Installation and Maintenance Manual

Forbes Marshall Bucket Trap

FMBT50

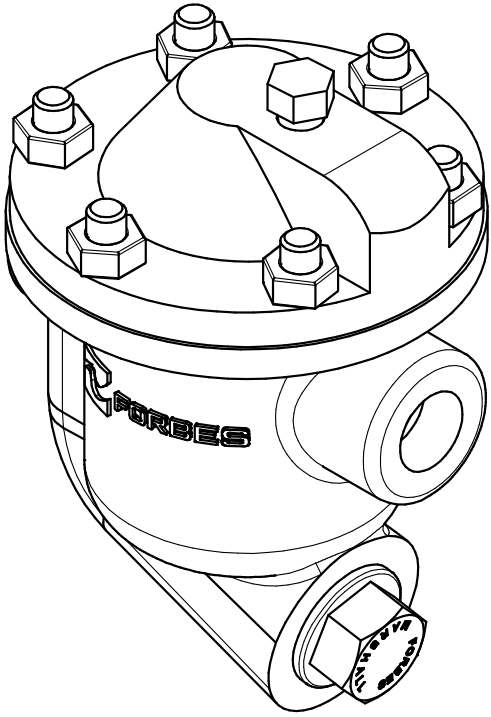


Table of Contents

1. Preface 1
2. Important Safety Notes 1
3. Brief Product Information 3
4. Product Working Principle 7
5. Installation Guidelines 7
6. Startup and Commissioning 8
7. Maintenance Guidelines 9
8. Troubleshooting 11
9. Available Spares 13
10. Warranty Period 13

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. Preface:

This manual is intended for anyone using, commissioning, servicing, or disposing the below mentioned products safely and efficiently.

Forbes Marshall Bucket Trap [FMBT50]

Sizes: DN 15 ($^1/_2$"), DN 20 ($^3/_4$") and DN 25 (1")

PLEASE NOTE:

Throughout this manual the following 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

2. Important Safety Notes:

Read this section carefully before installing/operating/maintaining the product. The precautions listed in this manual are provided for personnel and equipment safety. Furthermore, Forbes Marshall accepts no responsibility for accidents or damage occurring as a result of failure to observe these precautions. Note that the product is designed to perform for non-contaminated fluids only. A contamination in the form of chemical, foreign particle etc. can lead to problem with product performance and life of the product.

If these products in compliance with the operating instructions are, properly installed, commissioned, maintained and installed by qualified personnel (refer Section 2.7) the safety operations of these products can be guaranteed. General instructions for proper use of tools and safety of equipment's, pipeline and plant construction must also be complied with.

2.1 Intended use:

Check if the product is suitable for intended use/ application by referring to the installation and maintenance instructions, name plates and technical information sheets.

i) The product is suitable for use as defined in the technical information sheet. In case the need arises to use the product on any other fluid please contact Forbes Marshall for assistance.

ii) Check for the suitability in conformance to the limiting conditions specified in technical information sheet of the product.

iii) The correct installation and direction of fluid flow has to be determined.

iv) Forbes Marshall products are not intended to resist external stresses, hence necessary precautions to be taken to minimize the same.

2.2 Accessibility and Lighting:

Safe accessibility and working conditions are to be ensured prior to working on the product.

2.3 Hazardous environment and media:

The product has to be protected from hazardous environment and check to ensure that no hazardous liquids or gases pass through the product.

2.4 Depressurizing of systems and normalizing of temperature:

Ensure isolation and safety venting of any pressure to the atmospheric pressure. Even if the pressure gauge indicates zero, do not make an assumption that the system has been depressurized. To avoid danger of burns allow temperature to normalize after isolation.

2.5 Tools and consumables:

Ensure you have appropriate tools and / or consumables available before starting the work. Use of original Forbes Marshall replacement parts is recommended.

2.6 Protective clothing:

Consider for the requirement of any protective clothing for you/ or others in the vicinity for protection against hazards of temperature (high or low), chemicals, radiation, dangers to eyes and face, noise and falling objects

2.7 Permits to work:

All work to be carried out under supervision of a competent person. Training should be imparted to operating personnel on correct usage of product as per Installation and Maintenance instruction. "Permit to work" to be complied with (wherever applicable), in case of absence of this system a responsible person should have complete information and knowledge on what work is going on and where required, arrange to have an assistant with his primary goal and responsibility being safety. "Warning Notices" should be posted wherever necessary.

