N4000

THERMOSTATIC BIMETALLIC STEAM TRAP

INSTALLATION, SERVICING AND MAINTENANCE INSTRUCTIONS

Velan Valves Ltd
Leicester, England

THERMOSTATIC TRAP

MODEL N4000

INSTALLATION, SERVICING AND MAINTENANCE INSTRUCTIONS

CONTENTS **PAGE**

QUICK REFERENCE - Handling, Storage, Installation and Operating Instructions.

It is necessary to read and understand the following instructions prior to working on the trap. Additional information is available in the manual.

Receiving Goods

All traps must be inspected upon reception for damages that may have occured during transportation or handling. Any damage noted should be documented; serious damage should be reported immediately to Velan Valves Ltd.

Storage and Handling

Traps should be stored in a suitable sheltered location to prevent contamination by weather, dampness or foreign material. All traps are shipped from Velan factory with end protectors on the inlet and outlet. These protectors should remain on the trap until they are ready for installation. For large traps a hoist and nylon slings are needed. Place a nylon sling under the trap body and hoist vertically to move to final destination.

Operation, Installation & Orientation

All traps have direction of flow indicated by an arrow on the body.

Prior to installation, remove end protectors, clean weld prep, threads, and flanges using rags with unused acetone or alcohol. (During welding and construction stages trap should be protected from foreign debris getting inside, that could cause extensive damage during operation.)

Ensure that the traps are installed in the proper orientation, arrow pointing in the direction of flow.

Ensure that trap materials of construction and pressure/temperature limits shown on the nameplate are suitable for the intended application.

Tighten all mating flange fasteners in a diagonal pattern and check bolting torques and retighten as necessary after installation.

A minimum distance of 2-3 feet (0.6m-1m) of condensate pipe at the inlet end of the trap should not be insulated, otherwise the trap performance will be effected.

For large traps, due to weight additional local support may be required on site by others.

General Maintenance

Traps should be inspected regularly during operation and should be subjected to schedule maintenance.

Spare Parts

All parts on any steam trap can be ordered. Correctly determine which parts are required and provide the information shown on the trap nameplate.

Warning

For safety reasons, it is important to take the following precautions before you start to work on the trap :

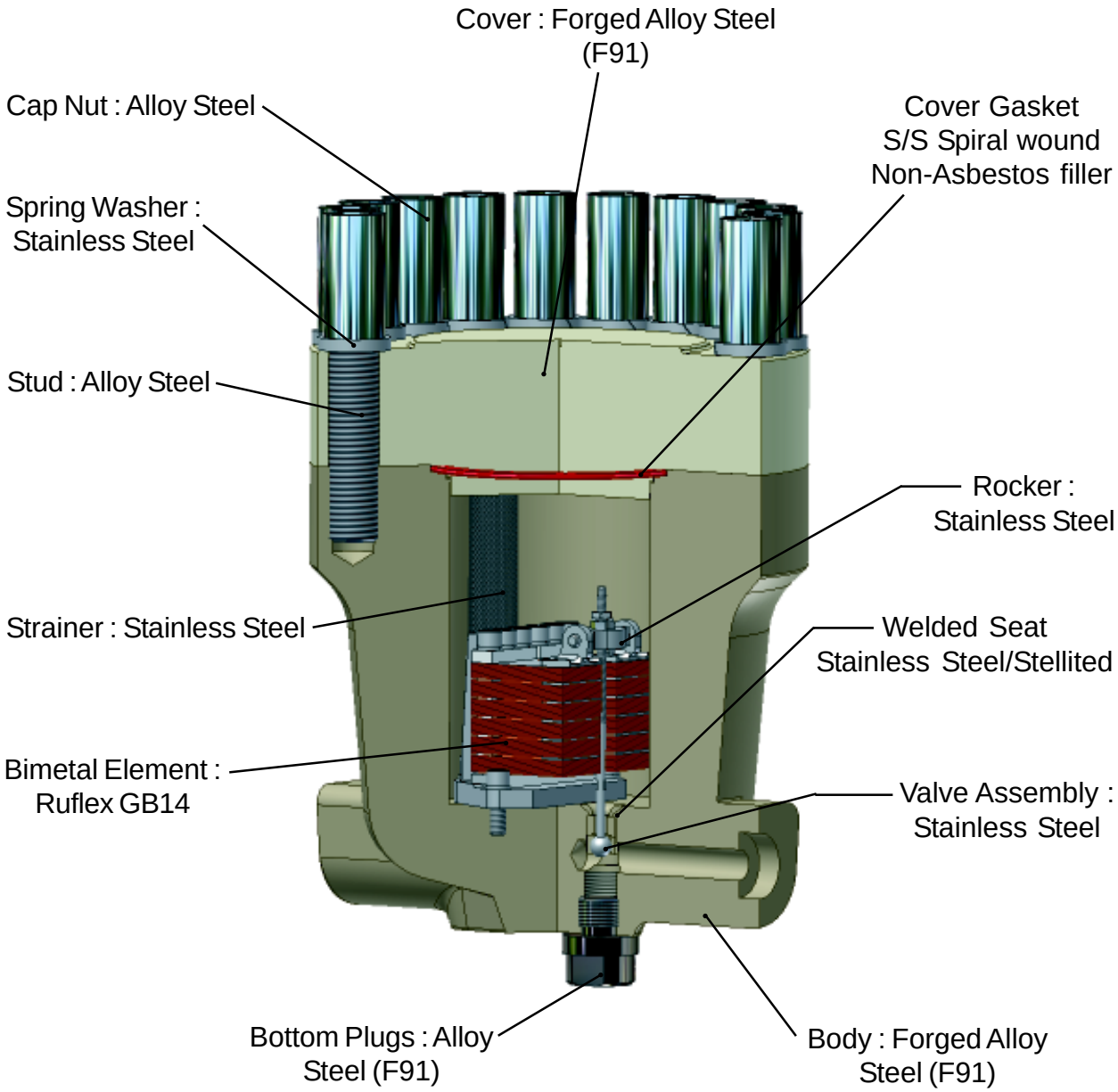
1. Personnel should wear suitable safety equipment while making any adjustment to the trap.
2. Depressurise, drain and vent the line, before working on the trap.
3. Steam trap should be fully isolated from the system before removing any cover/plugs or loosening bolts. Check isolation valves are locked to prevent accidental opening.
4. Mechanical supports attached to the trap are the responsibility of the end user.
5. Ensure warning notices or safety guards are in place to avoid personnel, touching the trap whilst in operation. **Traps get very hot.**
6. Ensure the trap is installed in the correct direction of the flow.
7. Non - OEM parts are not warrantable.
8. Local / national rules must be followed during installation and servicing. If in doubt seek advice from your safety personnel.

