Velan Valves Ltd
Leicester, England

THERMOSTATIC TRAP

MODELS N150/300/675/900/1500/2500/2600

INSTALLATION, SERVICING AND MAINTENANCE INSTRUCTIONS

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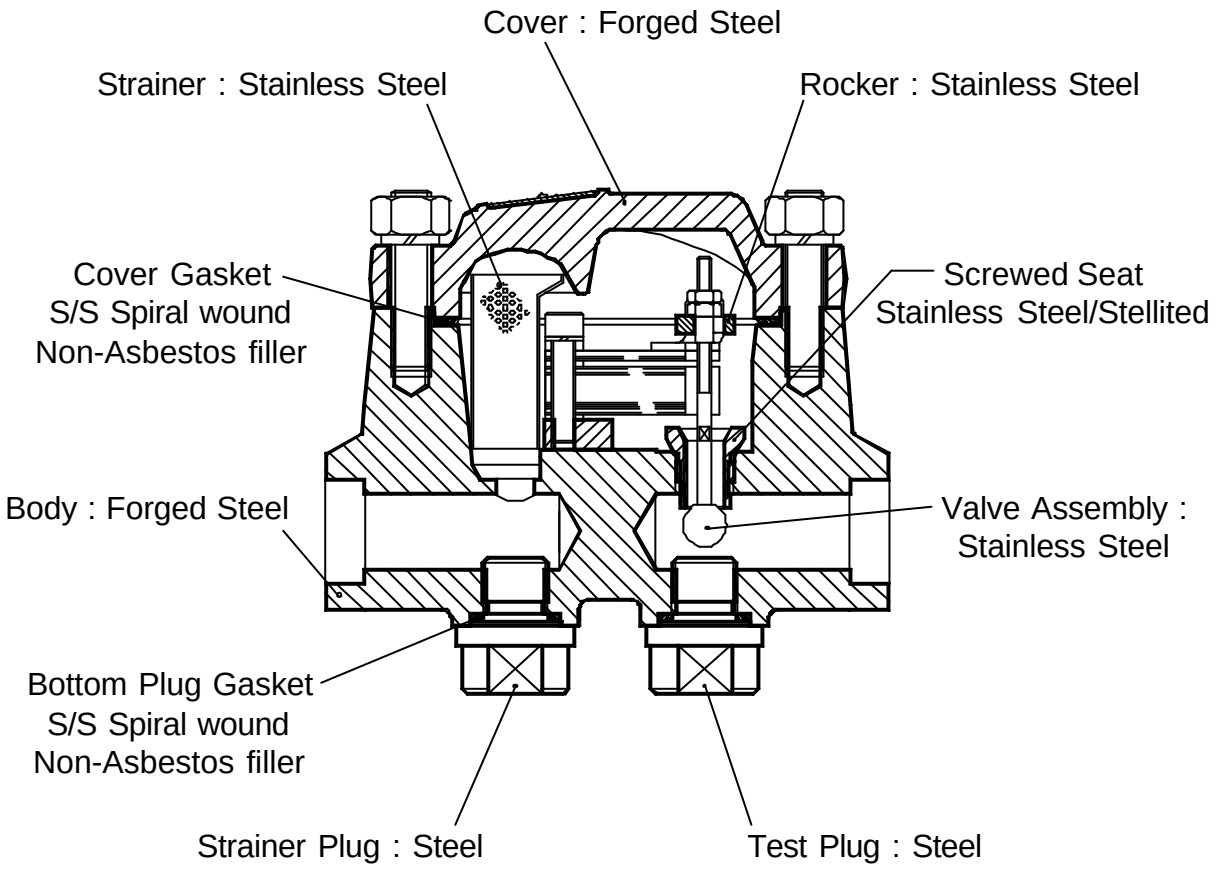
MODELS N150/300/675/900/1500/2500/2600

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 where necessary, assure long life under severest service.

