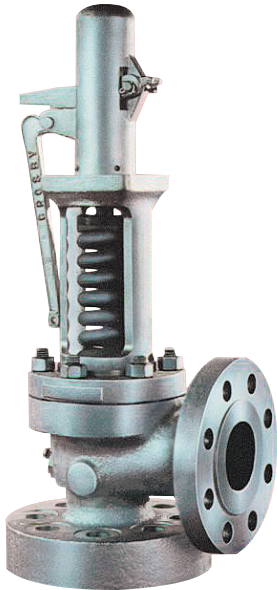




CROSBY SERIES HSJ SAFETY VALVES

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Before installation, these instructions must be carefully read and understood.



OVERVIEW

Series HSJ is a full nozzle reaction type safety valve designed for saturated and superheated steam service on drums, superheater outlets, reheater inlets and outlets and economizer applications. Increasing operating efficiency through the use of the FLEXI-DISC™ seat design. The FLEXI-DISC™ seat design is recessed for pressure and temperature equalization, ensuring a flat and tight seal.

SPARE PARTS

Emerson recommends spare parts as shown on the outline drawing Figure 1. When ordering spare parts, the valve size, style and assembly number and/or serial number should be given together with set pressure, part name, and reference number from Figure 1. The valve assembly number is shown on the valve nameplate as 'Shop No'. Spare parts may be ordered from any Emerson regional sales office or representative.

SERVICE RECORDS

Service records should be completed before a valve is returned to service. These records are important and will provide guidance on establishing time intervals between repairs as well as providing the historical record of repairs and service conditions. Well kept records will be useful in predicting when to retire a valve and which spare parts should be maintained in inventory to ensure uninterrupted plant operation.

WARNING

The safety of lives and property often depends on the proper operation of the safety valves. Consequently, the valves should be kept clean and should be tested periodically and reconditioned to make sure they function properly.

EMERSON FIELD SERVICE AND REPAIR PROGRAMS

Field service

Emerson field service provides on-site, in line testing and repair capability for all types of pressure relief devices. It is strongly recommended that on new installations, a Emerson service engineer be present for assembly and testing of safety valves.

Parts

Emerson will help you establish the right mix of on-site spares with our own distribution and manufacturing support.

Training

Emerson offers intensive factory or on-site training seminars to improve maintenance and application skills.

Testing

Emerson has the capability to evaluate safety valve operability either in the field or at various Emerson facilities. Special qualification programs may also be conducted in our laboratories.

Contract management

Emerson will combine a group of services to satisfy your special maintenance needs.

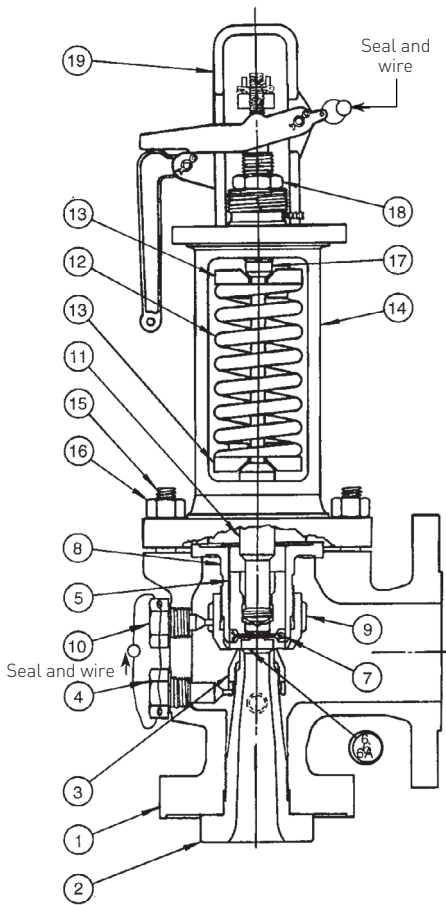
Emerson' full-spectrum service

- Valve repair
- Field service
- Replacements parts
- Contract management
- Training
- Testing
- Contract

CROSBY SERIES HSJ SAFETY VALVES

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

FIGURE 1



NOTES

1. Consumable spare parts: soft goods (gaskets, etc.) which should be replaced as part of any disassembly, and disk inserts which must be replaced if seats are damaged.
2. Repair spare parts: goods exposed to wear and/or corrosion during normal operation. They are in fluid flow paths and may require replacement as part of any repair.
3. Insurance spare parts: hard goods exposed to process or environmental wear and/or corrosion and may require replacement as part of a major repair.

Emerson recommends that sufficient inventory of spare parts be maintained to support process requirements.

Always be sure to use genuine Emerson parts to ensure continued product performance and warranty.

VALVE NAMEPLATE

ANDERSON GREENWOOD CROSBY, STAFFORD, TX					
SIZE	2 H 3	HSJ-46			
SHOP NO.	82216000	SET PRESS PSI	600 PSI/G	CDTP PSI	N/A
SER. NO.	VA0035053	BP PSI	N/A	TC PSI	N/A
CAP. 22458 PPH SAT STM				OVER PRESS.	3%
TAG PSV-503					

NOTES

On Series HSJ with closed bonnet option (except Series HSJ-DOW) the bonnet vent MUST REMAIN OPEN. Keeping the bonnet vent open is essential for proper valve operation.

On Series HSJ-DOW (for organic fluid vaporizer generator applications) use a closed bonnet having the bonnet vent plugged and Type A screwed cap.

