

FMBDV Blow Down Vessel

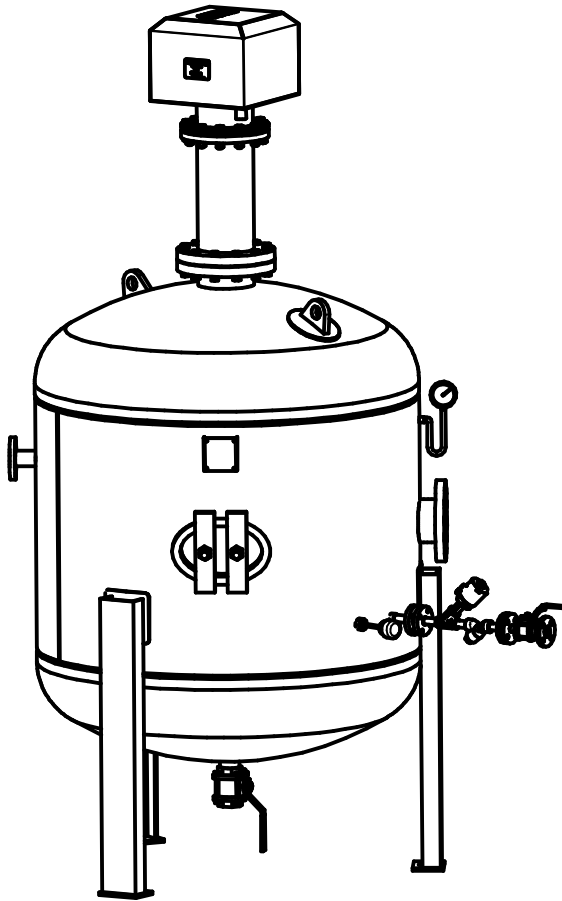


Table of Contents

1.	Safety Information	1
2.	Product-Specific Safety Information.....	6
3.	Product Information.....	7
4.	Installation Guidelines	9
5.	Commissioning Guidelines	12
6.	Product Working Principle	13
7.	Maintenance Guidelines	14
8.	Available Spares	15

PLEASE NOTE - Throughout this manual this cautionary symbol is used to describe a potential damage or injury that might occur if the safety considerations are overlooked. This symbol denotes **CAUTION**, **WARNING** or **DANGER**.



1. Safety information

Forbes Marshall products are designed, manufactured and tested to exacting standards to meet modern system requirements.

Safe operation of the unit can only be guaranteed if it is properly installed, commissioned and maintained by a qualified person (see Section 1.10 on page 4) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

The product is designed and constructed to withstand the forces encountered during normal use. Use of the product for any other purpose, or failure to install the product in accordance with these Installation and Maintenance Instructions, could cause damage to the product, and cause injury or fatality to personnel.

1.1 Intended use

Referring to these Installation and Maintenance Instructions, nameplate and Technical Information Sheet, check that the product is suitable for the intended use/application.

i) The products have been specifically designed for use with steam. The product's use on other fluids may be possible but, if this is contemplated, Forbes Marshall should be contacted to confirm the suitability of the product for the application being considered.

ii) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous over pressure or over temperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.

iii) Determine the correct installation situation and direction of fluid flow.

iv) Forbes Marshall products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.

I) Remove protective covers from all connections and protective film from all name-plates, where appropriate, before installation on steam or other high temperature applications.

1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

1.4 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider; flammable materials, substances hazardous to health, extremes of temperature.

1.5 Hazardous environment around the product

Consider; explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery

1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk? Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks. Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

1.7 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns

1.8 Tools and consumables

Before starting work ensure that you have suitable tools and /or consumables available. Use only genuine Forbes Marshall replacement parts.

1.9 Protective clothing

Consider whether any protective clothing is required by yourself and /or others in the vicinity to protect against the hazards of, for example, chemicals, high / low high / low temperature, noise, falling objects, and dangers to eyes and face.

1.10 Permits to work

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to these instructions. Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety Post 'warning notices' if necessary.

1.11 Handling

Manual handling of Forbes Marshall products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being.

1.12 Residual hazards

In normal use the external surface of the product may be very hot. If used at the maximum permitted operating conditions the surface temperature of blowdown vessels may reach a temperature approaching 183°C Many products are self-draining. Take due care when dismantling or removing product from an installation (refer to 'Maintenance Instructions').

