macnaught positive displacement flowmeters

macnaught wm-SERIES

macnaught m-SERIES

Macnaught Pty Ltd was established in 1948 and is an independent 100% Australian-owned manufacturing company based at Turrella in Sydney, Australia.

Macnaught's M-SERIES™ is a comprehensive range of quality positive displacement flowmeters, designed and manufactured in our factory.

Macnaught has added a new range of meters to the existing range designated WM-SERIES™. This range of meters have the same specifications as the M-SERIES™, with exception that these meters have Weights and Measures certification.

By closely monitoring the needs and knowledge of its international user base, Macnaught strives to continually improve its products and customer service levels to set new standards.

With strong market leadership in Australia, Macnaught products are sold successfully through a distributor network in more than 60 countries. Highlighting the importance placed on export successes and to service the growing needs in multiple regions, Macnaught has sales offices in Singapore, Indonesia, the USA and the UK.

In recognition of the company's achievements, Macnaught has won three Australian National Export Awards and two Australian Design Council Awards.

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macnaught
M-SERIES

Contents

Certificates and Accreditation

Standards Australia

Quality Endorsement
applicable to Macnaught
Head Office Sydney Only

Quality System
Quality Endorsed Company
ISO 9001 LIC 8602
Standards Australia

National Association of Testing Authorities

Macnaught Pty Ltd
Accreditation No: 15485

A test facility that complies with the requirements of ISO/IEC 17025 (2005)

- Flow Measuring devices - Liquid Meters
- Calibration of flow rate and volume on oil 0.25 l/m to 750 l/m

Contact Macnaught
for more information

NATA
WORLD RECOGNISED ACCREDITATION

National Conference on Weights and Measurement

Certificate Number: 07-061

- National Type Evaluation Program
- Certificate of Conformation for Weighing and Measuring Devices
- Meter Indicating Volume (Stationary Application)
- Pulse Output Meters Only
- Meter Types: M10, M40, M50, M80

Contact Macnaught
for more information

Australian Government National Measurement Institute

Interim Certificate of Approval No 5/6B/211

- Meter Indicating Volume (Stationary Application)
- Pulse Output Meters Only
- Meter Types: WM10, WM40, WM50, WM80 and WM100

Contact Macnaught
for more information

meter numbering system

For M05, M1 and M2.

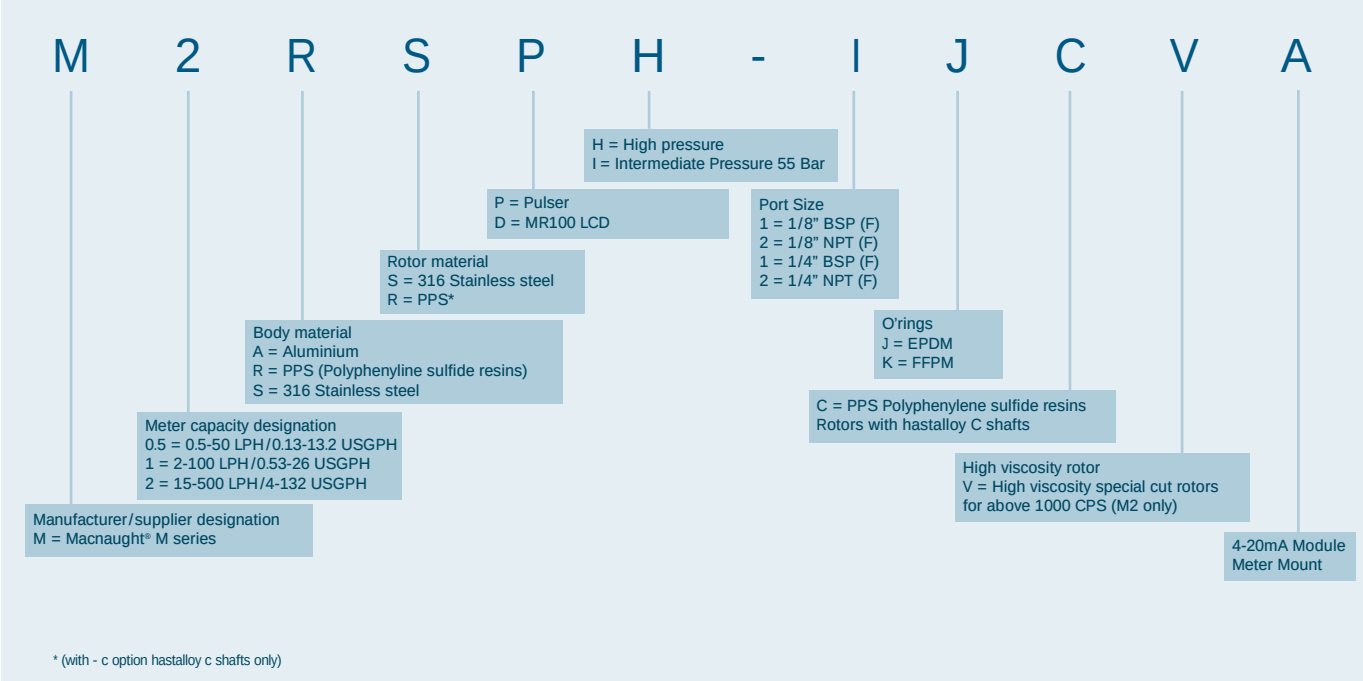
M05ASP-1

M1RRP-1C

M2SSP-1

Specifications

Model	M05	M1	M2
Meter Type	Pulse	Pulse	Pulse
Meter Body Material	Stainless Steel or Aluminium	PPS or Stainless Steel or Aluminium	PPS or Stainless Steel or Aluminium
Wetted Components:	Stainless Steel / Sapphire	Stainless Steel / Ceramic	Stainless Steel / Ceramic
Shafts	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
O'ring	FKM (Standard Model)	FKM (Standard Model)	FKM (Standard Model)
Flow Rate Ranges (Litres Per Hour/US Gallons Per Hour)			
Above 5 cPs	0.5 To 50 / 0.13 To 13.2	2 To 100 / 0.53 To 26.4	15 To 500 / 4 To 132
Below 5 cPs (Excluding Water)	2 To 50 / 0.53 To 13.2	5 To 100 / 1.32 To 26.4	25 To 500 / 6.6 To 132
Accuracy- Within (Of Reading)	± 1%	± 1%	± 1%
Maximum Viscosity	1000 At 100% of flow	1000 Centipoise	1000 Centipoise
Maximum Operating Pressure PSI/KPA	St St 150/1034 (I - 800/5516) AL 75/517	St St 150/1034 (I - 800/5516) (HP 8000/55160) AL/PPS 75/517	St St 150/1034 (I - 800/5516) (HP8000/55160) AL/PPS 75/517
Pulser Type	Dual Output Hall Effect, Reed Switch	Dual Output Hall Effect, Reed Switch	Dual Output Hall Effect, Reed Switch
Pulses Per Litre/Us Gallon	1547/5855.4	1000 / 3785.4 (OPT 2000/7570.8)	400 / 1514.2 (OPT ENCODER)
Dimensions Meter Body	50x50mm / 1.97"X1.97"	50x50mm / 1.97"X1.97"	50x50mm / 1.97"X1.97"
Port Face To Face	65mm / 2.58"	65mm / 2.58"	65mm / 2.58"
Weight	AL 308g / 10.86oz St St 600g / 21.2oz	PPS 240g / 8.5oz AL 308g / 10.86oz St St 600g / 21.2oz HP 3.3kg/116.5oz	PPS 240g / 8.5oz AL 308g / 10.86oz St St 600g / 21.2oz HP 3.3kg/116.5oz
Max. Operating Temperature	AL 80ºc / 176ºF St St 120°C / 248°F	PPS/AL 80°C / 176°F St St 120°C / 248°F	PPS/AL 80°C / 176°F St St 120°C / 248°F
Recommended Mesh Strainer Size	200 Mesh	200 Mesh	200 Mesh



* (with - c option hastalloy c shafts only)

meter numbering system

For M4, M6, M7, M10, WM10, M40, WM40, M50, WM50, M80, WM80, M100 and WM100.

M4 M6 M7 M10 M40 M50 M80 M100

Model	M4	M6	M7	M10	M40	M50	M80	M100
Meter Type	Pulse (Refer to meter numbering system for LCD or mechanical options)			WM10	WM40	WM50	WM80	WM100
Meter Body Material	Aluminium, Stainless Steel, Bronze, PPS							
Wetted Components:								
Rotor Material	PPS or Stainless Steel	PPS / Stainless Steel	PPS or Stainless Steel	PPS or Stainless Steel	PPS or Stainless Steel	PPS or Stainless Steel	Aluminium / Stainless Steel	Aluminium / Stainless Steel
Shafts	Stainless Steel	Stainless Steel	Stainless Steel or Hastalloy	Stainless Steel	Stainless Steel	Stainless Steel	STST / Hardened steel	STST / Hardened steel
O'ring	NBR Standard (For options refer numbering system)	NBR Standard	NBR Standard	NBR Standard	NBR Standard	NBR Standard	NBR Standard	NBR Standard
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)								
Above 5 cPs	2 To 30 / 0.5 To 8	3 To 80 / 0.8 To 21	3 To 80 / 0.8 To 21	6 To 120 / 1.6 To 32	15 - 350	14 - 93	20 To 750 / 5 To 194	120 To 1200 / 32 To 317
Below 5 cPs	3 To 25 / 0.8 To 6.6	8 To 70 / 2 To 18.5	8 To 70 / 2 To 18.5	10 To 100 / 2.6 To 26	HF 15 - 550	HF 4 - 146	66 To 616 / 17 To 163	220 To 1000 / 58 To 264
Accuracy - Within	± 0.5%	± 0.5%	± 0.5%	± 0.5%	± 0.5%	± 0.5%	± 0.5%	± 0.5%
(Of Reading)	Note: Mechanical option is digital ± 1% analogue ± 0.5%							
Maximum Viscosity (Of Standard Model)	1000 cPs (> 1,000,000 With HV Rotors)							
Maximum Operating Pressure	See Relevant Individual Model Specifications							
Pulser Type	Dual Reed Switch (For options refer to numbering system)							
Pulses Per Litre/Us Gallon	112 / 424	52 / 196.8	52 / 196.8	36 / 136.3	14.5 / 54.9	6.68 / 25.29	2.59 / 9.81	2.315 / 8.763
Max. Operating Temperature	80°C / 176°F (For High Temperature Rotors Refer To Meter Numbering System) St St Rotors 120°/248°F							
Strainer Size Recded Mesh	60 Mesh	60 Mesh	60 Mesh	60 Mesh	60 Mesh	40 Mesh	40 Mesh	40 Mesh

M 4 R R P A - I E H T V S L A

- **M** — Manufacturer supplier designation
  M = Macnaught® M-SERIES™
  WM = Macnaught WM-SERIES™ (Weights & Measures approved models)
- **4** — Meter size and capacity
  4 = 1/2" 2-30LPM/0.5-8 US GPM
  6 = 3/4" 3-80 LPM / 0.8-21 US GPM
  7 = 1" 3-80 LPM/0.8-21 US GPM
  10 = 1" 6-120 LPM/1.6-32 US GPM
  40 = 1 1/2" 10-250 LPM/4-93 US GPM
  50 = 2" 15-350 LPM/4-93 US GPM
  50 = 2" 15-550 LPM/4-145 US GPM
  80 = 3" 20-733 LPM/5-194 US GPM
  100 = 4" 120-1200 LPM/52-317 US GPM
- **R** — Body material
  A = AA610 Aluminium
  S = 316 Stainless Steel
  B = Bronze
  R = PPS (Polyphenylene Sulfide Resins)
- **R** — Rotor material
  A = Aluminium
  R = PPS (Polyphenylene Sulfide Resins)
  S = 316 Stainless Steel
  N = PPS High Flow (M50 Only)
- **P** — Display/Pulser
  P = Pulser only
  E = Deluxe LC Display and Pulser
  G = Standard LC Display and Pulser
  D = MR100 LCD
  M = Mechanical registers
- **A** — A = Analogue register
  I = Industrial register
  VR = Veeder-Root Registers
- **-** — Port size
  1 = BSP(F) - Litre, 2 = NPT(F) US Gallons
  3 = ANSI 150lb Flange - Litre, 4 = ANSI 150lb flange - USG
  5 = DIN Flange version, 6 = Tri-clover - Litre and SS only
  7 = Tri-clover - USG, 13 = JIS 10K Flange
- **I** — Hall effect sensor in place of standard reed switch
  (3 wire 4.5 - 24vDC) ER - Hall / Reed Combination
- **E** — High viscosity rotors
  H = High viscosity special cut
  Rotors for above 1000cps
- **H** — High Tempreature PPS
  Rotors (120ºC/248ºF)
- **T** — O'rings
  J = EPDM, K = FEP encapsulated,
  V = FKM
- **V** — Solvent kit - mechanical version only Included in St St Models
- **S** — NPT - PORT
  Litre calibration
- **L** — 4-20mA Module
  Meter Mount
- **A**

M05 – 1/8” pulse meters

The M05 is a small capacity meter in the M-SERIES™ range and is differentiated by its flow rate capabilities. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

MR100

Features

- Very compact size.
- Low flow capability with high resolution output.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Solid state Hall Effect Sensor/Reed Combination.
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Has IP54/NEMA13 protection.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).

M05ASP-X

Specification:

MODEL	M05SSP-X	M05ASP-X
Meter Type	Pulse	Pulse
Meter Body Material	316 Stainless Steel	Aluminium / PPS
Wetted Components:		
Rotor Material	316 Stainless Steel / Ceramic	316 Stainless Steel / Bronze
Shafts	316 Stainless Steel	316 Stainless Steel
O'ring	FKM	FKM
Flow Rate Ranges (Litres Per Hour/US Gallons Per Hour)		
Above 5 cPs	0.5 To 50 / 0.13 To 13.2	0.5 To 50 / 0.13 To 13.2
Below 5 cPs	2 To 50 / 0.53 To 13.2 (Excluding Water)	2 To 50 / 0.53 To 13.2
Accuracy- Within (Of Reading)	+/- 1%	+/- 1%
Repeatability	0.03%	0.03%
Maximum Viscosity	1000 Centipoise	1000 Centipoise
Maximum Operating Pressure	1000kpa/ 150psi/ 10bar “I” 5500kpa/ 800psi/ 55bar	500kpa/ 75psi/ 5bar
Pulser Type	Dual Hall Effect Sensor/ Reed Switch	Dual Hall Effect Sensor/ Reed Switch
Pulses Per Litre/US Gallon	1547 / 5855.4	1547 / 5855.4
Model Dimensions		
Meter Body	50x50mm / 1.97”X1.97”	50mm X 50mm/1.97” X 1.97”
Port Face To Face	67mm / 2.64”	60mm / 2.36”
Weight	600g / 21.2oz	310g / 11oz
Max. Operating Temperature	120°C / 248°F	80°C / 176°F
Recommended Mesh Strainer	200 Mesh	200 Mesh

X = Port Size To order flowmeter you must replace ‘X’ with the relevant number.
Meter mounted options = MR100 LCD and or MR150LA (4-20mA - module) or combination of both.

Port Size:

Port Size:	Calibrated In:	Electrical Connections
1 = 1/8” BSP (F) ports	litres	1m/39” pulser fly lead (5 core cable)
2 = 1/8” NPT (F) ports	US gallons	1m/39” pulser fly lead (5 core cable)

PPS = Polyphenylene Sulfide Resins
Note: Water usage is limited due to poor lubricating quality of the fluid limiting accuracy and bottom end stable operation.

M05 – 1/8” pulse meters

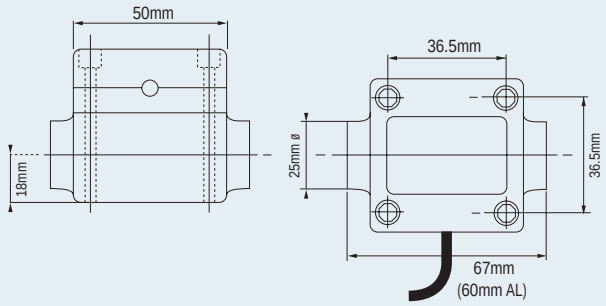
Options and accessories

M05 - 1/8” Pulse Meters	M05SSP-X	M05ASP-X
FKM O-Ring	●	●
FFPM Elastomer	○	○
EPDM O-Ring	○	○
High Temp Rotors	–	–
High Viscosity Rotors	–	–
Hall Effect Sensor	●	●
Reed Switch	●	●
Solvent Kit	–	–
PPS Rotors With Hastalloy C Shafts	–	–
Remote Mounted LC Display	+	+
4-20ma Module (Remote)	+	+
Meter Mounted LC Display	+	+
Meter Mounted 4-20mA Module	+	+

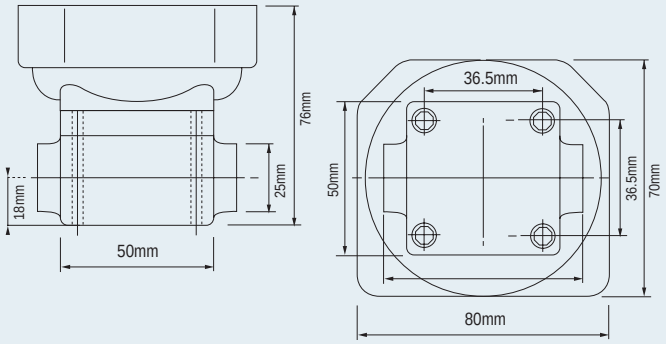
● Standard ○ Optional – Not Available + Accessory

Dimensions

Standard meter



Standard meter with MR100



Generic Diagram for M05/M1/M2 (fitted with MR100 Register)

Note: When MR150 is fitted the O/A height increases by 22mm for each model. (Sizes are common,) as shown in plan view.