N150/300



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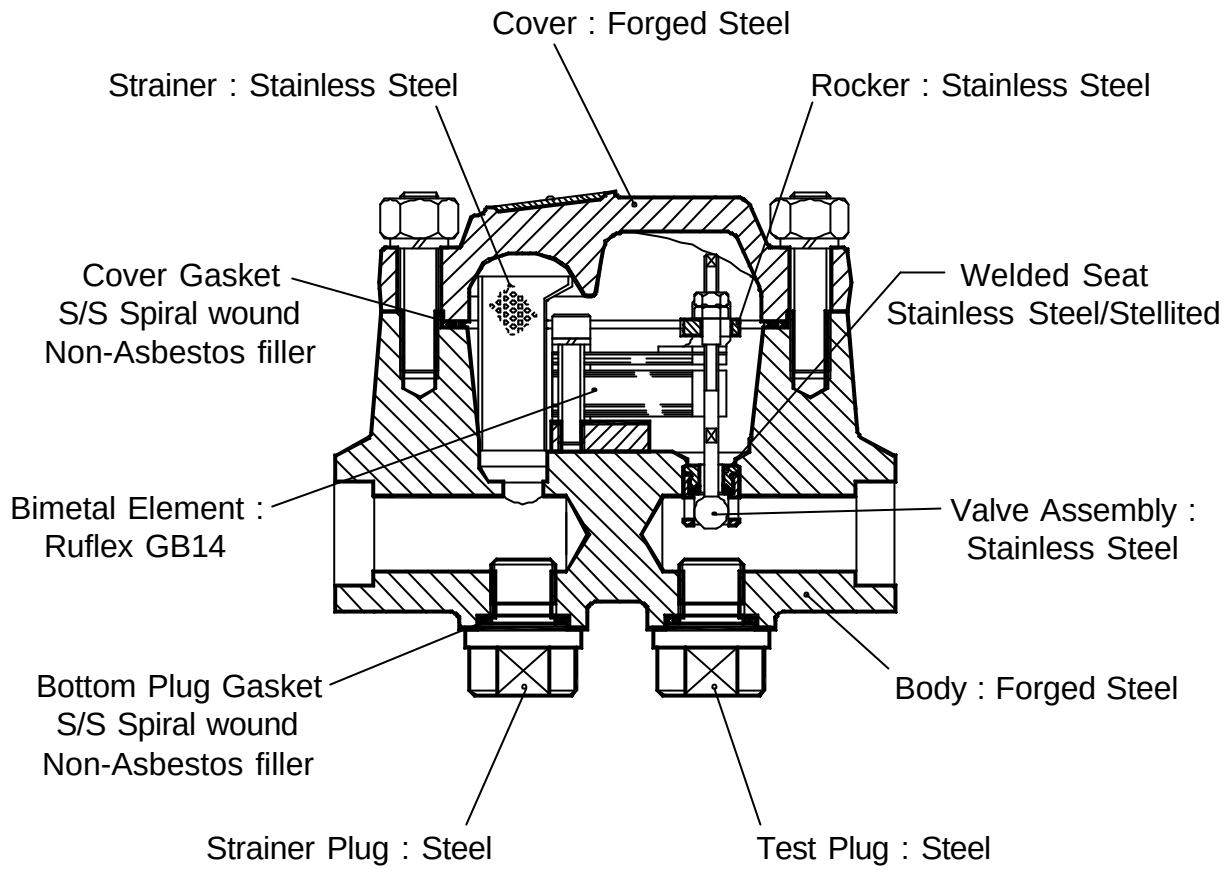
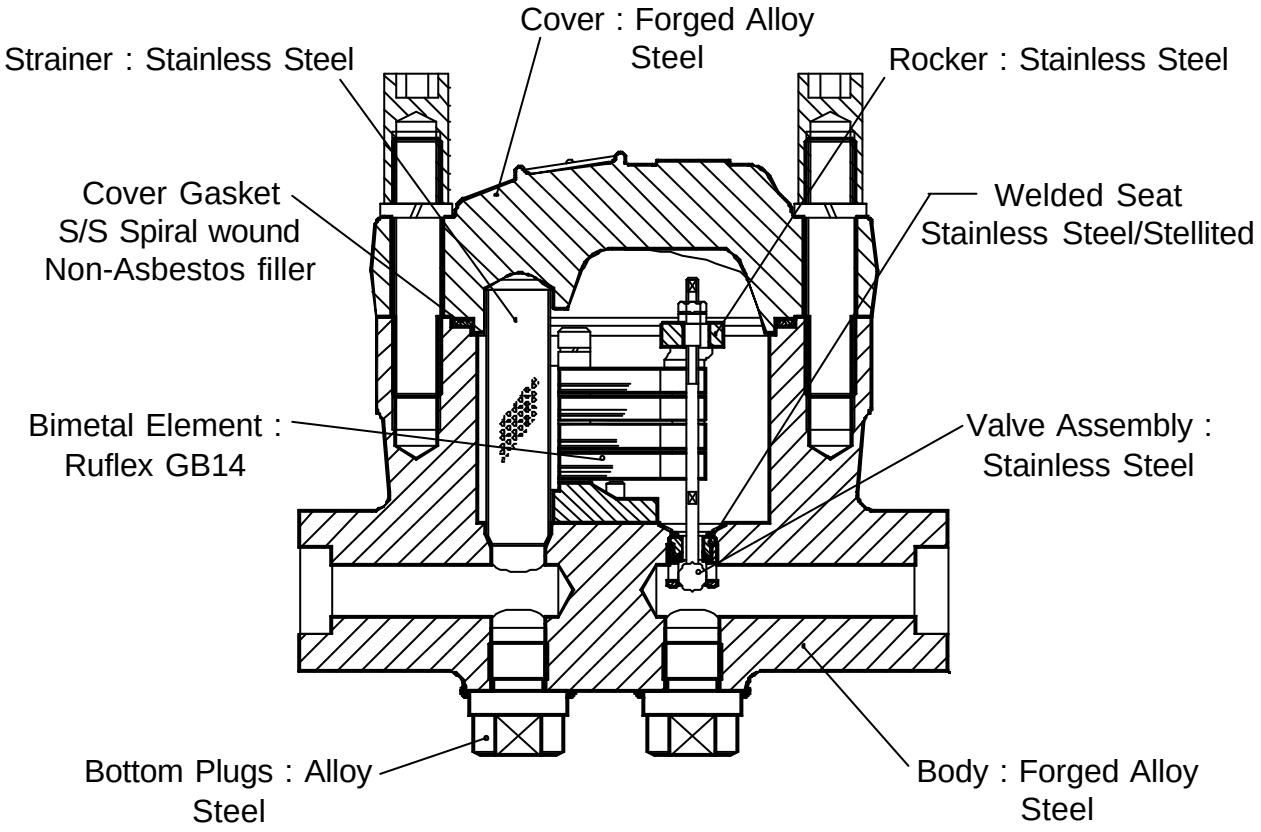
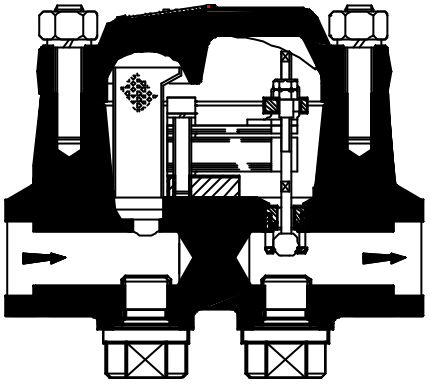


N2500/2600



a. Fast warm up with automatic air venting

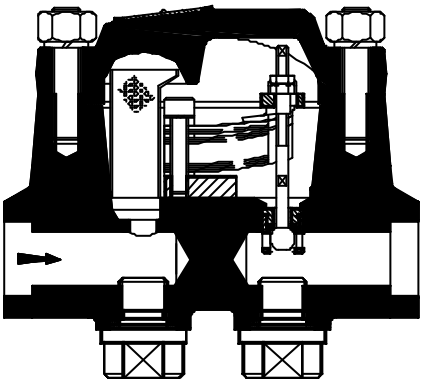
When cold the bi-metal relaxes and the discharge valve is wide open allowing air, gasses and cold water to clear quickly, ensuring no air binding or water logging occurs to delay equipment warm up. Steam wasting by-passes, or other secondary air venting systems are unnecessary.



