

Installation and Maintenance Manual Forbes Marshall Pipeline Connector

FMPC50, FMPC51, FMPC52





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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.



Preface:

1.

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

Forbes Marshall Pipeline Connector [FMPC50, FMPC51, FMPC52]

Size: DN15 (1/2") and DN20 (3/4")

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.

- 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 Details:

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.



Brief Product Information:

3.1 Description:

3.

The Forbes Marshall Pipeline Connector, FMPC50, is designed for use with swivel connector steam traps. The FMPC50 is a module with integral piston type stop valve which isolates upstream of the steam trap. The FMPC50 is available with connections for the draining of upstream pipework and trap venting upstream of the steam trap.



Figure 1: Forbes Marshall Pipeline Connecter FMPC50 Figure 2: Forbes Marshall Pipeline Connecter FMPC52

3.2 Sizes and Pipeline Connections:

DN 15, DN20 screwed BSPT or socket weld ends to ANSI B 16.11 Class 3000 Available with IBR certificate on request.

Standards:

This product fully complies with the requirement of ASME B 16:34 class 600 standard.

3.3 Limiting Conditions:

| Body design conditions | ASME class 600 |
|--------------------------------------|-------------------------------------|
| PMO Maximum operating pressure | 42 bar g for saturatedsteam service |
| TMO Maximum operating temperature | 425°C |
| Maximum cold hydraulic test pressure | 63 bar g |

3.4 Operating Range:





Ky Values

All Sizes Ky =1.8 For conversion Cv (UK)=Kv x 0.963, Cv (US)=Kvx1.156 The Kv stated is for each valve rather than the complete connector module

3.5 Available Types:

| Туре | Description |
|--------|---|
| FMPC50 | Mainline compact module with upstream isolation valve |
| FMPC51 | Main line compact module with upstreamisolation valve and trap bypass valve (DV1) |
| FMPC52 | Main line compact module with upstream isolation valve, trap bypass |
| | valve (DV1) and trap vent (DV2) |



Figure 3: Exploded view of Forbes Marshall Pipeline Connector

| water | | | | | | |
|-------|-----------------------|-----------------|---------------------|--|--|--|
| No. | Part | Material | Standard | | | |
| 1 | Body | Carbon steel | ASTM A105 N | | | |
| 2 | Sealing stack | Graphite and SS | | | | |
| 3 | Bonnet | Carbon steel | ASTM A105 N | | | |
| 4 | Spacer | Stainless steel | ASTM A276 Gr. 410 | | | |
| 5 | Stem-Piston | Stainless steel | ASTM A276 Gr. 316 | | | |
| 6 | Hand wheel | S G Iron | S G IRON 400/15 | | | |
| 7 | Nameplate | Stainless steel | SS 304 | | | |
| 8 | M8 Studs | Carbon steel | ASTM A196 Gr. B 7 | | | |
| 9 | M8 Nuts | Carbon steel | ASTM A194 Gr. 2 H | | | |
| 10 | Disc spring washer | Spring steel | SS 304 | | | |
| 11 | Plain washer | Stainless steel | SS 304 | | | |
| 12 | M6 LH lock nut | Stainless steel | SS 304 | | | |
| 13 | M15 lock nut DV1 | Stainless steel | ASTM A 276 Gr SS304 | | | |
| 14 | M22 lock nut DV2 | Stainless steel | ASTM A 276 Gr SS304 | | | |
| 15 | Trap bypass valve DV1 | Carbon steel | ASTM A105 N | | | |
| 16 | Trap vent valve DV2 | Carbon steel | ASTM A105 N | | | |
| | | | | | | |

Matarial



3.6 Product Dimension and Drawing:



Y

X and Y denote position of Bypass valve (DV1) and depressurisation valve (DV2) connection. **Figure 4: Dimensional drawing of Forbes Marshall Pipeline Connector**

| С | D | Е | F | G | Н | J | K | L | Ν |
|----|----|----|----|----|----|-----|-----|----|----|
| 35 | 96 | 22 | 61 | 48 | 96 | 115 | 130 | 22 | 57 |

Dimensions (approximate) in mm



Operation :

4.

