Smith Meter® Air Eliminators

Model DE-3 Air Release Heads

Installation / Operation Manual

Bulletin MN03021 Issue/Rev 0.2 (1/19)

Contents

Principle of Operaton

The Smith Meter Model DE-3 Air Release Head is designed to be used in conjunction with a Petro-gard II unloadingsystem interfaced to an AccuLoad® with a model AR or VAR air eliminator tank. The three float switches on the DE-3 assembly are configured as Stop (lower switch), Low (middle switch) and High (top switch) flow Digital Inputs in the AccuLoad® to define when to open the flow control valve, when to advance from the low flow rate to high flow rate, and when to close the valve in the unloading operation.

When the batch is started, the main pump is turned on and product starts to fill the system and the AccuLoad monitors the lower float switch (stop flow switch). The control valve remains closed to allow the air vent 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. A sight glass is incorporated in the DE-3 plumbing to verify that the product is not bypassing the meter. When the stop float switch is activated, the control valve is opened and low flow is initiated as programmed in the AccuLoad®. An optional zero flow timer can be programmed in the AccuLoad®. If this option is used, as the fluid level rises in the tank, the zero flow timer counts down. If the stop float switch is not activated by the incoming fluid within the count down timer, the batch is stopped.

As the tank fills with product and air is vented through the air vent solenoid, the middle and the upper float switches are monitored. Once the middle and the upper float switches are activated, the AccuLoad® will initiate the high flow rate programmed in the AccuLoad®. 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 AccuLoad® will signal the control valve to initiate the low 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 air enters 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 fluid level in the tank drops to the lower float switch. When the lower float drops the AccuLoad turns off the main pump.

*Reference AccuLoad® III Unloading Application Bulletin AB06055 for optional gear pump operation and product detection using Boolean Equations in the AccuLoad® III.

DE-3 Electronic Head Logic

Flow Rate Condition vs. Floats/Switches and Air Vent							
Flow Rate	**Zero**	**Low**	**Low**	**High**	**High**	**Low**	**Zero**
Air Vent (N.C)	Open	Open	Open	Closed	Closed	Open	Open
Top Float	Down	Down	Down	Up	Down	Down	Down
Middle Float	Down	Down	Up	Up	Up	Down	Down
Lower Float	Down	Up	Up	Up	Up	Up	Down

Table 1

Proper operation requires the flow rate conditions to move sequentially starting from left to right and then right to left in the above table. If for any reason the AccuLoad® detects the DE Head switches in an undefined state (such as Top floats up and middle and low float down), a DE Head alarm will be generated.