MODEL N4000

INSTALLATION, SERVICING AND MAINTENANCE INSTRUCTIONS

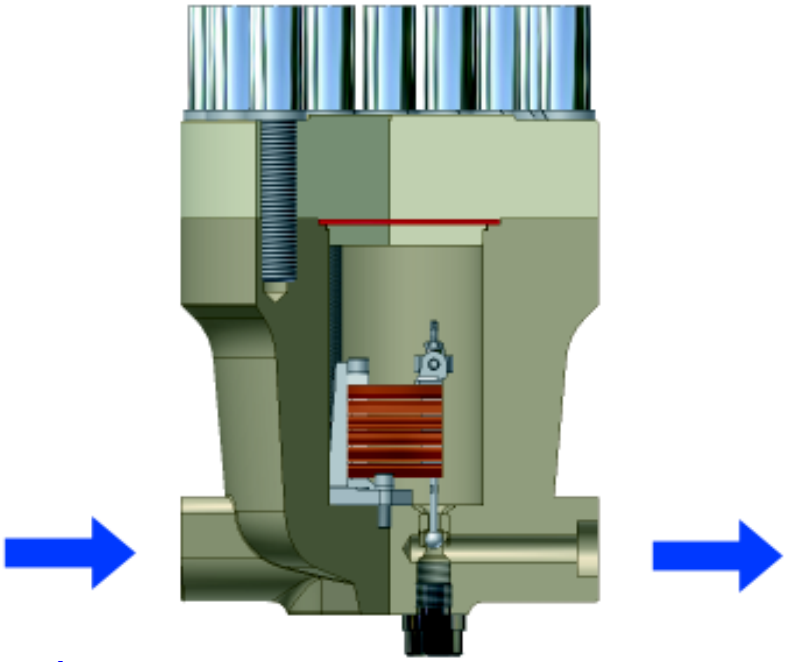
1. FEATURES

The Type 'N' Trap range is particularly suitable for high pressure/high temperature trapping applications in power plants, marine applications, superheated mains and other equipment. The forged steel design and stainless steel parts, stellite faced, assure long life under severest service.



a. Fast warm up with automatic air venting

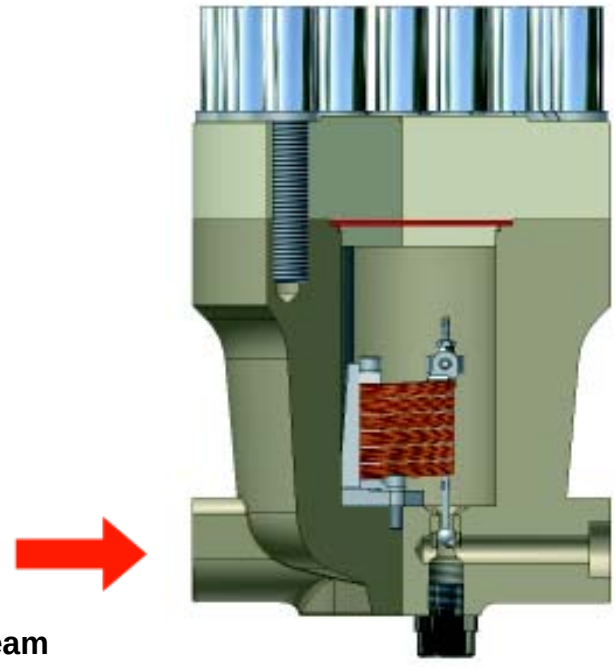
When cold the bi-metal relaxes and the discharge valve is wide open allowing air, gasses and cold water to clear quickly, ensuring no air binding or water logging occurs to delay equipment warm up. Steam wasting by-passes, or other secondary air venting systems are unnecessary.



b. Positive Steam Trapping

i : Saturated Steam

Incoming steam contacting the bimetal element causes the bimetal to deflect and develop thermal power to act on the valve stem, overcoming the line pressure and close the valve tight. The power of the bimetal element increases or decreases as a function of the saturated steam temperature. The same element operates efficiently at any given pressure within its range.

