construction.
- Choice of companion flanges with 2" standard and 1 1/2" optional...NPT or BSPT threads...also aluminum or steel welding flanges. ANSI and DIN adaptors available (consult factory).



**M-7-NX-1**

## M-10™

- Capacity: 150 GPM (550L/min.)
- Case made of aluminum with meter element components of various materials as required for Class 1 or 2 construction (for metering refined petroleum products only, including aviation fuels).
- Choice of 2" NPT, BSPT or Slip Weld Companion Flanges. ANSI and DIN adaptors available (consult factory).



**M-10-GX-1**

# M™-Series Meters

## M-5™ Stainless Steel (for acid pH liquids)

- Capacity: 50 GPM (190 L/min.)
- Case made of 316 S.S. for Class 8 construction (optional with some 17-4 pH components).
- Choice of 1 1/2" or 2" NPT, BSPT or Slip Weld Companion Flanges. ANSI and DIN adaptors available (consult factory).

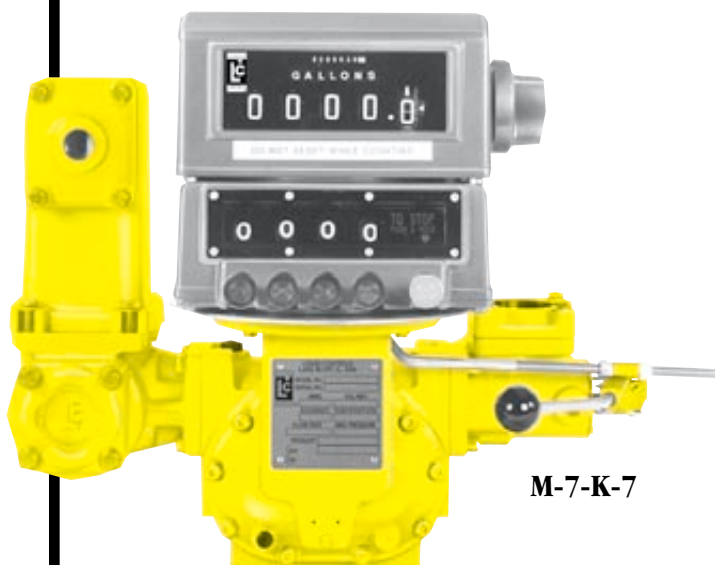


**M-5-A-8**

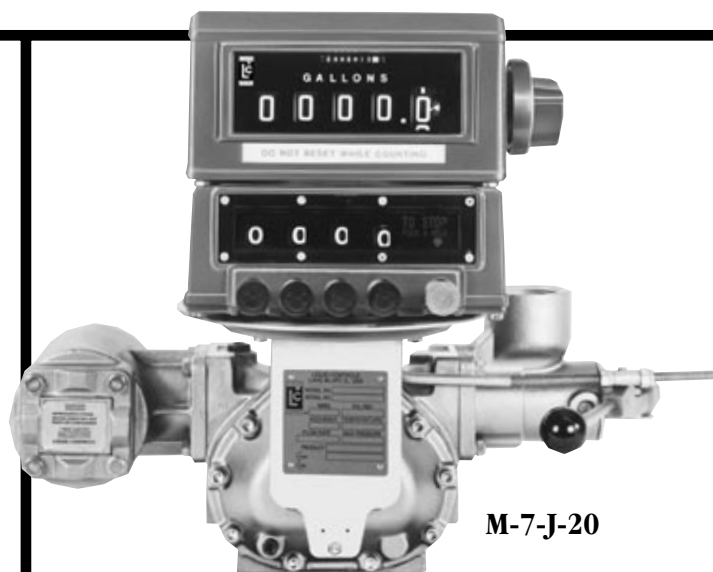
## M-7™ Cast Iron

(for caustic pH liquids and chlorinated solvents)

- Capacity: 100 GPM (380 L/min.)
- Case made of C.I. with meter element components of various materials as required for Classes 7, 27 and 37 construction.
- Choice of 2" NPT, BSPT or Slip Weld Companion Flanges (1 1/2" optional). ANSI and DIN adaptors available (consult factory).



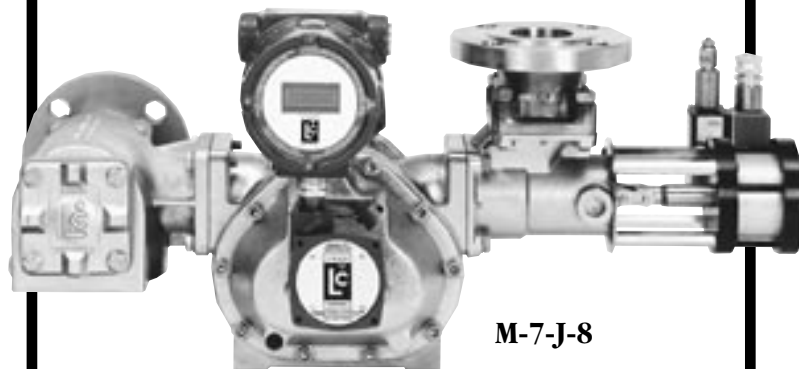
**M-7-K-7**



**M-7-J-20**

## M-7™ Brass (for process water)

- Capacity: 100 GPM (380 L/min.)
- Case made of brass for Class 20 construction (optional with some S.S. components).
- Strainer inlet and valve outlet 2" female NPT only (when air eliminator required, use 2" S.S. strainer/air eliminator combination).
- Choice of 2" NPT or BSPT Companion Flanges (for meter only). ANSI and DIN adaptors available (consult factory).



**M-7-J-8**

## M-7™ Stainless Steel (for acid pH liquids)

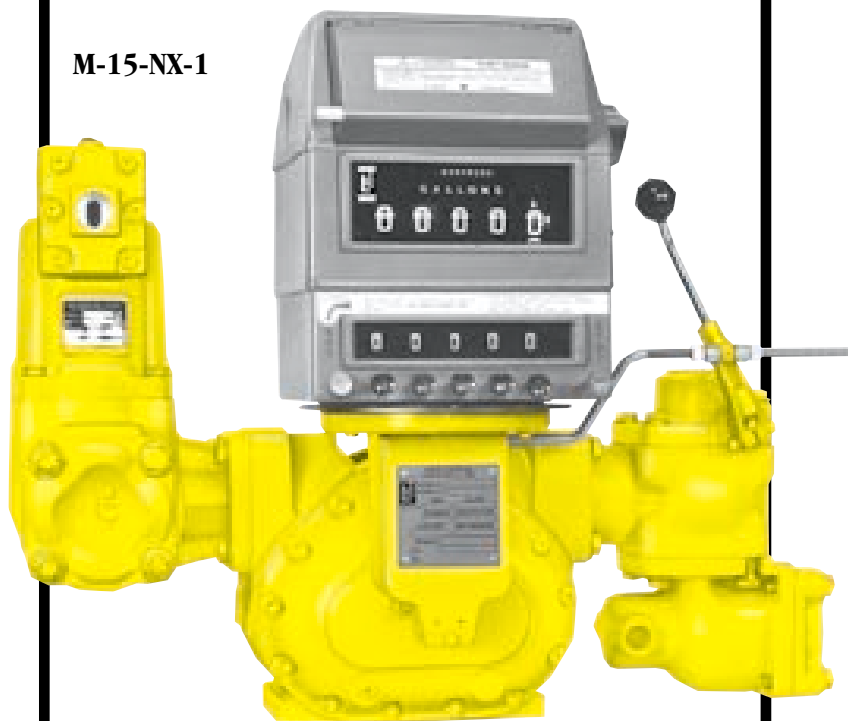
- Capacity: 100 GPM (380 L/min.)
- Case made of 316 S.S. for Class 8 construction (optional with some 17-4 pH components).
- Choice of 1 1/2" or 2" NPT, BSPT or Slip Weld Companion Flanges. ANSI and DIN adaptors available (consult factory).

# M™-Series Meters

## M-15™

- Capacity: 200 GPM (760 L/min.)
- Case made of aluminum with meter element components of various materials as required for Classes 1, 2, 3, 4, 14, 15 and 16 construction.
- Choice of 3" NPT and 3" BSPT connections. Also 3" aluminum or steel welded flanges.

