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INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

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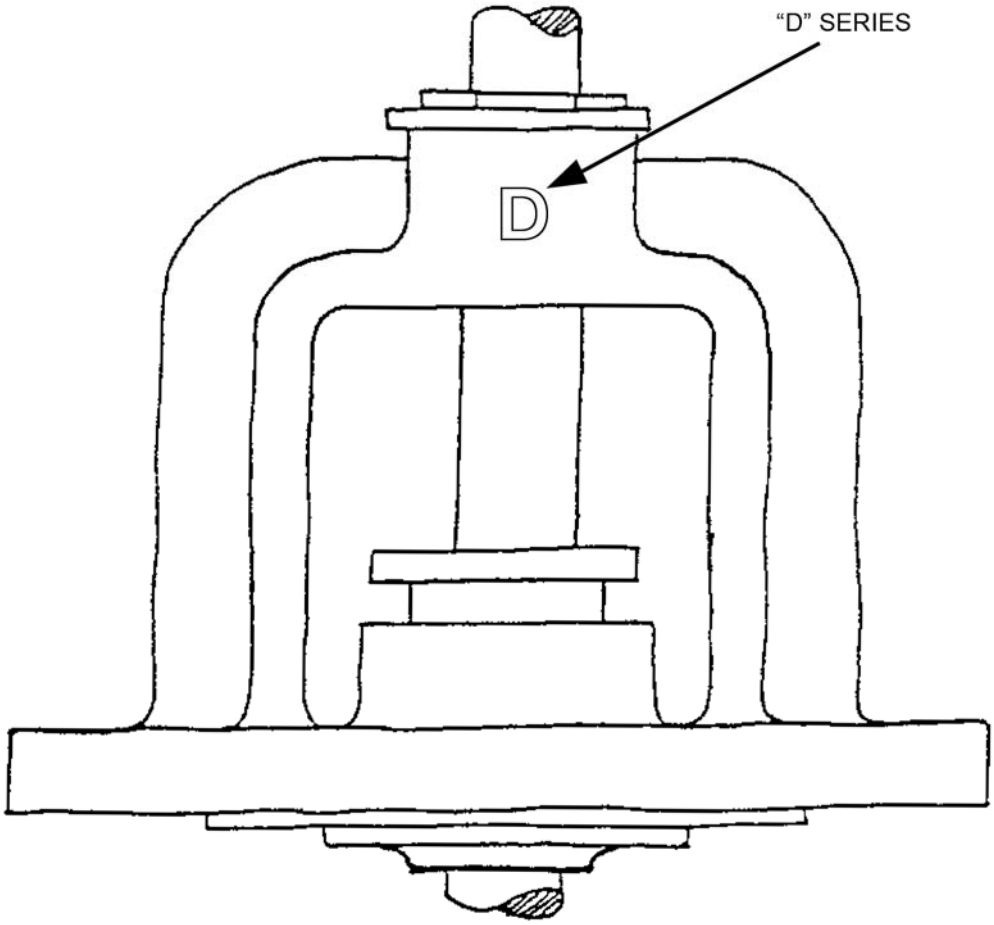
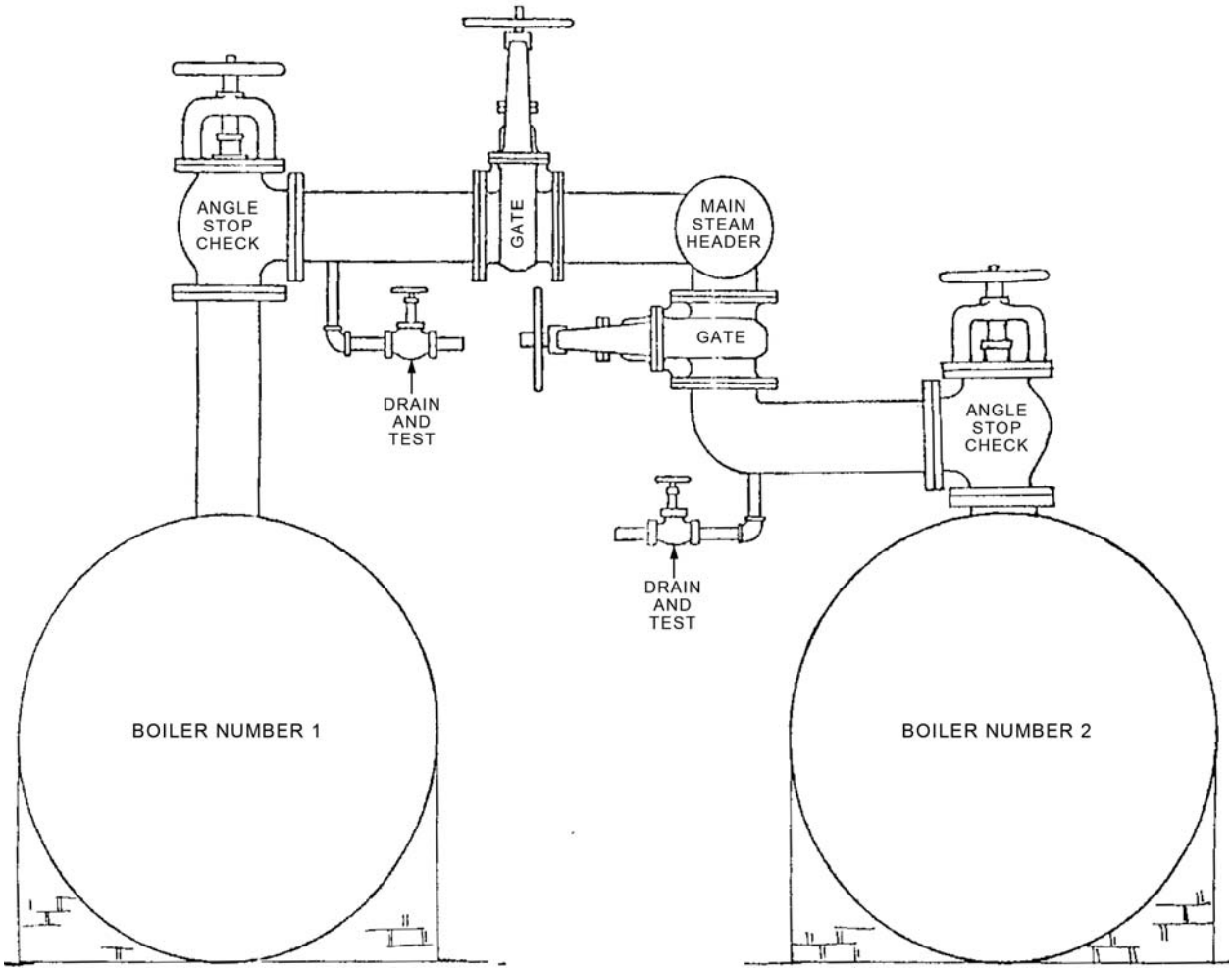
Installation and Maintenance Guidelines for NIBCO® Automatic Steam Stop Check Valves (F-869-B) "D" VERSION ONLY