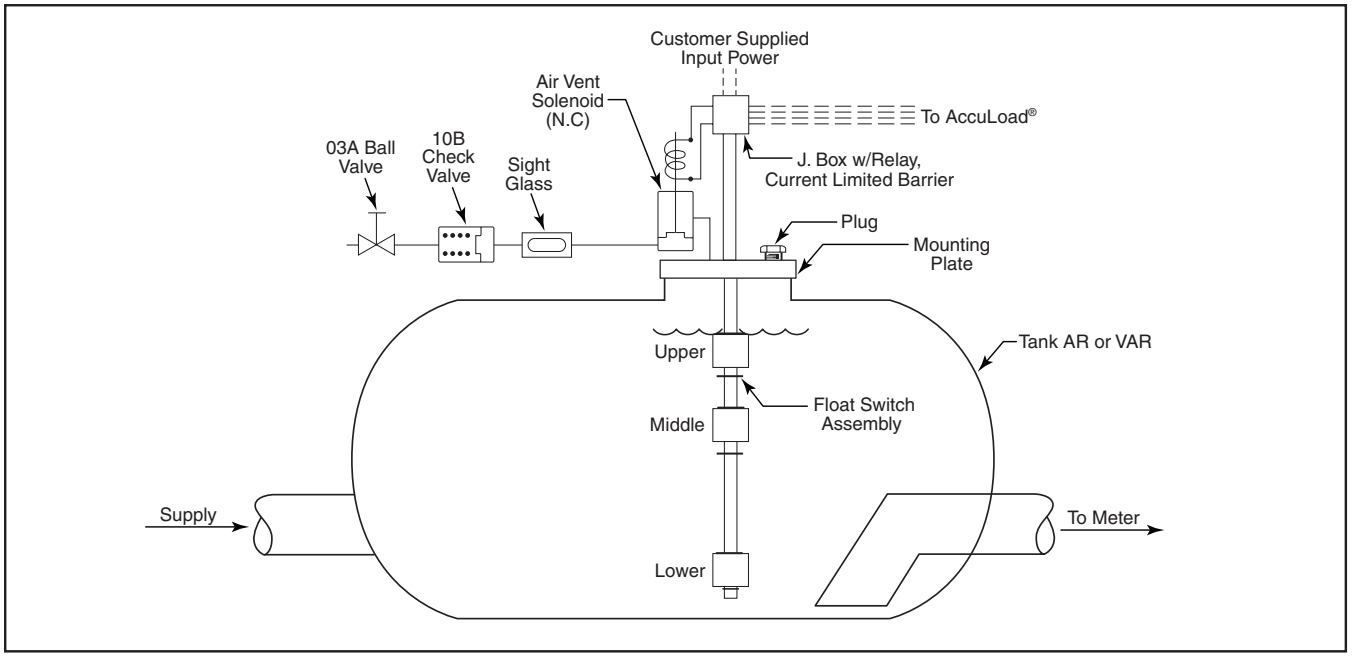


Figure 1 – Smith Meter® Model DE-3 with Model AR Air Eliminator Tank