### M-15-NX-1



## M-25™

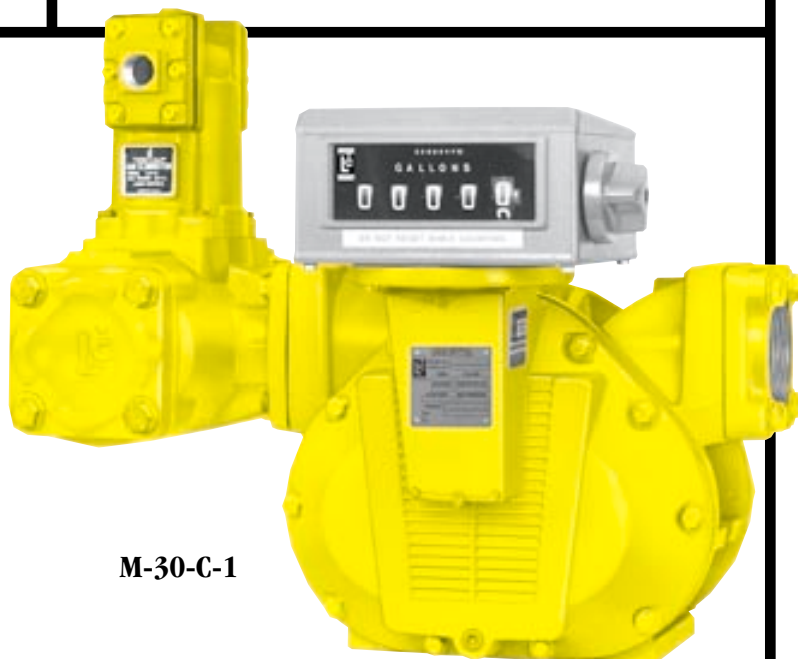
- Capacity: 300 GPM (1,135 L/min.)
- Case made of aluminum with meter element components of various materials as required for Class 1 & 2 construction for metering refined petroleum products including aviation fuels.
- Supplied in choice of 3" NPT and 3" BSPT companion flanges. Also 3" aluminum or steel welding flanges.

### M-25-A-2



## M-30™

- Capacity: 350 GPM (1,325 L/min.)
- Case made of aluminum with meter element components of various materials as required for Classes 1, 2, 3, 4, 14, 15 and 16 construction.
- Choice of companion flanges with 4" standard and 3" optional...NPT or BSPT threads...also aluminum or steel welding flanges.
- Case made of cast iron with meter element components of various materials as required for Classes 7, 27, 37 and 47 construction. Meter flanged 3" ANSI FF.



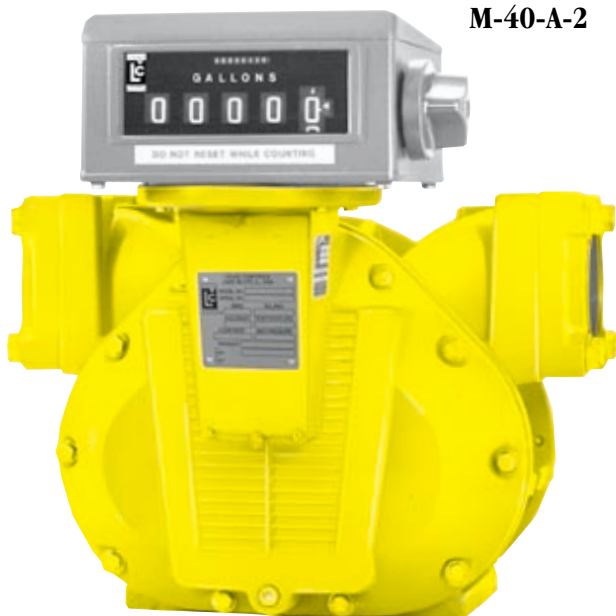
### M-30-C-1

# M™-Series Meters

## M-40™

- Capacity: 450 GPM (1,700 L/min.)
- Case made of aluminum with meter element components of various materials as required for Classes 1 and 2 construction for metering refined petroleum products including aviation fuels.
- Choice of companion flanges with 4" NPT or 4" BSPT connection...also 4" aluminum or steel welding flanges.

**M-40-A-2**



## M-60™

- Capacity: 600 GPM (2,271 L/min.)
- Case made of aluminum with meter element components of various materials as required for Classes 1, 2, 3, 14 and 15 construction.
- 4" square flanged spool and 4" companion flange connection standard...NPT or BSPT threads. Choice of 4" and 6" ANSI FF flanged connections and 4" and 6" Victaulic spools. Also aluminum or steel welding flanges. 4" or 6" ANSI RF, aluminum, forged flanged connections optional.

**M-60-A-1**



**M-80-A-2**

## M-80™

- Capacity: 800 GPM (3,000 L/min.)
- OVERLOAD OPERATION: Capable of momentary overload operation at 125% of maximum rated capacity in either direction without damage to mechanism (applies to Class 2 meters only, on Jet Fuel only). 125% overload operation (1,000 GPM) requires 6" ANSI or 6" Victaulic connections only.
- Case made of aluminum with meter element components of various materials as required for Class 2 construction for refined petroleum products including aviation fuels
- Standard with 6" Victaulic (Right Angle Inlet to Outlet orientation). Optional choice of 4" and 6" ANSI FF flanged connections and 4" and 6" Victaulic spools. Also 4" square flanged spools and 4" companion flanges with NPT or BSPT threads or aluminum or steel welding flanges. 4" or 6" ANSI RF, aluminum, forged flanged connections optional.



# MS™-Series Meters



**MS-15-G-1**

## MS METERS

### MS-7™:

- Capacity: 100 GPM (380 L/min.)
- Supplied with 2" ANSI flanged connections.

### MS-15™:

- Capacity: 200 GPM (760 L/min.)
- Supplied with 3" ANSI flanged connections.

### MS-30™:

- Capacity: 350 GPM (1,325 L/min.)
- Supplied with 3" ANSI flanged connections.

### MS-40™:

- Capacity: 450 GPM (1,700 L/min.)
- Supplied with 3" ANSI flanged connections.

### MS-75™:

- Capacity: 700 GPM (2,650 L/min.)
- Supplied with 4" ANSI flanged connections.

### MS-120™:

- Capacity: 1,000 GPM (3,785 L/min.)
- Supplied with 6" ANSI flanged connections.



**MSAA-30-N-1**

## MSAA METERS

### MSAA-7™:

- Capacity: 100 GPM (380 L/min.)
- Supplied with 2" ANSI flanged connections.

### MSAA-15™:

- Capacity: 200 GPM (760 L/min.)
- Supplied with 3" ANSI flanged connections.

### MSAA-30™:

- Capacity: 350 GPM (1,325 L/min.)
- Supplied with 3" ANSI flanged connections.

### MSAA-40™:

- Capacity: 450 GPM (1,700 L/min.)
- Supplied with 3" ANSI flanged connections.

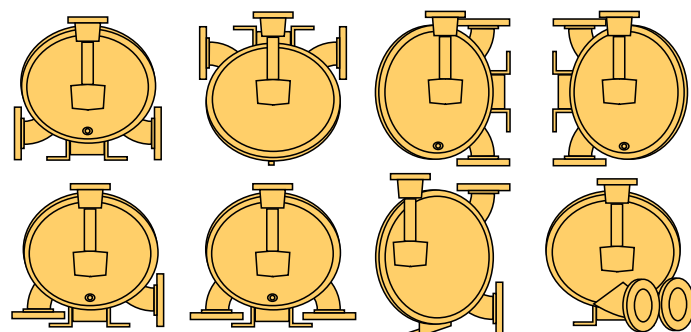
### MSAA-75™:

- Capacity: 700 GPM (2,650 L/min.)
- Supplied with 4" ANSI flanged connections.

### MSAA-120™:

- Capacity: 1,000 GPM (3,785 L/min.)
- Supplied with 6" ANSI flanged connections.

## Choice of Installation Configurations



- All MS Series Meter outer cases are made of Steel, or Stainless Steel and offer measuring chamber components of various materials, including Classes 1, 2, 7, 8, 10, 14, 16 and 37 Construction.

## VARIATIONS BY REPOSITIONING REGISTER MOUNTING FLANGE ASSEMBLIES\*

Register mounting flange assemblies may be installed in four different positions as shown. Meters operate with equal accuracy in any of the positions indicated.

## ADDITIONAL VARIATIONS BY REPOSITIONING FLANGED SPOOL\*

While flange spools are normally positioned in line for straight-through flow, many other positions are available to meet a particular installation requirement. Some of these other possible configurations are shown here.

