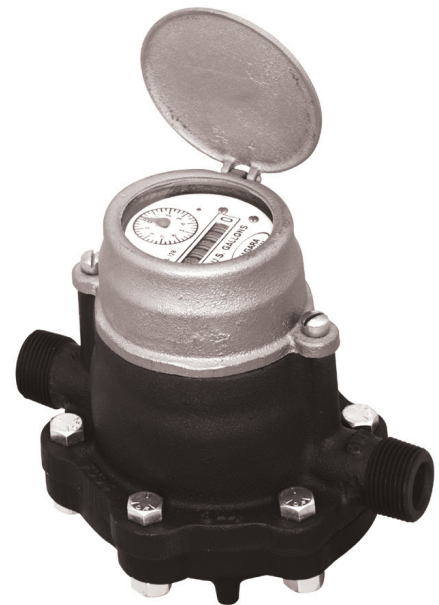




Nutating Disc Meter Installation & Operation Manual





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SAFETY SYMBOLS



WARNING:

IDENTIFIES CONDITIONS OR PROCEDURES, WHICH IF NOT FOLLOWED, COULD RESULT IN SERIOUS INJURY. RISK OF ELECTRICAL SHOCK.



CAUTION:

IDENTIFIES CONDITIONS OR PROCEDURES, WHICH IF NOT FOLLOWED, COULD RESULT IN SERIOUS DAMAGE OR FAILURE OF THE EQUIPMENT.

Nutating Disc Meter Installation & Operation Manual

I. HANDLING AND STORAGE

SAVE THESE INSTRUCTIONS

INSPECTION AND HANDLING

Do not dispose of the carton or packing materials.

Each package should be inspected upon receipt for damage that may have occurred due to mishandling during shipping. If the unit is received damaged, notify the carrier or the factory for instructions. Failure to do so may void your warranty. If you have any problems or questions, consult Customer Support at 800-778-9251 or (864) 574-3327.

DISPOSAL AND RECYCLING

This product can be recycled by specialized companies and must not be disposed of in a municipal collection site. If you do not have the means to dispose of properly, please contact for return and disposal instructions or options.

STORAGE

If the device is not scheduled for immediate installation following delivery, the following steps should be observed:

1. Following inspection, repackage the unit into its original packaging.
2. Select a clean dry site, free of vibration, shock and impact hazards.
3. If storage will be extended longer than 30 days, the unit must be stored at temperatures between 32° and 158° F (0° to 70° C) in non-condensing atmosphere with humidity less than 85%.



CAUTION: DO NOT STORE A NON-POWERED UNIT OUTDOORS FOR A PROLONGED PERIOD.

II. GENERAL SAFETY

AUTHORIZED PERSONNEL

All instructions described in the document must be performed by authorized and qualified service personnel only. Before installing the unit, please read these instructions and familiarize yourself with the requirements and functions of the device. The required personal protective equipment must always be worn when servicing this device.

USE

The device is solely intended for use as described in this manual. Reliable operation is ensured only if the instrument is used according to the specifications described in this document. For safety and warranty reasons, use of accessory equipment not recommended by the manufacturer or modification of this device is explicitly forbidden. All servicing of this equipment must be performed by qualified service personnel only. This device should be mounted in locations where it will not be subject to tampering by unauthorized personnel.

MISUSE

Improper use or installation of this device may cause the following:

- Personal injury or harm
- Application specific hazards such as vessel overfill
- Damage to the device or system

If any questions or problems arise during installation of this equipment, please contact Customer Support at 800-778-9251 or (864) 574-3327.

III. PRODUCT DESCRIPTION

FUNCTION

Liquid enters a precision-machined chamber containing a disc which nutates (wobbles). The position of the disc divides the chamber into compartments containing an exact volume. Liquid pressure drives the disc to wobble and a roller cam causes the nutating disc to make a complete cycle. The compartments are filled and emptied each cycle. The movements of the disc are transmitted by a gear train to a register/totalizer or pulse transmitter. Close clearances between the disc and chamber ensure minimum leakage for accurate and repeatable measurement of each volume cycle.