PARTS LIST

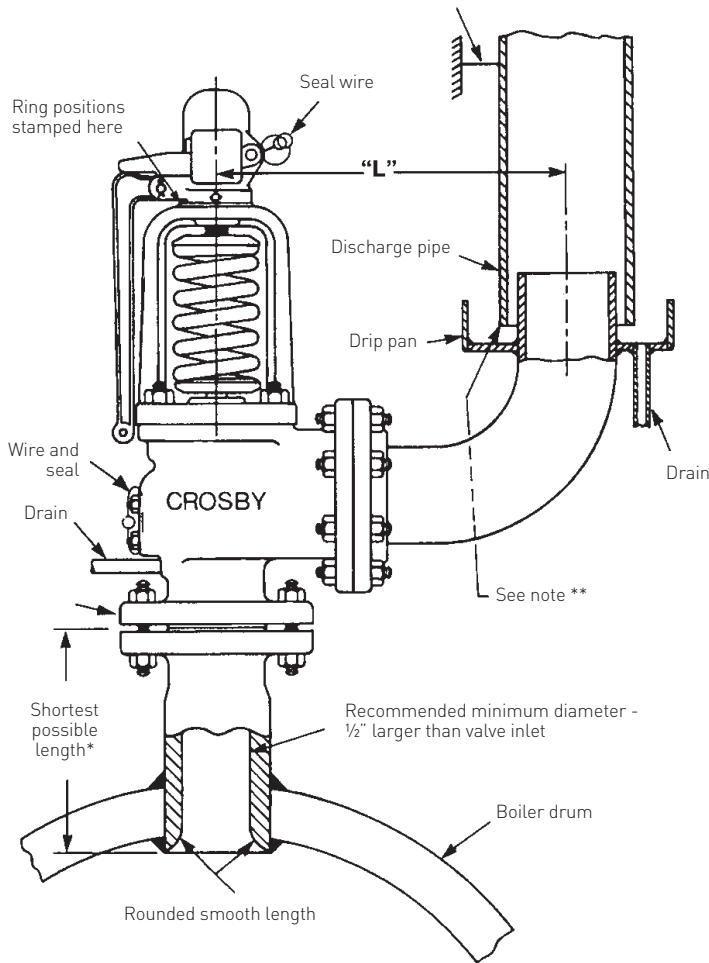
Part No.	Part name	Material and maximum temperature		Spare parts designation (See notes 1, 2, 3)
		750°F (399°C)	1000°F (538°C)	
1	Body	Carbon steel ASME SA-216 Gr. WCB	Alloy steel ASME SA-217 GR. WC6	
2	Nozzle	Stainless steel	Stainless steel	3
3	Nozzle ring	Stainless steel	Stainless steel	3
4	Nozzle ring set screw	Stainless steel	Stainless steel	3
5*	Disk holder	Nickel alloy	Nickel alloy	2
6*	Disk insert	Stainless steel	Stainless steel	1
6A*	Disk	Stainless steel	Stainless steel	1
7*	Disk insert cotter	Stainless steel	Stainless steel	1
8	Guide	Nickel alloy	Nickel alloy	3
9	Guide ring	Stainless steel	Stainless steel	3
10	Guide ring set screw	Stainless steel	Stainless steel	3
11	Spindle assembly	Stainless steel	Stainless steel	3
12	Spring	Alloy steel Corrosion resistant coating	Alloy steel Corrosion resistant coating	3
13	Spring washers	Steel	Steel	3
14	Bonnet	Carbon steel ASME SA-216 Gr. WCB	Alloy steel ASME SA-217 GR. WC6	
15	Bonnet stud	ASME SA-193 Gr. B7	ASME SA-193 Gr. B7	
16	Bonnet stud nut	ASME SA-194 Gr. 2H	ASME SA-194 Gr. 2H	
17	Adjusting bolt	Stainless steel	Stainless steel	3
18	Adjusting bolt nut	Steel	Steel	3
19	Cap lever assembly	Steel/iron	Steel/iron	
	Gaskets	Organic fiber non asbestos	Organic fiber non asbestos	1

* One piece disk (6A) replaces part reference numbers 5, 6 and 7 in orifice sizes F, G, H, and J for CL 150, CL 300 and CL 600.

CROSBY SERIES HSJ SAFETY VALVES

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

FIGURE 2 Fixed support anchored to building structure



NOTES

- * Refer to ASME boiler code section 1, pg-71.2
- ** Allow sufficient space to prevent bottoming or side binding of the drip pan to the discharge pipe under maximum conditions of expansion

CAUTION

The valve should never be lifted or handled using the lifting lever.

WARNING

To have trouble-free performance be sure to clean the inlets and outlets of valves thoroughly before installing. All dirt, sediment and scale in the protected vessel and piping must be removed completely before installation (foreign material entering the valve may cause seat leakage, plugging and valve malfunction).

1 INTRODUCTION

Crosby Series HSJ safety valves have been selected because of their performance features, reliability and ease of maintenance. Adherence to the installation and maintenance procedures specified herein will provide the utmost in safety, a minimum of maintenance and a long service life. Crosby Series HSJ safety valves are manufactured in accordance with the requirements of Section 1, Power Boilers, and Section VIII and Section XIII, Unfired Pressure Vessels, of the ASME Boiler and Pressure Vessel Code.

2 STORAGE AND HANDLING

Often, valves are on hand at the job site months before they are installed. Unless stored and protected properly, valve performance may be affected adversely.