M1 – 1/4” pulse meters

The M1 is a small capacity meter in the M-SERIES™ range and is differentiated by its flow rate capabilities. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

M1RSP-X

MR100

Features

- Very compact size.
- Low flow capability with high resolution output.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Solid state Hall Effect Sensor/Reed Combination.
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Has IP54/NEMA13 protection.

  MISSPH-XY IP65-NEMA 9
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).

M1SSPH-X

Specification:

MODEL	M1RSP-X	M1SSP-X	M1SSPH-X	M1ASP-X
Meter Type	Pulse	Pulse	Pulse	Pulse
Meter Body Material	PPS	316 Stainless Steel	316 Stainless Steel	Aluminium / PPS
Wetted Components:				
Rotor Material	316 Stainless Steel / Ceramic	316 Stainless Steel / Ceramic	316 Stainless Steel / Ceramic	316 Stainless Steel / Bronze
Shafts	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
O'ring	FKM	FKM	FKM	FKM
Flow Rate Ranges (Litres Per Hour/US Gallons Per Hour)				
Above 5 cPs	2 To 100 / 0.53 To 26.4	2 To 100 / 0.53 To 26.4	2 To 100 / 0.53 To 26.4	2 To 100 / 0.53 To 26.4
Below 5 cPs (Excluding Water)	5 To 100 / 1.32 To 26.4	5 To 100 / 1.32 To 26.4	5 To 100 / 1.32 To 26.4	5 To 100 / 1.32 To 26.4
Accuracy- Within (Of Reading)	+/- 1%	+/- 1%	+/- 1%	+/- 1%
Repeatability	0.03%	0.03%	0.03%	0.03%
Maximum Viscosity	1000 Centipoise	1000 Centipoise	1000 Centipoise	1000 Centipoise
Maximum Operating Pressure	500kpa/ 75 Psi/ 5 Bar	1000kpa/ 150psi/ 10bar	55160kpa/ 8000psi/ 551bar	500kpa/ 75psi/ 5bar
Pulser Type	Dual Hall Effect Sensor/ Reed Switch	Dual Hall Effect Sensor/ Reed Switch	Hall Effect Sensor or Reed Switch	Dual Hall Effect Sensor/ Reed Switch
Pulses Per Litre/US Gallon	1000 / 3785.4	1000 / 3785.4	1000 / 3785.4	1000 / 3785.4
Model Dimensions				
Meter Body	50x50mm / 1.97”X1.97”	50x50mm / 1.97”X1.97”	86mm Dia X 110mm H/3.4” Dia X 4.33” H	50mm X 50mm/1.97” X 1.97”
Port Face To Face	67mm / 2.64”	67mm / 2.64”	83mm / 3.26”	60mm / 2.36”
Weight	240g / 8.5oz	600g / 21.2oz	3.3kg / 116.5oz	310g / 11oz
Max. Operating Temperature	80°C / 176°F	120°C / 248°F	120°C / 248°F	80°C / 176°F
Recommended Mesh Strainer	200 Mesh	200 Mesh	200 Mesh	200 Mesh

X = Port Size To order flowmeter you must replace ‘X’ with the relevant number.
Meter mounted options = MR100 LCD and or MR150LA (4-20mA - module) or combination of both.

Port Size:

Port Size:		Calibrated In:	Electrical Connections
1 = 1/4” BSP (F) ports		litres	1m/39” pulser fly lead (5 core cable)
2 = 1/4” NPT (F) ports		US gallons	1m/39” pulser fly lead (5 core cable)
1 = 1/4” BSP (F) ports	HP only with	litres	20mm (F) Conduit Thread
2 = 1/4” NPT (F) ports	pulser cap	US gallons	1/2” NPT (F)

PPS = Polyphenylene Sulfide Resins
Note: Water usage is limited due to poor lubricating quality of the fluid limiting accuracy and bottom end stable operation.

M1 – 1/4” pulse meters

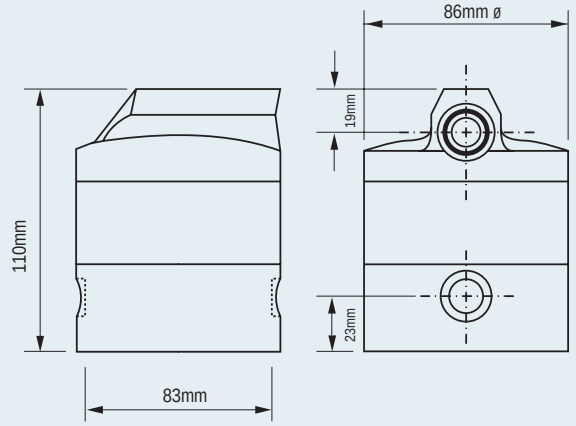
Options and accessories

M1 - 1/4” Pulse Meters	M1RSP-X	M1SSP-X	M1SSPH-X	M1ASP-X
FKM O-Ring	●	●	●	●
FFPM Elastomer	○	○	○	○
EPDM O-Ring	○	○	○	○
High Temp Rotors	–	–	–	–
High Viscosity Rotors	–	–	–	–
Hall Effect Sensor	●	●	●	●
Reed Switch	●	●	●	●
Solvent Kit	–	–	–	–
PPS Rotors With Hastalloy C Shafts	○	–	–	–
Remote Mounted LC Display	+	+	+	+
4-20ma Module (Remote)	+	+	+	+
Meter Mounted LC Display	+	+	+	+
Meter Mounted 4-20mA Module	+	+	+	+

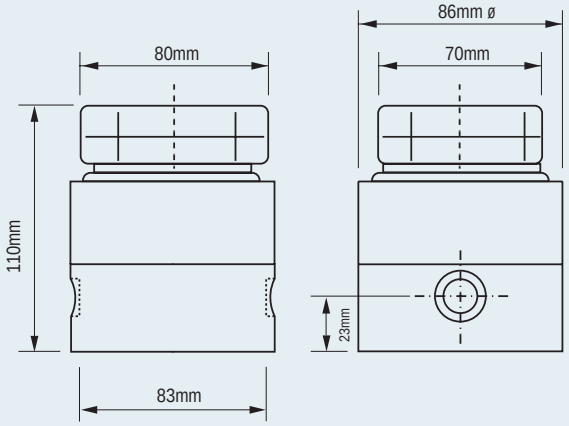
● Standard ○ Optional – Not Available + Accessory

Dimensions

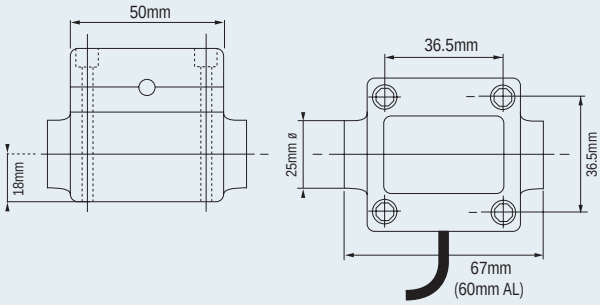
High pressure meter



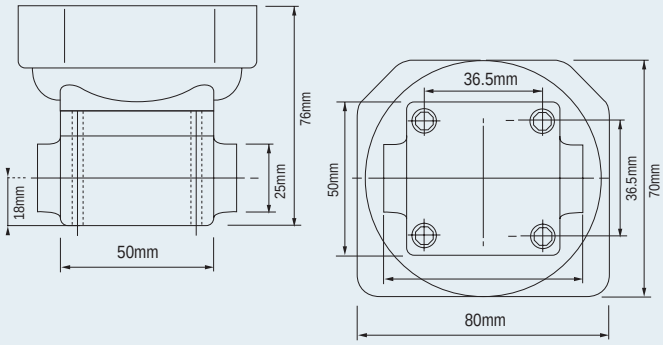
High pressure meter with MR100



Standard meter



Standard meter with MR100



Generic Diagram for M05/M1/M2 (fitted with MR100 Register)

Note: When MR150 is fitted the O/A height increases by 22mm for each model. (sizes are common,) as shown in plan view.

M2 – 1/4” pulse meters

The M2 is one of the small capacity meters in the M-SERIES™ range and is differentiated by its flow rate capabilities. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

M2SSP-X

M2SSPH-X

Features:

- Very compact size.
- Low flow capability with high resolution output.
- Solid state Hall Effect Sensor/Reed Switch Combination.
- Has IP54/NEMA13 protection. (M2SSPH-XY IP65/NEMA9)
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter design minimises the number of wearable and replaceable parts and extends product life.

Specifications:

MODEL	M2RSP-X	M2SSP-X	M2SSPH-X	M2ASP-X
Meter Type	Pulse	Pulse	Pulse	Pulse
Meter Body Material	PPS	316 Stainless Steel	316 Stainless Steel	Aluminium
Wetted Components:				
Rotor Materials	316 Stainless Steel / Ceramic	316 Stainless Steel / Ceramic	316 Stainless Steel / Ceramic	316 Stainless Steel / Ceramic
Shafts	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel
O'ring	FKM	FKM	FKM	FKM
Flow Rate Ranges (Litres Per Hour/US Gallons Per Hour)				
Above 5 cPs	15 To 500 / 4 To 132	15 To 500 / 4 To 132	15 To 500 / 4 To 132	15 To 500 / 4 To 132
Below 5 cPs	25 To 500 / 7 To 132 (Excluding Water)	25 To 500 / 7 To 132	25 To 500 / 7 To 132	25 To 500 / 7 To 132
Accuracy- Within (of reading)	+/- 1%	+/- 1%	+/- 1%	+/- 1%
Repeatability	0.03%	0.03%	0.03%	0.03%
Maximum Viscosity	1000 Centipoise (> 1000 Option)	1000 Centipoise (> 1000 Option)	1000 Centipoise (> 1000 Option)	1000 Centipoise (> 1000 Option)
Maximum Operating Pressure	500kpa/ 75 Psi/ 5 Bar	1000kpa/ 150psi/ 10bar	55000kpa/8000psi/550Bar (Intermediate 5500kpa/800psi/ 55Bar)	500kpa/ 75psi/ 5bar
Pulser Type	Dual Hall Effect Sensor/Reed Switch	Dual Hall Effect Sensor/Reed Switch	Hall Effect Sensor or Reed Switch	Dual Hall Effect Sensor/Reed Switch
Pulses Per Litre/Us Gallon	400 / 1514.2	400 / 1514.2	400 / 1514.2	400 / 1514.2
Model Dimensions				
Meter Body	50x50mm / 1.97”X1.97”	50x50mm / 1.97”X1.79”	86mm Dia X 110mm H / 3.4” Dia X 4.33” H	50mm X 50mm / 1.97” X 1.97”
Port Face To Face	67mm / 2.64”	67mm / 2.64”	83mm / 3.26”	60mm / 2.36”
Weight	240g / 8.5oz	600g / 21.2oz	3.3kg /116.5oz	320g /12g
Max. Operating Temperature	80°C / 176°F	120°C / 248°F	120°C / 248°F	80°C / 176°F
Recommended Mesh Strainer Size	200 Mesh	200 Mesh	200 Mesh	200 Mesh

X = Port Size To order flowmeter you must replace ‘X’ with the relevant number.
Meter mounted MR100 LCD and or MR150LA (4-20mA module)
Special variant - Hi viscosity rotors for above 1000 cPs fluids.

Port Size:

Port Size:		Calibrated In:	Electrical Connections
1 = 1/4” BSP (F) ports		litres	1m/39” pulser fly lead (5 core cable)
2 = 1/4” NPT (F) ports		US gallons	1m/39” pulser fly lead (5 core cable)
1 = 1/4” BSP (F) ports	HP only with	litres	20mm (F) Conduit Thread
2 = 1/4” NPT (F) ports	pulser cap	US gallons	1/2” NPT (F)
6 = TRI-CLOVER™		Litres	1m/39” pulser fly lead (5 core cable)
7 = TRI-CLOVER™		US gallons	1m/39” pulser fly lead (5 core cable)

PPS = Polyphenylene Sulfide Resins
Note: Water usage is limited due to poor lubricating quality of the fluid limiting accuracy and bottom end stable operation.

M2 – 1/4” pulse meters

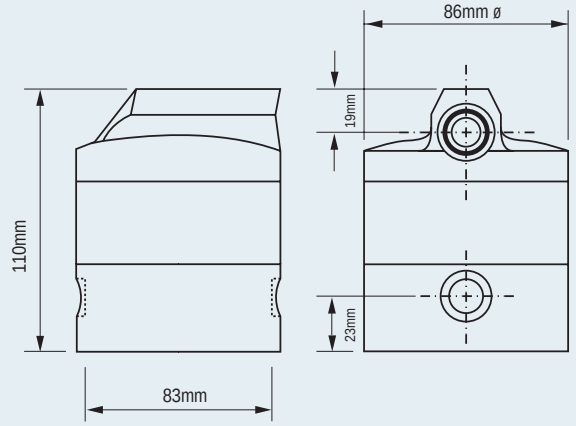
Options and accessories

M2 - 1/4” PULSE METERS	M2RSP-X	M2SSP-X	M2SSPH-X	M2ASP-X
FKM O-Ring	●	●	●	●
FFPM Elastomer	○	○	○	○
EPDM O-Ring	○	○	○	○
High Temp Rotors	–	–	–	–
High Viscosity Rotors	○	○	○	○
Hall Effect Sensor	●	●	○	●
Reed Switch	●	●	●	●
Solvent Kit	–	–	–	–
PPS Rotors With Hastalloy C Shafts	○	–	–	–
Remote Mounted LC Display	+	+	+	+
4-20ma Module (Remote)	+	+	+	+
Meter Mounted LC Display	+	+	+	+
Meter Mounted 4-20mA Module	+	+	+	+

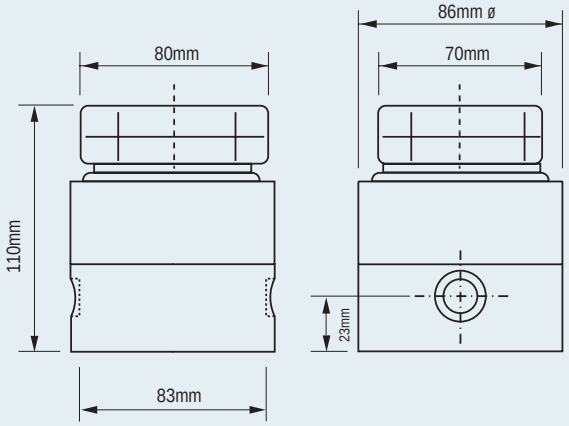
● Standard ○ Optional – Not Available + Accessory

Dimensions

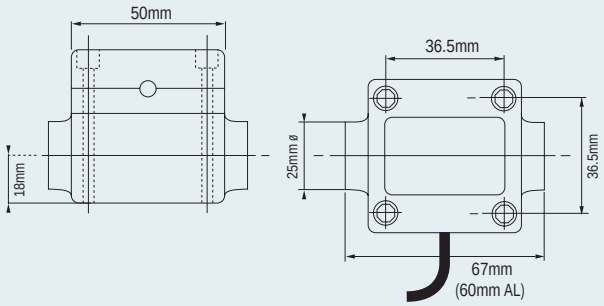
High pressure meter



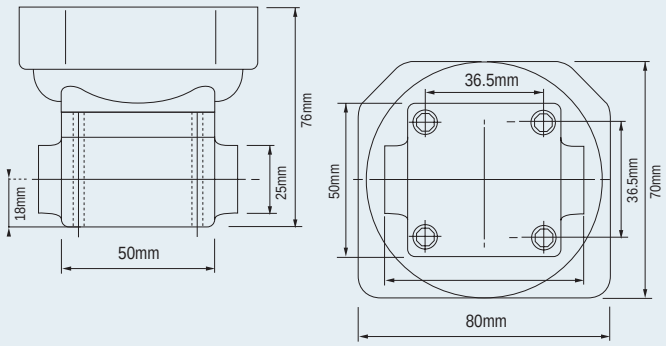
High pressure meter with MR100



Standard meter



Standard meter with MR100



Generic Diagram for M05/M1/M2 (fitted with MR100 Register)

Note: When MR150 is fitted the O/A height increases by 22mm for each model. (sizes are common,) as shown in plan view.

positive displacement flow meters

M4 – 1/2” pulse and LC display meters

The M4 is a low to medium flow range model. It is a compact meter that has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

M4ARP-X

Features

- Compact size.
- Two independent pulse units.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- All LC Displays meet European CE directive for EMC.
- Display/Pulse Version has IP65/NEMA9 protection.
- Intrinsically safe LC Deluxe & Standard Displays. Certificate of conformity number PTB Nr. Ex-93.C.4033x & KEMA O5ATEX1168X

Standard LC Display

Deluxe LC Display

MR100

Specification:

Model	M4
Meter Type	Pulse / Standard LC Display / Deluxe LC Display/MR100 Display
Meter Body Material	Aluminium / 316 Stainless Steel / Bronze
Wetted Components:	
Rotor Material	PPS / 316 Stainless Steel
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 cPs	2 To 30 / 0.5 To 8
Below 5 cPs	3 To 25 / 0.8 To 6.60
Accuracy- Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (Optional Hi Viscosity Rotors)
Maximum Operating Pressure	5500kpa/ 800 Psi/ 55 Bar
Pulser Type	Hall Effect or Reed Switch or Combination HE / RS
Pulses Per Litre/Us Gallon	112/424
Max. Operating Temperature	80°C / 176°F, High Temp Option120°C / 248°F
Recommended Mesh Strainer Size	60 Mesh

*Note: For doubled pulse output or SAA flame proof certification use M5 series models (contact for more info)

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated In:	Electrical Connections
1 = 1/2” BSP (F) ports	Litres	20mm (F) Conduit Thread
2 = 1/2” NPT (F) ports	US Gallons	1/2” NPT

PPS = Polyphenylene Sulfide Resins

Special Models

M4SSPH-X	High Pressure Version
Threaded Versions Only	200 Bar / 2900 PSI Working Pressure

