FORGED STEEL GATE, GLOBE AND CHECK VALVES

B.F.E. S.p.A.
BONNEY FORGE
VALVE LICENSEE

USE THIS MANUAL FOR:	
BFE STANDARD PRODUCT	SPECIAL CONFIGURATION

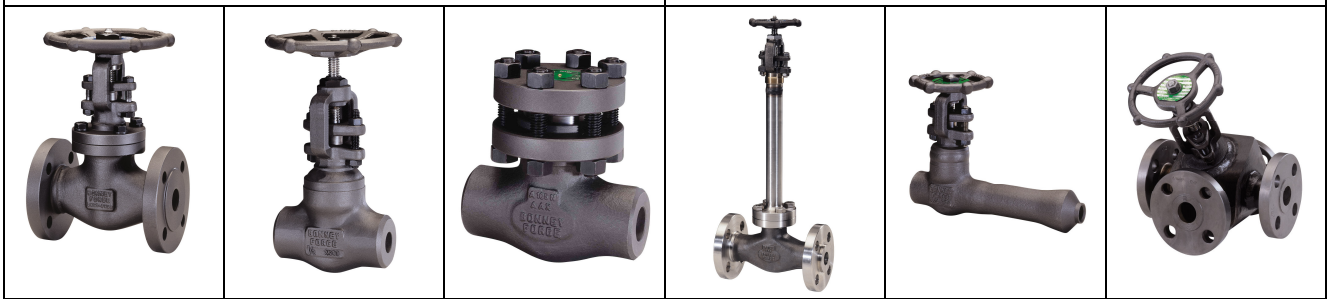

TABLE OF CONTENTS

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1. INTRODUCTION

This manual has been prepared to provide the end user with general guidelines in the installation, operation and routine maintenance of BFE valves. If, after reviewing the contents of this manual, you require any special instructions, assistance, repair services or have any additional questions, please contact either our factory or our nearest representative for assistance.

2. GENERAL DESCRIPTION

A. CATALOGUE : A copy of our catalogue is available upon request.

B. TECHNICAL DATA : Nameplate & Valve Information.
The nameplate permanently attached to the valve, provides you with the rated working pressure, temperature range and material used. When ordering replacement parts, reference to the information provided on the nameplate will aid in ensuring that you receive correct component parts for your valves. For further information refer to this manual or contact BFE Customer Service.
WARNING!!! Never attempt to modify BFE valves in any way without authorization and assistance of BFE, otherwise the mechanical guarantee will not apply and severe damage to the equipment could result.

3. VALVE STORAGE

A. Preparation and Preservation for Shipment

Preservation and other protective measures for shipment must be sufficient to protect against deterioration and physical damage during shipment. The type of packing must be defined in the Customer's Order and shall be appropriate to ensure safe transportation and conservation before installation.
BFE valves are normally shipped from the factory in boxes, crates or on skids. Protruding parts, such as the handwheels, indicator rods, and stem protectors are sometimes removed from the valves and either attached to the box or crate or packaged separately.

B. Inspection Procedure

All valves and associated parts should be inspected carefully for any visible sign of damage and if necessary, claims promptly submitted to the carrier. Any parts shipped loose or separately should be properly packed to prevent losts or damage. Care should be taken in handling valves to prevent damage, particularly to equipment extending above the valve bonnet and any fittings protruding from the valve body. Upon receipt, the valves should be inspected for shipping damage. If the end protectors are removed for inspection purpose, be sure to re-install them to maintain internal cleanliness. If caps are missing, an inspection of the valve cavity is required. All foreign matter must be removed.

C. Handling

- Most handling can be accomplished by placing "hook" diagonally into holes on each side of the end flanges, or by the usage of straps slung around the arms of the valve body.
- Never lift or move the valve assembly using the bore, shafts, nut as a pressure point.
- Never lift or move the valve assembly by using the actuator, positioner, extensions, handwheel, gland bolting or other valve options.
- Transport, unpack and store being careful not to scratch the surfaces of flanges or gaskets. Also, take steps that will prevent any foreign matter from getting into the valves. Wooden plate or plastic caps should not be removed until the valves are installed.
- The transportation of all packed material must be carried out safely and following the local safety regulations.

D. Storage Procedure

- If the valves are to be stored for any extended period of time, the flange or end protector should be examined to ensure they are fastened securely, and any other open areas should be sealed to prevent any moisture damage.
- All valves should be securely held in place by banding or other means of support to prevent accidental damage due to movement of the valves.
- Valves should be kept in a clean, heated, weather tight (dry), well-ventilated, fire-resistant storage facility with flooring that seals against dust and dirt and will not be subject to flooding.
- Valves should be stored off of the floor on suitable skids, pallets or racks and protected from dirt, debris and exposure to direct sunlight, particularly to soft sealing surfaces.
- Valve assemblies with electrical components, pneumatic tubing, positioners, actuators, and other accessories should be protected from impact.
- Old rust and dust, and the end faces must be protected with plastic or wooden discs fixed with straps.
- Periodical checks at least every 6 months have to be carried out in the storage area to verify that the above mentioned conditions are maintained.

