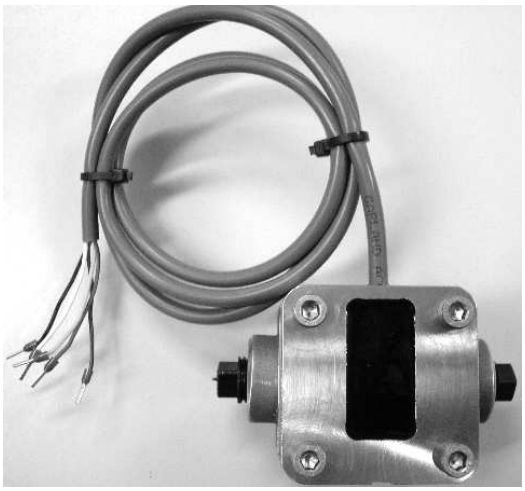
MS873
0310
0001

M05,M1& M2 SERIES FLOWMETER
(Serial Number Prefix "E")
INSTRUCTION MANUAL



This flow meter 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.

INSTALLATION

Please read this information carefully before use.

1. Always ensure that the fluid to be used is compatible with the meter materials. 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 page 7 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 page 3 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.

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 page 3 for Sensor wiring details.
- One of the bolts/screw has a blue wax seal, this is a warranty seal.

Pulse Meter Re-assembly

1. Replace the rotors (Item 5 & 6), see Fig 1 for correct orientation. Rotate the rotors by hand to ensure correct engagement.

2. Fit the o'ring (Item 7) into the o'ring groove in the meter body (Item 1).

3. Fit the top cap assembly (Item 2), fit the legend plate (item 3) into correct orientation. Ensure all the alignment marks are lined up with the mark on the body.

4. Fit and tighten the 4 bolts/screws (1-3-2-4) to the required torque, see page 7, Specifications, for details.

5. Check meter function using low air pressure.

6. Restore the fluid & reconnect the wiring as detailed on page 3.

MAINTENANCE

Pulse Meter Disassembly

1. Loosen and remove 4 Phillips head or cap head screws (Item 4), see Fig 2.

2. Remove the meter cap (Item 2) and o'ring (Item 7).

3. Remove the rotors (Item 5 & 6), note the position of the rotor with the magnet(s) or grub screws

4. Clean and Inspect all components, replace as necessary, see pages 5 & 6 for spare parts listing.

PCB Details

The circuit boards in this model are fully encapsulated and can not be replaced, a complete cap will be required. Consult wiring connections for each model in wiring terminations section.

