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INSTALLATION, OPERATION & MAINTENANCE INSTRUCTIONS

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OWNER & MAINTENANCE GUIDELINES

FOR

NIBCO

2" THROUGH 12" CLASS 125, 150 & 250 THREADED AND FLANGED END

CAST IRON, 3% NI IRON, AND DUCTILE IRON HORIZONTAL SWING CHECK VALVES

FIGURE NUMBERS

F-918-B,Y,W
T-918-B,Y,W
F-918-N
F-968-B
F-918-13
F-938-31
F-938-33

For Lever and Weight (L&W) and Lever and Spring (L&S) options for F -918 Valves, see Addendum I.

For Check Valves in pump applications, see Addendum II and NIBCO **Technical Bulletin Check Valves-Design & Use NTB-0703**

For Check Valve Cracking Pressures, see Addendum III and NIBCO **Technical Bulletin Check Valve Cracking Pressure NTB-0596**

1.0 GENERAL INFORMATION

1.1 SCOPE

These guidelines are furnished for use in the installation, operation and maintenance of NIBCO IBBM, all iron, 3% nickel-iron, and ductile iron swing check valves with bolted bonnet, horizontal-swing, renewable seat and disc in the following sizes:

NPS 2 through 12: Class 125 cast iron, and 3% NI Iron Check valves
NPS 2-1/2 through 6: Class 250 cast iron
NPS 2 through 12: Class 150 ductile iron

1.2 GENERAL DATA

A. MANUFACTURER

NIBCO INC.
500 Simpson Street
Elkhart, IN 46515
Phone (574) 295-3000
NIBCO Technical Services
1-888-446-4226
CS-TechnicalServices@nibco.com

B. FIGURE NUMBERS AND DESCRIPTIONS

FIGURE NUMBER	DESCRIPTION
F-918-B, Y, W	Swing Check Class 125 cast iron, flanged end, bolted bonnet, B-bronze disc, Y-PTFE disc, W-Nitrile rubber disc.
T-918-B, Y, W	Swing Check Class 125 cast iron, threaded end, bolted bonnet, B-bronze disc, Y- PTFE disc, W-Nitrile rubber disc.
F-918-N	Swing Check Class 125 cast iron, flanged end, bolted bonnet, N-iron disc.
F-968-B	Swing Check Class 250 cast iron, flanged end, bolted bonnet, bronze disc.
F-938-31	Swing Check Class 150 ductile iron, flanged end, bolted bonnet, B-bronze disc

F-938-33	Swing Check Class 150 ductile iron, flanged end, bolted bonnet, stainless steel disc 2-4" size and DI disc with stainless steel disc face ring 5- 12"
F-918-13	Swing Check Class 125 3% nickel cast iron, flanged end, bolted bonnet, CF8M stainless steel trim.

ASME B16.5—Class 150 flanges will mate to ASME B16.1—Class 125 cast iron flanges.
ASME B16.5—Class 300 flanges will mate to ASME B16.1—Class 250 cast iron flanges.

C. IDENTIFICATION PLATES

An aluminum identification plate is attached to valve via a bonnet bolt. This identification plate gives the figure number of the valve, some general information about the trim and location of NIBCO's corporate office. When more detailed information is required, refer to the current NIBCO ***Bronze & Iron Valve*** catalog, using the valve figure number as the guide (www.nibco.com).

D. SERVICE

When installing valves for service in corrosive media, the most current edition of the NIBCO ***Chem-Guide*** should be consulted for specific data (www.nibco.com) or contact NIBCO Technical Services by phone at 888-446-4226.

NOTE: It is the obligation of the installer and/or end-user to make the ultimate decision of fitness for use for any product in specific application.

E. PRESSURE TEMPERATURE RATINGS

Pressure and temperature ratings may be found on each catalog page for each valve and in the Engineering section of the latest printing of NIBCO ***Bronze & Iron Valve*** catalog (www.nibco.com).

F. CODES & REGULATIONS

A valve used under the jurisdiction of the ASME Boiler and Pressure Vessel Code, the ASME code for Pressure Piping, government or other regulations, is subject to any limitation of these codes or regulations and to the applicable ASME and MSS valve standards.

G. PRODUCTION TEST PROCEDURES

Iron and 3% Nickel Iron valves are shell tested and seat tested at pressures in accordance with MSS SP-71 requirements. Ductile iron valves are shell tested and seat tested at pressures in accordance with MSS SP-136 requirements.

H. PRINCIPAL DIMENSIONS

Principal dimensions of the valve are specified in the appropriate catalog.