1.13 Freezing

Provision must be made to protect products which are not selfdraining against frost damage if they are inoperative in environments where they may be exposed to temperatures below freezing point during shutdown. The vessel should be thoroughly defrosted prior to use. Trace heating should be considered under severe environmental conditions, in order to prevent the operating temperature of the vessel dropping below -10°C (14°F) during service.

1.14 Disposal

This product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

2. Product - specific safety information

The following information is specific to this product and should be read in conjunction with the General Safety Information - Section 1.

Warning

If this product is not used in the manner specified by this UM, then the protection provided may be impaired?

2.1 Overpressure protection

The outlet flash steam connection should not be restricted in any way that would cause a rise in the vessel pressure above ambient conditions. Therefore no pressure safety device need be fitted to this vessel.

2.2 Guard rail

The vessel may need a guard rail and /or mesh screen to prevent injury caused by accidental contact with the hot vessel or pipework.

2.3 Associated equipment

Please ensure that you make reference to the technical / installation information for equipment coupled to this vessel to avoid any possible operational difficulties with associated equipment.

3. Product information

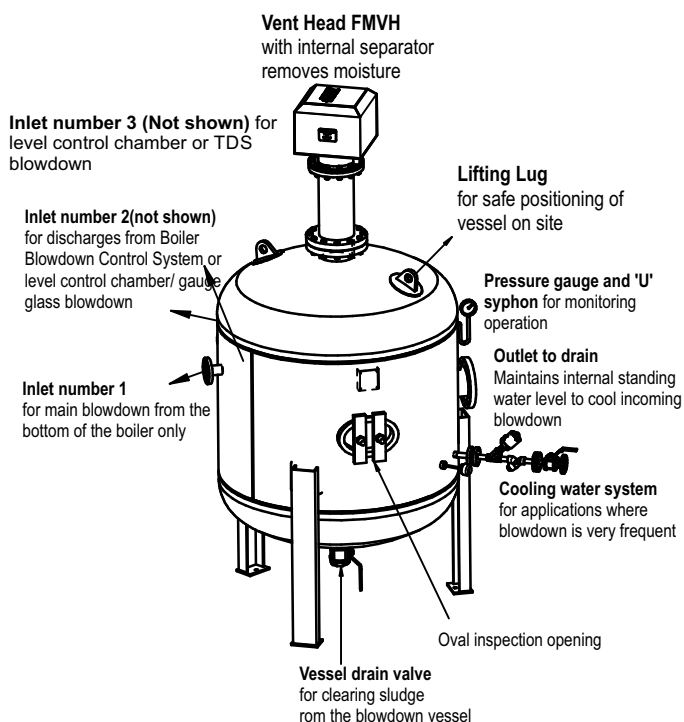
3.1 General information

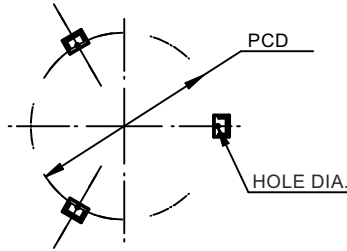
Forbes Marshall products are designed, manufactured and tested to exacting standards to meet modern system requirements. Where applicable, they satisfy current safety and design codes and users can expect long service life when products are selected, installed and maintained in accordance with Forbes Marshall recommendations.

These vessels are particularly suited to accept manual/automatically controlled bottom blowdown, manually controlled bleed valves for continuous blowdown, automatically controlled valves and control systems for TDS, vessels and ancillaries and heat recovery equipment. This Installation and Maintenance Instruction document provides comprehensive information on operation, installation and maintenance and should be read prior to commencing work on the product.