b. Positive Steam Trapping

i : Saturated Steam

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

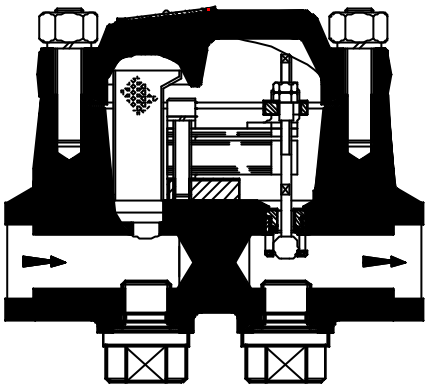


ii : Superheated steam

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

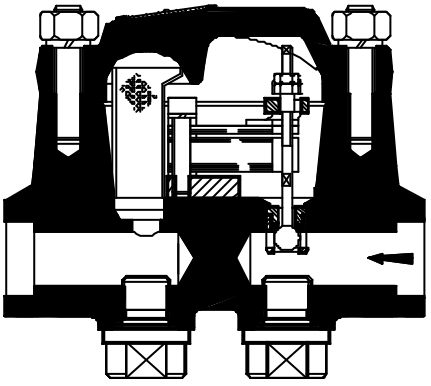
c. Condensate Discharge

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.



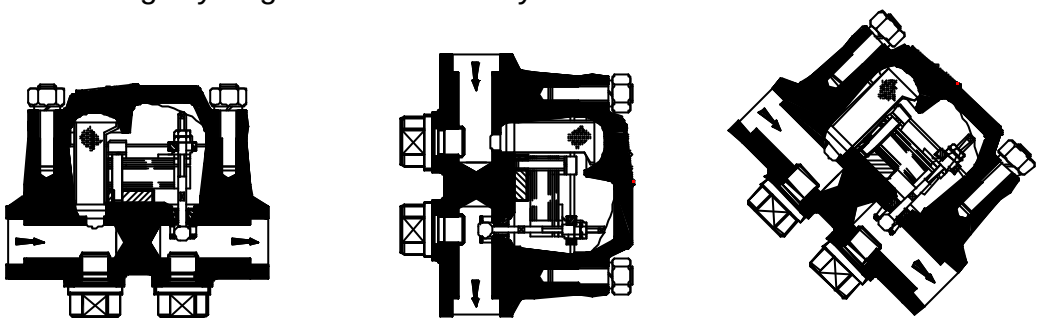
d. Check Valve

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 Plenty 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 under the body and on the cover.



Horizontal Vertical Angle

Fig.5 All position installation

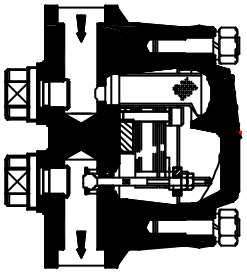


Fig.6 Self draining

b. Install the trap 5' - 8' (1.5m - 2.5m) from the equipment drain point when possible. The minimum distance is 18inches (0.5m). 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.

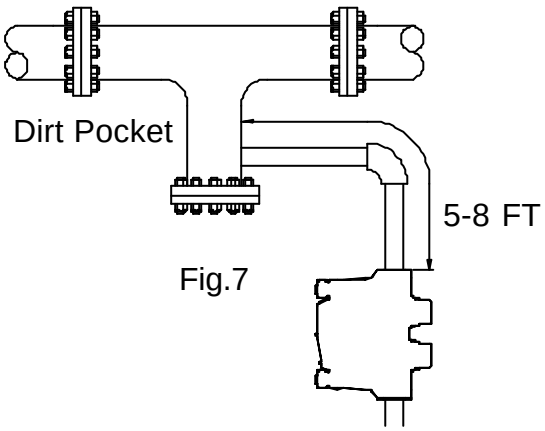


Fig.7

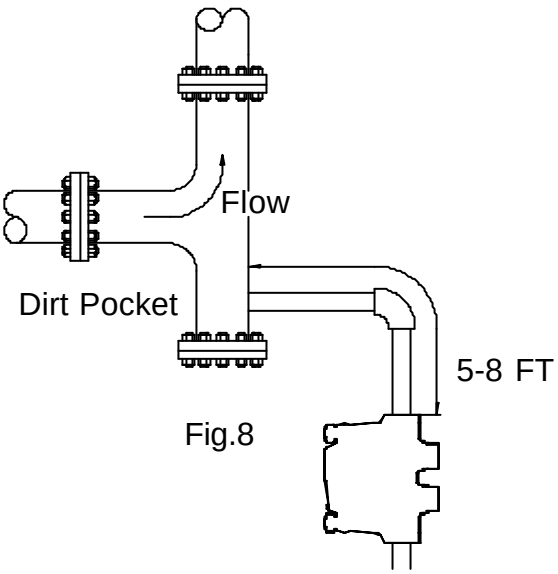
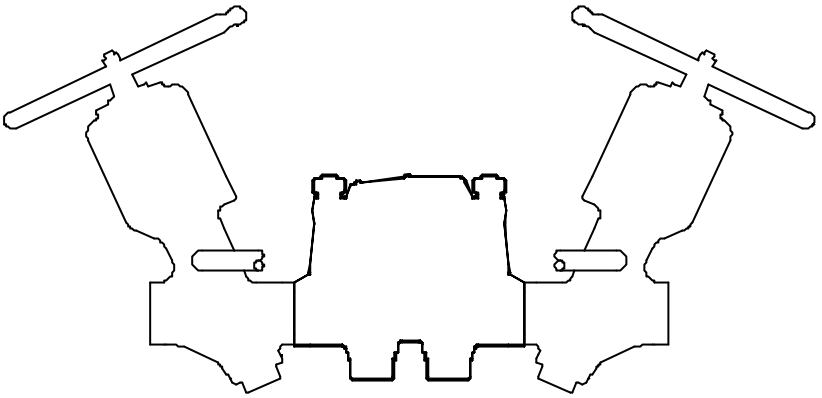


