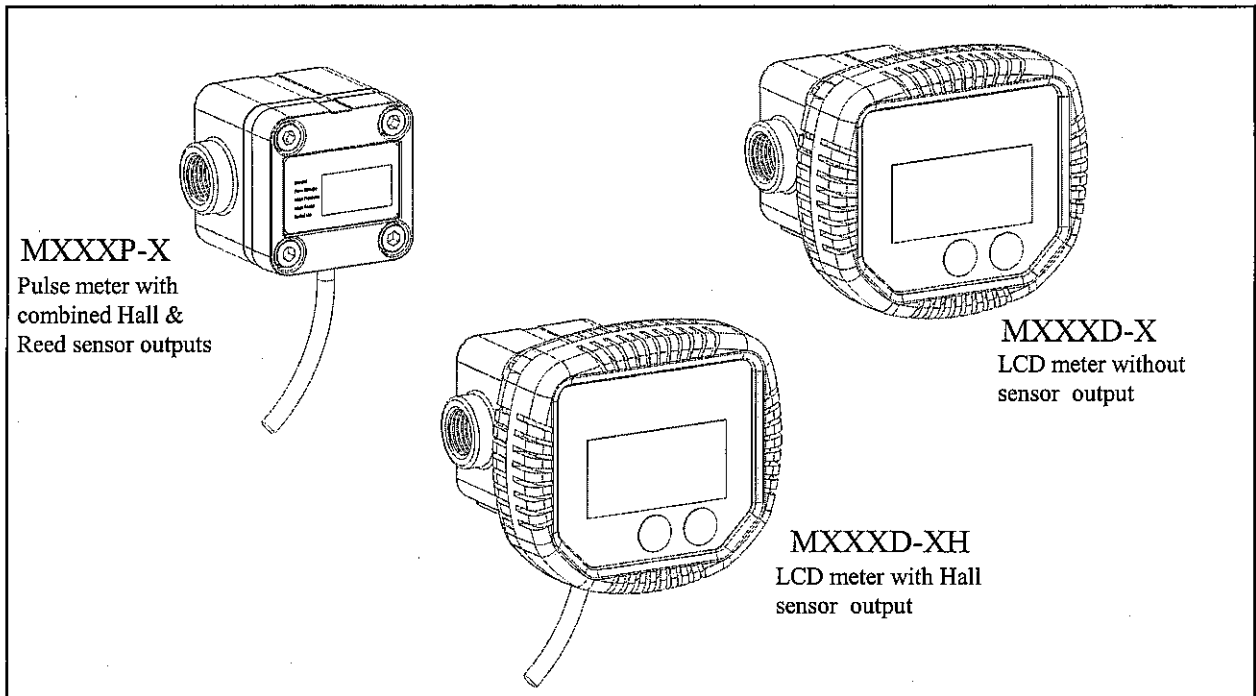


MS792
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0001

MACNAUGHT®

M05, M1& M2 Series Flowmeter - Excludes HP models Instruction Manual



Contents:

- Section 1. Installation
- Section 2. Maintenance general
- Section 3. Maintenance - Pulse meters MXXXP-X
- Section 4. Maintenance - LCD meters MXXXD-X, D-XH
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This Flowmeter series incorporates oval rotor principle in its design, to ensure exceptional accuracy and repeatability over a wide range of fluid viscosities and flow rates. This manual contains installation and operation instructions as well as performance specifications and trouble shooting details. **Please read and retain this manual for future reference.** If you require further information please contact your local representative or distributor.

Section 1. - Installation

Please read this information carefully before use

1. Always ensure that the fluid to be used is compatible with the meter. Refer to industry fluid compatibility charts or consult your local representative or distributor.
2. It is **strongly recommended** that a strainer be installed before the meter for every application. Meters damaged by particles in the fluid may not be covered by warranty. Refer Section 8 page for recommended strainer size.
3. To prevent damage to the meter from entrapped air during initial commissioning or after maintenance, slowly fill the piping system with fluid before starting pumping systems.
4. Use a liquid thread sealant on pipe fittings.
5. Use flexible pipe connections to prevent meter strain.
6. Ensure the meter is mounted with the shafts in the horizontal plane.
7. Refer to Section 8 for sensor wiring details.
8. Always select meters to operate around the middle of the specified flow rate.
9. Install a system pressure relief valve to prevent possible meter damage caused by thermal expansion.