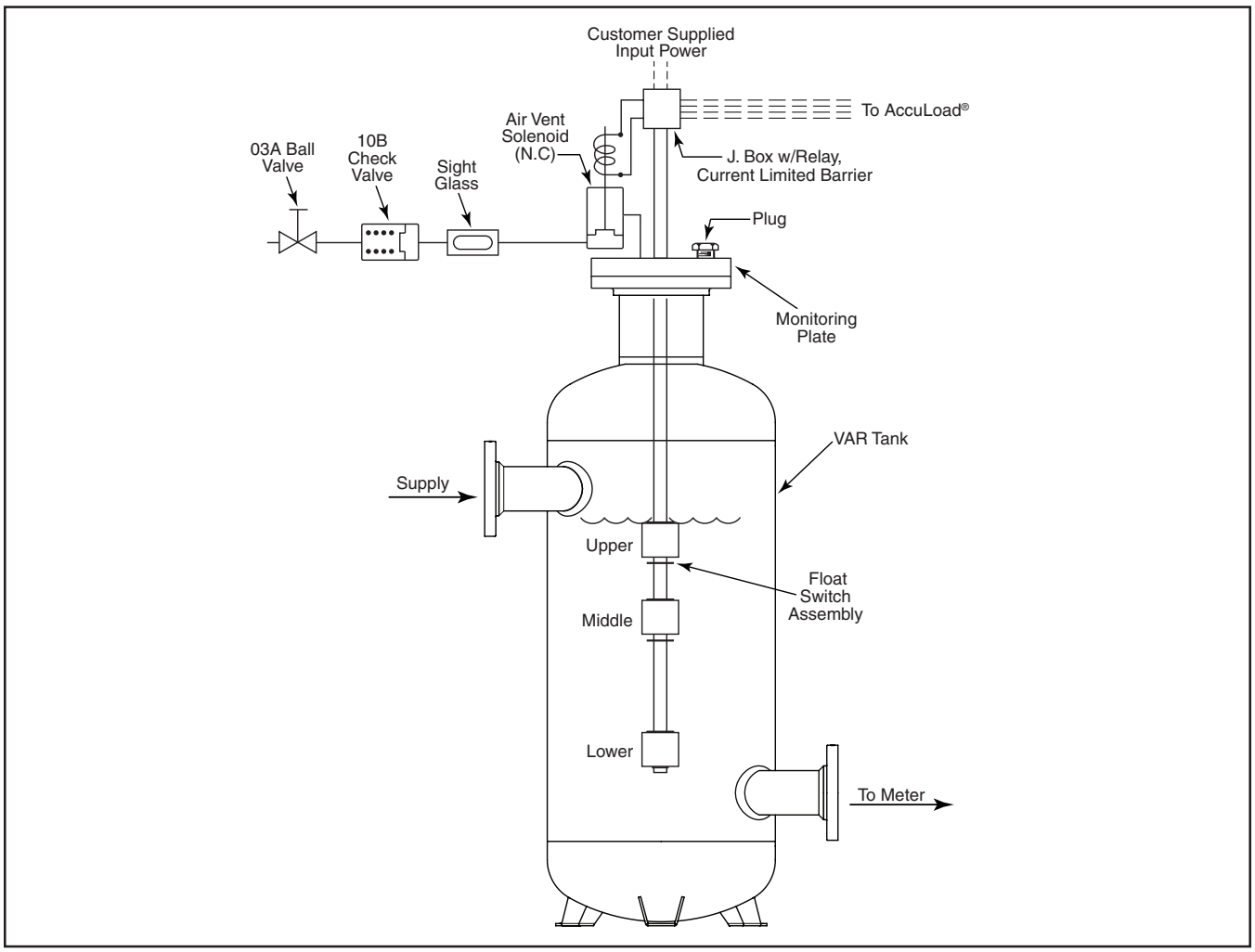
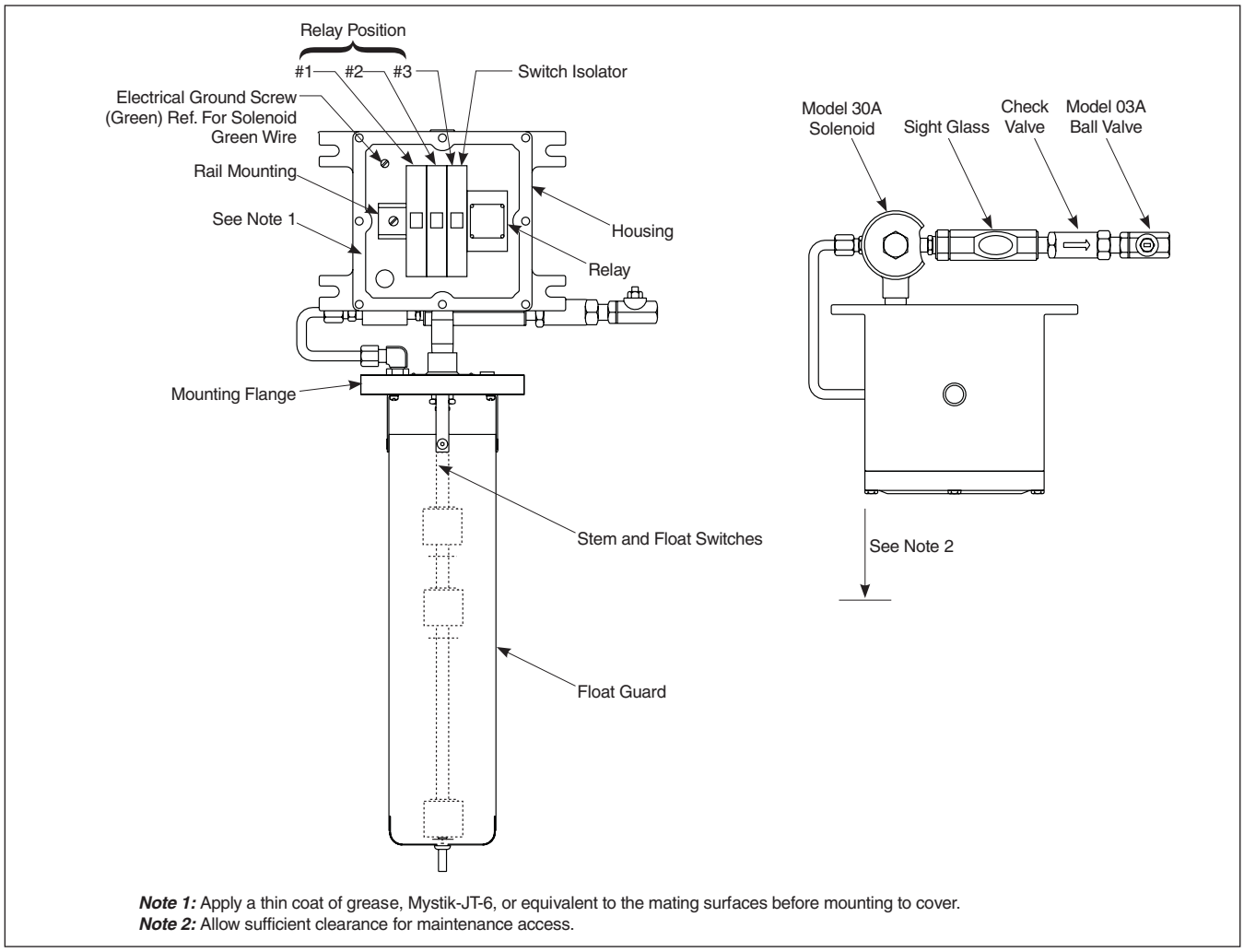