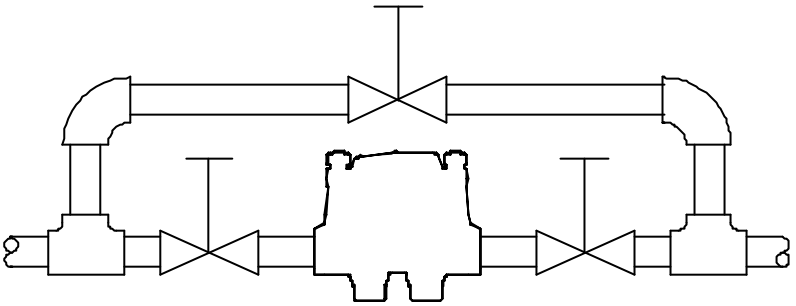
Fig.8

c. Secondary air vents, check valves and strainers are not necessary, these are incorporated in 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 the standard bypass, see fig 9. The piping king unit allows “in line” maintenance.



Plenty 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 welding 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 operation of the trap when installed in a closed return system a test valve can be fitted as shown as in fig 10. Alternatively the trap can be supplied with a thermometer fitted to the outlet connection, or a contact temperature recorder used to measure the temperature differential across the trap. 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. 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 11.

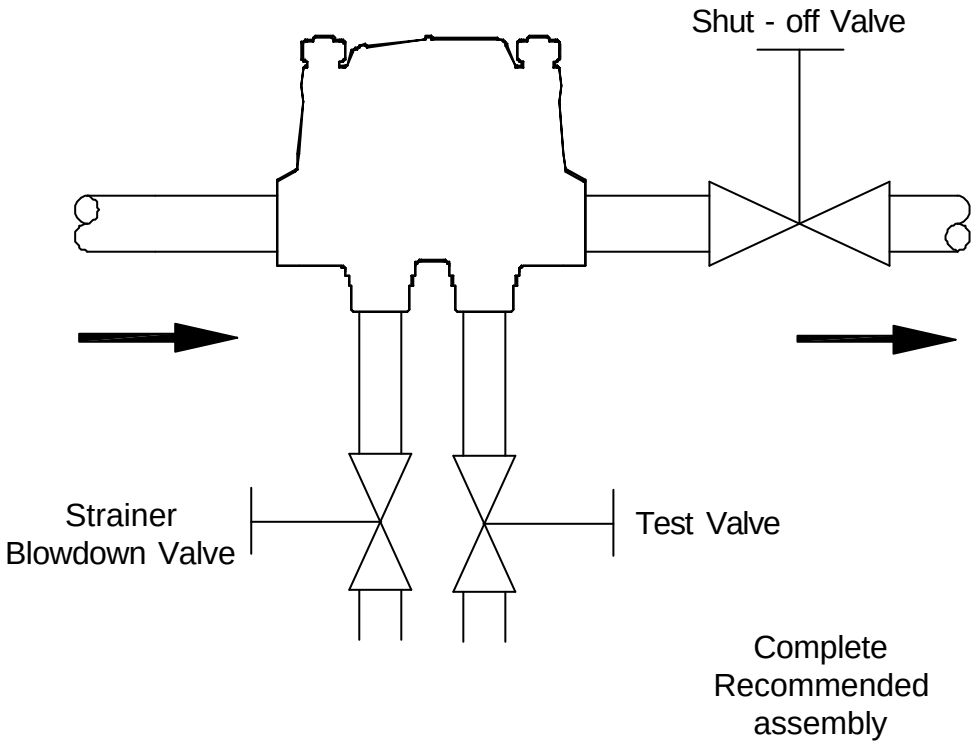


Fig. 10

WELDING AND POST WELD HEAT TREATMENT

Welding

Velan steam traps are designed to withstand the effect of heat generated by normal welding processes and any subsequent Post Weld Heat Treatment (PWHT) provided the processes are performed by skilled operators working in accordance with approved procedures.

Care must be taken to avoid application of excessive heat when welding.

Modern practices recommend the use of purge gas to achieve a good quality root run on full penetration welds. Socket welds do not normally require a purge gas since the process or filler metals used provide adequate protection to the weld pool.

Post Weld Heat Treatment

Under no circumstances should a thermal blanket be used to wrap the entire steam trap during PWHT, neither should the welded unit be furnace PWHT'd.
(The heat generated by these methods will destroy the bimetals).

ONLY LOCALIZED PWHT OF THE WELD AND HAZ IS ALLOWED.

So to clarify; there is no need to disassemble the steam traps if the above instructions are observed. If however the weld(s) can only be PWHT'd using thermal blanket or furnace methods then the traps will need

a) disassembling prior to PWHT then
b) re-assembling and
c) re-setting following PWHT.

Instructions on how to do this follow in section 4 and 3 respectively of this manual.

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, 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 this 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.

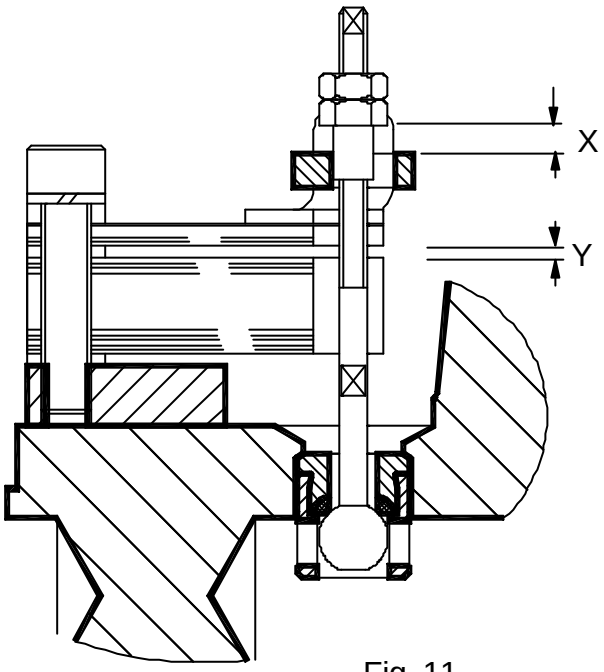


Fig. 11

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).