The "D" series valves are identified by the raised letter "D" cast into the bonnet as shown above.

These guidelines apply only to the valves so marked.

CAUTION: Only qualified personnel should undertake the procedures outlined in this document. NIBCO INC., its agents, representatives and employees assumes no liability for the use of these procedures. These procedures are offered as suggestions only.


ANGLE
STOP
CHECK
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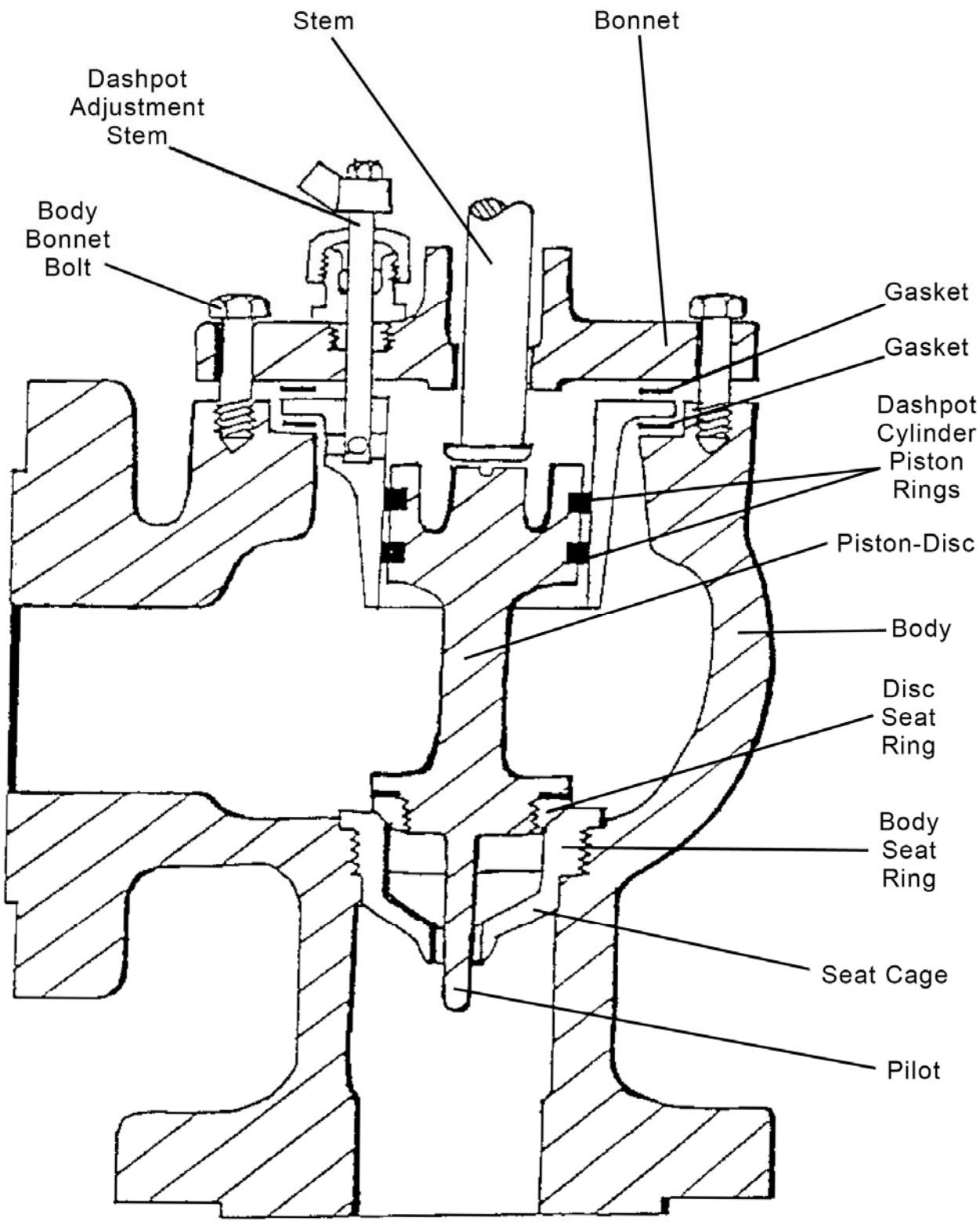
BOILER NUMBER 2