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1.3 DETAIL DESCRIPTION

The NIBCO horizontal swing check valves listed above and covered in these guidelines are iron valves made of ASTM A126-B material for Class 125 and 250 cast iron valves and from ASTM A395 ductile iron material for Class 150 valves. The 3% nickel-iron valves are made from ASTM A126-B 3% nickel-iron.

These valves, used to prevent backflow in piping systems, are directional. In order for them to function properly, they must be installed with the arrow pointing in the direction of normal flow. The flow direction arrow is cast onto the side of the valve body.

In order to determine the type of seat that is used within the valve, it is necessary to refer to the identification plate for the figure number to provide this information.

The iron disc will be uniform in color and texture with the other parts of the valve like the body and bonnet. The bronze disc will be metallic and yellow in color, the PTFE disc is white in color, and the Nitrile rubber disc is black (and softer than the other materials).

These valves are operated by the flow of fluid to open and gravity and back pressure to close, when the demand for flow stops.

The bolted bonnet body and bonnet connection is held together by bolts and nuts. There is a non-asbestos gasket between the body and bonnet to affect a seal.

Class 125 cast iron valves have a flat-faced flange. Class 250 cast iron and Class 150 ductile iron valves have raised-face flanges.

2.0 INSTALLATION

2.1 PRELIMINARY INFORMATION

Horizontal swing check valves may be installed in both horizontal and vertical lines with upward flow or in any intermediate position. They will not operate satisfactorily in a declining plane. Under no circumstances should the valve be installed in a horizontal line with the bonnet facing in the vertical down position (upside down). This will not only trap fluids, but it will not allow the valve to function in the check position.

NIBCO recommends that check valves should not be used in close proximity to reciprocating pumps and compressors. The constantly fluctuating pressure curve causes pulsations to the moving parts of the valve, which severely shortens the life of the valve due to increased wear. Loose parts that have failed can also be passed down the line which would compound the problem.

Screw type and centrifugal pumps and compressors that deliver a constant pressure curve do not exhibit this issue.

In some carefully designed systems, check valves have been used successfully by incorporating surge tanks, hammer arrestors, and other piping modifications with the valve placed downstream from the pump. The ultimate decision for fitness of use however, lies in the hands of the end user and the system piping designer.

All NIBCO check valves should be protected from contamination, damage, and accumulation of dust or dirt on the seating surfaces. No internal blocking is used in valves shipped from the factory.

NOTE: Check valves should never be installed immediately adjacent to a pump discharge or change in direction. Check valves should be installed downstream from all sources of line turbulence, including fittings and valves, at a minimum of FIVE times the nominal pipe diameter (preferably TEN times the nominal pipe diameter) with straight piping to provide laminar flow.

See **Addendum 1** for additional information.

2.2 HANDLING AND INSTALLATION

Each valve should only be handled with apparatus that will safely support the valve weight. If lift slings are used, they should be placed in such a manner as to balance the load when lifting.

First, position the valve to the desired lifting position and block it. Reposition the slings and lift the valve to the installing location. Remove the expandable end protectors, if present, and install the valve according to the piping layout with the arrow on the valve pointing in the direction of the normally intended flow. The hanger pin should be level.

Media type, temperature, pressure and velocity must be considered for installation of valves into pipelines. Flange bolting and gaskets are governed by the applicable codes and pipeline specifications as well.

On threaded end valves, it is very important to make certain that the threads of the valve and the pipe are clean at all times and machined properly. When improperly tapered threaded pipe is screwed into the female valve threads, the pipe can be screwed so deeply that it can block the movement of the valve disc.

While the valve is being installed, care should be taken to prevent foreign material from entering the valve.

For flange bolting data, refer **to Appendix 1**. Prior to system start up, the valve should be checked for correct operation and ensure no joints leak.

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CAUTION

Care should be taken during handling, installation, and operation to prevent personal injury and damage to valve components, especially seating surfaces.

3.0 OPERATION

Check valves are designed to prevent flow reversal or backflow. Check valves seal adequately, when the back pressure is high, but leakage is expected when the reverse pressure is relatively low.

In testing procedures, a check valve is allowed to leak (4) times as much in the reverse flow (check) position as a metal-seated gate valve.

The allowable leakage rate for a check valve is 40ml per inch of nominal diameter per hour. This is in accordance with MSS SP-71 standard for check valves. (10ml = ≈0.33 ounces).

The check valves described in this manual are not to be used as foot valves on a pump or pressure regulating devices. Their construction is not suited to these types of requirements.