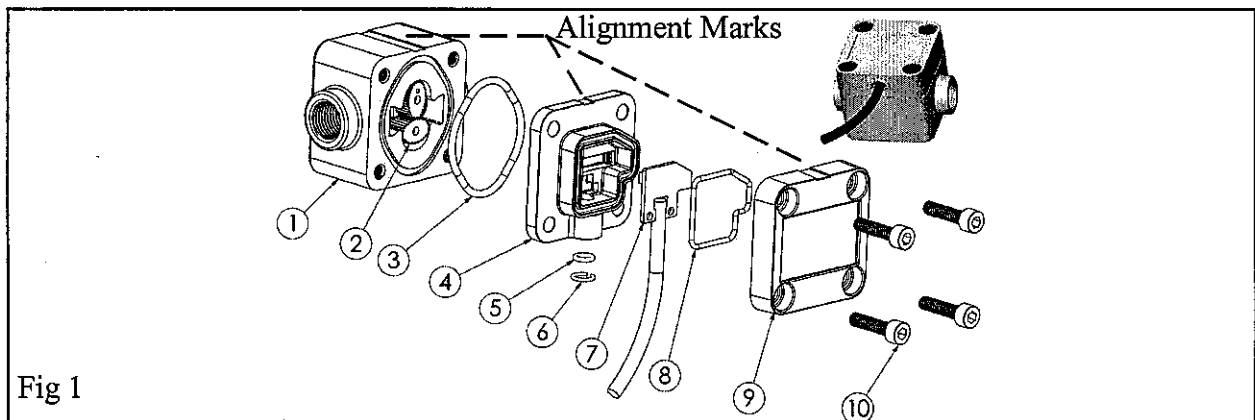
Section 2. - General Maintenance

Please read this information carefully before disassembly.

Cautions

- Ensure the fluid is isolated from the meter to be repaired.
- Ensure the fluid line is depressurized before commencing disassembly.
- Ensure electrical wiring is isolated and disconnected before commencing repairs.
- To prevent damage to the meter during re-commissioning, slowly fill the piping system with fluid before starting the pumping system.
- Refer to Section 8 for Sensor wiring details.

Section 3. - Maintenance - Pulse Meters (MXXXP-X)



Pulse Meter Disassembly

1. Loosen and remove 4 Phillips head or cap head screws (Item 10), see Fig 1.
2. Remove the meter cap (Item 9) and o'ring (Item 8).
3. Remove the inner plate and PCB assembly (Items 4 to 7), refer to Section 5 for PCB maintenance details.
4. Remove the o'ring (Item 3).
5. Remove the rotors (Item 2), note the position of the rotor with the magnet(s) or grub screws
6. Clean and Inspect all components, replace as necessary, see Section 9 for spare parts listing

Pulse Meter Re-assembly

1. Replace the rotors (Item 2), see Fig 2 or 3 for correct orientation. Rotate the rotors by hand to ensure correct engagement.
2. Fit the o'ring (Item 3) into the o'ring groove in the meter body (Item 1).
3. Fit the inner plate assembly (Items 4 to 7), form the o'ring (Item 8) into the inner plate (Item 4), and fit the meter cap (Item 9). Ensure all the alignment marks are lined up with the mark on the body, see Fig 1.
4. Fit and tighten the 4 bolts (Item 10) to the required torque, see Section 10 for details.
5. Check meter function using low air pressure.
6. Restore the fluid & reconnect the wiring as detailed in Sections 1 & 8 respectively.