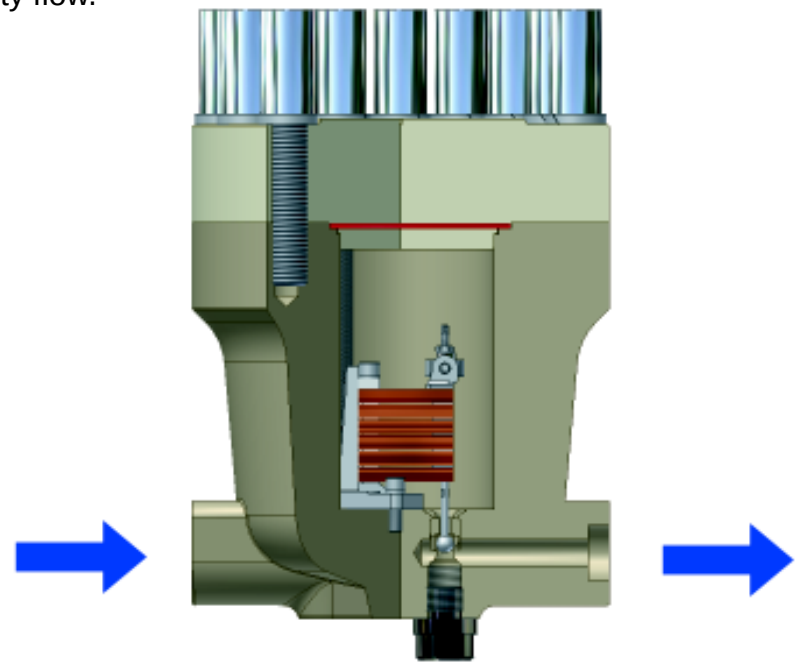


ii : Superheated steam

As for saturated steam, but the higher steam temperature increases bimetal pull and shuts the valve even tighter.

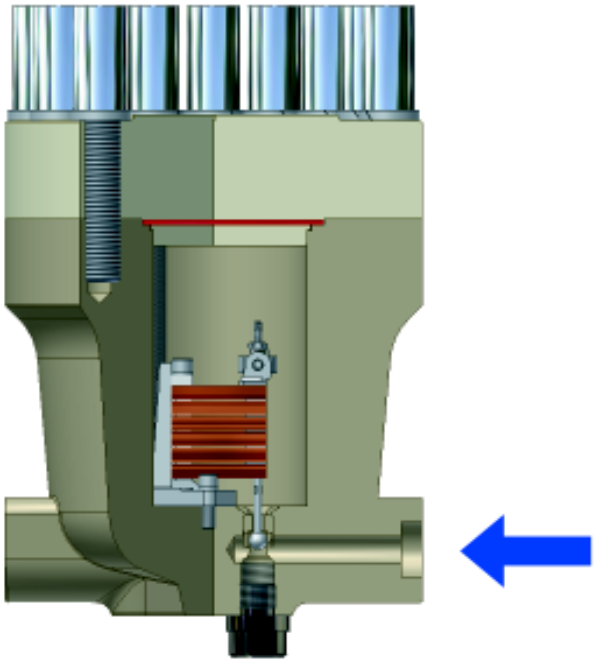
c. Condensate Discharge

Cooler condensate gradually reduces the bimetal force until the unbalanced pressure on the valve cracks the orifice and releases the flow. This is the first stage of the smooth opening. The second stage occurs as the flow is released , the unbalanced pressure acts on the full valve area, increasing its force, fully opening the orifice for maximum capacity flow.



d. Check Valve

For traps installed in a condensate return system, or a multiple collection header, excess back pressure, traps discharging on different cycles, a drop in line pressure or discharge to overhead return lines, can cause a reverse flow of condensate through the trap. Separate check valves are required down-stream of the trap to prevent this occurring. However the free floating self heating valve inside the Velan trap will close immediately reverse flow is present and no additional valve is necessary.



2. INSTALLATION AND OPERATION

a. The trap can be installed in any convenient position (see fig 5). In the vertical position with the inlet on top, the trap is self-draining and therefore freezeproof, provided the condensate can drain away (see fig 6). Direction of flow is indicated by arrows- integrally forged on the body.

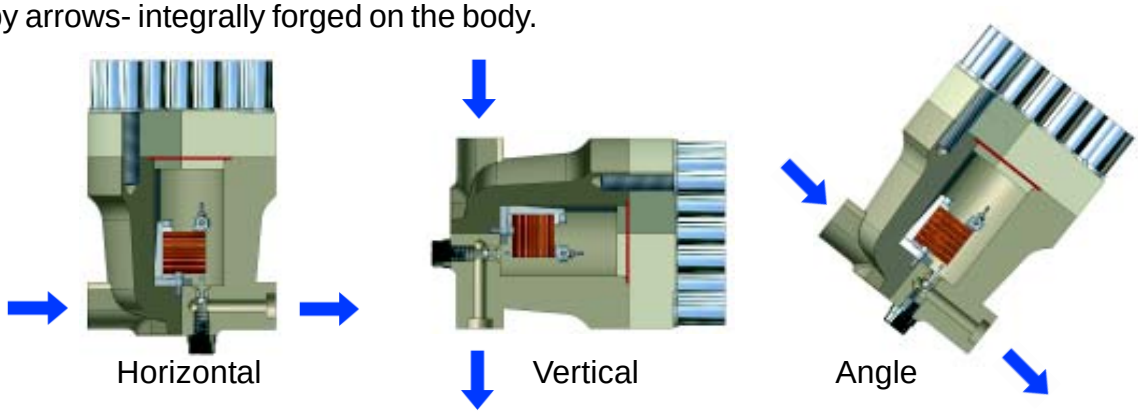


Fig.5 All position installation

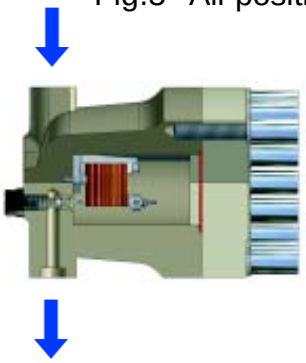


Fig.6 Self draining

b. Install the trap 5' - 8' (1.5m - 2.5m) from the equipment drain point when possible. The minimum distance is 24inches (0.6m). This cooling leg acts as a storage chamber improving the trap operation.