\*Position of mounting feet to be determined per customer order.

- Supplied in choice of maximum non-shock pressures of 150, 275, 300, 720 and 1,440 PSI. . . MS, MSAA, MSA, MSB and MSC respectively. DIN flanges are optional on all MS-Series Meters.



# MS™-Series Meters

## MSA METERS

### MSA-7™:

- Capacity: 100 GPM (380 L/min.)
- Supplied with 2" ANSI flanged connections.

### MSA-15™:

- Capacity: 200 GPM (760 L/min.)
- Supplied with 3" ANSI flanged connections.

### MSA-30™:

- Capacity: 350 GPM (1,325 L/min.)
- Supplied with 3" ANSI flanged connections.

### MSA-75™:

- Capacity: 700 GPM (2,650 L/min.)
- Supplied with 4" ANSI flanged connections.

### MSA-120™:

- Capacity: 1,000 GPM (3,785 L/min.)
- Supplied with 6" ANSI flanged connections.



MSA-30-GY-10

## MSB METERS

### MSB-7™:

- Capacity: 100 GPM (380 L/min.)
- Supplied with 2" ANSI flanged connections.

### MSB-15™:

- Capacity: 200 GPM (760 L/min.)
- Supplied with 3" ANSI flanged connections.

### MSB-30™:

- Capacity: 350 GPM (1,325 L/min.)
- Supplied with 3" ANSI flanged connections.

### MSB-75™:

- Capacity: 700 GPM (2,650 L/min.)
- Supplied with 4" ANSI flanged connections.

### MSB-120™:

- Capacity: 1,000 GPM (3,785 L/min.)
- Supplied with 6" ANSI flanged connections.



MSB-75-E-14

## MSC METERS

### MSC-7™:

- Capacity: 100 GPM (380 L/min.)
- Supplied with 2" ANSI flanged connections.

### MSC-15™:

- Capacity: 200 GPM (760 L/min.)
- Supplied with 3" ANSI flanged connections.

### MSC-30™:

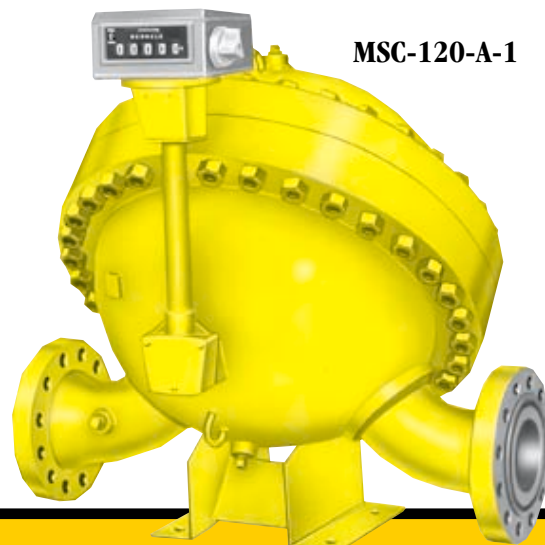
- Capacity: 350 GPM (1,325 L/min.)
- Supplied with 3" ANSI flanged connections.

### MSC-75™:

- Capacity: 700 GPM (2,650 L/min.)
- Supplied with 4" ANSI flanged connections.

### MSC-120™:

- Capacity: 1,000 GPM (3,785 L/min.)
- Supplied with 6" ANSI flanged connections.



MSC-120-A-1

# MA™-Series Meters

## MA-4™/MA-5™

MA-4 Meters in Class 10 construction are designed specifically for LPG motor fuel applications (UL Listed):

- Capacity: 30 GPM (115 L/min.)
- Choice of 1 1/2" standard and 2" optional companion flanges.

MA-5 Meters in Class 10 construction are designed for LPG truck and high speed LPG motor fuel applications (UL Listed):

- Capacity: 60 GPM (225 L/min.)
- Choice of 1 1/2" standard and 2" optional companion flanges.



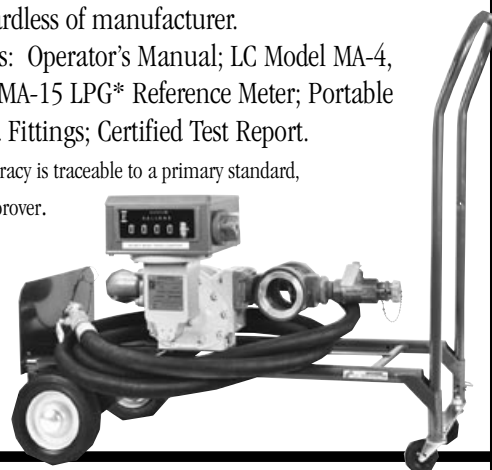
MA-4-CX-10

## LPG Meter Proving Cart

LC's custom-built portable meter cart provides for a quick/easy method to check the accuracy of your LP Gas meters from a flow range of 5 to 200 GPM.

- No Down Time-Simply connect the reference meter inline during normal operation or by recirculation back into the supply tank (Bobtail).
- Portable-Can be handled and operated by one person and easily transported from one location to another.
- Accuracy-Reference meter is calibrated and sealed conforming to NIST Standards. Can be used to check any LPG meter regardless of manufacturer.
- System Includes: Operator's Manual; LC Model MA-4, MA-5, MA-7 or MA-15 LPG\* Reference Meter; Portable Cart, Hoses and Fittings; Certified Test Report.

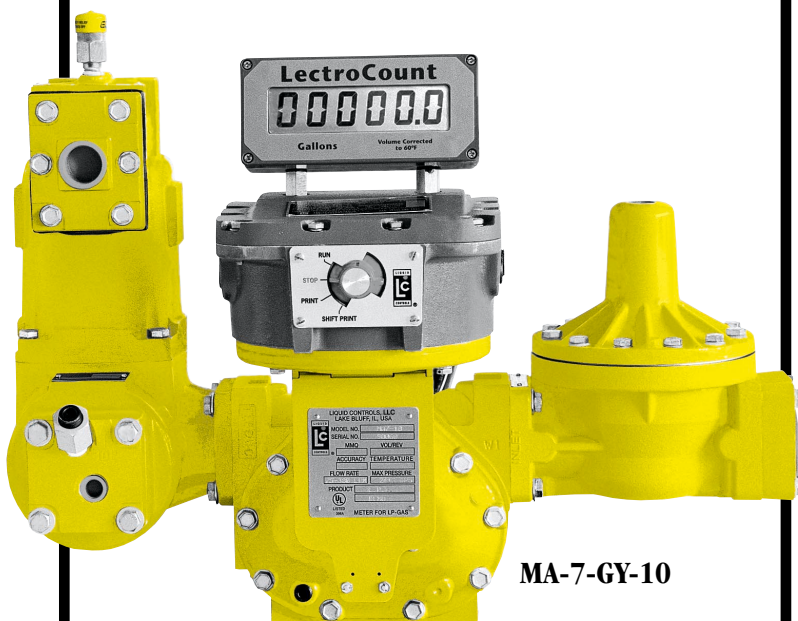
\* Reference meter accuracy is traceable to a primary standard, certified, volumetric prover.



## MA-7™

MA-7 Meters in Class 10 construction are designed for LPG truck and bulk loading applications (UL Listed):

- Capacity: 100 GPM (380 L/min.)
- Class 12 construction for NH<sub>3</sub> (Anhydrous Ammonia) service available upon request.
- Choice of 2" NPT standard, 1 1/2" optional companion flanges.



MA-7-GY-10

## MA-15™

MA-15 Meters in Class 10 construction are designed for LPG bulk delivery truck and bulk loading applications (UL Listed):

- Capacity: 200 GPM (760 L/min.)
- Standard 3" inlet, 2" outlet with choice of NPT, BSPT or steel welding flange (3" outlet optional).



MA-15-GY-10

## Preset Counter



Enables you to select and automatically control Preset Valve closure so that an exact predetermined volume will be delivered. Valve closure is controlled either in two stages, with a pre-shut-off dwell period to prevent hydraulic

shock or in a single-stage for shut-off only. Normally single stage valve operation is preferred in low velocity systems and/or high viscosity applications.

Preset Counter includes red emergency stop button to abort preset deliveries. Preset Counter also available with switches

to control pump starter circuit, security block valve or pilot-operated control valves. Switches are available conforming to applicable UL or CSA electrical codes.

Preset Counters as indicated above may be supplied (1) mechanically linked directly to the valve and/or (2) electrically connected to other system components such as a pump starter circuit or pilot-operated control valve.

