Before installation, these instructions must be fully read and understood.
## Crosby Style HL Low Pressure Steel Full Nozzle Safety Valves
### Installation, Maintenance and Adjustment Instruction

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<td>39</td>
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</tbody>
</table>

* Critical spare parts.

Crosby recommends that sufficient inventory of critical spare parts be maintained to support process requirements.
Always be sure to use genuine Crosby parts to ensure continued performance and warranty.
Figure 1
HL Low Pressure Steel Full Nozzle Safety Valve
Warning

The protection and safety of equipment, property and personnel depends on the proper operation of the safety valves described in this manual. All Emerson safety valves should be kept in proper working condition in accordance with the manufacturer’s written instructions. Periodic testing and maintenance by the user of this equipment is essential for reliable and safe valve operation. All installation, maintenance, adjustment, repair and testing performed on safety valves should be done by qualified technicians having the necessary skills and training adequate to perform such work. All applicable Codes and Standards, governing regulations and authorities should be adhered to when performing safety valve repair. No repair, assembly, adjustment or testing performed by other than Emerson or its authorized assemblers and representatives shall be covered by the warranty extended by Emerson to its customers. The user should use only original, factory supplied OEM parts in any maintenance or repair activity involving this product. This Maintenance Manual is provided as a general guide for the repair and maintenance of the safety valves described herein. It is not possible to describe all configurations or variations with such equipment. The user is advised to contact Emerson or its authorized assemblers and representatives for assistance in situations that are not adequately covered or described in this manual.

Before removing a safety valve for maintenance, ensure that the system pressure has been fully depressurized. If an isolation block valve is used ensure that any trapped fluid between the block valve and the safety valve is safely vented.

Before disassembling the safety valve ensure that the valve has been decontaminated from any harmful gasses or fluids and that it is at a safe temperature range for handling. Fluids can be trapped in the dome space of pilot operated safety valves. Before installation, the Installation and Operational Safety Instructions should be fully read and understood. These Instructions may be requested from the factory or are available at www.valves.emerson.com.

Field Service and Repair Programs

Field Service
Crosby 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 Crosby Service Engineer be present for assembly and testing of safety valves.

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

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

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

Contract Management
Crosby will combine a group of services to satisfy your special maintenance needs.

Introduction
Crosby Style HL 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 Style HL safety valves are manufactured in accordance with the requirements of Section I, Power Boilers, and Section VIII Unfired Pressure Vessels, of the ASME Boiler and Pressure Vessel Code. Details of the HL valve design, materials of construction, pressure-temperature ratings and dimensions are provided in Crosby Catalog CROMC-0292-US.
Storage

Safety valves are often received at the job site months before they are actually installed. Unless they are properly stored and protected, their performance may be seriously affected. Rough handling may damage flanges or cause misalignment of the valve parts. It is best to level valves in shipment cases, stored in a dry place and with a protective covering until they are to be used.

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 adversely affect seat tightness. 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.

Caution

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

Inspection

Safety valves should be visually inspected 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.

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 completely removed before installation (foreign material entering the valve may cause seat leakage, plugging and valve malfunction).

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 that 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 thoroughly cleaned 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.

Figure 2 - Installation

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 the valve spindle. However, when the valves are to be gagged for a hydrostatic test, a gag as shown in Figure 3 should be used but at pressures no greater than 10% above the nameplate set pressure. Blank flanges must be removed and the safety valve reinstalled before the vessel is placed in service. Test gags should be positioned evenly on the bonnet and care must be exercised to prevent overtightening that could damage the spindle and valve seats. A test rod that is finger tight will generally provide sufficient force to hold the valve closed. After the hydrostatic test, the test gag must be removed and replaced with the cap and lifting lever gear.

Figure 3 - Test Gag
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.

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.

Adjustment

Set Pressure Adjustment

For parts identification, see Figure 1:

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 change of an inadvertent valve opening.

a) Remove the cap (25) and lifting lever device following the instruction on Page 7.

b) Loosen the compression screw nut (21).

c) Turn the compression screw (20) clockwise to increase set pressure or counterclockwise to reduce set pressure.

d) Retighten the compression screw nut (21) following each adjustment.

e) Once the set pressure has been established, replace the cap (25) and lifting lever device following the instruction on Page 11 and install a new seal and wire.

