



Series M and MA

Positive Displacement Flow Meters

Overview

Liquid Controls M and MA Series rotary motion positive displacement (PD) meters offer the ultimate in measurement accuracy for custody transfer of petroleum products, aviation fuels, LPG, and a broad range of industrial liquids. LC meters incorporate a unique design, presenting minimal intrusion in a flowing stream of liquid, as well as minimal pressure drop through the meter.

The LC meter consists of a housing in which three synchronized rotors turn with no metal-to-metal contact. Hydraulic sealing is accomplished by a stationary boundary layer of liquid, not by the wiping action of mechanical parts.

Superior performance features

- **Low pressure drop:** will operate on gravity flow or pump pressure.
- **Sustained accuracy:** no wear from metal-to-metal contact inside the measuring chamber means minimal deterioration in accuracy over time, fewer recalibrations and longer service life. Meters conform to NIST and International Weights and Measures accuracy requirements
- **Wide temperature range:** products can be metered accurately from -40°C (-40°F) to 71°C (160°F).
- **Wide viscosity range:** LCE meters can accurately meter products from less than 30 SSU (less than 1 cP) to 1500000 SSU (325000 cP).
- **Maximum adaptability:** right angle design with choice of stock or custom elbows/fittings provides unequaled mounting flexibility to meet your installation requirements.

Industries served

LCE series M and MA meters are well-suited for use in industries requiring precise flow measurement and reliable, extended service life:

- Refined petroleum products
- Aviation fuels
- LPG
- Agricultural chemicals
- Paints and coatings
- Foods and beverages
- Petrochemicals
- Pharmaceuticals
- Cosmetics
- Printing inks
- Textiles



Liquid Controls' unique measuring chamber with no metal-to-metal contact minimizes wear and ensures precise and consistent measurements over a long service life.

Performance specifications

LCE positive displacement meters are designed to provide accurate performance and a long, trouble-free service life requiring minimal maintenance with few replacement parts. The unique cast-case construction of the M and MA series meters results in low pressure drop for most liquids, delivering superior performance and minimal demand on system pumps. The exclusive LCE metering element eliminates inaccuracies due to clearance changes, minimizes loads on bearings, eliminates axial thrust and performs with equal accuracy for forward or reverse flow. M and MA series meters' compact design and multiple inlet/outlet flange configurations provide unmatched mounting versatility.

LCE meters meet NTEP (NIST Handbook 44) and International Weights and Measures accuracy requirements as well as U.S. Military specifications. MA series meters are UL listed for metering liquid propane gas (LPG).

Accuracy/Performance^a

Repeatability

Mech. registration: capable of 0.05% of reading over entire range
Elect. registration: capable of 0.03% of reading over entire range

Linearity

- Over 5:1 range
Mech. registration: capable of $\pm 0.125\%$ or better from max. nom. flow rate
Elect. registration: capable of $\pm 0.10\%$ or better from max. nom. flow rate
- Over 10:1 range
Mech. registration: capable of $\pm 0.22\%$ or better from max. nom. flow rate
Elect. registration: capable of $\pm 0.10\%$ or better from max. nom. flow rate
- Over 40:1 range
Mech. registration: capable of $\pm 0.5\%$ or better from max. nom. flow rate
Elect. registration: capable of $\pm 0.15\%$ or better from max. nom. flow rate

Temperature range

-40° F to 160° F (-40° C to 71° C)

^a Stated accuracy obtainable when all variables remain constant. Reading/measurements reflect a minimum of one minute of flow at selected rate(s). All accuracy statements based on metering safety solvent (aliphatic hydrocarbon), approximate viscosity 1 CPS. On higher viscosity products, the average deviation in accuracy will be less.

Construction

Meter housing and rotors

Cast aluminum (other metalurgies available including brass, cast-iron and stainless steel)

Internal components

Aluminum, Ni-Resist, stainless steel

Seal materials

UL recognized component: Buna-N, Viton®, Teflon®

Bearings

Carbon, Teflon®, Ni-Resist

Viton® and Teflon® are registered trademarks of DuPont Corporation.
Victaulic® is a registered trademark of Victaulic Company.