Stem
Bonnet
Dashpot
Adjustment
Stem
Body
Bonnet
Bolt
Gasket
Gasket
Dashpot
Cylinder
Piston
Rings
Piston-Disc
Body
Disc
Seat
Ring
Body
Seat
Ring
Seat Cage
Pilot

Guidelines for Disassembly and Cleaning
NIBCO® F-869-B Automatic Steam Stop Check Valves

The NIBCO F-869-B automatic steam stop check valve is the preferred type of valve used on discharge nozzles of steam boilers in multiple boiler installations. The ANSI/ASME Power Piping Code B31.1 makes reference to this in Section 122.1.7A.

Periodically it may become necessary to perform maintenance on these valves to keep them performing at their best. Depending on the water used, conditioners used in the water, as well as other characteristics of the piping system, accumulation of scale and other foreign materials may interfere with good operation of the valve.

After some years of operation, it would be wise to disassemble the valve and inspect for buildup of scale, damage to seating surfaces or any other cause that may interfere with good operation. This can be done during normal shutdown and is not a complicated or expensive job if done properly. Normally, insulation will not have to be removed. Insulation is usually limited to the body portion of the valve. The body should not have to be removed from the system in the majority of cases. In an effort to improve maintenance efficiency, some large multiple boiler installations with four or more boilers keep a spare valve on hand and change one valve every year. This gives the maintenance staff the opportunity to renew one valve each year at their convenience. The following will be a step-by-step guide for this purpose. Also included will be guidelines for renewing the seat and disc surfaces.

CAUTION: A valve shop can do this type of work if they are competent. You may want to check with others in your locale to find out if there is a competent valve shop in your area; but in no case undertake this work yourself or assign this work to others if you have any doubts concerning safety and/or possible damage to the valve or the piping system.

1. Shut down, isolate and drain the portion of the system where the valve is located. Let the system cool off before starting any work on the valve.

2. Mark the body and the bonnet of the valve with chalk or an ink marker in three or four places at the bonnet-body joint to serve as aligning marks during reassembly. Open the valve main operating stem all the way with the handwheel.

3. Remove the valve bonnet-body bolts.

4. Remove the bonnet assembly from body. This must be done very carefully to avoid damaging the main operating stem or the dashpot adjustment stem. The dashpot adjustment stem sticks down into the dashpot without much clearance. Jerking or quick release of the bonnet may result in damage. It may be necessary to loosen the gasket between the bonnet and the dashpot in the body with a putty knife or some similar tool before lifting off the bonnet. Be careful to lift the bonnet straight up until the dashpot adjusting stem clears the dashpot. Take care when setting the bonnet down not to damage or bend the dashpot adjusting valve stem.

   Mark the position of the dashpot adjustment assembly on the bonnet if you remove it from the bonnet. You may want to mark the open and closed position of the dashpot adjustment valve permanently by using a small punch mark on the top of the bonnet.

The full operation of this adjustment is only of a turn, 90°, from full open to full close.

5. Remove and discard the gasket between the bonnet and the top lid of the dashpot cylinder. It is not worth the gamble to use an old gasket over again when you consider the valve my leak at the joint afterwards.

6. Mark the dashpot cylinder and body with an ink marker or chalk for alignment when reassembling. The dashpot cylinder may be stuck to the body. Carefully pry the lip of the dashpot cylinder to loosen. Remove the dashpot cylinder. Remove the piston-disc assembly. Lift straight up so as not to bend the disc pilot on the bottom of the disc.

7. Remove and discard the gasket between the body of the valve and underside of the lip on the dashpot cylinder. Carefully clean gasket surfaces.

8. Inspect the valve carefully for evidence of wear, buildup of scale, other foreign matter and any other problem which may cause the valve to operate erratically or incorrectly. It will not be necessary to disassemble the piston-disc, disc seat and pilot to thoroughly examine all components. It will be necessary to examine the piston rings for wear or damage. If they are worn or damaged, they must be replaced. They are not repairable.

   Be very careful not to score or mark any of the components while examining them. This is an unhandy procedure so extra care must be taken. It is easy to break or bend the disc pilot on the bottom of the disc if proper care is not taken. The piston rod cannot be removed from the disc or the piston, as it is all one piece.