Available Options: Pulse LC Displays - Hi Viscosity Rotors

M4 – 1/2” pulse and LC display meters

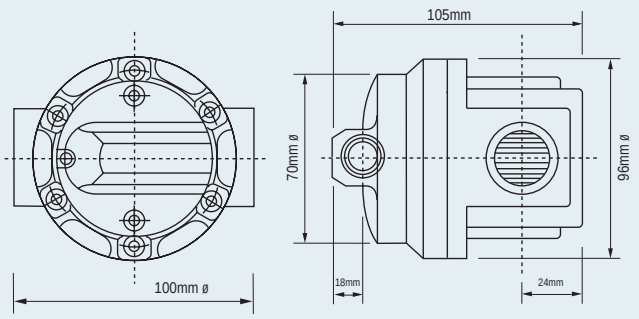
Options and accessories

M4 - 1/2” PULSE AND LC DISPLAY METERS	M4ARX-X	M4ASX-X	M4SRX-X	M4SSX-X	M4BRX-X
FKM O-Ring	○	○	○	○	○
FEP O-Ring	○	○	○	○	○
EPDM O-Ring	○	○	○	○	○
High Temp Rotors	○	●	○	●	○
High Viscosity Rotors	○	○	○	○	○
Hall Effect Sensor	○	○	○	○	○
Reed Switch	●	●	●	●	●
Solvent Kit	–	–	–	–	–
Hastalloy C Shafts	–	–	–	–	–
Protective Boot Deluxe LCD	–	+	+	+	○
Protective Boot Standard Display	–	+	+	+	○
Remote Mounted LC Display	+	+	+	+	+
Heating Jacket	–	–	–	–	–
4-20mA Module (Meter or Remote Mount)	+	+	+	+	+

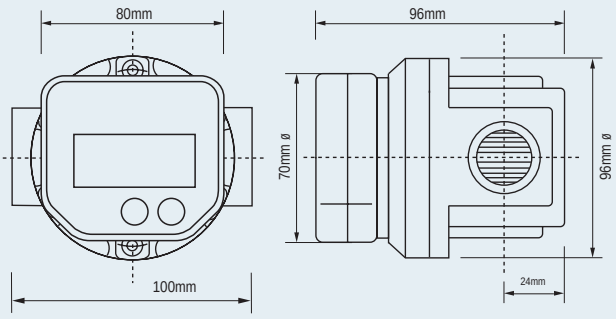
● Standard ○ Optional – Not Available + Accessory

Dimensions

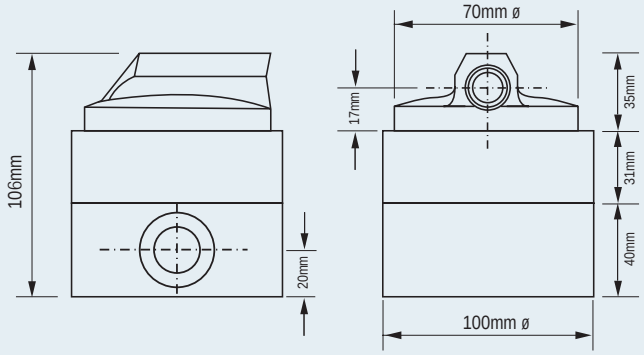
Standard display H 122mm x W 137mm.
Deluxe display H 122mm x W 137mm.



MR100 display H 70mm x W 80mm.



M4SSPH high pressure version



positive displacement flow meters

M4 – 1/2” meters with mechanical register

The M4 is a low to medium flow range model. It is a compact meter that has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

Features

- Compact size.
- Easy to read and operate mechanical register.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Meter design minimises the number of wearable and replaceable parts and extends product life.

M4ARM-X

Mechanical Register

MH450 Industrial Register

Specification:

Model	M4
Meter Type	Meter With Mechanical Register
Meter Body Material	Aluminium / 316 Stainless Steel / Bronze
Wetted Components:	
Rotor Material	PPS Only
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges	
(Litres Per Minute/US Gallons Per Minute)	
Above 5 cPs	2 To 30 / 0.5 To 8
Below 5 cPs	3 To 25 / 0.8 To 6.60
Accuracy- Within (Of Reading)	+/- 1%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise
Maximum Operating Pressure	3400kpa/ 34 Bar / 500 Psi
Max. Operating Temperature	80°C / 176°F, High Temp Option 120°C / 248°F
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated In:
1 = 1/2” BSP (F) ports	Litres
2 = 1/2” NPT (F) ports	US Gallons

PPS = Polyphenylene Sulfide Resins

M4 – 1/2” meters with mechanical register

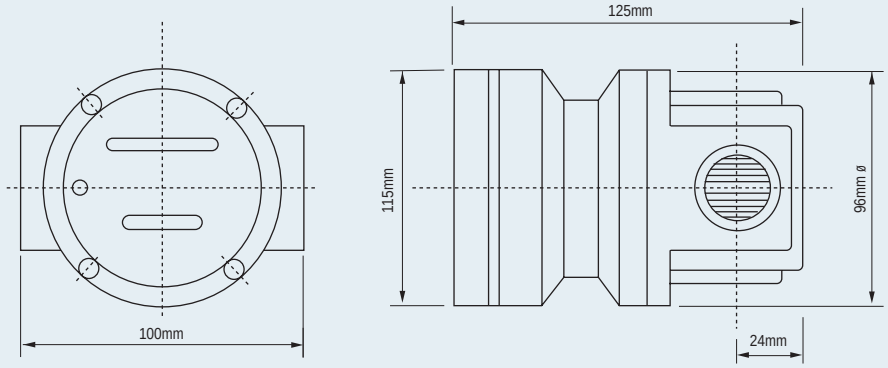
Options and accessories

M4 - 1/2” METERS WITH MECHANICAL REGISTER	M4ARM-X	M4SRM-X	M4ARMI-X	M4SRMI-X
FKM O-Ring	○	○	○	○
FEP O-Ring	○	○	○	○
EPDM O-Ring	○	○	○	○
High Temp Rotors	○	○	○	○
High Viscosity Rotors	○	○	○	○
Hall Effect Sensor	–	–	–	–
Reed Switch	–	–	–	–
Solvent Kit	○	○	○	○
Hastalloy C Shafts	–	–	–	–
Protective Boot	+	+	–	–
Remote Mounted LC Register	–	–	–	–
Heating Jacket	–	–	–	–
4-20mA Module	–	–	–	–
Protective Boot	○	○		

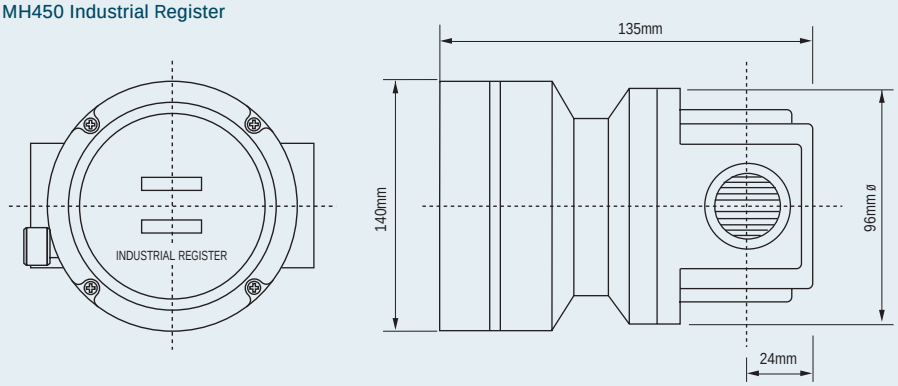
● Standard ○ Optional – Not Available + Accessory

Dimensions

Mechanical Register



MH450 Industrial Register



positive displacement flow meters

M6 – 3/4” Pulse and LC display meters

The M6 is a low to medium flow range model. It is a compact meter that has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

M6ARP-X

Features

- Compact size.
- Two independent pulse units.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- All LC Displays meet European CE directive for EMC.
- Display/Pulse Version has IP65/NEMA9 protection.
- Intrinsically safe LC Deluxe & Standard Displays. Certificate of conformity number PTB Nr. Ex-93.C.4033x & KEMA O5ATEX 1168X

Standard LC Display

Deluxe LC Display

MR100

Specification:

Model	M6
Meter Type	Pulse / Standard LC Display / Deluxe LC Display/ MR100 Display
Meter Body Material	Aluminium / Bronze
Wetted Components:	
Rotor Material	PPS / St St
Shafts	316 St St
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 cPs	3 To 80 / 0.8 To 21
Below 5 cPs	8 To 70 / 2 To 18.5
Accuracy - Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (Optional Hi Viscosity Rotors)
Maximum Operating Pressure	5,500kpa / 800psi / 55bar
Pulser Type	Hall Effect or Reed Switch or Combination HE / RS
Pulses Per Litre/US Gallon	52/196.8
Max. Operating Temperature	80°C / 176°F (Optional 120ºC/248ºF)
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated In:	Electrical Conduit Connection:
1 = 3/4” BSP (F) ports	Litres	20mm (F)
2 = 3/4” NPT (F) ports	US Gallons	1/2” NPT (F)

PPS = Polyphenylene Sulfide Resins

M6 – 3/4” Pulse and LC display meters

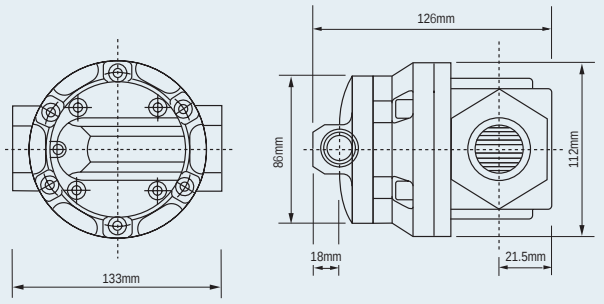
Options and accessories

M6 - 3/4” PULSE AND LC DISPLAY METERS	M6ARP-X	M6ASP-X	M6ARG-X	M6ARD-X	M6ARE-X
FKM O-Ring	○	○	○	○	○
FEP O-Ring	○	○	○	○	○
EPDM O-Ring	○	○	○	○	○
High Temp Rotors	○	–	–	–	–
High Viscosity Rotors	○	○	○	○	○
Hall Effect Sensor	○	○	○	○	○
Reed Switch	●	●	●	●	●
Solvent Kit	–	–	–	–	–
Hastalloy C Shafts	–	–	–	–	–
Protective Boot Deluxe LCD	–	–	+	–	+
Protective Boot Standard Display	○	○	–	–	–
Remote Mounted LC Display	+	+	+	+	+
Heating Jacket	○	○	○	○	○
4-20mA Module Meter or Remote Mount	+	+	+	+	+

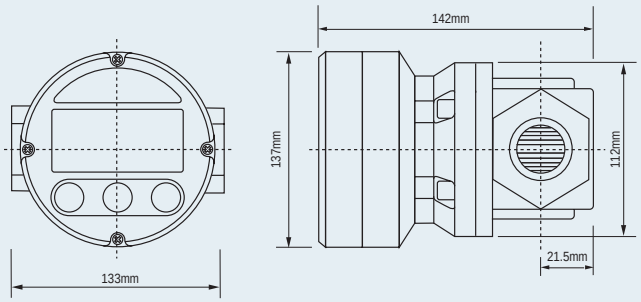
● Standard ○ Optional – Not Available + Accessory

Dimensions

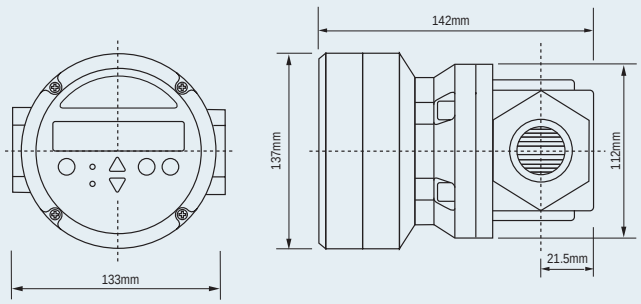
Pulse



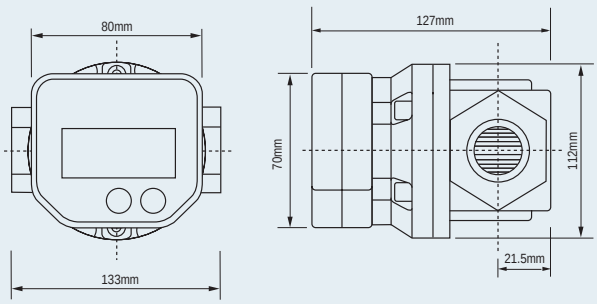
Standard Display



Deluxe Display



MR100



positive displacement flow meters

M7 – 1” Pulse and LC display meters

The M7 is a specialised meter for aggressive chemicals and water based products. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

M7RRP-X

Features

- Compact size.
- Two independent pulse units.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Meter accuracy is verified by factory calibration check after which an individual metrology report is issued.
- LCD & Pulse Version have IP65/NEMA9 protection.

Standard LC Display

Deluxe LC Display

MR100

Specification:

Model	M7
Meter Type	Pulse / Standard LC Display / Deluxe LC Display / MR100 LC Display
Meter Body Material	PPS
Wetted Components:	
Rotor Material	PPS / St St
Shafts	316 St St Or Hastalloy C (Optional Meter Model Designation - C)
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 cPs	3 To 80 / 0.8 To 21
Below 5 cPs	8 To 70 / 2 To 18.5
Accuracy- Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (Optional High Viscosity Rotors)
Maximum Operating Pressure	1000kpa / 150psi / 10bar
Pulser Type	Hall Effect or Reed Switch or Combination HE / RS
Pulses Per Litre/Us Gallon	52/196.8
Max. Operating Temperature	80°C / 176°F (120ºC / 248ºF S/S Rotors)
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated In:	Electrical Conduit Connection:
1 = 1” BSP (F) ports	Litres	20mm (F)
2 = 1” NPT (F) ports	US Gallons	1/2” NPT (F)

PPS = Polyphenylene Sulfide Resins

Special Models

M7ARPH-XR	High Pressure Version (Aluminium)
Threaded Versions Only	250 Bar / 3625 PSI Maximum Working Pressure

Available Options: Pulse LC Displays, ST ST Rotors, Hi Viscosity Rotors

M7 – 1” Pulse and LC display meters

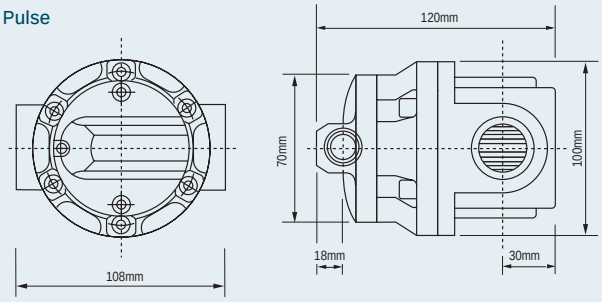
Options and accessories

M7 - 1” PULSE AND LC DISPLAY METERS	M7RRP-X	M7RRG-X	M7RRE-X	M7RRD-X
FKM O-Ring	○	○	○	○
FEP O-Ring	○	○	○	○
EPDM O-Ring	○	○	○	○
High Temp Rotors	–	–	–	–
High Viscosity Rotors	–	–	–	–
Hall Effect Sensor	○	○	○	○
Reed Switch	●	●	●	●
Solvent Kit	–	–	–	–
Hastalloy C Shafts	○	○	○	○
Protective Boot Deluxe LCD	–	+	+	–
Protective Boot Standard Display	–	○	–	–
Remote Mounted LC Display	+	+	+	+
Heating Jacket	–	–	–	–
Stainless Steel Rotors (Hi Temp 120ºC/248ºF)	○	○	○	○
4-20mA Module Meter or Remote Mount	+	+	+	+

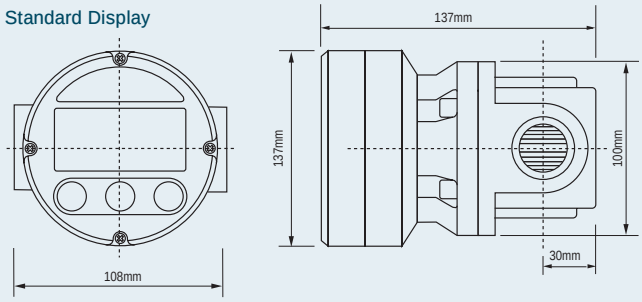
● Standard ○ Optional – Not Available + Accessory

Dimensions

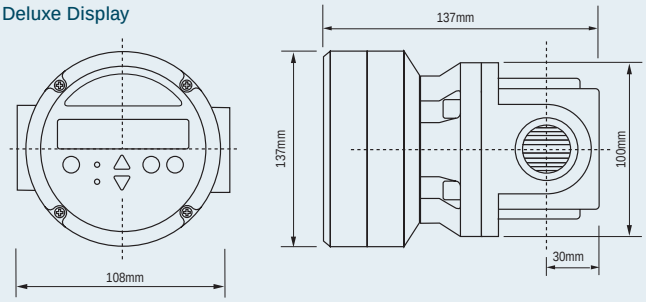
Pulse



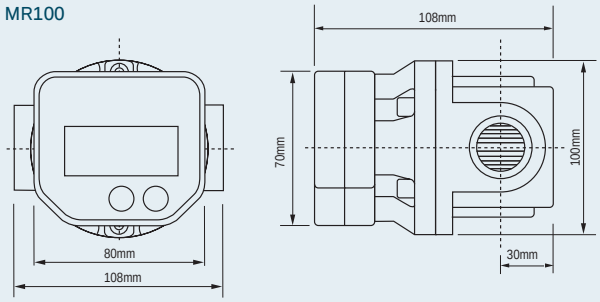
Standard Display



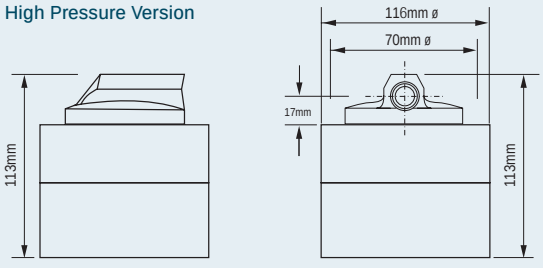
Deluxe Display



MR100



High Pressure Version



Macnaught Pty Ltd reserves the right to modify or alter product materials, dimensions, design and construction, when necessary, to improve the performance of our products. Please check with your local distributor or Macnaught to confirm current specifications of our products.