2.8 Handling:

There is a risk of injury if heavy products are handled manually. Analyze the risk and use appropriate handling method by taking into consideration the task, individual, the working environment and the load.

2.9 Freezing:

Provision should be made to protect systems which are not self-draining, against frost damage (in environment where they may be exposed to temperatures below freezing point) to be made.

2.10 Returning products:

Customers and Stockist are reminded that, when returning products to Forbes Marshall they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk.

This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

3. Brief Product Information:

3.1 Description:

The Forbes Marshall Bucket Trap FMBT50, is designed so that it may be fitted into horizontal pipelines. It is maintainable in line and is complete with integral strainer screen.

3.2 Sizes and End Connections:

DN 15, DN20, and DN25

Screwed BSPT/NPT

Socket weldable ends

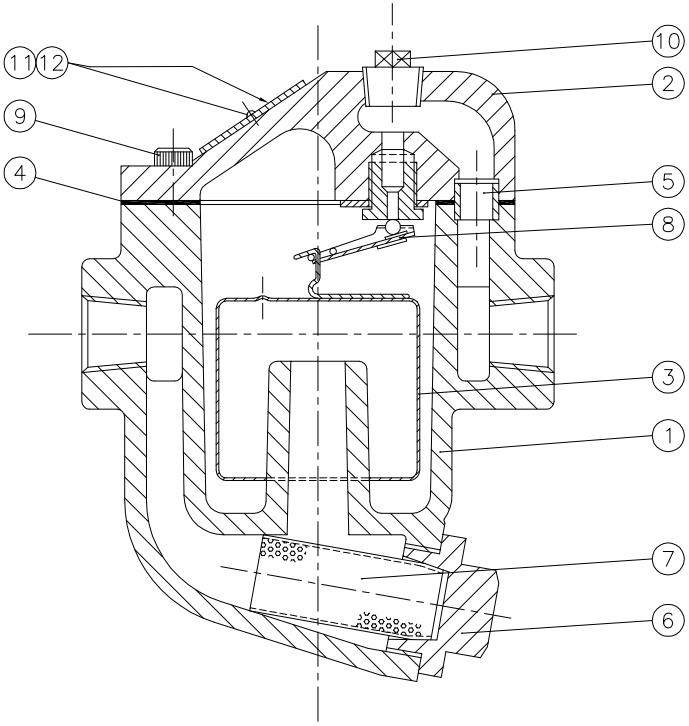
3.3 Limiting Conditions:

Maximum body design condition	42 bar g
PMA-max. allowable pressure	32 bar g
TMA-max.allowable temperature	300 °C
Cold hydraulic test pressure	84 bar g

Maximum operating conditions depend upon orifice size.

△ PMX-max. differential pressure

DN 15	DN 20	DN 25	△ PMX (bar) g
FMBT50 /4	FMBT50 /5	FMBT50 /5	32.0
FMBT50 /5	FMBT50 /6	FMBT50 /6	20.0
FMBT50 /6	FMBT50 /7	FMBT50 /8	12.0
FMBT50 /7	FMBT50 /8	FMBT50 /10	8.5
FMBT50 /8	FMBT50/10	FMBT50 /12	4.0



Material

S.No.	Description	Material	Standard
1	Body	Cast Steel	ASTM A216 Gr WCB
2	Cover	Cast Steel	ASTM A216 Gr WCB
3	Bucket Assembly	Stainless Steel	S.S. 304
4	Cover Gasket	SS Exfoliated Graphite	
5	Ferrule	Stainless Steel	S.S. 304
6	Strainer Cap	Stainless Steel	BS 3146 ANC2
7	Strainer Screen	Stainless Steel	S.S. 304
8	Valve and Seat Assly. 10 BAR Valve and Seat Assly. 8.5 BAR Valve and Seat Assly. 4.0 BAR	Stainless Steel	S.S. 304
9	Socket HD. CAP SCREW	Alloy Steel	ASTM A 193 Gr B7
10	Plug 3/8" BSPT	Carbon Steel	ASTM A 105
11	Name plate	Stainless Steel	SS304
12	Name plate Rivet	Aluminum	