Preset Counters are available in choice of models to meet the requirements for 1/10 unit and whole unit registration. For two stage operation, Preset Counter models are offered in a choice of 10, 20, 30, 40, 50, 60, 70, 80 and 90 unit dwell on 2nd wheel and 3, 4, 5, 6, 7, 8, or 9 on 1st wheel. Externally adjustable for precise zero shut-off.

## Microswitches

Converts mechanical signal from Preset Counter to electrical or pneumatic signal to provide Preset Counter control of remotely located valve, pump and related system equipment. Electrical Microswitches available in preset mounted splash-proof design and explosion-proof UL approved design. Pneumatic switches are available on request.



## Temperature Volume Compensators

### VARIABLE GRAVITY TVC

A positive displacement meter measures gross volume regardless of temperature and/or specific gravity. On those products with a linear coefficient of expansion, a Temperature Volume Compensator automatically corrects registration to indicate the volume of the liquid at a selected base temperature (normally 60°F [15°C]). Whether or not a Temperature Volume Compensator should be used in a meter assembly would be determined by one or more of the following considerations:

- (1) the magnitude of the coefficient of expansion of a product;
- (2) the magnitude of variation in product temperature;
- (3) the commercial value of the product;
- (4) the degree of metering accuracy desired;
- (5) the requirement that the product be measured by weight instead of volume.

The Temperature Volume Compensator contains an infinitely variable transmission, which reacts to product and ambient temperature sensed by a fluid filled capillary system connected to a motor bellows. Changes in product temperature produce



changes in the bellows length. This change in length is sensed and mechanically transmitted to a differential. The degree to which this variation in length affects the registration is based on the coefficient of expansion, which may be set in the field on a TVC/VG (variable gravity) model on a scale conveniently located on the front face plate of the Temperature Volume Compensator.

### FIXED GRAVITY TVC FOR LPG

Automatically corrects counter reading for product volume changes due to temperature. Corrects to a net volume at 60°F (15°C). Heavy duty ratchet and pawl speed change mechanism provides longer service life. Thermal sensing system with ambient bellows offsets the effect of outside ambient temperature. Operating range -30°F (-34°C) to +120°F (49°C). Factory set for LPG at .505 specific gravity.

Removable temperature sensing bulb enables field check for accuracy of thermal sensing system. Field repairable to minimize downtime.

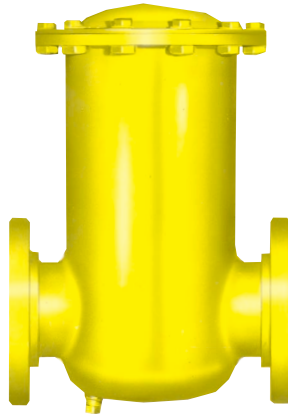




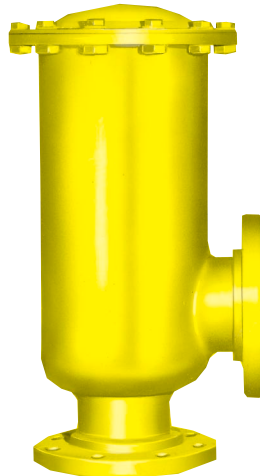
# Strainers

Both steel strainers shown here are designed for applications requiring Classes 1, 7, 10, 14, 16, 27 and 37 materials of construction. NOTE: FSA Series Strainers in Class 10 construction for LPG include thermowell for TVC and thermometer well for Weights & Measures testing.

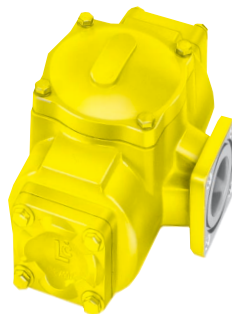
**FS-SERIES**, 150 PSI...FSAA-Series, 275 PSI...and FSA-Series, 300 PSI Strainers. 2", 3", 4" and 6" sizes, made of steel. Straight-through flow standard...angle inlet to outlet configurations optional. When air eliminator is used, cover is replaced with air eliminator cover assembly.



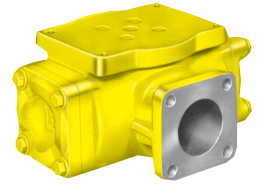
**Bottom inlet**, side outlet, vertical, right-angle flow. FS-Series, 150 PSI...FSAA-Series, 275 PSI...and FSA-Series, 300 PSI Strainers. 2", 3", 4" and 6" sizes, made of steel. When air eliminator is used, cover is replaced with air eliminator cover assembly.



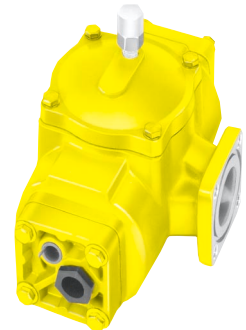
**F-7 Strainer**...2" (1 1/2" optional) 350 PSI, aluminum for M-5 and M-7 Meters. Materials of construction for Classes 1, 2, 3, 4, 14, 15, 16 and 30 applications. Supplied with cover...or without cover when air eliminator is used. Available if desired with two 45° elbows to assemble unit for in-line flow.



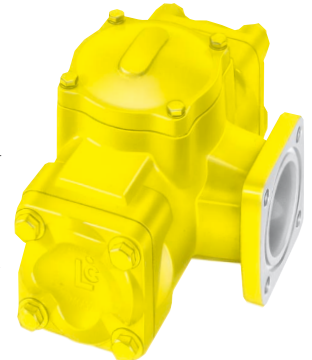
**F-7 Strainer**...2" (1 1/2" optional) 150 PSI, choice of cast iron or stainless steel for M-5 and M-7 Meters. Materials of construction for Classes 7, 8, 27 and 37 applications. Easily adapted for air eliminator mounting when required.



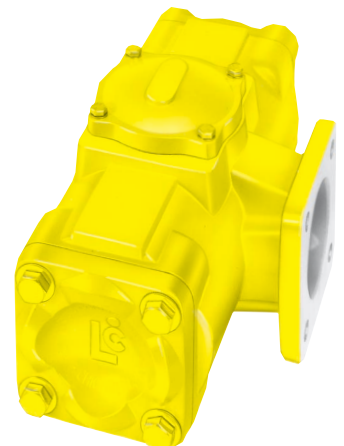
**FA-7 Strainer**...2" (1 1/2" optional) 350 PSI, high pressure aluminum for MA-5 and MA-7 Meters. Materials of construction for Class 10 LPG applications. Other classes available on special order including Class 12 for NH 3. Supplied with cover or without cover when air/vapor eliminator is used. Relief valve provided as required for Classes 10 and 12 service.



**F-15 Strainer**...3" 350 PSI, aluminum for M-15, and M-25 Meters. Materials of construction for Classes 1, 2, 3, 4, 10, 14, 15 and 16 applications. Supplied with cover or without cover when air eliminator is used.

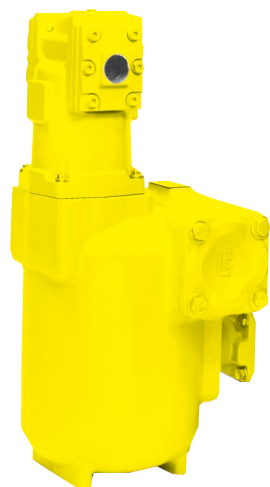


**F-30 Strainer**...4" (3" optional) 150 PSI, aluminum for M-30, M-40 and M-60 Meters. Materials of construction for Classes 1, 2, 3, 4, 14, 15 and 16 applications. Supplied with cover or without cover when air eliminator is used.



**Note:** 100-mesh strainer basket supplied standard for all Class 1 meters applied for gasoline service, and 200-mesh strainer basket for all Class 10 meters applied for LPG service. These strainer baskets are supplied to provide extended service life for the meters.

# High Capacity Air Eliminator/Strainers



**F-7 High Capacity Aluminum Air Eliminator/Strainer** assembly with integral check valve, for use with 2" M-7 and M-10 Class 1 meters. Designed specifically for refined fuels delivery truck applications. Passes U.S. and Canadian Weights & Measures split compartment tests.