positive displacement flow meters

WM10 – 1” pulse meters M10 – 1” pulse and LC display meters

The M10 is the medium capacity meter in the M-SERIES™ range. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

M10ARP-X

Features

- Compact size.
- Two independent pulse units which can be linked to allow doubling of the pulse output.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- LC Display meets European CE directive for EMC.
- Deluxe/Standard Displays Pulse Version have IP65/NEMA9 protection.
- Intrinsically safe LC Deluxe & Standard Displays. Certificate of conformity numbers PTB Nr. Ex-93.C.4033x & KEMA O5ATEX1168X
- Pulse versions have Flameproof Certification AUS Ex2377x

Standard LC Display

Deluxe LC Display

MR100

Specification:

Model	M10/WM10
Meter Type	Pulse / Standard LC Display / Deluxe LC Display / MR100 LC Display
Meter Type	Pulse / LCD
Meter Body Material	Aluminium / 316 Stainless Steel / Bronze
Wetted Components:	
Rotor Material	PPS / 316 Stainless Steel
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 cPs	6 To 120 / 1.6 To 32
Below 5 cPs	10 To 100 / 2.6 To 26
Accuracy - Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (optional hi viscosity rotors)
Maximum Operating Pressure	5500kpa/ 800 Psi/ 55 Bar Flange Rule Where Fitted
Pulser Type	Hall Effect or Reed Switch or Combination HE / RS
Pulses Per Litre/Us Gallon	36 /136.3 With Dual Pulse Output 72 / 272.6
Max. Operating Temperature	80°C / 176°F / High Temp Option 120°C / 248°F
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:	Electrical Conduit Connection:
1 = 1” BSP (F) ports	Litres	20mm (F)
2 = 1” NPT (F) ports	US Gallons	1/2” NPT (F)
3 = 1” ANSI 150lb Flange	Litres	20mm (F)
4 = 1” ANSI 150lb Flange	US Gallons	1/2” NPT (F)
5 = 25mm DIN 16 Flange	Litres	20mm (F)
6 = 1” Triclover Flange	Litres	20mm (F)
7 = 1” Triclover Flange	US Gallons	1/2” NPT (F)
13=25mm JIS 10K Flange	Litres	20mm (F)

PPS = Polyphenylene Sulfide Resins
Bronze = Available in 1 or 2 port configuration only
Note: See relevant Flange Technical Information on page 45

Special Models

M10ARPH-X	High Pressure Version
M10SSPH-X	High Pressure Version
Threaded Versions Only	Working Pressure 13800 kPa / 2000 PSI / 138 BAR

Available Options: All as listed

STANDARDS AUSTRALIA
Flameproof Approval

WM10 – 1” pulse meters
M10 – 1” pulse and LC display meters

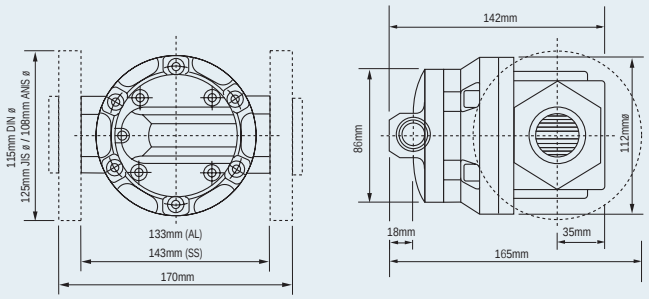
Options and accessories

WM10 - 1” PULSE AND LC DISPLAY METERS M10 - 1” PULSE AND LC DISPLAY METERS	WM10ARX-X M10ARX-X	WM10ASX-X M10ASX-X	WM10SRX-X M10SRX-X	WM10SSX-X M10SSX-X	WM10BRX-X M10BRX-X
FKM O-Ring	○	○	○	○	○
FEP O-Ring	○	○	○	○	○
EPDM O-Ring	○	○	○	○	○
High Temp Rotors	○	●	○	●	○
High Viscosity Rotors	○	○	○	○	○
Hall Effect Sensor	○	○	○	○	○
Reed Switch	●	●	●	●	●
Solvent Kit	–	–	–	–	–
Hastalloy C Shafts	–	–	–	–	–
Protective Boot Deluxe LCD	+	+	+	+	+
Protective Boot Standard Display	+	+	+	+	+
Remote Mounted LC Display	+	+	+	+	+
Heating Jacket	+	+	+	+	+
4-20mA Module	+	+	+	+	+

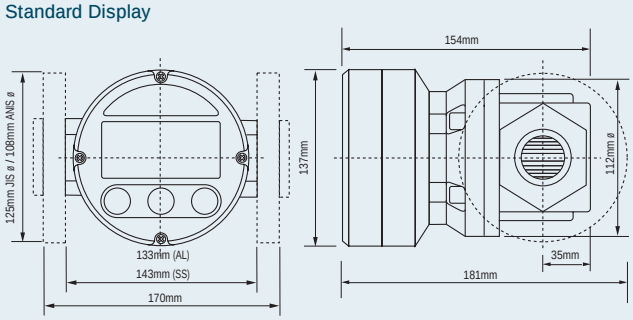
● Standard ○ Optional – Not Available + Accessory

Dimensions

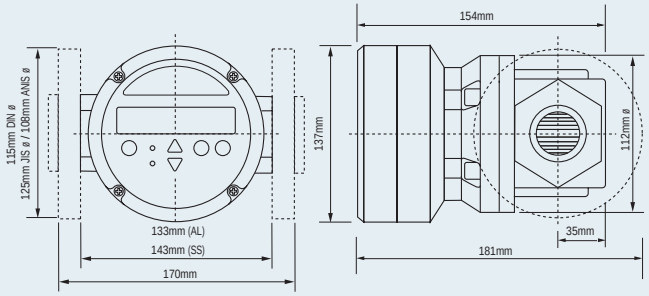
Pulse



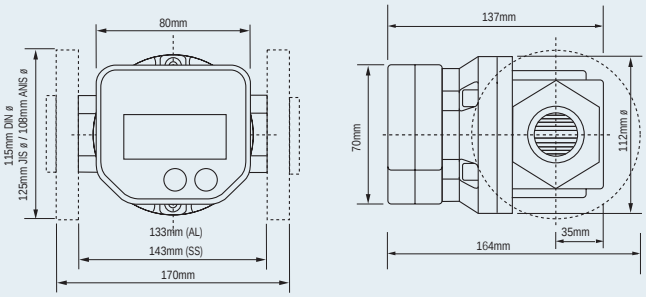
Standard Display



Deluxe Display



MR100



positive displacement flow meters

M10 – 1” meters with mechanical register

The M10 is the medium capacity meter in the M-SERIES™ range. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

Features

- Compact size.
- Easy to read and operate mechanical register.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- An Option of 100 Pulse per unit of measure output is available for the Analogue version.

M10ARM-X

Mechanical Register

MH450 Industrial Register

Analogue Mechanical Register

Specification:

Model	M10
Meter Type	Meter With Mechanical Register
Meter Body Material	Aluminium / 316 Stainless Steel / Bronze
Wetted Components:	
Rotor Material	PPS / 316 Stainless Steel
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute / US Gallons Per Minute)	
Above 5 cPs	6 To 120 / 1.6 To 32
Below 5 cPs	10 To 100 / 2.6 To 26
Accuracy- Within (Of Reading)	+/- 1% / Analogue Register +/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (>1000 Hi Vis Rotors)
Maximum Operating Pressure	3450kpa/ 500 Psi/ 34.5 Bar Or Flange Rule Where Fitted
Max. Operating Temperature	80°C / 176°F, High Temp Option 120°C / 248°F
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:
1 = 1” BSP (F) ports	Litres
2 = 1” NPT (F) ports	US Gallons
3 = 1” ANSI 150lb Flange	Litres
4 = 1” ANSI 150lb Flange	US Gallons
5 = 25mm DIN 16 Flange	Litres
13=25mm JIS 10K Flange	Litres

PPS = Polyphenylene Sulfide Resins

Note: See relevant “Flange Technical Information” on page 45.

M10 – 1” meters with mechanical register

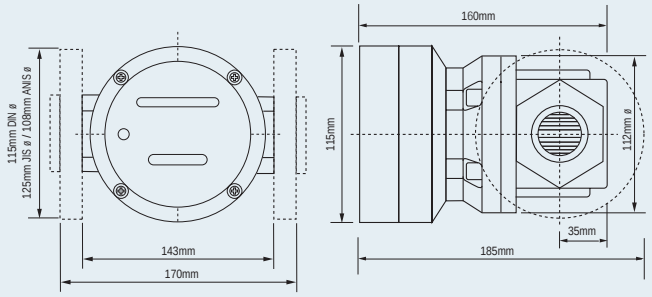
Options and accessories

M10 - 1” METERS WITH MECHANICAL REGISTER	M10ARM-X	M10ASM-X	M10SRM-X	M10SSM-X	M10BRM-X
FKM O-Ring	○	○	○	○	○
FEP O-Ring	○	○	○	○	○
EPDM O-Ring	○	○	○	○	○
High Temp Rotors	○	●	○	●	○
High Viscosity Rotors	○	○	○	○	○
Hall Effect Sensor	–	–	–	–	–
Reed Switch	–	–	–	–	–
Solvent Kit	○	●	●	●	○
Hastalloy C Shafts	–	–	–	–	–
Analogue Register	○	○	○	○	○
MH 450 Register	○	○	○	○	○
Pulse Kit P500	+	+	+	+	+
Remote Mounted LC Display	–	–	–	–	–
Heating Jacket	+	+	+	+	+
4-20mA Module	–	–	–	–	–
Protective Boot Standard Mechanical Register	+	+	+	+	+

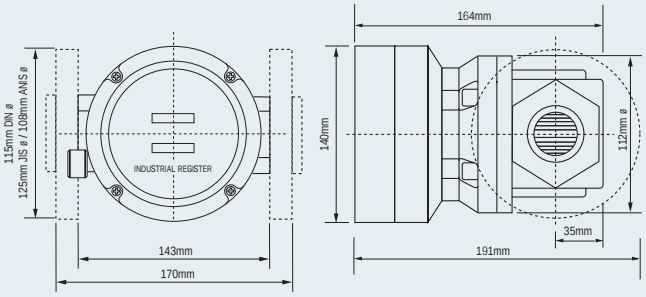
● Standard ○ Optional – Not Available + Accessory

Dimensions

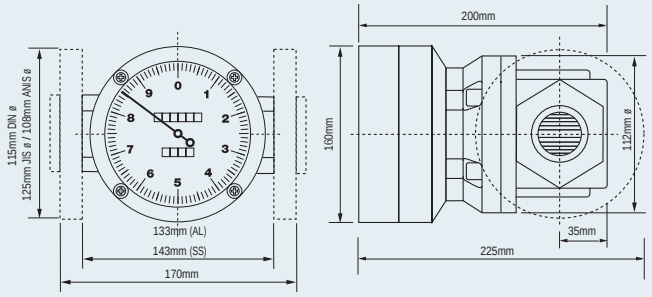
Mechanical Register



Industrial Mechanical Display



Analogue Mechanical Display



WM40 – 1 1/2” pulse meters M40 – 1 1/2” pulse and LC display meters

The M40 is the medium to large capacity meter in the M-SERIES™ range. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

M40ARP-X

Features

- Compact size.
- Two independent pulse units which can be linked to allow doubling of the pulse output.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Both LC Displays meets European CE directive fot EMC.
- Deluxe/Standard Displays and Pulse Version have IP65/NEMA9 protection.
- Intrinsically safe LC Deluxe & Standard Displays. Certificate of conformity number PTB Nr. Ex-93.C.4033x & KEMA O5ATEX1168X
- Pulse Versions have Flameproof Certification. AUS Ex2377x

Standard LC Display

Deluxe LC Display

MR100

Specifications

Model	M40/WM40
Meter Type	Pulse / Standard LC Display / Deluxe LC Display
Meter Body Material	Aluminium / 316 Stainless Steel / Bronze
Wetted Components:	
Rotor Material	PPS / 316 Stainless Steel
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 cPs	10 To 250 / 2.6 To 66
Below 5 cPs	15 To 235 / 4 To 62
Accuracy- Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (> 1000 Hi Vis Rotors)
Maximum Operating Pressure	5500 kpa/800psi/55bar or flange rule where fitted (*PEI 1800kpa/260psi/18bar)
Pulser Type	Hall Effect Or Reed Switch Or Combination HE /RS
Pulses Per Litre/Us Gallon	14.5 / 54.9
Max. Operating Temperature	80°C / 176°F, High Temp Option 120°C / 248°F
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:	Electrical Conduit Connection:
1 = 1 1/2” BSP (F) ports	Litres	20mm (F)
2 = 1 1/2” NPT (F) ports	US Gallons	1/2” NPT (F)
3 = 1 1/2” ANSI 150lb Flange	Litres	20mm (F)
4 = 1 1/2” ANSI 150lb Flange	US Gallons	1/2” NPT (F)
5 = 40mm DIN 16 Flange	Litres	20mm (F)
6 = 1 1/2” Triclover Flange	Litres	20mm(F)
7 = 1 1/2” Triclover Flange	US Gallons	1/2” NPT (F)
9 = 600LB ANSI Flange	Litre	20mm(F)
13=40mm JIS 10K flange	Litres	20mm(F)

PPS = Polyphenylene Sulfide Resins

Note: See relevant “Flange Technical Information” on page 45.

STANDARDS AUSTRALIA
Flameproof Approval

*European common market - pressure equipment directive requirements

WM40 – 1 1/2” pulse meters
M40 – 1 1/2” pulse and LC display meters

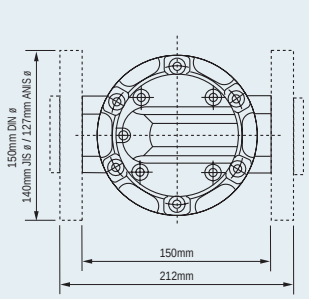
Options & Accessories

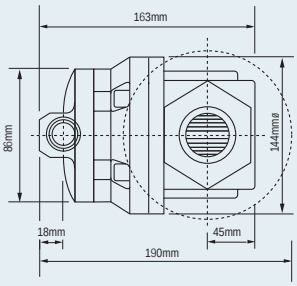
WM40 - 1 1/2” PULSE & LC DISPLAY METERS M40 - 1 1/2” PULSE & LC DISPLAY METERS	WM40ARX-X M40ARX-X	WM40ASX-X M40ASX-X	WM40BRX-X M40BRX-X	WM40SRX-X M40SRX-X	WM40SSX-X M40SSX-X
FKM O-Ring	○	○	○	○	○
FEP O-Ring	○	○	○	○	○
EPDM O-Ring	○	○	○	○	○
High Temp Rotors	○	●	○	○	●
High Viscosity Rotors	○	○	○	○	○
Hall Effect Sensor	○	○	○	○	○
Reed Switch	●	●	●	●	●
Solvent Kit	–	–	–	–	–
Hastalloy C Shafts	–	–	–	–	–
Protective Boot Deluxe LCD	+	+	+	+	+
Protective Boot Standard Display	+	+	+	+	+
Remote Mounted LC Display	+	+	+	+	+
Heating Jacket	+	+	+	+	+
4-20ma Module Meter & Remote Mount	+	+	+	+	+

● Standard ○ Optional – Not Available + Accessory

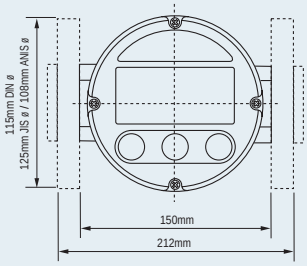
Dimensions

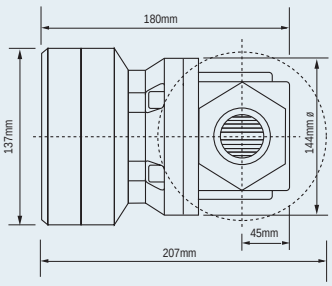
Pulse



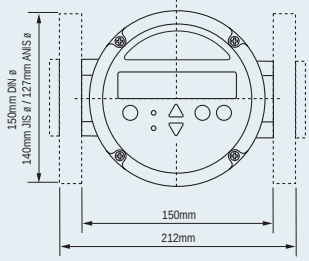


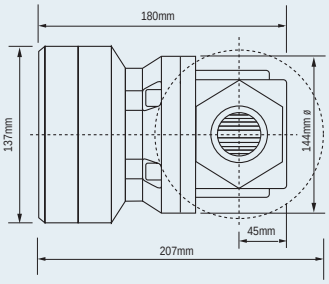
Standard Display



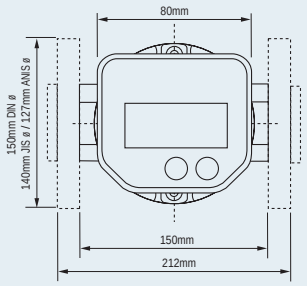


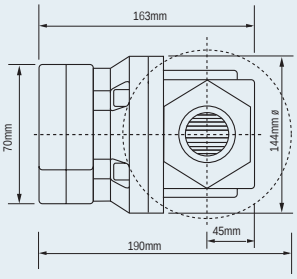
Deluxe Display





MR100





positive displacement flow meters

M40 – 1 1/2” metres with mechanical register

The M40 is the medium to large capacity meter in the M-SERIES™ range. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

Features

- Compact size.
- Easy to read and operate mechanical register.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- An Option of 100 Pulse per unit of measure output is available for the Analogue version.