3.4 Product Dimension Drawing :

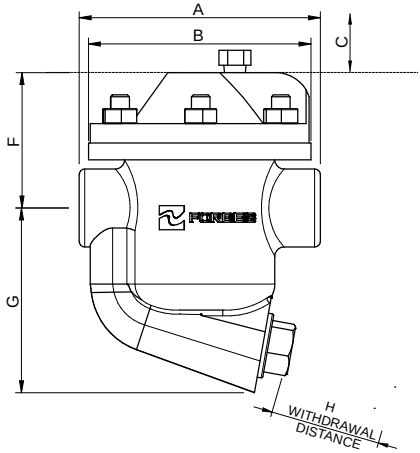


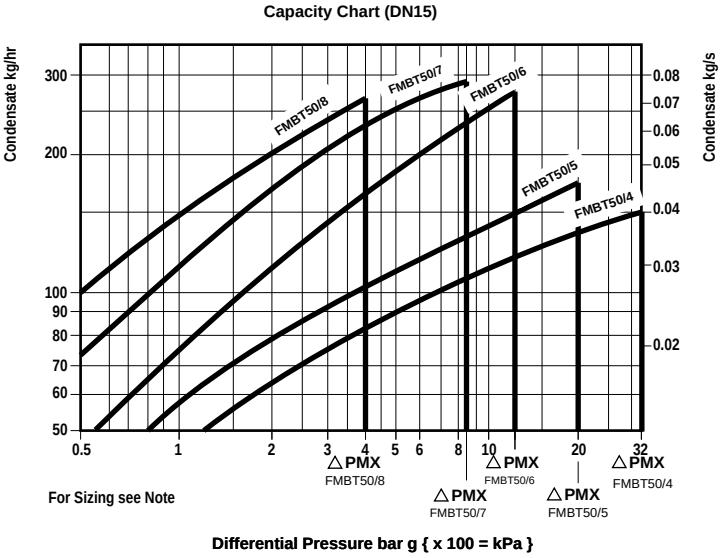
Figure 2 : Dimensional Drawing of FMBT50

Dimensions(approx.)in mm

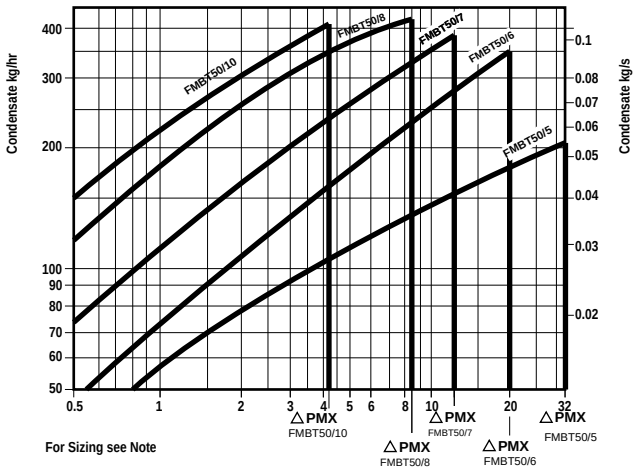
Size(DN)	A	B	C	F	G	H	Wt.(kg)
15	130	120	110	75	100	65	5.50
20	130	120	150	93	117	65	6.25
25	180	165	170	132	127	851	2.25

GEN TOL ±3.0

3.5 Capacity Chart:

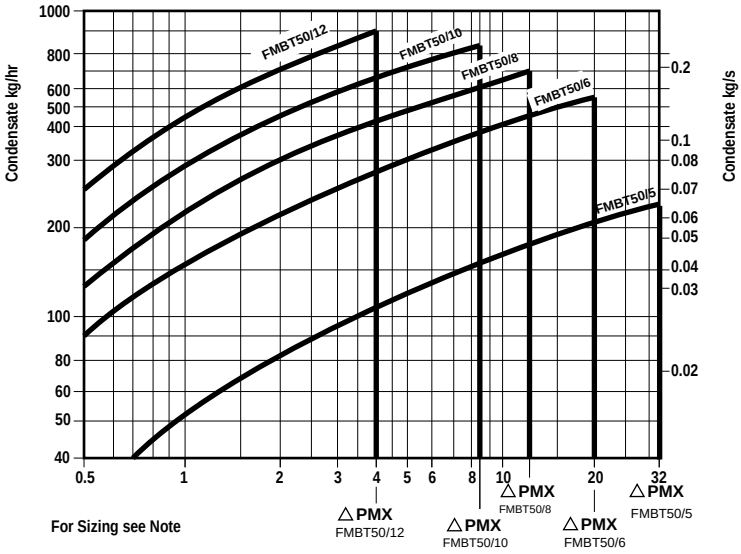


Capacity Chart (DN20)



Differential Pressure bar g { x 100 = kPa }

Capacity Chart (DN25)



Differential Pressure bar g { x 100 = kPa }

Note :

Trap should be selected for the most appropriate working differential pressure and not on the basis of load e.g.DN25 FMBT50, 80 Kg/h at 7 bar differential should be handled by FMBT50/10 and not FMBT50/5.