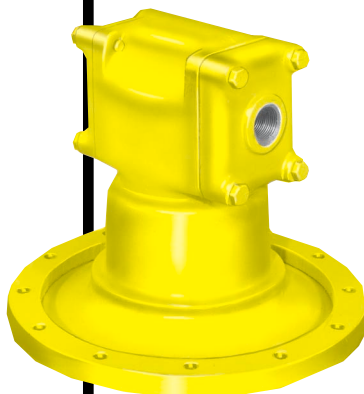
**F-15 High Capacity Aluminum Air Eliminator/Strainer** assembly with integral check valve, for use with 3" M-15 and M-25 Class 1 meters. Designed specifically for refined fuels delivery truck applications. Passes U.S. and Canadian Weights & Measures split compartment tests.

## Air Eliminators

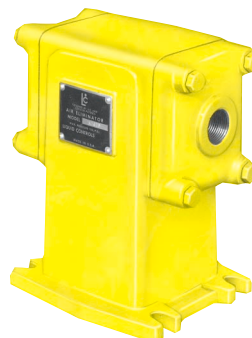
**Bulk Plant Air Eliminators** are installed on upstream side of the strainer and as close to the pump outlet or unloading connection as possible. For use in any 150 PSI working pressure system using aluminum M-Series or steel MS-Series Meters. Choice of 3", 4", 6" and 8" flanged connections. Shown is the dual head model providing twice the normal venting capacity.



**Aluminum Air Eliminator** for use with M-5, M-7, M-10, M-15, M-25, M-30, M-40 and M-60 Meters. Materials of construction for Classes 1, 2, 3, 4, 14, 15, 16 and 30 applications. Designed for installation of F-7, F-15 and F-30 Strainers.



**Steel Air Eliminator** for use with MS-, MSAA- and MSA-Series steel case Meters. Materials of construction for Classes 1, 7, 10, 14, 16, 27 and 37 applications. For installation on FS-, FSAA- and FSA-Series Strainers.



**Cast Iron Air Eliminator** for use M-7 meters. Materials of construction for Classes 7, 27 and 37 applications. Designed for installation on F-7 Class 7 Strainers.

**High pressure Aluminum Air Eliminator** for use with 350 PSI, MA-4, MA-5, MA-7 and MA-15 Meters...Materials of construction for Class 10 LPG Service. Other Classes available on special order, including Class 12 NH<sub>3</sub>. Relief valve provided as required for Classes 10 and 12 applications.



**Stainless Steel Air Eliminator** for use with M-5 and M-7 Meters. Materials of construction for Class 8 applications. Designed for installation on F-7, Class 8 Strainer.

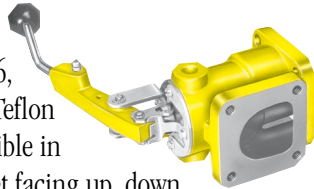


# Valves & Fittings

## Valve Models

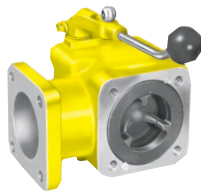
### V-7 VALVES, ALUMINUM, STAINLESS STEEL AND CAST IRON

For M-5, M-7 and M-10 Meters, Classes 1, 2, 3, 4, 7, 8, 14, 15, 16, 27, 30 and 37. Viton, Buna or Teflon seals. This angle valve is indexible in 90° increments with valve outlet facing up, down, back or front. Also available with 90° elbow for offset in-line piping configuration. Class 20 Brass Valve with 2" female NPT outlet also available.



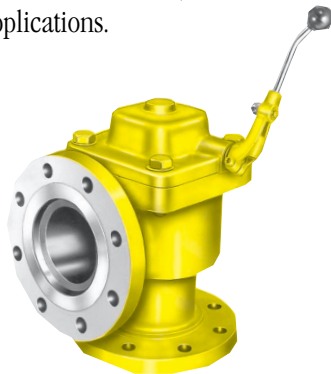
### ALUMINUM V-15 AND V-30 VALVES

For M-15 and M-30 Meters, Classes 1, 2, 3, 4, 14, 15 and 16. Viton or Teflon seals. Angle valves may be indexed in 90° increments same as V-7 Valve. Also available for use with M-25, M-40 and M-60 Meters, Classes 1 & 2 applications.



### STEEL VS-SERIES VALVES

For MS-, MSAA- and MSA Series 3" and 4" Meters, Classes 1, 14 and 16 Viton Seals. Standard mounting is outlet facing up. Teflon fitted valves also available.



## Differential Pressure And Check Valves

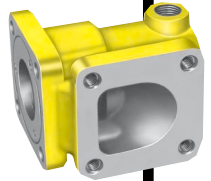
### DIFFERENTIAL VALVE

Provides a constant 15 PSI differential pressure and controls flow when vapor is sensed. This Basic Diaphragm Style Valve is spring loaded and designed to fail closed.



### AIR ACTIVATED/DIFFERENTIAL CHECK VALVES

For use with M-7, M-10, M-15, M-25 and M-30 Meters. Designed to stop the flow whenever air or vapor is present thereby assuring accurate measurement.



### SPRING LOADED CHECK VALVES

Provides back pressure to increase air/vapor eliminator efficiency and to prevent reverse flow. For additional information on see Publication LC-77.



### BACK CHECK VALVE

Designed with a soft seat to prevent reverse flow and eliminate counter advancement when PTO is engaged. Includes built-in pressure relief to keep the meter, downstream piping and delivery hose packed to at set pressure. Full port design assures maximum system flow rate.



### MODEL 119-2 AIR CHECK VALVE OR VAPOR ACTIVATED DIFFERENTIAL VALVE

For use with all MS, MSA & MSAA series meters. ANSI 150 or 300# flanged, 2", 3", 4" or 6" sizes, steel body with stainless steel tubing, pilot and fittings. Designed to stop flow whenever air or vapor is present. Operates in conjunction with an LC air/vapor eliminator.



## Fittings

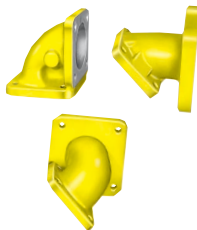
### VICTAULIC SPOOLS

Available for M-60 and M-80 Meters in 4" size. Used in aircraft refueling installations.



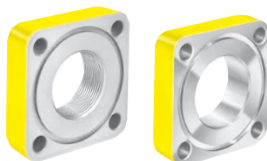
### ELBOWS

Elbows are provided for M-5 and M-7 Meters to increase mounting flexibility of the Meter and accessories. For M-5 Meters, combination 45° and 90° rear facing Elbows are available.



### FLANGES

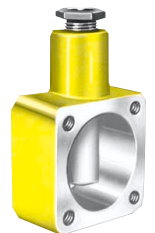
For use with all M-series meter and accessories. Available in Aluminum, Brass, Nodular Iron and Stainless Steel if meter size selected is offered in that material of construction. Optional NPT or BSPT with "O" ring groove for improved sealing (no flat gasket). Also available in Aluminum, Steel and Stainless Steel slip weld version.



### THERMOWELLS

Thermowell assembly for mechanical TVC's are available for all aluminum M-Series Meters in 2", 3" and 4" pipe sizes. For Classes 7, 27 and 37 all ferrous construction meters and Class 8 stainless steel meters, a Stainless Steel 1" male NPT Thermowell only is supplied. A 1" female NPT connection in the inlet pipeline to the meter is required to accept the Thermowell.

MS-Series Meters are supplied with a 1" half coupling welded to the inlet spool to accept the Thermowell. On all M-5, M-7, M-10, M-15 and M-25 or MA-4, MA-5 or MA-7 or MA-15 Series Meters ordered with a Strainer and a Temperature Volume Compensator, the Thermowell is supplied in the strainer cover assembly.





# Accessories

## LARGE NUMERAL COUNTER (REGISTER)



A Large Numeral Counter records the amount of each delivery or batch and provides a five digit resettable totalizer and an eight digit non-resettable totalizer.

Choice of registration includes 1/10 and whole U.S. Gallons, 1/10 and whole Imperial Gallons, Liters, Decaliters, Cubic Meters, Barrels, Pounds, etc.

## LARGE NUMERAL COUNTER (REGISTER) WITH TICKET PRINTER

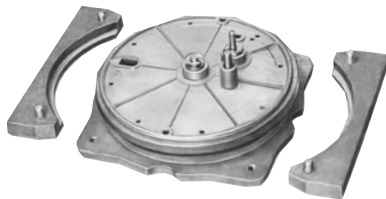
Printer provides an imprinted ticket record of the transaction. Further security is provided by before and after imprinting of consecutive sales numbers and printing of meter/product identifiers.