MODEL	FLANGE SIZE	MAX NOM. FLOW RATE	WORKING PRESSURE	NET WEIGHT
M5	1½" or 2"	250 l/min 66 GPM	10,5 bar 150 PSI	6,4 kg 14 lbs
M7	1½" or 2"	500 l/min 132 GPM	10,5 bar 150 PSI	8,6 kg 19 lbs
M10	2"	550 l/min 145 GPM	10,5 bar 150 PSI	8,6 kg 19 lbs
M15	3" or 3" in, 2" out	1000 l/min 264 GPM	10,5 bar 150 PSI	16,8 kg 37 lbs
M25	3"	1150 l/min 304 GPM	10,5 bar 150 PSI	16,8 kg 37 lbs
M30	3" or 4"	1300 l/min 343 GPM	10,5 bar 150 PSI	54,4 kg 120 lbs
M40	4"	1700 l/min 449 GPM	10,5 bar 150 PSI	54,4 kg 120 lbs
M60	4" or 6"	2800 l/min 740 GPM	19 bar 275 PSI	91,2 kg 201 lbs
M80	4" or 6"	3300 l/min 872 GPM	19 bar 275 PSI	91,2 kg 201 lbs
MA5	1½" or 2"	227 l/min 60 GPM	25 bar 350 PSI	6,4 kg 14 lbs
MA7	1½" or 2"	380 l/min 100 GPM	25 bar 350 PSI	8,6 kg 19 lbs
MA15	3" or 3" in, 2" out	760 l/min 200 GPM	25 bar 350 PSI	16,8 kg 37 lbs

^b Meter only (aluminum body). Consult factory for weights of brass, cast iron or stainless steel body meters.

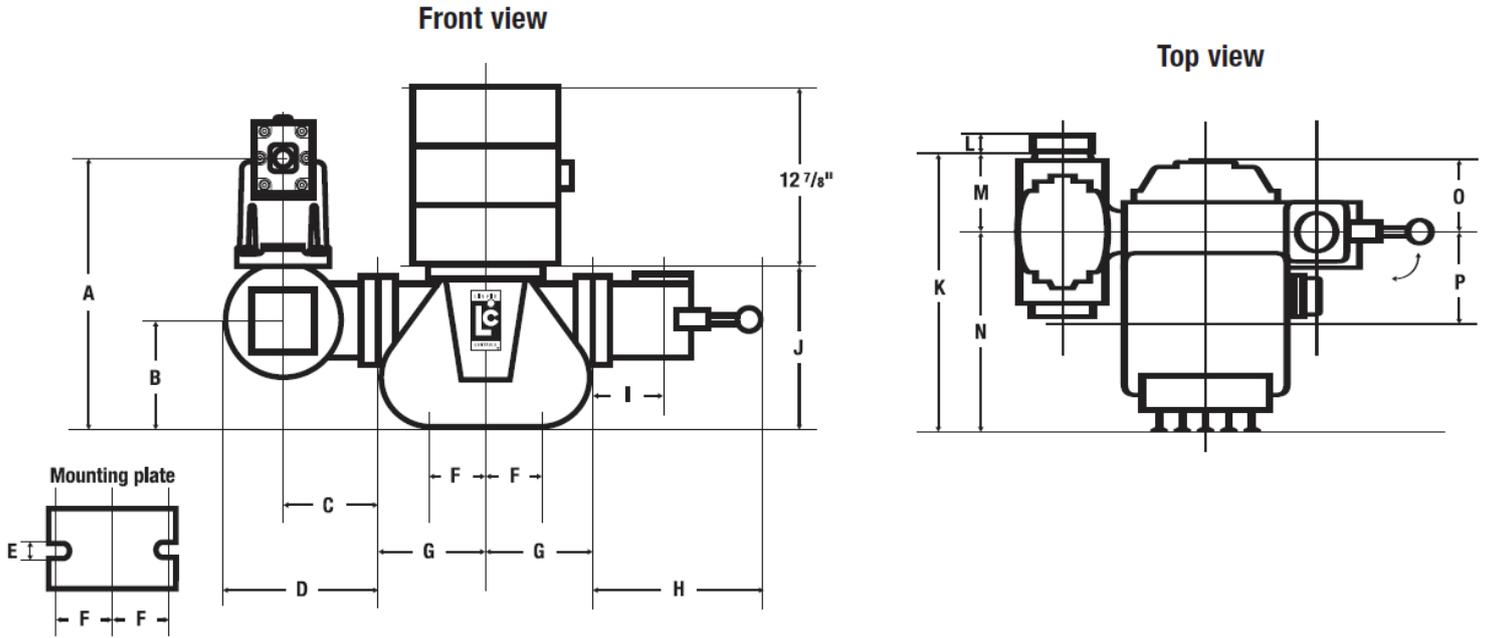
^c M-80 meter capable of momentary overload operation at 125% of maximum rated capacity in either direction without damage to mechanism (applies to Class 2 meters only, on jet fuel only). 125% overload operation (1,000 GPM) requires 6" ANSI or 6" Victaulic® connections.