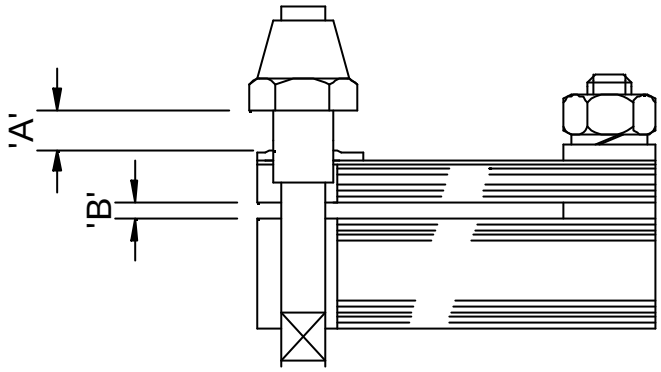
The standard factory setting is made with the bimetal at an ambient temperature of 65 Deg F (18 Deg C). If it is not possible to make the setting at this temperature an alternative setting as shown in the table below should be used, for the appropriate ambient (bimetal) temperature.

BIMETAL PLATES – RUFLEX GB-14

NOTE

A) COLD CLEARANCE GAUGE SHOULD BE A SLIDING FIT BETWEEN THE LOCKNUT AND ROCKER.

B) WHEN CHECKING THE CLEARANCE 'A' WITH THE GAUGE DO NOT REDUCE THE CLEARANCE 'B' BETWEEN THE BIMETAL SEGMENTS, THIS MUST ALWAYS BE EQUAL TO THE SPACER IN THE ELEMENT.



ROOM TEMP		N150 N300	N2500		N675 N900 N1500
°F	°C				
50	10	.086	.110		.086
55	12.8	.084	.107		.084
60	15.6	.081	.103		.081
65	18.3	.078	.100		.078
70	21.1	.075	.096		.075
75	23.4	.072	.093		.072
80	26.7	.070	.089		.070
85	29.4	.067	.086		.067
90	32.2	.064	.082		.064
95	35	.061	.079		.061
100	37.8	.059	.075		.058

SETTINGS IN INCHES

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

The gauge should be a sliding fit between the locknut and rocker plate, and it is important that the clearance 'Y' between the bimetal segments is not reduced. This should always be equal to the spacer in the element fig.11

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.

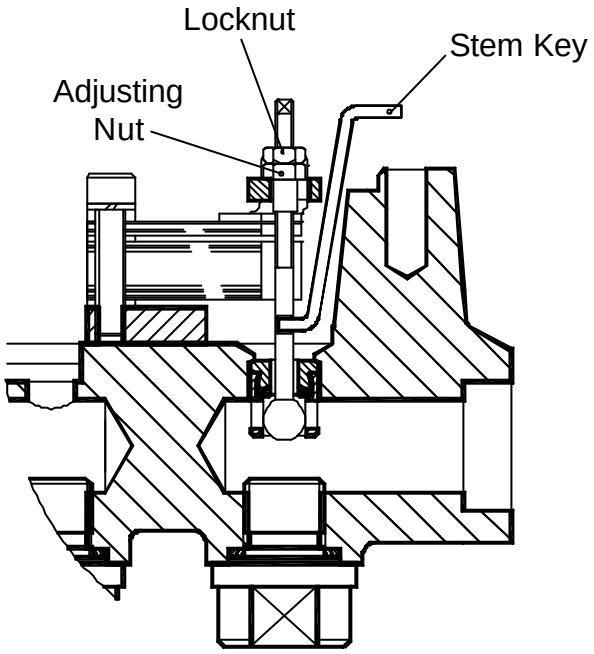


Fig. 12

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 approximately, 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%

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 and gasket.

If the trap leaks steam after trying 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 leakage above the valve. See fig.13.

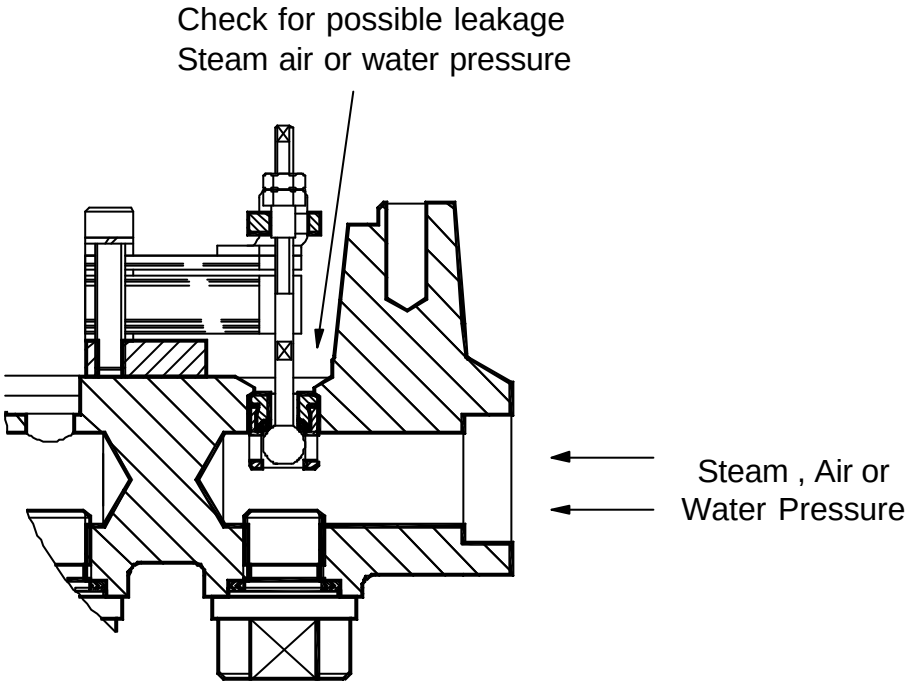


Fig. 13

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.

