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## Section 1 - Introduction

### Receipt of Equipment

When the equipment is received, the outside packing case should be checked immediately for any shipping damage. If the packing case has been damaged, the local carrier should be notified at once regarding his liability. Carefully remove the unit from its packing case and inspect for damaged or missing parts.

If damage has occurred during shipment or parts are missing, a written report should be submitted to the Customer Service Department, FMC Technologies Measurement Solutions, Inc., Erie, Pennsylvania, 16514-0428.

Prior to installation, the unit should be stored in its original packing case and protected from adverse weather conditions and abuse.

### Principle of Operation

The Smith Meter™ Model DE-3 Air Release Head is designed to be used in conjunction with a Petro-gard system. A zero flow time is programmed into the controller. When the batch is started, the main pump is turned on and product starts to fill the system and the controller monitors the lower float switch. The control valve remains closed to allow the air eliminator solenoid to vent the initial slug of air from the tank.

The vented air may be plumbed back into the flow, downstream of the meter, to eliminate the need for a "spit can". A sight glass is incorporated in the DE-3 plumbing to assure that the product is not bypassing the meter.

As the fluid level rises in the tank the zero flow timer counts down. If the lower float switch is not activated by the incoming fluid within the count down time, the batch is stopped. When the lower float switch is activated within the zero flow count down, the control valve is opened, low flow is initiated and the gear pump is turned on. The controller then monitors the flow switches to ensure that the product selected is the product flowing.

As the tank fills with product and air is vented through the eliminator solenoid, the middle and the upper float switches are monitored. Once the middle and the upper float switches are activated the controller will initiate high flow. If during the batch entrapped air in the fluid accumulates in the tank so the fluid level drops below the upper and the middle float switches, the controller will signal the control valve to lower the flow rate and the air will be vented. The low flow rate will remain until the air is vented and the middle and the upper float switches are raised, at that time high flow will be returned to resume delivery of the batch.

At the end of the batch the fluid level in the tank will lower as a large slug of air accumulates in the tank. As the air accumulates the upper and the middle floats will drop initiating low flow. The delivery will continue at low flow until the level in the tank drops to the lower float switch. When the lower float drops the controller turns off the main pump and starts the drain gear pump count down timer to deliver the remainder of the batch. The gear pump is plumbed so it will evacuate the residual product still in the tank and system. When the count down timer for the gear pump ends the control valve is signaled to close and the gear pump is turned off.

