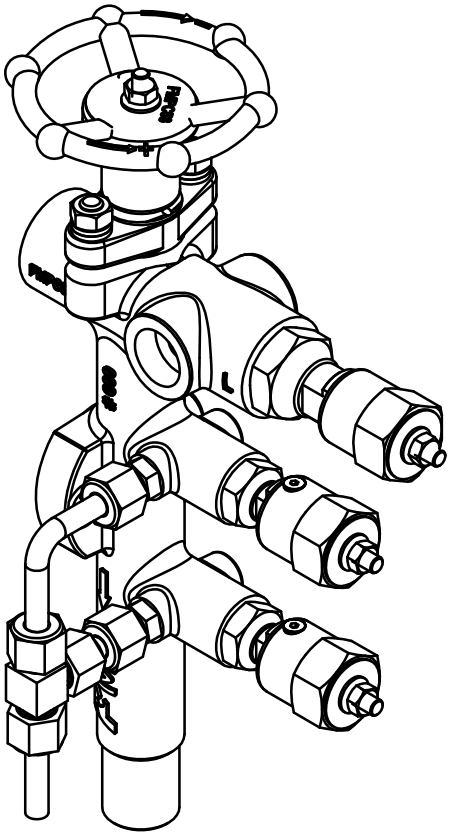
Installation and Maintenance Manual

Forbes Marshall Pipeline Connector (DV1, DV2, DV3)

FMPC53



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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 Pipeline Connector with (DV1, DV2 and DV3) [FMPC53]

Size: DN 15 (½") and DN20 (¾").

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.

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 equipments, 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 Product Disposal:

It is necessary to dispose this product only in accordance with local regulations at the authorized, qualified collecting point specified for equipment’s and its parts—Please refer the part details mentioned in the material table of this manual. Please follow all waste disposal guidelines (Management & Handling) as published by local governing authorities in India & abroad

2.11 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 Pipeline Connector with (DV1, DV2 and DV3) ,FMPC53, is designed for use with swivel connector steam traps. The FMPC53 is a pipeline connector with an integral stop valve which isolates upstream of the steam trap. The FMPC53 has trap bypass valve (DV1) for the draining of upstream pipe work, trap vent valve (DV2) for trap venting and trap test valve (DV3) to monitor trap performance. DV3 can be used when FMPC53 is connected to condensate return pipeline with outlet isolation valve. All valves in FMPC53 are of piston type.

3.2 Sizes and Pipe Connections:

Sizes DN 15 and 20

Inlet: Female – Screwed BSPT / Female SWE

Outlet: Male SWE

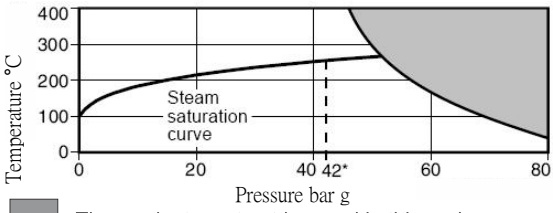
IBR approved FMPC53 available on request.

Note: All certification / inspection requirements must be stated at the time of order placement.

3.3 Limiting Conditions:

Body design condition	ANSI class 600
Maximum cold hydraulic test pressure	63 bar g

3.4 Operating Range:



The product must not be used in this region

* PMO Maximum operating pressure recommended for saturated steam

KV values:

All sizes Kv 1.8

For conversion:Cv (UK) =Kv x 0.963,

Cv(US)=Kv x 1.156

The Kv stated is for each valve rather than the complete connector

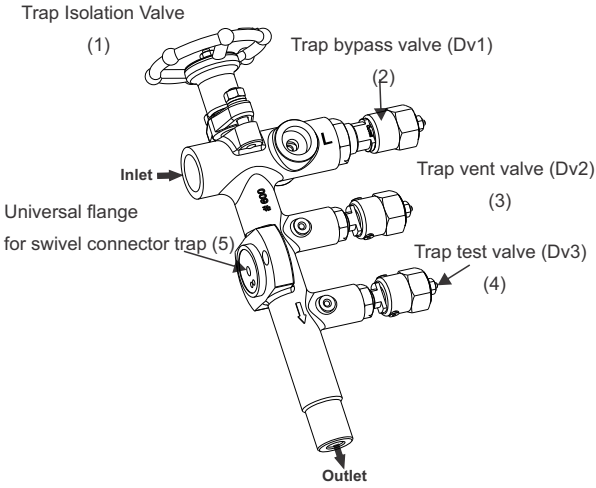


Figure 1:Forbes Marshall Pipeline connector with (DV1, DV2 and DV3)

