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**BSK**  
**Bellows Sealed Globe Valves**  
Installation and Maintenance Instructions

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1. General safety information
2. General product information
3. Transport and storage
4. Installation
5. Commissioning
6. Maintenance
7. Spare parts
8. Fault finding



# 1. General safety information

Safe operation of these products can only be guaranteed if they are properly installed, commissioned, used and maintained by qualified personnel (See Section 11 of this document) in compliance with the operating instructions. General installation and safety instructions for pipeline and plant construction, as well as the proper use of tools and safety equipment must also be complied with.

## 1.1 Intended use

Intended use Referring to the Installation and Maintenance Instructions, name-plate and Technical Information Sheet, check that the product is suitable for the intended use/application.

The products listed below comply with the requirements of the European Pressure Equipment Directive 2014/68/UE and carry the **CE** mark for DN 32÷250.

The products fall within the following Pressure Equipment Directive categories:

Product		Group 1 Gas	Group 2 Gas	Group 1 Liquid	Group 2 Liquid	
BSK1 BSK1T	PN16	DN15÷25	SEP	SEP	SEP	
		DN32÷50	1	SEP	SEP	
		DN65÷125	2	1	SEP	SEP
		DN150÷200	2	1	2	SEP
		DN250	3	2	2	SEP
BSK2 BSK2T	PN16	DN15÷25	SEP	SEP	SEP	
		DN32÷50	1	SEP	SEP	
		DN65÷125	2	1	SEP	SEP
		DN150÷200	2	1	2	SEP

- I) The products have been specifically designed for use on steam, compressed air, water and other industrial fluids that are in Group 2 of the above mentioned Pressure Equipment Directive. The products' use on other fluids may be possible but, if this is contemplated, Spirax Sarco should be contacted to confirm the suitability of the product for the application being considered.
- II) Check material suitability, pressure and temperature and their maximum and minimum values. If the maximum operating limits of the product are lower than those of the system in which it is being fitted, or if malfunction of the product could result in a dangerous overpressure or overtemperature occurrence, ensure a safety device is included in the system to prevent such over-limit situations.
- III) Determine the correct installation situation and direction of fluid flow.
- IV) Spirax Sarco products are not intended to withstand external stresses that may be induced by any system to which they are fitted. It is the responsibility of the installer to consider these stresses and take adequate precautions to minimise them.
- V) Remove the protective cover from all the connections and, if necessary, the protective film from all the nameplates before installation on steam or high temperature plant equipment.

## 1.2 Access

Ensure safe access and if necessary a safe working platform (suitably guarded) before attempting to work on the product. Arrange suitable lifting gear if required.

## 1.3 Lighting

Ensure adequate lighting, particularly where detailed or intricate work is required.

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## 1.4 Hazardous liquids or gases in the pipeline

Consider what is in the pipeline or what may have been in the pipeline at some previous time. Consider: flammable materials, substances hazardous to health, extremes of temperature.

## 1.5 Hazardous environment around the product

Consider: explosion risk areas, lack of oxygen (e.g. tanks, pits), dangerous gases, extremes of temperature, hot surfaces, fire hazard (e.g. during welding), excessive noise, moving machinery.

## 1.6 The system

Consider the effect on the complete system of the work proposed. Will any proposed action (e.g. closing isolation valves, electrical isolation) put any other part of the system or any personnel at risk? Dangers might include isolation of vents or protective devices or the rendering ineffective of controls or alarms. Ensure isolation valves are turned on and off in a gradual way to avoid system shocks.

## 1.7 Pressure systems

Ensure that any pressure is isolated and safely vented to atmospheric pressure. Consider double isolation (double block and bleed) and the locking or labelling of closed valves. Do not assume that the system has depressurised even when the pressure gauge indicates zero.

## 1.8 Temperature

Allow time for temperature to normalise after isolation to avoid danger of burns.

## 1.9 Tools and consumables

Before starting work ensure that you have suitable tools and/or consumables available. Use only genuine Spirax Sarco replacement parts.

## 1.10 Protective clothing

Consider whether you and/or others in the vicinity require any protective clothing to protect against the hazards of, for example, chemicals, high /low temperature, radiation, noise, falling objects, and dangers to eyes and face.

## 1.11 Permits to work

All work must be carried out or be supervised by a suitably competent person. Installation and operating personnel should be trained in the correct use of the product according to the Installation and Maintenance Instructions.

Where a formal 'permit to work' system is in force it must be complied with. Where there is no such system, it is recommended that a responsible person should know what work is going on and, where necessary, arrange to have an assistant whose primary responsibility is safety.

Post 'warning notices' if necessary.