4. VALVE INSTALLATION

A. General

- Remove valve assembly from box or crate with caution.
- Prior to installation, confirm that there are no scratches on the surfaces of flanges and stem. Also, make sure that the inside of the valve port area and seat surfaces are cleaned with a dry cloth. The seat surfaces are most important in achieving optimal valve performance and special attention should be taken to ensure that there are no “scratches” or defects to these surfaces.
- All BFE Valves are shipped from the factory in the closed position and normally will have a coating of rust protective oil. Before installing the valves, all oil or grease (used to protect the valve) should be removed taking care not to damage the seat contact surfaces.
- Following installation of the valve, operate the gate disc fully open and closed at least once prior to hydrostatic testing of the line to ensure freedom of operation.
- Ensure that the construction materials listed on the valve nameplates are appropriate for the service intended and are as specified.
- For threaded ends use conventional sealant, for flanged ends or other ends (clamp etc) use the standard method described in the international standards.
- After the valve installation and before the line testing, it is recommended to perform an accurate cleaning of the lines to eliminate dirt and any foreign matter that could seriously jeopardize the tightness between seat/disc and the correct operation of the valve.
- If the valve has been stored for a long time, check the bolt torque for all bolting.
- If piping system is pressurized with water for testing, and in case the piping system has been shut down after testing for a long time, it is recommended to use corrosion inhibitor with water to pressurize the piping system and after testing, the piping system should be depressurized and the test water completely drained.
- The pipeline must have a pulsation dampener if there are pulsation sources in the line. Lines subjected to pipe vibration and pulsation affect the lifetime of the valve seal parts.
- After completion of hydrostatic testing, the valve should be drained to eliminate any water or test fluid which may have been trapped in the valve.

B. INSTALLATION TABLE BASED ON VALVE CONNECTION TYPE

Simply choose your procedure depending on the Valve End Finish:

FLANGED END

Make sure that two like flanges are being fitted together. Usually the proper set-up is either plain face to plain face or raised face to raised face flange. Tighten the flange bolts in a crossover pattern as follows:

A - Slightly torque all bolts using a crossover bolt sequence. Bolts should be tightened evenly to prevent cocking of the flange and uneven gasket loading.
B - Repeat step 'A' using additional torque until all bolts are tightened properly.
This may require several re-torques because as one bolt is torqued, it will relieve stress on the adjacent bolts.
C - On high pressure, high temperature applications, it is recommended that the bolts be retightened after 24 hours of operation to compensate for any relaxation or creep that may have occurred.

BUTT WELDING END

WARNING!!! Gate and Globe valves should be lightly closed to prevent damage to the seating surfaces and stem caused by thermal expansion during the socket welding process.

NOTES:
- Proper welding is required to ensure a pressure tight seat and to retain its ability to withstand stress. Remember that the valve, pipe and weld root must be of compatible materials and the welding be performed by a properly trained welder and approved weld procedures and qualifications.
- Be sure to leave a proper gap between the end of the pipe and the end of the valve. This will allow for expansion of the materials as it is welded, any extended welding time could cause excessive heat build up on the valve seat area which could cause damage such as loosening of the seat rings, surface distortion etc.
- The specified PWHT can then be performed in line without affecting the valve. When welding the valve directly into the line make sure the valve is in the closed position. Shortly after welding, open and close the valve to check for proper operation to make sure no binding has occurred due to welding heat.
- Also welding slags and spatters are to be completely removed and cleaned to avoid damage on seating areas.
- Where possible, attach the electrical ground to the adjoining pipe on the same side of the valve as the weld being made. Do not attach the earth to the handwheel or upper structure of the valve or arcing across the valve seating surfaces could occur.
- Where possible, welding should be done in the flat or horizontal position. Where vertical welding is necessary, progression should be upward (vertical down welding is prone to lack-of-fusion).

SOCKED WELD END

WARNING!!! Gate and Globe valves should be lightly closed to prevent damage to the seating surfaces and stem caused by thermal expansion during the socket welding process.

Weld the connection as follows:
A - Remove all grease, oil or paint from the pipe that is to be welded into the valve and from the valve end connections.
B - Insert the pipe into the valve end connection until it bottoms out in the socket weld bore.
C - Withdraw the pipe 1/16" so that a gap remains between the pipe and the bottom of the socket weld bore to prevent cracks (ASME B16.11). Tack the pipe into the valve and complete the fillet weld.
NOTES:
A minimum of two layers should be used for all socket welds. This will decrease the chance of leaking even if one pass contains a weld defect.
- Where possible, welding should be done in the flat or horizontal position. Where vertical welding is necessary, progression should be upward (vertical down welding is prone to lack-of-fusion).

THREADED END

See Annex A of this manual.

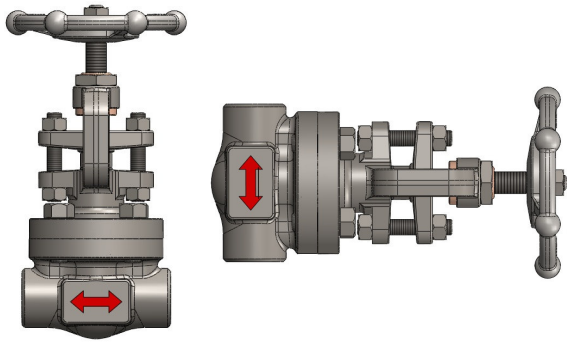
C. VALVE POSITIONING

Positioning the valve in the pipe run is very important. Prior to actual installation, check for clearance around the valve to ensure adequate space for proper operation. Also, keep in mind the need for clearance for future maintenance and repair. Once proper positioning and clearance have been assured the system should be cleaned of all foreign matter. Whenever possible, blow out the pipeline with water to remove grit and dirt. Also be sure to remove the valve end protectors and check the valve again for cleanliness.