The integral trap isolation valve should be either fully open or fully closed. To open the trap isolation valve turn the handwheel in the anticlockwise direction until it stops completely and to close, turn the handwheel in the clockwise direction until it stop rotating further. The trap bypass valve (DV1) and trap test valve (DV2) should be either fully open or fully closed when operated respectively. To open the trap bypass valve (DV1), turn the hex knob in the anticlockwise direction until it stops completely and to turn close, turn the hex knob in the clockwise direction until it touches the trap bypass valve bonnet.

Note: Trap bypass valve (DV1) and trap test valve (DV2) are not available in Forbes Marshall Pipeline Connector FMPC50. Do not remove Allen lock set screw provided on hex knob of trap vent valve (DV2) respectively when Forbes Marshall Pipeline Connector FMPC52 is in operation condition. Do not use trap integral isolation valve for throttling which result in excessive wear of internals. Operation of the handwheel 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 piston valve internals may occur.

Important Note: When Forbes Marshall Pipeline Connector 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 is added with Forbes Marshall universal tracer line trap [FMTLT63-U] which works on thermostatic principle, please refer Forbes Marshall universal tracer line trap [FMTLT63-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 'Importance 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 (FMPC50, FMPC51, FMPC52):

- 1. Check materials, pressure and temperature and there maximum values.
- 2. Determine the correct installation locations and the direction of the fluid flow.
- 3 Remove protective covers from all connections.
- 4. Before installation of Forbes Marshall Pipeline Connector 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 Pipeline Connector body. Flow can be horizontal (either direction), vertical or inclined.
 - b. The connection face for the swivel connector steam trap must be in the vertical plane.
- Ensure that there is sufficient access to the handwheel 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 e.g. 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 trap be installed immediately after the Forbes Marshall Pipeline Connector is in the pipework. Alternately, 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 safe place.



For socket weld / butt weld end connections coat the welded ends with primer and suitable high temperature paint immediately after welding before corrosion sets in.



5.2. Typical installation of Forbes Marshall Pipeline Connector : (Refer Fig. 5)



Figure5: Typical installation of Forbes Marshall Pipeline Connector

| Part No. | Description |
|----------|--|
| 1 | Forbes Marshall Moisture Separator |
| 2 | Forbes Marshall Pipeline Connector |
| 3 | Forbes Marshall Universal Thermodynamic Trap |



6. Start-up and Commissioning:

6.1. Flushing of lines: [Refer Figure 1 and 2]

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.

- 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 minute until clear condensate starts coming out, whichever is earlier.
- 3. Now slowly close the trap bypass valve (2) completely and open the trap isolation valve (1) fully.

Note: Trap bypass valve (DV1) and trap test valve (DV2) are not available in Forbes Marshall Pipeline connector FMPC50 product. 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 and 2]:

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 (2) is closed and trap isolation valve (DV1) (1) is opened.
- Ensure only trap isolation valve (1) and integral isolation valve of manifold is open, similarly trap bypass valve (DV1) (2) and trap vent valve (DV2) (3) should be remained closed when the module is in operation.
- 3. Check for leaks and attend if any.



Maintenance Guidelines:



7.

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 | PARAMETERS TO BE | FREQUENCY FOR CHECKING VARIOUS | | | | | |
|-----|---|--------------------------------|--------|---------|-----------|----------------|----------|
| No. | . CHECKED | | 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 |
|-------|---|-----------------------|--------------------------------------|
| | | M8 studs | Stud Runner M8 X 1.25 |
| | trap | M8 nuts for bonnet | Open spanner 13mm (A/F) |
| | isolation | M6 nut for hand wheel | Open spanner 10mm (A/F) |
| | valve | Sealing stack | Insertor tool (Available as spares) |
| | assembly | Sealing stack | Extractor tool (Available as spares) |
| | | Hexagonal knob | Open spanner 29 mm (A/F) |
| | DV1 (Trap bypass valve assembly) | Bonnet | Open spanner 19 mm (A/F) |
| DN15/ | | Bonnet lock nut | Open spanner 30 mm (A/F) |
| 20 | | Sealing stack | Insertor tool (Available as spares) |
| | | Sealing stack | Extractor tool (Available as spares) |
| | | Hexagonal knob | Open spanner 29 mm (A/F) |
| | | Bonnet | Open spanner 10 mm (A/F) |
| | DV2 (Trap | Bonnet lock nut | Open spanner 24mm (A/F) |
| | vent valve | Allen key | 3mm |
| | , | Sealing stack | Insertor tool (Available as spares) |
| | | Sealing stack | Extractor tool (Available as spares) |