^d M-60, M-80 "G" and "B" dimensions vary depending upon flange type.

M-5® M-7® et al. are registered trademarks of Liquid Controls, A Unit of IDEX Corporation.

Dimensions: flow meters with mechanical registration

Note: Dimensions shown are not for construction use. Consult factory when certified engineering prints are required.



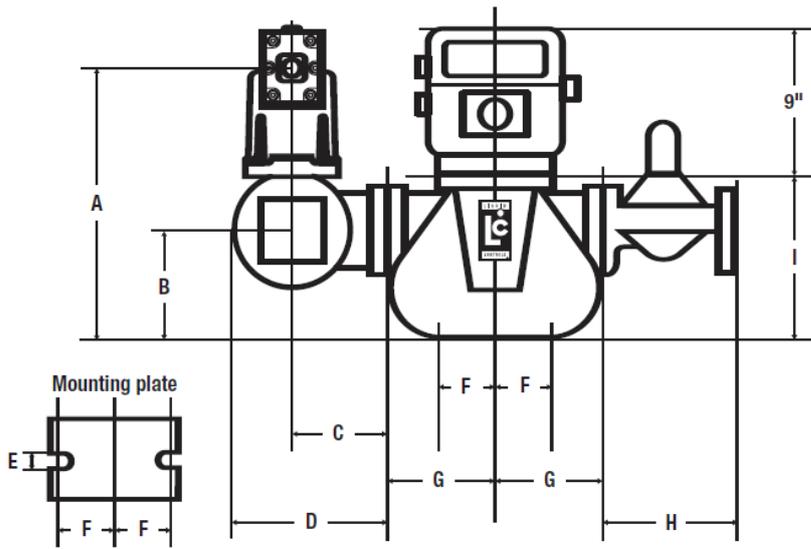
Dimensions	A ^e	B	C ^f	D ^g	E	F	G	H	I	J	K	L	M	N	O	P
in	14.2	5.3	4.1	6.8	.56	1.9	4.9	11.7	2.5	8.6	15.3	0.9	4.7	16.8	3.2	4.6
mm	360	135	105	172	14	48	125	297	64	219	387	24	119	428	81	116
in	14.3	5.4	4.1	6.8	.56	2.8	4.2	11.7	2.5	9.5	16.3	0.9	4.7	16.5	4.2	5.6
mm	362	137	105	171	14	71	106	297	64	241	413	24	119	421	106	141
in	14.3	5.4	4.1	6.8	.56	2.8	4.2	11.7	2.5	9.5	16.3	0.9	4.7	16.5	4.2	5.6
mm	362	137	105	171	14	71	106	297	64	241	413	24	119	421	106	141
in	17	7.5	5	7.7	.69	3.8	5.5	12.6	5.1	10.8	17.5	1.3	5	16.9	5.1	6.5
mm	432	191	127	195	17	95	140	321	129	273	445	32	127	430	129	165
in	17	7.5	5	7.7	.69	3.8	5.5	12.6	5.1	10.8	17.5	1.3	5	16.9	5.1	6.5
mm	432	191	127	195	17	95	140	321	129	273	445	32	127	430	129	165
in	20.5	10.6	5.6	9.1	.87	4.8	7.9	15.9	6.2	13.8	20.9	1.4	7.1	19	6.6	7.7
mm	521	270	143	230	22	122	200	405	157	351	530	36	181	482	167	195
in	20.5	10.6	5.6	9.1	.87	4.8	7.9	15.9	6.2	13.8	20.9	1.4	7.1	19	6.6	7.7
mm	521	270	143	230	22	122	200	405	157	351	530	36	181	482	167	195
in	25.4	15.5 ^d	5.6	9.1	1/2"-13 thd	1.5	13.3 ^d	15.9	6.2	19.6	22.6	1.4	7.1	23	8.4	9.5
mm	645	394 ^d	143	230	1/2"-13 thd	38	337 ^d	405	157	498	575	36	181	583	213	241
in	n/a	16.6 ^d	n/a	n/a	1/2"-13 thd	1.5	14.3 ^d	n/a	n/a	19.6	n/a	n/a	n/a	18.8	8.4	9.5
mm	n/a	421 ^d	n/a	n/a	1/2"-13 thd	38	362 ^d	n/a	n/a	498	n/a	n/a	n/a	479	213	241
in	14.2	5.3	4.1	6.8	.56	1.9	4.9	7.4	4.1	8.6	25.8	0.9	4.7	12.6	3.2	4.6
mm	360	135	105	172	14	48	125	189	105	219	657	24	119	320	81	116
in	14.3	5.4	4.1	6.8	.56	2.8	4.2	7.4	4.1	9.5	27.7	0.9	4.7	13.5	4.2	5.6
mm	362	137	105	171	14	71	106	189	105	241	705	24	119	343	106	141
in	17	7.5	5	7.7	.69	3.8	5.5	7.4	6.8	10.8	15.6	1.3	5	14.4	5.1	6.6
mm	432	191	127	195	17	95	140	189	174	273	395	32	127	366	129	167