Nozzle Ring, Guide Ring and Adjusting Screw Adjustment

The nozzle ring (5), guide ring (9) and adjusting screw (11) adjustment is made at the factory but resetting in service is sometimes necessary.

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

Important

Crosby steel safety valves have the shipment ring settings stamped on the machined surface on the bonnet directly under the cap. See Figure 1.

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.

Whenever nozzle ring, guide ring or adjustment screw 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.

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 pin (8) 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 should never be moved more than ten notches either way without retesting the valve. After each adjustment always replace, tighten and seal wire the guide ring pin, being careful that its point fits in the notch without making contact with the ring or bearing on top of a tooth.

Nozzle Ring Adjustment

The nozzle ring adjustment is carefully determined by factory test and resetting in service is seldom necessary. Should it be necessary, the nozzle ring (5) is adjusted by removing the nozzle ring pin (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 warm 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 nozzle ring pin, 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 pin has been reinstalled and tightened.
Adjusting Screw Adjustment
The adjusting screw is used as a secondary means of controlling blowdown. The primary blowdown control is through the setting of the guide ring. The adjusting screw setting should only be changed when guide ring settings fail to obtain a desired blowdown. Should it be necessary, the adjusting screw setting is changed by first loosening the adjusting screw nut. If the adjusting screw is fully or partially open, turning the adjusting screw to the right will tighten it resulting in decreased blowdown. If the adjusting screw is fully or partially closed, turning the adjusting screw to the left will loosen it resulting in increased blowdown. The adjusting screw should never be moved more than ¼ turn without retesting the valve. After each adjustment always tighten the adjusting screw nut. Seal wire the adjusting screw after the final setting is made.

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

Valve Maintenance
The functioning and service life of a safety valve depends primarily upon 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.

Disassembly of Cap and Lifting Lever Gear
The cap and lifting lever gear consists of the cap (25), release nut (26) and cotter (29), fork assembly (fork (24), fork pin (27), and cotter (28)) and the lever assembly (lever (22), lever pin (23) and cotter (28)). The cap cannot be removed from the safety valve without first removing the fork assembly which is seal wired to prevent tampering with the compression screw. To disassemble the cap and lifting lever gear, proceed as follows:
a) Remove the fork pin cotter (28), fork pin (27) and fork (24).
b) Loosen the two cap screws (30) and remove the cap (25) and lever assembly.
c) Remove the release nut cotter (29) and unscrew the release nut (26) off the spindle (19).

Disassembly of F through K Orifice Sizes
a) CAUTION: Nozzle ring pins and guide ring pins are custom fitted to each valve and are not to be interchanged.
Remove the nozzle ring pin (4). Check the nozzle ring (5) setting by counting the number of notches turned until it makes contact with the disc (6). Record the number of notches. This location is given as minus (-) notches from this contact position.
Remove the guide ring pin (8). Check the guide ring (9) setting by counting the notches while returning the guide ring 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 disc (6). 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.
b) Before releasing the spring load, measure and make note of the height of the compression screw (20) over the top of the bonnet (18). This information will help when reassembling the valve to its approximate original setting.
c) Loosen the compression screw nut (21). Count the number of turns required to remove the spring load by rotating the compression screw (20) in a counterclockwise direction.
d) Loosen and remove the bonnet stud nuts (14).