FEATURES

- Exceptional value by eliminating upstream and downstream straight run piping requirements; power not required for mechanical version
- Compact size saves space
- Various construction materials allows for a broad range of fluids

TECHNICAL SPECIFICATIONS

FUNCTIONAL	
Fluid Type	Liquid
Maximum Pressure	See Table 3
Fluid Temperature	See Table 3
Registration	U.S. gallons, lbs., Imperial gallons, Liters, etc.
Outputs	Mechanical totalizing, mechanical batching, electro-mechanical totalizing, electro-mechanical batching, and blind electronic pulse registers available.
PERFORMANCE	
Accuracy	+ 1.5% of rate over flow ranges of Table 2 - std. + 0.5% of rate available (consult factory)
Repeatability	+ 0.25% of rate
Flow Turndown Ratio	See Table 2
Agency Approvals	UL and CSA, Class 1 Div 1 Group D, R22 only, Display and Totalizer available
PHYSICAL	
Materials of Construction	See Table 3
Case	Bronze; 316 SS; or Epoxy coated Cast Iron or carbon steel
Chamber Material	Bronze; Ni-resist; or 316 SS
Disc	Ryton®
Ball	Ryton® or carbon
Gasket	Nitrile, Synthetic Fiber with Rubber Binder or Teflon with 316 SS chamber
Gears	Bronze or 316 SS with 316 SS chamber
Register Housing	Plastic, Bronze, Aluminum
Connections & Mountings	See chart below for MNPT Connections
Mounting Position	Horizontal: Ensure meter remains full with register up.
Typical Straight Pipe Requirements	Upstream: none, Downstream: none
Process Connections	MNPT: Flange 3" and 4". See Table 2.
Electrical Connection	Only for optional electronic transmitter

Table 1. Flow Rate Group

Group 1	Up to 30 SSU (.20 to 1.00 centipoise)
Group 2	31 to 450 SSU (1 to 90 centipoise)
Group 3	450 to 1,000 SSU (90 to 220 centipoise)
Group 4	1,000 to 5,000 SSU (220 to 1,100 centipoise)
Group 5	5,500 to 20,000 SSU (1,100 to 4,400 centipoise)
Group 6	20,000 to 50,000 SSU (4,400 to 11,000 centipoise)

Table 2. Flow Ranges

Flow Rate Group (flow rates in GPM) (Reference Table 1)						High Pressure Epoxy Coated Carbon Steel with Mechanical Drive	Epoxy Coated Cast Iron with Mechanical Drive	Bronze with Mechanical Drive	Bronze with Magnetic Drive	316 SS with Mechanical Drive
1	2	3	4	5	6					
0.75 - 5	0.5 - 7	0.2 - 5	0.2 - 5	0.2 - 3			0.75" MNPT	0.75" MNPT		
1 - 11	1 - 20	1 - 15	1 - 8	1 - 4		1" MNPT	1" MNPT	1" MNPT		1" MNPT
3 - 18	2 - 30	3 - 20	1 - 12	1 - 6	0.5 - 4		1.25" MNPT	1.25" MNPT		
5 - 30	3 - 50	5 - 30	2 - 15	1 - 8	1 - 5	1.5" Flg.	1.5" MNPT	1.5" MNPT		1.5" Flg.
7 - 35	5 - 100	7 - 50	2 - 35	2 - 20	1.5 - 10		2" MNPT	2" MNPT		
12 - 65	8 - 160	12 - 100	5 - 70	5 - 40	2 - 20	2.5" Flg.	2.5" MNPT			2.5" Flg.
18 - 100	8 - 240	15 - 125	9 - 80	9 - 45	4 - 25			3" G Flg.		
22 - 120	15 - 300	25 - 180	12 - 110	12 - 60	10 - 30			3" I Flg.		
35 - 185	20 - 400	30 - 250	16 - 190	16 - 100	14 - 50			4" Flg.		

