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Service Manual

RW Flowmeter

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I. TOOLS, TEST EQUIPMENT AND SERVICE MATERIAL

A. TOOLS

Screwdriver - (1/4 in. (6 mm) flat blade
Screwdriver-No.2 Phillips
Open end wrenches – 7/16 in, 9/16 in, 5/8 in, 11/16 in
Adjustable wrench-10 in (25) cm
Hex key wrench-1/16 in
Internal retaining ring pliers
Punch-1/8 in (3mm)
Dental Pick (or similar pointed instrument)

B. TEST EQUIPMENT

Test flowmeters with an accuracy of + or – 2% if reading @ 70 degrees F (21 degrees C) and 14.7 psi (101 Kpa). Flow from 20 ccm to 60 LPM, in according to engineering flow specifications for different kind of rotors.

Test pressure gauge with a range of 0-100 psi (0-690 kPa) and accuracy in according to ASME 40.1-1998, Grade "B", permissible error (+/- % of span):
- lower ¼ of scale (0-25 psig) = +/- 3%;
- middle ½ of scale (25-75 psig) = +/-2%;
- upper ¼ of scale (75-100 psig) = +/- 3%.

Leak detector – Nupro "Snoop" or equivalent (oxygen compatible)

C. SERVICE MATERIALS

Krytox 240 AC Fluorinated Grease (DuPont)
Teflon tape – ¼ in (6mm)
Isopropyl alcohol
Cloth – lint free
Oxygen tubing – ¼ in (6mm) I.D.
Screw – 6-32 UNC
Service Instructions

II. SPECIFICATIONS

Flowmeters with FMW Cover or DISS Cap are designed and manufactured in accordance With:
CGA E-7 "American National standard for Medical gas regulators and Flowmeters and
CGA E-8 "Standard for Gas Flowmeters".
See also Flotec Device Master Record (Form DMRI- QSP 7.3-2).
Flotec Medical Gas Flowmeters are small, lightweight devices that are available in a variety of configurations to meet the various requirements for medical gas delivery. Flotec Medical Gas Flowmeters can be equipped with a 12 position, detented flow control valve or a variety of designated inlet flow connectors. It is recommended that the repair technician read this service and repairs instructions thoroughly before servicing Flotec Flowmeters .

Storage Temperature: -40 degrees F to 140 degrees F
Operating Temperature: -20 degrees F to 150 degrees F
Materials: Brass, Bronze, Anodized Aluminum, Teflon, Neoprene, Silicone, Stainless Steel and Buna N
Filtration: sintered copper- nickel 30 micron (rotor filter body) or sintered bronze, 40 micron Filter disk.

Operating Pressure: 50 psi (17, 20, 24, 30, 40, 58, 70, 90, 110, 125 psig available upon request).

Inlet Connections: Any CGA inlet connection is available for specific gases and most International is available upon request)
Dimensions: Variable depending on type and style specified
Weight: Variable depending on type and style specified.
Flow rate: forward or reverse flow, in according to Engineering specifications.
Power take Inlet and Outlet Connections: 1 or 2 of any combination of the following: DISS check valve, DISS Fitting, Hose Barb, Chemetron QD, Hansen QD, Ohio QD, Puritan Bennett QD, Schrader QD.

III. PRODUCT CLASSIFICATION DATABASE

Device-	Flowmeter, Calibration, Gas
Device Description-	Gas calibration flowmeter
Medical Specialty	Anesthesiology
Product Code	BXY
Regulation Number	FDA #868.2350
Device Class	1
GMP Exempt?	No
510(k) Exempt?	Yes

IV. DEFINITION OF STATEMENTS

NOTE The Flotec Medical Gas Flowmeter is shown in enclosed drawings.

Statements in this manual proceeded by the following words are of special significance.

WARNING means there is the possibility of injury or death to you or others.

CAUTION means there is the possibility of damage to the unit or other property.

NOTE indicates points of particular interest for more efficient and convenient operation.

Always disassemble, inspect, clean and repair Flowmeter components in accordance with these instructions. Be aware of all the potential hazards associated with handling and using high-pressure gas equipment. Also, be aware that the possibility of fire exists when the combination of a combustible material, a source of ignition and oxygen is present (Called the Fire Triangle.

WARNING Replacement of parts on the Flowmeter should be made only by qualified personnel familiar with their operation. Do no remove or install parts with the regulator installed on a cylinder. Use only the proper repair tools and parts. Always wear eye protection when servicing Flowmeters.

WARNING Contaminants or hydrocarbons may, in the presence of an ignition source and oxygen may combine and burn violently. Never permit oil, grease or other combustible substances to come in contact with medica gas cylinders, Flowmeters parts or repair tools. Provide a clean; oil free surface on which to place disassembled regulator parts.

WARNING Always open medical gas line SLOWLY. This should always be done in order to allow the heat of gas compression to dissipate.