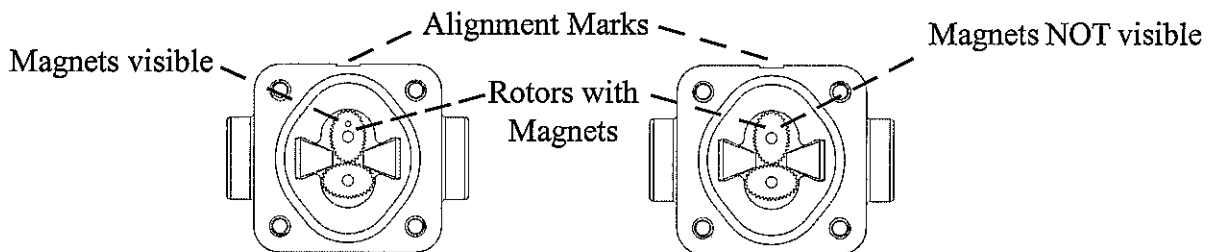


Fig 2 - M05 meters

Fig 3 - M1 & M2 meters

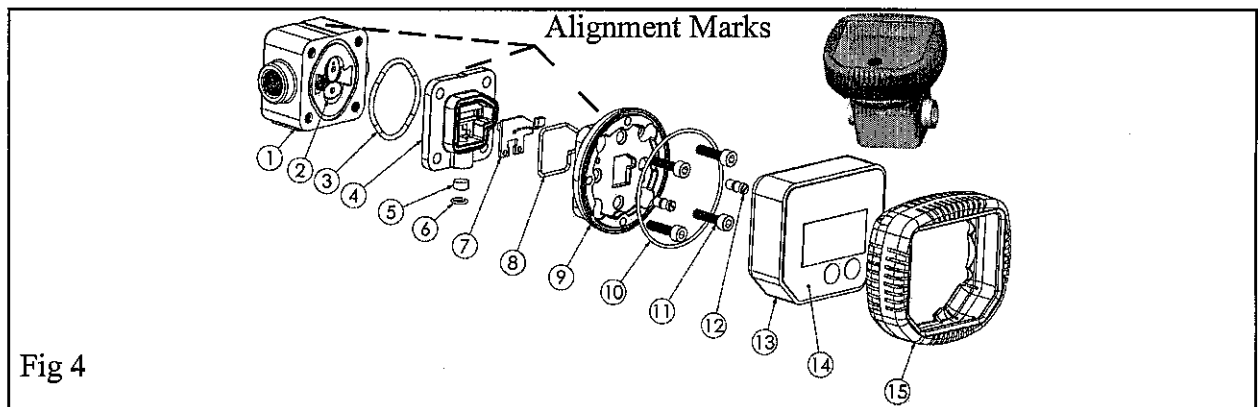


Fig 4

Section 4. - Maintenance - LCD Meters (MXXXD-X &-XH)

LCD Meter Disassembly

1. Remove the protective boot (Item 15), see Fig 4.
2. Using a 2mm Allen key, loosen and unscrew, a few turns, the two grub screws located on each side of the register (Item 13).
3. Carefully remove the register and disconnect sensor connector (Item 7) from the rear of the register.
4. Loosen and remove 4 Phillips head or cap head screws (Item 11).
5. Remove the o'ring (Item 10) and adaptor plate (Item 9).
6. Remove the o'ring (Item 8).

- 7a. For Models MXXXD-X, remove the PCB (Item 7) and the inner plate assembly (Items 4 to 6)
- 7b. For Models MXXXD-XH, remove the inner plate assembly (Items 4 to 7)
8. Remove the o'ring (Item 3).
9. Remove the rotors (Item 2). Note the position of the rotor with the magnet(s).
10. Clean and inspect all components, replace as necessary, see Section 9 for spare parts listing.

LCD Meter Re-assembly

1. Replace the rotors (Item 2), see Fig 2 or 3 for correct orientation.
2. Fit the o'ring (Item 3) into the o'ring groove in the meter body (Item 1), see Fig 4.
- 3a. For Models MXXXD-X, replace the inner plate and seal assembly (Items 4 to 6) onto the meter body (Item 1) and fit the PCB (Item 7)
- 3b. For Models MXXXD-XH, replace the inner plate, PCB & seal assembly (Items 4 to 7)
4. Check the alignment marks, see Fig 4, and form the o'ring (Item 8) into the groove.
5. Pass the PCB cable (Item 7) through the adaptor (Item 9) and fit the adaptor, check the alignment marks, see Fig 4.
6. Fit 4 screws (Item 11) and tighten, see Section 10 for torque specifications.
7. Fit the o'ring (Item 10).
8. Connect the PCB cable to the 3 pin terminal on the rear of the register (Item 13).
9. Locate the Register (Item 13) onto the connecting bollards (Item 12) which are located on the adaptor unit (Item 9). Ensure the PCB cable is not trapped between the Adaptor (Item 9) and the Register (Item 13).
10. Lightly push the Register (Item 13) against the o'ring (Item 10) and using a 2mm Allen key, tighten the 2 grub screws located on each side of the register.
11. Fit the Protective Boot (Item 15).
12. Refer to the Register programming manual supplied for details of register operation.