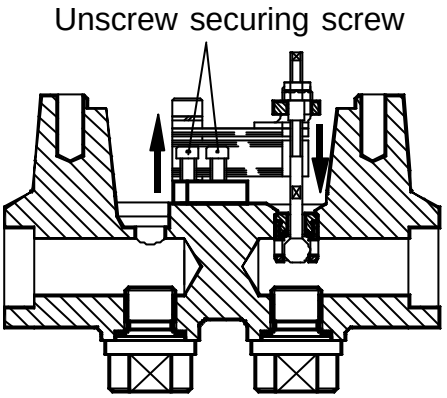


Fig. 14

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, for model N-2500/2600 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.

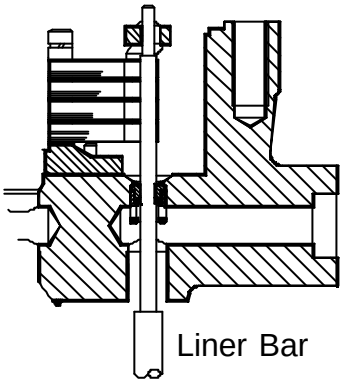


Fig. 15

For models N-600/675/900/1500 a multi diameter liner bar is available. This is used from above the trap. Lift out of the rocker plate from its support bridge. Pass the liner bar down the bimetal slot until appropriate diameter is fully inserted into the orifice. Tighten the holding screws, remove the liner bar and replace the rocker plate.

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, and on the rear edge 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 sea weld construction prevents leakage between the body and set 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:

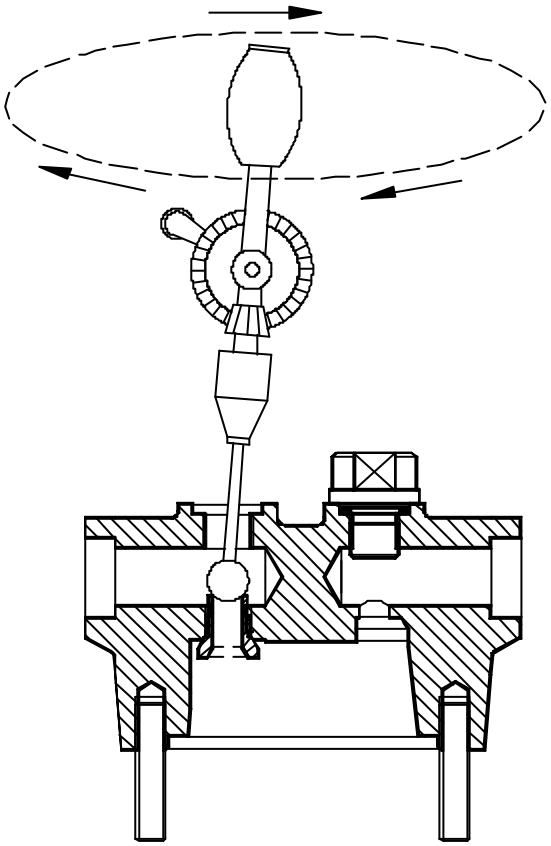


Fig. 16

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

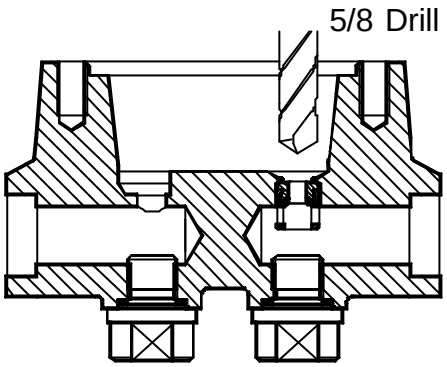


Fig.17

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.

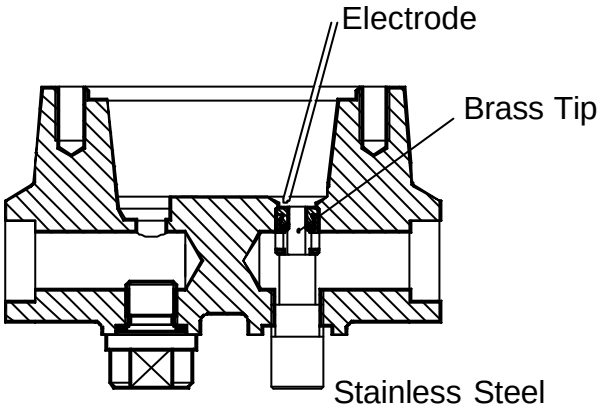


Fig.18

iii) Valve Seat (Screwed)

low-pressure N traps 150/300 (now replaced by equivalent SF cage unit models) contain a screwed valve seat. Check for leakage (see above) also at points ‘A’ & ‘B’ fig.19. If trap leaks at ‘A’ between seat and body.

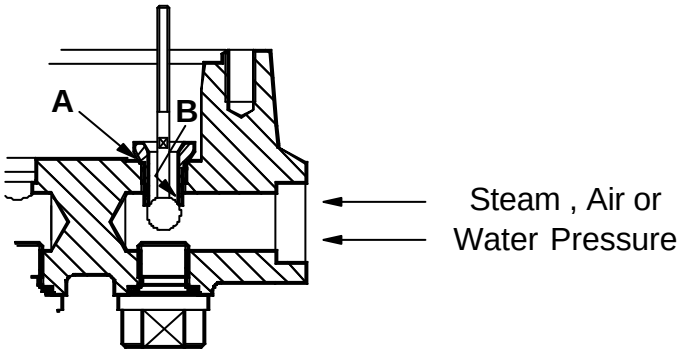


Fig.19

Check valve seat is correctly screwed in. If valve seat is damaged on its body seating area, replace with new seat. When seating 'land' in the body is damaged, remachine seat bevel using 60° countersink fig.20.