## 1.12 Handling

Manual handling of large and/or heavy products may present a risk of injury. Lifting, pushing, pulling, carrying or supporting a load by bodily force can cause injury particularly to the back. You are advised to assess the risks taking into account the task, the individual, the load and the working environment and use the appropriate handling method depending on the circumstances of the work being done.

## 1.13 Residual hazards

In normal use the external surface of the product may be very hot. If used at the maximum permitted operating conditions the surface temperature of some products may reach very high temperatures 300°C. Many products are not self-draining. Take due care when dismantling or removing the product from an installation (refer to 'Maintenance' instructions).

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## 1.14 Freezing

Provision must be made to protect products which are not self-draining against frost damage in environments where they may be exposed to temperatures below freezing point.

## 1.15 Safety information specific for the product

See the specific details relating to the product in the following 'Maintenance' section.

## 1.16 Disposal

Unless otherwise stated in the Installation and Maintenance Instructions, this product is recyclable and no ecological hazard is anticipated with its disposal providing due care is taken.

## 1.17 Returning products

Customers and stockists are reminded that under EC Health, Safety and Environment Law, when returning products to Spirax Sarco they must provide information on any hazards and the precautions to be taken due to contamination residues or mechanical damage which may present a health, safety or environmental risk. This information must be provided in writing including Health and Safety data sheets relating to any substances identified as hazardous or potentially hazardous.

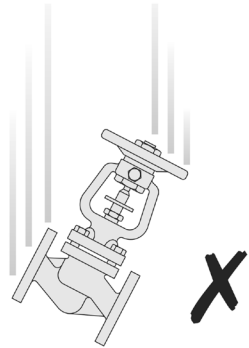
## 1.18 Working safely with cast iron products on steam

Cast iron products are commonly found on steam and condensate systems. If installed correctly using good steam engineering practices, it is perfectly safe. However, because of its mechanical properties, it is less forgiving compared to other materials such as SG iron or carbon steel. The following are the good engineering practices required to prevent waterhammer and ensure safe working conditions on a steam system.

### Safe Handling

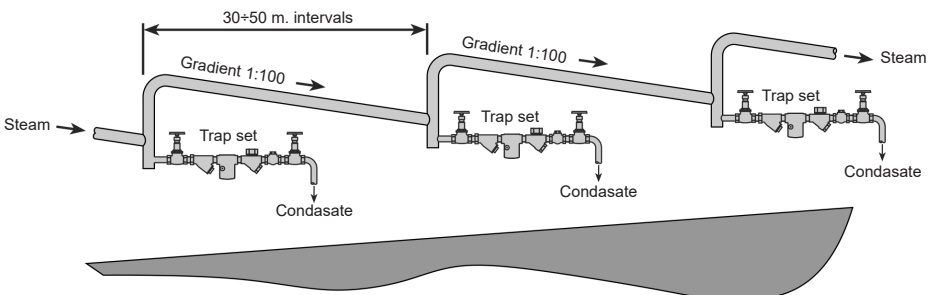
Cast Iron is a brittle material. If the product is dropped during installation and there is any risk of damage the product should not be used unless it is fully inspected and pressure tested by the manufacturer.

Please remove label before commissioning.

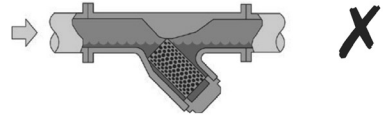
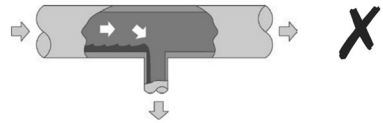
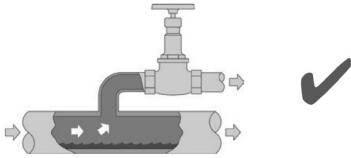
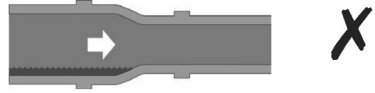
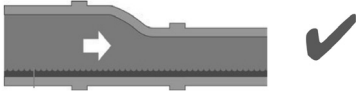
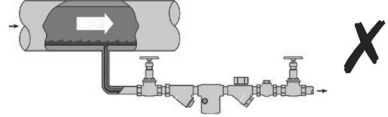
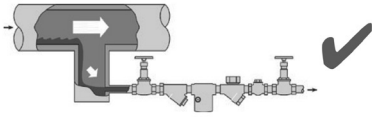


### Prevention of water hammer

Steam trapping on steam mains:



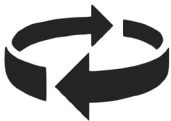
## Steam Mains - Do's and Dont's:



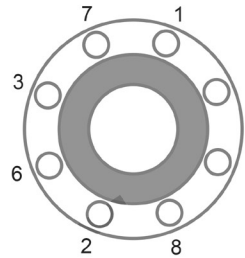
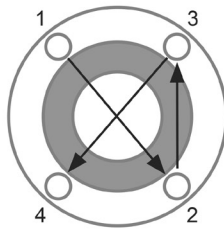
## Prevention of tensile stressing

Pipe misalignment:

Installing products or re-assembling after maintenance:



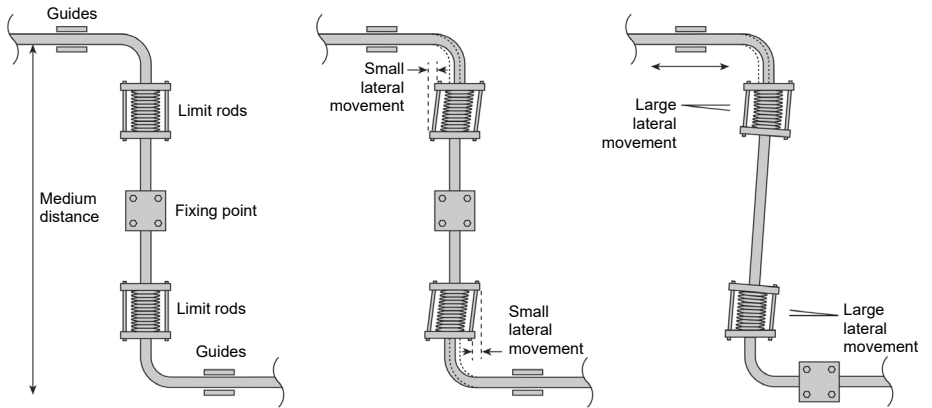
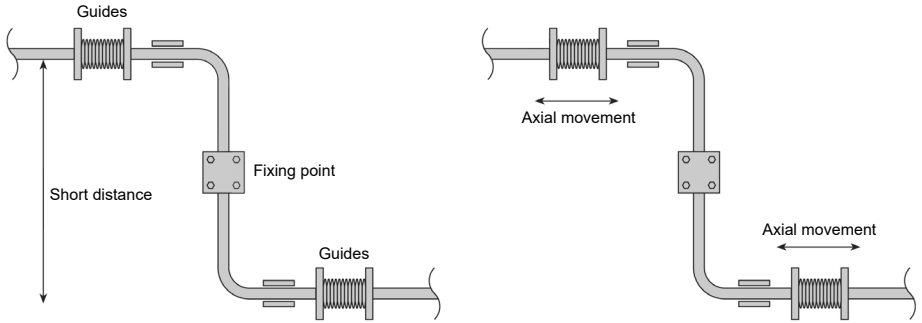
Do not over tighten.  
Use correct torque figures.



Flange bolts should be gradually tightened across diameters to ensure even load and alignment.

## Thermal expansion:

Examples showing the use of expansion bellows. It is highly recommended that expert advise is sought from the bellows manufacturer.



## 2. General product information

### 2.1 General description

Manually operated isolation globe valves equipped with spinning handwheel that rotates clockwise and anticlockwise to open/close the valve, used as on-off valves (flat head plug, BSK) or for throttling services (modulating shutter, BSKT) on steam, condensate, hot or cold water and other compatible non-corrosive fluids. They are robust and compact units with bodies in cast iron and SG Iron, bellows sealed spindle and on-line flanged connections. To facilitate the plug closure under high pressure conditions, valves with larger dimensions (DN150, DN200 and DN250) are equipped with pressure balancing discs

#### Standards

These appliances fully comply with the requirements of the European Pressure Equipment Directive 2014/68/UE for DN32-250 and bear the **CE** mark.

#### Certifications

On request, BSK and BSKT valves can be supplied with "Manufacturer's Typical Test Report" as drawn up by the manufacturer.