^e Dimension "A" for 2" high capacity strainer is
Dimension "A" for 3" high capacity strainer is

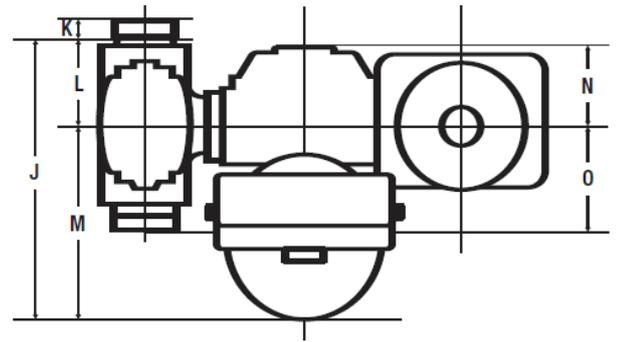
^f Dimension "C" for 2" high capacity strainer is 7.1".
Dimension "C" for 3" high capacity strainer is 8".

^g Dimension "D" for 2" high capacity strainer is 11.7".
Dimension "D" for 3" high capacity strainer is 12.6".

Front view



Top view



A ^e	B	C ^f	D ^g	E	F	G	H	I	J	K	L	M	N	O
14.2 360	5.3 135	4.1 105	6.8 172	.56 14	1.9 48	4.9 125	8.3 213	8.6 219	13.9 352	0.9 24	4.7 119	9.2 233	3.2 81	4.6 116
14.3 362	5.4 137	4.1 105	6.8 171	.56 14	2.8 71	4.2 106	8.3 213	9.5 241	14.9 378	0.9 24	4.7 119	10.2 259	4.2 106	5.6 141
14.3 362	5.4 137	4.1 105	6.8 171	.56 14	2.8 71	4.2 106	8.3 213	9.5 241	14.9 378	0.9 24	4.7 119	10.2 259	4.2 106	5.6 141
17 432	7.5 191	5 127	7.7 195	.69 17	3.8 95	5.5 140	11.5 291	10.8 273	16.1 410	1.3 32	5 127	11.1 283	5.1 129	6.5 165
17 432	7.5 191	5 127	7.7 195	.69 17	3.8 95	5.5 140	n/a n/a	10.8 273	16.1 410	1.3 32	5 127	11.1 283	5.1 129	6.5 165
20.5 521	10.6 270	5.6 143	9.1 230	.87 22	4.8 122	7.9 200	n/a n/a	13.8 351	19.4 494	1.4 36	7.1 181	12.3 313	6.6 167	7.7 195
20.5 521	10.6 270	5.6 143	9.1 230	.87 22	4.8 122	7.9 200	n/a n/a	13.8 351	19.4 494	1.4 36	7.1 181	12.3 313	6.6 167	7.7 195
25.4 645	16.6 ^d 421 ^d	5.6 143	9.1 230	1/2"-13 thd 1/2"-13 thd	1.5 38	13.3 ^d 337 ^d	n/a n/a	19.6 498	21.3 540	1.4 36	7.1 181	14.2 359	8.4 213	9.5 241
25 645	16.6 ^d 421 ^d	5.6 143	9.1 230	1/2"-13 thd 1/2"-13 thd	1.5 38	14.3 ^d 362 ^d	n/a n/a	20 498	21 540	1.4 36	7 181	14 359	8 213	10 241
14.2 360	5.3 135	4.1 105	6.8 172	.56 14	1.9 48	4.9 125	8.3 213	8.6 219	16.4 418	0.9 24	4.7 119	11.7 297	3.2 81	4.6 116
14.3 362	5.4 137	4.1 105	6.8 171	.56 14	2.8 71	4.2 106	8.4 213	9.5 241	17.4 443	0.9 24	4.7 119	12.6 320	4.2 106	5.6 141
17 432	7.5 191	5 127	7.7 195	.69 17	3.8 95	5.5 140	8.7 221	10.8 273	16.2 411	1.3 32	5 127	13.5 343	5.1 129	6.6 167