Rough handling and dirt may damage or cause misalignment of the valve parts. It is recommended that the valves be left in their original shipping containers and that they be stored in a warehouse or at a minimum on a dry surface with a protective covering until they are used.

CROSBY SERIES HSJ SAFETY VALVES

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

3 INSTALLATION

Rigging

Safety valves must be handled carefully and never subjected to sharp impact loads. While in the shipment case or when uncrated they should not be bumped or dropped. Rough handling may alter the pressure setting, deform valve parts and affect seat tightness adversely.

When it is necessary to use a hoist, a sling should be placed around the valve body and bonnet in a manner that will ensure that the valve is in a vertical position to facilitate installation.

Flange protectors should remain in place until the valve is ready to be installed on the system.

Inspection

Safety valves should be inspected visually before they are installed to ensure that no damage has occurred during shipment or while in storage. All protective material, sealing plugs and any extraneous material inside the valve body or nozzle must be removed.

The valve nameplate and other identifying tags should be checked to ensure that the particular valve is being installed at the location for which it was intended. The seals protecting the spring setting and ring adjustments should be intact. If seals are not intact, the valve should be inspected, tested and new seals installed before use.

Inlet piping

Safety valves should be mounted in a vertical position, directly on the pressure vessel; the nozzle should have a well-rounded approach that provides smooth, unobstructed flow between the vessel and the valve. A safety valve should never be installed on a fitting having an inside diameter smaller than the inlet connection of the valve as restricted flow can cause faulty valve operation.

Inlet piping (nozzles) must be designed to withstand the total resultant forces due to the valve discharging at the maximum accumulated pressure and the expected piping loads.

The precise nature of the loading and the resulting stresses will depend on the configuration of the valve and the discharge piping. This must be taken into consideration by those responsible for the installation of the safety valve and associated vessel or piping. Determination of outlet reaction forces is the responsibility of the designer of the vessel and/or piping.

Many valves are damaged when first placed into service because of failure to clean the connections properly when installed. It is essential that the valve inlet, the vessel and the line on which the valve is mounted be cleaned thoroughly of all foreign material. The inlet connection bolts or studs should be tightened uniformly to avoid straining or distorting the valve body.

Outlet piping

Discharge piping should be simple and direct. Where possible, a short vertical pipe connected through a long radius elbow discharging directly into the atmosphere is recommended. Discharge piping should be designed so as not to impose any loading on the valve. Excessive discharge piping may cause seat leakage or faulty valve operation. The inside diameter of the discharge pipe must never be less than that of the valve outlet.

Valve effluent must discharge to a safe disposal area.

Valve bodies are provided with pipe thread openings for drains. These should be connected to prevent any accumulation of fluid in the valve body. In addition, it is recommended that discharge piping also be drained to prevent any accumulation of fluid. Care must be observed to ensure that the drains are directed or piped to a safe disposal area.

CROSBY SERIES HSJ SAFETY VALVES

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

CAUTION

Gags should not be used when inlet pressures are more than 10% greater than the safety valve set pressure. Damage to the valve may result.

4 HYDROSTATIC TESTING

When a hydrostatic test is made on the system, it is recommended that blank flanges be used in preference to gagging of the safety valves. Excessive tightening of the gag (test rod) may damage or bend the valve spindle. However, when the valves are to be gagged for a hydrostatic test, a gag as shown in Figure 4 on page 10 should be used.

Blank flanges must be removed and the safety valve reinstalled before the vessel is placed in service.

When test rods are used, care must be exercised to prevent overtightening that could damage the spindle and valve seats. Generally, a test rod which is finger tight will provide sufficient force to hold the valve closed.

After the hydrostatic test, the test rod (gag) must be removed and replaced by either a cap plug or a cap not fitted with a test rod.

5 TESTING SAFETY VALVES

Before a new boiler is put in service all safety valves should be tested. Each valve has been set and tested at the factory but service conditions differ and it is sometimes necessary to make adjustments. Safety valves may be tested by raising the system pressure and popping the valve. All safety valves on the system with lower set pressures should be gagged.

6 DESCRIPTION OF OPERATION

The valve will open with a sharp pop at the pressure for which it is set and remain open, relieving full capacity at 3% overpressure. As pressure decays below the popping pressure, the valve will remain open until the blowdown pressure is reached. The valve will close sharply.

7 ADJUSTMENT

Set pressure adjustment

Before making any adjustments, reduce the system pressure under the valve 10% to 20% below the set pressure stamped on the valve. This will prevent damage to internal parts and minimize the chance of an inadvertent valve opening.

For parts identification see Figure 1 on page 2:

- a. Remove the cap (19) and lifting lever device (if any) following the instructions on page 8.
- b. Loosen the adjusting bolt nut (18).
- c. Turn the adjusting bolt (17) clockwise to increase set pressure or counterclockwise to reduce set pressure.
- d. Retighten the adjusting bolt nut (18) following each adjustment.
- e. Once the set pressure has been established replace the cap (19) and lifting lever device (if any) following the instructions on page 9 and install a new seal and wire.

Nozzle ring and guide ring adjustment

The nozzle ring (3) and guide ring (9) adjustment is made at the factory and resetting in service seldom is necessary.

Should it be necessary to change blowdown or reduce valve simmer, the following steps should be taken:

Whenever ring adjustments are changed, a record should be kept of the number of notches and the direction in which the ring was moved. This will make it possible to return to the original setting in case of error.

