



## Expansion Vessels

Installation, Operation &  
Maintenance Manual

# VERY IMPORTANT - PLEASE READ CAREFULLY

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# 1. General Description

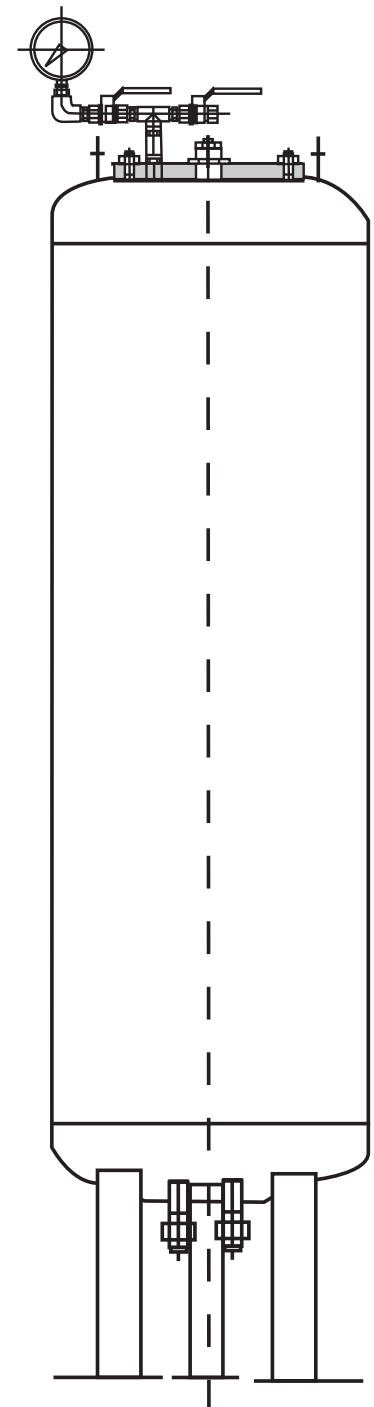
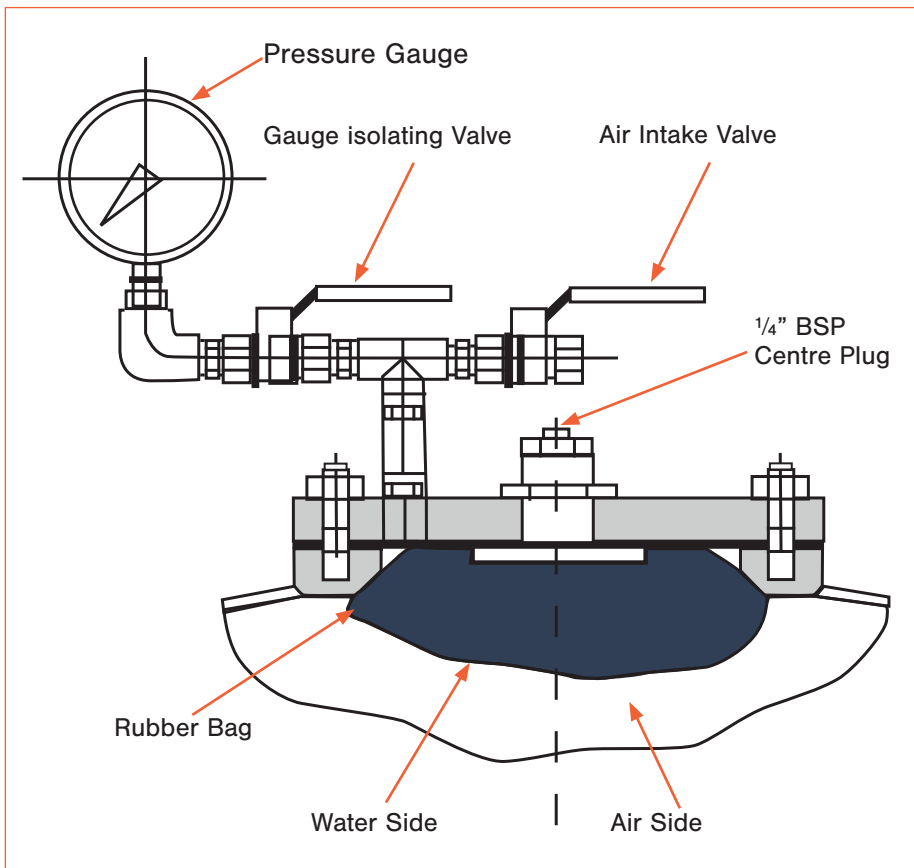
The expansion vessel is used to prevent the dangerously high pressures that the expansion fluid can cause when it is heated. This process utilises a neoprene bag within a mild steel expansion vessel. As the fluid in the system (and thus the bag) expands so the gas inside the vessel is compressed, raising the system pressure.