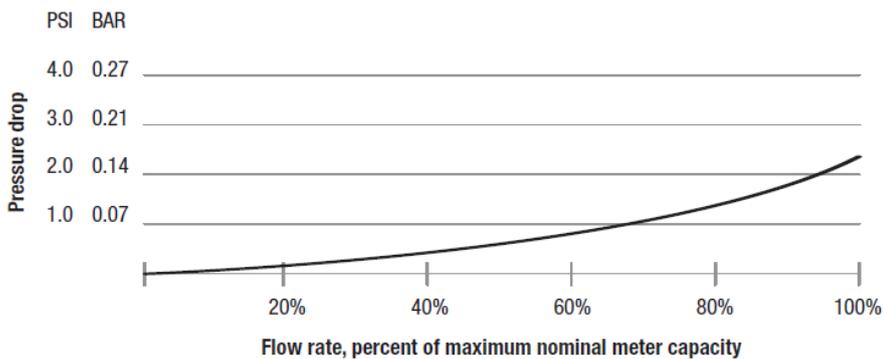
Relationship of meter pressure drop to flow rate and viscosity

With LCE unique design, the bearing surfaces of the meter element are internally and externally subjected to the same system pressure. Due to the low pressure drop inherent to the LCE meter, it is often possible to satisfactorily meter higher viscosity products through a smaller LCE meter than its competitive equivalent.

Pressure drop through a meter depends on product temperature, viscosity and flow rate. When metering a liquid, the pressure drop will increase as viscosity increases. Illustrated below is the pressure loss vs. flow rate curve for an M60 meter at 2271 l/min (600 GPM) on safety solvent.

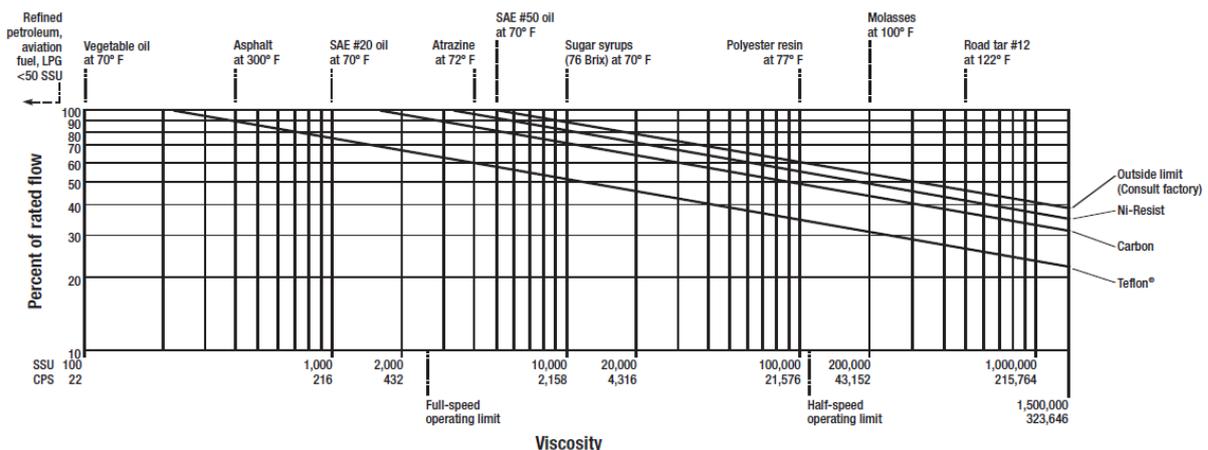
For additional pressure loss data, consult the factory.