4.0 TROUBLESHOOTING

4.1 LEAKAGE THROUGH THE BONNET JOINT

1. Make sure the piping system is shut down upstream and downstream, cool, no pressure and no fluid inside. Decontamination may be required for hazardous fluids in the pipeline.
2. Mark the valve body-to-bonnet flange connection with chalk or marker, so they can be aligned properly, during reassembling.
3. Remove body-bonnet nuts and bolts.
4. Carefully remove the bonnet.
5. Thoroughly clean the body and bonnet internal surfaces. (Be careful not to nick or scratch the seating surfaces).
6. Check the body and bonnet gasket surfaces for any scratches, gouges, or other irregularities and clean surfaces thoroughly.
7. In the event the surfaces are marred, they must be filed or machined flat again. If the damage is considerable, the body or bonnet may have to be replaced. A competent valve shop or machine shop may have to be consulted.
8. With the surfaces cleaned and flat, place a new gasket on the body and replace the bonnet. Be careful to use the alignment marks to put everything back together the same way it came apart. Always use a clean fresh gasket. Reusing the old gasket is not recommended.

9. Carefully reinstall the body-bonnet nuts and bolts. Follow the bolt tightening procedure in **Appendix I**. If nuts and bolts have been repeatedly disassembled and reassembled, it may be necessary to obtain a new set, due to over-stressing the elastic limit of the bolts.
10. Prior to use, pressure test the valve for shell leakage to see if a good joint has been made and the seats are holding. Use the appropriate MSS SP-71, or SP-136 procedure for testing.

4.2 LEAKAGE THROUGH THE VALVE SEAT

Leakage across the valve seat is most commonly due to foreign matter lodged in the seat. Operation of the valve several times may help to clean off the seat. If the leakage persists, disassemble the valve and examine the seat surface on the disc and the seat surface in the body. (See **Section 4.1**).

Minor scratches can be corrected by polishing the seat and disc face, but generally if there are deep scratches in either the seat or the disc, the valve should be removed from the line and replaced or repaired by a competent valve shop. An acceptable method for seat renewal to correct minor scratches is as follows:

1. After the bonnet is removed as outlined in **Section 4.1**, remove the side plug.
2. While carefully holding the disc-hanger assembly, remove the hanger pin with pliers. (In large valves, this may be a two person operation).
3. Remove the hanger-disc assembly from the valve, being careful not to drop or nick the edges of the disc.
4. Mark the position of the disc nut on the disc with a marker.
5. Carefully remove the disc nut from the disc to release the disc from the hanger.

NOTE: the disc nut will be staked.

6. Loosen the disc nut screw by turning counter-clockwise.
7. Cut strips of 120 grit emery paper about ½" long and ½" wide.
8. Using double-backed adhesive tape, stick strips on the body seat ring seating surface. The strips should be evenly spaced around the seat.
9. Place the hanger disc in the body and rotate the disc back and forth with very light pressure. The further around you can rotate, the better surface you will get. Finish up with full rotation.
10. Examine surface periodically. A new clean, lighter 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.
11. Repeat the previous step for renewing the body seat by placing the strips of emery and double-backed tape on the disc.
12. 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 clearly be seen. This line MUST be unbroken all the way around if a good seal is to be achieved. A break in the line is a place where the valve will leak.

5.0 MAINTENANCE

5.1 TOOLS AND EQUIPMENT

Standard wrenches and tools are suitable for servicing valves as follows:

A. For removing the bonnet-body nuts and bolts a full set of ½" and ¾" drive sockets, box-end, or open-end wrenches are normally used.

CAUTION: Pipe wrenches on nuts or bolts have a definite crushing action which will deform them and are not recommended.

B. Standard packing tool can be used or a blunt hook is sometimes used to remove packing rings. A screwdriver to raise the packing gland (if it is in the fully down position) and generally combination box - open end wrenches are used to tighten the packing nut. (L& W, L&S options).

C. Punches, hammer, pliers, files, wire brush, putty knife, emery paper, sandpaper, chalk, ink markers, and other tools generally contained in a good set of mechanics tools will be needed for things like cleaning up the gasket surfaces, removing keys from hanger pin connections, marking alignments, etc.

6.0 SPARE PARTS

NIBCO does not offer “repair kits” for these valves. If the bonnet or body are damaged, it is normally less expensive to remove the entire valve from the line and install a new one, than to affect repairs.