The Expansion Vessel is simple to use and requires a little adjusting in normal use. For efficiency, safety and ease of use however, it is important that these operating instructions are carefully followed.

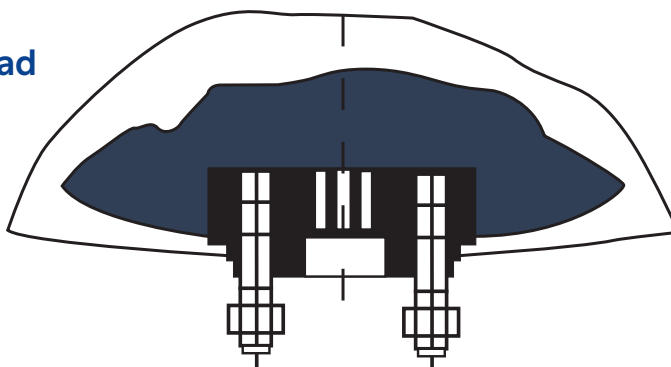
Figure 1 (below) illustrates a basic expansion vessel with details of the air inlet assembly and the bottom pad assembly.

**Figure No.1**

## 1.1 Air Inlet Assembly



## 1.2 Bottom Pad Assembly



## 2. Filling and Starting Procedure

### 2.1 Preparing the Vessel for Filling

- 1 Check the vessel is empty. If the vessel is empty proceed to step 3, if not:
- 2 Drain down the vessel by disconnecting the bottom flange.

#### NOTE

Under no circumstances should the system be fitted with any flow prevention devices between the system and the expansion vessel. To enable maintenance, a lockshield valve and drain connection may be fitted to this line. If this valve is not fitted, the entire system must be drained and the bottom connection opened.

- 3 Check the air inlet assembly is fitted to the 1/2" BSP inlet connection on the top cover, as shown in Fig 1. (The gas inlet assembly is made up of 2 ball valves, 1 pressure gauge and interconnecting pipework). Use PTFE tape on all the 1/2" BSP connections to ensure gas tight joints. All other connections should also be checked for tightness.

#### NOTE

Time spent getting joints right may prevent having to drain down the system later

- 4 Connect a compressed air or nitrogen gas supply to the air inlet assembly. Compressed air should be passed through a suitable filter to remove any moisture from it.  
  
Take care to ensure adequate ventilation when working with Nitrogen.
- 5 Remove the 1/4" BSP plug from the centre of the top cover.

#### THE VESSEL IS NOW READY TO BE PRECHARGED

### 2.2 Precharging the Vessel

- 6 Open both valves on the air inlet assembly and charge the vessel to 50% of the final working pressure or 2 bar, whichever is the smaller. Then close the air inlet valve.
- 7 Check the inlet assembly and vessel for gas leaks. Use soapy water to check joints or leave the vessel for 15 minutes and check for any drop in the pressure of the gas held in it. If leaks are found by either method, the joints should be tightened and then steps 6 and 7 repeated.

#### NOTE

If nitrogen is being used then take care to ensure step 7 is carried out in a well ventilated area and that nitrogen concentrations do not build up in the air.

#### NOTE

If the leak is persistent, gas could be escaping from either the top or bottom bag connections, or from the gasket joints between the top and bottom plates and the main vessel (as shown in figure 1). These leaks are unlikely, but should be checked.