| Part No. | Item | j j | or 💏 | Torque Range |
|----------|--------------|--------|------|--------------|
| 12 | M6 LH Nut | 10 A/F | M6 | 3.5 Nm |
| 9 | M8 Nuts | 13 A/F | M8 | 10 Nm |
| 15 | M22 Lock Nut | 30 A/F | M22 | 100 Nm |
| 16 | M15 Lock Nut | 24 A/F | M15 | 70 Nm |
| | DV1 Bonnet | 19 A/F | | 18 Nm |
| | DV2 Bonnet | 10 A/F | | 18 Nm |

7.3. Recommended tightening torques:

Table 1: Recommended tightening torque

7.4. Procedure to service: [Refer Figure 6] (FMPC50, FMPC51, FMPC52)



Note: The graphite stem sealing stacks (items 2) contain thin stainless steel support rings which may cause physical injury if not handled and disposed of carefully.

- 1. **Hot Tightening:** After Forbes Marshall Pipeline Connector is first put into service (8 to 12 hours) or after a change of sealing stacks (2), the bonnet nuts (10) should be lightly tightened with the valve in the closed position. Ensure the bonnet (3) 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 that is developed. If perfect sealing cannot be achieved in this way, repack the valve following the procedure below (refer section 7.6).
- 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 (2) and for lubrication of the stem-piston (5) when the valve is closed.



Figure 6: Section view of Inlet valve



7.5. Preparation of dismantling the isolation valve: (FMPC50, FMPC51, FMPC52)

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 the trap vent valve (3) as shown in figure 2. 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.

Note: Trap test valve (DV2) is not available in Forbes Marshall Pipeline Connector FMPC50 product.

7.6. Dismantling the isolation valve: [Refer Figure 6] (FMPC50, FMPC51, FMPC52)

- **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 (3).
- Rotate the bonnet (3) 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 (2) and so release piston / bonnet sub-assembly from the body.
- **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 6 and 7] (FMPC50, FMPC51, FMPC52)

- 1. With the valve dismantled, insert the valve internals with extractor tool through the sealing stacks (2) 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 (2) and the spacer (4).
- 3. Thoroughly clean the sealing stacks (2) housing and all the internals.
- **4.** Fit new lower sealing stack (2), spacer (4) and new upper sealing stack (2), using insertor tool. Use mallet to apply light strokes on insertor ensuring they fit perfectly.

Note: The lower and upper sealing stacks (2) are the same.

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





Figure 7. View showing extractor tool and insertor tool

7.8. Reassembling the isolation valve: [Refer Fig. 6] (FMPC50, FMPC51, FMPC52)

- 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 (2) 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 (3) is driven down straight, gradually tighten the bonnet nuts (10) to the recommended torque 10 Nm. (Refer Table.1)
- 4. If any insulation was present then refit it again.



7.9. Dismantling the trap bypass valve (DV1) and trap vent valve (DV2): [Refer Figure 10 (A) and 10 (B)] (FMPC51, FMPC52)

- 1. Using the hex knob (29 and 39) fully open the valve.
- 2. Loose the bonnet locknut (27and 38) & carefully unscrew the bonnet (26 and 37) out from the valve body.
- 3. Turn the hex knob (29 and 39) in the opening direction to release the stem-piston (25 and 36) from the sealing stack (2 and 34) and release piston / bonnet sub-assembly from the body.
- 4. Examine the stem -piston (25 and 36) 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

7.10. Repacking the trap bypass valve (DV1) and trap vent valve (DV2): [Refer Figure 7, 10 (A) and 10 (B)] (FMPC51, FMPC52)

- 1. With the valve dismantled, insert the valve internals with extractor tool through the two sealing stack (2 and 34) and spacer (4 and 35).Separate extractor tool are available for trap vent valve (DV2).
- 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 stack (2 and 34) and the spacer (4 and 35).
- 3. Thoroughly clean the sealing stack housing and all the internals.
- 4. Fit new lower sealing stack (2 and 34), spacer (4 and 35) and new upper sealing stack (2 and 34), using Insertor tool. Separate insertor tool are available for trap vent valve (DV2). Use mallet to apply light strokes on insertor ensuring they fit perfectly.