M40SRM-X

Mechanical Register

MH450 Industrial Register

Analogue Mechanical Register

Specifications

Model	M40
Meter Type	Meter With Mechanical Register
Meter Body Material	Aluminium / 316 Stainless Steel / Bronze
Wetted Components:	
Rotor Material	PPS / 316 Stainless Steel
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/Us Gallons Per Minute)	
Above 5 cPs	10 to 250/2.6 to 66
Below 5 cPs	235/4 to 62
Accuracy - Within (Of Reading)	+/- 1% / Analogue Register +/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (> 1000 Hi Vis Rotors)
Maximum Operating Pressure	3500 kpa/500psi/35bar or flange rule where fitted (*PEI 1800kpa/260psi/18bar)
Max. Operating Temperature	80°C / 176°F, High Temp Option 120°C / 248°F
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:
1 = 1 1/2” BSP (F) ports	Litres
2 = 1 1/2” NPT (F) ports	US Gallons
3 = 1 1/2” ANSI 150lb Flange	Litres
4 = 1 1/2” ANSI 150lb Flange	US Gallons
5 = 40mm DIN 16 Flange	Litres
9 = 1 1/2” ANSI 600lb Flange	Litres
13=40mm JIS 10K Flange	Litres

PPS = Polyphenylene Sulfide Resins

Note: See relevant “Flange Technical Information” on page 49.

*EU - pressure equipment directive 97/23/EC

M40 – 1 1/2” metres with mechanical register

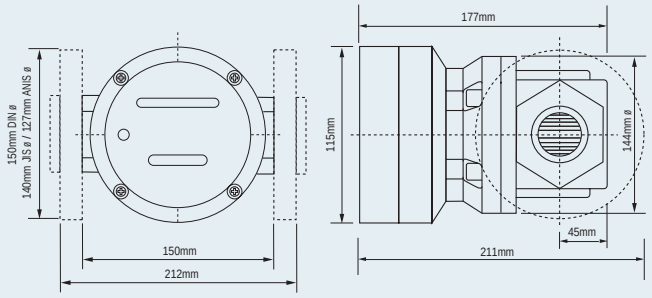
Options & Accessories

M40 - 1 1/2” METERS WITH MECHANICAL REGISTER	M40ARM-X	M40ASM-X	M40SRM-X	M40SSM-X
FKM O-Ring	○	○	○	○
FEP O-Ring	○	○	○	○
EPDM O-Ring	○	○	○	○
High Temp Rotors	○	●	○	●
High Viscosity Rotors	○	○	○	○
Hall Effect Sensor	–	–	–	–
Reed Switch	–	–	–	–
Solvent Kit	○	●	●	●
Hastalloy C Shafts	–	–	–	–
Analogue Register	○	○	○	○
MH450 Register	○	○	○	○
Pulsar Kit P500	+	+	+	+
Remote Mounted LC Display	–	–	–	–
Heating Jacket	+	+	+	+
Protection Boot	+	+	+	+
4-20ma Module	–	–	–	–

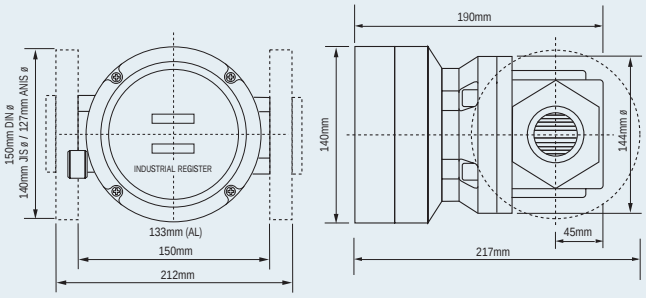
● Standard ○ Optional – Not Available + Accessory

Dimensions

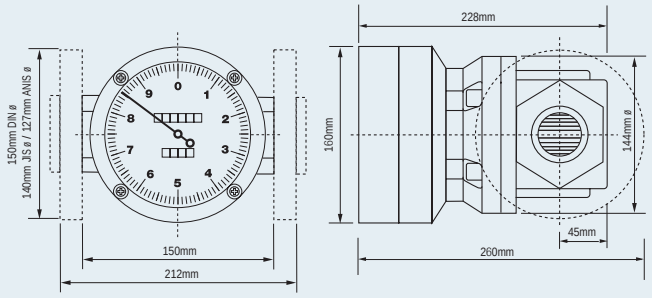
Mechanical Register



Industrial Mechanical Register



Analogue Mechanical Register



WM50 – 2” pulse meters M50 – 2” pulse and LC display meters

The M50 is a large capacity meter in the M-SERIES™ range. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

M50ARP-X

Features

- Compact size.
- Two independent pulse units.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- All LC Displays meets European CE directive for EMC.
- Standard/Deluxe Displays MR100 and Pulse Version have IP65/NEMA9 protection.
- Intrinsically safe LC Deluxe and Standard Displays. Certificate of conformity number PTB Nr. Ex-93.C.4033x & KEMA Ex-00.E.1127x
- Pulse Versions have Flameproof Certification. AUS Ex2377x

Standard LC Display

Deluxe LC Display

MR100

Specifications

Model	M50/WM50
Meter Type	Pulse / Standard LC Display / Deluxe LC Display / MR100 LC Display
Meter Body Material	Aluminium / 316 Stainless Steel / Bronze
Wetted Components:	
Rotor Material	PPS / 316 Stainless Steel / Hi Flow PPS
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/Us Gallons Per Minute)	
Above 5 cPs	15 To 350 / 4 To 93 (HF 15 to 550 / 4 to 146)
Below 5 cPs	30 To 300 / 8 To 79
Accuracy- Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (> 1000 Hi Vis Rotors)
Maximum Operating Pressure	5500 kpa/800psi/55bar or as per flange rule (*PEI 1800kpa/260psi/18bar)
Pulser Type	Hall Effect or Reed Switch or Combination HE / RS
Pulses Per Litre/Us Gallons	6.68 / 25.29
Max. Operating Temperature	80°C / 176°F, High Temp Option 120°C / 248°F
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:	Electrical Conduit Connection:
1 = 2” BSP (F) Ports	Litres	20mm (F)
2 = 2” NPT (F) Ports	US Gallons	1/2” NPT (F)
3 = 2” ANSI 150lb Flange	Litres	20mm (F)
4 = 2” ANSI 150lb Flange	US Gallons	1/2” NPT (F)
6 = 2” Tri Clover Flange	Litres	20mm (F)
7 = 2” Tri Clover Flange	US Gallons	1/2” NPT (F)
5 = 50mm DIN 16 Flange	Litres	20mm (F)
13 = 50mm JIS 10k flange	Litres	20mm (F)

PPS = Polyphenylene Sulfide Resins

Note: See relevant “Flange Technical Information” on page 45.

*EU - pressure equipment directive 97/23/EC

WM50 – 2” pulse meters
M50 – 2” pulse and LC display meters

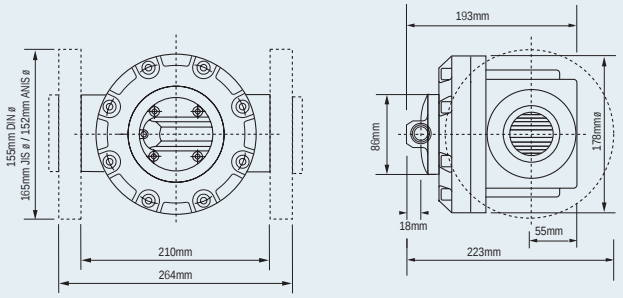
Options & Accessories

WM50 - 2” PULSE AND LC DISPLAY METERS M50 - 2” PULSE AND LC DISPLAY METERS	WM50ARX-X M50ARX-X	WM50SRX-X M50SRX-X	WM50SSX-X M50SSX-X	WM50ASX-X M50ASX-X
FKM O-Ring	○	○	○	○
FEP O-Ring	○	○	○	○
EPDM O-Ring	○	○	○	○
High Temp Rotors	○	○	●	●
High Viscosity Rotors	○	○	○	○
Hall Effect Sensor	○	○	○	○
Reed Switch	●	●	●	●
Solvent Kit	–	–	–	–
Hastalloy C Shafts	–	–	–	–
Protective Boot Deluxe LCD	+	+	+	+
Protective Boot Standard Display	+	+	+	+
Remote Mounted LC Display	+	+	+	+
Heating Jacket	+	+	+	+
4-20ma Module Meter or Remote Mount	+	+	+	+

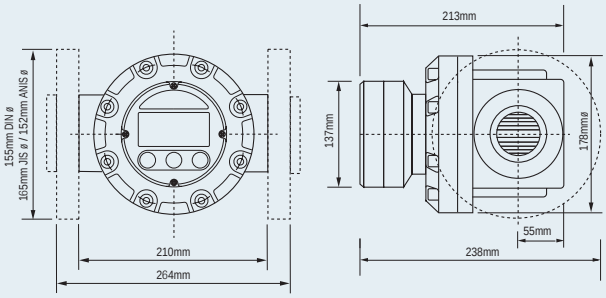
● Standard ○ Optional – Not Available + Accessory

Dimensions

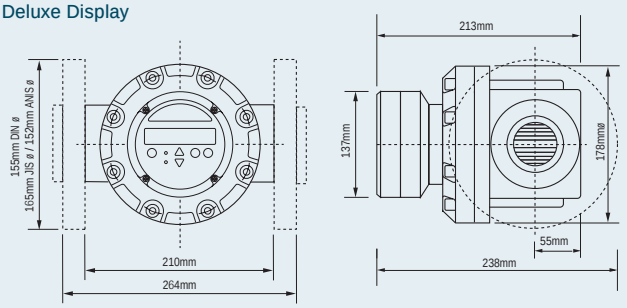
Pulse



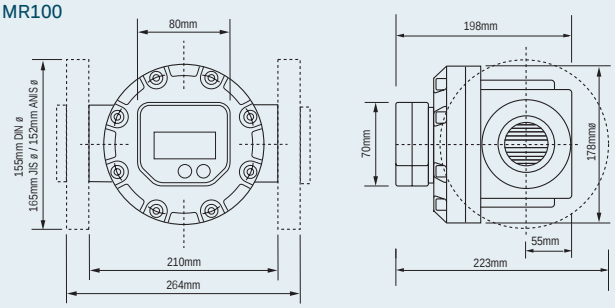
Standard Display



Deluxe Display



MR100



M50 – 2” meters with mechanical register

The M50 is the medium to large capacity meter in the M-SERIES™ range. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

Features

- Compact size.
- Easy to read and operate mechanical registers.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- An Option of 100 Pulses per unit of measure output is available for the Analogue version.

M50ARM-X

Mechanical Register

MH450 Industrial Register

Analogue Mechanical Register

Specifications

Model	M50
Meter Type	Meter With Mechanical Register
Meter Body Material	Aluminium / 316 Stainless Steel / Bronze
Wetted Components:	
Rotor Material	PPS / 316 Stainless Steel / Hi Flow PPS
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 Cps	15 to 350/ 4 to 93 HF 15 to 550/4 to 146
Below 5 Cps	33 to 300/9 to 79 HF 30 to 500/9 to 132
Accuracy- Within (Of Reading) Repeatability	+/- 1% / Analogue Register +/- 0.5% 0.03%
Maximum Viscosity (Of Standard Model)	1000 Centipoise (> 1000 Hi Vis Rotors)
Maximum Operating Pressure	3500 kpa/800psi/55bar or as per flange rule (*PEI 1800kpa/260psi/18bar)
Max. Operating Temperature	80°C / 176°F, High Temp Option 120°C / 248°F
Recommended Mesh Strainer Size	60 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:
1 = 2” BSP (F) Ports	Litres
2 = 2” NPT (F) Ports	US Gallons
3 = 2” ANSI 150lb Flange	Litres
4 = 2” ANSI 150lb Flange	US Gallons
5 = 50mm DIN 16 Flange	Litres
13=50mm JIS 10k flange	Litres

PPS = Polyphenylene Sulfide Resins

Note: See relevant “Flange Technical Information” on page 45.

*EU - pressure equipment directive 97/23/EC

M50 – 2” meters with mechanical register

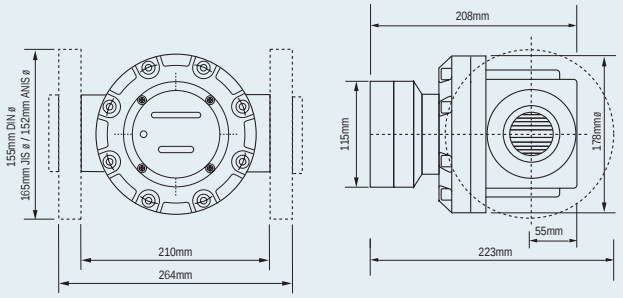
Options & Accessories

M50 - 2” METERS WITH MECHANICAL REGISTER	M50ARM-X	M50SRM-X	M50SSM-X	M50ASM-X
FKM O-Ring	○	○	○	○
FEP O-Ring	○	○	○	○
EPDM O-Ring	○	○	○	○
High Temp Rotors	○	○	●	●
High Viscosity Rotors	○	○	○	○
Hall Effect Sensor	–	–	–	–
Reed Switch	–	–	–	–
Solvent Kit	○	●	●	●
Hastalloy C Shafts	–	–	–	–
Analogue Register	○	○	○	○
MH450 Register	○	○	○	○
Pulser Kit P500 Suit Analogue Register	+	+	+	+
Remote Mounted LC Display	–	–	–	–
Heating Jacket	+	+	+	+
4-20ma Module	–	–	–	–
Protection Register Boot Standard Mechanical Register	+	+	+	+

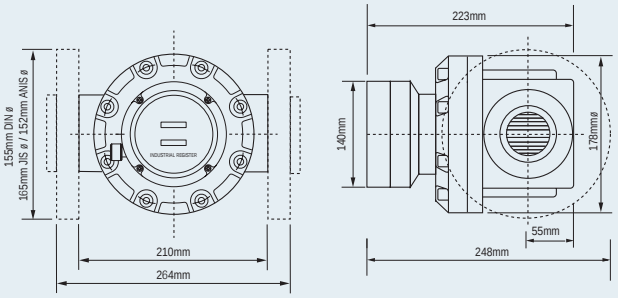
● Standard ○ Optional – Not Available + Accessory

Dimensions

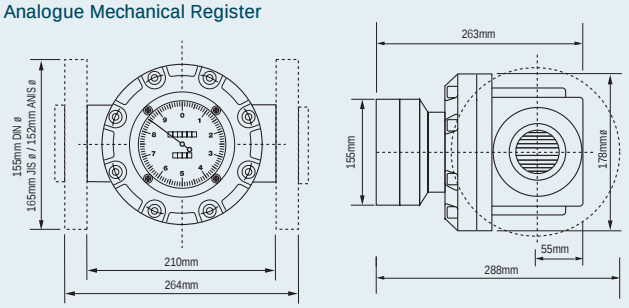
Mechanical Register



Industrial Mechanical Register



Analogue Mechanical Register



WM80 – 3” pulse meters
M80 – 3” pulse and LC display meters

The M80 is a large capacity meter in the M-SERIES™ range. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

Features

- Compact size.
- Two independent pulse units.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Both LC Displays meets European CE directive for EMC.
- Standard/Deluxe Displays and Pulse Version have IP65/NEMA9 protection.
- Intrinsically safe LC Deluxe and Standard Displays. Certificate of conformity number PTB Nr. Ex-93.C.4033x & Kema O5ATEX1168X

M80AAP-X

Standard LC Display

Deluxe LC Display

MR100

Specifications

Model	M80/WM80
Meter Type	Pulse / Standard LC Display / Deluxe LC Display
Meter Body Material	Aluminium / Stainless Steel / Bronze
Wetted Components:	
Rotor Material	Aluminium / Stainless Steel
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 Cps	20 To 733 / 5 To 194
Below 5 Cps	66 To 700 / 17 To 185
Accuracy- Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model) Available)	1000 Centipoise (> 1000 Hi Vis Rotors
Maximum Operating Pressure	1200kpa/175psi/12bar
Pulser Type	Hall Effect or Reed Switch or Combination HE / RS
Pulses Per Litre/Us Gallons	2.59 / 9.8
Max. Operating Temperature	AL 80°C / 176°F St St 120ºC / 248ºF
Recommended Mesh Strainer Size	40 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:	Electrical Conduit Connection:
1 = 3” BSP (F) Ports	Litres	20mm (F)
2 = 3” NPT (F) Ports	US Gallons	1/2” NPT (F)
3 = 3” ANSI 150lb Flange	Litres	20mm (F)
4 = 3” ANSI 150lb Flange	US Gallons	1/2” NPT (F)
5 = 80mm DIN 16 Flange	Litres	20mm (F)
13 = 80mm JIS 10K Flange	Litres	20mm (F)

PPS = Polyphenylene Sulfide Resins

Note: See relevant “Flange Technical Information” on page 45.