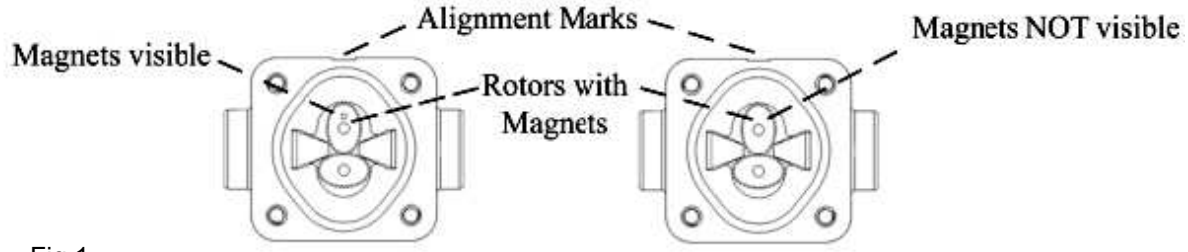


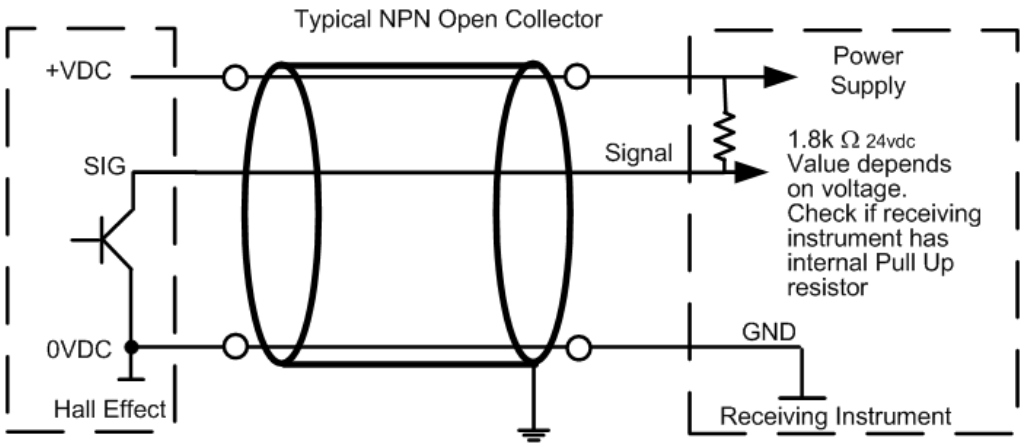
Fig 1

M05xx-x

M1xx-x & M2xx-x

Sensor Wiring Connections

Output Type		Wire	Function	Wire	Function	Wire	Function	Note
Reed/Hall	Reed	Green		Yellow				No Polarity Required
	Hall	Red	+ VDC	Black	Gnd (0V)	White	Signal	NPN Open Collector
Reed/Reed	Reed	Green		Yellow				No Polarity Required
Dual Hall		Red	+ VDC	Black	Gnd (0V)	White	Signal	NPN Open Collector
Reed/Hall LCD	Reed	Black		Black				Connects to LCD
	Hall	Red	+ VDC	Black	Gnd (0V)	White	Signal	NPN Open Collector



Hall Effect Specifications

Absolute Maximum Ratings

Characteristic	Symbol	Notes	Rating	Units
Supply Voltage	V_{CC}		30	V
Reverse Supply Voltage	V_{RCC}		–30	V
Output Off Voltage	V_{OUT}		30	V
Reverse Output Voltage	V_{ROUT}		–0.5	V
Output Current	$I_{OUTSINK}$		25	mA
Magnetic Flux Density	B		Unlimited	G
Operating Ambient Temperature	T_A			
		Range L	–40 to 150	°C
Maximum Junction Temperature	T_J(max)		165	°C
Storage Temperature	T_{stg}		–65 to 170	°C

Reed Switch Specifications

Magnetic properties	Conditions	Min	Typ	Max	Unit
Pull-In	at 20°C			36.5	AT
Test equipment			KMS-03		

Special Product Data	Conditions	Min	Typ	Max	Unit
Contact rating	Any DC combination of V & A not to exceed their individual max.'s			10	W
Switching Voltage	DC or Peak AC			30	VDC
Operating Ampere	DC or Peak AC			0.5	A
Switching current	DC or Peak AC			0.5	A
Sensor-resistance	measured with 40% overdrive			360	mOhm
Housing material			Celanex 3216		
Case colour			black		
Sealing compound			Epoxy resin		

Environmental data	Conditions	Min	Typ	Max	Unit
Operating temperature		-5		130	°C
Storage temperature		-20		130	°C

Cable specification	Conditions	Min	Typ	Max	Unit
Cable type			single wires		
Temperature range unmoved		-30		130	°C
Temperature range moved		-5		130	°C
Cable material			FEP		
Cross section			AWG 28		

FAULT FINDING

Trouble Shooting Guide		
Trouble	Cause	Remedy
No flow through the meter	a) Foreign matter blocking the rotors	a) Dismantle meter & clean rotors "Strainer should be fitted at all times"
	b) Strainer is blocked	b) Clean strainer
	c) Damaged rotors	c) Replace rotors
	d) Meter connections over tightened	d) Use flexible hoses to connect to meter, beware of connection types
Reduced meter flow	a) Strainer partially blocked	a) Clean strainer
	b) Fluid too viscous	b) See specifications about viscosity & flow rate restrictions
Reading inaccurate	a) Fluid flow rate is too high or low	a) Check flow specifications
	b) Air in fluid	b) Check system for air entry & correct
	c) Wear caused by incorrect installation	c) Correct installation on page 1
No pulse signal	a) Faulty PCB	a) Replace meter cap
	b) Loss of magnetic strength	b) replace rotors
	c) Rotors incorrectly installed after maintenance	c) Refer to page 2 for correct installation