4. Product Working Principle:

The Forbes Marshall Bucket Trap [FMBT50] is mechanical steam trap operated by the movement of an inverted bucket which operates on the difference in density between steam and condensate.

4.1. Operation of Forbes Marshall Bucket Trap [FMBT50]: [Refer figure 1]

1. When steam is turned on to the system, the bucket '4' is at the bottom of the trap and the valve seat '8' is wide open. Any air which is reaching the trap will bleed air into top of the trap from small vent hole provided on top of the bucket '4'.
2. As condensate enters the trap, it forms a water seal inside the body '3'. The weight of the bucket '4' keeps the valve '9' off its seat '8' and so condensate can flow around the bottom of the bucket '4' and out of the trap. Under low load or super heat conditions, the trap may need to be 'primed' with water before system start-up.
3. When steam enters the underside of the bucket '4' the bucket becomes buoyant and rises. this positions the valve lever '10' such that the valve '9' snaps off.
4. The bucket '4' will lose its buoyancy as the enclosed steam condensate due to radiation losses and steam escape through the vent hole. The weight of the bucket '4' will pull the valve '9' off its seat '9' and the cycle is then repeated.
5. Inverted bucket traps discharge condensate intermittently and at steam temperature.

5. Installation Guidelines:

Before implementing any installations observe the 'Important Safety Notes' in Section 2. Referring to the Limiting conditions and name – plate, check the product is suitable for the intended installation.

1. Check materials, pressure and temperature and their maximum values.
2. Determine the correct installation situation and the direction of fluid flow.
3. Remove protective covers from all connections.
4. The Forbes Marshall Bucket Trap should be installed with the body upright so that the bucket is rising and falling vertically. The inlet and outlet connections should be in a horizontal plane, with the trap installed below the drain point so that a water seal can be maintained around the open end of the bucket. When superheat conditions exist the steam trap body may need to be primed with water prior to steam being turned on to avoid steam blowing through the trap.
5. When Forbes Marshall Bucket Trap is fitted in exposed conditions the possibility of freezing damage can be reduced by thermal insulation.
6. Where the trap discharges into a closed condensate return system or where there is a lift at the steam trap, a check valve should be fitted downstream of the steam trap.
7. If the trap has to be installed at a higher point than the drainage point then a small bore riser into a 'U' seal should be used. A check valve should be fitted before the steam trap to prevent the loss of the internal water seal. (Refer Fig. 3)

Note: If the trap is discharged to atmosphere ensure it is to a safe place, the discharging fluid may be at a temperature of 100°C (217°F)

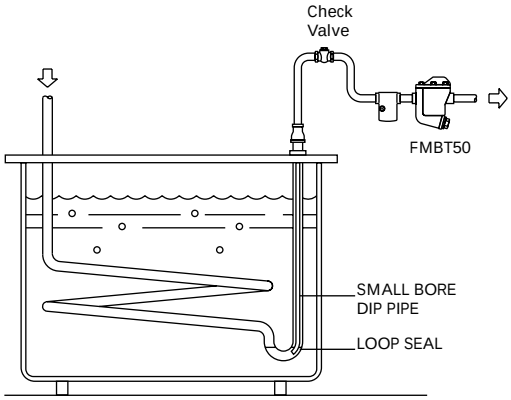


Figure 3 : FMBT50 trap draining in storage tank

6. Start-up and Commissioning:

6.1. Flushing of lines:

As part of pre-installation all fluid handling equipment particularly piping should be thoroughly cleaned of scale and the internal debris which accumulates during construction. This is accomplished by blowing or flushing with air, steam, water and other suitable medium.

Follow these steps to carry out the flushing

1. Close the upstream trap isolation valve and open the bypass isolation valve.
2. Let the condensate drain for 10-15 minutes or until clear condensate starts coming out, whichever is earlier.
3. Now slowly close the bypass isolation valve and open the trap isolation valve.