IMPORTANT

Crosby steel safety valves have the shipment ring settings stamped on the machined surface on the bonnet directly under the cap. See Figure 2.

CAUTION

Should any ring adjustments be made while the valve is installed on a pressurized vessel, the valve should be gagged. Care must be exercised to prevent excessive tightening of the gag that could damage the valve spindle and valve seats. However, sufficient force must be applied to the gag to prevent the valve from lifting.

CROSBY SERIES HSJ SAFETY VALVES

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Guide ring adjustment

The guide ring (9) is the principal blowdown control ring in the valve. To change the guide ring position, remove the guide ring set screw (10) and insert a screwdriver to engage one of the notches. Turning the guide ring to the right raises it and decreases the blowdown. Turning the guide ring to the left lowers the ring, thereby increasing the blowdown.

The guide ring (9) should never be moved more than ten notches either way without retesting the valve. After each adjustment always replace, tighten and seal wire the set screw being careful that its point fits in the notch in the ring without making contact with the ring or bearing on top of a tooth.

Nozzle ring adjustment

The nozzle ring adjustment is determined carefully by factory test and resetting in service is seldom necessary. Should it be necessary, the nozzle ring (3) is adjusted by removing the nozzle ring set screw (4) and inserting a screwdriver to engage the ring notches. Turning the ring to the right raises it and results in a strong 'pop' action that will increase blowdown. Moving the ring to the left lowers the ring, decreasing the blowdown and may result in warn or simmer if lowered too far. The range of adjustment of this ring is limited and it should not be moved more than one notch at a time from its set position. The valve performance should be checked after each adjustment. After each adjustment always replace, tighten and seal wire the set screw (4), being careful that its point fits in the notch without making contact with the ring or bearing on top of a tooth. It is very important not to let the valve pop before the nozzle ring set screw has been reinstalled and tightened.

Restamping

If different ring locations are obtained after testing, restamp the valve bonnet with the new (tested) ring settings.

8 VALVE MAINTENANCE

The functioning and service life of a safety valve depends primarily on methods used in its maintenance. For this reason, the following maintenance procedures are recommended:

Disassembly

When possible, remove the valve from the system before dismantling. There should be no system pressure when a valve is either dismantled in place or removed for shop repair. For parts identification, see Figure 1 on page 2:

- a. Remove the cap (19) and lifting lever device (if any) following the instructions on page 8.

- b. Remove the nozzle ring set screw (4). Check the nozzle ring setting by turning the nozzle ring (3) to the right and counting the number of notches turned until it makes contact with the disk holder assembly (5). Record the number of notches. This location is given as minus (-) notches from this contact position. Remove the guide ring set screw (10). Check the guide ring setting by returning the guide ring (9) to its level position. The guide ring is in level position when the bottom face of the guide ring is level with the bottom face of the disk holder assembly (5). The guide ring should be turned to the right or left, whichever is necessary to return it to its level position. The guide ring position is recorded as minus (-) (down) or plus (+) (up) notches from this level position.
- c. Before releasing the spring load, measure and make note of the height of the adjusting bolt (17) over the top of the bonnet (14). This information will help when reassembling the valve to its approximate original setting.
- d. Loosen the adjusting bolt nut (18). Count the number of turns required to remove the spring load by rotating the adjusting bolt (17) in a counterclockwise direction.
- e. Loosen and remove bonnet stud nuts (16).
- f. Carefully lift the bonnet (14) straight up to clear the spindle (11) and valve spring (12). Exercise care when lifting the bonnet as the spring and spindle will then be free to fall aside.
- g. Lift the spring (12) and spring washers (13) off the spindle. The spring and spring washers are fitted together and must be kept together as a subassembly. Spring washers are not interchangeable between ends of the spring.
- h. The disk holder assembly (5) or disk (6A) and spindle (11) can now be removed from the valve body (1) by lifting the spindle.
- i. Remove the guide (8) and guide ring (9) from the body (1) as an assembly and unscrew the guide ring from the guide.
- j. If the valve has a 2-piece disk design (insert and holder), remove the disk insert cotter pin (7) and the disk insert (6) from the disk holder assembly (5).
- k. Remove the spindle (11) from the disk holder assembly (5) or disk (6A) by pulling up on the spindle rod to engage the spindle point threads in the disk/holder. Turn the spindle counterclockwise while holding the disk/holder still and remove the spindle rod.
- l. Unscrew the nozzle ring (3) from the nozzle (2).
- m. Unscrew the nozzle (2) from the body (1).

CAUTION

Nozzle and guide ring set screws are custom fitted to each valve and are not to be interchanged.

CAUTION

Never loosen bonnet stud nuts before completely releasing spring tension with the adjusting bolt.

CROSBY SERIES HSJ SAFETY VALVES

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

Repair procedure

All the parts should be cleaned thoroughly. Guiding surfaces may be polished using a fine emery cloth. All parts should be examined to determine their condition. Inspection of valve components is important to ensure proper valve performance. Damaged valve parts must be repaired or replaced. Parts identification may be found in Figure 1 on page 2.

Lapping or refurbishing of valve seats

Good seating surface on the nozzle (2) and disk insert (6) or disk (6A) are of the greatest importance when reconditioning the safety valves. The seats should be flat and free from surface scratches.