When placing an order for the spare parts, it is necessary to give the size, the valve figure number found on the identification plate and also the serial letter which is generally cast into the valve body on its side. This will be alphabetical letter A, B, C, D, etc. It is vital to give the serial letter because over a period of time the valve designs have had modifications which could render the parts useless if they are of a different letter series.

7.0 MAJOR REPAIRS

For other repairs or replacement not covered in the above description, contact the Technical Services Department of NIBCO INC. Always give the figure number and size shown on the identification plate affixed to the valve along with the general serial letter.

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 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 should be cleaned with a suitable solvent or cleanser that will remove all dirt, grime and gasket particles.
3. The threads of the bolts and the surfaces under the bolt heads and nuts 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. At a minimum, bolt threads should be flush with the bottom of the nut, if not extending beyond the nut.
6. After the nuts are hand tight, follow the tightening sequence shown in the table, below. 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 not have direct torque control is prohibited for body-to-bonnet bolts. The use of a hand torque wrench, electronic torqueing system, or power wrench with direct torque control is recommended.

IRON VALVE BOLT TORQUE

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

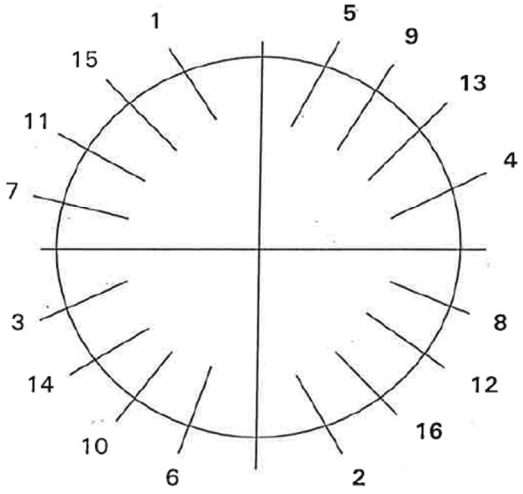
The torque tightening table listed below applies to clean, undamaged, well-lubricated threaded fasteners. When tightening, use the sequence chart below. Tighten in three steps.

1. Identify bolt grade by the markings on the head and determine torque in foot lbs.
2. Initially, tighten fasteners to half of the final torque target.
3. Finally, tighten using the full torque target.

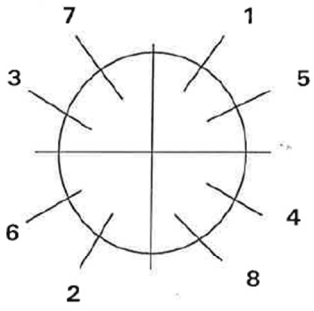
BOLT GRADE	BOLT HEAD MARKING	BOLT SIZE							
		7/16"	1/2"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"
ASTM A307		20	30	60	85	125	190	270	380
SAE J429 GRADE 2									
ASTM A193 GRADE B7		50	75	150	250	400	600	900	1250
SAE J429 GRADE 8									

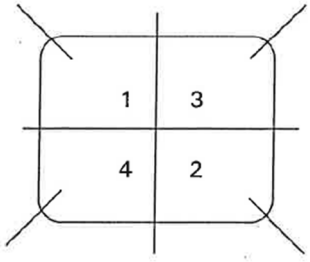
BOLT TIGHTENING SEQUENCE

LARGE VALVES



SMALL VALVES





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ADDENDUM I

LEVER & WEIGHT AND LEVER & SPRING CHECK VALVES

Lever and Weight (L&W) and Lever and Spring (L&S) Check Valves are optional, made-to-order modifications available on the Class 125 F-918-B horizontal swing check valves.

These modifications allow some outside adjustable control of the opening and closing force on the valve disc. This is especially useful in pump discharge applications as the disc is assisted in closing by an extra weight on a lever attached to the hanger pin (L&W) or by spring tension on a lever attached to the hanger pin (L&S).

In both valve modifications the external force on the disc then becomes adjustable. The closing force can be adjusted by sliding the weight back and forth on the lever arm of an L&W valve. Tension can be increased or decreased by an adjustable eye bolt and stop nut on the spring connected to the arm on an L&S valve. This adjustment is possible because the hanger pin and disc are keyed together forming a connected system from the disc inside of the valve to the lever on the outside.

These valves have components that are not interchangeable with the standard valves. For a detailed breakdown of components, see the related pages of the current NIBCO ***Bronze & Iron Valve*** catalog.

In addition, these valves have a stuffing box where the hanger pin comes through the side of the valve. The packing in the stuffing box is consumable and may need replacing or adding to from time to time over the life of the valve.