Figures 7 and 8 indicate correct methods for collecting condensate from steam mains, ensuring that most of the condensate flowing along the main can be collected.

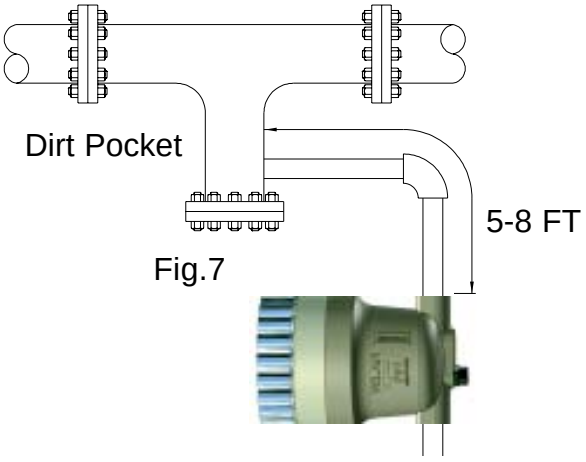


Fig.7

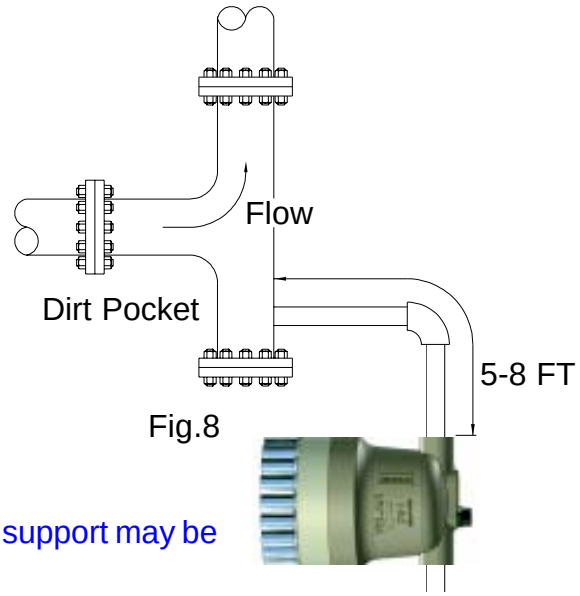


Fig.8

Due to the weight of the trap additional local support may be required on site by others.

c. Secondary air vents, check valves and strainers are not necessary, as these are standard feature of the trap.

d. Where a bypass is required the equivalent ‘piping king’ should be used. This provides considerable savings in space and construction costs compared to a conventional bypass, (see fig 9). The piping king unit allows “in line” maintenance.

Velan Piping King Unit

Standard Bypass Configuration

Fig. 9

e. Blow out the line or unit with air, or steam if possible, before installing the trap, to remove dirt and scale.

f. The trap and at least the last 2 - 3 feet (0.6m - 1.0m) of the cooling leg should not be insulated, otherwise the trap performance will be affected.

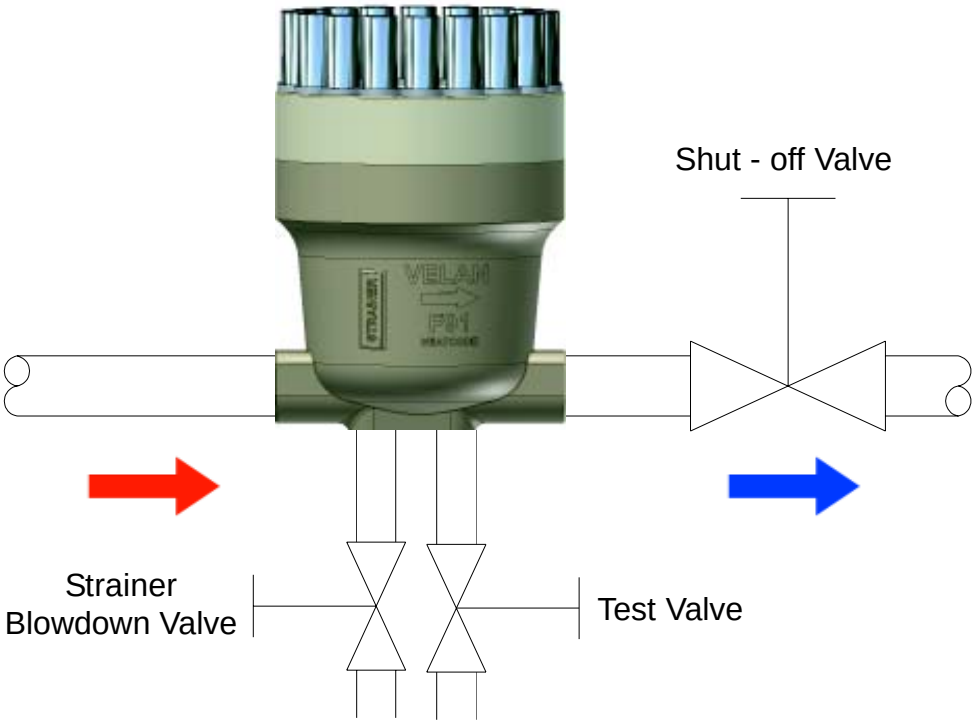
g. It is not necessary to disassemble the trap when welding into position. However correct weld procedures must be used without excessive heat input.