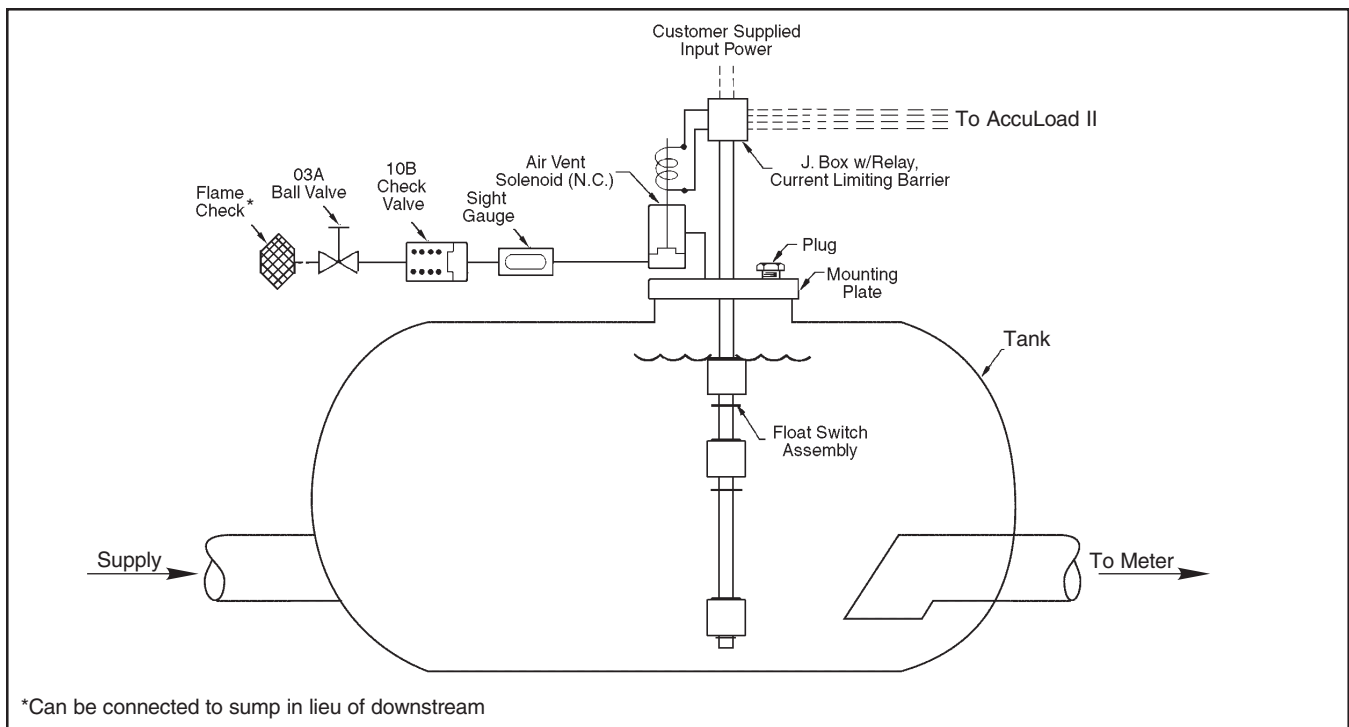
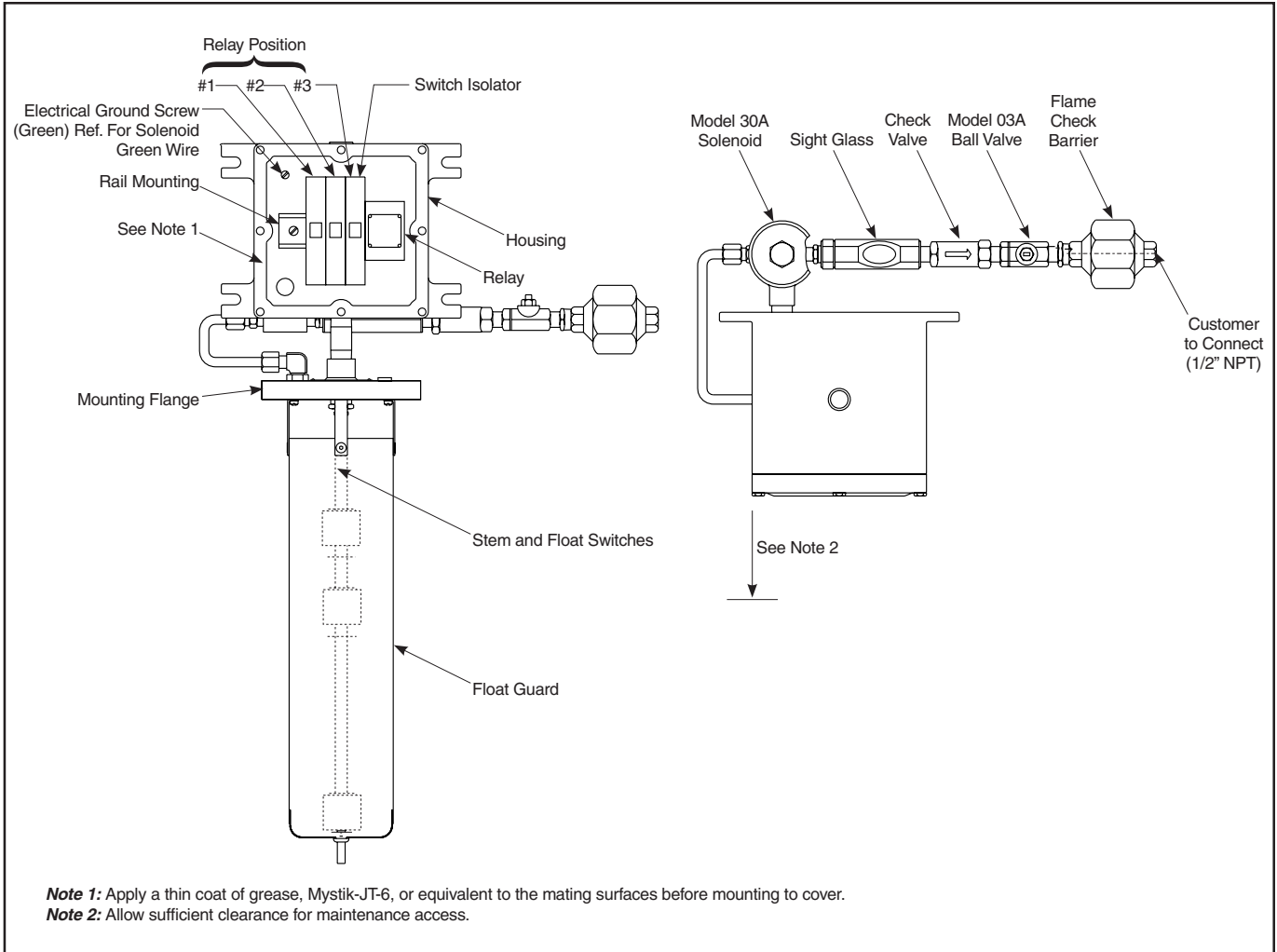