If the thread in the body is eroded, the body should be replaced.

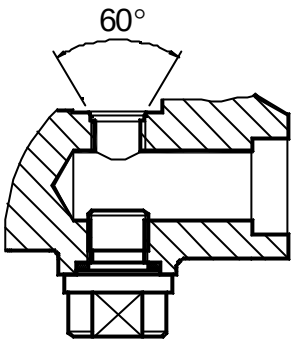


Fig.20

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

The cover must be fitted with the direction of flow arrow towards the outlet connection. The forged recess must be above the valve stem, and the top of the strainer located in the recess in the cover. To ensure correct positioning, for models N-675/900/1500, one stud is fitted with a collar, which locates in the appropriate enlarged bolt hole on one side of the cover.

To ensure no leakage spiral wound gaskets must be compressed correctly. Plenty 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 compresses evenly. This is achieved by tightening the nuts by small equal amounts moving diagonally opposite across the cover.

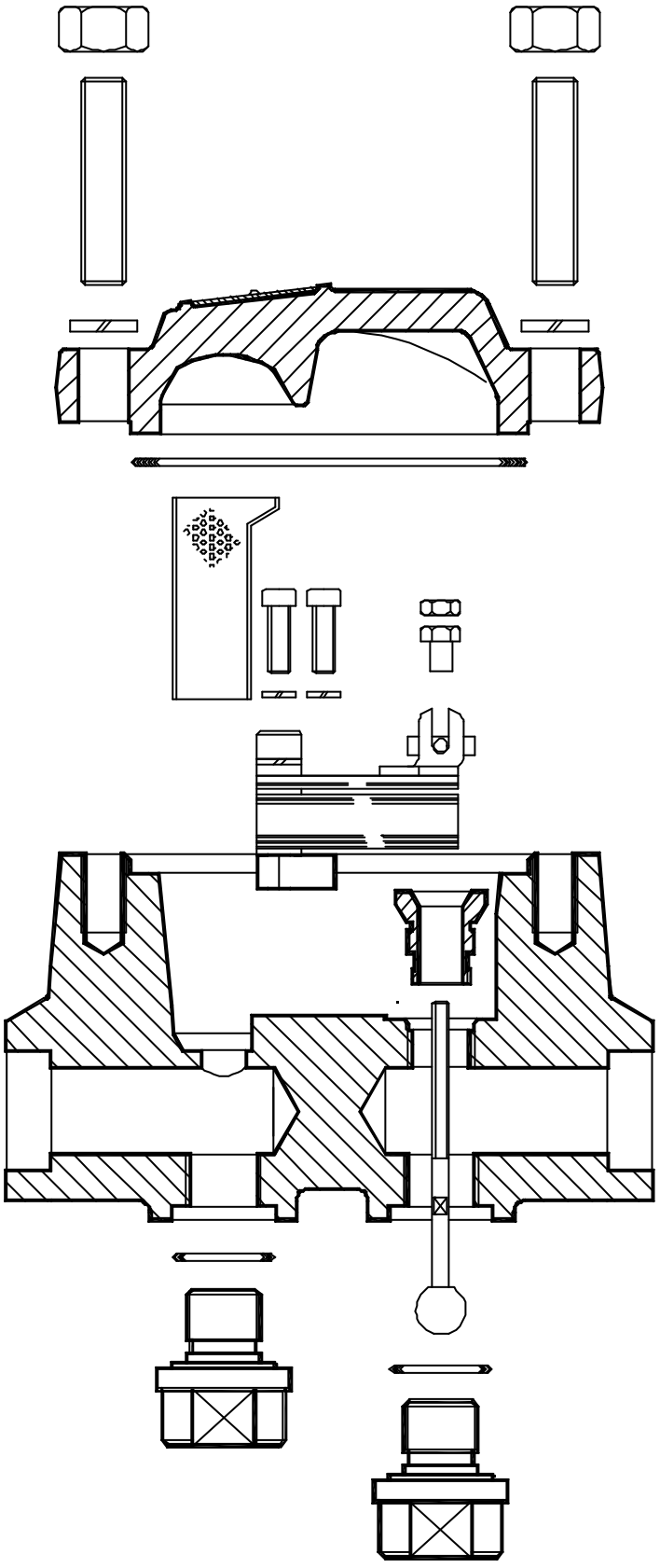
Correct compression is applied when the cover is in full metal contact with the body.