h. When operating, the trap will adjust to the quantity and flow condition of the condensate. If intermittent, the trap will discharge intermittently. However if condensate flow is continuous the trap will also discharge continuously.

i. For checking the trap operation when installed in a closed return system a test valve can be fitted as shown as in fig 10. Ultrasonic meters must be used with care if the trap is operating in a continuous discharge mode as the results indicated can be misleading.

j. Upstream pressure waves in excess of normal operating pressures (water hammer) will overcome the bimetal closing force, opening the valve and dissipating the excess pressure downstream, preventing damage to the internals.

k. Clean strainers periodically otherwise they may plug up and prevent the free flow of condensate. For efficient, fast and economical cleaning, install a small valve to the strainer blowdown connection (optional) as in Fig 10. The valve must be suitable for max pressure/temperature and system material.



Complete Recommended assembly

Fig. 10

3. ADJUSTMENT

NOTE: Before undertaking any adjustment or repair work, always ensure that the steam trap is fully isolated from the system. Before removing any covers or plugs, gradually loosen bolting and break gasket seal to release any pressurised steam trapped in the body.

a. Bimetal/Valve Clearance

The discharge temperature of condensate is dependent upon the clearance setting ‘ X ‘ fig.11. Increasing the clearance reduces the force exerted on the valve by the bimetal, allowing a closer to saturation discharge temperature. It will also increase capacity. Conversely, reducing the clearance increases the bimetal force requiring an increased amount of sub-cooling before discharge can take place. This will hold back condensate utilising its heat before discharge giving efficient energy utilisation. It will also reduce discharge capacity.

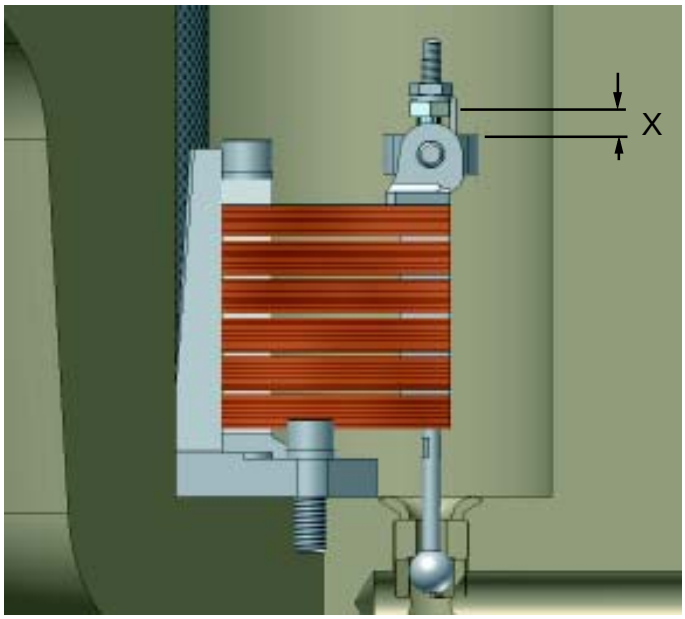


Fig. 11

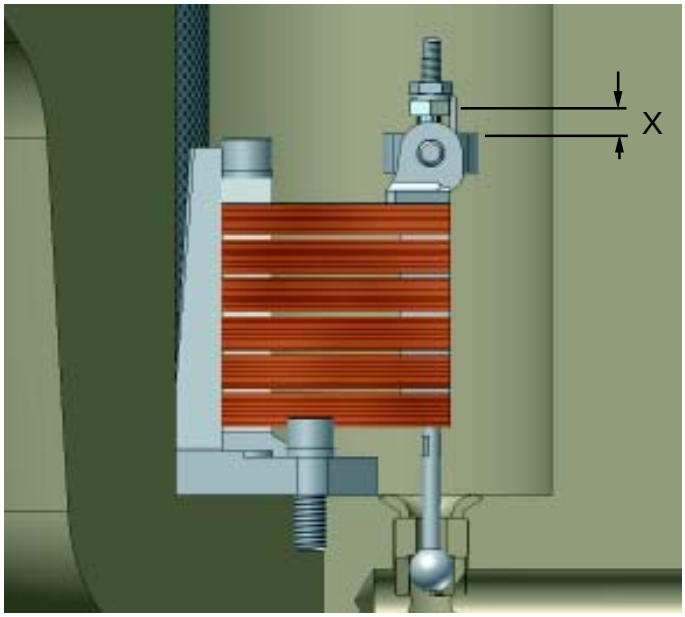
The clearance is measured at point ‘ X ‘ fig.11 between the top of the rocker plate and the underside of the adjusting nut. The standard factory setting is made at an ambient temperature of 65 Deg F (18 Deg C) and will allow the valve to commence opening at 15 Deg F (8 Deg C) approx. Below saturation, with full discharge, as shown in the individual capacity diagrams for each model, around 40 Deg F (22 Deg C) sub - cooling.

The standard factory setting is made with the bimetal at an ambient temperature of 65 Deg F (18 Deg C). If it is not possible to make the setting at this temperature an alternative setting as shown in the table (on next page) should be used, for the appropriate ambient (bimetal) temperature.