Prints on standard zero-start, Neptune zero or accumulative style tickets. Magnetic lid with rubber seal keeps out dirt and weather. Right or optional left hand reset available.



## SWIVEL

The swivel is installed below the counter or counter printer. Permits rotating counter or counter printer as desired throughout a 360° range. Designed for use with all LC Meters.



## NON-RESET COUNTERS

Liquid Controls offers a ten digit Non-Resettable Totalizer. This Counter provides registration of the cumulative total only.



## GEAR PLATE

The Gear Plate is installed in the base of the Large Numeral Counter to convert meter output to an engineered unit. Since all conversions are made with easily accessible gears, this greatly simplifies changing units of measure, i.e. U.S. to Metric measure.



## REGISTER STACK ADAPTERS

For use when installation of a meter in a vertical line is preferred over the standard horizontal mounting. Only required on certain M-Series cast case meters.

The 90° angle Counter Adapter will permit proper positioning of the register stack components so they can be viewed along a horizontal axis. Where the location of a register bezel is well below the normal visible level, the use of a 45° Counter Adapter provides an upward tilt to the Counter face for easier reading.



## EXTENSIONS

In most installations the register stack is mounted directly on the meter. When required by the installation, an extension provides a means of elevation and separating the register stack from the meter for ease of viewing. Alternately, the extension may be required on high temperature applications (above 180° [82°C]) to dissipate the heat and protect the non-metallic parts of the register stack from damage.



## EXTERNAL DRIVE MODULES

A modular housing element, driven by the Meter on which may be mounted various assemblies to serve a variety of purposes.

A basic Module unit with a 0.023 tang tip with 7/8 x 18 NS threaded male coupler to drive portable pulsers, etc. is available.



## MECHANICAL RATE-OF-FLOW INDICATOR

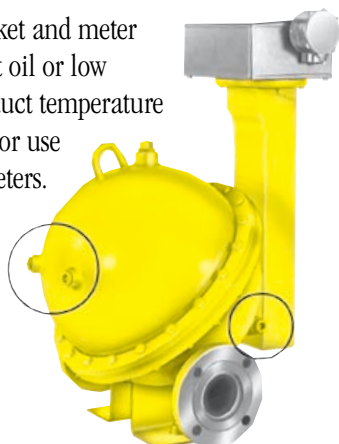
Calibrated in choice of Gallons and Metric units of measure. Direct reading dial accurately shows rate-of-flow through meter to within 1% at full scale reading. Indicator is mounted on a specially designed adjuster cover plate for viewing from front of meter. Unit is a precision-built eddy current device providing smooth, noiseless operation, instantaneous response, no pointer fluctuation, negligible torque and dependable reading accuracy. Available for use with all LC Meters...either left-to-right or right-to-left flow.



# Accessories

## HOT OIL/STEAM JACKETS

Assembly consists of integral Jacket and meter cover. Permits circulation of hot oil or low pressure steam to maintain product temperature within the metering chamber. For use on all M-, MA- and MS-Series Meters.



## UL LISTED RECOGNIZED COMPONENT

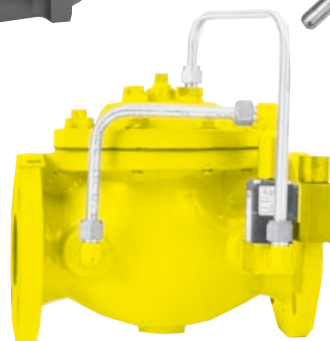
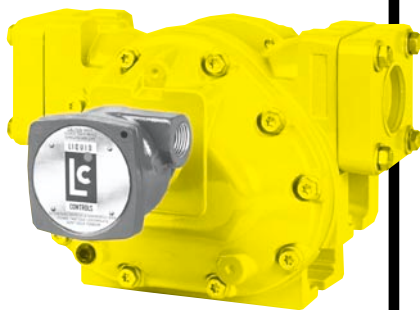
LC MA-4/MA-5 Meters now available with Neptune\*-style elbows for easy, cost effective total interchangeability.

- Simple bolt-in replacement of Neptune\* 1 1/2" type 4D meter with an LC Meter.
- 3 Year or 1.8 Million Gallon Warranty.
- No need to repipe or replace accessories.



\* Neptune is a trademark of Schlumberger Industries, Inc.

**See Electronics Products Overview Bulletin #500045 for details on LectroCount<sup>3</sup> and LectroCount LCR systems, Pulsers, Flow Computers, Electronic Counters, Electronic Temperature Compensators and Solenoid Valves.**



## Industries Served

Automotive	Beverage	Food Processing	Marine	Pulp & Paper
Adhesives	Cosmetics	Fuel Oil Delivery	Paint and Varnish	Refining Commercial
Agriculture	Chemical Processing	General Industrial	Petroleum Marketing	Solvents
Asphalt	Concrete Add Mixtures	Hydrocarbon Processing	Petroleum Production	Recycling
Aviation Fueling	Dairy	Liquefied Gases	Pharmaceutical	Railroad
Animal Feeds	Liquid Fertilizers	Lube Oils	Printing Ink	Textile

## Customers Served

(List derived from Fortune Magazine. Many other valued customers, while not included by the magazine, are of equal importance to LC)

General Motors	Westinghouse Electric	Armco	Firestone Tire & Rubber	Crown Zellerbach	Gillette
Exxon	Eastman Kodak	Weyerhaeuser	International Harvester	Cooper Industries	Baxter Healthcare
Mobil	Kimberly-Clark	Aluminum Co. of America	Boise Cascade	Scott Paper	Land O'Lakes
Ford Motor	Goodyear Tire & Rubber	Bethlehem Steel	Eaton	Grumman	Engelhard
International Business Machines	Lockheed	Northrop	Owens-Illinois	Diamond Shamrock	Jim Walter
Texaco	Allied-Signal	Burroughs	American Cyanamid	Avon Products	Pennzoil
Chevron	General Foods	Colgate-Palmolive	Merck	Staley Continental	Cabot
E.I. du Pont de Nemours	Union Carbide	Texas Instruments	Quaker Oats	Kellogg	Murphy Oil
General Electric	Ashland Oil	Archer Daniels Midland	Swift Independent	American Can	Sherwin-Williams
Amoco	Amerada Hess	Borden	Whirlpool	Burlington Industries	Dresser Industries
Atlantic Richfield	W.R. Grace	American Home Products	Reynolds Metals	Mead	Uniroyal
Chrysler	Coastal	Pillsbury	American Standard	Kaiser Aluminum & Chemical	Upjohn
Shell Oil	Anheuser-Busch	Litton Industries	Abbott Laboratories	Ingersoll-Rand	Lever Brothers
U. S. Steel	Caterpillar Tractor	International Paper	Kerr-McGee	Interco	Mack Trucks
United Technologies	Monsanto	Bristol Myers Squibb	Owens-Corning Fiberglass	Hercules	Rohm & Haas
Phillips Petroleum	Georgia Pacific	Martin Marietta	Eli Lilly	BASF	CPC International
ITT	Honeywell	Farmland Industries	FMC	Fruehauf	R.R. Donnelley & Sons
Beatrice	Johnson & Johnson	Union Camp	SmithKline Beecham	Penn Central	Hershey Foods
Phillip Morris	Ralston Purina	Deere	Teledyne	USG	PPG Industries
Dow Chemical	Champion International	H.J. Heinz	B.F. Goodrich	James River Corp. Of Virginia	Morton Thiokol
McDonnell Douglas	Sperry	Pfizer	Manville	Revlon	Mapco
Rockwell International	General Mills	Campbell Soup	Warner-Lambert	American Petrofina	Schering-Plough
Unocal	ConAgra	Borg-Warner	Inland Steel		Libbey-Owens-Ford
			Olin		

## Quality Statement

Everyone associated with **Liquid Controls** must be committed to our quality effort and to pursuing perfection.

To gain satisfaction in the eyes of our customers, we must accurately define and fulfill the customer's continuing needs.

We will strive to minimize the user's total cost by providing products of high reliability, maintainability, serviceability, and of no planned obsolescence, which combine to give the customer superior value.

Our people are our greatest resource. We will create a positive, team-oriented environment in which every person has trust and respect for one another, is recognized for achievement, and motivated toward excellence.

Absolute accountability for our efforts is determined by significant measures, our customer's level of satisfaction, the development of our people, and our contribution to the community.