CAUTION: Never loosen bonnet stud nuts before completely releasing spring tension with the compression screw.
e) Carefully lift the bonnet (18) straight up to clear the spindle (19) and valve spring (17). Exercise care when lifting the bonnet as the spring and spindle will then be free to fall aside.
f) Lift the spring (17) and spring washers (16) off the spindle (19).
g) Remove the spindle (19), overlap collar (32), cover (13), disc (6), lifting adjusting spacer (33), guide (10) and guide ring (9) from the body (2) as an assembly. Care should be used at this point to prevent damage to the disc seating surface.
h) Unscrew the spindle (19) from the disc (6) by pulling up on the spindle to engage the spindle point threads in the disc. Turn the spindle counterclockwise while holding the disc still and remove the spindle.
Disassembly of L through Q Orifice Sizes

a) CAUTION: Nozzle ring pins and guide ring pins are custom fitted to each valve and are not to be interchanged.

b) Before releasing the spring load, measure and make note of the height of the compression screw (20) over the top of the bonnet (18). This information will help when reassembling the valve to its approximate original setting.
c) Loosen the compression screw nut (21). Count the number of turns required to remove the spring load by rotating the compression screw (20) in a counterclockwise direction.
d) Unscrew and remove the spring washer set screw (38) from the upper spring washer (16B).
e) Loosen and remove the bonnet stud nuts (14).

CAUTION: Never loosen bonnet stud nuts before completely releasing spring tension with the compression screw.
f) Carefully lift the bonnet (18) straight up to clear the spindle (19) and valve spring (17). Exercise care when lifting the bonnet as the spring and spindle will then be free to fall aside.
g) Lift the spring (17) and spring washers (16 and 16B) off the spindle (19).
h) Remove the overlap collar cotter (31) and lift the cover (13) straight up to clear the spindle (19). The adjusting screw (11) and adjusting screw nut (12) may be removed from the cover or left on at this time.
i) Remove the spindle (19), overlap collar (32), lift adjusting spacer (33), disc holder (7), disc (6), and disc holder retainer (34) from the body (2) as an assembly. Care should be used at this point to prevent damage to the disc seating surface.
j) Unscrew the spindle (19) from the disc (6) by pulling up on the spindle to engage the spindle point threads in the disc. Turn the spindle counterclockwise while holding the disc still and remove the spindle.
k) The overlap collar (32) and lift adjusting spacer (33) can remain on the spindle or removed by unscrewing each piece off the spindle.
l) Remove the disc holder retainer (34) from the spindle (19) by removing the disc holder retainer cotter pin (35) and unscrewing the disc holder retainer off the spindle.
m) Remove the guide (10) and guide ring (9) from the body as an assembly and unscrew the guide ring from the guide.
n) Unscrew the nozzle ring (5) from the nozzle (1).
o) The nozzle (1) may be unscrewed from the body (2) at this time or left in if the nozzle is not being replaced.

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.

Lapping or Refurbishing of Valve Seats

Good seating surface on the nozzle (1) and disc (6) 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 disc 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 4. Lapping blocks and lapping block resurfacing plates are available from your Emerson representative. Crosby also reconditions lapping blocks and plates.

Figure 4

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

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<th>Grit Compound No.</th>
<th>Description</th>
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<tr>
<td>320</td>
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<td>400</td>
<td>Medium</td>
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<tr>
<td>600</td>
<td>Fine</td>
</tr>
<tr>
<td>900</td>
<td>Polish</td>
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Lapping Procedure
Unless the seats have been badly damaged by dirt or scale, lapping the seating surfaces should restore them to their original condition. Never lap the disc 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. Unless much lapping is called for, the first step can be omitted. 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. Discs should be lapped in the same way as nozzles. If applicable, the disc must be removed from the disc holder before lapping. Before the disc is placed back in the disc holder all foreign material should be removed from both parts. The disc must be free when in the disc holder. If the disc is damaged too badly to be reconditioned by lapping it should be replaced. Remachining the disc will change critical dimensions, affect the action of the valve and is not recommended.
Replacement of Disc and Nozzle Seats

When the damage to the disc or nozzle seat is too severe to be removed by lapping, the disc or nozzle should be replaced. Remachining of the disc or nozzle seat is not recommended. The disc seating surface may be lapped provided that the minimum overall disc height shown in Figure 7 is maintained. The nozzle seating surface may be lapped provided that the minimum nozzle face to seat dimension in Table II on Page 14 is maintained.

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
- Compression screw and bonnet threads

For parts identification, refer to Figure 1.