3.2 Pressure /Temperature Limits

Body design Conditions	ASA 150
Maximum Design Pressure	10 kg/cm ² @ 183 deg C
Maximum Design Temperature	183 deg C @ 10 kg/cm ²
Minimum Design Temperature	-10 deg C
Maximum Operating Pressure	0.35 kg/cm ²
Maximum Operating Temperature	109 deg C
Minimum Operating Temperature	0 deg C
Designed For Maximum Cold Hydraulic	16 bar g
Test Pressure	





FOUNDATION DETAILS

İHKĜ	PCD (mm)	BOLT HOLE (mm)
FMBDV-3	448	20
FMBDV-4	604	20
FMBDV-5	757	20
FMBDV-6	895	20
FMBDV-8	1192	20
FMBDV-10	1487	20

4. Installation

Before actioning any installation observe the 'Safety information' in Sections 1 and 2. Ensure that any permanent plugs supplied with the vessel are fitted securely, both at ambient and operating temperatures. The vessel must be mounted with the flash steam outlet uppermost, as shown in Figure 1. Each vessel incorporates a 3/8" BSPT screwed boss for a pressure gauge, U-syphon and cock. Please refer to Table 1 for the numbers of legs and bolt holes. The outlet flash steam connection should not be restricted in any way that would cause a rise in the vessel pressure above ambient conditions. Therefore no pressure safety device need be fitted to this vessel.

Table 1 Fixing bolts

Vessel feet have a pre-drilled hole for fixing bolts (diameters are as stated):-

Blowdown vessel	No. of Legs	PCD of bolt holes
FMBDV3	3	Ø20 mm on a 448 mm
FMBDV4	3	Ø20 mm on a 604 mm
FMBDV5	3	Ø20 mm on a 757 mm
FMBDV6	3	Ø20 mm on a 895 mm
FMBDV8	3	Ø20 mm on a 1192 mm
FMBDV10	4	Ø20 mm on a 1487

4.1 Positioning:

- Use the lifting lugs to position the vessel.
- Ensure there is access to the inspection opening.
- Remove all plastic plugs and blanks from the vessel connections.
- Plug or blank off connections which are not to be used.

WARNING: Do not blank off the vent

or the outlet connections.

- Use a spirit level to check that the blowdown vessel is perfectly vertical. This is essential for optimum performance. Use a non-compressible packing under the legs if necessary.

4.2 Mating of vessel pipework on site

We offer as much guidance and technical detail as possible for the vessel to help with connection to system pipework /valves.

When making the final connections between the blowdown vessel and the system pipework please use any technical documents that refer to individual porting dimensions as a guide only and use the final position of the vessel to match up the individual ports to the system pipework for level and mating accuracy.

4.3 Inlet layout

Install the inlet pipework at a lower level than the vessel. This ensures that the blowdown line remains flooded, minimising the effect of water hammer. Ensure the proper use of stop valves and check valves, or the combination of both to avoid adverse interaction between different supply lines to and from the vessel.

Note: Inlets 1,2 & 3 should only be used for the main blowdown ,level control chamber/gauge glass blowdown and TDS blowdown.

4.4 Vent layout

Install the vent pipe vertically if possible. If it has to run horizontally then it should have a slight slope to drain back to the vessel. It should not join other vent lines.

WARNING: Do not fit a check valve or stop valve in the vent line.

It is useful to fit a spool piece between the vessel and vent pipework, which can be removed to facilitate blanking-off for hydraulic testing.

We strongly recommend the use of a Forbes Marshall vent head to maximise the separation of any entrained water there by offering protection to nearby personnel and buildings.

Connect the vent head drain to waste, ideally with an air break, which could take the form of a tundish. Do not connect it into the blowdown vessel.

4.5 Outlet

Connect the outlet to drain, which must be at a lower level than the vessel.

WARNING: Do not fit a stop valve or a check valve in the outlet pipework.

It is useful to fit a spool piece between the vessel and the outlet pipework, which can be removed to facilitate blanking-off for hydraulic testing.

4.6 Cooling water system

All vessels are fitted with two connections for a cooling water system, one for a temperature controller and one for cooling water. Install the temperature controller as described in the relevant Installation and Maintenance Instructions supplied with the product.

Set the controller to operate at a temperature below a set point recommended by local government guidelines.

4.7 Paint finish

The vessel is protected with one coat of silver paint which would be deemed suitable for protection during transit or for vessels located within the boiler house.

For vessels stored or used in external locations more appropriate protection such as additional paint finish or insulation will need to be considered - See Section 4.8.

4.8 Frost protection

If the vessel is located outdoors there should be some consideration for vessel temperature protection, guarding against the water reservoir freezing.

Provide trace heating in extreme cases.

5. Commissioning

Before putting the unit into service, ensure that:

- Permanent plugs are tight; Tighten these when the vessel has reached normal operating temperature.