WM80 – 3” pulse meters
M80 – 3” pulse and LC display meters

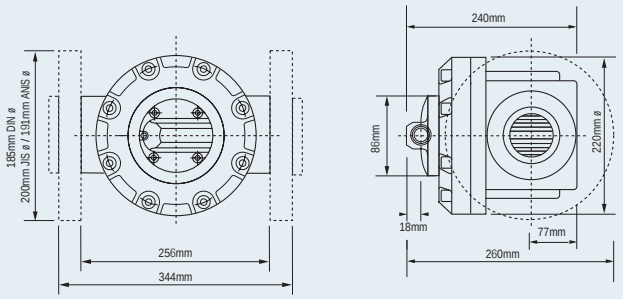
Options & Accessories

WM80 - 3” PULSE AND LC DISPLAY METERS M80 - 3” PULSE AND LC DISPLAY METERS	WM80AAX-X M80AAX-X	WM80SSX-X M80SSX-X	WM80BAX-1 M80BAX-1
FKM O-Ring	○	○	○
FEP O-Ring	○	○	○
EPDM O-Ring	○	○	○
High Temp Rotors	–	●	–
High Viscosity Rotors	○	○	○
Hall Effect Sensor	○	○	○
Reed Switch	●	●	●
Solvent Kit	–	–	–
Hastalloy C Shafts	–	–	–
Analogue Register	–	–	–
Pulser Kit P500	–	–	–
Remote Mounted LC Display	○	○	○
Heating Jacket	–	–	–
4-20ma Module	○	○	○
Protection Boot LC Displays	+	+	+

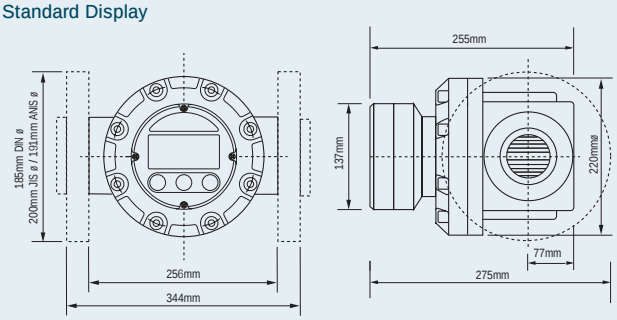
● Standard ○ Optional – Not Available + Accessory

Dimensions

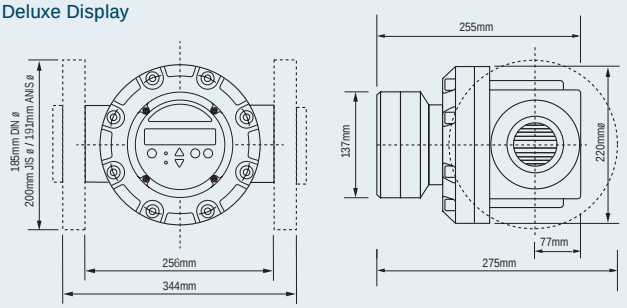
Pulse



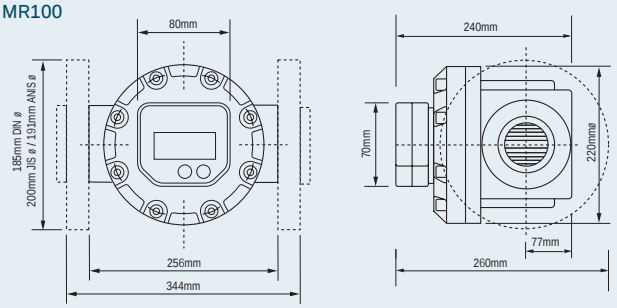
Standard Display



Deluxe Display



MR100



Macnaught Pty Ltd reserves the right to modify or alter product materials, dimensions, design and construction, when necessary, to improve the performance of our products. Please check with your local distributor or Macnaught to confirm current specifications of our products.

positive displacement flow meters

M80 – 3” meters with mechanical display

The M80 is the large capacity meter in the M-SERIES™ range. It has the ability to handle a wide range of fluid viscosities with exceptional levels of repeatability and durability.

Features

- Compact size.
- Easy to read and operate mechanical display.
- Flexibility of installation options (e.g. can be mounted horizontally or vertically; no flow conditioning required).
- Low pressure drop allows for economical pump selection or gravity flow applications.
- Meter construction enables fast and easy on-site servicing without removal from application.
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued.
- Meter design minimises the number of wearable and replaceable parts and extends product life.
- An Option of 10/100 Pulse per unit of measure output is available.

M80AAMA-X

Analogue Mechanical Display

Specifications

Model	M80
Meter Type	Meter With Mechanical Display
Meter Body Material	Aluminium / Bronze
Wetted Components:	
Rotor Material	Aluminium
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 Cps	20 To 733 / 5 To 194
Below 5 Cps	66 To 616 / 17 To 163
Accuracy- Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model) Available)	1000 Centipoise (> 1000 Hi Vis Rotors
Maximum Operating Pressure	1200kpa/175psi/12bar
Max. Operating Temperature	80°C / 176°F
Recommended Mesh Strainer Size	40 Mesh

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:
1 = 3” BSP (F) Ports	Litres
2 = 3” NPT (F) Ports	US Gallons
3 = 3” ANSI 150lb Flange	Litres
4 = 3” ANSI 150lb Flange	US Gallons
5 = 80mm DIN 16 Flange	Litres
13 = 80mm JIS 10K Flange	Litres

Note: See relevant “Flange Technical Information” on page 45.

M80 – 3” meters with mechanical register

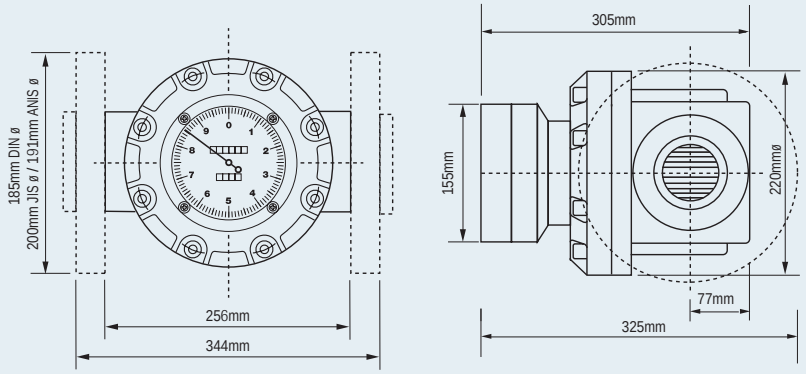
Options & Accessories

M80 - 3” METERS WITH MECHANICAL DISPLAY	M80AAMA-X	M80BAMA-X
FKM O-Ring	○	○
FEP O-Ring	○	○
Epdm O-Ring	○	○
High Temp Rotors	–	–
High Viscosity Rotors	○	○
Hall Effect Sensor	–	–
Reed Switch	–	–
Solvent Kit	○	○
Hastalloy C Shafts	–	–
Analogue Register	●	●
Pulser Kit P500	+	+
Remote Mounted LC Display	–	–
Heating Jacket	–	–
4-20ma Module	–	–

● Standard ○ Optional – Not Available + Accessory

Dimensions

Mechanical Register



WM100 – 4” pulse meters M100 – 4” pulse and LC display meters

Suitable for fuels, lubricants and corrosive fluids (stainless steel only) to a viscosity of 1000cPs, the M100 is a 100mm (4"), high flow, oval gear flowmeter and is capable of measuring fluid flows of up to 1200LPM. The M100 is accurate to +/- 0.5% and provides exceptional levels of reliability and durability.

Features

- Easy to read and operate, resetable LC display options available
- Flexibility of installation options (eg: can be mounted horizontally or vertically - no flow conditioning required
- Low pressure drop allows for economical pump selection or gravity flow applications
- Meter construction enables fast and easy on-site servicing without removal from application
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued
- Meter design minimises the number of wearable and replaceable parts and extends product life
- Available with 4’ ANSI 150lb, JIS10K and DIN 16 flanges (modular construction) or 3’ screwd BSP (F) or NPT (F)
- LCD optional displays meet European CE directive
- Standard/deluxe displays/MR100 and pulse version have IP65/NEMA9 protection
- Intrinsically safe LC display options available.
- 12 month warranty

M100AAP-X

Standard LC Display

Deluxe LC Display

MR100

Specifications

Model	M100/WM100
Meter Type	Pulse / Standard LC Display / Deluxe LC Display
Meter Body Material	Aluminium / Stainless Steel / Bronze
Wetted Components:	
Rotor Material	Aluminium / Stainless Steel
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 Cps	120 To 1200 / 32 - 317
Below 5 Cps	200 To 1200 / 53 - 317
Accuracy- Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000cPs (> 1000 cPs Hi Vis Rotors Available)
Maximum Operating Pressure	1200kpa/175psi/12bar
Pulser Type	Hall Effect or Reed Switch or Combination HE / RS
Pulses Per Litre/Us Gallons	2.32 / 8.782
Max. Operating Temperature	AL 80ºC/176ºF St St 120ºC/248ºF
Recommended Mesh Strainer Size	40

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:	Electrical Conduit Connection:
3 = 4” ANSI 150lb Flange	Litres	20mm (F)
4 = 4” ANSI 150lb Flange	US Gallons	1/2 NPT (F)
5 = 100mm DIN 16 Flange	Litres	20mm (F)
13 = 100mm JIS 10K Flange	Litres	20mm (F)
14 = 3” ANSI 150LB Flange	Litres	20mm (F)
15 = 3” ANSI 150LB Flange	US Gallons	1/2 NPT (F)
16 = 3’ BSP (F) Port	Litres	20mm (F)
17 = 3” NPT (F) Port	US Gallons	1/2 NPT (F)

Note: See relevant “Flange Technical Information” on page 45.

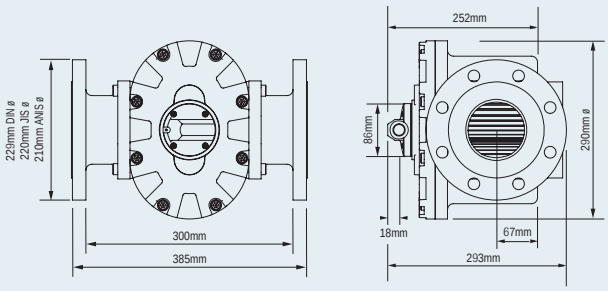
WM100 – 4” pulse meters
M100 – 4” pulse and LC display meters

M100 - 3” PULSE AND LC DISPLAY METERS	M100AAX-X	M100SSX-X	M100BAX-X
FKM O-Ring	○	○	○
FEP O-Ring	○	○	○
EPDM O-Ring	○	○	○
High Temp Rotors	–	–	–
High Viscosity Rotors	○	●	○
Hall Effect Sensor	○	○	○
Reed Switch	●	●	●
Solvent Kit	–	–	–
Hastalloy C Shafts	–	–	–
Analogue Register	–	–	–
Pulser Kit P500	–	–	–
Remote Mounted LC Display	+	+	+
Heating Jacket	–	–	–
4-20ma Module	+	+	+
Protection Boot for LC Displays	+	+	+

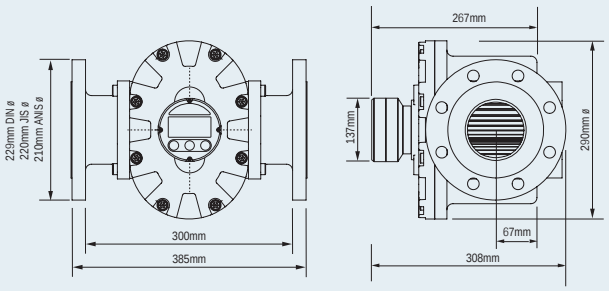
● Standard ○ Optional – Not Available + Accessory

Dimensions

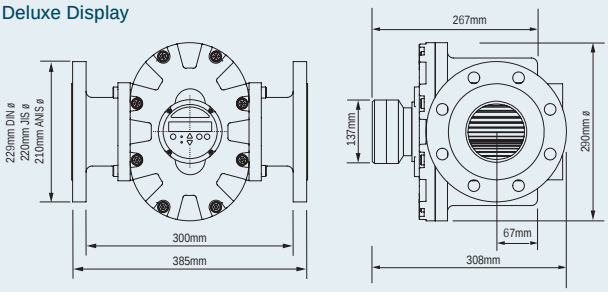
Pulse



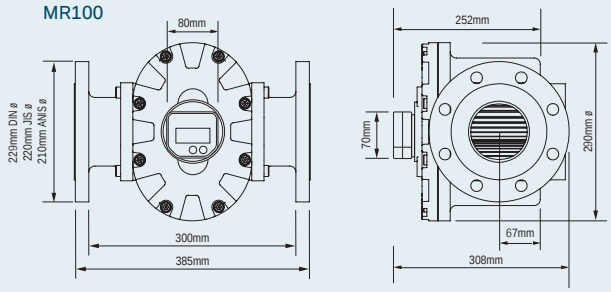
Standard Display



Deluxe Display



MR100



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positive displacement flow meters

M100 – 4” meters with mechanical register

Suitable for fuels, lubricants and non-corrosive fluids to a viscosity of 1000cPs, the M100 is a 100mm (4"), high flow, oval gear flowmeter and is capable of measuring fluid flows of up to 1200LPM. The M100 is accurate to +/- 0.5% and provides exceptional levels of reliability and durability.

The M100 is available with Veeder-Root preset register, veeder root reset register, analogue mechanical register.

Features

- Easy to read and operate, resetable mechanical register options available
- Flexibility of installation options (eg: can be mounted horizontally or vertically - no flow conditioning required
- Low pressure drop allows for economical pump selection or gravity flow applications
- Meter construction enables fast and easy on-site servicing without removal from application
- Meter accuracy is verified by a factory calibration check after which an individual metrology report is issued
- Meter design minimises the number of wearable and replaceable parts and extends product life
- Available with 4’ ANSI 150lb, JIS10K and DIN 16 flanges (modular construction) or 3’ screwd BSP (F) / NPT (F) / ANSI Flange
- An option of 10 pulse per unit of measurable output available (mechanical only) P500

M100AAMA-X

Analogue Mechanical Display

Specifications

Model	M100
Meter Type	Meter with mechanical display
Meter Body Material	Aluminium / Bronze / Stainless Steel
Wetted Components:	
Rotor Material	Aluminium / Stainless Steel
Shafts	316 Stainless Steel
O'ring	NBR (Nitrile)
Flow Rate Ranges (Litres Per Minute/US Gallons Per Minute)	
Above 5 cPs	120 To 1200 / 32 - 317
	(1000 cPs Hi Vis Rotors Available)
Below 5 cPs	200 To 1200 / 53 - 317
Accuracy- Within (Of Reading)	+/- 0.5%
Repeatability	0.03%
Maximum Viscosity (Of Standard Model)	1000 cPs
Maximum Operating Pressure	1200kpa/175psi/12bar
Pulser Type	With P500 Option Litre/US Gallons 10/38
Max. Operating Temperature	AL 80ºC/176ºF St St 120ºC/248ºF
Recommended Mesh Strainer Size	40

Port Size

To order flowmeter you must replace ‘X’ with the relevant number. This number will determine the following specifications:

Port Size:	Calibrated and Display In:
1 = 4” BSP (F) Ports	Litres
2 = 4” NPT (F) Ports	US Gallons
3 = 4” ANSI 150lb Flange	Litres
4 = 4” ANSI 150lb Flange	US Gallons
5 = 100mm DIN 16 Flange	Litres
13 = 100mm JIS 10K Flange	Litres
14 = ANSI 150lb Flange	Litres
15 = ANSI 150lb Flange	US Gallons
16 = BSP (F)	Litre
17 = NPT (F)	US Gallons

Note: See relevant “Flange Technical Information” on page 45.

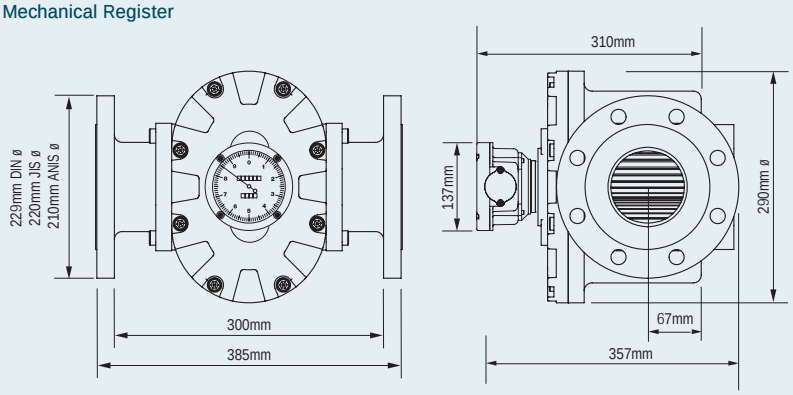
M100 – 4” meters with mechanical register

M100 - 4” METERS WITH MECHANICAL REGISTER	M100AAMA-X	M100BAMA-X
FKM O-Ring	○	○
FEP O-Ring	○	○
Epdm O-Ring	○	○
High Temp Rotors	–	–
High Viscosity Rotors	○	○
Hall Effect Sensor	–	–
Reed Switch	–	–
Solvent Kit	○	–
Hastalloy C Shafts	–	–
Analogue Register	●	●
Pulser Kit P500	+	+
Remote Mounted LC Display	–	–
Heating Jacket	–	–
4-20ma Module	–	–

● Standard ○ Optional – Not Available + Accessory

Dimensions

Mechanical Register



O'rings

Protective boot

Rotors

MR150

optional - o'rings

Various optional O'Rings are available for the M-SERIES™ range to allow the flowmeters to have maximum flexibility in most applications.
For the M05, M1 and M2, both EPDM and FFPM Elastomer O'Rings are available. The M4, M6, M7, M10, M40, M50, M80 and M100 are available with FKM, EPDM and FEP O'Rings. FFPM = Perfluor Natural Rubber, FKM = Viton ® and FEP = PTFE encapsulated.

optional - high temperature rotors

For fluid temperatures above 80°C/176°F and up to 120°C/248°F, select 'high temperature' rotors. This option only applies for PPS rotor models of the M4, M10, M40 and M50. Meters fitted with Stainless Steel rotors are capable of handling temperatures up to 120°C/248°F.

optional - high viscosity rotors

For fluids above 1000cps viscosity, optional high viscosity PPS or stainless steel rotors can be specified for M2, M4, M6, M7 M10, M40, M80 and M100 models. If necessary consult your local distributor for additional technical assistance as the flow rate will vary in accordance with fluid viscosity (See page 46/47).

optional - hall effect sensor

The M4, M7, M10, M40, M50 and M80 pulse models can be optionally fitted with two digital output Hall Effect Switches to eliminate oscillation (pulse bounce) that can be experienced with standard reed switches. M05, M1 & M2 come with hall and reed sensors as standard

The HE Switches are 3-wire solid state open collector devices with 5 - 24-volt DC supply voltage ratings. A common power supply must be used.

optional - hastalloy c shafts

Special Hastalloy C Shafts are available for the M1, M2 and M7 PPS body meters for use with extremely aggressive chemicals.

optional - solvent kit

MECHANICAL DISPLAY METERS ONLY

Mechanical versions of the M4, M10, M40, M50 and M80 aluminium models can be fitted with a special seal kit for use with most common solvents. This kit is standard on all stainless steel mechanical models or mechanical models with SS Rotors.

silicone protection boot

Silicone protection boots are available for when the Deluxe, Standard or Mechanical is used in an aggressive atmosphere. Accessory part number is B400, B500, B600.

accessory - remote mounted LC displays

Supplied with mounting brackets, these displays are for remote mounting and connection to M-SERIES™ pulse meters originally supplied without a display. They can be connected also to the auxiliary pulse output of a local display meter for use as a second remote display. Accessory part numbers are F500 (deluxe version) and G500 (standard version). Available with optional 4-20mA, intrinsically safe and backlight.

optional - MR150 4-20mA loop powered module

MR150 DIGITAL UNIT

- Reed Switch Input
- 4-20mA Output
- Loop Power Device
- Meter or Remote Mount
- Output Pulse (Scaled)
- Hi/Lo Alarm
- Optional PC Calibration (MR120)

P500 pulser kit

Suit Analogue Register

10/100 pulses per unit of measure (Litre or US Gallon). 3 wire device, open collector, 5-12 VDC Power Requirements.

standard LC display

The standard LC Display is available on specific M4, M6, M7, M10, M40, M50, M80, M100 series models. It is also available as an accessory so it can be used as a remote mounted display for any M-SERIES™ meter model supplied without a display e.g. M1, M2, M10ARP.