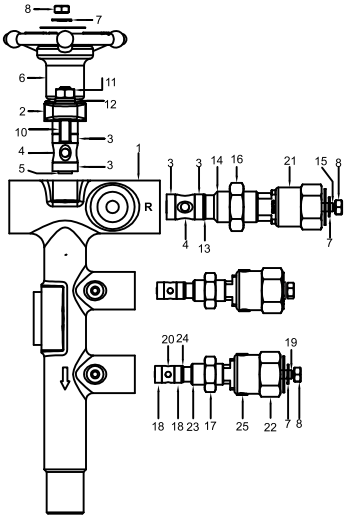


Figure 2: Exploded view of Forbes Marshall Pipeline connector with (Dv1, DV2 and DV3)

Material:

No.	Part	Material	Standard
1	Bod	Carbon	Steel ASTM A105 N
2	Bonnet	Carbon	Steel ASTM A105 N
3	Sealing ring	Graphite and SS ring	
4	Spacer	Stainless Steel	ASTM A276 Gr.410
5	Steam piston	Stainless Steel	ASTM A276 Gr.316
6	Hand wheel	SG Iron	SG IRON 400/15A
7	M6 Plain washer	Stainless Steel	
8	M6 LH nut	Stainless Steel	
9	M4 Allen screw	Stainless Steel	
10	M8 Stud	Carbon Steel	ASTM A193 Gr.B 7
11	M8 Nut	Spring Steel	ASTM A194 Gr.2H
12	Disc spring washer	EN 42	
13	Plain washer	Stainless Steel	
14	DV1 Bonnet	Stainless Steel	ASTM A276 Gr.410
15	DV1 Steam piston	Stainless Steel	ASTM A276 Gr.316
16	Lock nut M 22x1.5	Stainless Steel	ASTM A 276 Gr SS304
17	Lock nut M 15 x 1.5	Stainless Steel	ASTM A 276 Gr SS304
18	DV2 / CV3 sealing rings	Graphite and SS rings	
19	DV2/DV3 steam piston	Stainless Steel	ASTM A276 Gr.316
20	DV2/DV3 spacer	Stainless Steel	ASTM A276 Gr.410
21	DV1 Hex knob	S G Iron	MS, IS2062
22	DV2/DV3 Hex knob	S G Iron	MS, IS2062
23	DV2/DV 3 Bonnet	Stainless Steel	ASTM A276 Gr.410
24	Plain washer	Stainless Steel	

3.5 Product Dimension and Drawing:

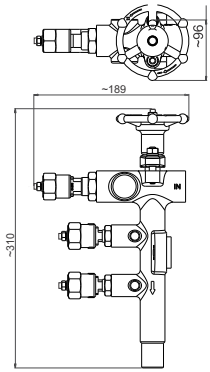


Figure 3: Dimension Drawing of FMPC53

4. Operation: [Refer figure 2]

The integral trap isolation valve should be either fully open or fully closed. To open the trap isolation valve turn the handwheel (6) in the anticlockwise direction until it stops completely and to close, turn the handwheel (6) in the clockwise direction until it stop rotating further. The trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3) should be either fully open or fully closed when operated respectively. To open the trap bypass valve (DV1), turn the hex knob (21) in the anticlockwise direction until it stops completely and to turn close, turn the hex knob (23) in the clockwise direction until it touches the DV1 bonnet (14). The working of trap vent valve (Dv2) and trap test valve (DV3) is same as trap bypass valve (DV1).

Note: Do not remove Allen lock set screws (24) provided on hex knob (21) of trap vent valve (DV2) and trap test valve (DV3) respectively when Forbes Marshall Pipeline Connectoris in operation condition. Do not use trap integral isolation valve for throttling which result in excessive wear of internals. Operation of the handwheel (6) should always be by the hand, it is not recommended to use a valve key or F key. If the handwheel is over-tightened, damage of the integral isolation valve internals may occur.

Important Note: When Forbes Marshall Pipeline Connector [FMPC53] is added with Forbes Marshall universal thermodynamic trap [FMTD64-U] which works on thermodynamic principle, please refer Forbes Marshall universal thermodynamic trap [FMTD64-U] manual for the working principle and when Forbes Marshall Pipeline Connector [FMPC53] is added with Forbes Marshall universal tracer line trap [FMTLT-63-U] which works on thermostatic principle, please refer Forbes Marshall universal tracer line trap [FMTLT63-U] manual for the working principle.

5. Installation Guidelines:

Note: Before implementing any installations observe the 'Important Safety Notes' in Section 2. Referring to the installation and maintenance instructions, name-plate and technical information sheet check the product is suitable for the intended installation.