9. Clean all components as necessary, except the seating surface on the disc and in the body seat. Use light emery cloth of fine sand paper so no large scratches are made on the operating surfaces or sealing surfaces. Check the disc pilot hole in the bottom of the body seat cage.

10. Replace any damaged and non-repairable components. It is always better to change a questionable component then to use it.

11. If the disc and seat are leaking and need to be renewed, cut strips of 120 grit emery paper about 1-1/2” long and 3/8” or 1/2” wide. Using double-backed adhesive tape, stick strips on the seat ring seating surface. The strips should be evenly spaced around the seat. Place the disc in the body and rotate the disc back and forth with very light pressure. The further around you can rotate, the better the surface you will get. Finish up with full rotation. Examine surface periodically, and the new surface will be seen developing. When complete, the new surface on the disc should be all the way across equal to the width of the seat ring seating surface.

12. Repeat this previous step on the seat ring by placing the strips of emery and double-backed tape on the disc.

13. Clean thoroughly then rotate the disc once or twice lightly in the seat. A shiny line should appear all the way around on the disc and the seat ring. Repeat the above steps until this shiny line can be clearly seen. This line must be unbroken if a good seal is to be achieved. A break in the line is a place the valve will leak. Repeat as needed.

14. Before reassembly make sure all the components are thoroughly clean, particularly gasket surfaces. Check carefully inside the valve body (still mounted on the boiler). It is very important that all foreign particles and residue be removed from the valve. A light lubricant such as kerosene or fuel oil may be used very sparingly for parts difficult to reassemble. A drop or two is plenty.

15. Two new identical gaskets are required – one on top of and one under the lip of the dashpot. The top one will seal against the bonnet and the bottom one will seal against the body of the valve. Carefully replace the cylinder in the valve body with one gasket under the lip. Carefully reinstall the disc-piston assembly into the valve making sure the disc pilot pin is through the pilot pin hole in the seat ring cage. Use aligning markings put on earlier. Make sure the piston-disc can slide up and down freely before going any further. This can be done by grasping the piston and pulling up and down. Use two vise grips on the flange and dashpot cylinder to keep the dashpot from moving. Don't forget to use a tongue depressor or the like under the vise grips to keep from damaging the flange and dashpot lip.

16. Carefully place the bonnet and one gasket on top of the valve body making sure the stem of the dashpot adjustment can move freely. Align with markings put on earlier. Make sure the valve stem is well open (by turning the handwheel counterclockwise) so the stem is not pressing on the piston. Damage can be caused when the bonnet-body bolts are being tightened if this is not done.

17. Make sure that the body and bonnet bolts are thoroughly cleaned and lubricated before fastening down the bonnet. Check each threaded hole carefully. Install all bolts finger tight then torque to the figure indicated in foot pounds on the attached sheet and use the tightening sequence indicated.

18. Operate the stem up and down by turning the handwheel counterclockwise then clockwise to make sure nothing is preventing the piston from rising.

19. When the boiler is brought back up and steam is flowing through the valve, it is a good idea to check for complete operation of the automatic feature. This would require closing off then reopening. The valve should then open automatically. With pressure in the header, if the boiler is shut down, the valve should close automatically. (The handwheel should be in the wide open position to operate in the full check position).

CAUTION: When doing these final checks, your specific system may require additional operation for safe performance and to prevent damage to boiler or piping components. These steps are suggestions to check out the valve only – the operator must keep in mind the characteristics of his own system and check out the valves using the steps based on these characteristics.

APPENDIX I

Body to Bonnet Bolt Installation Procedure for NIBCO® Cast Iron, Alloy Iron and Ductile Iron Valves

The following procedure outlines the methods to be used in the assembly of and field installation of the body to bonnet bolts and nuts in order to assure the proper clamping stresses. The correct sequence and torque for tightening the body to bonnet bolts and nuts is also identified.

These instructions apply for ASTM A307 Grade B high tensile strength bolting material used on NIBCO cast iron, alloy iron, and ductile iron valve body and bonnet flange joints.

1. Visually inspect all threads and remove all foreign matter such as rust, dirt, corrosion and any lubricant.

2. Clean the body gasket and bonnet gasket seating area thoroughly.

   The gasket seating area must be clean prior to assembly as the area becomes inaccessible after assembly. The area is to be cleaned with a suitable solvent or cleanser that can remove all dirt, grime and gasket particles.

3. The threads of the bolts and the surfaces under the bolt heads and nuts are to be coated with an anti-seize compound such as Felpro, type C5A Hi-Temp Anti-seize compound or equal. The threads of the nuts should also be lubricated. Clean off excess lubricant with solvent as noted in Item 2.

4. Clean off the gasket. Make sure that no foreign particles are stuck to it that might cause a leak. Make sure the gasket is the correct size. It should fit inside the bonnet-body bolt holes.

5. Place the bonnet in position; insert the bolts and hand tighten the nuts against the body. A minimum of 2-1/2 threads should extend beyond each nut.

6. After the nuts are hand tight, follow the tightening sequence shown in the table. The sequence shown is an illustrated method only, and the actual sequence is dependent upon the total number of bolts.