Lapping block

Lapping blocks are made of a special grade of annealed cast iron. There is a block for each orifice size. Each block has two perfectly flat working sides and it is essential that they retain this high degree of flatness to produce a truly flat seating surface on the disk, or disk insert and/or the nozzle.

Before a lapping block is used, it should be checked for flatness and reconditioned after use on a lapping block resurfacing plate. The block should be lapped in a figure eight motion, applying uniform pressure while rotating the lapping block against the plate as shown in Figure 3.

Lapping blocks and lapping block resurfacing plates are available from Emerson sales, service and distribution centers.

Lapping compounds

Experience has proven that medium coarse, medium, fine and polish lapping compounds will condition any damaged safety valve seat properly except where the damage requires machining. The following lapping compounds, or their commercial equivalents are suggested:

TABLE 1

Grit compound no.	Description
320	Medium coarse
400	Medium
600	Fine
900	Polish

Lapping procedure

Unless the seats have been damaged badly by dirt or scale, lapping the seating surfaces should restore them to their original condition. Never lap the disk insert or disk against the nozzle.

Lap each part separately against a cast iron lapping block of the proper size. These blocks hold the lapping compound in their surface pores and must be reconditioned frequently. Lap the block against the seat. Never rotate the block continuously, but use an oscillating movement. Extreme care should be taken throughout to make certain that the seats are kept perfectly flat.

If considerable lapping is required, spread a thin coat of medium coarse lapping compound on the block. After lapping with this compound, lap again with a medium grade compound. The first step can be omitted unless much lapping is called for.

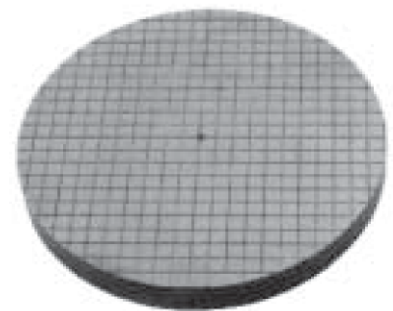
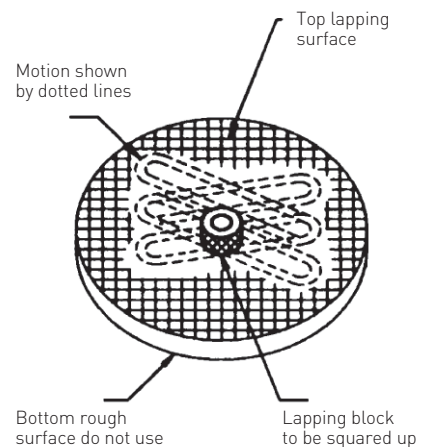
Next, lap again using a fine grade compound. When all nicks and marks have disappeared remove all the compound from the block and seat. Apply polish compound to another block and lap the seat.

As the lapping nears completion only the compound left in the pores of the block should be present. This should give a very smooth finish. If scratches appear, the cause is probably dirty lapping compound. These scratches should be removed by using compound free of foreign material. Disks and disk inserts should be lapped in the same way as nozzles. The disk insert must be removed from the holder before lapping. Before the disk insert is placed back in the holder all foreign material should be removed from both parts. The insert must be free when in the holder. If the disk insert is damaged too badly to be reconditioned by lapping, it should be replaced. Remachining the insert will change critical dimensions, affect the action of the valve and is not recommended.

Machining of nozzle seats

If machining of the nozzle seat or other major repairs are necessary it is recommended that the valve be returned to a Emerson authorized facility for repair. All parts must be machined accurately per Emerson specifications. No safety valve will be tight, nor will it operate properly unless all parts are correctly machined. If unable to a return to a Emerson authorized repair facility for remachining, use of a reseating machine is recommended.

FIGURE 3



Lapping block resurfacing plate



Lapping block

CROSBY SERIES HSJ SAFETY VALVES

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If a reseating machine is not used, the most satisfactory way to machine a nozzle is to remove it from the valve body. However, it may also be machined while assembled within the valve body. In any event it is vitally important that the seating surfaces run absolutely true. Machining dimensions for Crosby Series HSJ valves are shown in Figure 5. Remove only enough metal to restore the surface to its original condition. Turning to the smoothest possible finish will facilitate lapping. The nozzle must be replaced when the minimum face to seat dimension is reached. This critical dimension is shown in Table 2.

Machining of disk and disk insert seats

When the damage to the disk or disk insert seat is too severe to be removed by lapping, the disk or disk insert should be replaced. Remachining of the disk or disk insert seat is not recommended.

The disk or disk insert seating surface may be lapped provided that the minimum overall disk height shown in Figure 6 is maintained.

CAUTION

Care should be used in this assembly operation to prevent damage to the valve seating surfaces.

Assembly

All components should be clean.

Before assembling the following parts, lubricate with pure nickel 'Never-Seez' or equivalent.