Section 5. - PCB Maintenance - MXXXP-X & MXXXD-XH

PCB Removal

1. The PCB contains components that are sensitive to static shock, ensure all items and maintenance staff are grounded before working on the PCB.
2. Using a thin blade, or similar, remove the wire clip (Item 6) and seal (Item 5) on MXXXP-X, (See Fig 1) and MXXXD-XH (See Fig 2) models.
2. While lifting the PCB with the blade inserted near the inner plate alignment marks carefully push the cable into the inner plate, continue to lift the back of the PCB until all components on the PCB clear the inner plate.
3. Grasp the cable near the PCB and pull the cable through the opening in the inner plate until the cable ferrules are near the inner plate opening.
4. Push the cable ferrules into the PCB opening, one at a time and remove the cable.

PCB Replacement

1. The PCB contains components that are sensitive to static shock, ensure all items and maintenance staff are grounded before working on the PCB.
2. Feed the cable ferrules, one at a time, through the cable opening in the inner plate.
3. Gently pull the cable through the inner plate opening until the PCB almost touches the inner plate.
4. While pulling the cable gently tilt the PCB into the recess in the inner plate, ensure components underneath the PCB do not come into contact with the inner plate.
5. Pull the cable until the cable ties contact the inner plate, gently push the PCB down into the housing.
6. Press the seal (Item 5) into the inner plate cable entry, followed by the wire clip (Item 6), ensure they are both seated correctly.

Section 6. - Fault Finding

Trouble Shooting Guide		
Trouble	Cause	Remedy
No flow through the meter	a) Foreign matter blocking rotors	a) Dismantle meter and clean rotors Strainer MUST be fitted to maintain warranty
	b) Line strainer blocked	b) Clean strainer
	c) Damaged rotors	c) Replace rotors Strainer MUST be fitted to maintain warranty
	d) Meter connections over tightened	d) Adjust connections
Reduced meter flow	a) Line strainer partially blocked	a) Clean strainer
	b) Fluid is too viscous	b) See specifications for maximum fluid viscosity
Reading inaccurate	a) Fluid flowrate is too high or too low	a) See specifications for flow rate range
	b) Air in fluid	b) Bleed air from system
	c) Wear caused by incorrect installation	c) Correct installation, see Section 1
No pulse signal	a) Faulty PCB	a) Replace PCB
	b) Faulty magnets	b) Replace rotors
	c) Rotors incorrectly installed after maintenance	c) Refer Section 3 or 4 for correct installation

Section 7. - Wetted Materials

Component	Models	Wetted Materials
Body	M 05/1/2	316L Stainless Steel
	M 05/1/2	Aluminium
	M 1/2	PPS
Shafts	M 05/1/2	Stainless Steel
	M 1/2	Hastalloy (optional)
Rotors	M 05/1/2	PM Stainless Steel
	M 1/2	PPS
Bush	M 1/2	Zirconia
	M 05	Sapphire
Inner Plate / Meter Cap	M 05/1/2	316L Stainless Steel
	M 05/1/2	PPS
Magnet	M 05/1/2	Samarium Cobalt

Section 8. - Sensor wiring details

Red Wire	Hall Sensor Power (+)	Hall Voltage Range	4.5 - 24V DC
Black Wire	Hall Sensor Negative (-)	Hall Max Rated current	25mA
White Wire	Hall Sensor Signal	Hall Connection	1K ohm Pull up resistor fitted
Yellow Wire	Reed Sensor Connection	Reed Max Voltage	30V
Green Wire	Reed Sensor Connection	Reed Max Current	0.5A
		Reed Life (Typical)	500x10 ⁶ cycles 10VDC @ 10mA