Table 3. Temperature & Pressure Ratings

CASE MATERIAL		BRONZE										
Chamber Material		Bronze Standard										
Drive		Magnetic					Mechanical					
Size		0.75"	1.00"	1.50"	2.00"	3.00" G	3.00" I	4.00				
Temperature & Pressure (in psi)	100°F	150	200	225	250	225	225	150				
	200°F	135	185	210	235	200	210	135				
	300°F	115	165	195	215	175	185	110				
	400°F	100	150	175	200	150	160	85				
End Connections		MNPT		MNPT	MNPT	MNPT	Flg.	Flg.	Flg .			
Case Material		EPOXY COATED CAST IRON										
Chamber Material		Bronze Standard						Ni-resist Optional		Stainless Steel Optional		
Size		0.75"	1.00"	1.25"	1.50"	2.00"	2.50"	1.25"	1.00"	1.50"	2.50"	
Temperature & Pressure (in psi)	100°F	150	300	250	250	250	175	250	300	250	175	
	200°F	135	285	235	235	235	160	235	285	235	160	
	300°F	115	265	215	215	215	140	215	265	215	140	
	400°F	100	250	200	200	200	125	200	250	200	125	
End Connections		MNPT	MNPT	MNPT	MNPT	MNPT	MNPT	MNPT	MNPT	MNPT		
Case Material		EPOXY COATED CAST IRON - HIGH PRESSURE INK METER										
Chamber Material		Bronze										
Size		1"										
Temperature & Pressure (in psi)	150°F	5000										
End Connections		MNPT										
Case Material		HIGH PRESSURE EPOXY COATED CARBON STEEL										
Chamber Material		Steel										
Size		1"	1.5"	2.5"								
Temperature & Pressure (in psi)	100°F	1440	720	720								
	200°F	1400	700	700								
	300°F	1365	680	680								
	400°F	1330	665	665								
End Connections		MNPT	Flg.	Flg.								
Case Material		HIGH PRESSURE EPOXY COATED CARBON STEEL										
Chamber Material		Steel										
Size		1"	1.5"	2.5"								
Temperature & Pressure (in psi)	100°F	150	150	150								
	200°F	130	130	130								
	300°F	115	115	115								
	400°F	100	100	100								
End Connections		MNPT	Flg.	Flg.								

IV. MECHANICAL INSTALLATION



WARNING: USE THE METER ONLY WITH THE LIQUID FOR WHICH IT WAS ORDERED AND WITHIN THE SPECIFIED LIMITS OF PRESSURE, TEMPERATURE AND FLOW RATE.

MOUNTING CONSIDERATIONS

- If fluid is prone to sediment, consider adding a trap strainer to the system - arranging the strainer so it can be easily cleaned. See Figure 2 as an example.
- In gravity-pressure installations, set the meter to take advantage of all possible pressure head.
- In pump-pressure installations, set the meter on the discharge side of the pump.
- If the line must be kept in continuous service, install a bypass around the meter and strainer valves being installed or replaced.

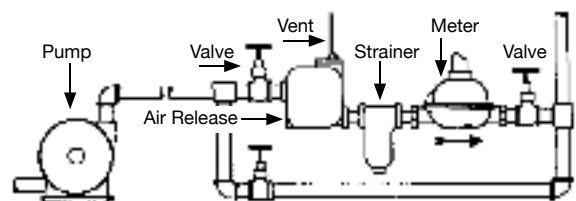
NUTATING DISC INSTALLATION

1. Drain system, if in use.
2. Determine where the meter will be installed within the current system.
3. Cut the pipe (if applicable).
4. Install 20 mesh (0.03 in.) strainer. Strainer should be installed so it can easily be cleaned.
5. Connect meter couplings (if applicable).
6. Flush line thoroughly with liquid to remove pipe cuttings, chips, etc.
7. Install the meter and tighten into place.
8. Purge air from the line.
9. (Re)Fill system slowly to ensure no air is in the line. Meter is ready to take readings. Pipe must remain fully flooded at all times in order for the meter to take accurate readings; avoid passing air or vapor through the meter.

NOTE: To help keep air out, do not let the meter drain between periods of usage. Trap the meter in a depression in the pipeline if necessary. Keep suction lines and pump stuffing boxes tight. If air cannot be kept out of a line handling light oils or solvents, use an air release valve between the pump and meter.

NOTE: The meter must be operated within its proper capacity range; it can be operated at the full rated capacity without damage.

Figure 2. Typical Component Configuration



V. MAINTENANCE

Inspect the unit periodically for worn parts due to natural water wear, corrosion or abrasion.

Strainer should be checked and cleaned regularly.