Figure 2 – Smith Meter® Model VDE-3 with Model VAR Air Eliminator Tank



Note 1: Apply a thin coat of grease, Mystik-JT-6, or equivalent to the mating surfaces before mounting to cover.
Note 2: Allow sufficient clearance for maintenance access.

Figure 3 – DE-3 and VDE-3 Electric Petro-gard II Assembly

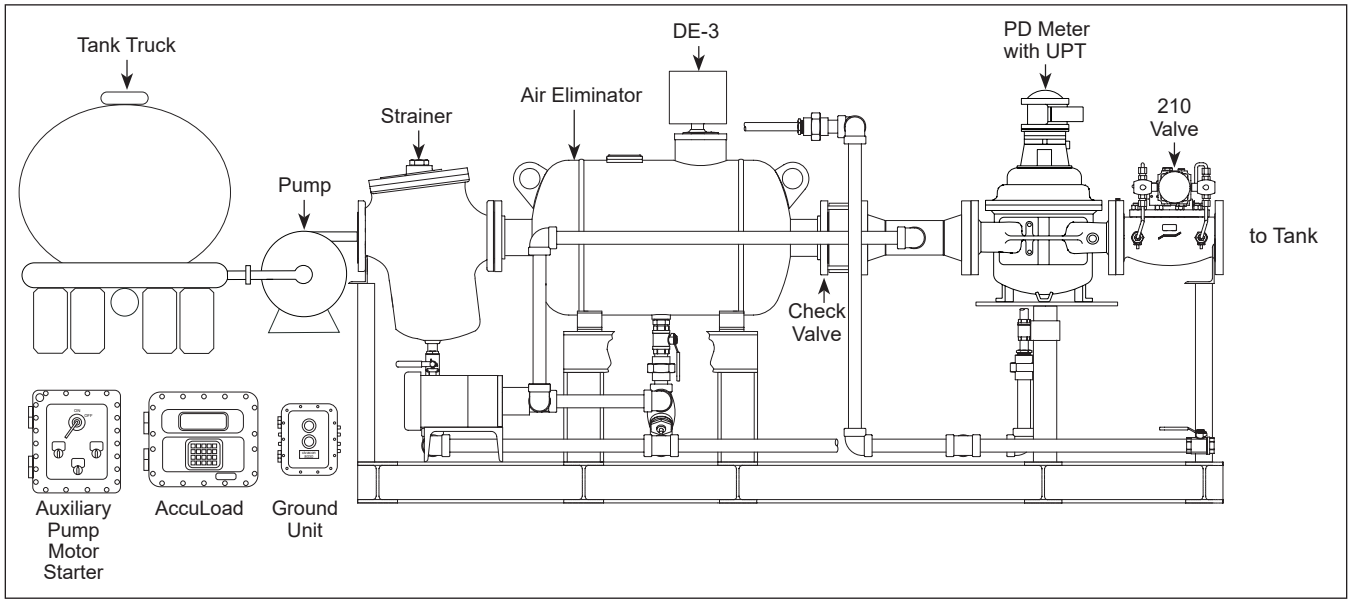


Figure 4 – DE-3 Electric Petro-gard II Assembly on Truck Skid

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 ball valve to vapor recovery or plumb vent back into the system downstream of the meter.
7. 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 14 on the intrinsically safe barrier at position #3. AWG 18 minimum wire size is recommended for all connections (Figure 4).
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 (see AccuLoad Installation Manual).
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 1 and 3 of each barrier and there should be continuity.
5. See Table A for operation truth table.