7. The use of an air impact device which does <u>not</u> have a direct torque control is prohibited for the torquing of body to bonnet bolts. The use of a hand torque wrench, electronic torquing system, or power wrench with direct torque control is recommended. If such equipment is not available, the following standard wrenches may be used:

1/2” bolts	6” wrench
5/8” bolts	12” wrench
3/4” bolts	18” wrench
7/8” bolts	24” wrench
1” bolts	36” wrench

IRON VALVE BOLT TORQUE

Before tightening, make sure all surfaces that the fastener will contact are clean and dry.

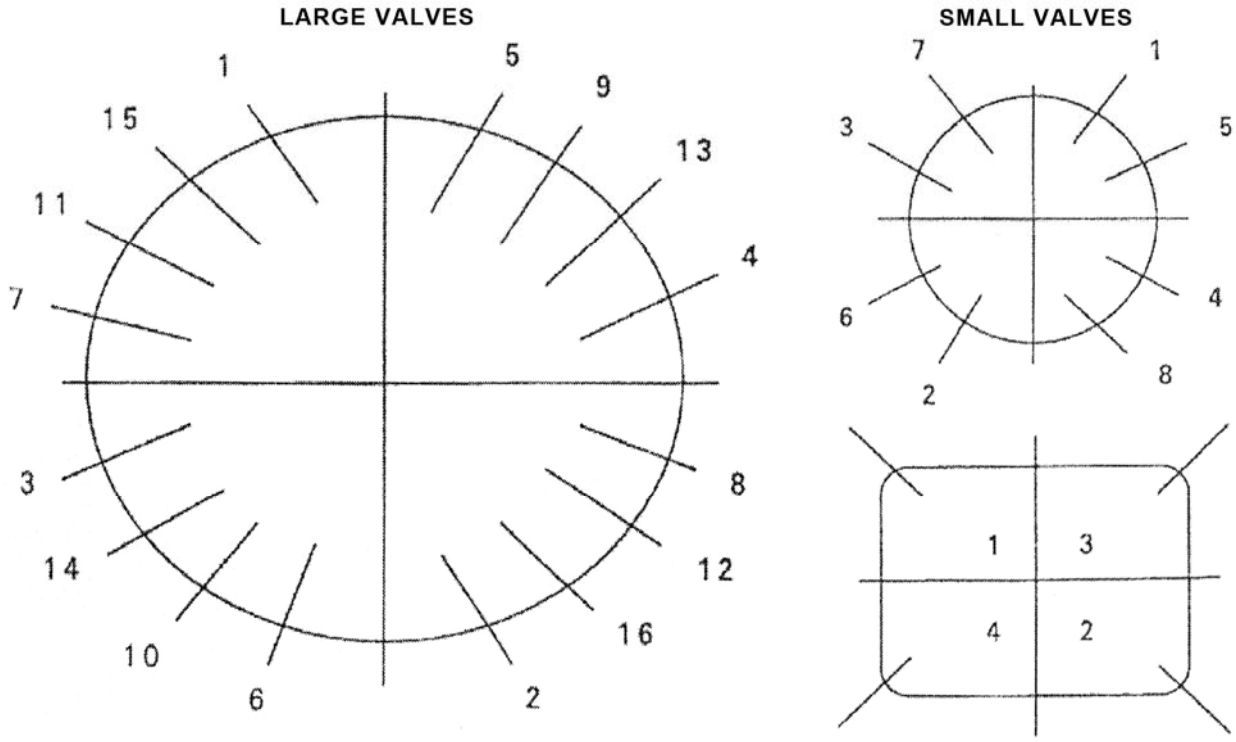
The torque tightening table listed below applies to clean, undamaged, well lubricated threaded fasteners. When tightening, use the sequence chart below. Tighten in two steps.

When tightening, use the sequence chart below. Tighten in two steps.

1. Tighten fastener using about 1/2 the final torque figure.
2. Final tighten using the full torque figure. ASTM A307 steel only.

Fastener Size	7/16	1/2	9/16	5/8	3/4	7/8	1	1-1/8	1-1/4	1-3/8	1-1/2
Torque in Ft. Lbs.	30	45	66	93	150	202	300	474	659	884	1057

BOLT TIGHTENING SEQUENCE



VALVE SALES INFORMATION

Technical Bulletin
July 1, 1980

September 26, 1969
Reissued May 20, 1985

(Everything You Always Wanted to Know About) NIBCO F-869-B Automatic Stop-Check Valves

Stop-check valves are as essential to the safe operation of a multi-boiler plant as any other safety device that is attached to a boiler, and have four very important functions in the steam piping systems.

1. To act as an automatic non-return valve by preventing the back flow of steam from the header to the boiler in the event of failure in the boiler.

2. To assist in cutting a boiler out of the steam system when it has ceased to fire. In this case the disc automatically closes and prevents the pressure in the header from entering the boiler.

3. To assist in bringing a boiler into service after a shutdown. This operation requires considerable care when performed manually, but is accomplished automatically by a stop-check valve without pressure fluctuations or disturbance of the water level.

4. To act as a “safety first” valve by preventing back flow of the steam from the header into a boiler that has been shut down for inspection should the valve be opened accidentally.