#### THE VESSEL IS NOW READY TO BE FILLED WITH FLUID

- 8 Open the fluid supply and slowly fill the vessel. When fluid flows through the hole in the top cover plate, shut off the supply.

Care should be taken when filling the vessel – if the flow is too great, a jet of fluid will spurt from the hole in the top cover plate.

- 9 Replace the 1/4" pug in the top cover plate.

#### THE VESSEL IS NOW READY TO BE CHARGED.

### 2.3 Charging the Vessel

- 10 Open both valves of the air inlet assembly (see fig 1) and isolate the gas supply.

Release the pressure in the gas supply line, taking care not to vent nitrogen into a confined space.

Finally, disconnect the air/nitrogen gas supply and plug the inlet valve using PTFE tape for an airtight seal.

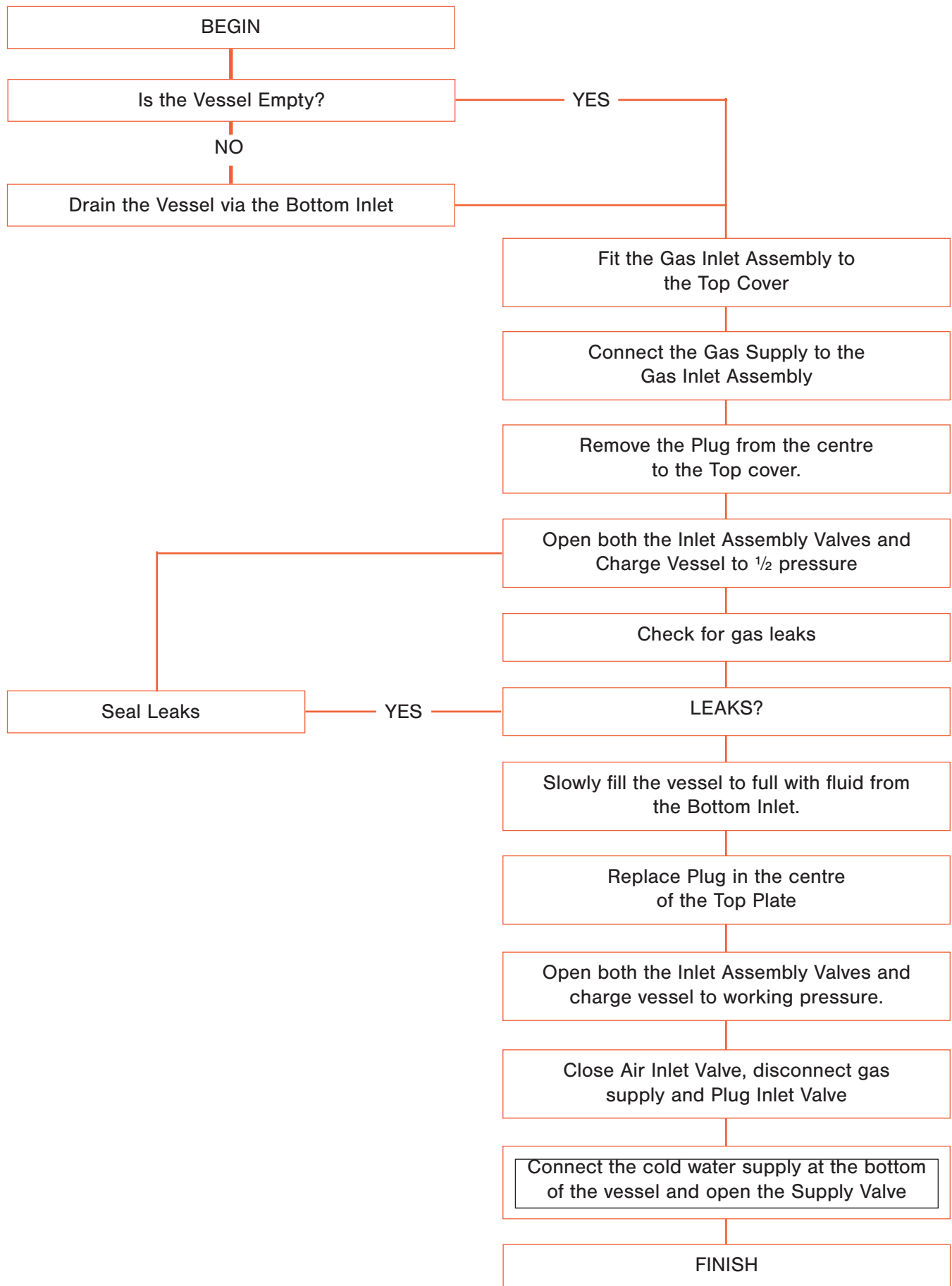
- 11 Open the supply valve at the bottom of the vessel.
- 12 The system is now charged and ready for operation