Note: The lower and upper sealing stack is the same.

5. Apply a thin layer of graphite based grease to threads only. (not to internals and stempiston).

7.11. Reassembling trap bypass valve (DV1) and trap vent valve (DV2): [Refer Figure 10 (A) & 10 (B)] (FMPC51, FMPC52)

- 1. Take the piston / bonnet sub-assembly and turn the Hex Knob (29 and 39) in the opening direction until it is fully open.
- 2. Insert stem piston into the upper sealing stack (2 and 34) and push it down carefully until it is possible to engage the bonnet (26 and 37) with threaded valve body and then screw the bonnet to rest on the sealing stack (2 and 34).
- 3. Close the Hex Knob (29 and 39) till its bottom face rest on the step provided on bonnet (26 and 37).
- 4. Tighten the bonnet slowly to compress sealing stack. Compress it by single thread rotation of bonnet (26 and 37).
- 5. In operation if leak persists from the bonnet (3) then compress the sealing stack (2) slowly by tightening the bonnet nut (10) by quarter of a turn to stop the leakage.



7.12. Depressurization of pipework:

7.12.1. Operation of trap bypass valve (DV1) and trap vent valve (DV2) : (FMPC51. FMPC52)

Trap bypass valve (DV1) is fitted to FMPC51 and additional trap vent valve (DV2) is fitted to FMPC52 for providing safe and reliable bypass and venting respectively

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



Figure 8: Forbes Marshall Pipeline Connector [FMPC52]

7.12.2. To remove or replace steam trap fitted to FMPC51, FMPC52: [Ref. Figure 8]

- 1. Close the upstream trap isolation valve (1).
- 2. Open the trap bypass valve DV1 (2) 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 (3) to relieve pressure which is only available with FMPC52

Note: Under no circumstances should the lock set screw removed as it prevents blow out at the valves stem.

- 5. Carefully undo the two trap retaining bolts 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 (2) and trap test valve DV2 (3) and then slowly open the upstream trap isolation valve (1) checking for leaks, if no leaks are detected open the isolation valve (1) completely.





Figure 9: Forbes Marshall Pipeline Connector [FMPC50]

7.12.3. To remove or replace steam trap fitted to FMPC50: [Refer Figure 9]

- 1. Close the upstream trap isolation valve (1).
- 2. Carefully undo the two trap retaining bolts (2) ensuring that any trapped steam / condensate can safely bleed away.
- 3. After removal of the plastic protector (on new trap) replace the steam trap and tighten the bolts.
- 4. Slowly open the isolation valve checking for leaks, if no leaks are detected open the isolation valve completely.

7.13. Lubrication Procedure for isolation valve, trap bypass valve (DV1) and

trap vent valve (Dv2): (FMPC50, FMPC51, FMPC52)

Clean the valve unit before lubrication. Lubricate the valve frequently with *Molykote M30 oil or equivalent. Lubricate stem piston, bonnet threading of upstream trap isolation valve, trap bypass valve (DV1) and trap vent valve (DV2). 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.