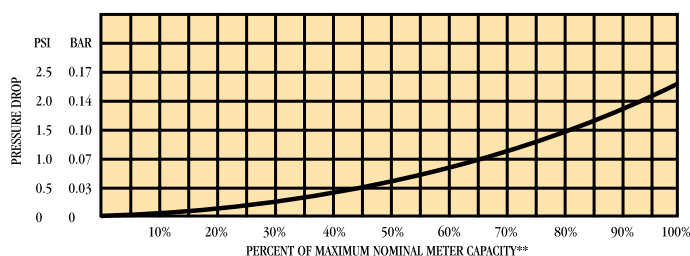
Our goal is to be SIMPLY THE BEST.



# Relationship of Viscosity to Pressure Loss

When metering a liquid, the pressure loss will increase as viscosity increases. The pressure loss data shown in the graph below is based on metering safety solvent with viscosity of approximately 30 SSU. The chart below may be used to determine the pressure drop on higher viscosity products for any model meter. Because of the low pressure drop inherent in the LC Meter, it will often be possible to satisfactorily meter higher viscosity products through a smaller LC Meter than its competitive equivalent.

## Average\* Meter Pressure Drop vs. Flow Rate (M60 @ 600 gpm)



\*Based on metering safety solvent, approximate viscosity 30 SSU (1 centipoise).

\*\*When meter is operated at 100% capacity, the average pressure drop on safety solvent at 30 SSU (1 centipoise) will be approximately 2.3 PSI (0.16 bar).  
When operated at 50% capacity, average pressure drop will be approximately 0.6 PSI (0.04 bar).

The Conversion Factor table at right for determining pressure loss as viscosities increase is approximate only. However the data is acceptable when preparing specifications for most metering systems. The pressure loss through a Strainer or Faucet Valve will be approximately the same as the pressure loss through equivalent size Meter.

## Meter Flow Rate Limit based on Viscosity and Bearing Materials

### Maximum Pressure Loss

4 PSI

8 PSI

10 PSI

### Bearing Material

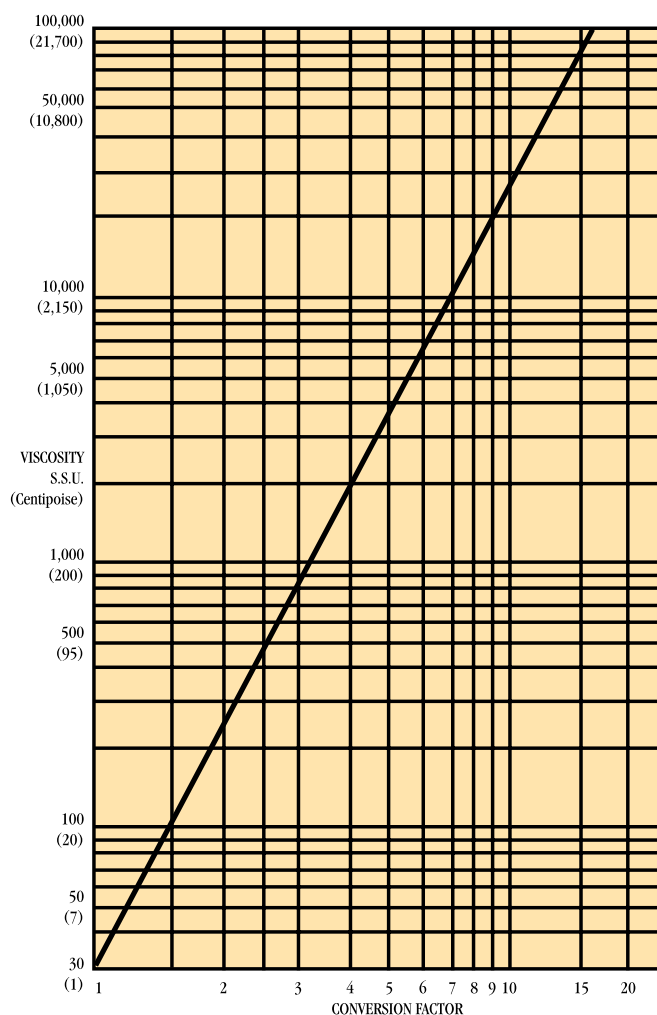
Teflon/Metal

Carbon/Metal

Metal/Metal

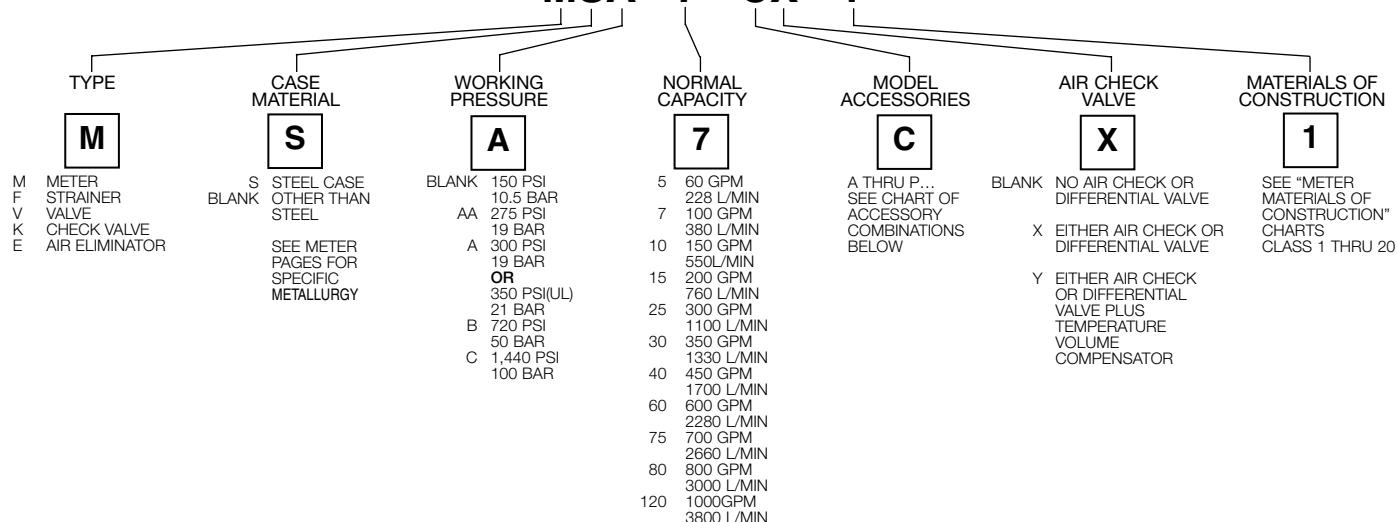
## HOW TO USE THIS CONVERSION FACTOR TABLE to determine Pressure Loss as affected by viscosity

The graph (at left...Average Meter Pressure Drop vs. Flow Rate) is based on the use of an LC Meter on safety solvent with a viscosity of 30 SSU. To determine the pressure drop of a liquid with a higher viscosity, multiply the pressure drop as indicated for safety solvent (at whatever % of flow rate is involved) by the conversion factor that applies. For example: If the Meter is to be operated at 100% of capacity the pressure drop for safety solvent would be 2.3 PSI. If the liquid to be metered has a viscosity of 1,000 SSU the conversion factor would be 3.2 (approximate) and the pressure loss would be calculated as 2.3 PSI x 3.2 or 7.36 PSI (0.507 bar).



# Model Description Chart

## EXAMPLE SHOWN IS METER MODEL MSA - 7 - CX - 1



## Accessory Configurations A, C, I, K

### Chart of Meter Accessory Configurations

Meters are available in four basic configurations designated by letters A, C, I, and K, as shown below. Optional accessory items may be specified separately with your order to build a complete metering system.

#### Basic Configuration

- A** Meter with Counter
- C** Meter with Counter, Strainer, Air Eliminator
- I** Meter with Preset Counter, Counter, Preset Valve
- K** Meter with Preset Counter, Counter, Preset Valve, Strainer, Air Eliminator

#### Optional Accessories

- Printer, Strainer
- Printer
- Printer, Strainer
- Printer

## Purchase Specifications

When issuing purchase specifications and to assure you of receiving a Liquid Controls Meter with all of the many installation, operating and maintenance advantages available only in an LC Meter, we suggest that meter engineering specifications include the following statements in addition to the LC model number and description.

"Meter shall be of the positive displacement design having rotary motion without axial thrust or flow impingement. No eccentric, sliding, reciprocation or oscillating parts to induce excess liquid shear or liquid compressibility within meter element. Rotary parts to be horizontally supported on both sides by solid support bearings and rotor journals of materials compatible with product to be metered. No ball bearings, springs, or cams.