#### NOTE

See fig 2 for a flow chart of the filling and starting procedure.

## 2. Filling and Starting Procedure

### 2.4 Stages Check Procedure



## 3. General Maintenance

### 3.1 Inspection

Provided that the vessel is charged with nitrogen or dry compressed air and the water temperature within the bag does not exceed 85°C the vessel should operate satisfactorily for 3 years.

An annual check should be made to ensure that the diaphragm bag has not ruptured. The inspection procedure for these checks is:

- 1 Fully drain the waterside of the vessel via the water inlet connection at the bottom of the vessel (see note in 2.1.2)
- 2 Observe the gas side pressure of the vessel, as indicated on the gas inlet assembly's pressure gauge at the top of the vessel.
- 3 If the gas pressure continues to fall after the initial drop, then check the top cover, top and bottom connections and inlet connectors for leaks. These checks should be performed using soap-solution or similar.
- 4 Any leaks that are found should be eliminated (by sealing the joint) and the vessel should be re-tested.

If, in 3 the pressure falls but no leaks are found then the bag should be removed and examined for damage (see next section).

If there is no pressure drop, and no other visible leak, then re-charge the vessel (as described in section 2 – FILLING AND STARTING PROCEDURE).

**THE BASIC INSPECTION IS NOW COMPLETE**

## 4. Shut Down Procedure

### 4.1 Diaphragm Bag Removal

(Steps continued from 'General Maintenance, section).

- 5 If required, isolate the supply from the bottom of the vessel and drain the expansion vessel.
- 6 Remove the pressure from within the cylinder by removing the air inlet valve plug and carefully opening the valve.

#### **WARNING**

The vessel may be charged with nitrogen. Use a pipe connected to the air inlet assembly to discharge the gas to a well-ventilated area.

- 7 Mark the top cover plate and lower flange together with their mating vessel pads to ensure they will be replaced in the same orientation.
- 8 Undo the lower flange retaining nuts and remove the lower flange from the bottom inlet. (As shown in Fig 1)
- 9 Remove the top cover plate retaining nuts and use the cover plate to lift the bag out of the vessel. This is substantially easier if a lifting eye is fitted to the cover plate and a crane is used to support the weight of the bag.