REPLACEMENT PARTS

PART NUMBER	DESCRIPTION
51028P013	Seal Nut for All Nutating Disc Flowmeters Manufactured After 1996
51030P021	Seal for All Nutating Disc Flowmeters Manufactured After 1996
MODEL N075 SERIES	
51034P001	Top Chamber, Bronze
51032P001	Diaphragm
51210G487	Disc, Ryton/Ryton
51210G475	Disc, Ryton/Carbon
51033P001	Bottom Chamber, Bronze
51068P322	Gasket
MODEL N100 SERIES	
51034P002	Top Chamber, Bronze
51034P005	Top Chamber, Stainless Steel
51032P045	Diaphragm
51210G488	Disc, Ryton/Ryton
51210G476	Disc, Ryton/Carbon
51033P002	Bottom Chamber, Bronze
51033P005	Bottom Chamber, Stainless Steel
51068P302	Gasket
51068P083	Gasket, Teflon for Iron Body
51068P081	Gasket, Teflon for Stainless Steel Body
MODEL N125 SERIES	
51034P007	Top Chamber, Bronze
51034P008	Top Chamber, Ni-Resist
51032P044	Diaphragm
51210G489	Disc, Ryton/Ryton
51033P007	Bottom Chamber, Bronze
51033P008	Bottom Chamber, Ni-Resist
51068P330	Gasket
MODEL N150 SERIES	
51034P009	Top Chamber, Bronze
51034P010	Top Chamber, Stainless Steel
51032P010	Diaphragm
51210G490	Disc, Ryton/Ryton
51210G478	Disc, Ryton/Carbon
51033P009	Bottom Chamber, Bronze
51033P010	Bottom Chamber, Stainless Steel
51068P331	Gasket
51068P089	Gasket, Teflon for Iron Body
51068P070	Gasket, Teflon for Stainless Steel Body
MODEL N200 SERIES	
51034P013	Top Chamber, Bronze
51032P046	Diaphragm
51210G491	Disc, Ryton/Ryton
51210G479	Disc, Ryton/Carbon
51033P013	Bottom Chamber, Bronze
51068P334	Gasket
MODEL N250 SERIES	
51034P014	Top Chamber, Bronze
51034P015	Top Chamber, Stainless Steel
51032P022	Diaphragm
51210G492	Disc, Ryton/Ryton
51210G480	Disc, Ryton/Carbon
51033P014	Bottom Chamber, Bronze
51033P015	Bottom Chamber, Stainless Steel
51068P335	Gasket
51068P071	Gasket, Teflon for Iron Body
51068P093	Gasket, Teflon for Stainless Steel Body

VI. TROUBLESHOOTING

Repairs or replacement of parts may affect the accuracy of the meter.

SYMPTOM	POSSIBLE CAUSE	SOLUTION
Meter stops	Liquid is no longer flowing through the pipe	Check all systems for flow of liquid, including valves ahead of the meter in the pipe line
		Remove the register box or lift a vertical register off its seat and see whether the drive shaft passing upward from the meter body turns when liquid is flowing. If the drive shaft turns, the trouble is in the register; if it does not turn, the issue is inside the meter.
Register is issue - after drive shaft test		Tighten set screw of all the change (calibrating) gears
Meter is issue - after drive shaft test		Clean unit - see Maintenance section for detailed instructions
Consistent inaccuracy (less than 5%)	Error in original calibration, wear, change in liquid viscosity	Call factory
Over-registers (erratically)	Air, steam or gas is in the line with the liquid	Remove air, steam or gas; install an air release valve ahead of the meter
Under-registers (erratically)	Severe wear or clogged pipe	Check to see if any debris is in the line
Dial hand stops and jumps ahead	Difficulty with the meshing of the gearing, usually in the change gears.	Adjust the change gears so they mesh smoothly with just enough clearance to prevent binding and replace worn gears.
Leakage of metered liquid - at the point where the register is attached to the meter body	Meter built before 1996 and stuffing box packing has become loose	Tighten packaging (RY: see page 9 for details)
	Meter built after 1996, the mechanical seal has worn out	Replace seal
	Temperature may be too high for seal used	Check original specifications of the meter for temperature range, check temperature of fluid - replace with new meter designed for higher temperature or cool the fluid into appropriate temperature range
	Shaft may have score marks	Top gear and shaft should be replaced
Leakage of metered liquid - around the meter body	Operating pressure is above that which the gasket was intended	Reduce pressure
	Temperature is too high for the gasket	Reduce temperature or change out meter to match application
	Meter was not correctly assembled (usually after a repair)	Check all connections and fittings
Leakage at the couplings - threaded meters	Coupling washer is not holding tight or is missing	Pipe must be correctly aligned
	A leather washer was used	Replace with "better" washer
No flow indication when flow exists	Meter bypass lines are not closed	Close bypass lines
	Mechanical register may have seized due to freezing	Check lines and temperature
	Defective register	Call factory
	Defective magnetic drive assembly inside meter	Call factory
Reduced or nonexistent fluid discharge	Leaky valves in bypass line	Check and fix bypass lines
	Blocked or frozen strainer	Remove debris; warm to unfreeze
	Debris inside flowmeter causing sticking	Remove debris
	Worn control roller, diaphragm plate or piston in flowmeter	Replace worn parts
	Damaged/rough interior meter surfaces due to dirt or grit in flow medium	Add strainers to remove debris; replace damaged parts as needed