- Nozzle and body threads
- Nozzle and body sealing surfaces
- All stud and nut threads
- Spindle bearing surfaces and threads
- Set screw threads
- Spring washer bevels
- Adjusting bolt and bonnet threads

For parts identification, refer to Figure 1 on page 2:

- a. Before installing the nozzle (2), lubricate the flange surface in contact with the valve body (1) and on the nozzle threads. Then screw the nozzle (2) into the valve body (1) and tighten until the nozzle flange is seated fully against the valve body.
- b. Screw the nozzle ring (3) onto the nozzle (2).
Note: The top of the nozzle ring should be approximately one ring revolution above the nozzle seating surface.
- c. Thread the spindle assembly (11) into the disk holder (5) or disk (6A). Turn the spindle until it drops off the internal threads and contact is made between the spindle ball and the disk or disk holder bushing.
Note: If spindle does not thread into disk, check the design version number in the model number for compatibility. Do not force the spindle to thread into the disk. Reference Section 10 for more detail on the design version numbers and contact Emerson to get the correct disk and spindle.
- d. If the valve has a 2-piece disk design (insert and holder), place the disk insert (6) into the disk holder (5). Turn the insert until alignment is achieved between the hole in the button end of the insert and the hole in the bottom end of the holder. Insert disk insert cotter (7) to hold in place.
- e. Thread the guide ring (9) onto the guide (8).
- f. Valves with Type A/B and D/E caps require two guide gaskets (not shown), one above and one below the guide (8). Valves with Type C caps do not include guide gaskets. If supplied, place one guide gasket on top of the body (1). Install the guide (8) and guide ring (9) assembly into the top of the body. The guide of Type C valves should be seated directly on the top surface of the valve body. Maintain proper alignment between the guide (8) and the body (1) to ensure that the guide is seated correctly in the body.
- g. Lower the spindle (11) and disk (6A) or disk holder assembly (5) into the guide (8) and onto the nozzle (2).
- h. Place the second guide gasket of Type A and D valves on top of the guide (8). Place the spring (12) and washers (13) assembly onto the spindle (11). Lower the bonnet (14) over the spindle and spring, onto the bonnet studs (15) in the body (1). In closed bonnet valves, the bonnet vent should be aligned with the valve outlet. Position the bonnet counter bore on the O.D. of the guide (8) and lower the bonnet onto the guide.
- i. Screw the bonnet stud nuts (16) onto the bonnet studs (15) and tighten down evenly to prevent unnecessary strain and possible misalignment.
- j. Lift the disk insert slightly by lifting the spindle rod. Lower the nozzle ring (3) below the seats. Release the spindle slowly to permit the disk insert to contact the nozzle seat gently. Check that the nozzle ring moves freely.
- k. Screw the adjusting bolt (17) and nut (18) into the top of the bonnet (14) the same number of turns originally required to remove the spring load. The original set pressure can be approximated by screwing the adjusting bolt down to the height above the bonnet measured during disassembly.
- l. Move the nozzle ring (3) up until it touches the disk holder (5). From this position lower it to the original recorded position (paragraph b, page 6). Move the guide ring (9) until the bottom of the guide ring is at the same level as the bottom face (6A) of the disk or disk holder assembly (5). If the guide ring position originally recorded is a positive number, raise the guide ring by the number of notches indicated; if a negative number, lower the ring that number of notches. Rings are moved up by turning them to the right and lowered by turning them to the left.

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- m. Place the set screw gaskets (not shown) onto the set screws (10, 4). Screw the set screws into the body (1) engaging both the nozzle ring (3) and guide ring (9). Both rings should move back and forth slightly after the set screw is tightened.
- n. The valve is now ready for testing. After testing, the following steps should be taken:
- Be sure that adjusting bolt nut (18) is locked.
 - Install the cap assembly (see below).
 - Seal wire the cap and set screws to prevent tampering.

9 ASSEMBLY OF CAP AND LIFTING LEVER DEVICES

Series HSJ safety valves are furnished with several different caps and lifting lever devices. The following describes assembly of the available types of construction (disassembly is the reverse of assembly). For part identification refer to Figure 4.

Type A

Install the cap gasket and screw the cap onto the top of the bonnet. Tighten the cap with a strap wrench.

Type B

Install the cap gasket and screw the cap onto the top of the bonnet. Tighten the cap with a strap wrench. Install the cap plug gasket and screw cap plug into the cap. The test rod is installed only during system hydrostatic testing. Never install the test rod unless performing system hydrostatic testing.

Type C

Screw the spindle nut onto the spindle. Place the cap on the bonnet. Install the forked lever and forked lever pin. Attach the lever to the cap using the lever pin and secure with the lever pin cotter. Adjust the spindle nut until there is a 1/16 inch minimum of play between the forked lever and the spindle nut. The spindle nut may be adjusted by removing the forked lever pin, forked lever and cap. When the spindle nut is in proper adjustment, install the spindle nut cotter pin. Replace the cap and forked lever and install the forked lever pin and forked lever pin cotter. Position the lever opposite the valve outlet and install the four cap set screws and tighten them against the groove in the top of the bonnet.

Type D

Install the cap gasket on the bonnet. Screw the spindle nut onto the spindle. Place the dog in the cap and install the dog shaft so that the dog is horizontal and the square on the end of the dog shaft has a corner on top. With the dog shaft in the position above, scribe a horizontal line on the end of the dog shaft. This line must be horizontal when the lifting gear is installed finally on the valve. Install the dog shaft O-ring in the dog shaft bearing and place the dog shaft bearing gasket on the dog shaft bearing. Screw the dog shaft bearing into the cap. Rotate the dog shaft so that the dog is pointing down and install the cap assembly onto the bonnet.

Rotate the dog shaft so that the dog contacts the spindle nut. With the scribed line horizontal, remove the assembly and adjust the position of the spindle nut. Repeat the operation until the scribed line is horizontal when the dog contacts the spindle.

Remove the assembly and install the spindle nut cotter pin. Install the lifting gear assembly onto the bonnet and secure it with cap studs and nuts.