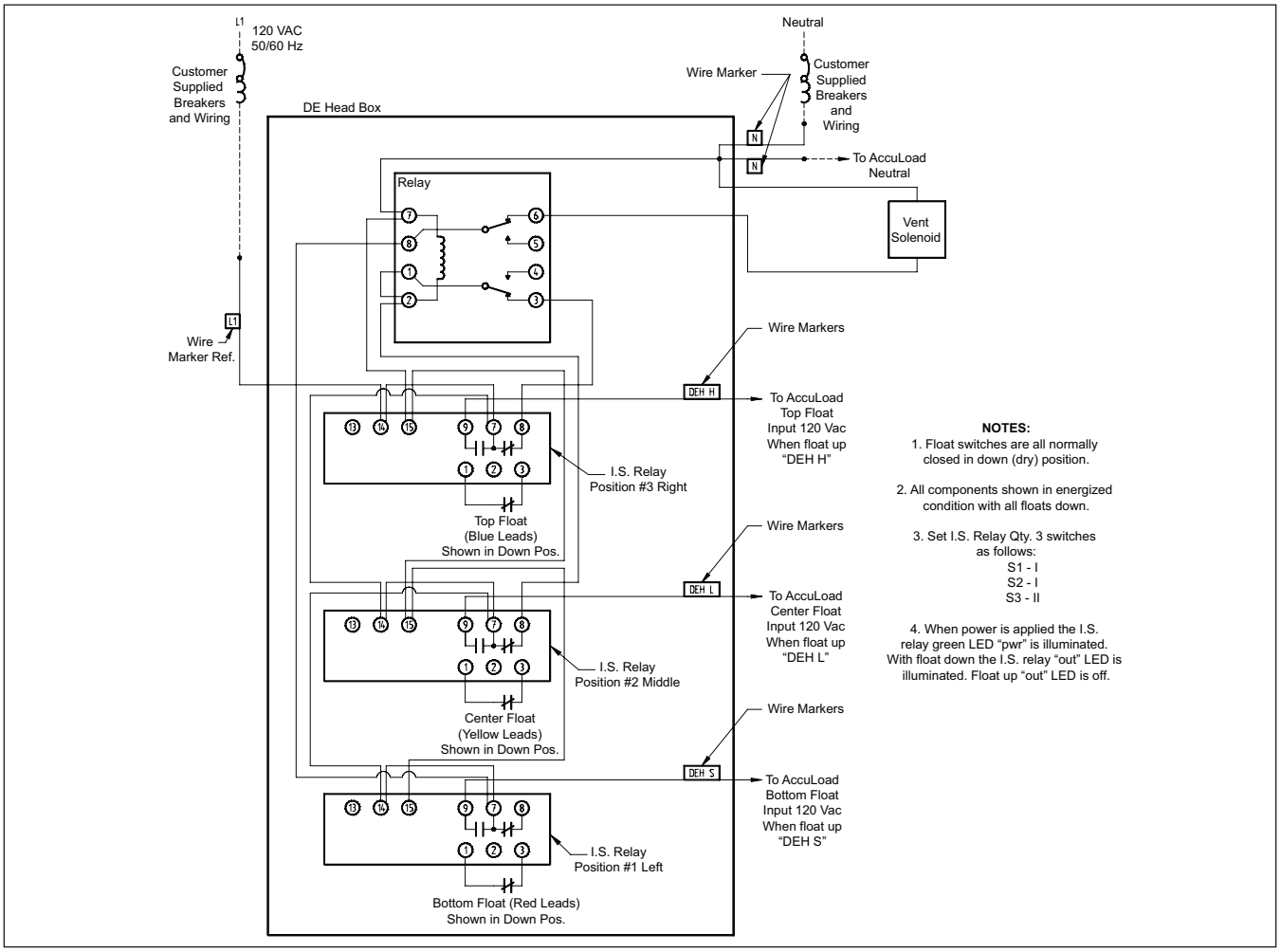


Figure 5 – Wiring Diagram (120 Vac)

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 (see AccuLoad Installation Manual).
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 1 and 3 of each barrier and there should be continuity.
5. See Table A for operation truth table.