5.1. Installation of Forbes Marshall Pipeline Connector[FMPC53]:

1. Check materials, pressure and temperature and there maximum values.
2. Determine the correct installation location and the direction of the fluid flow.
3. Remove protective covers from all connections.
4. **Before installation of FMPC53 ensure that upstream pipework is thoroughly flushed to remove the weld fluxes, metal burrs and foreign particle.**

   Note: Lubricate the product before installation as indicated if stored for more than 6 months.
5. There are two criteria which must be satisfied to ensure that the swivel connector trap will operate correctly and ensure effective condensate removal:
   a. The Forbes Marshall Pipeline Connector shall be installed with the flow in the direction of the arrow on the FMPC53 body. Flow can be horizontal (either direction), vertical or inclined.
   b. The connection face on FMPC53 for the swivel connector steam trap must be in the vertical plane.
6. Ensure that there is sufficient access to the handwheel to allow proper operation. After installation it is recommended that the Forbes Marshall Pipeline Connector be insulated to minimize radiated heat losses and to protect personal from burns risk.
7. The Forbes Marshall Pipeline Connector and trap are joined by a high integrity spirally wound gasket joint. It is important that no damage is caused, example by weld, weld splatter, knocks, etc. to the trap gasket face hence care must be taken when installing the Forbes Marshall Pipeline Connector into the pipework. It is recommended that the steam trap be installed immediately after the Forbes Marshall Pipeline Connector is in the pipework. Alternatively, the trap can be joined to the Forbes Marshall Pipeline Connector prior to installation.
8. **It is recommended to follow the requisite engineering standards for welding of Forbes Marshall Pipeline Connector to the drip legs or other pipeline networks.**

   Note: If the Forbes Marshall Pipeline Connector is to discharge to atmosphere ensure it to a safe place.

5.2. Typical installation of Forbes Marshall Pipeline Connector [FMPC53]:

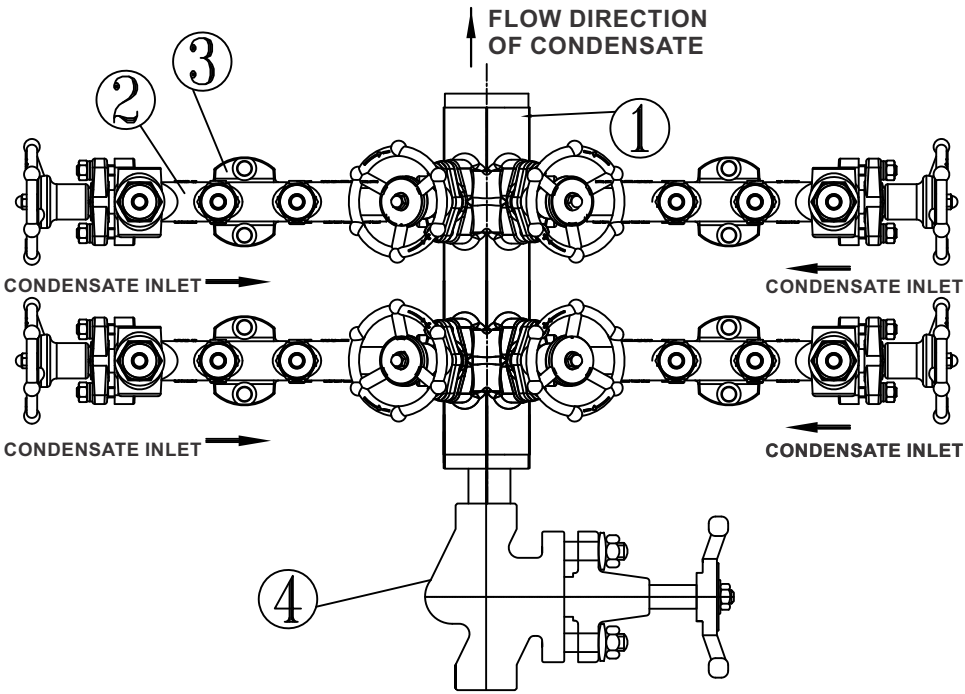


Figure 4: Typical installation of FMPC53 with Forbes Marshall universal tracer line trap [FMTLT63-U] installed on condensate manifold.

Part No.	Description
1	Forbes Marshall Condensate Manifold
2	Forbes Marshall Pipeline Connector[FMPC53]
3	Forbes Marshall Universal Tracerline trap [FMTLT63-U]
4	Stop Valve

6. Start-up and Commissioning:

6.1. Flushing of lines: [Refer figure 1]

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 this step to carry out flushing of lines.

1. Close the trap isolation valve (1), open the trap vent valve (DV2) (3) until trap depressurize then close the trap vent valve (DV2) (3) and later open the trap bypass valve (DV1) (2) respectively
2. Drain the condensate 10-15 minutes or until clear condensate starts coming out, whichever is earlier.
3. Now slowly close the trap bypass valve (DV1) (2) and open the trap isolation valve (1).

Note: Trap bypass valve (2) should be used to remove muck or dirt and not for welding fluxes and metal burrs. For a detailed procedure on flushing of lines please visit Forbes Marshall website.