ACTUATED VALVES: valves are designed to withstand the actuator only with stem in vertical position. If the installation requires a different stem position, user must fasten the actuator to avoid damage or incorrect working of valve-actuator system.

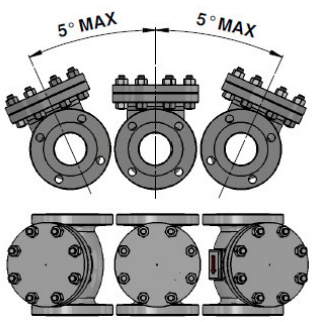
VALVE POSITIONING for GATE & GLOBE VALVES

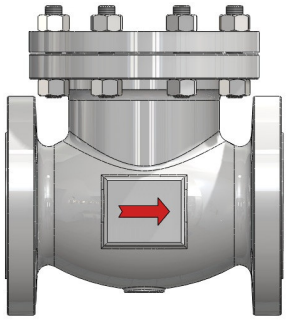
Gate and globe valves should be installed with the stem in an upward position on horizontal lines. However, an alternative stem position is at an angle between the vertical and horizontal axis that will allow for complete drainage. If installed with the stem below the horizontal axis, complete drainage is not possible and solids may accumulate in the valve bonnet that will greatly affect the valve operation and service life. A gate valve can be installed in line with disregard to flow direction. However, install the valve carefully according to the flow direction arrow, when the disc is provided with pressure balance holes to prevent abnormal pressure increase.

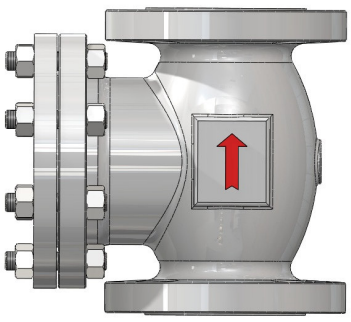


VALVE POSITIONING for CHECK VALVES

Check valves must be fitted in horizontal pipe runs with the cover facing vertically upward. Variance to either side of the vertical axis must not exceed 5 degrees. Swing check valves and spring loaded check valve design allow for additional position, such as vertical upwards flow. Valves must not be installed in vertical downward flow pipe runs or in horizontal pipe runs with the cover not in vertical up position. Always install valves in the direction indicated by the flow arrow stamped on the body. Piston and stop check valves should be fitted similarly to check valves.







D. PURGING AND TESTING OF LINE

Once the valve is in line, open the valve and flush or blow out the line again to remove any dirt or foreign objects that may have collected during installation. Check for tightness of body/bonnet bolts and for proper packing gland adjustment. Operate the valve to ensure correct operation. Pressure test the valve to ensure the integrity of all joints.

5. VALVE OPERATION

- The gate/globe valve is closed by rotating the handwheel in a clockwise direction; and is opened by rotating the handwheel in a counter clockwise direction.
- Do not apply excessive torque to the gate of the valve after it has reached the fully open or fully closed position as this could result in damage to the gate, stem or operating nut.
- Gate valve should be used in fully opened or fully closed position. If it is used in a slight or half opened position, the disc may vibrate at a high speed that may cause pulsation of the flow. Therefore, do not use a gate valve for flow control or throttling service.
- Globe valves can also operate in either direction or flow, but it is recommended that pressure is always against/under the disc.
- **WARNING!!! If the valve is SLAB or PARALLEL SLIDE TYPE: When the position indicator is in the closed position the valve is fully isolated. DO NOT APPLY ANY ADDITIONAL FORCE.**

6. MAINTENANCE

A. GENERAL

WARNING!!! Do not remove or disassemble the valve while it is under pressure. Depressurize the line and the valve as following:

- ✓ Place the valve in the open position and drain the line.
- ✓ Cycle the valve to relieve the pressure trapped in the body cavity.
- ✓ After removal and before disassembly, cycle the valve several times.

WARNING!!! Line Fluid can be toxic, corrosive or dangerous the health and safety. Protect yourself and others by observing all applicable standard procedures. Make the right choice, ***SAFETY FIRST***!

B. RECOMMENDED PREVENTIVE MAINTENANCE

Maintenance programs vary greatly from application to application, depending on factors such as operational frequency, fluid make-up, external environment, etc. The end user should establish a routine maintenance program to extend the life of the valves and minimize downtime for repair.

SUGGESTED MONTHLY MAINTENANCE	SUGGESTED 6 MONTHS MAINTENANCE
1.Visually inspect the valve for signs of leakage or corrosion.	1.Cycle the valve fully open and closed at least once to check for freedom of operation.
2.Visually inspect the stem packing to avoid any leakage from the stuffing box.	2.Remove the stem protection (if any) and lubricate the valve stem.
3.Lubricate the valve, if necessary (stem and stem nut).	3.Repeat steps 1, 2 and 3 from the monthly maintenance recommendations.