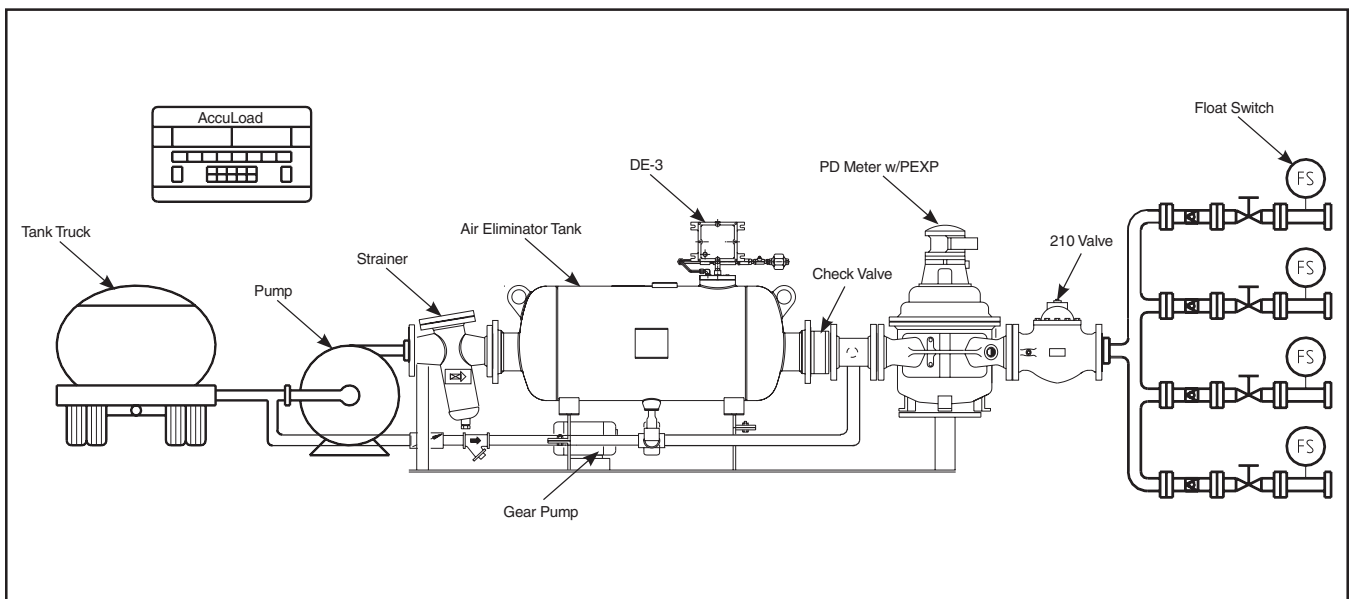