Note: For a detailed procedure on flushing of lines please visit Forbes Marshall website.

6.2. Commissioning:

After installation or maintenance ensure that the system is fully functioning by confirming fluid is passing through it.

1. After flushing of lines is complete, ensure that bypass isolation valve is closed and upstream trap isolation valve is opened.
2. Check for leaks and attend if any.

7. Maintenance Guidelines:

Note: Before undertaking any maintenance of the product it must be isolated from both supply line and return line and ensure pressure is normalized to atmosphere. The product should then be allowed to cool. When re-assembling ensure that all joint faces are clean.

7.1. Routine and preventive maintenance:

Please refer to the maintenance schedule mentioned in the table below to undertake routine maintenance of the Forbes Marshall Bucket Trap [FMBT50].

Sr. No.	Parameters to be checked	Frequency for checking various parameters						
		Immediate	Daily	Weekly	Monthly	Quarterly	Half Yearly	Annually
1	Test High Pressure steam traps (17.5 bar g and above)		Y					
2	Test Medium Pressure steam traps (3.5 bar g to 17.5 bar g)			Y				
3	Test Low pressure steam traps (below 3.5 bar g)				Y			
4	Repair / Replace steam traps - when testing shows leaks	Y						
5	Clean internals / strainer of FMBT50					Y		
6	Visual Inspection for leakages			Y				
7	Arresting any other leaks	Y						

7.2. Tool Kit:

To carry out maintenance of the Forbes Marshall Bucket Trap [FMBT50] refer the tools mentioned in the table below.

Size	Component	Tool used and size
DN 15/20	Valve Seat	Box spanner 13 mm (A/F)
	Cover Nuts	Box spanner 17 mm (A/F)
	Strainer Cap	Box spanner 26 mm (A/F)
DN 25	Valve Seat	Box spanner 16 mm (A/F)
	Cover Nuts	Box spanner 19 mm (A/F)
	Strainer Cap	Box spanner 26 mm (A/F)

7.3. Recommended tightening torques:

Part	Sizes	Torques
Valve Seat	DN 15 / 20	23 – 27 Nm
	DN 25	80 – 88 Nm
Studs & Nuts	15 / 20	25 – 28 Nm
	DN 25	85 – 95 Nm
Strainer Cap	DN 15 / 20	90 – 100 Nm
	DN 25	125 – 145 Nm

Table 1 Recommended Tightening Torques.

7.4 Procedure to fit the valve and seat assembly: [Refer Figure 1]

Note: The cover gasket contains a thin stainless steel support ring which may cause physical injury if not handled and disposed of carefully.

1. Undo the cover bolts and nuts (2) and remove the cover from the body.
2. Unhook the bucket (4) from the valve lever (10).
3. Remove the valve guide plate by undoing the two screws (5).
4. Remove the seat (8) from the cover.
5. Ensure all the joining faces are clean and then screw in the new seat to the recommended tightening torque. Use a small amount of joining paste on the threads.
6. Fit new valve guide plate with the two screws supplied and refit the new lever. Ensure that the valve and seat are aligned correctly before finally tightening the guide plate screws.
7. Hook the bucket to the lever and ensure gasket faces on the body cover are clean.
8. Using a new cover gasket (7) refit the cover to the body ensuring the small ferrule (11) is positions correctly. Tighten cover bolts / nuts to the recommended tightening torque (see Table 1).

7.5. Procedure to clean / replace the strainer screen: [Refer Figure 1]

1. Undo the strainer cap (13) and remove the strainer screen (12).
2. Clean or replace the strainer screen (12) as required.
3. Ensure threads are clean.
4. Screw the strainer cap into the body, ensuring the strainer screen is located centrally. Use anti-seize compound on the threads and tighten to the recommended torque. (See Table 1).

8. Troubleshooting:

If the expected performance is unachievable after installation Forbes Marshall Bucket Trap [FMBT50], check the following points for appropriate corrective measures.