C. MAINTENANCE INSTRUCTION

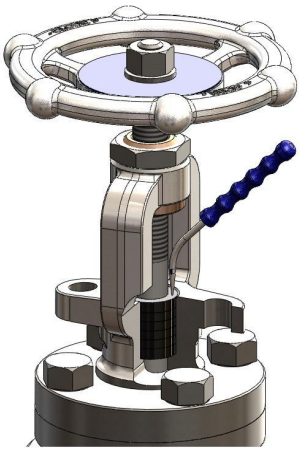
The maintenance and repair of BFE valves is usually limited to the adjustment of the packing gland and the lubrication of yoke sleeve as previously stated.
For standard maintenance of valves the only components suitable to be substitute are: Stuffing box packing & Body/bonnet gasket.
For special ordinary maintenance the seat replacement and the seal surface retrofit can be performed.
Should you need to perform the mentioned above repairs the following information should be used as a guide in your repairs always in conjunction with the applicable GAD (ask BFE if you don't have it). For special requirements ask BFE for special custom instruction & VGI.

C1. STEM PACKING

If the gland has run out of travel or excessive tightening does not stop the leakage, isolate and de-pressurise the valve for repacking. The valve need not be taken out of line for simple repacking, however, repacking is not recommended while the valve is in service.

If the stem does not backseat correctly and seal completely against the backseat bushing, the stem packing can not be replaced while the valve is under service conditions.

To extract packing remove the gland nuts and studs, lift the gland flange and gland out of the stuffing box. Next, remove old packing, by using an extractor tool of the correct size. Any remnants of old packing must be removed from the stuffing box and the stem. Clean the stem and stuffing box and examine it for damage. Install new packing rings, one at a time.



Each ring should be firmly compressed into position before the next ring is added. Rings should fit snugly into the stuffing box. Install the gland and the gland flange and secure with the gland nuts. Tighten the nuts uniformly, but only to the extent needed to prevent leakage. When graphite packing is to be installed, their replacement may be made by cutting the preformed rings in two halves/by a single cut and carefully opening the ring to allow its insertion into the stuffing box. Procedure to insert is then the same as stated for normal packing.

SUGGESTED GLAND BOLTS TORQUE [Nm]

VALVE NPS	ASME CLASS					
	UP TO ASME 800		FROM 900 UP TO 2680		ABOVE 2680	
	FULL	REDUCED	FULL	REDUCED	FULL	REDUCED
3/8"	5	N.A.	12	N.A.	24	N.A.
1/2"	7	5	14	12	30	24
3/4"	8	7	18	14	35	30
1"	10	8	20	18	40	35
1"-1/4	12	10	22	20	46	40
1"-1/2	14	12	24	22	50	46
2"	16	14	26	24	65	50

C2. GASKET REPLACEMENT (BOLTED BONNET VALVES ONLY)

Complete disassembly procedures are listed below. However, it is recommended that disassembly be limited only to the extent required to carry out repairs.

1 - Isolate and de-pressurize the system and operate the valve to its full open position.
2 - Match mark the body and bonnet, the wedge and body to maintain their relation upon reassembly.
3 - Remove the body bolts and lift up the entire bonnet assembly, taking care not to damage the wedge.
4 - Examine the gasket-seating surface of the body and the bonnet for evidence of wear damage or deterioration.
5 - Discard the old gasket. Replace or repair all damaged parts, then clean the seating surfaces to remove all rust, gasket residue and other debris.
6 - Polish the gasket-seating surfaces using a fine emery cloth. Remove any radial scratches or other defects, taking care that the emery cloth does not remain in the valve.
7 - A radial scratch across the seating surface may allow for a leak path. To affect a good seat, the gasket-seating surface must be flat and should have a finish between Ra=1.6 and Ra=3.2.
8 - Again, clean the surface to remove all polishing residue. Install a new gasket and reassemble the valve. No gasket-sealing compound should be used when installing the gasket. Care should be taken to ensure that the wedge does not contact the seats during reassembly and bolt tightening. Re-tighten the bolts acc.to Annex “B” of this manual.

C3. VALVE SEATING

GENERAL FOR GATE AND SWING CHECK VALVES

The valve and seat ring design and the method of seat ring installation are such that the valve must be removed from the line when seat ring replacement is necessary. Therefore, we recommend that the valve be replaced or returned to the maintenance work shop for seat replacement.
Seat rings for gate valves, sizes 1" and larger, if not too badly damaged (defect not deeper than 0.8 mm), may be repaired in the body by lapping. Smaller size valves can be repaired, but with great difficulty; therefore BFE recommends the installation of new seats.
The seats can be lapped in the body, using a flat lapping plate larger than that of the seat. The plate must have a square hole in the center for attachment to a square end tool. Make a square tool of suitable size and length with one end to fit a brace and the other end attached to the plate. Valve seats can then be hand lapped by using a fine grain compound. Wedges can be lapped on any surface plate, but care should be taken to maintain the correct wedge angle. As noted previously, we recommend that the valves be replaced or returned to the factory for seat ring replacement. However, it's suggested the following instructions are issued to aid in any attempts of seat replacement in the field maintenance work shop.