#### **NOTE**

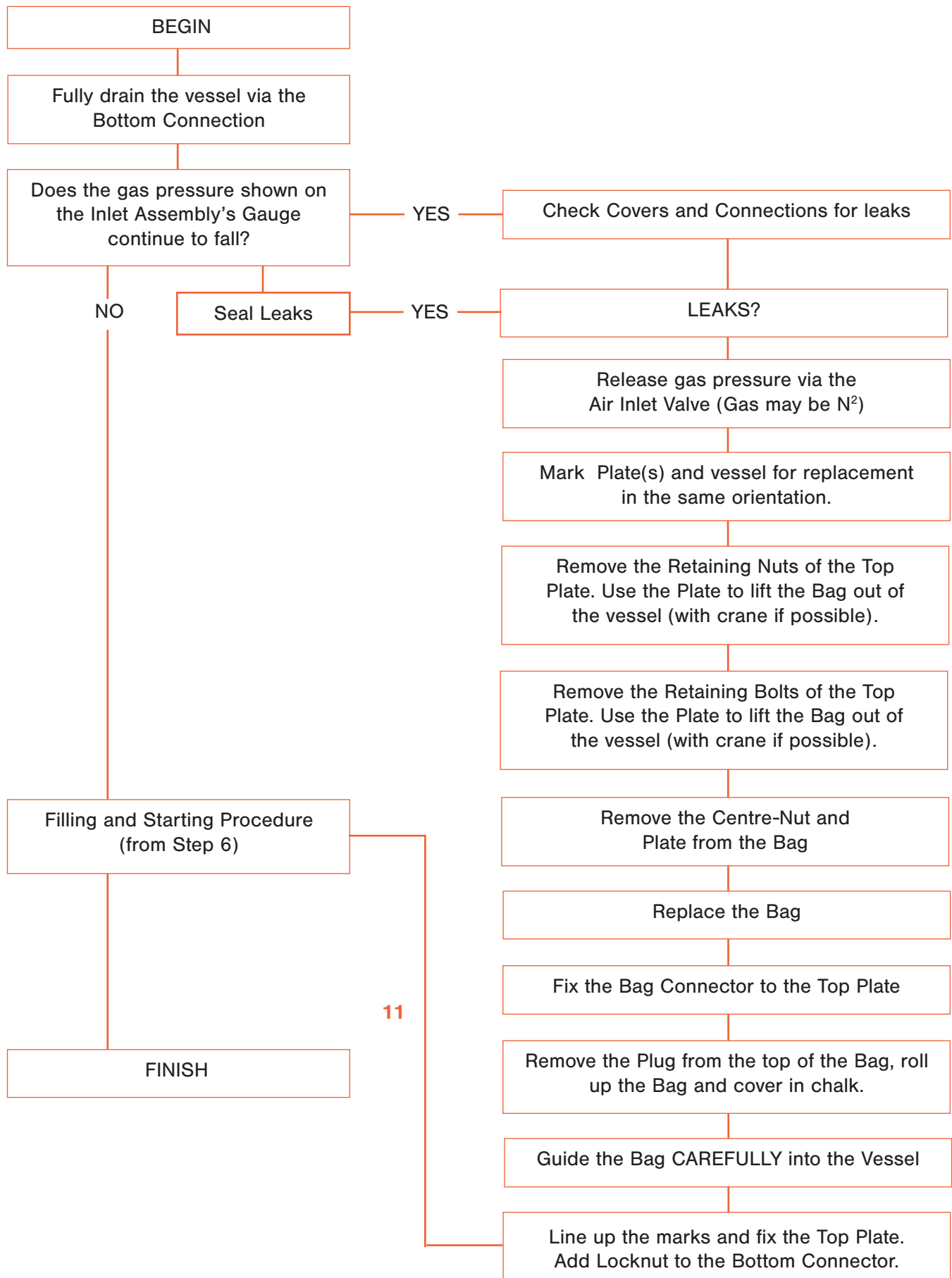
Care should be taken to avoid damaging the bag on the sides of the opening, top cover studs etc.

- 10 Remove the centre nut and top connector of the bag from the cover plate.

**THE BAG IS NOW FULLY REMOVED**

## 4. Shut Down Procedure

### 4.2 Stages Check Procedure



## 5. Restarting Procedure

### 5.1 Diaphragm Bag Replacement

(Steps continued from 'Diaphragm Bag Removal' section)

To fit a new bag the procedure is basically the reverse of the removal procedure. The following points should however, be observed.

- 11 First connect the top cover plate to the top connector of the bag using the centre-nut. Remove the plug (as shown in figure 1) from the centre inlet at the top of the bag. Lay the bag on the floor and roll it up longitudinally. Liberally cover it with French chalk.
- 12 Lower the bag carefully into the shell. Pull the bottom connector studs through the holes in the lower connector vessel pad.
- 13 Set the top cover plate in the same position it was before removing the bag by lining up the marks made in step 7. Add the retaining bolts and tighten.
- 14 Set the lower flange in the same position it was before removing the bag by lining up the marks made in step 7. Add the retaining bolts and tighten.



The 'Filling and Starting' procedure listed in section 2 should now be followed from stage 6







Duncombe Road,  
Bradford, England BD8 9TB.

Telephone: +44 (0) 1274 490911. Email: [sales@ormandygroup.com](mailto:sales@ormandygroup.com)

[www.ormandygroup.com](http://www.ormandygroup.com)