iv) Bottom Plugs

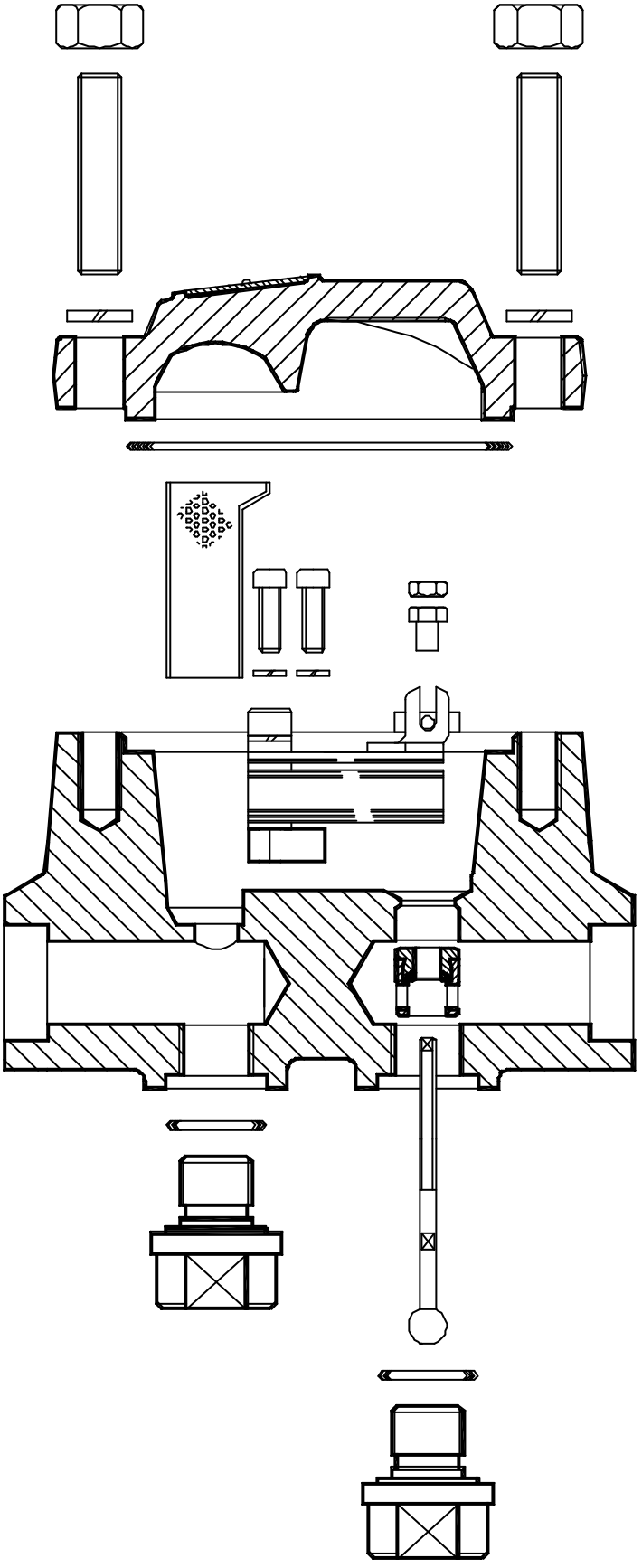
Ensure both test plugs are fully tightened fitting new gaskets if necessary. For current production a shoulder is machined on the plug to ensure correct compression of the gasket. Ensure that the plug is tightened until this shoulder is in contact with the trap body.

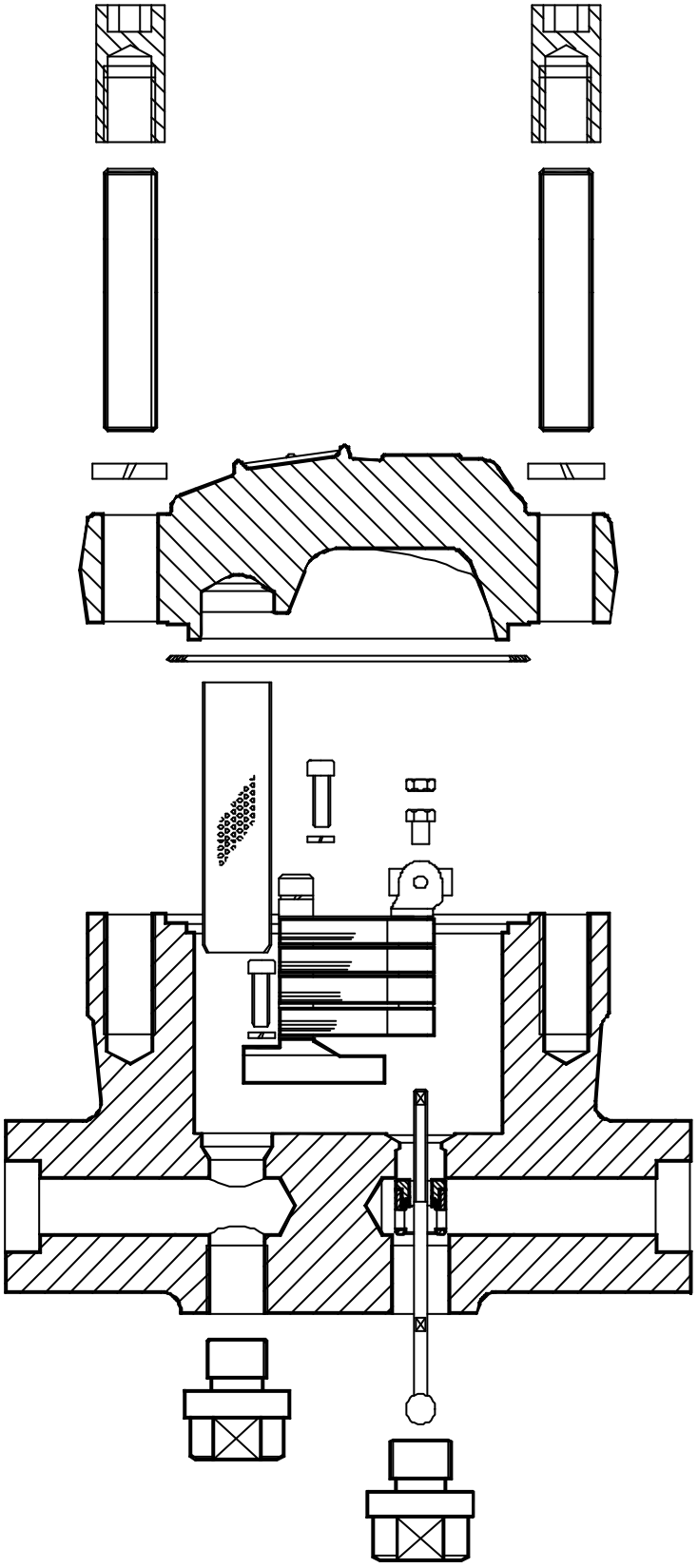
Some older models may be fitted with ½" NPT taper plugs.

N150/300



N675/900/1500





5. TOOL PART NUMBERS

MODEL	STEM KEY	SETTING GAUGE	LINER BAR	SEAT LOCATING TOOL
N150/300	L99002	L99005/B1	L99014	NOT REQUIRED
N675	L99002	L99005/B1	L99027	L99046
N900/1500	L99002	L99005/B1	L99027	L99045
N2500/2600	L99002	L99005/B2	L99011/1	L99046/1

6. BOLTING TORQUE

MODEL	COVER	
	Ft.lb	Nm
N150/300 N675/900/1500	60	81
N2500/N2600	180	244