SEAT REMOVAL & REPLACEMENT FOR GATE AND SWING CHECK VALVES

The valve and seat ring design and method of seat ring installation are such that the valve must be removed from the line when seat ring replacement is necessary. Therefore, BFE recommends that the valve be replaced or returned to the factory for seating ring replacement.

GENERAL FOR GLOBE AND PISTON CHECK VALVES

Prior to lapping the disc of the globe valves, the disc may require machine refinishing. When defects are found on the stem/disc assembly-seating surface, it is recommended to place the stem/disc assembly into a lathe spindle and check the disc diameter, without taking the assembly apart. Hold the disc using a 3-jaw chuck so that large OD and seating surface run true. Grind the seating surface using a tool grinder. Machine only deep enough to clean the surface, then polish the seating surface with a fine emery cloth, retaining the original shape of the disc.

When surface damage is minor, the seats may be repaired by a lapping operation use a small quantity of lapping compound between the seat and the disc surfaces.

It is important that not too much pressure be applied to the disc and seat. With the lapping compound in place, between the mating surface, the disc should be reciprocally rotated, the strokes should be light and the disc should be lifted frequently and turned to a new position (circularly around the valve body) so the lapping will take place over a new area. Continue lapping until all defects are removed, and then apply a final finish with a fine compound. It is recommended that the face of the disc be "blued" to check for contact of seating surface after final lapping. The globe valve stem/disc assembly may be used in the lapping operation, however, due to its loose disc design, it is necessary to prevent the disc from rotating on the stem.
This can be accomplished by preparing a fixture (the valve handwheel can then be re-attached to the stem and used as a convenient handle when re-lapping the seats).

Valves having renewable (threaded-in) seats may have the seat ring replaced only in the factory by means of special tools.
The seat ring may then be removed by un-threading in a counter-clockwise direction. The seat threads in the valve body should be carefully inspected to make sure they are in a usable condition. When installing new seats, the seats should be screwed tightly into the valve body, then unscrewed to make sure they are making continuous contact for a tight seal.

SUGGESTED TOOLS & CONSUMABLES FOR LAPPING

- Lapping compound (Carborundum).
- Grain size: 400 - 600 mesk – for rough finishing.
- Grain size: 800 – 1200 mesk – for fine finishing.
- The surface plate should be homogenous cast iron having approximate HB 250 Hardness.

Machine oil, fillet scraper, bluing compound and waste cloth.

D. LUBRICATION

BFE valves are made from selected materials to give long and trouble free service, when properly installed for the correct applications. Proper care and maintenance in the field can contribute to extended performance of the valve. The general maintenance operation on a valve usually consists of periodical lubrication. See the lubrification chart below for details:

LUBRIFICATION CHART

STEM THREADS LUBRICATION	GEAR HOUSING LUBRIFICATION	SLEEVE LUBRICATION
Exposed stem threads should be kept clean and should be lubricated. Because a tacky lubricant on exposed stem threads can attract abrasive particles from the atmosphere the use of dry lubricants is recommended. Graphite powder can be applied by spraying or by the use of a normal brush. When valves will be supplied according to Statoil specifications, BFE will use Molykote BR2 plus grease approved by STATOIL.	On valves equipped with bevel gear operators, the operators are basically sealed units which are considered to be permanently lubricated. BFE recommends that the operators be at least partially disassembled every three years to inspect the condition of the lubrication and component parts. Should dirt, water or other foreign matter be found during the inspection, the units should be flushed using a commercial cleaner/degreaser which is not corrosive or incompatible with bearings and gears. Other close fitting parts should be liberally coated by hand with grease prior to reassembly.	The valve yoke-sleeve shall be lubricated periodically based on cycle and service conditions, but not less than once a year. Any good grade of grease may be used on these parts. Only a small amount of grease is required over lubricating the stem bearings will result in the leakage of grease around the bearing housing.
SERVICE TEMPERATURE T=350°C AND BELOW: - VISCOL-SIGNAL CEP 30 or REINER-FUCH-CEPLATTYN 300 or KLUBER-GRAFLOSCON	AMBIENT TEMPERATURE RANGE [-30°C;+85°C] AGIP-GR MU/EP1 or ESSO-BEACON EP1 or BP-LTX 1	AMBIENT TEMPERATURE RANGE [-30°C;+85°C] AGIP-GR MU/EP1 or ESSO-BEACON EP1 or BP-LTX 1
SERVICE TEMPERATURE ABOVE T=350°C: - EXXON-RONEX EXTRA DUTY 2	AMBIENT TEMPERATURE RANGE [-60°C;+65°C] AGIP-FN 20/00	AMBIENT TEMPERATURE RANGE [-60°C;+65°C] AGIP-FN 20/00

E. LIST OF ORDINARY MAINTENANCE TOOLS

1. Seat removing tools (for removal of the threading seat rings, these tools can be supplied on request).
2. Packing extraction tool (can be supplied upon request)
3. Injector gun (can be supplied upon request).