6.2. Commissioning: [Refer figure 1]

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 trap bypass valve (DV1) (2) is closed and trap isolation valve (DV1) (1) is opened.
2. To check swivel connector trap operation, first close the integral isolation valve of manifold to which it is connected. Open the Hex Knob of the trap test valve (4) to ensure trap discharge fluid later close the Hex Knob of the trap test valve (4) respectively
3. Ensure only trap isolation valve (1) and integral isolation valve of manifold is open, similarly trap bypass valve (DV1) (2), trap vent valve (DV2) (3) and trap test valve (Dv3) (4) should be remained closed when the module is in operation.
4. 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. Once completed open the handwheel slowly and check for leaks.

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 Pipeline connector.

Sr. No.	PARAMETERS TO BE CHECKED	FREQUENCY FOR CHECKING VARIOUS PARAMETERS					
		Daily	Weekly	Monthly	Quarterly	Half Yearly	Annually
1.	Valve Operation for Forbes Marshall Pipeline Connector			Y			
2.	Lubrication of trap isolation valve.				Y		
3.	Visual inspection and cleaning of stem-piston threads				Y		

7.2 Tool Kit:

To carry out maintenance of the Forbes Marshall Pipeline Connector refer the tools mentioned in the table below.

Size	Part	Component	Tool used & Size
DN15/20	Upstream trap isolation valve Assembly	2 M8 studs	Stud Runner M8 X 1.25
		M8 nuts for bonnet	Open spanner13 mm (A/F)
		M6 LH nut for hand wheel	Open spanner 10 mm (A/F)
		Sealing stack	Extractor tool (Available as spares)
		Sealing stack	Insertor tool (Available as spares)
	DV1 (Trap bypass valve assembly)	Hexagonal knob	Open spanner29 mm (A/F)
		DV1 Bonnet	Open spanner 19 mm (A/F)
		DV1 lock nut	30 mm open spanner (A/F)
		Sealing stack	Extractor Tool (Available as Spares)
		Sealing stack	Insertor Tool (Available as Spares)
	DV2 (Trap vent valve assembly) and DV3 (Trap test valve assembly)	Hexagonal knob	Open spanner29 mm (A/F)
		DV2 Bonnet	Open spanner 10 mm (A/F)
		DV2 lock nut	Open spanner 24mm (A/F)
		Allen key	3mm
		Sealing stack	Extractor Tool (Available as Spares)
		Sealing stack	Insertor Tool (Available as Spares)

7.3. Recommended tightening torques:

Part No.	Item	or mm		Torque Range
8	M6 LH Nut	10 A/F	M6	3.5 Nm
10	Bonnet Nut	14 A/F	M8	10 Nm
15	DV1 Lock Nut	30 A/F	M22	100 Nm
13	DV1 Bonnet	19 A/F		18 Nm
16	DV2 Lock Nut	22 A/F	M15	70 Nm
22	DV2 Bonnet	10 A/F		18 Nm

Table 1: Recommended tightening torques

7.4. Procedure to service: [Refer figure 5]

Note: The graphite stem sealing stacks (items 3) contain thin stainless steel support rings which may cause physical injury if not handled and disposed of carefully.

1. **Hot Tightening:** After the Forbes Marshall Pipeline Connector is first put into service (8 to 12 hours) or after a change of sealing stacks (3), the bonnet nuts (10) should be lightly tightened with the valve in the closed position. Ensure the bonnet (2) is driven down straight during tightening and that care is taken with the handwheel (6) operation.
2. This operation is to be repeated to trace for any leakage is developed. If perfect sealing cannot be achieved in this way, repack the valve following the procedure below (refer in section 7.6).
3. A small diameter hole evident in the valve bonnet (3) is primarily to prevent pressurization within the bonnet (3), but is useful for observing leaks past the upper sealing stack (3) and for lubrication of the stem-piston (5) when the valve is closed.

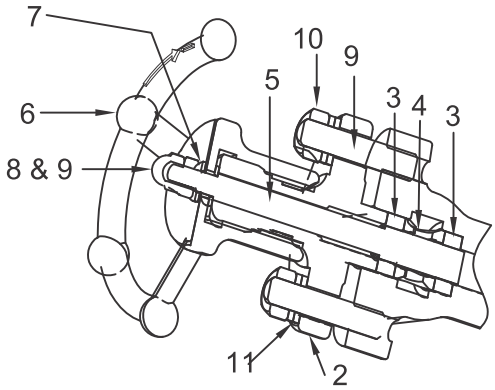


Figure 5: Section view of isolation valve

7.5. Preparation of dismantling the isolation valve :

Before starting work ensure that you have suitable tools and consumables available. Before attempting to carry out any maintenance, ensure that the Forbes Marshall Pipeline Connector is fully isolated and safety depressurized by opening trap vent valve (DV3) (4) as shown in figure 1. Do not assume the system is depressurized even when the pressure gauge indicates zero. While performing maintenance if the pipework is hot, wear appropriate protective clothing. Carefully remove insulation if fitted. While using the optional insulation jacket, this is easily removed by undoing the fastenings. It is not necessary to remove the steam trap to dismantling the isolation valve.