There are three basic questions regarding the NIBCO stop-check valve:

1. What is a stop-check valve?
2. Where is it used?
3. How does it work?

Question #1 – What is a stop-check valve?

The purpose of a stop-check valve is predominantly in the steam line at the boiler steam riser. It allows steam to pass through it from the boiler to the main steam header, but in case the boiler steam delivery is interrupted, the stop-check will automatically prevent steam from flowing back into the boiler. The stop-check valve is a back flow preventer. Its function is the same as the swing or lift check valve in that it allows flow in one direction but not in the opposite direction.

A stop-check valve can also function as a stop and throttling valve the same way as a globe pattern valve is used.

Question #2 – Where is a stop-check valve used?

The stop-check valve is designed to be used between the boiler steam exit and the steam header in a multiple boiler plant to serve as a backflow preventer and stop valve.

Generally, there are two valves between the boiler and the header. One valve is a stop-check valve and the other valve is a stop valve, either gate, angle or globe type. The two valves are used to make maintenance more convenient and in most cases, are required by code for the inspectors safety while inspecting the boiler (See sketch).

Question #3 – How does a stop-check valve work?

As stated in the answer to question #1, the stop-check valve in principle works like a lift check valve but with two very important additional features:

1. A method is provided to control the rate of ascent and descent of the disc.

2. A means is provided to close the disc positively so that the fluids may not flow in either direction regardless of the pressure differential.

Various manufacturers provide different methods of controlling dashpot movement. Basically, the two methods are by spring tension or dashpot arrangement.

Lunkenheimer is the only manufacturer that produces a valve with an external spring tension adjustment to control the disc movement. Other manufacturers, including NIBCO, use the less complicated dashpot arrangement. NIBCO is the only manufacturer who supplies a valve with an external control of the dashpot. All other popular manufacturer's valves must be disassembled so that the piston rings may be added or removed to respectively slow down or speed up automatic disc movement.

Generally, all manufacturers provide a globe valve stem arrangement to positively close the disc. This stem merely pushes down on the disc through the linkage on the Lunkenheimer valve, or the dashpot piston on other valves (See sketch).

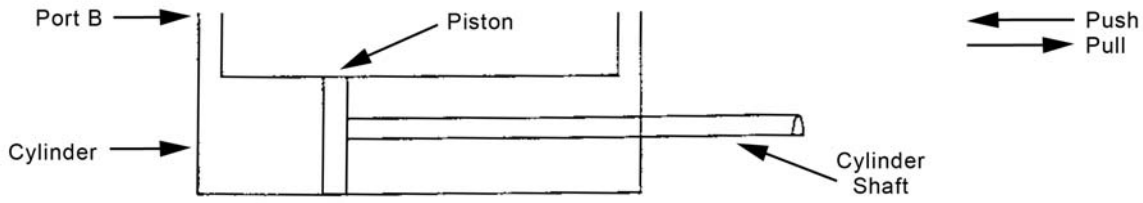
The purpose of the dashpot is to control the rate of ascent and descent of the disc so that the disc does not slam and chatter in the line. Since valves are connected to a network of pipes in the system, this would mean that the noise of a slamming and chattering disc could be transmitted through the piping system. This noise is distracting in office buildings, hospitals, etc, where concentration is essential. Moreover, the slam and chatter is extremely harmful to the disc. It should also be noted that slamming and chattering of the disc causes pulsations within the steam line which makes it very difficult for automatic steam regulator and other steam equipment to function properly. Therefore, the disc must be controlled by some means of dampening which, in most cases, is the dashpot.

The disc has a tendency to slam and chatter at various times. Usually the slam and chatter will be obvious when the boiler is coming up to operating pressure. At this time, the steam is tending to lift the disc and as it does the pressure in the boiler drops allowing the disc to fall and make noise. Sometimes this is in the form of a slam, or it can be in the form of a chatter if it occurs many times a minute. The disc can also make noise at periods when the boiler is at peak delivery. Here the disc can rise rapidly banging up against the stem end or the dashpot housing to cause noise.

We cannot stop the disc from coming into contact with the seat or stem, but we can and do control the rate of impact to prevent loud noises in the piping system.

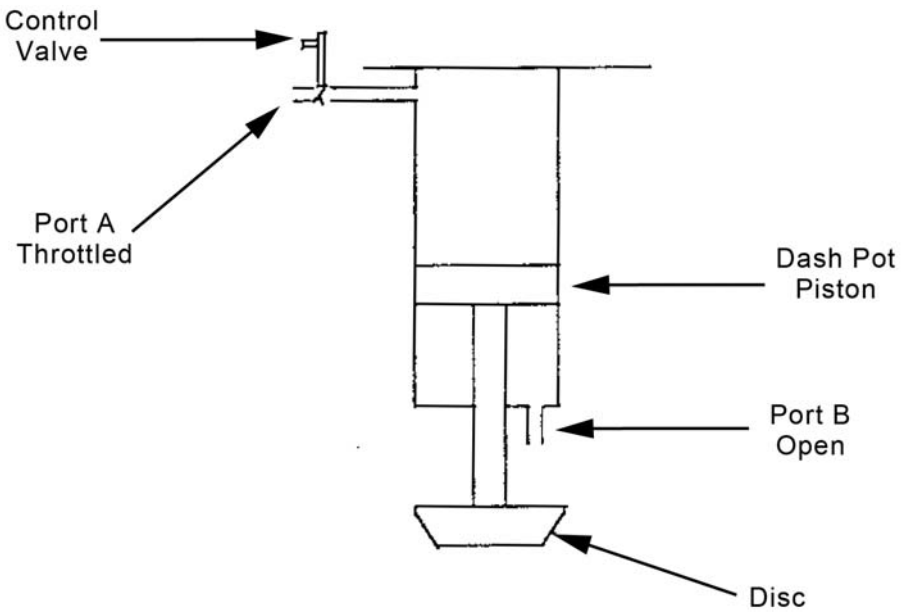
Finally, we come to the questions – How is this done? How does the dashpot work? How is the adjustment made?