BIMETAL PLATES – RUFLEX GB-14

NOTE

COLD CLEARANCE GAUGE SHOULD BE A SLIDING FIT BETWEEN THE ADJUSTING NUT AND ROCKER.



ROOM TEMP		N4000	
°F	°C	INCHES	MM
50	10	.086	2.18
55	12.8	.084	2.15
60	15.6	.081	2.06
65	18.3	.078	1.98
70	21.1	.075	1.91
75	23.4	.072	1.83
80	26.7	.070	1.78
85	29.4	.067	1.70
90	32.2	.064	1.63
95	35	.061	1.55
100	37.8	.059	1.50

A standard setting gauge is available – See tool part numbers on back page, or feeler Gauges of the correct amount can be used.

The gauge should be a sliding fit between the locknut and rocker plate.

To alter the clearance release the locknut from the adjusting nut, fit a stem key (see tool part numbers) to the flat on the stem below the bimetal fig.12. Turn the adjusting nut anti-clockwise to increase the clearance, or clockwise to reduce.

Do not increase clearance beyond point where the trap passes steam.

On completing setting operation, relock the adjusting nut with the locknut.

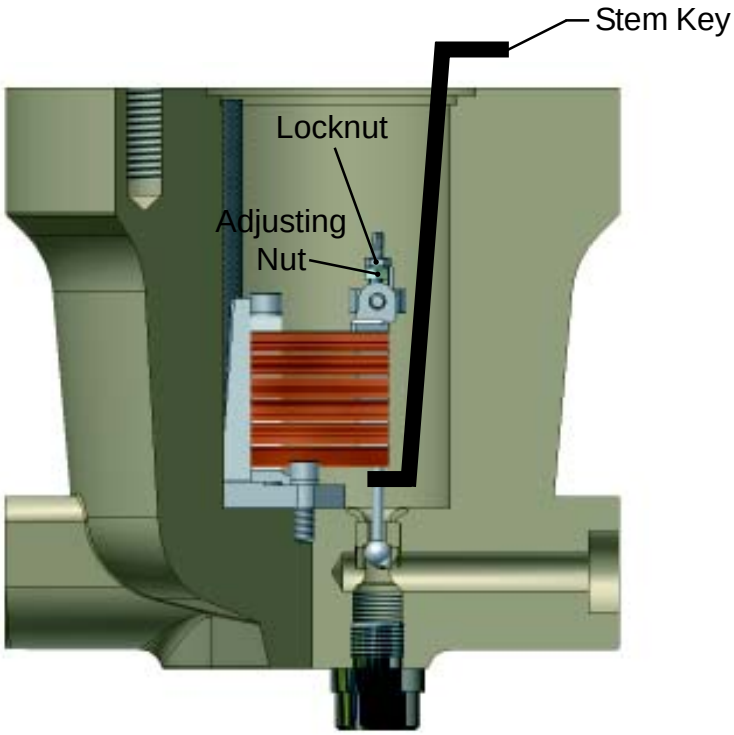


Fig. 12

b. High Back Pressure

The trap will operate against high back pressures, but the discharge temperature and discharge capacity will be correspondingly affected. For effective operation against back pressures in excess of 30%, the clearance should be increased gradually, up to a maximum of one full turn of the locknut, ensuring that the trap continues to close tight on steam.Do not confuse with the discharge of flash steam released by the hot condensate.

The trap can operate against back pressure of 80% of inlet pressure.

4. MAINTENANCE

After completely isolating from live steam alterations can be performed with the trap in line by removing the cover.

The traps are designed for easy servicing and dis-assembly of parts without removing the trap body from the line.

a. Testing of valve seat.

If the trap leaks steam after re-adjustment inspect valve and valve seat. If no visible sign of damage, apply air or water pressure through outlet connection and observe for signs of leakage above the valve. See fig.13.

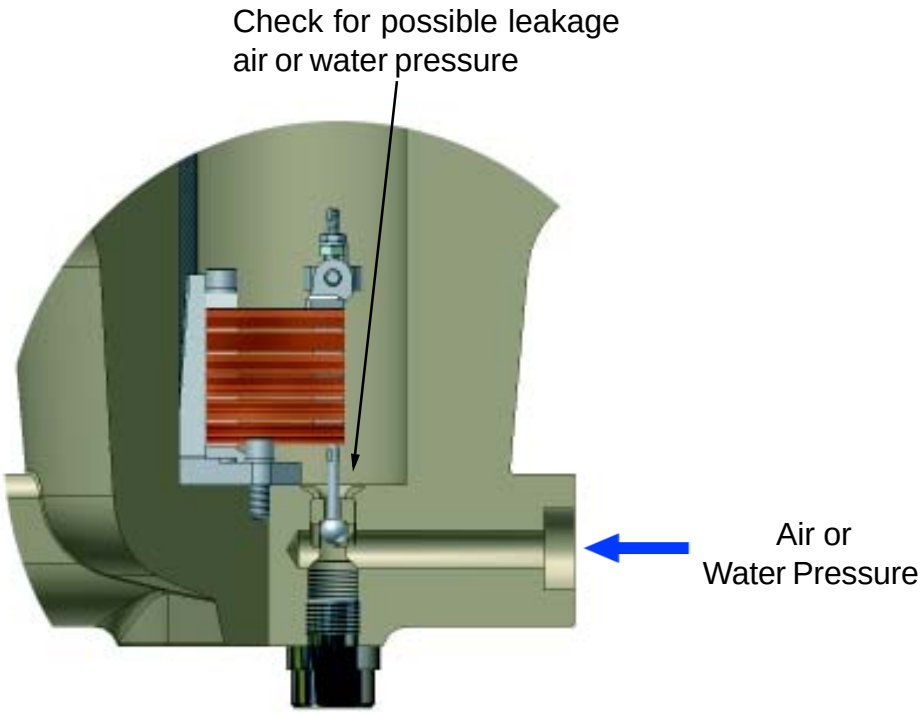


Fig. 13

b. Removal of Bimetal

The bimetal element can be removed without disassembly of the seat or valve. Unscrew the screws securing the holder to the body, lift the element from the rear, until the valve stem slips through the slot in the rocker, and then lift out the element fig.14

Inspect the element for dirt lodging between the segments and clean if necessary.