7.6. Dismantling the Isolation valve: [Refer figure 5]

1. Using the handwheel (6), fully open the valve.
2. Remove the bonnet nuts (10) and washers (11) from studs (9).
3. Carefully turn the handwheel (6) in the closing direction to lift the bonnet (2).
4. Rotate the bonnet (2) to ensure that the flange bolt holes are misaligned with the studs (9).
5. Turn the handwheel (6) in the opening direction to release the stem-piston (5) from the sealing stacks (3) and so release piston / bonnet sub-assembly from the body (1).
6. Examine the stem-piston (5) for signs of scouring, corrosion etc., which could affect perfect tightness of the valve.
7. Check other parts for wear / damage and replace if necessary

7.7. Repacking the isolation valve: [Refer figure 5 and 6]

1. With the valve dismantled, insert the valve internals with extractor tool through the two sealing stacks (3) and spacer (4).
2. Firmly tap to ensure that the tool bottoms out in the bore and with a quarter turn of the handle carefully remove the sealing stacks (3) and the spacer (4).
3. Thoroughly clean the sealing stack housing and all the internals.
4. Fit new lower sealing stack (3), spacer (4) and new upper sealing stack (3), using insertor tool. Use mallet to apply light strokes on insertor ensuring they fit perfectly.

   Note: The lower and upper sealing stacks (3) are the same.
5. Apply a thin layer of graphite based grease to threads only (not to internals and stem-piston).

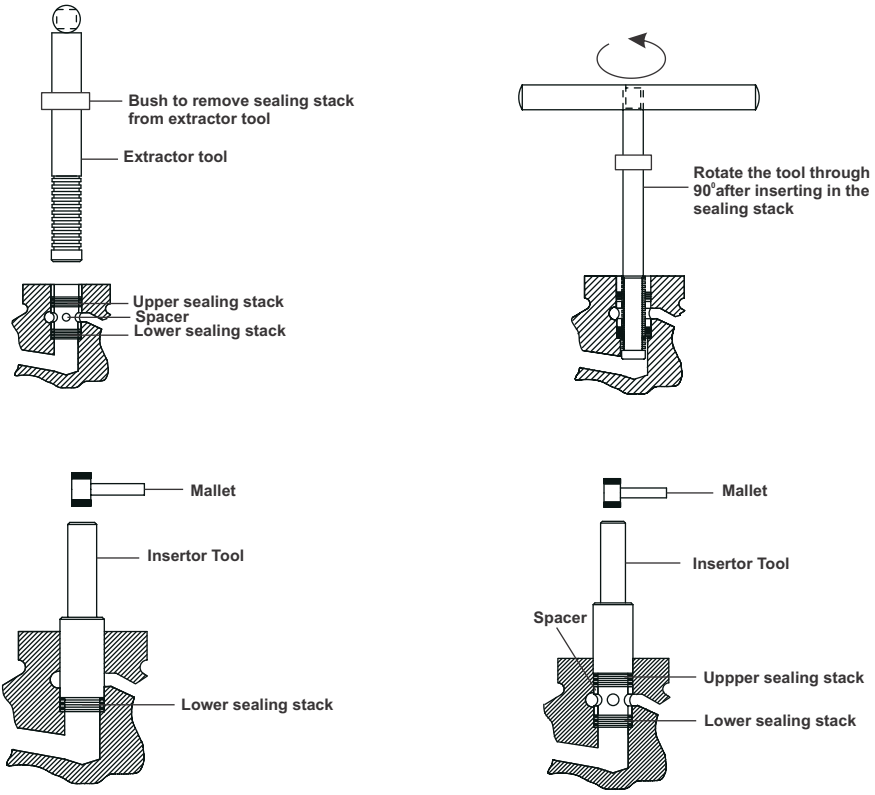


Figure 6. View showing extractor tool and insertor tool

7.8. Reassembling the isolation valve: [Refer figure 5]

1. Take the piston / bonnet sub – assembly and turn the handwheel (6) in the opening direction until stem-piston (5) stop.
2. Insert stem-piston (5) into the upper sealing stack (3)and push it down until it is possible to fit washers (11) and bonnet nuts (10) onto the studs (9) and then hand tighten.
3. Shut the valve fully, ensuring that the bonnet (2) is driven down straight, gradually tighten the bonnet nuts (10) to the recommended torque 10 Nm.
4. If any insulation was present then refit it again.

7.9. Dismantling trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3) : [Refer figure 2]

1. Using the hex knob (21 and 22) fully open the valve.
2. Loose the bonnet locknut (16 and 17)and carefully unscrew the bonnet (14 and 23) out from the valve body (1).
3. Turn the hex knob (21 and 22) in the opening direction to release the stem-piston (15 and 19) from the sealing stacks (3 and 18) and so release piston / bonnet sub-assembly from the body (1).
4. Examine the stem-piston (15 and 19) for signs of scouring, corrosion etc., which could affect perfect tightness of the valve.
5. Check other parts for wear / damage and replace if necessary

   Note: Remove the two allen lock screw (24) provided on the hex knob (21) in trap vent valve (DV2) and trap test valve (DV3), to dissemble the hex knob (22) from the bonnet (22).