**Note:** All certification / inspection requirements must be stated at the time of order placement.

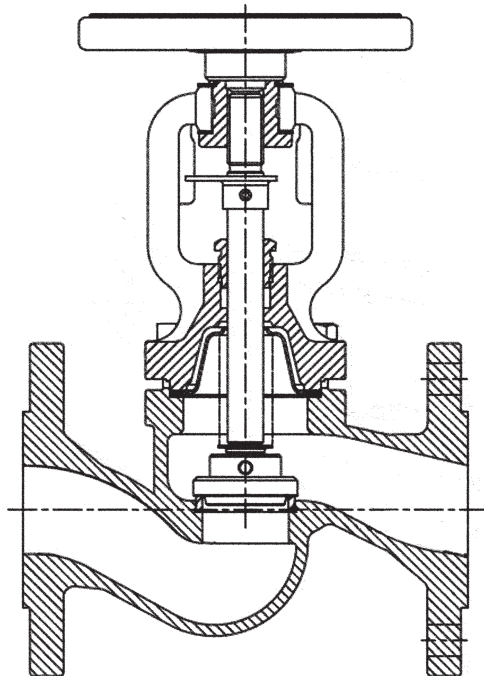


Fig. 1

### 2.2 Sizes and pipe connections

Flanged EN 1092 PN 16, standard

**BSK1:** DN15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150, 200 and 250.

**BSK1T:** DN15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150 and 200

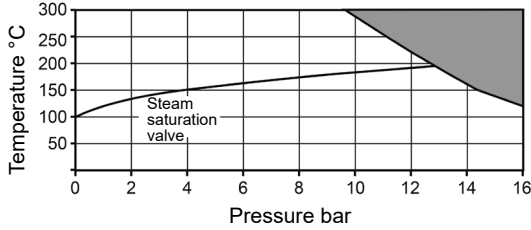
**BSK2:** DN15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150 and 200


**BSK2T:** DN15, 20, 25, 32, 40, 50, 65, 80, 100, 125, 150 and 200



## 2.3 Pressure/temperature limits

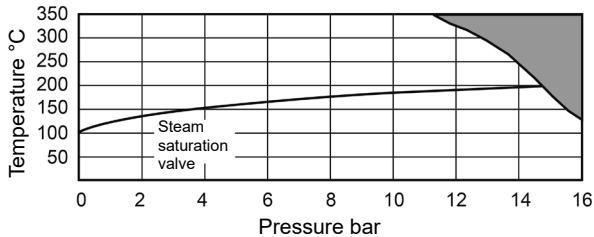
### BSK1 BSK1T




 The product must not be used in this region

Body design conditions		PN 16
PMA - Maximum allowable pressure	@ 120°C	16 bar
TMA - Maximum allowable temperature	@ 9,6 bar	300°C
Minimum allowable temperature		-10°C
PMO - Maximum operating pressure	@ 195°C	12,9 bar
TMO - Maximum operating temperature	@ 9,6 bar	300°C
Minimum operating temperature, danger of freezing considered		-10°C
<b>Note:</b> For lower temperatures, contact Spirax Sarco		
ΔPMX - Maximum differential pressure limit at PMO (on-off mode)		
Designed for a maximum cold hydraulic test pressure of		24 bar

### BSK2 BSK2T



 The product must not be used in this region

Body design conditions		PN 16
PMA - Maximum allowable pressure	@ 120°C	16 bar
TMA - Maximum allowable temperature	@ 11.2 bar	350°C
Minimum allowable temperature		-10°C
PMO - Maximum operating pressure	@ 200.5°C	14,7 bar
TMO - Maximum operating temperature	@ 11.2 bar	350°C
Minimum operating temperature, danger of freezing considered		-10°C
<b>Note:</b> For lower temperatures, contact Spirax Sarco		
ΔPMX - Maximum differential pressure limit at PMO (on-off mode)		
Designed for a maximum cold hydraulic test pressure of		24 bar

## 3. Transport and storage

Our valves are supplied ready-for-use with the plug in closed position and with all connections shielded with suitable protective covers (to be removed upon installation).

During transport it is paramount to ensure that valves are not damaged in any way. This applies particularly to the most exposed parts (spindle and handwheel). All valves weights are reported on the relevant technical data sheet (3C.115). Larger valves must be transported properly fixed to the protective bridge covers using suitable handling ropes.

Upon delivery, carefully inspect for any damage or defects which must be reported to Spirax Sarco immediately. Furthermore, it is necessary to verify that the technical specifications are in compliance with the plant equipment characteristics, that the manufacturing materials and the operating fluid are suitable for the intended use, and that the maximum pressure and temperature limits comply with the provided limits (See the valves ID plate).

**Unloading and handling note: NEVER hook or string any lifting tools to the flanges holes or to the handwheel spokes.**

The storage of the valves must ensure their perfect performance even after extended stocking periods: for this reason, valves should be stored up in a closed, decontaminated, dry environment with a temperature ranging from -20°C and +65°C. Furthermore, this environment should be free of any moisture, corrosion or freezing risk, and should not have any dirt or foreign matter on the inside which is potentially harmful to the valves.

## 4. Installation

**Note: Before actioning any installation observe the 'Safety information' in Section 1.**

Any mistake during positioning and mounting the valve may compromise its correct operation and constitute a high potential safety risk. It is therefore absolutely necessary to follow with the utmost attention to the directions listed below:

Unpack the valves and remove the protective covers.