Caution! The maximum operating temperature is 183 deg C, 10 kg/cm²

- All connections to adjoining pipework/plant are sound and secured so that no external stresses are introduced into the unit.
- No extraneous objects / material is present within the vessel.
- The vessel is filled with a standing level of water.

6. Operation

Operation of the blowdown vessel is inherently simple and no special operating instructions are required. The vessel allows for the safe expansion of hot water from high to lower pressures with the accompanying production of flash steam.

Before use and after draining / flushing the vessel, it must be replenished to its normal working level (level with the outlet on the centreline of the vessel shell) by introducing fresh water until it discharges at the outlet.

On a precautionary note, vessels are designed to operate at high temperatures and care should be taken to avoid personal injury as vessels are normally unlagged to dissipate heat. We recommend that the pressure gauge is checked during bottom blowdown.

If it indicates more than 0.35 bar g (5 psi g) then it may indicate that the vent or outlet is blocked, a situation demanding immediate attention.

WARNING: The stop valve at the vessel/manifold must be in the fully open position before operating / testing any bottom blowdown valve, auto TDS control system, level control system, etc. that may drain into the vessel.

This is particularly important in the case of level control systems, as level controls may appear to be working correctly but in reality will be untested, and may be faulty.

Operating conditions

Forbes Marshall blowdown vessels are designed to operate up to: 10 kg/cm² @ 183°C

They have a minimum operating temperature of: 0°C

7. Maintenance

WARNING:

Isolate the vessel by closing and securing stop valves on blowdown lines at the vessel inlet, closing all boiler blowdown valves and opening any line valves (i.e. double block and bleed principle).

Repairs to pressure vessels are not recommended as specialist design procedures and welding operations are required, together with re-inspection by a qualified competent person.

6 month intervals

The vessel must be drained every 6 months to remove concentrated blowdown water / sludge. Any accumulation of sludge within the vessel must be cleared by passing a hose through the inspection / access hatch and flushing with the drain valve open. Before reusing, after draining /flushing the vessel, it must be replenished to its normal working level (level with the outlet on the centreline of the vessel shell) by introducing fresh water until it is replenished to its normal working level (level with the outlet on discharges at the outlet).

14 month intervals

Blowdown vessels should be thoroughly examined by a 'competent person' every 14 months or at every major boiler inspection. An examination would normally include a visual examination of the internal surfaces of the vessel to ensure that there is no excessive corrosion, erosion, or scaling, and a check for scaling or other obstruction in the vessel vent, outlet or outlet antisiphon hole. It is the task of the 'competent person' to determine which checks to carry out, and the necessary action to be taken. Fit a new gasket to the inspection opening every time the cover is removed (see Section 8, Spare parts).

The Table below gives detail of inspection port openings for each model:

Vessel designation Inspection port opening

FMBDV3, FMBDV4, FMBDV5 Handhole size 180 x 120 mm oval

FMBDV6, FMBDV8, FMBDV10 Handhole size 320 x 200 mm oval

Note:

Vessels should be included in a written scheme of examination compiled by a suitably qualified competent person who is responsible for determining the frequency of examination.

8. Spare parts

Gaskets are the only available spares for blowdown vessels:

SIZE	DIMENSIONS	CODE
FMBDV 3	Outside Dimenions 200 x 140	Set of 3 gaskets , part code SPARE-FMBDV3-4-5-GKIT
FMBDV 4		
FMBDV 5		
FMBDV 6	Outside Dimenions 380 x 260	Set of 3 gaskets , part code SPARE-FMBDV6-8-10-GKIT
FMBDV 8		
FMBDV 10		



www.forbesmarshall.com

Forbes Marshall Arca

Codel International

Krohne Marshall

Forbes Vyncke

Forbes Marshall Steam Systems

A: Forbes Marshall Pvt. Ltd.

Opp. 106th Milestone, CTS 2220,
Mumbai-Pune Road, Kasarwadi,
Pune MH 411034 INDIA

P: +91(0)20-68138555

F: +91(0)20-68138402

E: ccmidc@forbesmarshall.com

Forbes Marshall International Pte. Ltd.

16A, Tuas Avenue 1,
#05-21, JTC Space @Tuas
Singapore - 639533

P: +65 6219 3890

CIN No: U28996PN1985PTC037806