7.10. Repacking the trap bypass valve (DV1), trap vent valve (DV2)& trap test valve (DV3): [Refer figure 2 and 6]

1. With the valve dismantled, insert the valve internals with extractor tool through the two sealing stacks (3 and 18) and spacer (4 and 20).

Note: Separate extractor tools are available, use same extractor tool for isolation valve/trap bypass valve (DV1) and for trap vent valve (DV2) / trap test valve (DV3) use same extractor tool.

2. Firmly tap to ensure that the tool bottoms out in the bore and with a quarter turn of the handle carefully remove the sealing stacks (3 and 18) and the spacer (4 and 20).

3. Thoroughly clean the sealing stack housing and all the internals.

4. Fit new lower sealing stack (3 and 18), spacer (4 and 20) and new upper sealing stack (3 and 18), using insertor tool. **Note:** Separate insertor tools are available, use same insertor tool for isolation valve /trap bypass valve (DV1) and for trap vent valve (DV2) / trap test valve (DV3) use same insertor tool.

5. Use mallet to apply light strokes on insertor tool ensuring they fit perfectly.

Note: The lower and upper stack is the same.

6. Apply a thin layer of graphite based grease to threads only (not to internals and stem-piston).

7.11. Reassembling the trap bypass valve (DV1), trap vent valve (Dv2) & trap test valve(DV3): [Refer Figure 2]

1. If the hex knob (21 and 22) is disassembled from stem-piston (15 and 19) then reassemble it and tighten the two allen lock screw (25) in the hex knob (21) to lock the hex knob (21) with the bonnet (23).
2. Take the piston / bonnet sub-assembly and turn the hex knob (21 and 22) in the opening direction until it is fully open.
3. Insert stem-piston (15 and 19) into the upper sealing stack (3 and 18) and push it down carefully until it is possible to engage the bonnet (14 and 23) with threaded valve body and then screw the bonnet (14 and 23) to rest on the sealing stacks (3 and 18).
4. Close the hex knob (21 and 23) till its bottom face rests on the step provided on bonnet (14 and 23).
5. Tighten the bonnet (14 and 23) slowly to compress sealing stack. Compress it by single thread rotation of bonnet (14 and 23).
6. In operation if leak persists from the bonnet (14 and 23) then compress the sealing stack (3 and 18) slowly to stop the leakage.

   Note: Under no circumstances should the allen lock set screw (25) be removed as it provide the opening stoppage to the hex knob (21) and hence prevents blow out of the hex knob (21) and stem -piston (19).

7.12. Depressurization of pipework:

7.12.1. Operation of trap bypass valve (DV1), trap vent valve (DV2)&trap test valve (DV3) fitted to Forbes Marshall Pipeline Connector:

Forbes Marshall Pipeline Connector has trap bypass valve (DV1) to provide safe and reliable bypass, trap vent valve (DV2) for trap depressurization and trap test valve (DV3) for trap testing for the steam traps installed.

Note: It is important to ensure that the discharges from trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3) valves are directed to safe position and that correct safety precautions are taken when operating the valves.

7.12.2. To remove / replace a steam trap fitted to Forbes Marshall Pipeline Connector [FMPC53] : (Refer figure 7)

1. Close the upstream isolation valve (1).
2. Open the trap bypass valve (DV1) to keep the steam line drained.
3. If fitted on a system which does not discharge directly to atmosphere, ensure that any downstream pressure is isolated and depressurized before continuing.
4. Open trap vent valve (DV2) to relieve pressure.

Note: Under no circumstances should the allen lock set screw be removed as it prevents blow out of the hex knob and stem-piston.

5. Carefully undo the two trap retaining bolts (4) ensuring that any trapped steam / condensate can safely bleed away.
6. After removal of the plastic protector (on new trap) replace the steam trap and tighten the bolts.
7. Close the trap bypass valve (DV1) and trap test valve (DV2) and then slowly open the upstream isolation valve (1). Check for leaks and if no leaks are observed open the trap inlet valve completely.
8. Check swivel connector steam trap discharge condensate by opening trap test valve (DV3).