7. PRECAUTIONS

WORKING PRESSURE AND TEMPERATURE	When using the valve, be sure to work with proper pressure temperature combinations within the maximum allowed as per the ratings marked on valve nameplate. The rating tables are those of ASME B16.34 or EN 12516-1 as applicable. For special materials and conditions not "Rated", check that the design condition specified in the customer order, are correctly specified and applied (also check the valve nameplate).
VALVE MATERIAL CHOICE	It is the client's responsibility to select the correct material, based upon the media and operational condition. The correct choice will aid in increasing valve life expectancy andvice versa, corrosion, erosion or other factors which can lead to a reduced valve life.
CORROSION ALLOWANCE	Standard valves are designed to be safe taking into account a maximum corrosion allowance of 3mm. Never use the valve with a higher corrosion allowance unless specified in the customer order.
PIPELINE LOAD	Standard valves have not been designed for support purposes, hence the client must avoid any significant pipeline load concentrations at valve interface. If requested, BFE can supply the necessary information to allow the customer to perform the relevant verification or be required to perform the verification based on client data.
CYCLIC LOAD	In case of a significant number of cycles and load variations, further stress analysis shall be performed to verify the valve strength. This being the case, BFE can supply the necessary information to allow the customer to perform the relevant verification, or can be asked to perform the verification based on client data.
START-UP	Once the valve has been installed in accordance with all the procedures and precautions as described in the previous chapters, the valve can be started-up. For gate valves only, be careful not to heat-up the valve in a closed position with fluids inside, this could result in over pressurizing the valve.
NORMAL OPERATION	When in operation, the gate and globe valve can be hand-operated from open to close or vice versa by the handwheel. Prior to operating the valve, make sure that the temperature of the handwheel is not too hot or cold which could result in injury to the operator's hands.
NORMAL SHUT-DOWN PROCEDURE	No special procedures are required for shut-down.
VALVE MODIFICATION	In no case is the user allowed to modify the geometry or the material of valve components. This action determines the immediate expiring of factory warranty.

8. EXPLOSIVE ATMOSPHERES (ATEX)

Valves may be used in potentially explosive atmospheres. Where the customer require valves in conformity to ATEX 94/9/EC, B.F.E. can supply valves in conformity to Zone II category 2. In accordance with the Directive 94/9/EC. in this manual B.F.E gives some indications to the valve users on how to operate in safe conditions.

LEAKAGE FROM PACKING	Check frequently the condition of packing and monitor the amount of emission by the use of suitable means (i.e. sniffers); in the case of significant leakage level change or adjust the packing.
LEAKAGE FROM BODY/BONNET CONNECTION	In the case of valve leakage through body-bonnet joint, it is necessary to substitute the gasket.
INADEQUATE LUBRICATION	In the case of long and frequent operations, the friction between stem, yoke sleeve and bonnet, can cause a local increase of the temperature. Therefore BFE recommends lubricating all the parts involved.
INADEQUATE ELECTRIC CONTINUITY	BFE valves are made with permanently contactable steel components hence a full electric continuity is guaranteed. If the connection to the pipeline does not guaranty the metal continuity (i.e. flanged connection with fully or partially non metallic gasket) BFE suggests adopting equipotential devices.
INADEQUATE THERMAL INSULATION	Valves can be used at any temperature allowed by the relevant rating table; the high temperature of external surfaces can be a potential cause of explosion. In this case it is good practice to insulate the valves when used in hot conditions with similar devices as adopted for the rest of the pipeline. However, the temperature of the fluid conveyed in the inner part has to be compared with the minimum temperature for priming of explosive atmosphere in order to check the compatibility.
ELECTRIC COMPONENTS	If the valves need any electrical equipment mounted, check if the Ex certificates of the electric components are for the protection level necessary for the site conditions.
PRESENCE OF POWDERS THAT MAY TRIGGER EXPLOSION	BFE valves are constructed in such a way that any powders in the surrounding environment cannot enter the valve itself. Nevertheless it is recommended to check at regular intervals the fastening of the stuffing box in order to prevent the infiltration of these powders, which, after contact with the inner fluid/gas, might trigger explosions. During the cleaning of the external valve surfaces, it is recommended to use wet cloths to prevent electrostatic effects, which may trigger explosions, if in contact with the powders themselves.

9. ENVIRONMENTAL PRECAUTIONS

The following are the indications of good practice which should be adopted during the life cycle of the product for correct use and in order to protect the environment and prevent pollution.

ASSEMBLY	When installing the valve, the materials for packing and protection have to be removed and disposed of according to the following procedures: DO NOT BURN IN UNCONTROLLED WAY DISPOSE ACCORDING TO THE NATIONAL RULES IN FORCE PREFERABLY RECYCLE – ALL THE PACKING MATERIALS USED ARE RECYCLABLE
OPERATION AND MAINTENANCE	Observe the indications contained in this manual to prevent leakage of products that are harmful for the environment. The material used for the packings is free from asbestos fibres, use products with the same features when replacing. Maintenance should be in accordance with the indications of this manual.
DISPOSAL	When the valve life has come to the end it becomes waste and it should be disposed of according to the following indications DISPOSE ACCORDING TO THE NATIONAL RULES IN FORCE TEMPER WHEN THE VALVE WAS IN CONTACT WITH HARMFUL PRODUCTS PREFERABLY RECYCLE – ALL THE MATERIALS USED ARE RECYCLABLE

ANNEX "A" - NPT ASSEMBLY INSTRUCTIONS

The following steps are applicable to all the NPT connections of the valve (Plugs, End Connections, etc).