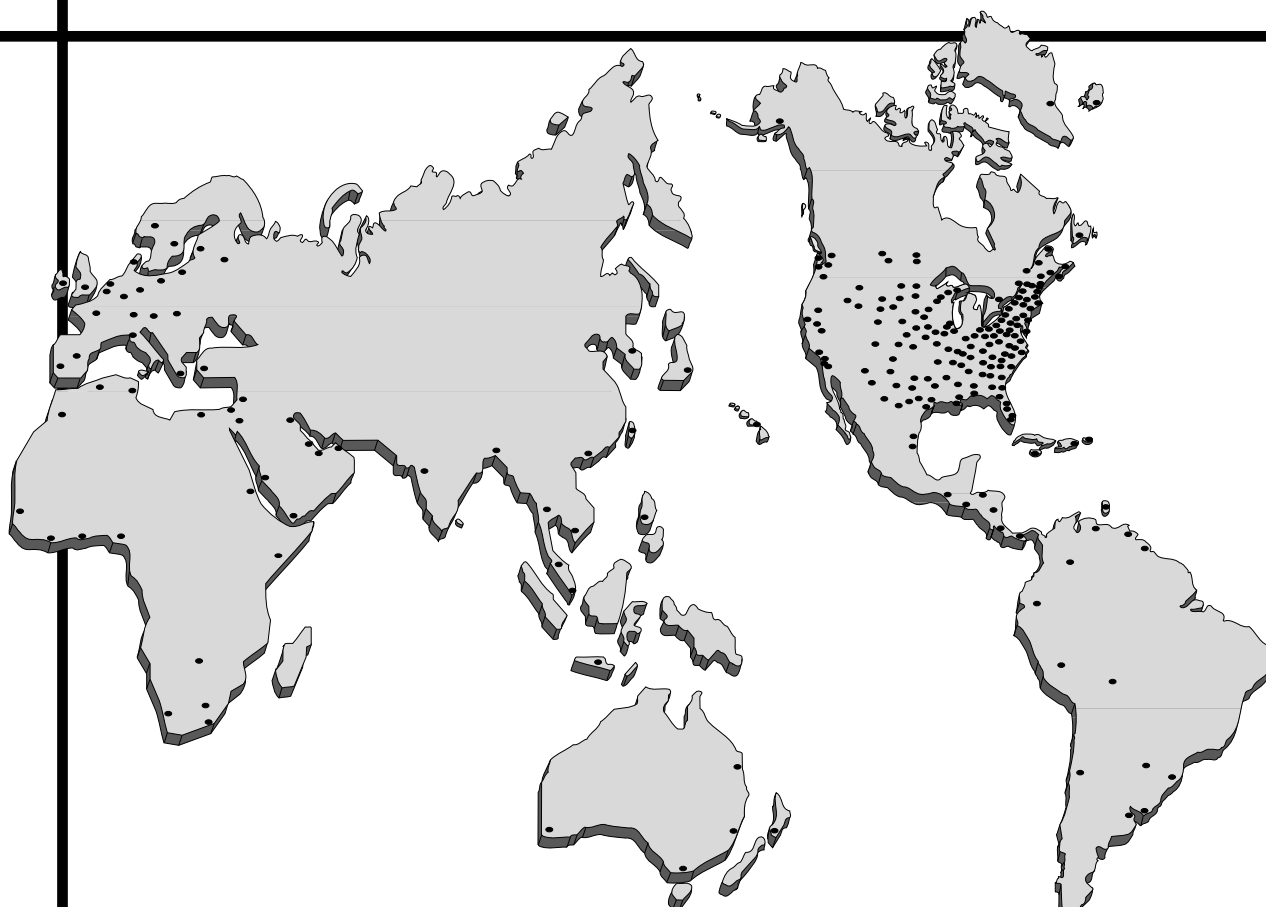
"Rotary drive and meter adjustment output to all mechanical readout shall be non-cyclic without pulsation and capable of infinite meter accuracy adjustment of 0.02% or better. Meter calibration adjustment device must be externally accessible not requiring removal of any readout equipment for calibration or replacement.

"Steel dual case meters to have readily removable inner elements, packing gland drives, and adjustors without necessity of removing any ancillary readout equipment. Meter measuring element shall have a minimum braking torque and shall immediately respond to product low flow movement."

## Ordering Information

Product: \_\_\_\_\_  
Rates: \_\_\_\_\_Max. \_\_\_\_\_Normal \_\_\_\_\_Min.  
Operating Temperatures: \_\_\_\_\_Max. \_\_\_\_\_Normal \_\_\_\_\_Min.  
Maximum Non-Shock Operating Pressure: \_\_\_\_\_  
Maximum Viscosity: \_\_\_\_\_@ \_\_\_\_\_(TEMP.)  
Specific Gravity: \_\_\_\_\_@ \_\_\_\_\_(TEMP.)  
Construction Class: (1,2,3, ETC.) \_\_\_\_\_  
Accessory Configuration: (A,B,C,ETC.) \_\_\_\_\_  
Seal Material: \_\_\_\_\_STANDARD BUNA/VITON  
\_\_\_\_\_ALL VITON \_\_\_\_\_ALL TEFLON  
Direction Of Flow: \_\_\_\_\_L TO R \_\_\_\_\_R TO L  
Read Out: (Gallons, Liters, Pounds, Etc.) \_\_\_\_\_  
Counter And Printer: \_\_\_\_\_Zero/Face Up  
\_\_\_\_\_Zero/Face Down \_\_\_\_\_Accum.  
Strainer Basket: \_\_\_\_\_40M \_\_\_\_\_80M \_\_\_\_\_OTHER \_\_\_\_\_  
Flange Size: \_\_\_\_\_  
Flange Type: \_\_\_\_\_NPT \_\_\_\_\_BSPT \_\_\_\_\_SLIP WELD  
\_\_\_\_\_ANSI \_\_\_\_\_DIN \_\_\_\_\_OTHER  
Options: \_\_\_\_\_  
\_\_\_\_\_

# SOLD AND SERVICED BY A NETWORK OF HIGHLY TRAINED FULL SERVICE DISTRIBUTORS



## Backed By Our Worldwide Reputation For Quality, Accuracy and Advanced Design.

### WARRANTY:

LIQUID CONTROLS ("Seller") products are warranted against defects in material or workmanship for a period of one (1) year from date of installation, provided that the warranty shall not extend beyond twenty-four (24) months from the date of original shipment from Seller. Seller's obligations, set forth below, shall apply only to failure(s) to meet the foregoing obligations provided that Seller is given written notice within thirty (30) days of any occurrence from which a claim of defect arises. If a warranty dispute occurs, the Purchaser shall be required to provide Seller with proof of date of sale. The minimum requirement to establish date of sale shall be a copy of the Seller's invoice. In the event that a factory inspection by Seller or its designee(s) supports the validity of a claim, at the discretion of Seller, repair, replacement or refund shall be the

sole remedy for defect and shall be made, free of charge, ex-works factory. In no event shall Seller be liable for any special, consequential, incidental, indirect or exemplary damages arising out of warranty, contract, tort (including negligence) or otherwise, including but not limited to, loss of profit or revenue, loss of use of the product or any associated products and/or equipment, cost of substitute goods or services, downtime costs or claims of or by Purchaser's clients or customers. In any event, the total liability of Seller for any and all claims arising out of or resulting from the performance, non-performance or use of the product shall not exceed the purchase price of the individual product giving rise to the claim. All other guaranties, warranties, conditions and representations, either express or implied, whether arising under any statute, common law, commercial usage or otherwise are excluded. Electronic Products require

installation, start-up and servicing by local factory-trained service representatives. In the absence of installation, start-up and servicing of Electronic Products by Seller trained service representatives, this warranty is null and void. Seller's obligations as set forth above shall not apply to any product, or, or any component or part thereof, which is not properly installed, used, maintained or repaired, or which is modified other than pursuant to Seller's instructions or approval. NOTE: The above warranty applies only to products manufactured by Liquid Controls, Lake Bluff, Illinois. Private label, OEM, and/or products manufactured by Liquid Controls licensee(s) are specifically excluded from the above warranty. Consult factory for all non-Liquid Controls manufacturers' warranties. NO IMPLIED OR STATUTORY WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE SHALL APPLY.

**LIQUID  
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