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.

Operation Truth Table A

Reference:

Vent	ON	ON	ON	OFF	OFF	ON	ON
Top Float	I	I	I	O	I	I	I
Center Float	I	I	O	O	O	I	I
Bottom Float	I	O	O	O	O	O	I
DEH H	O	O	O	I	O	O	O
DEH L	O	O	I	I	I	O	O
DEH S	O	I	I	I	I	I	O

I = FLOAT DOWN
O = FLOAT UP

I = ON
O = OFF

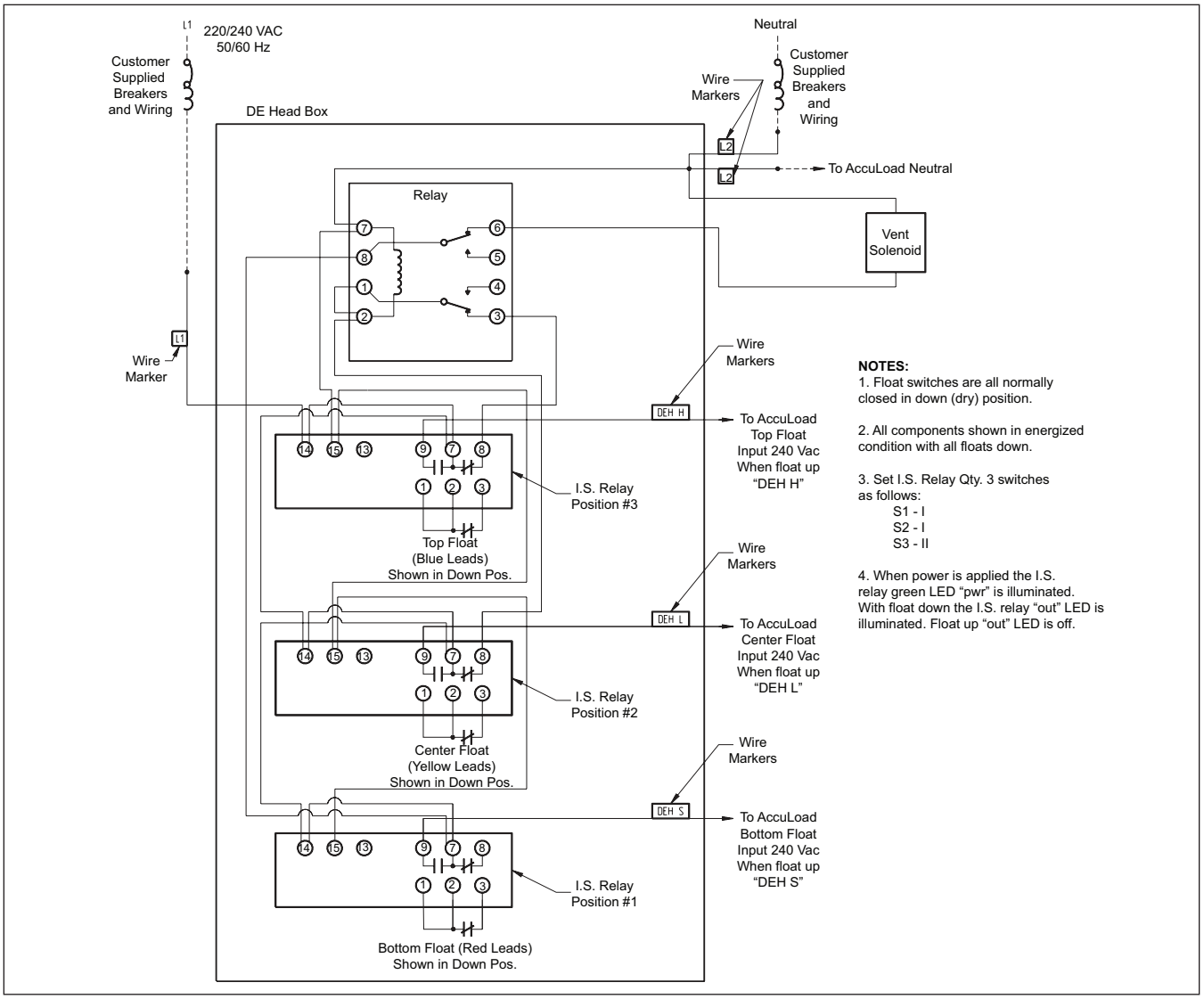


Figure 6 – Wiring Diagram (240 Vac)

DE-3 With 210 Valve

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.

Preventive Maintenance

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.
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.
3. Waxy crudes may coat the stem assembly of the DE-3 head floats and require periodic cleaning.
4. Base maintenance and/or cleaning schedules of strainers on a prior history of product requirements.

Warning: Remove DE-3 head to a non-hazardous area for troubleshooting after removing power from the unit.

Symptom	Cause	Corrective Action
No flow.	No pump pressure.	Turn pump on.
	No power.	Check for power to input.
	Pump permissive contact open. Control valve no opening.	Confirm pump contact (N.O.). Close and apply power to the DE-3 head.
	Float switches (N.C.) dry, not opening as tank fills.	Check operation of float switches with volt ohm meter (VOM) or multimeter as they are moved. See correct schematic figures.
	Relay defective.	If active, voltage is between Terminals 2 and 7 of the relay. The relay should activate, if not, replace.
	Main control valve diaphragm defective.	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.	Check for debris, clean as needed.
	Floats jammed (down position or leaking).	Check floats, high paraffin base crude will cause build up, clean as required.
	Intrinsic safe barrier defective.	Check barrier float, input contacts, and wiring with tank filled float switches open. Replace or correct as required. See table A.
	10B Check Valve defective.	Test 10B Valve for one-way flow, clean or replace as required.
	Relay defective.	With floats in down position, the relay should be inactive - voltage to Relay Terminal 2 to 7. Repair or replace as required.