Figure 1 — Smith Meter™ Model DE-3 with Air Eliminator Tank

## Section 2 - Installation



**Figure 2 – DE-3 Electric Petro-gard Assembly**



**Figure 3 – DE-3 Electric Petro-gard Assembly on Truck Skid**

## Section 2 - Installation

### Mechanical

1. After the initial unpacking and inspection of equipment, the DE-3 air eliminator head should be ready for installation.
2. Insert eight studs into the air eliminator tank branch connection (Smith Meter standard "RB" bolt circle) on top of the tank. Place the gasket over studs and branch connection.
3. Be sure that the floats on the float switch assembly travel freely on stem.
4. Carefully lower the DE-3 float assembly into the tank, being careful not to bend or damage floats and stem inside of float guard. Be aware of outlet nozzle inside the tank and possible contact. Be sure that the float assembly is vertical and the junction box cover is accessible.
5. Fasten the eliminator head to tank studs with eight nuts.
6. Make the appropriate connection to the air vent line from the air eliminator head. Run vent line from the flame barrier to "spit can" or plumb vent back into the system downstream of the meter.

6. Proceed to the next section appropriate to your installation.

### Electrical - 120 Vac

**Caution: Be sure all power is turned off before wiring the equipment.**

1. Connect the main AC power being supplied through L1 to Terminal 11 on the intrinsically safe barrier at position #3.
2. Connect the AC supply neutral to the relay Terminal 7 and the air eliminator vent solenoid.
3. Make the three (DEH H, DEH L, and DEH S) connections to the AccuLoad II (see AccuLoad II Installation Manual, Bulletin No. MN06037).
4. Use an ohm meter to test that all three float contacts to the intrinsically safe barriers are closed (with tank dry and floats down). Test between Terminals 2 and 3 of each barrier and there should be continuity.