Features

- 7 Digit x17mm/ 0.67" and 11 Digit x8mm/ 0.31" Liquid Crystal Display.
- Display can be rotated in 90° steps.
- Flow rate display in litres or US gallons (according to model selected).
- 2 total displays - resettable and non-resettable, up to 9999999999.9 litres or US gallons (according to model selected).
- Fully progammable.
- Long life 3.2 volt (7 year) Lithium battery.
- Approved for hazardous locations
  EEx ia11B/11C T6 (Kema Ex-00.E.1127x)

deluxe LC display

The Deluxe LC Display is available on specific M4, M6, M7, M10, M40, M50, M80, M100 series models. It is also available as an accessory so it can be used as a remote mounted display for any M-SERIES™ meter model supplied without a display e.g. M1, M2, M10ARP.

Features

- 7 Digit x 12.7mm (1/2") Liquid Crystal Display.
- Display can be rotated in 90° steps.
- Selectable flow rate display in litres or US gallons.
- 2 total displays.
- Up to 999999.9 litres or US gallons (resettable).
- Pre-settable batch control function up to 9999 units (99.99, 999.9 or 9999 optional settings).
- 10 preset batch quantity storage capacity.
- 3 digit cycle counter for batch dispensed.
- Single or dual valve actuation output to be used with appropriate trip amplifier.
- Factory set calibration constant (K Factor).
- Additional 9 calibration constants (K Factors) available for "in-the-field" settings.
- Up to 9999999 litres or US gallons (non-resettable).
- Switch output for trip amplifier.
- Long Life 3-volt Lithium battery.
- Approved for hazardous locations (standard battery only) EEx ia IIC T6 (PTB nr. Ex-93.C 4033X).

MR100 Digital Display

- 6 x 12mm Digits
- battery life 2 years
- Grand Total / Reset Total / Batch Total / Rate
- Fully field programmable
- 2 x AAA Alkaline batteries
- Rate Units: sec, min, hr
- IP65 Protection
  (Optional PC Programme MR120)

A110 Rate Totaliser

- Liquid Crystal Display
- 7 x 17mm Digits
- 11 x 8mm Digits
- Total / Reset Total / Rate
- 7 Year Battery Life
- Scaled Pulse Output
- 4 – 20mA Analogue Output
- Fully Programmable
- IP65 Protection
- Optional Functions
- Meter or Remote Mount

ER480 heavy duty meter mounted LC display

The ER480 is an aluminium IP65 enclosure designed to take the full range of LC dispaly models for meter mounted applications. The unit is provided with 2 x 16mm and 1 x 20mm or 3 x 1/2" NPT screwed conduit connections. Fitted with the latest easy touch push buttons and large clear viewing window, The outside is protected by a long lasting epoxy finish and has provision for tamperproof sealing.

miscellaneous displays

- Batch Control Units
- Add/Subtract rate totalisers
- Hi/Lo alarm rate totalisers

Options

- Case Materials
- Outputs
- Communications
- Temperature Compensation
- Intrinsically Safe Certifications
- Power Source AC/DC/Battery
- Selectable Input Types
- Backlight (LED Bi-Colour)

Standard LC Display

Deluxe LC Display

MR 100 Display

A110 Rate Totaliser

ER480 heavy duty meter mounted LC display

options and accessories

Mechanical Display

Analogue Mechanical Register

MH450 Industrial Mechanical register

Veeder Root Display

Strainer / Air Eliminator

mechanical display - digital

The Mechanical Display is available on specific M4, M10, M40 and M50 Series meter models.

Features

- Litre or US gallon display (according to model selected).
- Two Totals;
  - Non Reset
  - Litre 9,999,990
  - USG 999,999
  - Reset
  - Litre 9,999USG 999.9
- Push button reset.
- Display can be rotated in 90° steps.

analogue mechanical register

is the latest addition to our range of mechanical meters with sweep hand to indicate fluid quantity.

Features

- 156mm Diameter Face – 10/100 Litre or US Gallon Per Needle Revolution.
- Non Reset Register – 9,999,999.9 minimum resolution 0.1
- Reset Register – 9,999
- Optional Pulse Module – 100/1,000 pulses per revolution (10/100 pulses per unit of measure)
- Allows +/- 0.5% or better (of reading) accuracy.
- Rugged construction with toughened glass facia.
- Suitable for M10, M40, M50, M80 and M100 mechanical models.
- See model numbering system for part number identification

MH450 Industrial Mechanical register

- Extra robust design
- Aluminium facia plate with toughened
  - glass exterior
- Aluminium reset knob
- Reset total 4 digits
- Grand total 6 digits
- IP65 Protection
- Suitable for M4 to M100 models

Veeder Root Display

- Reset Total 5 Digits
- Grand Total 8 Digits
- Suitable for M50 to M100 models

Strainer / Air Eliminator

MST11-CA1/MAE21-CA1
Suits M10 to M50 with screwed or flanges connections, 25mm, 40mm & 50mm

MST21-CA1/MAE21-CA1
Suite M80 & M100 with screwed or flanged connections, 80mm & 100mm

meter display specifications

high pulse resolution meters

The following models are available with a high resolution pulse output. Each pulse unit offers two pulse streams and directional signal

M2 -	2,000 or 10,000 pulses per litre
M4 -	1,000 pulses per litre.
M10, M40, M50, M80	100 or 1,000 pulses per litre
Power:	5 - 12VDC
Output:	Open Collector

High Pulse Resolution Meter

CERTIFICATIONS directive 97/23/ec pressure equipment directive

Overview

The PED came into force on the 29th May 2002, the directive relates to how pressure equipment is designed and tested and from there sold into the member states of the European Economic Area (EEA). For simplicity the changes detailed below will be introduced to all local and overseas markets. The changes will become effective 1st of May 2002.

To comply with this directive we needed to ensure that all our flow meters are manufactured in accordance with the directive and where applicable have CE labels attached before sale. The directive classifies pressure equipment into various categories based on several factors such as nominal size, temperature, rated pressure, internal volume and the type of fluid being transmitted. Pressure equipment is then given a category rating of either SEP (Sound Engineering Practice), Cat1, Cat2 or Cat3. Equipment rated at Cat2 or above requires an external body to have surveillance over all facets of design, production and assessment procedures.

We have de-rated several meter models to reduce the classification category. By reducing the classification we can use our existing in house quality process, along with the Essential Health and Safety Requirements (ESHR) of the directive to self certify our meters.

directive

89/336/EEC

Both the standard and deluxe displays have CE marking for the above directive.

SAA flame proof approval

M5, M10, M40, and M50 Stainless Steel and Aluminium pulse version have
SAA flame proof approvals for Exd IIB T6 1P66 Class 1 Zone 1

STANDARDS AUSTRALIA

Flameproof Approval

intrinsically safe approval

Standard Display Ex II 1 G D EEx ia llc T4 T100ºC (KEMA 05ATEX 1168X)
Deluxe Display EEx ia 11C T6 (PTB NR.EX-93.C4033X)

A110 Meter Mount & Remote Units

EEx ia 11B/11C T4 T100ºC (KEMA 03ATEX 1074x)

Flange Technical Information

Macnaught meter flanges are sized to flange requirements in the ASME B31.3 Code of Pressure Piping at the stated meter flange's rated pressure (this may differ from the meter's rated pressure); the sizing is based on the meter material properties taken at ambient temperature. Gasket factors used for stainless steel flanges to develop adequate installation and operation gasket seating force are:

- Raised face type flange 'm; = 5 and 'y' = 15 MPa requiring bolts of grade ASTM A193-B7.
- Flat face type flange 'm' = 1 and 'y' = 1.4 MPa, typical of soft rubber or neoprene, requiring bolts of grade ASTM A193-B7.

The use of gaskets with factors larger than those stated above for the respective flange face types is the responsibility of the end user/installer. For materials other than stainless steel offered in the Macnaught meter range please consult the Macnaught web site for current technical data on flange size, material specification, and pressure rating.

calibration certificate


Flow Meter Calibration Report

Each M Series meter is checked for accuracy after being manufactured, the process is to enter the specific "K Factor" for that meter and to verify using a one point calibration at the mid range of flow rate of the meter against an approved master meter. Although our standard test is at one point, additional points can be done on request and would incur additional costs.

A certificate as illustrated above is included in the documentation package with the meter.
Master meters have their accuracy checked and proving certificates are issued by the National National Measurement Institute, on regular basis.

applications and fluid viscosities

APPLICATIONS

Following are examples of the many applications for which the Macnaught M-SERIES™ flowmeter range can be used

INDUSTRY	USAGE
Aviation	Fuel Management - Water & Chemical Loading/Unloading
Beverages	Alcoholic Spirits - Fruit Juice - Milk
Cement/Ceramic/Glass	Additives - Water
Chemical	Ammonia - Caustic Soda - Methyl Chloride - Butane - Acetones - Keytones
Cleaning Agents	Detergents - Soaps - Polish
Construction	Fuel - Oils
Cosmetics	Perfume - Foundation Creams - Alcohol - Shampoo
Energy	Fuel - Water - LPG - Freon
Food Industry	Sauces - Pastes - Glucose - Chocolate - Yeast - Mayonnaise
Gas & Oil	Mecaptans - LPG - Additives - Oils
Lubrication	Oils - Coolants - Hydraulic Fluids
Marine	Fuel Monitoring - Loading/Unloading

INDUSTRY	EXAMPLES
Metal Manufacturing	Release Agents - Acids - Water - Oils
Oils & Fats	Vegetable Oils - Cooking Oils - Lards - Tallow
Paints / Inks	Automotive Paints - Commercial Paints - Solvents - Printing Inks
Petrochemical	Ethylene Oxide - Propylene - Vinyl Chloride Monomers - Styrene
Petroleum	Heavy Oil - Gasoline - Bitumen - Kerosene - Naphtha
Pharmaceuticals	Alcohol - Water - Syrups - Glycerine - Liquid Sugar
Pulp & Paper	Dyes - Acids - Additives
Semi-conductors	Acids - Solvents - Chemicals
Textiles	Dyes - Bleach - Chemicals
Toiletries	Shampoo - Conditioner - Mouth Wash - Alcohol - Tooth Paste - Gels
Transport	Fuel Monitoring - Tanker Loading/Unloading
Water Treatment	Fluoride - Acid Addition - Chemical Additives

fluid viscosities above 1000cps

To achieve the lowest possible pressure drop, a range of special cut high viscosity optional rotors is available for the M2, M4, M6, M7 M10, M40, M50, M80 & M100 meter models.

The M-SERIES™ range of oval gear type Positive Displacement meters has a distinct advantage in measuring extremely viscous materials with the pressure drop being the only limiting factor.

With fluids above 1000cps, meter sizing and required flow rate become important decisions.

For example:

- With SAE90 gear oil @ 20°C/68°F with a viscosity of 1000cps, the maximum pressure drop of an M10 at its maximum flow rate (120lpm/32USGM) would be 100kPa/14.5psi/1BAR.

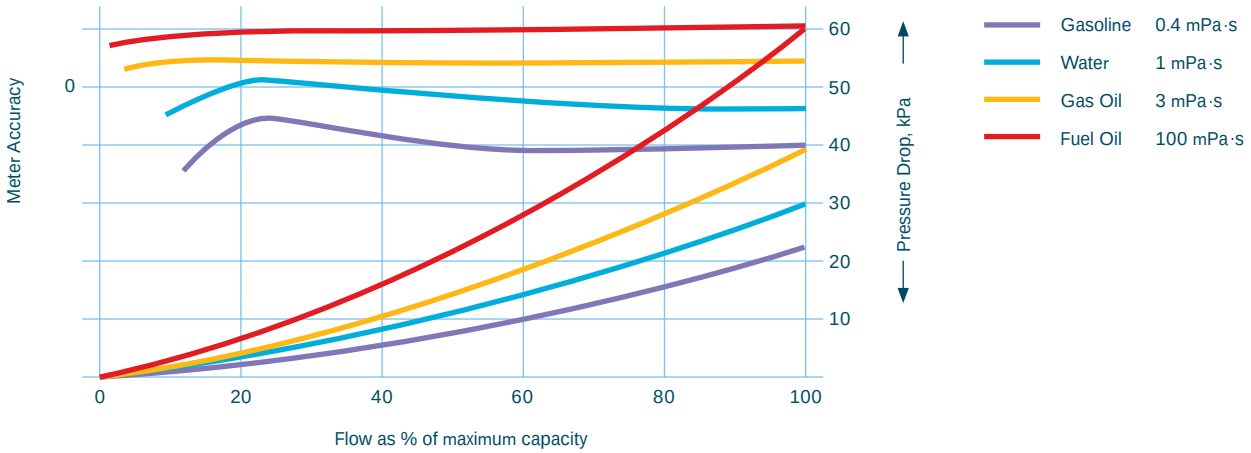
  However, the pressure drop with the M40 or M50 meters, at the same flow rate would be:
  M40: Max 50kPa/7.2psi/0.5BAR
  M50: Max 35kPa/5.0psi/0.35BAR

- To approximately determine the expected maximum flow rate for different high fluid viscosities for each M-SERIES™model at a 100kPa/14.5psi/1BAR pressure drop using high viscosity rotors, the following coefficient factors are applied and Macnaught has created the table at the bottom of this page as a guide:

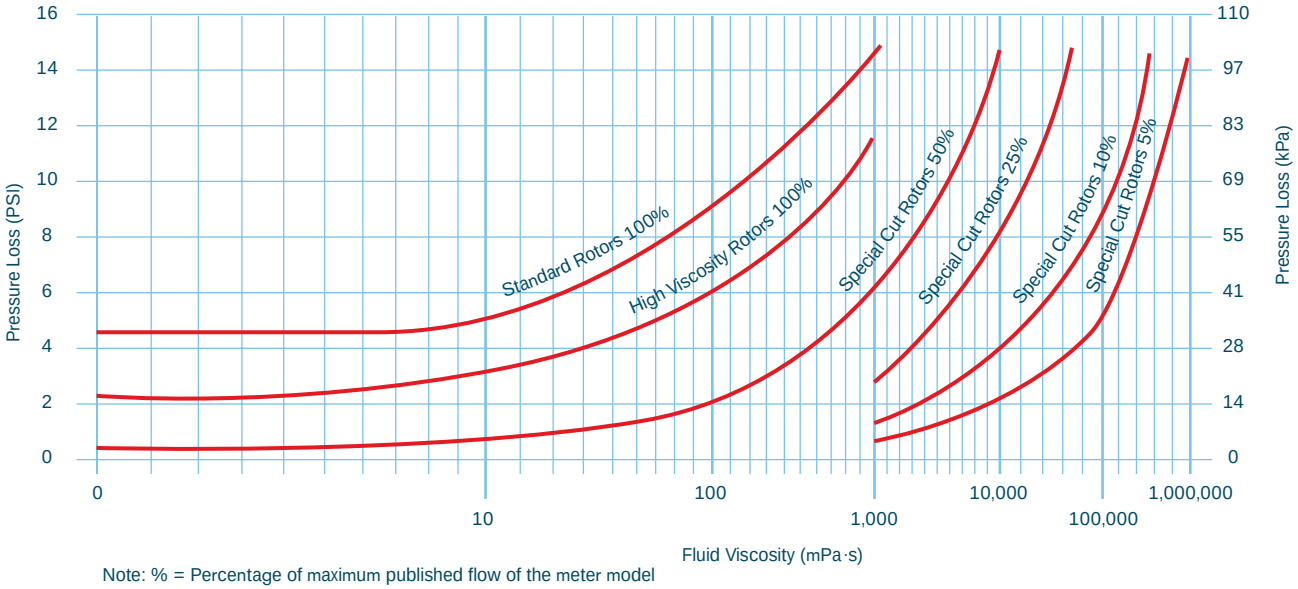
Coefficient Viscosity		M2		M4		M6		M7		M10		M40		M50	
Factor		Litres/Hr	USG/Hr	Litres/Min	USG/Min	Litres/Min	USG/Min	Litres/Min	USG/Min	Litres/Min	USG/Min	Litres/Min	USG/Min	Litres/Min	USG/Min
1	<2500cps	500	132.09	30	7.93	80	21	80	21	120	31.70	250	66.04	350	92.5
0.9	<3000cps	450	118.88	27	7.13	72	19	72	19	108	28.53	225	59.44	324	86
0.8	<4000cps	400	105.67	24	6.34	64	17	64	17	96	25.36	200	52.83	280	74
0.7	<5000cps	350	92.46	21	5.55	48	13	48	13	84	22.19	175	46.23	245	65
0.6	<8000cps	300	79.25	18	4.76	40	11	40	11	72	19.02	150	39.63	210	56
0.5	<12000cps	250	66.04	15	3.96	24	6.3	24	6.3	60	15.85	125	33.02	175	46
0.4	<25000cps	200	52.83	12	3.17	16	4.2	16	4.2	48	12.68	100	26.42	140	37
0.3	<40000cps	150	39.63	9	2.38	8	2.1	8	2.1	36	9.51	75	19.81	105	28
0.2	<95000cps	100	26.42	6	1.59	4	1.06	4	1.06	24	6.34	50	13.21	70	18.5
0.1	<450000cps	50	13.21	3	0.79					12	3.17	25	6.60	35	9.25
0.05	<1000000cps	25	6.60	1.5	0.40					6	1.59	12.5	3.30	17.5	4.6

Note: M80 and M100 High Viscosity Data, refer to graph on page 48.