WETTED MATERIALS

Component	Model	Wetted Material
Body	M05/M1/M2	316L Stainless Steel
	M05/M1/M2	Aluminium 6351
	M1/M2	PPS (Fortron ®)
Rotors	M05/M1/M2	316L Stainless Steel
	M1/M2 PPS	(Ryton ®)
Shafts	M05/M1/M2	316L Stainless Steel
	M1/M2 PPS	Hastalloy C
Bush	M05/M1/M2	Special Carbon
Magnet	M05/M1/M2	Samarium Cobalt
Cap	M05/M1/M2	Aluminium
Note: PCB fully encapsulated	M05/M1/M2	316L Stainless Steel
Loctite LOC32478	M1/M2	PPS (Fortron ®)

Parts Breakdown

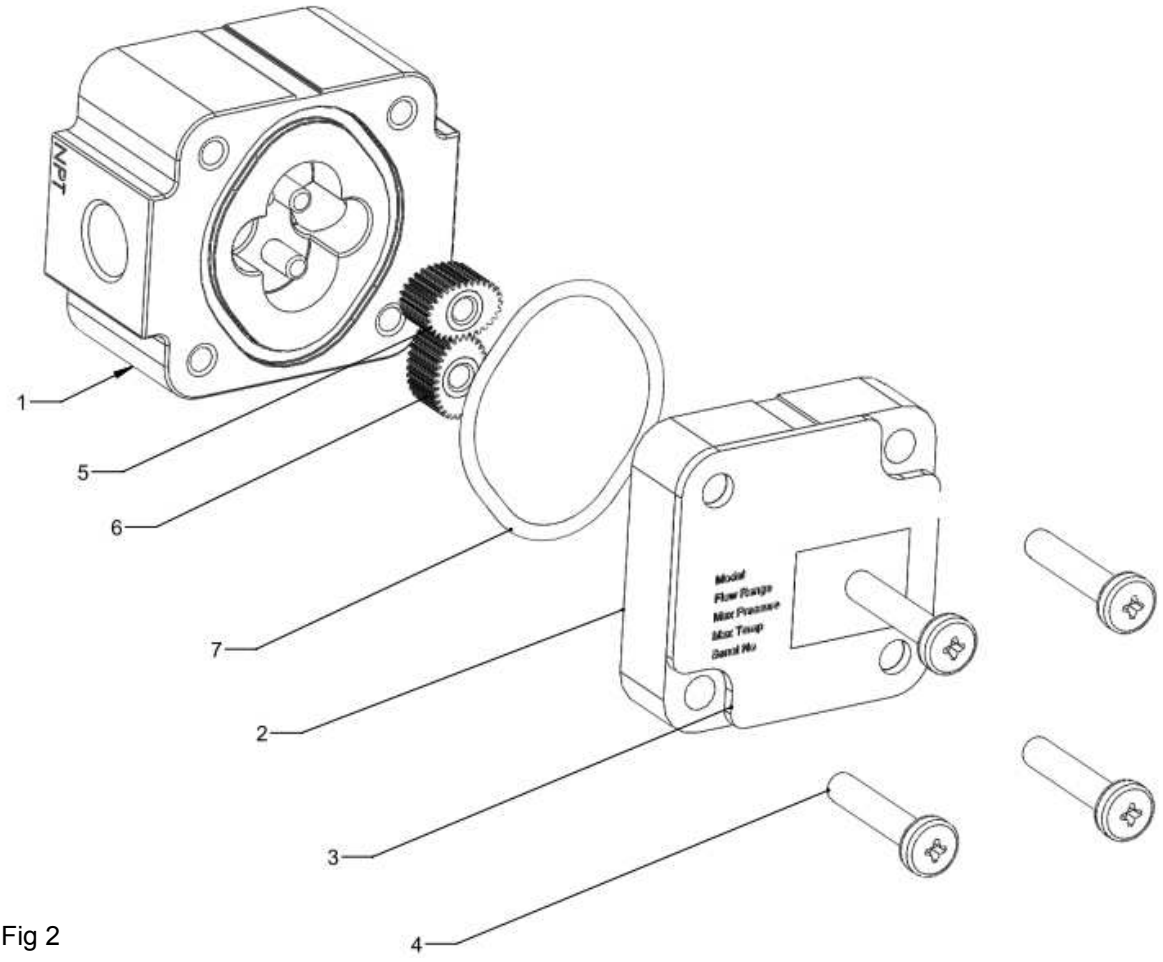


Fig 2

Item No.	Model	Part Number	Description	Option
1 *Meter Body Set*	M05	MS605BS	1/8” RP (BSP) Aluminium Meter Body	MS6051BS (RC)
		MS605NS	1/8” NPT Aluminium Body	
		MS600BS	1/8” RP (BSP) Stainless Steel Meter Body	MS6001BS (RC)
		MS600NS	1/8” NPT Stainless Steel Meter Body	
	M1	MS1AL-1S	1/4” RP (BSP) Aluminium Meter Body	MS1AL-11S (RC)
		MS1AL-2S	1/4” NPT Aluminium Meter Body	
		MS1S-1S	1/4” RP (BSP) Stainless Steel Meter Body	MS1S-11S (RC)
		MS1S-2S	1/4” NPT Stainless Steel Meter Body	
		MS1R-1C	1/4” RC (BSP) PPS (Fortron®)	
		MS1R-2S	1/4” NPT PPS (Fortron®)	
	M2	MS2AL-1S	1/4” RP (BSP) Aluminium Meter Body	MS2AL-11S (RC)
		MS2AL-2S	1/4” NPT Aluminium Meter Body	
		MS2S-1S	1/4” RP (BSP) Stainless Steel Meter Body	MS2S-11S (RC)

Parts Breakdown Continued

Item No.	Model	Part Number	Description	Configuration
1 *Meter Body Set*	M2	MS2S-2S	1/4" NPT Stainless Steel Meter Body	
		MS2R-1C	1/4" RC (BSP) PPS (Fortron®)	
		MS2R-2S	1/4" NPT PPS (Fortron®)	