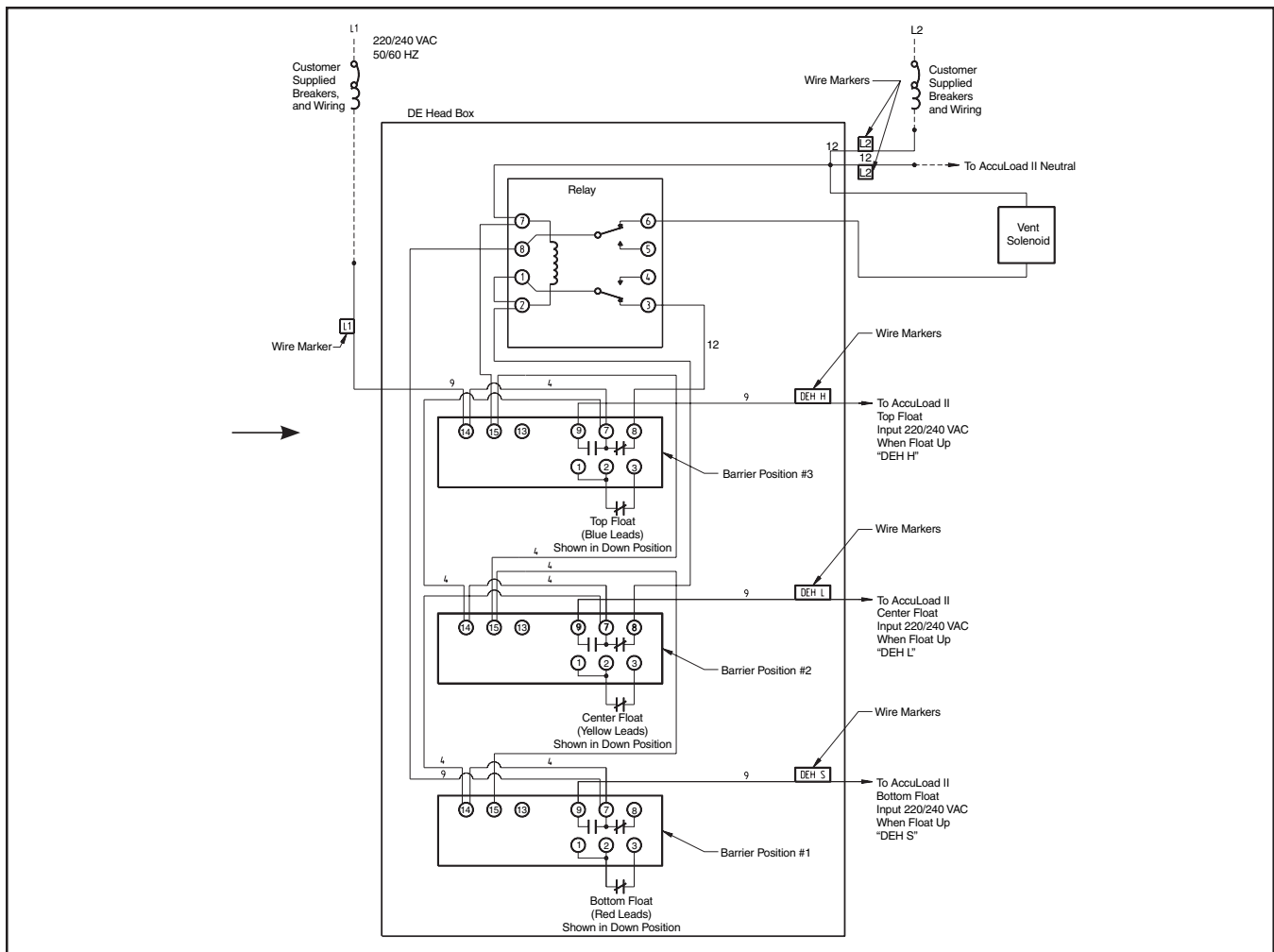


Figure 4 – Wiring Diagram (120 Vac)

## Section 2 - Installation

### Electrical - 240 Vac

**Caution:** Be sure all power is turned off before wiring the equipment.

1. Connect the main AC power being supplied through L1 to Terminal 14 on the intrinsically safe barrier at position #3. AWG 18 minimum wire size is recommended for all connections (Figure 5).
2. Connect the AC supply neutral to the relay Terminal 7 and the air eliminator vent solenoid.
3. Make the three (DEH H, DEH L, & DEH S) connection to the AccuLoad II (see AccuLoad II Installation Manual, Bulletin No. MN06037).
4. Use an ohm meter to test that all three float contacts to the intrinsically safe barriers are closed (with tank dry and floats down). Test between Terminals 2 and 3 of each barrier and there should be continuity.

### Grounding

Be sure the power ground (green) wire from the solenoids and AC power ground (green) wire are connected to the grounding screw in the explosion proof junction box.