The dashpot is the same in principle as a shock absorber on an automobile. It does not prevent, but rather controls the rate of movement. The dashpot must have fluid to displace. In the case of the stop-check, this fluid is the fluid within the piping system, namely steam. All dashpots are very similar to an air cylinder.



If one tries to push the disc-piston down in the cylinder, air will come out of the bottom of the cylinder into Port A. Pushing the disc-piston up in the cylinder will cause air to be pushed through Port A. Now if a throttle (dampener) valve is put on Port A and throttled very closely, the same amount of force applied to push down the disc-piston will allow a much reduced rate of air movement. This creates a partial vacuum in the cylinder. This reduces the rate of descent much as ketsup is held in the bottom by a partial vacuum. So, when the disc bottoms out there will only be a small click heard instead of a loud bang. The rate of travel will be controlled by the dampener control valve being opened or closed.

We have now developed the principle on which the NIBCO stop-check valve was designed, only now we add the principle of gravity and keep the air cylinder in the vertical position and add a disc to have the following diagram.



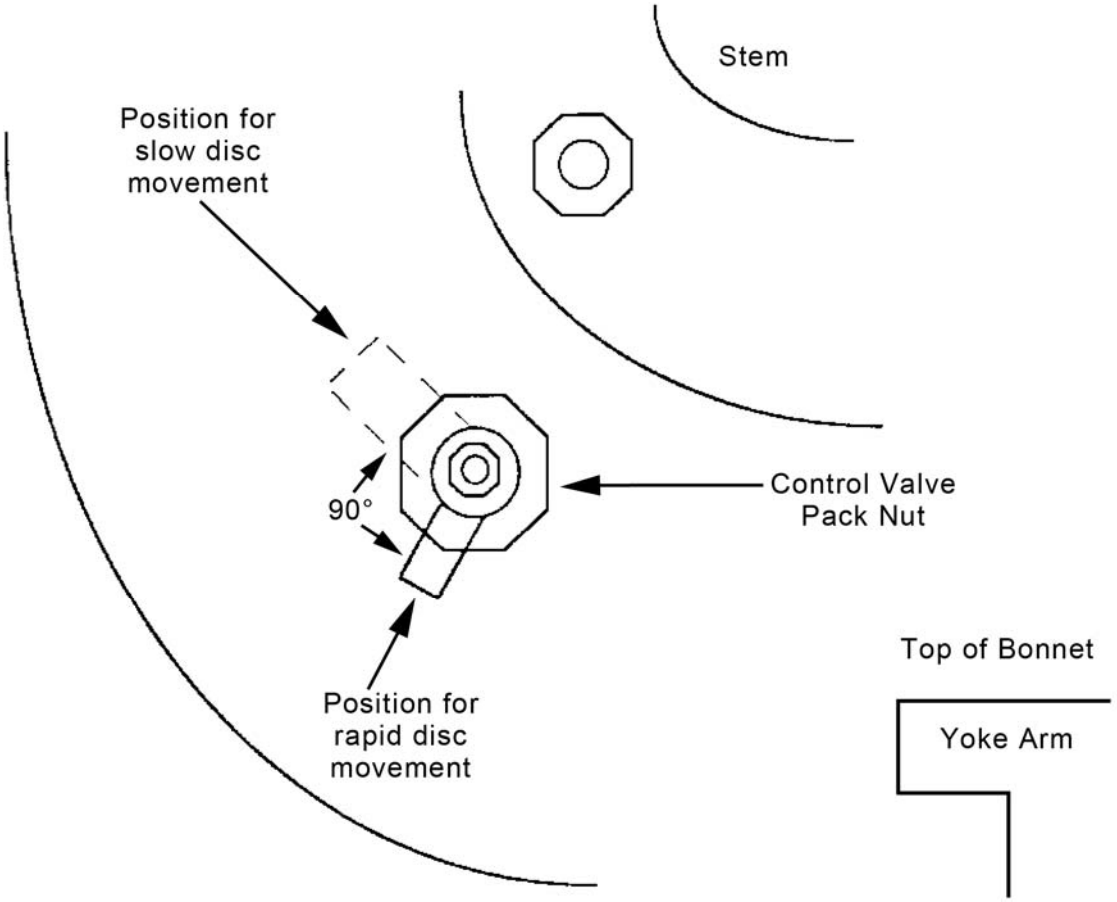
Now note that Port B is merely a drilled hole at the bottom of the dashpot, which allows the steam to enter and exit freely. Also, it serves to drain any resultant condensation. Port A, you will note, has a control valve which can be throttled to allow steam to enter the chamber above the piston, either rapidly for quick descent or slowly for a slow descent. This is a function of the

dashpot arrangement. It should be pointed out that the stop-check valve must always be in an upright position with the handwheel on top of the valve. If this is not done there is no way that the valve will work in its proper capacity.