2 *Meter Cap Set*	M05/M1/M2	DR006AS	Aluminium ***(DR/DRA Register)*** Cap	**Hall/Reed Combo**
		DR006-1AS	Stainless Steel ***(DR/DRA Register)*** Cap	**Hall/Reed Combo**
		DR006RAS	PPS ***(DR/DRA Register)*** Cap	**Hall/Reed Combo**
		MS1180AS	Aluminium Cap c/w 1 metre Cable	**Hall/Reed Combo**
		MS1180-1AS	Stainless Steel Cap c/w 1 metre Cable	**Hall/Reed Combo**
		MS1180RAS	PPS Cap c/w 1 metre Cable	**Hall/Reed Combo**
		MS1180DS	Aluminium Cap c/w 1 metre Cable	**Single Reed**
		MS1180-1DS	Stainless Steel Cap c/w 1 metre Cable	**Single Reed**
		MS1180RDS	PPS Cap c/w 1 metre Cable	**Single Reed**
		MS1180-1CS	Stainless Steel Cap c/w 1 metre Cable	**Hi Res Hall**
3	M05/M1/M2	MS1193S	Macnaught Legend Plate Kit	
4	M05/M1/M2	MS1228S	M5x20 Pan Head SS Phillips	**Aluminium x 4**
Screw Set	M05/M1/M2	MS1213S	M5x20 SHCS A4-80 SS Cap Screws	**Stainless Steel x 4**
	M1/M2	MS1228S	M5x20 Pan Head SS Phillips	**PPS x 4**
5 & 6 *Rotor Set* <u>Notes</u> 5 rotor c/w magnet (s) 6 Neutral rotor	Available in set of two only	MS601S	Stainless Steel M05 Rotor Set	**Suits Reed/Hall**
		MS6-1S	Stainless Steel M1 Rotor Set	**Suits Reed/Hall**
		MS814S	Stainless Steel M2 Rotor Set	**Suits Reed/Hall**
		MS6S	PPS M1 Rotor Set	**Suits Reed/Hall**
		MS813S	PPS M2 Rotor Set	**Suits Reed/Hall**
		MS814HS	St St M2 High Viscosity Rotor Set	**Suits Reed/Hall**
7 *O'Ring Set*	M05/M1/M2	BS029ES	EPDM O'ring	
		BS029VS	FKM (Viton®) O'ring	
		BS029PS	FFPM (Perfluor™) O'ring	