Assembly of F through K Orifice Sizes

a) Before installing the nozzle (1), lubricate the flange surface in contact with the valve body (2) and on the nozzle threads. Screw the nozzle into the body and tighten with an appropriate nozzle wrench.

b) Screw the nozzle ring (5) onto the nozzle (1).
   Note: The top of the nozzle ring should be above the nozzle seating surface.

c) If removed, thread the overlap collar (32) onto the spindle (19) with the notches facing upwards. Do not insert the cotter pin (31) at this time. Adjustment to the overlap collar will be made later in the assembly.

d) Thread the guide ring (9) onto the guide (10).

e) Lower the lift adjusting spacer (33) onto the disc (6).

f) Place the disc (6) with the lift adjusting spacer (33) inside the guide (10).

g) Set the cover (13) on top of the guide (10). The guide should sit in the counterbore of the cover.

h) Insert the spindle through the cover and thread the spindle (19) into the disc (6). Turn the spindle until it drops off the internal threads and contact is made between the spindle point and the disc.

i) Lower the parts into the valve body (2) such that the cover (13) is placed directly on the top surface of the valve body, the guide (10) is sitting in the body counterbore and the disc (6) is placed onto the nozzle (1). Assure the hole in the cover for the adjusting screw (11) is facing towards the back of the valve. Maintain proper alignment between the guide and the body to ensure that the guide is seated correctly in the body.
   Care should be used in this assembly operation to prevent damage to the valve seating surfaces.

j) Adjust the overlap collar such that the bottom of the notches are level to \( \frac{1}{8} \) inch (3.2 mm) above the top surface of the cover (13). Insert the cotter pin (31) and bend back the ends.

k) If removed, thread the adjusting screw (11) and adjusting screw nut (12) into the cover (13) to the open position. The open position for the adjusting screw is defined as when the threads just start to become visible from the top hole in the cover.

l) Place the spring (17) and spring washers (16) onto the spindle (19).

m) Lower the bonnet (18) over the spindle-spring assembly onto the bonnet studs (15). Position the bonnet counterbore on the O.D. of the cover and lower the bonnet onto the cover. Position the bonnet such that the cast webs are inline with the outlet of the valve.

n) Screw the bonnet stud nuts (14) onto the bonnet studs (15) and tighten them evenly to prevent unnecessary strain and possible misalignment.

o) Lift the disc (6) slightly by lifting the spindle (19). Lower the nozzle ring (5) to a position below the seating surface. Slowly release the spindle to permit the disc to gently contact the nozzle seat. Check that the nozzle ring moves freely.
   Care should be exercised to avoid damage to seating surfaces.

p) Screw the compression screw (20) and compression screw nut (21) into the top of the bonnet (18) the same number of turns originally required to remove the spring load. The original set pressure can be approximated by screwing the compression screw down to the height above the bonnet measured during disassembly.

q) Move the nozzle ring (5) up until it touches the disc (6). From this “level” position lower it to the original recorded position.
Move the guide ring (9) until the bottom of the guide ring is at the same level as the bottom face of the disc (6). From this “level” position move the ring to the original recorded position. For a positive position, raise the guide ring by turning the ring to the right the desired number of notches. For a negative position, lower the guide ring by turning the ring to the left the desired number of notches.

Screw the nozzle ring pin (4) and guide ring pin (8) into the body (2) engaging both the nozzle ring (5) and guide ring (9). Both rings should move back and forth slightly after the pins are tightened.

The valve is now ready for testing. After testing, the following steps should be taken:
- Be sure that the compression screw nut (21) is locked
- Install the cap and lifting gear assembly (see Assembly of Cap Section)
- Seal wire the cap, ring pins, and adjusting screw to prevent tampering.

Assembly of L through Q Orifice Sizes

a) Before installing the nozzle (1), lubricate the flange surface in contact with the valve body (2) and on the nozzle threads. Screw the nozzle into the body and tighten with an appropriate nozzle wrench.

b) Screw the nozzle ring (5) onto the nozzle (1).