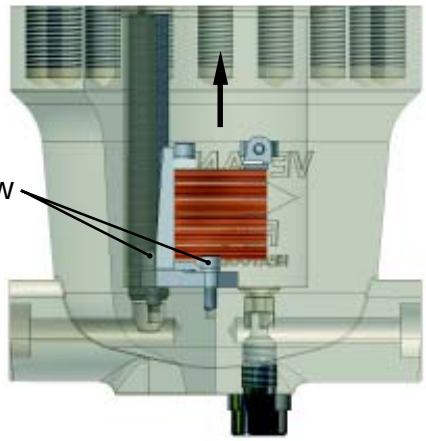


Fig. 14

To replace the element reverse the above procedure relocating the valve stem and adjusting nut into the rocker plate and locating the holder into the body. Before final tightening of the holding screws the bimetal must be located centrally in line with the centre of the valve orifice. This is to ensure that the bimetal force is directed along the axis of the valve stem. To assist with this an alignment bar, locating the orifice, bimetal slot and rocker plate is available. See tool part numbers. To use the line bar, remove the test plug under the valve, locknut and adjusting nut from the valve stem, and remove the valve through the test plug. Insert the liner bar from below body through the valve seat and rocker plate fig.15, until the appropriate diameter locates in the seat orifice. This will ensure that the bimetal is correctly aligned. Tighten bimetal holder screws and remove the liner bar.

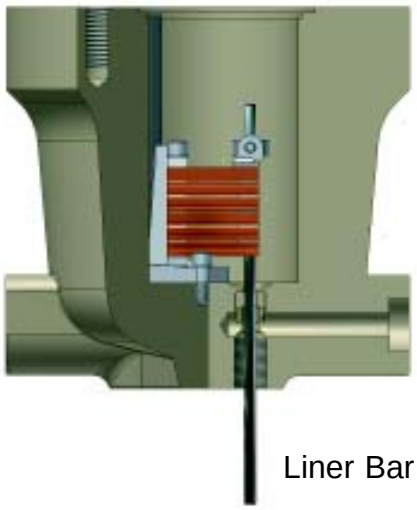


Fig. 15

NOTE:

The bimetal is supplied fully assembled on its mounting block and should not be removed, or the bimetal clamping screws loosened. Each plate must be concentric and in line with each other. Any plates out of the square may interfere with the free movement of the valve. Bimetal plates must be also fitted the correct way up, otherwise they will exert a negative force. Markings on the under side, indicate whether plates are assembled correctly.

c. Repair of valve and valve seat

(i). Valve

Slight damage to the valve (which has a hardness of 53Rc, 500 BHN) can be repaired by lapping (grinding) with the valve seat using an appropriate compound.

If the valve is badly ‘wiredrawn’ or eroded, it should be replaced with a new valve assembly.

(ii). Valve Seat (Welded)

The heavy stellite deposit ensures a long trouble free operating life under normal operating conditions. The seal weld construction prevents leakage between the body and seat by “backflow erosion” or “flash” forming beneath the valve. Minor damage can be repaired by relapping using an appropriate re-grinding compound. The seat can be relapped as shown in fig.16 using a hand drill, or if in the workshop a hand held air tool. Final lapping should be completed by hand with the valve in its correct operating position. If necessary the seat can be replaced as follows:

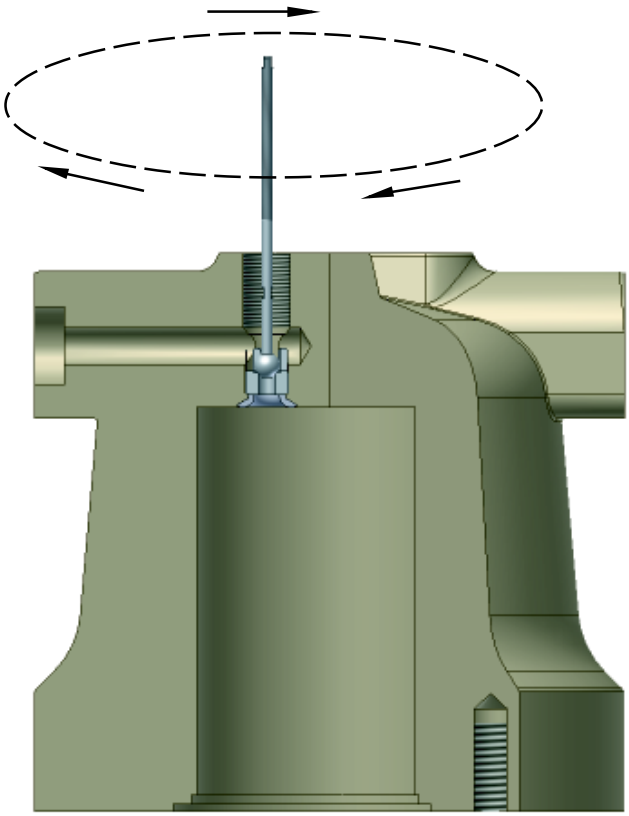


Fig. 16

Remove the damaged seat using a 5/8” drill to remove the seal weld fig.17.