Adjusting the F-869-B NIBCO Automatic Stop-Check Valve

The external control valve near the packing gland requires only a quarter turn to allow the disc to descend or rise slowly or rapidly when the F-869-B valve is functioning as an automatic stop and check valve (See sketch).

If slam or chatter exists in the line, the small control valve should be moved through 90° until the noise no longer exists. At this point, the small packing nut on the control valve should be tightened to assure the control valve does not move from its setting.



If a noise problem is still present and the steam delivery from the boiler is at a minimal operating range, the delivery may have fallen below the range the valve was designed for. This may be corrected by partially closing or “throttling” the valve by closing the handwheel. It is important to remember the valve must be opened again when the boiler demand is increased. If the steam delivery is changed to any great degree, the adjustment procedure may have to be repeated.

NOTE: 2-1/2” and 3” F-869-B stop-check valves do not have external disc control valves. The disc control setting is made at the factory and permanently fixed.

Sizing the NIBCO F-869-B Automatic Stop-Check Valve

It has been said that the automatic stop-check valve is the most sophisticated valve in the NIBCO line. One reason for this statement is the procedure required to select the proper size stop-check valve for a given installation.

The obvious way to determine valve size is to match the pipe diameter. For the stop-check valve this is not correct. In many boiler installations a valve smaller than pipe size could and should be selected. There are cases where a 3" stop-check valve should be used on a 8" header.

Size specification of the stop-check valve used on the boiler system is usually done by the architect or engineer, but it should be possible for the NIBCO salesman or technical services to assist the wholesaler or contractor in selecting the right valve if there is some doubt.

In order to size a stop-check valve, the technical information needed is saturated steam pressure, maximum and minimum required steam volume flow in pounds per hour. This information is then applied to the flow rates on the chart attached to determine proper valve size.

Boiler "turn down ratio" must also be considered. If the turn down ratio is 4:1, this means the boiler maximum output can be reduced to 25%.

Another technical question that comes up regarding our automatic stop-check valve is what pressure is required to open the disc on various sizes?

The line pressure required to open the valve is a function of the disc and dashpot piston weight and the size of the port diameter. For instance, on a 6" valve the weight of the piston is 7 pounds and the disc weighs 12-1/2 pounds for a combined weight of 19-1/2 pounds. The diameter of the opening is 6" or an area of 28.2 inches squared. Therefore, the minimum pressure required to open the valve, disregarding friction which is minimal, would be:

$$\frac{\text{19.5 pounds for weight of piston}}{\text{28.2 inches squared}} = .7 \text{ PSI}$$

Due to the design of the valves, all sizes open with a .7 PSI differential across the seat, providing the valve is properly installed (handwheel is in the open position), the valve has not been damaged (for instance, the pilot on the disc has not been bent) and no foreign particles from the line have cause the working parts to become inoperative.

In the event that a boiler does shut down, the stop-check valve must prevent backflow into the boiler. The weight of the disc-piston, through the force of gravity, promotes rapid sealing so steam and condensation cannot backflow into the boiler even at low pressures. The weight of the disc and piston is very helpful, especially in low pressure systems. In the NIBCO stop-check valves, you will note that the disc is mounted to permit the disc to settle into the seat area for positive sealing in case there is any misalignment due to assembly or uneven heat expansion. This feature also permits field repair of the valve seat without fear of improper assembly by field mechanics.

Theoretical Stop and Check Angle Valve Saturated Stem Flow Rates (Figure Number F-869-B)

VALVE SIZE	PRESSURE DROP PSI	SATURATED STEAM PRESSURE GAGE	STEAM VOLUME FLOW POUNDS PER HOUR
2-1/2”	2	10	1,540
2-1/2”	2	50	2,420
2-1/2”	2	120	3,520
2-1/2”	2	250	4,840
3”	2	10	2,200
3”	2	50	3,520
3”	2	120	4,840
4”	2	10	3,740
4”	2	50	5,940
4”	2	120	8,250
4”	2	250	11,550
6”	2	10	9,900
6”	2	50	15,400
6”	2	120	23,100
6”	2	250	33,000
8”	2	10	16,500
8”	2	50	27,500
8”	2	120	38,500
8”	2	250	55,000
10”	2	10	27,500
10”	2	50	44,000
10”	2	120	63,800
10”	2	250	88,000
4”	5	10	7,150
4”	5	50	11,000
4”	5	120	16,500
4”	5	250	23,100
6”	5	10	16,500
6”	5	50	25,300
6”	5	120	37,400
6”	5	250	51,700
8”	5	10	29,700
8”	5	50	46,200
8”	5	120	66,000
8”	5	250	93,500
10”	5	10	48,400
10”	5	50	77,000
10”	5	120	104,500
10”	5	250	154,000

For any technical enquiries please call NIBCO Technical Services.