Section 9. - Spare Parts Listing

ITEM	COMMON FLOWMETER PARTS										M1		M2		
	M05AXX-X	M05SXX-X	M05XXI-X	M1A0X-X	M1RXX-X	M1SXX-X	M1SXX-X	M2AXX-X	M2RXX-X	M2SXX-X	M2SXX-X	M2SXX-X	M2SXX-X	M2SXX-X	M2SXX-X
1	Meter Body & Shafts BSP	MS600BS	MS600BS	MS1AL-1S	MS1R-1S	MS1S-1S	MS1S-1S	MS2AL-1S	MS2R-1S	MS2S-1S	MS2S-1S	MS2S-1S	MS2S-1S	MS2S-1S	MS2S-1S
1	Meter Body & fast. Shafts-NPT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
1	Meter Body&fast.Shafts-NPT	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Rotor Assy.(Ind.Mat.Ref.)	MS810S(SS)	MS810S(SS)	MS810S(SS)	MS811S(PPS)	MS812S(SS)	MS812S(SS)	MS810S(SS)	MS813S(PPS)	MS814S(SS)	MS814S(SS)	MS814S(SS)	MS814S(SS)	MS814S(SS)	MS814S(SS)
2	Rotor Assy.(Ind.Mat.Ref.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Rotor Assy. - Double Pulse	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2	Rotor Assy. - High Visc.	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	O-ring - Viton	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS	BS029VS
3	O-ring - Nitrile	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S	BS029S
3	O-ring - EPDM	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES	BS029ES
3	O-ring - Perfluoroelastomer	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES	BS029TES
4	Inner plate	MS427S	MS427-1S	MS427-1S	MS427S	MS427S	MS427-1S	MS427S	MS427S	MS427-1S	MS427S	MS427-1S	MS427-1S	MS427-1S	MS427-1S
Spare Parts MXXXP-X, See Fig 1															
5	O-ring (NBR)	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S
6	Wire clip	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S
7	PCB assembly	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS	MS271AS
8	O-ring (NBR)	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S
9	Meter Cap	MS428S	MS428-1S	MS428-1S	MS428S	MS428S	MS428-1S	MS428S	MS428S	MS428S	MS428S	MS428-1S	MS428-1S	MS428-1S	MS428-1S
10	Fixing Screws	MS98S	MS113S	MS277S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S
Spare Parts MXXXD-X, See Fig 4															
5	Plug (NBR)	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S
6	Wire clip	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S
7	PCB assembly	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS
8	O-ring (NBR)	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S	N359S
9	Adaptor	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S	MS786S
10	O-ring (NBR)	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S	BS037S
11	Fixing Screws	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S	MS98S
12	Boilrads	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S	MR017S
13	Register Assembly	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS	MR100AS
14	Facia Decal	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S	MR019S
15	Protective Boot	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS	IM071BUS
Spare Parts MXXXD-XH, See Fig 4															
7	PCB assembly	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS	MS271A-MRS

Section 10. - Specifications

General Specifications	M05				M1				M2			
	M05AX-X	M05SXX-X	M05SXX-X	M05SXX-X	M1AX-X	M1RX-X	M1SX-X	M1SXX-X	M2AX-X	M2RX-X	M2SX-X	M2SXX-X
Port Size	1/8"	1/8"	1/8"	1/8"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"	1/4"
Accuracy	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1	+/-1
Maximum Viscosity	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
H Viscosity option												
Minimum Flow <5cp	2/0.528	2/0.528	2/0.528	2/0.528	2/0.53	2/0.53	2/0.53	2/0.53	25/6.6	25/6.6	25/6.6	25/6.6
Maximum Flow <5cp	50/13.2	50/13.2	50/13.2	50/13.2	100/26.4	100/26.4	100/26.4	100/26.4	500/132	500/132	500/132	500/132
Minimum Flow >5cp	0.5/0.132	0.5/0.132	0.5/0.132	0.5/0.132	1/0.26	1/0.26	1/0.26	1/0.26	15/4	15/4	15/4	15/4
Maximum Flow >5cp	50/13.2	50/13.2	50/13.2	50/13.2	100/26.4	100/26.4	100/26.4	100/26.4	500/132	500/132	500/132	500/132
K Factor	1552/5874.32	1552/5874.32	1552/5874.32	1552/5874.32	1000/3785	1000/3785	1000/3785	1000/3785	400/1514	400/1514	400/1514	400/1514
K Factor - Double Pulse									800/3028	800/3028	800/3028	800/3028
Max. Operating Pressure	75/5/500	150/10/1000	800/55/5515	800/55/5515	75/5/500	75/5/500	150/10/1000	800/55/5515	75/5/500	75/5/500	150/10/1000	800/55/5515
Rec. Strainer size	200	200	200	200	200	200	200	200	200	200	200	200
Bolt Torque	2	9	9	9	2	1	9	9	2	1	9	9
Specifications MXXP-X												
Minimum Temperature	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F
Maximum Temperature	80/176	120/248	120/248	120/248	80/176	80/176	120/248	120/248	80/176	80/176	120/248	120/248
Pulse Type	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall	Reed & Hall
Cable Length	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28
Weight												
Dim. width x depth x height	60x50x60	67x50x60	67x50x60	67x50x60	60x50x60	64x50x60	67x50x60	67x50x60	60x50x60	64x50x60	67x50x60	67x50x60
Dimensions flange to flange	60/2.36	67/2.63	67/2.63	67/2.63	60/2.36	64/2.52	67/2.63	67/2.63	60/2.36	64/2.52	67/2.63	67/2.63
Specifications MXXD-X & D-XH												
Minimum Temperature	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F	5°C / 41°F
Maximum Temperature	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F	55°C / 131°F
Min. Storage Temperature	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F	-10°C / 14°F
Max. Storage Temperature	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F	60°C / 140°F
Register K Factor**	1552	1552	1552	1552	1000	1000	1000	1000	400	400	400	400
Weight												
Pulse Type (MXXD-XH)	Hall only	Hall only	Hall only	Hall only	Hall only	Hall only	Hall only	Hall only	Hall only	Hall only	Hall only	Hall only
Cable Length (MXXD-XH)	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28	1/3.28
Dim. width x depth x height	90x60x60	90x60x60	90x60x60	90x60x60	90x60x60	90x60x60	90x60x60	90x60x60	90x60x60	90x60x60	90x60x60	90x60x60
Dimensions flange to flange	60/2.36	67/2.63	67/2.63	67/2.63	60/2.36	64/2.52	67/2.63	67/2.63	60/2.36	64/2.52	67/2.63	67/2.63