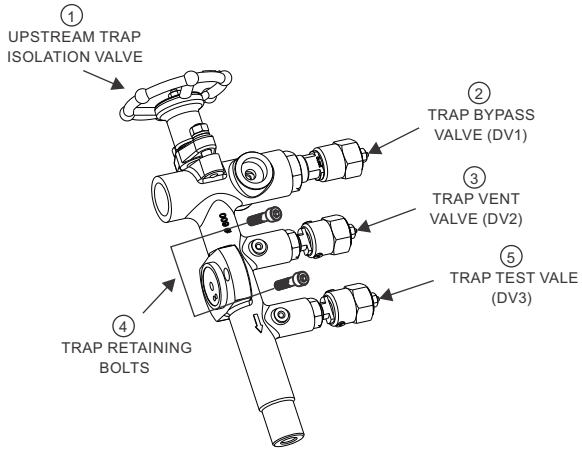


Figure 7. Steam trap fitment on FMPC53

7.13. Lubrication of the Valves:

Clean the valve unit before lubrication. Lubricate the valve frequently with Molykote M30 oil or equivalent. Lubricate stem piston, bonnet threading of upstream isolation valve, trap bypass valve (DV1) and trap test valve (DV2) respectively. Open and close the valves 2 – 3 times after lubrication.

Note:*Molykote'M30' lubricating oil is not available please use equivalent lubricating oil with specification as shown in table 2.

Note: Refer Forbes Marshall universal thermodynamic trap [FMTD64-U]manual and Forbes Marshall universal tracer line trap [FMTLT63-U] manual for maintenance instructions.

8. Troubleshooting:

If the expected performance is unachievable after installation of the Forbes Marshall Pipeline Connector, check the following points for appropriate corrective measures.

8.1. Forbes Marshall Pipeline Connector [FMPC53] with Forbes Marshall Universal Thermodynamic Trap [FMTD64-U]:

Failure Mode	Possible Cause	Remedy
No condensate is discharged (blocked).	Inlet drip leg or strainer screen is clogged with rust or scale.	Flush inline drip leg and clean strainer screen. If strainer screen is rusted, replace with new strainer screen.
	No condensate discharge.	Ensure trap upstream isolation valve is fully open.
	Seizing theisolation valve.	Lubricate the valve frequently with Molykote M30 oil.
	Steam trap body is hot but no condensate discharge.	To release flash steam locked (trapped) inside the steam trap, pour water on main bore cap of the steam trap to check it discharge condensate.
	Air – binding problem.	Loosen main bore cap and tighten to suitable torque or replace with Anti Air Binding Disc.
	Differential pressure is Low.	Verify inlet and outlet pressure. Minimum differential pressure required is 0.25 bar g.

Failure Mode	Possible Cause	Remedy
Steam leakage.	Trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3) is open or partially closed.	Ensure trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3) are fully closed.
	Improper installation of the product.	Check installation i.e. main bore cap to be on top and fluid flow direction should be same as arrow on the Forbes Marshall Pipeline Connector body.
	Sealing stack worn-out.	Check sealing stacks of upstream isolation valve, trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3)are damage or worn. If worn-out replace with new sealing stacks and nuts should be tighten to proper torque.
	Stem-piston is damaged or corroded.	Check if scouring, corrosion has occurred on stem-piston of upstream trap isolation valves, trap bypass valve (DV1), trap vent valve (DV2)and trap test valve (DV3). If damaged replace with new stem-piston and lubricate stem-piston with *Molykote M30 oil.
	Spiral gasket deterioration or damage.	Replace inner and outer spiral gasket with new one and retain them in the grooves using suitable adhesive (Locktite). **Note:** Care must be taken not to damage gasket faces. Do not use sharp edges to clean gasket and gasket faces.
	Foreign material or oil film on disc or body seat.	Clean both disc and body seat, flatness on disc and body seating face can be improved by lapping individually on flat surface / glass plate. **Note:** The total amount of metal from body seat face removed should not exceed 0.25mm (0.01”).
	Disc stuck to the main bore cap.	Give a light tap on top of the main bore cap and check if step (inner surface of the main bore cap) is worn out. If step is worn out replace with new steam trap.
	Back pressure exceeds allowable value.	Outlet pressure should not exceed 80% of the inlet pressure.
Motor boating (Chattering) of disc	Scratch on disc or body seat.	Check if scratch depth is less, then disc and body seating face flatness can be improved by lapping individually on flat surface or glass plate. If scratch depth is beyond repair replace with new disc. **Note:** The total amount of metal from body seat face removed should not exceed 0.25mm (0.01”).
	Disc or body seat is worn.	Replace with new disc. If body seat is slightly worn, it can be refaced by lapping on flat surface or glass plate. If body seat is worn beyond repair replace with new steam trap. **Note:** The total amount of metal from body seat face removed should not exceed 0.25mm (0.01”).

*Molykote 'M30' lubricating oil is not available please use equivalent lubricating oil with specification as shown in table 2.

Note: Never attempt to modify the product. When replacing old part with new part, use the spare parts listed in section 9. Please refer Forbes Marshall universal thermodynamic trap [FMTD64-U] manual for available spare parts.