SPECIFICATIONS

Specification	M05AS	M05SS	M1RR/S	M1AS	M1SS	M2RR/S	M2AS	M2SS
Port Size BSP/NPT	⅛″	⅛″	¼"	¼"	¼"	¼"	¼"	¼"
Thread RP Parallel or RC Taper	RP Std RC Opt	RP Std RC Opt	RC	RP Std RC Opt	RP Std RC Opt	RC	RP Std RC Opt	RP Std RC Opt
Accuracy % Reading	±1	±1	±1	±1	±1	±1	±1	±1
Max Viscosity cPs	1000	1000	1000	1000	1000	1000	1000	1000
High Visc. Option							V2	V2
Min Flow Lt/USG Hr	0.5/0.13	0.5/0.13	2/0.53	2/0.53	2/0.53	15/4	15/4	15/4
Max Flow Lt/USG Hr	50/13.2	50/13.2	100/26.4	100/26.4	100/26.4	500/132	500/132	500/132
K Factor Litre USG	1552 5875	1552 5875	1000 3785.4	1000 3785.4	1000 3785.4	400 1514.2	400 1514.2	400 1514.2
Max Pres Bar/PSI	10/150	55/800	5/75	10/150	55/800	5/75	10/150	55/800
Strainer Size (Mesh)	200	200	200	200	200	200	200	200
Bolt Torque N-m — in/lbs	**2/17.7**	**9/80**	**1/8.8**	**2/17.7**	**9/80**	**1/8.8**	**2/17.7**	**9/80**
Temperature Min C/F Max C/F	-10/14 80/176	-10/14 120/248	-10/14 80/176	-10/14 80/176	-10/14 120/248	-10/14 80/176	-10/14 80/176	-10/14 120/248
Pulse Type	**Reed/Hall or Reed**	**Reed/Hall or Reed**	**Reed/Hall or Reed**	**Reed/Hall or Reed**	**Reed/Hall or Reed**	**Reed/Hall or Reed**	**Reed/Hall or Reed**	**Reed/Hall or Reed**
Cable Length M/Ft	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 grams/ ounces	310/11	600/21.2	240/8.5	310/11	600/21.2	310/11	310/11	600/21.2
Dimensions WxDxH	**51x60x45**	**51x68x45**	**60x64x45**	**51x60x45**	**51x68x45**	**60x64x45**	**51x60x45**	**51x68x45**
Face to Face mm/Inch	60/2.36	68/2.68	64/2.68	60/2.36	68/2.68	64/2.568	60/2.36	68/2.68

EC Declaration of Conformity

MS816
0509
0002

In accordance with EN ISO17050:2004

We: Macnaught Pty Ltd

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

Declare that:

Macnaught M Series Flow Meter prefixed: M05 to M100, inclusive

From series CXXXX onwards

in accordance with the following Directive:

2006/42/EC The Machinery Directive (and its amending directives)

has been designed and manufactured to the following specifications:

EN ISO12100-1:2003 Safety of Machinery

Declare that:

Macnaught M Series Flow Meter prefixed: M40 to M100, inclusive

From series CXXXX onwards

in accordance with the following Directive:

97/23/EC The Pressure Equipment Directive (and its amending directives)

comply with the essential requirements of the Directive, classification Catergory 1 Group 1.

Declare that:

Macnaught M Series Flow Meter accessory prefixed: ER or DR, as fitted to models MXXXxR-XX

in accordance with the following Directive:

2004/108/EC The Electromagnetic Compatibility Directive (and its amending directives)

has been designed and manufactured to the following specifications:

EN61326-1:2006 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.

This declaration is no longer valid if the unit is modified without our agreement.

Name: S. Gavin Position: Operation Manager Date:30/4/09

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

CE