Fig.17

Locate the new seat squarely in the body recess. The locating tool fig.18 will keep the seat correctly positioned during welding. Seal weld using a stainless 309 or similar electrode 3/32” (2.5mm) Dia in accordance with an appropriate weld procedure.

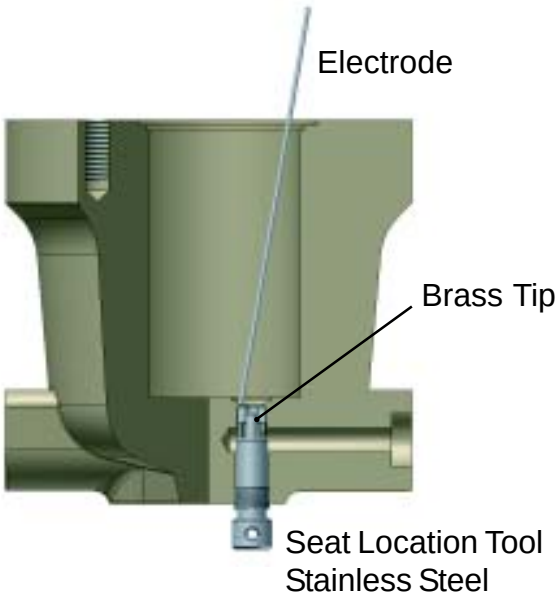


Fig.18

NOTE:

After seat replacement, finally lap valve and seat by hand and check for leakage at body/valve seat joint, and valve and valve seat. If the trap leaks through the seat after reassembly and a new valve assembly has been fitted, check that the valve assembly has been fitted, check that the valve assembly is not contacting the inside of the cover preventing seating. If so either incorrect valve assembly is used, or the cover incorrectly assembled - see below.

d. Re-assembly

i) Strainer

Ensure strainer is clean. If damaged or partially blocked. Fit new screen. Replace strainer with flat section adjacent to bimetal pack and located in strainer recess above strainer plug.

ii) Cover Gasket

Fit a new spiral wound gasket into the body recess, ensuring that the inner ring is fully supported for 100% of its periphery. This is important. If any part of this first ring is not supported by the body and cover gasket faces, leakage may occur.

iii) Cover

When fitting the cover ensure strainer element locates in the recess in the cover.

To ensure no leakage, spiral wound gaskets must be compressed correctly. Velan ensures this by machining the recess and spigot so that the correct compression is applied when the cover is in complete contact with the body flange.

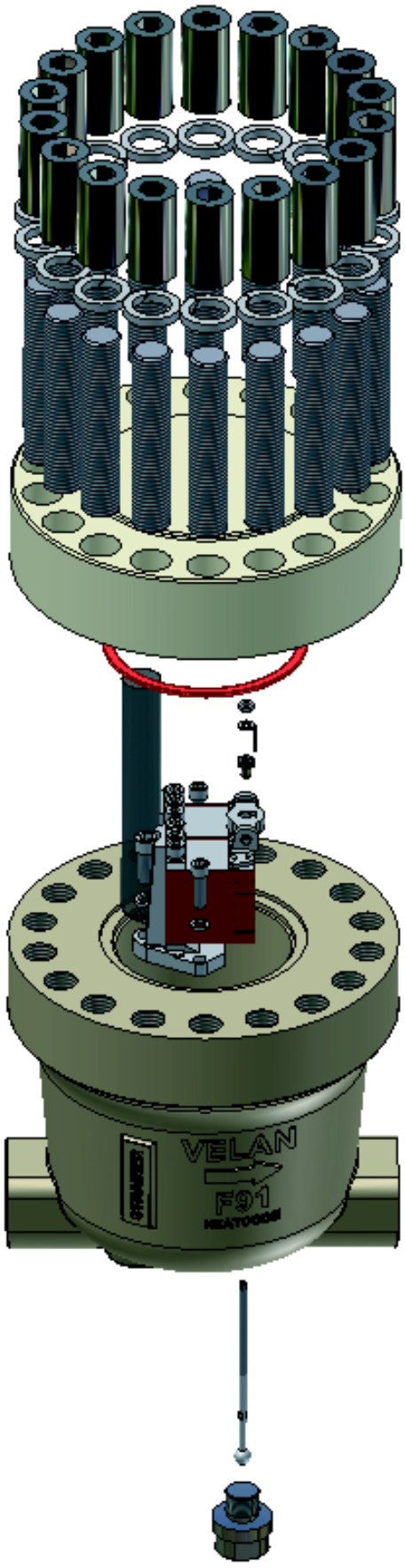
The gasket must be compresse evenly. This is achieved by tightening the nuts by small equal amounts moving diagonally opposite across the cover.

Correct compression is applied when the cover is in full metal to metal contact with the body.

iv) Bottom Plugs

Ensure both test plugs are fully tightened and seal welded.

N4000



TOOL PART NUMBERS

STEM KEY	**:**	**L99002**
SETTING GAUGES	**:**	**L99005/B1**
LINER BAR	**:**	**L99011**
SEAT LOCATING TOOL	**:**	**L99046/1**

BOLTING TORQUE

MAIN COVER : 350 ft.lb (475 Nm)

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