STEP-1 : Inspect port and fitting to ensure that both are free of contaminants and excessive burrs.

STEP-2: Apply a strip of an anaerobic liquid pipe sealant around the male threads leaving the first two threads uncovered. If no liquid sealant is available, wrap Teflon tape 1-1/2 turns in a clockwise direction, viewed from the pipe end, leaving the first two threads uncovered.
CAUTION: Teflon tape and some pipe sealants are damaging to hydraulic components. Always use extreme caution and follow manufacturer's recommendations for proper application of any sealant in order to prevent contamination.

STEP 3: Screw finger tight into the port.

STEP 4: Wrench tighten the fitting to the correct turns Past Finger Tight position (See following table).
A properly assembled fittings total thread engagement should be 3 to 6 turns.
CAUTION: Never back off an installed pipe fitting to achieve proper alignment. Loosening installed pipe fittings will corrupt the seal and contribute to leakage and failure.

Torque installation of pipe fittings is not a recommended practice. Thread taper and quality, different port and fitting materials, plating thickness and types, varying thread sealants, orientation, and other factors reduce the reliability of a torqued connection. If torque installation is required, refer to the following table for suggested torque values.

NPT TABLE

ITEM	SCREW SIZE	TURN PAST FINGER TIGHT	TORQUE [Nm]
1	1/8"	1.5 - 3.0	17
2	1/4"	1.5 - 3.0	35
3	3/8"	1.5 - 3.0	55
4	1/2"	1.5 - 3.0	75
5	3/4"	1.5 - 3.0	105
6	1"	1 - 2.5	150
7	1"-1/4	1 - 2.5	210
8	1"-1/2	1 - 2.5	290
9	2"	1 - 2.5	410

ANNEX "B" – BODY-BONNET BOLT OR SCREW TIGHTENING SPECIFICATION

To avoid having bolts over stressed during the valve re-assembly, follow the recommended bolting torques provided here:

BOLTING TORQUE TABLE [Nm]

IMPERIA BOLT SIZE	METRIC BOLT SIZE	**ALL MATERIAL OTHER THE ROW N°2**	ROW N°2 ONLY FOR X5CrNi18.10 (A2-70) 24CrMo5 (G) 21CrMoV57 (GA)
3/8 UNC	M10	**30**	45
1/2 UNC	M12	**70**	75
9/16 UNC	M14	**95**	120
5/8 UNC	M16	**140**	185
3/4 UNC	M20	**230**	260
7/8 UNC	M22	**370**	450
1-UNC	M24	**550**	670

NOTE:

- Torque tolerance ±10%.
- For temperatures above 400°C use 75% of the torque values.
- Torque values are with the bolts lubricated.
- When applying the torque to the bolts, each bolt should be torqued in steps of approximately 20% of the final torque.
- Do not use impacting devices to tighten up the bolting on the body/bonnet. Use suitable mechanical devices for tightening.
- In case of metric bolting use the nearest imperial nominal size available.
- Before installing flange bolts, it is recommend to apply a light coating anti-seize (non-galling, high temperature grease) to the threads of the bolts.

FLANGE BOLT TIGHTENING SEQUENCE

To ensure even distribution of stresses in the fully-installed flange, tighten the bolts in a star pattern then repeat the star pattern while tightening to the next torque value, and so on up to the maximum torque value.	**EXAMPLE OF CRISS-CROSS SEQUENCE**
	

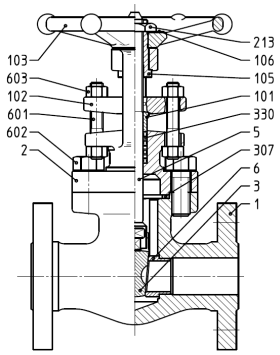
ANNEX "C" - TROUBLESHOOTING GUIDE

FAILURE	CAUSE	TROUBLESHOOTING
Leakage of packing	1-Gland flange nuts loose 2-Rings of packing insufficient 3-Packing aged or failing 4-Stem sealing damage	1-Equally tighten eyebolt nuts 2-Add packing 3-Replace packing 4-Stem should be maintained in accordance with the correct procedures or replaced according to with the maintenance of pipeline facilities
Leakage between sealing surface	1-Dirt between sealing surfaces 2-Sealing surface damaged	1-Clean sealing surface 2-Repair the sealing surfaces
Operation failure	1-Packing too tight 2-Stem nut over worn 3-Stem bent 4-Foreign matter between the stem and stem nut or gland or gland flange	1-Properly loosen gland flange nuts 2-Replace stem nut 3-Rectify or replace stem 4-Clean foreign matter
Leakage between body/bonnet flanges	1-Bonnet bolts loose 2-Bonnet gasket failure	1-Properly tighten bonnet nuts 2-Replace bonnet gasket
Body and bonnet broken and leaking	1-Static head 2-Fatigue 3-Cracking or breaking from freezing temperatures	1-Careful operation to prevent sudden stopping, pumping and rapid shutting 2-Replace valve that exceeds guarantee period or is found with early fatigue defection 3-Drain away water in winter when valve is not used
Disc fails to open	1- Disc blocked in the body 2- Stem is overheated and blocks the disc	1-Use proper torque 2-When the valve is closed and the pipeline is heated, rotate the handwheel slightly counter clockwise at varying intervals

IF THE PROBLEM PERSISTS, YOU HAVE ANY QUESTIONS OR NEED ADDITIONAL INFORMATION, PLEASE DO NOT HESITATE TO CONTACT BFE'S CUSTOMER SERVICE DEPARTMENT FOR FURTHER ASSISTANCE AND INSTRUCTIONS.