8.2. Forbes Marshall Pipeline Connector [FMPC53] with Forbes Marshall Universal Tracer Line Trap [FMTLT63-U]:

Failure Mode	Possible Cause	Remedy
No condensate is discharged (blocked)	Strainer screen is clogged with rust or scale.	Flush inlet pipeline and clean the strainer screen. If strainer screen is rusted replace with new strainer screen.
	No condensate discharge.	Ensure trap upstream isolation valve is fully open.
	Seizing the isolation valve.	Lubricate the valve frequently with *Molykote M30 oil.
	Valve Seat of FMTLT63-U is blocked.	Clean the valve seat and thermopod ball surface then re-assemble and refit the steam trap.
	Thermopod may be over extended due to excessive internal pressure caused by superheat steam making it impossible for the thermopod ball (valve head) to lift off from valve seat.	Replace the thermopod assembly.
Steam leakage.	Trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3) is open or partially closed.	Ensure trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3) is fully closed.
	Sealing stack worn-out.	Check sealing stacks of upstream trap isolation valve, trap bypass valve (DV1), trap vent valve (DV2) and trap test valve (DV3) are damage or worn. If worn-out replace with new sealing stack and nut should be tight with proper torque.
	Stem-piston is damaged or corroded.	Check scouring, corrosion have occur on stem- piston of the upstream trap isolation valve, trap bypass valve (DV1), trap vent valve (DV2)&trap test vale (DV3). If damaged replace with new stem-piston and lubricate stem-piston with *Molykote M30 oil.
	Spiral gasket deterioration or damage.	Replace inner and outer spiral gasket with new one and retain them in the grooves using suitable adhesive (Locktite). **Note:** Care must be taken not to damage gasket faces. Do not use sharp edges to clean gasket and gasket faces.
	Foreign material has built-up between thermopod ball (valve head) and valve seat.	Clean the valve seat and thermopod ball surface then re-assemble and refit the steam trap; check for any steam leak. If valve seat damage replace the thermopod and seat assembly.
	Valve seat and thermopod ball (valve head) does not shut – off tightly.	Clean both valve seat and thermopod ball after that *seat stamping should be done.
	Valve seat (FMTLT63-U) is wire drawing.	Replace with new thermopod and seat assembly.
	Cover gasket deterioration or damage.	Replace with new cover gasket.

***Seat stamping procedure:**

Place valve seat on the fixture, thermopod the valve seat (thermopod ball side resting on the valve seat orifice) and tap slightly on the center with a mallet. Due to stamping a seating surface is formed on the valve seat orifice.

*Molykote'M30' lubricating oil is not available please use equivalent lubricating oil with specification as shown in Table 2.

Note: Never attempt to modify the product. When replacing old part with new part, use the spare parts listed in section 9.Please refer tracer line trap- universal [FMTLT63-U] manual for available spare parts.

Specification of Molykote M30			
Colour			Black
Composition			Synthetic oil Molybdenum disulphide Dispersant
Density	**Density at 20°C (68°F) (Standard - DIN 51 757)**		1.0 g/ml
Viscosity	**Base oil viscosity at 40°C (104°F) (Standard - DIN 51 562)**		120 mm3/s
Temperature	**Service temperature range**		Oil lubrication up to +200°C (397°F)
			Dry lubrication up to +450°C (842°F)
Load –carrying capacity, wear protection.	**Four-ball tester (VKA)**	**Weld Load (Standard – DIN 51 562 pt.2)**	2000 N
		Wear scar under 800 N (Standard – DIN 51 350 pt.3)	1.02 mm
		Almen-Wieland machine OK load.	20000 N
Storage life			1 years.

Table 2: Specification of Molykote M30

9. Available Spares: [Refer figure 2]

Always order spares part by using the description and Spare Code No. given below and stating size

Sr. No.	Spares	Part No.	Spare Code
1.	Trap inlet and trap bypass valve sealing stack set	3	S20100567
2.	Trap depressurizing and trap test valve sealing stack set	17	S20100568
3.	Stem-piston for trap inlet valve	5	S20100569
4.	Stem-piston for trap bypass valve	14	S20100570
5.	Stem-piston trap vent & trap test valve	18	S20100571
6.	Trap inlet valve internals set	3,4,5,7,8	S20100572
7.	Trap bypass valve (DV1) internals set	3,4,7,8,13,15	S2004496
8.	Trap vent valve (DV2) and Trap test valve (DV3) internals set	7,8,17,18,19,23	S2004497
9.	Upstream trap isolation valve and trap bypass valve (DV1) Extractor and Insertor tools	Refer figure 6	FGS2035271
10.	Trap vent valve (DV2) and T valve Extractor and Insertor tools	Refer figure 6	FGS2035270

How to Order:

Example:1 No. Forbes Marshall Pipeline Connector, FMPC53 forged carbon steel body with integral piston valve, DN 15 socket welds.

How to Order Spares:

Always order spares by using the description given in the column headed “Available spares” and state type and size of equipment.

Example: 1 No. sealing ring set for the inlet valve on a Forbes Marshall Pipeline Connector, FMPC53 having DN15 socket weld connections.

10. Warranty Period:

As per ordering information and agreements in the contract.

FORBES MARSHALL

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