Average meter pressure drop vs. flow rate



Meter flow rate limit (percent of rated flow vs. viscosity)

Use the chart below to determine maximum meter flow rate relative to meter bearings material and product viscosity: (1) determine the percent of rated capacity at which the meter will be required to operate; (2) determine product viscosity at system operating temperature; (3) plot the point on the chart where the two lines intersect; (4) determine the meter bearing material from construction/application table above



Construction and application classes

LCE PD meters are suitable for metering a broad range of products as listed below. The appropriate meter class can be used to specify a desired meter by using the table on the next page of this publication.

Class	Description	Bearing Material
1	Refined petroleum products	Ni-Resist
2	Aviation and jet fuel	Ni-Resist
3	Variety of products includes: liquid sugars, sweeteners, syrups, vegetable oils	Ni-Resist
4	Treated waters and solvents where no red metals are allowed	Carbon
7	Chlorinated solvents	Carbon
8	Acid pH liquids includes: nitric, phosphoric, glacial acetic acids, citric juices, vinegar	Carbon
10	LPG	Carbon
14	Crude oil	Ni-Resist
15	Oil- or water-based latex products, polyester resins, adhesives, herbicides, nitrogen fertilizers	Teflon
16	General solvents	Carbon
20	Batch process water meter service	Carbon
27	Alkaline pH liquids: latex products, adhesives, liquid fertilizers	Teflon
30	Herbicides	Carbon
37	Sodium Hydroxide solutions, high sulfur crude oil, alkaline pH liquids	Ni-Resist
47	Mildly abrasive liquids	Ceramic

Purchase specifications

To make certain you receive a meter with the many installation, operating and maintenance advantages of a Liquid Controls product, please include the following statement in your engineering and purchase specifications.

"Meter shall be of the positive displacement design having rotary motion without axial thrust or flow impingement. No eccentric, sliding, reciprocating 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 readout devices shall be non-cyclic without pulsation and capable of 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. Meter measuring element shall have a minimum braking torque and shall immediately respond to product low flow movement."

Ordering information (please refer to chart at right for LC model naming system)

Model: _____ - _____ - _____ - _____ Description: _____

Flow rates: Max. _____ Normal _____ Min. _____

Operating temperatures: Max. _____ Normal _____ Min. _____

Maximum non-shock operating pressure: _____

Maximum viscosity: _____ @ _____ (Temp°/F or C)

Specific gravity: _____ @ _____ (Temp°/F or C)

Construction class: (1, 2, etc.) _____ Seal material: Standard Buna/Viton All Viton All Teflon

Direction of flow: L to R R to L Read out: Gallons Liters Pounds Other _____

Mechanical counter and printer: Zero/Face up Zero/Face down Accumulative

Strainer basket: 40M 80M 100M Other _____

Flange size: _____ Flange type: NPT BSPT Slip weld ANSI DIN Other _____

Options: _____

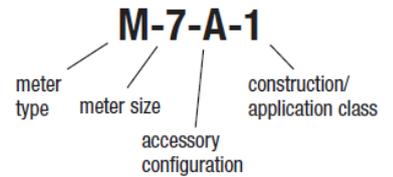
Mounting arrangements

LC meters may be mounted in a variety of configurations, as shown below. Do not mount with cover plate face down or up.
Note: regardless of meter mounting configurations, accessories such as the air/vapor eliminator must always be mounted in a vertical orientation to permit proper operation of the float-actuated apparatus.



* ONLY AVAILABLE ON DIRECT MOUNT PULSER MODELS OR MODELS LESS RESET COUNTER.

Product model numbering system:



-Standard accessory configurations (A, C, I, K): M-7 meter shown

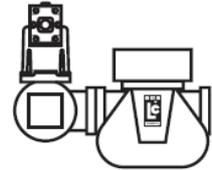
M/MA-7-A

A=Meter with counter



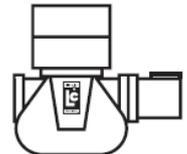
M/MA-7-C

C=Meter with counter, strainer and air eliminator



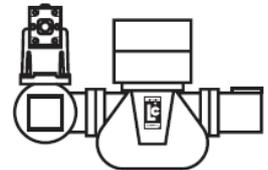
M/MA-7-I

I=Meter with counter, preset counter and preset valve



M/MA-7-K

K=Meter with counter, preset counter, preset valve, strainer and air eliminator



LIQUID CONTROLS EUROPE

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