Failure Mode	Possible Cause	Remedy
The surface temperature of the steam trap is cold.	Inlet Pipe or Strainer Screen is clogged with rust or scale	Flush inlet pipe and clean strainer screen if rusted replace with new strainer screen.
	The upstream or downstream isolation valves are closed.	Ensure Upstream and downstream isolation valve are fully open.
	End connection of the steam trap installed in reverse direction.	Check the installation, according to the flow direction arrow on the cover body.
Condensate discharge inadequate	The upstream or downstream isolation valves are closed	Ensure Upstream and downstream isolation valve are fully open.
	The condensate line inlet /outlet are dirt clogged.	Flush and clean the pipe line.
	Differential pressure is very low	Check the pipe size of the condensate line.
		Check downstream pressure of steam trap is higher i.e. live steam leakage in condensate line.
		Size the steam trap with a larger condensate discharge capacity or option for steam operated steam trap.
	The steam trap is undersized.	If it is discharging steadily with no bucket sound then it is too small. Replace trap with larger one i.e. size the steam trap with a higher condensate discharge capacity.
	The condensate is lifted from the downstream of the steam trap	Change the orientation of the condensate line. Option for higher differentiate pressure (PMX) steam trap with required condensate discharge.

Failure Mode	Possible Cause	Remedy
Steam leak	Live steam continuously leaking through the outlet.	Check the bypass is fully closed.
		Check valve seat and seat assembly is leaking or worn, replace with new one.
		There should always be enough water in the steam trap body to act as seal around the lip of the bucket. If the steam trap loses this water seal, steam will blow off to waste through the outlet.
	Regular pressure fluctuation in steam trap	Check valve should be fitted on the inlet line in front of the steam trap. This will help to prevent any loss of the water seal in the steam trap. In some applications where there is an abrupt drop in steam pressure, so that some of the condensate in the trap body flashes into steam. The water in the trap is pushed back through the inlet port until the bucket, sinks to the bottom of the steam trap. The discharge valve is then pulled open and steam blow out.
	Cover gasket deterioration or damage	Ensure to replace with new one during each service period.
	Improper tightening of cover nuts.	Tighten the cover nut to suitable torque to avoid fluid leakage between cover and body of the steam trap.
	The end connections of the steam trap are not tight.	Seal off the end connection.
	The steam trap body has been damaged by corrosion or erosion.	Check the pressure rating of the steam trap, resistance of the body material for the fluid used. A steam trap made from a material which is suitable for the fluid should be used.
	The steam trap has been damaged by frost.	Replace the steam trap with a new one. During shut down period make sure that the condensate lines and the steam trap are completely drained.
		Suitable lagging may be sufficient to overcome this problem, if conditions are not too severe.

Note: Never attempt to modify the product. When replacing part with new part, use the spare parts listed in Section 9.

9. Available Spare Parts:

Spares		Spare Code
VALVE & SEAT KIT FOR DN 15/20,FMBT50/5 :	A,B,C (2 Off), D	S2005041
VALVE & SEAT KIT FOR DN 20, FMBT50/10:	A,B,C (2 Off), D	S2005042
VALVE & SEAT KIT FOR DN 15, FMBT50/ 4 :	A,B,C (2 Off), D	S2005043
VALVE & SEAT KIT FOR DN 25, FMBT50/8 :	A,B,C (2 Off), D	S2005046
VALVE & SEAT KIT FOR DN 25,FMBT50/6:	A,B,C (2 Off), D	S2005047
VALVE & SEAT KIT FOR DN 25, FMBT50/5:	A,B,C (2 Off), D	S2005048
SCREEN & GASKET KIT FOR DN 15/20, FMBT50 [PACKOF2]:	E & F	S2005030
SCREEN & GASKET KIT FOR DN 25 FMBT50 [PACKOF2]:	E & F	S2005031

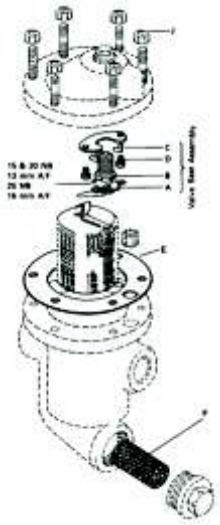


Figure 4: Parts available as spares (Heavy Outline) for [FMBT50]

How to Order:
Example: 1No. DN15 FMBT50 Forbes Marshall Bucket trap with screwed BSPT connections, IBR.

How to Order Spares:
Always order spares by using the description given in the column headed "Available Spares" and stating the size and series of the trap. For codes refer user manual.
Example :1 No. valve and seat assembly for DN15 Forbes Marshall Bucket Trap FMBT50

10. Warranty Period:

As per ordering information and agreements in the contract.

FORBES MARSHALL

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