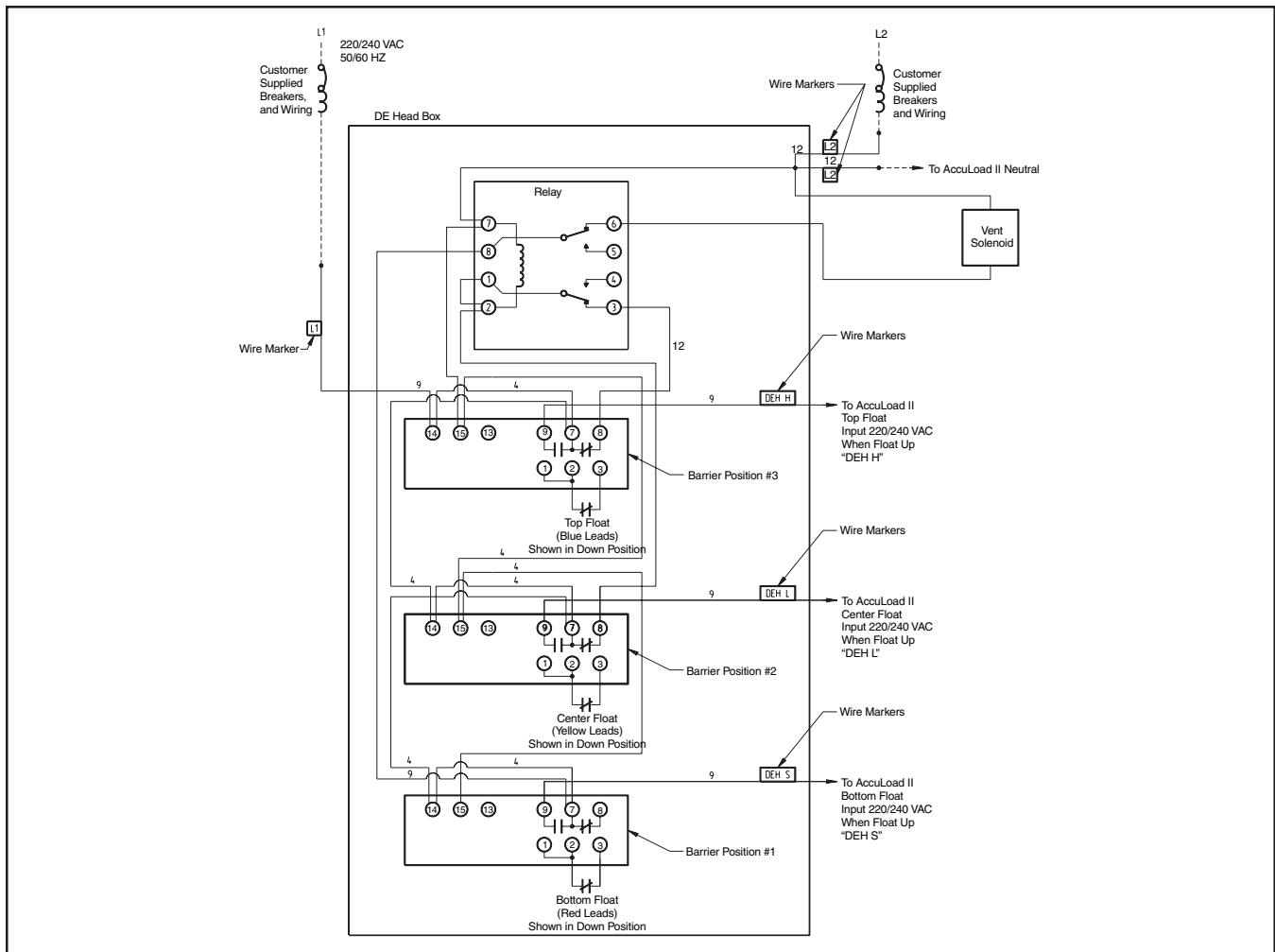


Figure 5 – Wiring Diagram (240 Vac)

## Section 3 - Start Up

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### ***DE-3 With 210 Valve***

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1. Fill the system by gravity to check for leaks and to prevent line shock during start-up.
2. Bleed all air from the valve, meter, and strainer as the system is filled with product. Close all exhaust ports as the system is filled.
3. Turn power "on" to system.
4. Consider the air eliminator tank to have entrapped air.
  - a. Open ball valve on DE-3 fully.
  - b. Jog the pump and check that air is evacuated and that the valve remains closed at this time.
  - c. Be sure that after air is evacuated, the valve opens. As the valve opens, the pump can be left on. No solid stream of product should be seen in the sight glass. Shut the system down if this occurs.
  - d. If the control valve does not open or the sight glass fills with product, refer to the Troubleshooting Section of this manual.