Note: The top of the nozzle ring should be above the nozzle seating surface.

c) Thread the disc holder retainer (34) onto the spindle (19) with the notches facing upwards.

d) Place the disc (6) into the disc holder (7) and thread the spindle (19) into the disc. Turn the spindle until it drops off the internal threads and contact is made between the spindle point and the disc. Set the retainer clearance and install the disc holder retainer cotter pin (35) per the instructions shown in Figure 5.

e) Thread the guide ring (9) onto the guide (10) and place the guide ring into position on the body (2). Maintain proper alignment between the guide and the body to ensure that the guide is seated correctly in the body.

<table>
<thead>
<tr>
<th>Valve Orifice Size</th>
<th>Retainer Clearance inches [mm]</th>
<th>Corresponding Number of Retainer Notches</th>
</tr>
</thead>
<tbody>
<tr>
<td>L</td>
<td>0.0098 - 0.0197 (0.25 - 0.50)</td>
<td>1 to 2</td>
</tr>
<tr>
<td>M</td>
<td>0.0098 - 0.0197 (0.25 - 0.50)</td>
<td>1 to 2</td>
</tr>
<tr>
<td>N</td>
<td>0.0098 - 0.0197 (0.25 - 0.50)</td>
<td>1 to 2</td>
</tr>
<tr>
<td>P</td>
<td>0.0098 - 0.0197 (0.25 - 0.50)</td>
<td>1 to 2</td>
</tr>
<tr>
<td>Q</td>
<td>0.0147 - 0.0221 (0.37 - 0.56)</td>
<td>2 to 3</td>
</tr>
</tbody>
</table>

Figure 5 - Disc Holder Retainer Clearance

The cotter pin head should be turned so that it fits between the into the retainer notch and makes contact with the spindle. The split ends of the cotter pin should both be bent downward.

Stand disc holder (7), disc (6), disc holder retainer (34) and spindle (19) assembly upright on a clean surface making certain that the end of the spindle rotates freely on the disc bearing surface (not loaded on the disc threads). Thread the disc holder retainer down until it makes contact with the disc holder. Locate the hole in the spindle relative to a notch on the retainer. Back off the retainer by turning it counterclockwise to establish the proper clearance. The clearances, and the corresponding number of notches, are listed in the table above. With the proper clearance established, install the retainer cotter pin (35). In order to accomplish this, the spindle must first be removed from the disc being careful not to lose the retainer position. Insert the retainer cotter pin through the appropriate notch and spindle and rethread the spindle into the disc.
f) With the new disc holder (7), disc (6), disc holder retainer (34) and spindle (19) assembled, place the assembly into position in the body (2) and guide (10). Care should be used in the assembly operation to prevent damage to the valve seating surface.

g) If removed, lower the lift adjusting spacer (33) over the spindle (19) with the notches facing upwards and onto the spindle shoulder.

h) If removed, thread the overlap collar (32) onto the spindle (19) with the notches facing upwards. Do not insert the cotter pin (31) at this time. Adjustment to the overlap collar will be made later in the assembly.

i) Lower the cover (13) over the spindle (19) and onto the body (2). Assure the hole for the adjusting screw (11) is facing towards the back of the valve.

j) Adjust the overlap collar (32) such that the bottom of the notches are level to ⅛ inch (3.2 mm) above the top surface of the cover (13). Insert the cotter pin (31) and bend back the ends.

k) If removed, thread the adjusting screw (11) and adjusting screw nut (12) into the cover (13) to the open position. The open position for the adjusting screw is defined as when the threads just start to become visible from the top hole in the cover.

l) Place the spring (17) and spring washers (16 and 16B) onto the spindle (19).

m) For the CL 300 orifice sizes N through Q and CL 600 orifices sizes L through Q, install the upper spring washer (16B) components which include a bearing (36) and bearing cover (3) fitted into the top end of the spring washer.

n) Lower the bonnet (18) over the spindle-spring assembly onto the bonnet studs (15). Position the bonnet counterbore on the O.D. of the cover (13) and lower the bonnet studs onto the cover. Position the bonnet such that the cast webs are in line with the outlet of the valves.