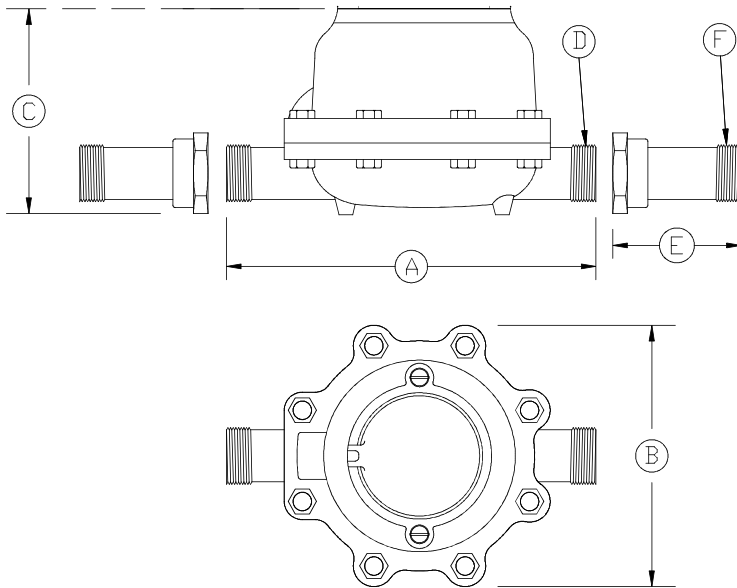
SYMPTOM, cont'd.	POSSIBLE CAUSE	SOLUTION
Leakage at meter casing/lid	Loose bolts	Tighten bolts
	Damaged O-ring due to excessive pressure	Replace o-ring; check and/or reduce pressure in line
	Debris between O-ring and sealing surfaces	Replace o-ring
Inconsistent over-registration	Air or gas in fluid	Purge line
Inconsistent under-registration	Leakage around flowmeter due to bypass piping	Check piping seals, add as needed
	Badly worn flowmeter internals	Replace parts as needed
	Damaged flowmeter casing	Call factory
	Debris in measuring chamber	Remove debris
	Suspended solids in fluid medium too large	Add strainers to remove solids
Consistent over or under-registration	Flowmeter in need of calibration	Call factory

Contact your local factory representative if additional assistance is needed. Please provide the following information:

- Model number
- Date of Purchase
- Application information (type of material, mounting configuration, etc.)
- Description of problem

If your local representative is unable to determine the cause of difficulty, you will be referred to a factory engineer. Equipment shipped back to the factory without proper authorization will be refused and returned at the shipper's expense.

VII. DIMENSIONAL DRAWINGS



METER DIMENSIONS - INCHES (MM)				COUPLER	
A	B	C	D	E	F
8.0	6.31	4.59	1.0" MNPT	2.5	0.75" MNPT
9.0	7.25	4.88	1.25" MNPT	2.38	1.0" MNPT
10.75	8.88	6.81	1.5" MNPT	2.75	1.25" MNPT
12.63	8.78	6.93	2.0" MNPT	2.88	1.5" MNPT
15.25	11.88	8.13	2.5" MNPT	3	2.0" MNPT
20	14.81	12.03	3.0" G Flange	NA	NA
24	17.50	17.28	3.0" I Flange	NA	NA
29	21.88	19.13	4.0" Flange	NA	NA



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MEASUREMENT

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M110 Rev. C