Main control valve not closing (continuous flow).	Control Valve Solenoid 30A malfunction.	Check operation of solenoid. Valve should close with no power; clean and/or replace as required.
	Debris lodged under main valve poppet.	Isolate valve, check for leakage. Clean / repair as required.
	Floats jammed up.	Check floats, high paraffin base crude will cause a build up, clean as required.
	Power to control solenoid not disabled.	Test intrinsically safe barrier for correct operation with control relay See table A. Repair/replace as required.
Does not vent (meter over registration).	Ball valves closed.	Open.
	Check valve blocked.	Clean.
	Vent solenoid failed closed.	No power; verify position of center and top floats.
	Top and Center floats jammed (up).	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. **Note:** Check for debris in valve body if electrically correct.
	Intrinsically safe barrier failed.	Replace.
	Relay failed.	Check voltage to relay terminals 2 to 7 with top and center floats down. Repair or replace as required.

Section 5 – Related Publications

The following literature can be obtained from TechnipFMC Measurement Solutions, Inc. Literature Fulfillment at measurement.fulfillment@technipfmc.com or online at http://info.smithmeter.com/literature/online_index.html.

When requesting literature from Literature Fulfillment, please reference the appropriate bulletin number and title.

DE-3

Specifications ..... Bulletin SS03037
AccuLoad II Installation ..... Bulletin MN06037
AccuLoad III Installation ..... Bulletin MN06135
Parts List..... Bulletin PO03021

Technical Support

Contact Information:
Field Service Response Center
24/7 Technical Support/Schedule a Technician: 1-844-798-3819
System Installation Supervision, Start-Up, Training, and Commissioning Services Available

Revisions included in MN03021 rev. 0.2 (1/19):
New company branding. No technical informational changes were made.

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