o) Screw the bonnet stud nuts (14) onto the bonnet studs (15) and tighten them evenly to prevent unnecessary strain and possible misalignment.

p) Apply a drop of Loctite® Threadlocker Adhesive or equivalent to the spring washer set screw (38) and thread into the upper spring washer (16B) through the slot in the bonnet (18).

q) Lift the spindle assembly and lower the nozzle ring (5) to a position below the seating surface. Check that the nozzle ring moves freely. Care should be exercised to avoid damage to seating surfaces.

r) Screw the compression screw (20) and compression screw nut (21) into the top of the bonnet (18) the same number of turns originally required to remove the spring load. The original set pressure can be approximated by screwing the compression screw down to the height above the bonnet measured during disassembly.

s) Move the nozzle ring (5) up until it touches the disc (6). From this “level” position lower it to the original recorded position.

t) Move the guide ring (9) until the bottom of the guide ring is at the same level as the bottom face of the disc (6). From this “level” position move the ring to the original recorded position. For a positive position, raise the guide ring by turning the ring to the right the desired number of notches. For a negative position, lower the guide ring by turning the ring to the left the desired number of notches.

u) Screw the nozzle ring pin (4) and guide ring pin (8) into the body (2) engaging both the nozzle ring (5) and guide ring (9). Both rings should move back and forth slightly after the pins are tightened.

v) The valve is now ready for testing. After testing, the following steps should be taken:
   - Be sure that the compression screw nut (21) is locked
   - Install the cap and lifting gear assembly (see Assembly of Cap Section)
   - Seal wire the cap, ring pins, and adjusting screw to prevent tampering.

Assembly of Cap and Lifting Lever Gear

The assembly of the cap is referred to several times in this instruction. The cap and lifting lever gear consists of the cap (25), release nut (26) and cotter (29), fork assembly (fork (24), fork pin (27), and cotter (28)) and the lever assembly (lever (22), lever pin (23), and cotter (28)). The cap cannot be removed from the safety valve without first removing the fork assembly which is seal wired to prevent tampering with the compression screw. To assemble the cap and lifting lever gear, proceed as follows:

a) Screw the release nut (26) onto the spindle (19).

b) Place the cap (25) on the bonnet (18).

c) Install the fork (24) and the fork pin (27).

(d) Attach the lever (22) to the cap (25) using the lever pin (23) and secure the lever pin with the lever pin cotter (28).

(e) Adjust the release nut (26) until the fork (24) rests on the lever (22) and there is a 1/16 inch (1.6 mm) minimum of play between the fork and the release nut. The release nut is adjusted by removing the fork pin (27), fork and cap (25). When the release nut is in proper adjustment, install the release nut cotter (29).

(f) Replace the cap (25) and fork (24) and install the fork pin (27) and fork pin cotter (28).

(g) Position the lever (22) opposite the valve outlet and install the two cap set screws (30) and tighten them against the groove in the top of the bonnet (18).
Table II - Minimum Nozzle Face-to-Seat Dimensions, inches [mm]

<table>
<thead>
<tr>
<th>Orifice</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>P</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>-3(4)</td>
<td>3.701</td>
<td>3.701</td>
<td>3.976</td>
<td>4.417</td>
<td>5.106</td>
<td>5.500</td>
<td>5.776</td>
<td>6.012</td>
<td>8.098</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[94]</td>
<td>[94]</td>
<td>[101]</td>
<td>[101]</td>
<td>[112.2]</td>
<td>[129.7]</td>
<td>[139.7]</td>
<td>[146.7]</td>
<td>[152.7]</td>
<td>[205.7]</td>
</tr>
<tr>
<td></td>
<td>[94]</td>
<td>[94]</td>
<td>[101]</td>
<td>[101]</td>
<td>[112.2]</td>
<td>[129.7]</td>
<td>[139.7]</td>
<td>[157.7]</td>
<td>[158.7]</td>
<td>[216.7]</td>
</tr>
</tbody>
</table>

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 operations.