Leakage through the stuffing box packing may be stopped by tightening the packing nut.

CAUTION: Do not over-tighten--excessive tightening may cause difficult operation of the valve and could cause damage to the stem or packing nut. The adjustment should be just tight enough to stop the leak.

WARNING: Repacking of valves under pressure is NOT a recommended practice. This is a dangerous and unsafe practice which could result in serious injury.

Keep in mind the stuffing box pressure can come from either the upstream *or* downstream side of the valve. Prior to changing packing, it will be necessary to shut down the piping system. Remove pressure, drain the line, and if necessary allow the valve/piping to cool and/or decontaminate, before working on the valve.

1. To remove the old packing, remove the lever arm, packing nut, and pack gland. Discard the old packing and do not try to put it back once it has been removed.
2. Clean the stem and examine it for damage. Rope packing is sometimes spiral wound around the stem and pushed into the stuffing box.

3. Install the new packing, which may either be rope packing or cut rings. If rope is used make sure there is enough put into the packing chamber so a little bit will stick out of the top. When the packing is compressed by the gland, it should then be slightly lower than the top.
4. If rings are used, install one ring at a time with the diagonal cut in each ring being staggered 90° away from the cut in the ring below. Each ring should be firmly compressed in the stuffing box after it is placed in position before the next ring is added.
5. Install the gland bushing and packing nut and tighten. The packing nut should be tightened only enough to prevent leakage.
6. Pressurize the valve and check the packing for leakage. Re-tighten as required. See also **Addendum II** for additional reference.

ADDENDUM II

CHECK VALVES DOWNSTREAM FROM PUMP DISCHARGE

Traditionally, there have been long-standing problems with regard to the installation of check valves, and for that matter, other fittings, in close proximity to pump discharges. Regarding the question involving swing check valves, there is a considerable problem which can result in short-term operation and eventual valve failure.

In almost all cases of serious water hammer or noise/chatter associated with a swing check valve, the issue is the piping system. It is important from the inception of the design through the final installation that steps to mitigate, if not entirely eliminate, excessive turbulence and hydraulic shock from the piping system's operation.

Swing check valves have no control over their operation. They are subject to the action of fluid in the system and the effect of gravity.

The unequal flow at the top and bottom of the pipe is not particularly harmful to a swing check; however, the turbulence created by pump discharge and chattering or banging that results on closing are detrimental to valve life and operation.

The preferred valve design for this type of application would be an in-line spring-loaded check, a lever and weight, or lever and spring type check valve. These designs allow the valve to close faster and avoid the heavy shock that comes in flow reversal when the common swing check is used.

With a standard swing check valve, the only forces that close the valve are gravity and the force of the fluid reversal. In this situation, the fluid flowing in the system slows down to a stop before it starts to reverse in the pipe. In addition, the disk does not immediately move, as "things in motion tend to stay in motion, and things at rest tend to stay at rest."

It is only a matter of a split second, but it makes a big difference in the function of the valve and the force that can be created from the operation of the valve.

In the case of an in-line spring check, lever and weight, or lever and spring type valve, when the flow starts to slow down before the reverse, pressure is reduced on the disk and the disk starts to immediately close as it is being aided by the force of the spring and/or the lever and weight. This puts the disk almost closed on the seat when the major increase comes in flow and pressure due to reversal. This quick action eliminates the chattering or banging that is created with a standard swing check. This little bit of quick closure can make all the difference in the world. This is why in pump discharge applications, these spring or mechanical assisted check valves are the valves of choice.

NIBCO recommends swing check valves be installed a minimum of five pipe diameters downstream from pump discharges or directional changes (i.e., fittings, such as elbows or tees) in order to avoid flow turbulence.

Other products exist that may help eliminate check valve issues such as flow straighteners. A flow straightener is a spool piece with an internal honeycomb material. This tends to reduce the amount of turbulence and "straighten out" the flow. It may be necessary to use a combination of items to achieve the desired final result, if proper straight piping cannot be accommodated to ensure laminar flow in the system.

ADDENUM III

IBBM HORIZONTAL SWING CHECK VALVE – CRACKING PRESSURES

See also NIBCO Technical Bulletin Check Valve Cracking Pressure NTB-0596

The following pressures are required to move the disc off the seat of all NIBCO IBBM horiztional swing check valves, often referred to as the “Cracking Pressure” of a check valve:

Figure Number	Nominal Pipe Size	Cracking Pressure
918/938/968	2” – 4”	½ psi
	5” – 12”	3 psi