For Type D lifting levers that have two part caps (cap and cap top), the above procedure is accomplished more easily. After the cap is screwed to the bonnet, the positioning of the dog shaft is the same as above except that the positioning of the spindle nut is performed last through the open end of the cap. With the dog in the horizontal position, screw the spindle nut onto the spindle until it contacts the dog.

Install the spindle nut cotter, cap top gasket and screw the cap top into the cap.

Type E

Assembly of Type E lifting lever is identical to Type D with the addition of the cap plug gasket and cap plug. The test rod is installed only during system hydrostatic testing. Never install the test rod unless performing system hydrostatic test.

10 VALVE DESIGN VERSION AND INTERCHANGEABILITY

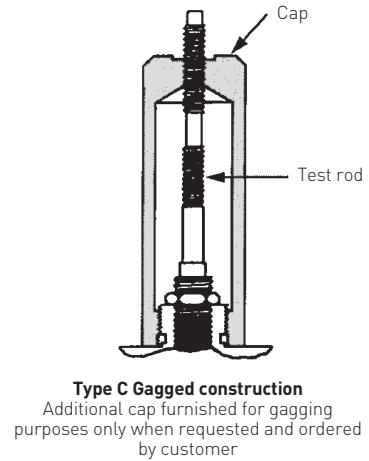
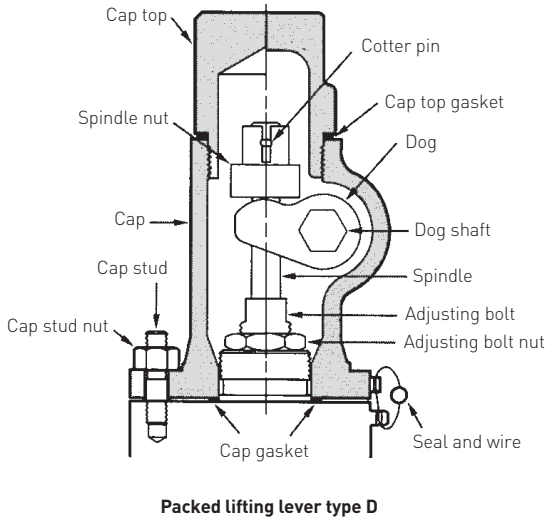
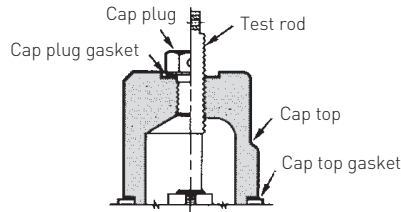
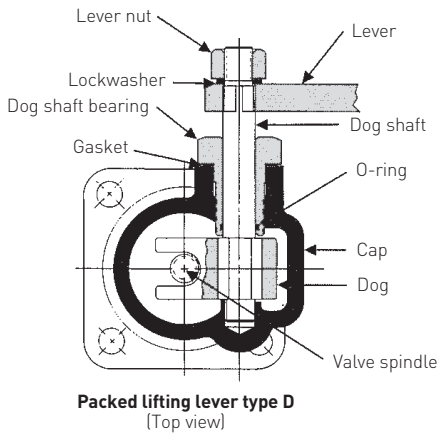
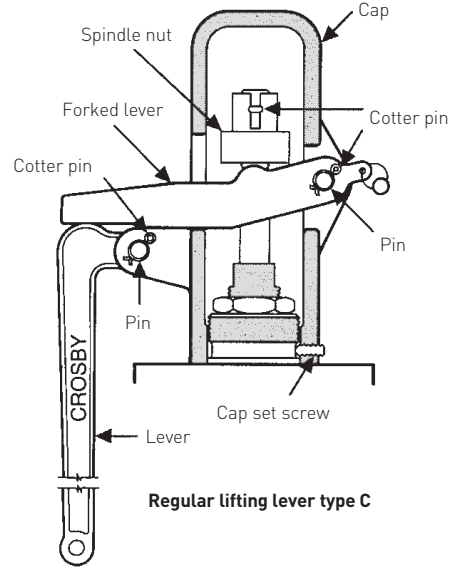
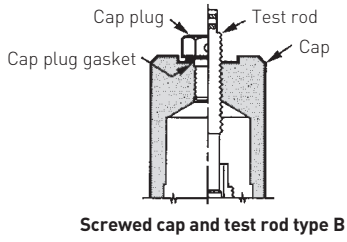
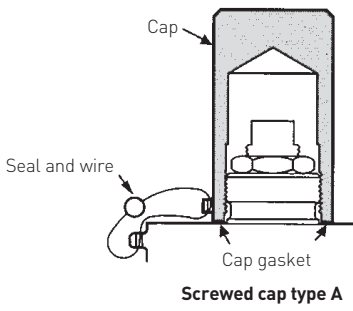
The design version number is used to distinguish specific versions of the HSJ valve design where the updated parts are not interchangeable with the previous version. The design version number is needed for reference when ordering spare parts and servicing the valve. If the design version does not match the current design version, new spare parts may not be compatible in the valve, and the valve may need to be upgraded to the new version.

The design version number will be at the end of the model number, and any model number with no design version number will be considered "-01".

Reference Table 3 for current version of HSJ design.