Note ** For models MXXD-X & D-XH the metric K Factor is used as the meter K Factor, the register then calculates all other display units automatically.

Section 11. - Approvals

EC Declaration of Conformity

In accordance with EN 45014:1998

We: Macnaught Pty Ltd

of: 41-49 Henderson Street, Turrella NSW, 2205, Australia

Declare that:

Macnaught M Series Flow Meter prefixed: M05, M1, M2

From series CXXXX onwards

in accordance with the following Directive:

98/37/EC The Machinery Directive (and its amending directives)

has been designed and manufactured to the following specifications:

EN292-1:1991 Safety of Machinery Part 1

EN292-2:1991 Safety of Machinery Part 2

EN292-2/A1:1995 Safety of Machinery Part 2 amendment 1

Declare that:

Macnaught M Series Flow Meter accessory prefixed: MR100, as fitted to models MXXXX-X & MXXXX-XH

in accordance with the following Directive:

89/336/EC The Electromagnetic Compatibility Directive (and its amending directives)

has been designed and manufactured to the following specifications:

EN61326:2002 Electromagnetic Compatibility – Electrical equipment for measurement, control and laboratory use.

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The product complies with all essential requirements of the Directives.

Name: S. Doyle

Position: Engineering Manager

Date:23/5/05

Done at: Macnaught Pty Ltd. 41-49 Henderson Street, Turrella NSW2205, Australia



USA Approvals

FCC Rules, Part 15, Subpart B Unintentional Radiators
Class A digital devices. ANSI C63.4-1992

Australian Approvals



Conforms to IEC61326:2002, Electrical equipment for measurement, control and laboratory use.
C-Tick N10097

Section 12. - Warranty & Supplier Details

Macnaught Industries ('Macnaught') warrants that the Products will be free from any defects caused by faulty material or workmanship for a period of twelve (12) months from the date of sale of the Products to the enduser (the 'Warranty Period') PROVIDED THAT, during the Warranty Period:

1. Macnaught receives notice setting out full details of any defect in any Product and details of the time and place of purchase of the product:

and

2. the enduser, at its own cost returns the Product to the nearest authorised Macnaught Service Centre.

Macnaught shall, as its option repair or replace any Product found defective by its inspection or refund the price paid by the enduser for that Product.

Macnaught's liability and the enduser's rights under this warranty shall be limited to such repair, replacement or refund and, in particular, shall not extend to any direct, special, indirect or consequential damage or loss of any nature.

Note:

This warranty does not form part of, nor does it constitute, a contract between Macnaught and the enduser. It is additional to any warranty given by the seller of the Products and does not exclude, limit, restrict or modify the rights or remedies conferred upon the enduser, or the liabilities imposed on the seller, by any statute or other laws in respect of the sale of the Product.

As part of a continual improvement process the information contained in the this Instruction manual is subject to change without notice, please contact your local reseller to confirm current specifications.



Macnaught Pty Ltd
ABN 66 000 075 785
41 - 49 Henderson Street, Turrella, Sydney, NSW, Australia 2205
PO Box 90 Amcliffe, Sydney, NSW, Australia 2205
International Telephone +61 2 9597 0401 Facsimile +61 2 9597 7773
Email: sales@macnaught.com.au - Web www.macnaught.com.au

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