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 with Forbes Marshall Universal Thermodynamic Trap FMTD64-U]:

*trap bypassvalve (DV1) is available with FMPC51, additional * trap vent valve (DV2) is

| Failure Mode | Possible Cause | Remedy |
|---|--|---|
| | 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 upstream isolation valve is fully open. |
| No | Seizing the isolation valve. | Lubricate the valve frequently with *Molykote M30 oil. |
| condensate is discharged (blocked). | 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. |
| | *trap bypass valve (DV1) and *trap vent valve (DV2) is open or partially closed. | Ensure *trap bypass valve (DV1) and *trap vent valve (DV2) is fully closed. |
| Steam leakage. | Improper installation of the product. | Check installation i.e. main bore cap to be on top and fluid flow direction should be same as aow on the Forbes Marshall Pipeline Connector body |
| | Sealing stack worn – out. | Check sealing stacks of upstream trap isolation valve, * trap bypass valve (Dv1) and *trap vent valve (DV2) are damage or worn. If worn-out replace with new sealing stacks and nuts should be tighten to proper torque. |



| Failure Mode | Possible Cause | Remedy |
|--------------------------|--|--|
| | Stem-piston is damaged or corroded. | Check if scouring, corrosion has occurred on stem- piston of upstream trap isolation valve, *trap bypass valve (DV1) and *trap vent valve (DV2) are damage. 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. |
| Steam leakage. | 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 or glass plate. Note: The total amount of metal from body seat face removed should not exceed 0.25mm (0.01"). |
| | Back pressure exceeds allowable value. | Outlet pressure should not exceed 80% of the inlet pressure. |
| | 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. |
| Motor- boating | 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 / glass plate. If scratch depth is more replace with new disc. Note: The total amount of metal from body seat face removed should not exceed 0.25mm (0.01"). |
| (chattering) of disc. | 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"). |

provided with [FMPC52].

*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.



| Failure Mode | Possible Cause | Remedy |
|-----------------------------|---|--|
| | Strainer screen is clogged with rust or scale. | Flush inlet pipeline and clean the strainer screen. If rusted replace with new strainer screen. |
| | No condensate discharge. | Ensure upstream trap isolation valve is fully open. |
| No condensate | Seizing the isolation valve. | Lubricate the valve frequently with *Molykote M30 oil. |
| is discharged (blocked). | 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. |
| | *Trap bypass valve (DV1) and *trap vent valve (DV2) is open or partially closed. | Ensure *trap bypass valve (DV1), *trap vent Valve (DV2) and is fully closed. |
| | Sealing stack worn – out. | Check sealing stack of upstream trap isolation valve, *trap bypass valve (DV1) and *trap vent valve (DV2) are damage or worn. If worn-out replace with new sealing stacks and nut should be tighten with proper torque. |
| | Stem – piston is damaged or corroded. | Check if corrosion has occurred on stem-piston of upstream trap isolation valve, *trap bypass valve (DV1) and *trap vent valve (Dv2). If damaged replace with new stem-piston and lubricate stem-piston with* Molykote M30 oil. |
| Steam leakage. | Spiral gasket deterioration or damaged. | 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 is damaged 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 is wire drawing. | Replace with new thermopod and seat assembly. |
| | Cover gasket deterioration or damaged. | Replace with new cover gasket. |

8.2. Forbes Marshall Pipeline connector with Forbes Marshall universal tracer line trap [FMTLT63-U]:

 * trap bypass value (DV1) is available with FMPC51, additional * trap vent value (DV2) is provided with FMPC52.

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



Seat stamping* procedure:

Place valve seat on the fixture, thermopod on 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.

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 Tracer line trap [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.1 years. | | |

Table 2: Specification of Molykote M30



Available Spares:

9.

| Spares | Part No. | Spare Code |
|--|----------------------|------------|
| Spare DV1 sealing stack | 34 | S2004467 |
| Spare DV1 and main valve sealing stack | 2,23 | S2004483 |
| Dv1 Extractor and Insertor tool | (Refer Fig. 7) | FGS2035271 |
| Dv2 Extractor and Insertor tool | (Refer Fig. 7) | FGS2035270 |
| DV1 spare kit | 2,4,7,12,13,22 to 30 | S2004491 |
| DV2 spare kit | 7,12,13,33 to 43 | S2004492 |





Figure10 ©: Exploding view showing Forbes Marshall Pipeline connector

How to Order:

Example 1No. Forbes Marshall pipeline connector FMPC50 in forged carbon steel body with integral piston valve $\frac{1}{2}$ " socket weld to ANSI B16.11 Class 3000.

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

10. Warranty Period:

As per ordering information and agreements in the contract.



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