## Section 4 - Troubleshooting

### Preventive Maintenance

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|---|--|
| <ol style="list-style-type: none"> <li>1. High paraffin base crude or products with sediment may plug the solenoid orifice or seats, monitor for correct operation, flush or wash as needed.</li> <li>2. Water in product at freezing temperature will solidify and cause the orifice valve or check valves to jam. Clean or apply heat as required to release them.</li> </ol> | <ol style="list-style-type: none"> <li>3. Waxy crudes may coat the stem assembly of the DE-3 head floats and require periodic cleaning.</li> <li>4. Base maintenance and/or cleaning schedules of strainers on a prior history of product requirements.</li> </ol> <p><b>Warning: Remove DE-3 head to a non-hazardous area for troubleshooting after removing power from the unit.</b></p> |
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Symptom	Cause	Corrective Action
No flow.          defective. intrinsically safe solid-replace.	No pump pressure. No power. Pump permissive contact open. Control valve no opening. Float switches (N.C.) dry, not opening as tank fills.  Intrinsically safe barrier relay voltage should be on Relay Terminal 7  Relay defective.  Main control valve diaphragm defective.	Turn pump on. Check for power to input. Confirm pump contact (N.O.). Close and apply power to the DE-3 head. Check operation of float switches with volt ohm meter (VOM) or multimeter as they are moved. See correct schematic figures.  With float switches closed, the active common. If not, state relay is defective -  If active, voltage is between Terminals 2 and 7 of the relay. The relay should activate, if not, replace.  If valve diaphragm is defective, pressure is equalized (no differential), valve will not open. Check or replace as needed.
Product in sight glass.	30A Solenoid open. Floats jammed (down position or leaking). Intrinsic barrier defective.  10B Check Valve defective.  Relay defective.	Check for debris, clean as needed. Check floats, high paraffin base crude will cause build up, clean as required. Check barrier float, input contacts, and wiring with tank filled float switches open. Replace or correct as required.  Test 10B Valve for one-way flow, clean or replace as required.  With floats in upper position, the relay should be inactive - no voltage to Relay Terminal 2. Repair or replace as required.
Main control valve not closing (continuous flow).	Control Valve Solenoid 30A malfunction.  Debris lodged under main valve poppet. Floats jammed up.  Power to control solenoid not disabled.	Check operation of solenoid. Parts should close with no power; clean and/or replace as required.  Isolate valve, check for leakage. Clean / repair as required.  Check floats, high paraffin base crude will cause a build up, clean as required.  Test intrinsically safe solid-state relay for correct operation with control relay. Repair/replace as required.
Does not vent (meter over registration).	Ball valves closed.  Check valve blocked. Vent solenoids failed closed. Lower float jammed (up).  Intrinsically safe solid-state relay failed. Relay failed.	Open.  Clean. No power or replace.  Check power wiring from DE-3 head. With no power to unit, check continuity of solenoid and resistance or coil ground for open or leakage. Typical coil resistance is less than 500 Ω. Leakage not less than 10 kΩ hot.  <b>Note: Check for debris in valve body if electrically correct.</b>  Replace. Replace.

## Section 5 - Related Publications

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The following literature can be obtained from FMC Technologies Measurement Solutions, Inc. Literature Fulfillment at [john@gohrs.com](mailto:john@gohrs.com) or online at [www.fmctechnologies.com/measurementsolutions](http://www.fmctechnologies.com/measurementsolutions). When requesting literature from Literature Fulfillment, please reference the appropriate bulletin number and title.

### **DE-3**

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Specifications .....	Bulletin SS03037
Parts List .....	Bulletin P0113.00

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The specifications contained herein are subject to change without notice and any user of said specifications should verify from the manufacturer that the specifications are currently in effect. Otherwise, the manufacturer assumes no responsibility for the use of specifications which may have been changed and are no longer in effect.

#### **Headquarters:**

1803 Gears Road, Houston, TX 77067 USA, Phone: 281/260-2190, Fax: 281/260-2191

#### **Gas Measurement Products:**

**Erie, PA USA** Phone 814/898-5000  
**Thetford, England** Phone (44) 1842-82-2900  
**Kongsberg, Norway** Phone (47) 32/286-700  
**Buenos Aires, Argentina** Phone 54 (11) 4312-4736

#### **Integrated Measurement Systems:**

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**Kongsberg, Norway** Phone (47) 32/286-700  
**San Juan, Puerto Rico** Phone 787/274-3760  
**United Arab Emirates, Dubai** Phone 971 +4/331-3646

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**Los Angeles, CA USA** Phone 661/702-8660  
**Slough, England** Phone (44) 1753-57-1515  
**Ellerbek, Germany** Phone (49) 4101-3040  
**Barcelona, Spain** Phone (34) 93/201-0989  
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