General performance characteristics

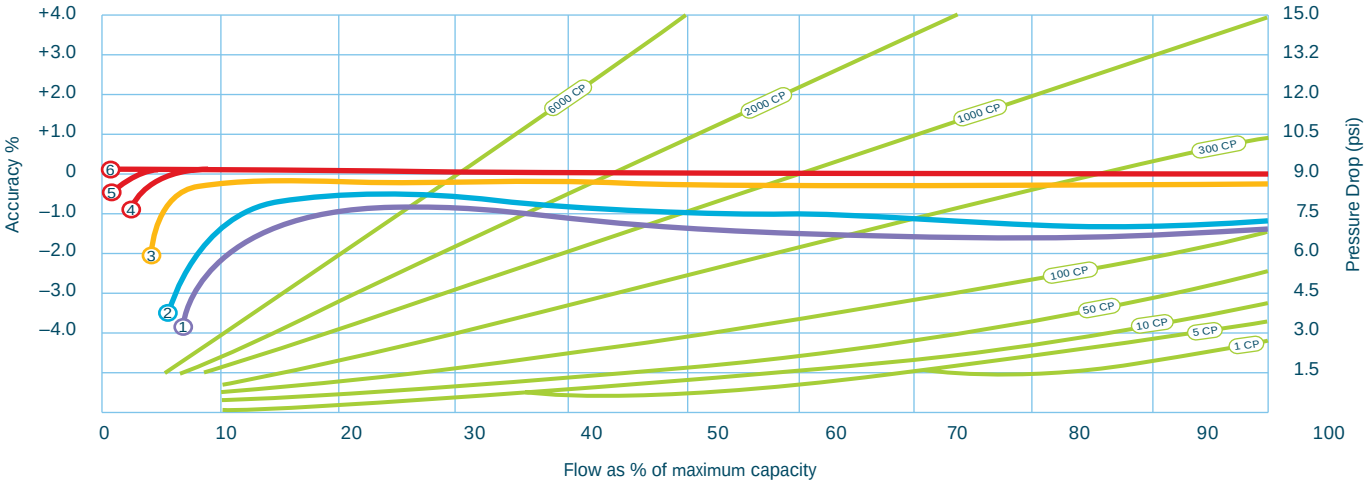


High viscosity fluids pressure loss and maximum flows



Note: % = Percentage of maximum published flow of the meter model

Viscosity versus maximum flowrate - general viscosity/accuracy curves

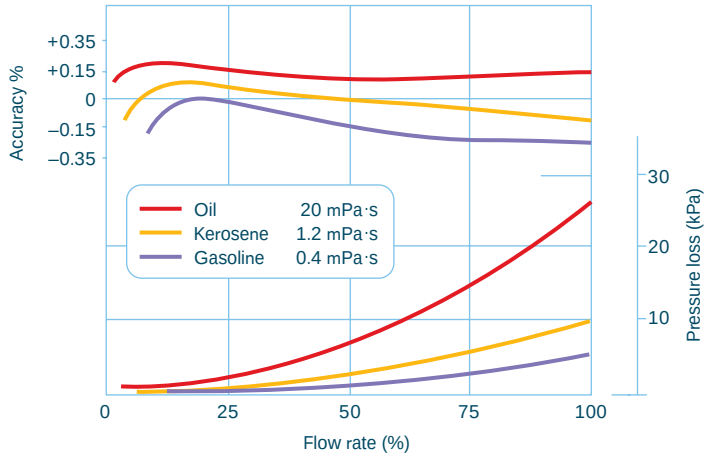


① Gasoline 0.4 mPa·s
② Water 1 mPa·s
③ Light Oil 20 mPa·s
④ A Heavy Oil 20 mPa·s
⑤ B Heavy Oil 100 mPa·s
⑥ C Heavy Oil 300 mPa·s

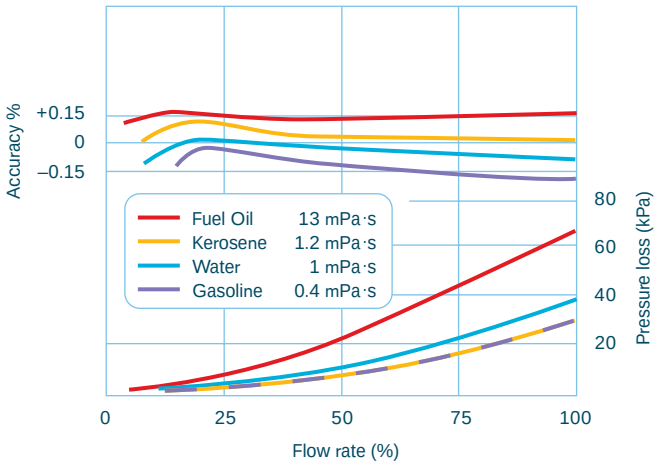
Note: For viscosities greater than 1000 mPa·s High Viscosity rotors are required

Meter Errors and Pressure Losses

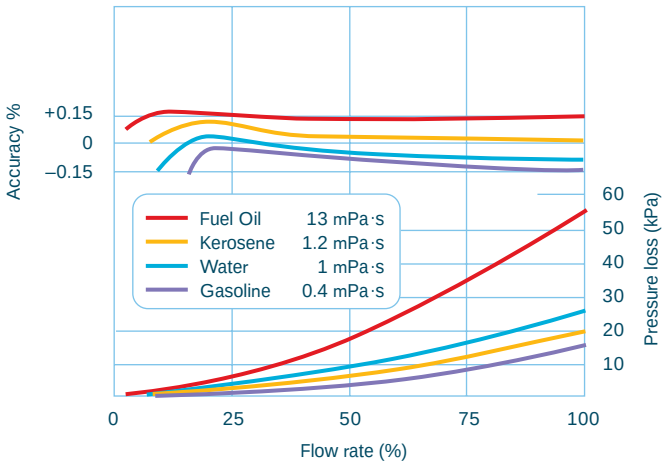
Meter sizes M05, M1 & M2



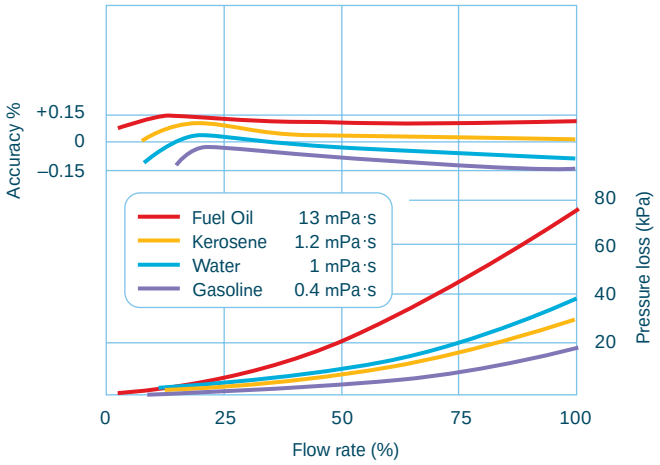
Meter sizes M4, M10 & M40



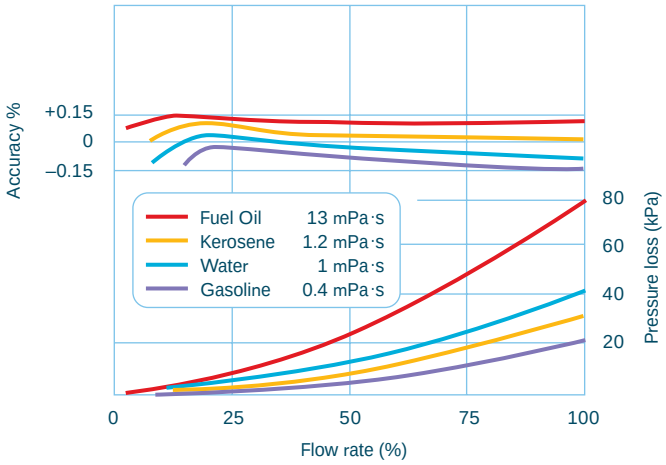
Meter sizes M50



Meter sizes M80

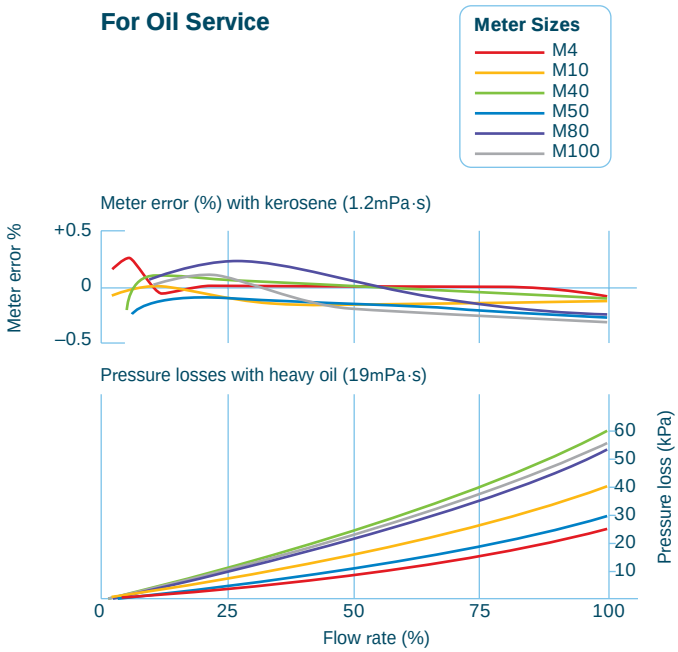


Meter sizes M100

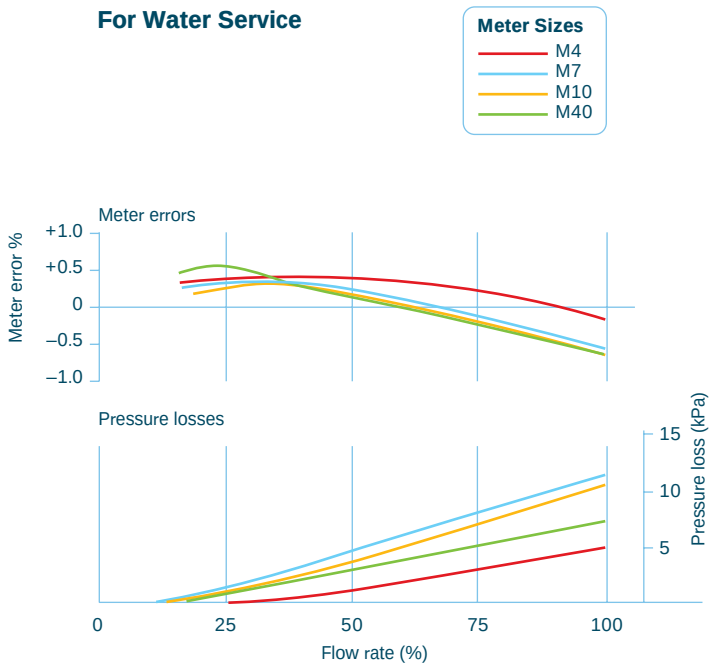


Meter Errors and Pressure Losses

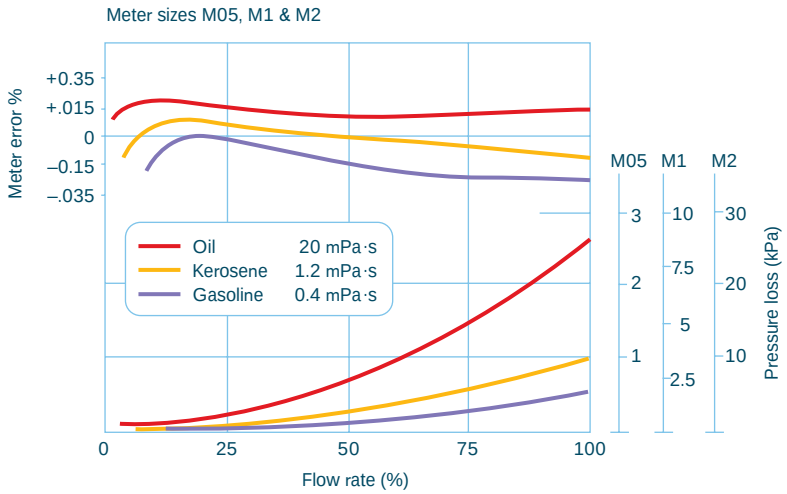
For Oil Service

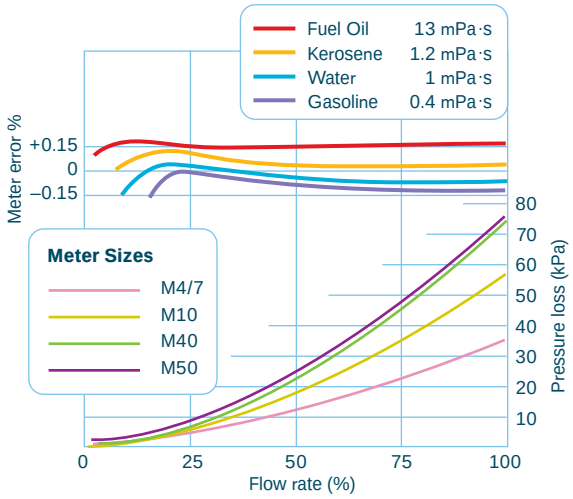


For Water Service



General Chemical Liquids Service





Macnaught M-SERIES™ Flowmeters are designed to be durable and completely serviceable on site.

All meters have a 24 month warranty period from their date of purchase.

Each meter is supplied with a detailed instruction sheet covering installation and operating procedures. An exploded parts diagram is also provided for easy identification of spare parts available.

We also guarantee to support our customers with on-going technical assistance to help with flowmeter selection or any servicing problems that may arise.

macnaught warranty

1. Macnaught Pty Ltd (“Macnaught”) warrants that all products manufactured by Macnaught and/or supplied by Macnaught under the “Macnaught” brand, excluding M-Series positive displacement meters (“Meters”) and components subject to wear, will be free from any defects caused by faulty materials or workmanship for a period of 5 years from the date of purchase of the product.
2. For Meters, the warranty period is 12 months from the date of purchase of that product.
3. For components contained in all products (including Meters) which are usually subject to wear from normal operation of the products (such as o-rings, seals, springs and hoses), the warranty period is 12 months from the date of purchase of the relevant product.
4. For products and components which are not manufactured by Macnaught and are supplied by Macnaught under a brand name other than “Macnaught”, the warranty period is the longer of 12 months from date of purchase of the relevant product and the period of the manufacturer’s warranty.
5. The warranties contained in clauses 1, 2, 3 and 4 above are conditional on the Purchaser, during the relevant warranty period:
    a. delivering to Macnaught a detailed notice setting out full details of any defect in any Product and details of the date and place of purchase (together with copies of purchase receipts and/or other supporting documents); and
    b. at the purchaser’s own cost, returning the defective Product to the nearest authorized Macnaught service centre.
6. Subject to compliance by the purchaser with clause 5, Macnaught shall, at its option, repair or replace any product or component found defective by its inspection by reason of faulty materials or workmanship of Macnaught.
7. This warranty does not cover failure of products, parts or components which, in the sole judgment of Macnaught, arises other than from faulty materials or workmanship of Macnaught, including misuse, abrasion, corrosion, negligence, accident, substitution of non-Macnaught parts, unauthorized modification, improper use, storage or handling, faulty installation or tampering by the purchaser or any third party.
8. If Macnaught inspection discloses no defect in material or workmanship, repair or replacement and return (at Macnaught’s sole option) will be made at customary charges, which will be advised to the purchaser.
9. Macnaught’s liability and the purchaser’s rights under this Warranty shall be limited to repair or replacement of defective products or components and in particular, shall not extend to any direct, special, indirect or consequential damage or losses of any nature.
10. The foregoing warranty supersedes, voids and is in lieu of all or any other warranties.

This warranty does not form part of, nor does it constitute, a contract between Macnaught and the end-user or purchaser. It is additional to any warranty given by the seller of the products. This warranty does not exclude, limit, restrict or modify the non-excludable rights or remedies conferred upon the end-user or purchaser, or the non-excludable duties or liabilities imposed on the seller or Macnaught, by Part V, Divisions 2 and 2A of the Trade Practices Act 1974 (Commonwealth) or other legislative provisions. Macnaught otherwise excludes, to the extent permitted by law, any rights conferred on the end-user or purchaser or duties or liabilities imposed upon Macnaught.

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