CROSBY SERIES HSJ SAFETY VALVES
 INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

FIGURE 4
 Cap and lifting levers



CROSBY SERIES HSJ SAFETY VALVES
 INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

TABLE 2 - MINIMUM NOZZLE FACE TO SEAT DIMENSIONS in inches (mm)

Orifice	Valve type							
	16	26	36, 37	46, 47	56	57	66, 67	76, 77
F	4.021 (102.133)	-	-	4.021 (102.133)	-	-	4.021 (102.133)	4.646 (118.008)
G	4.115 (104.521)	-	-	4.115 (104.521)	-	-	4.115 (104.521)	5.115 (129.921)
H	3.897 (98.984)	-	3.897 (98.984)	3.897 (98.984)	4.834 (122.784)	4.834 (122.784)	4.834 (122.784)	-
J	4.646 (118.008)	4.646 (118.008)	4.678 (118.821)	5.427 (137.846)	6.761 (171.729)	5.427 (137.846)	6.761 (171.729)	-
K	5.068 (128.727)	-	5.068 (128.727)	6.193 (157.302)	6.193 (157.302)	6.193 (157.302)	6.193 (157.302)	-
L	5.350 (135.890)	-	5.350 (135.890)	5.568 (141.427)	6.256 (158.902)	6.256 (158.902)	-	-
M	5.881 (149.377)	-	5.881 (149.377)	5.881 (149.377)	6.693 (170.002)	6.693 (170.002)	-	-
N	6.990 (177.546)	-	6.990 (177.546)	6.990 (177.546)	-	-	-	-
P	6.303 (160.096)	-	8.053 (204.546)	8.053 (204.546)	-	-	-	-
Q	7.178 (182.321)	-	7.178 (182.321)	7.178 (182.321)	-	-	-	-

TABLE 3 - DESIGN VERSION TABLE

Pressure Class	Orifice									
	F	G	H	J	K	L	M	N	P	Q
150#	02	02	02	02	01	01	01	01	01	01
300#	02	02	02	02	01	01	01	01	01	01
600#	02	02	02	02	01	01	01	01	01	01
900#	01	01	01	01	01	01	01	-	-	-
1500#	01	01	01	01	01	-	-	-	-	-
2500#	01	01	-	-	-	-	-	-	-	-

CROSBY SERIES HSJ SAFETY VALVES

INSTALLATION, OPERATION AND MAINTENANCE INSTRUCTIONS

FIGURE 5
Nozzle seat critical dimensions in inches

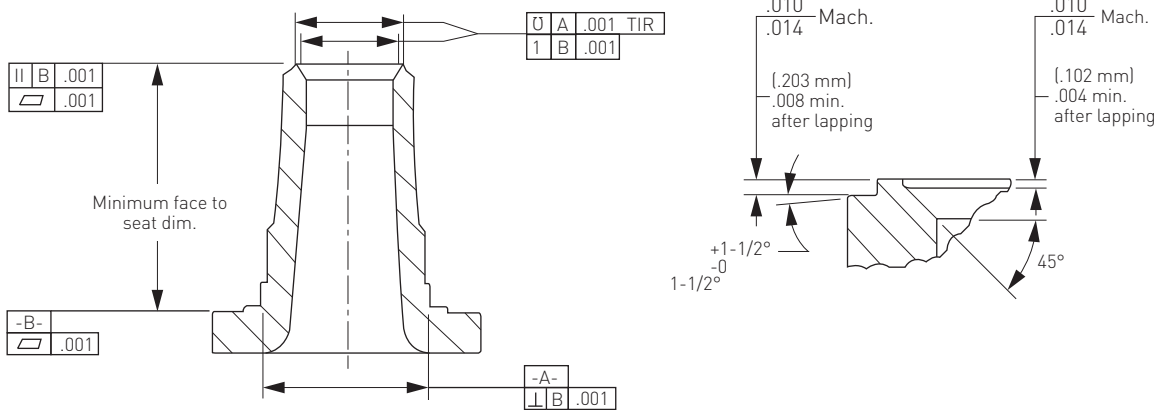
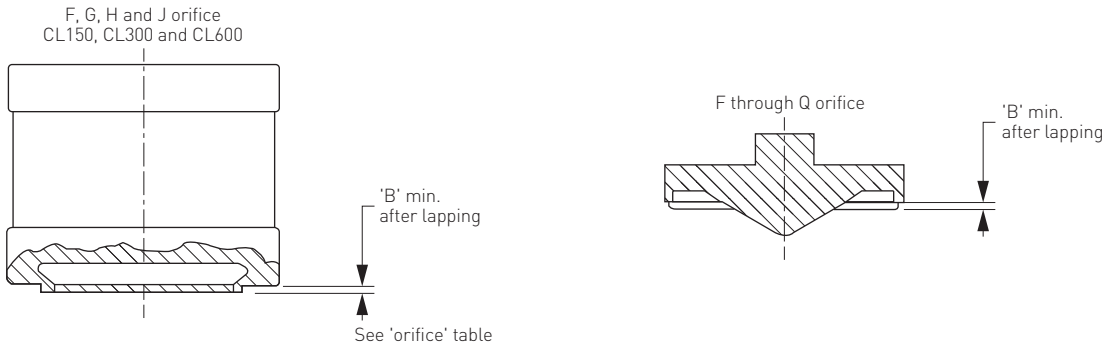


FIGURE 6
Disk insert minimum heights



'B' DIMENSIONS

Orifice	NPS	DN
F	.002	.051
G	.003	.076
H	.003	.076
J	.004	.102
K	.005	.127
L	.006	.152
M	.007	.178
N	.008	.203
P	.009	.229
Q	.012	.305

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