ANNEX "D" – TYPICAL VALVE SKETCHES

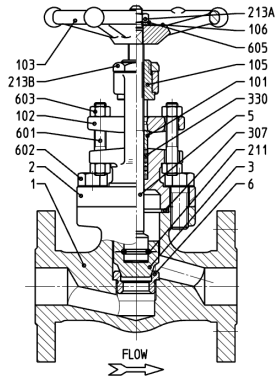
GATE



ITEM	DESCRIPTION
1	BODY
2	BONNET
3	GATE
5	STEM
6	SEAT
101	GLAND
102	GLANDE FLANGE
103	HANDWHEEL

ITEM	DESCRIPTION
105	SLEEVE
106	NAMEPLATE
213	NUT
307	GASKET
330	PACKING
601	BOLT
602	SCREW
603	NUT

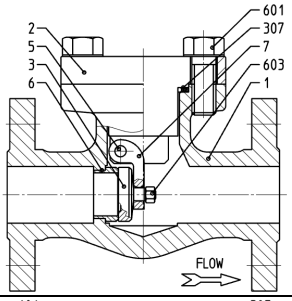
GLOBE



ITEM	DESCRIPTION
1	BODY
2	BONNET
3	DISC
5	STEM
6	SEAT
101	GLAND
102	GLAND FLANGE
103	HANDWHELL
105	SLEEVE
106	NAMEPLATE

ITEM	DESCRIPTION
211	WIRE
213A	NUT
213B	NUT
307	GASKET
330	PACKING
601	BOLT
602	SCREW
603	NUT
605	WASHER

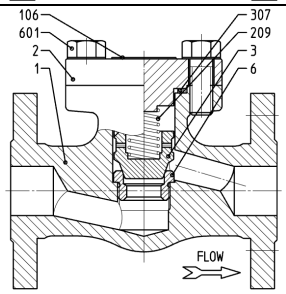
SWING CHECK



ITEM	DESCRIPTION
1	BODY
2	BONNET
3	GATE
5	STEM
6	SEAT

ITEM	DESCRIPTION
7	HINGE
307	GASKET
601	BOLT
603	NUT

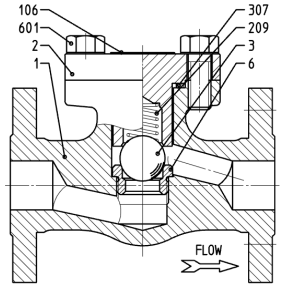
PISTON CHECK



ITEM	DESCRIPTION
1	BODY
2	BONNET
3	DISC
6	SEAT

ITEM	DESCRIPTION
106	NAMEPLATE
209	SPRING
307	GASKET
601	BOLT

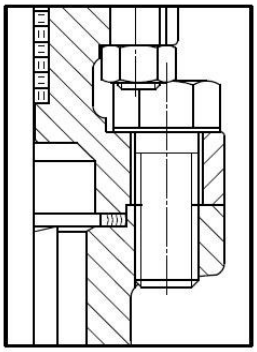
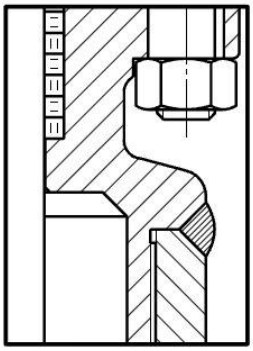
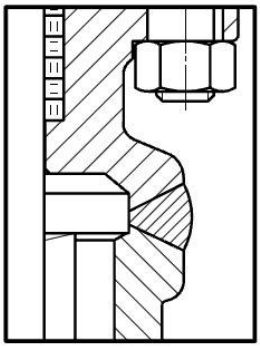
BALL CHECK



ITEM	DESCRIPTION
1	BODY
2	BONNET
3	BALL
6	SEAT

ITEM	DESCRIPTION
106	NAMEPLATE
209	SPRING
307	GASKET
601	BOLT

BODY-BONNET CONNECTIONS

BOLTED	WELDED	FULL PENETERATION WELDED
The bolted connection consist of a body bonnet gasket located in its housing between two flanges and compressed by bts.	Wlded bonnet valves are supplied in the standard type threaded in and fillet welded bonnet	The bolted connection consist of a full penetration weld.
		

VALVE CONFIGURATIONS (OTHER THEN BASIC)

BELLOW SEAL	CRYOGENIC	HIGH TEMPERATURE
Bellow seal valves feature a formed multi-ply bellows welded to the stem and to the bottom of the bonnet, creating a hermetic seal or impermeable barrier.	Cryogenic valves have an extended bonnet, the extension prevents cryogenic liquids from reaching the stem packing by enabling the liquids to boil and convert to gas.	The heat dissipation extended bonnet construction is made to dissipate heat and to lower the heat at the stem packing and to avoid subsequent failure of the packing and operation of the valve.