V. SAFETY AND INSTALLATION INSTRUCTIONS

5.1 Safety requirements

5.1.1 Proof test

a) For this test the Flowmeter shall be installed such that connected to a source of test gas at one and one-half times the maximum rated operating pressure of the Flowmeter. The outlet connection shall be capped with the outlet valve in the open position.

b) The test gas is then admitted into the Flowmeter inlet and the pressure shall be held constant for 5 minutes during which time the Flowmeter shall experience no permanent deformation, leakage, or failure.

5.1.2 Safety test

a) For this test the Flowmeter shall be installed such that the in;let is connected to a source of test gas at 4 times the maximum rated operating pressure of the Flowmeter or 200 psig (14 bar). The outlet connection shall be capped with the outlet valve in the open position.

5.2 Installation Instruction

See Insert Instructions provided with each regulator and Flowmeter.

VI. SERVICE AND REPAIR

Always perform the Flowmeter test procedures in this manual before placing a repaired regulator back in service.

Note: Refer to the Parts List and Parts Illustration for identification of parts referenced with bold numbers.

A. CLEANING, LUBRICATION AND SEALING

Clean metal parts of the Flowmeter with isopropyl alcohol and thoroughly blow dry with dry, oil free compressed gas. Use a mild solution of soap wand water to clean plastic parts. Use a clean lint free cloth with isopropyl alcohol to clean internal parts, being certain to remove any residual fibers.

O-ring seals that have been cleaned or are new replacements should be lubricated with a film of KRYTOX 240AC Fluorinated Grease.

Whenever pipe threaded (NPT) connections must be disassembled, reseal the threads with Teflon tape. When applying teflon tape remove old sealant from the male and female threads and wrap the male threads with Teflon tape in a clockwise direction, starting 1 to 2 threads back from the end.

B. SERVICE

Backflush all 11 flow positions with a medical gas. Check the screw holding the rotor assembly onto the knob shaft for tightness. Any other service work must be done by the manufacturer; there are no user serviceable parts in the flowmeter assembly. If the flowmeter needs to be returned to the manufacturer reassemble the flowmeter with the upper cover or DISS cap.

CAUTION The flow rotor is manufactured to exacting tolerances and utilizes a number of extremely small orifices. To prevent improper rotor operation due to contaminants, ensure hands, tools and worktable are clean when disassembling and servicing the flow rotor. There are no user serviceable parts in the flowmeter assembly

CAUTION Do not allow a lubricant film applied on the rotor face to accumulate in the rotor orifices.
WARNING Do not interchange rotors and FM bodies. Always assemble rotor with its original flow control valve body.
Verify that the shaft rotates smoothly and stops at each detented position.

C. INSTALLATION

1. Replace the O-ring on the flowmeter assembly as needed.
2. Thread the flowmeter into the upper body and turn clockwise to tighten. Using a vise on the regulator body and a strap wrench on the flowmeter assembly for Yoke style regulators or two strap wrenches on Nut & Nipple style regulators turn the flowmeter clockwise to tighten to 15 inch pounds.

D. REMOVAL

1. Remove either the flowmeter or the end cap by following instructions under FLOWMETER removal. **NOTE**: References made to the flow control valve body are also applicable to the regulator end cap.
1. of Krytox 240 AC lubricant approximately ½" wide to the inner surface of the regulator body.

VII. TESTING

FLOWRATE TEST

NOTE A number of variables including ambient atmospheric conditions and test instrumentation resolution and accuracy will affect the results of flowrate testing. Compensation must be made for deviation from ambient conditions of 70 degrees F and 29.3 inches HG at the location of the test.

1. Connect the flowmeter to a full gas line and **SLOWLY** open the valve.
2. Connect the flow control barbed outlet connector, the designated flow connector or the flowmeter outlet to the test flowmeter using as suitable length of oxygen tubing.
3. Verify that the flows read on the test flowmeter are in according to Engineering specification flow for rotor with different medical gases..

VIII. TROUBLESHOOTING GUIDE

Adjustable flow outlet with knob in off position	Flowmeter not functioning properly	Return to Flotec
Leaking THD connection Between FM Body and Cap	O-ring leaks	Replace connector O-ring

Threaded (NPT) connections	Loose connections	Disassemble clean and reseal threads, reassemble and tighten
There is no flow or the metered flow outlet	Flowmeter not functioning properly	Refer to Flowmeter service Instructions
There is no flow at the	Med. Gas line is empty	Replace Cylinder
Auxiliary DISS outlet	Flowmeter inlet filter is blocked	Replace inlet filter
	Hose connector not properly engaged	Re-engage and tighten hose connector

IX. ENCLOSED DRAWINGS:

- FXX-XXXXX Rev "C" Flowmeter Assembly
- XXXXX Rev "J" Flowmeter Oxygen, Sub-Assembly
- XXTXX Rev "A" Flowmeter Nitric Oxide, Sub-Assembly