Inspect the valve checking that they are complete and free of any traces of dirt that may have gathered during storage. Also check that the coupling piping is clean in its interior and is fitted with a filter upstream the valve. The presence of scale or foreign bodies inside the valve may cause irreversible damages to the sealing surfaces between seat and plug (Even during ordinary operation and, for this reason, not covered by warranty).

Check that the technical information and specifications on the ID plate match the operating conditions of the system to which the valve is to be fitted.

A safe operation can only be guaranteed if the supplied valve is destined for uses that are both known and agreed with Spirax Sarco and that do not exceed the limits shown on the ID plate (operating beyond such limits can cause excessive stress and be unsustainable). It is equally important to act in accordance with any other indication specified in the documentation supplied with the unit.

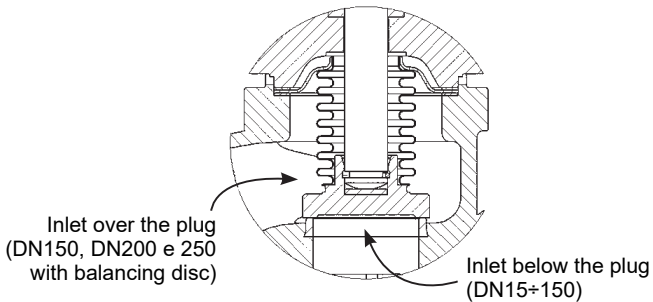
**Note:** it is appropriate that customers precisely notify Spirax Sarco about possible heavy loads or operating conditions which deviate from normal operation (eg. special applications, corrosive or toxic operating fluids etc.) to enable Spirax Sarco engineers to develop and propose appropriate measures/actions, such as alternative materials and seals / gaskets, special protections for areas intensely exposed to wear, solutions to prevent excessive and pressure/temperature values out of allowable range etc...

For maintenance and correct operational purposes, valves should always be installed in easily accessible positions.

Valves can be installed in any position, but it is advisable that the valve spindle is in vertical position and the handwheel downward, to prevent the collection of impurities into the bellows folds.

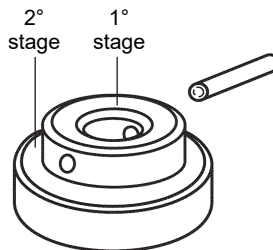
Always respect the flow direction indicated by the arrow imprinted on the valve body (Fig. 2).

For smaller valves (DN15-150), please note that the flow enters the valve body from the lower side, that is to say lightly touching the bottom surface of the plug (plug without balancing disc); In larger valves, (DN150, DN200 and 250), the operating fluid enters the upper chamber above the balanced plug (plug with balancing disc).



**Fig. 2**

**Note:** The balancing disc is a two-stage internal by-pass device (Fig. 3) which significantly reduces the motion force of the handwheel in the event of high differential pressures. When the first stage opens, it acts as a pre-opening pilot plug and allows a controlled flow of fluid to pass. This gradually reduces the differential pressure present between upstream and downstream the valve and, as a result, reduces the force required to lift the second stage (main plug) from its seat. Typically, large on/off valves are subjected to high differential pressures even under normal operating conditions. Therefore, the closure of these valves would be almost impossible without the balancing disc.



**Fig. 3**

These valves are not designed to withstand severe stress, so the mounting pipelines should be suitably mounted, aligned and properly supported in order not to transmit any adverse effects of expansion (thrust, torsion and flexing movements may cause leakages, deformation and and/or non-allowable stress to valve bodies). In addition, all coupling and sealing components should be constructed with materials that are allowable and compatible with the system specifications. During valve assembly, flanges should be perfectly aligned and gaskets perfectly centred, carefully cleaned and should not present any signs of damage, in order to ensure perfect tightness. Evenly cross-tighten the bolts, respecting recommended tightening torques (As shown in the table on pag. 10) to avoid over-tightening which might produce further stress over the whole structure.

**Note:** valves and pipelines working with high ( $> 50^{\circ}\text{C}$ ) or very low temperatures ( $< 0^{\circ}\text{C}$ ) should be insulated by suitable insulating jackets in order to prevent direct contact with personnel. If this is not possible, provide suitable warning signboards in proximity of the units/piping that represent hazardous conditions. If it is necessary to insulate the valves, make sure not to compromise their correct operation. The gasket between cover and stuffing box must always remain perfectly visible and accessible. During welding, coating and/or brickwork operations, valve should always be suitably protected from welding residue or drops as well as from dust, sand/grit or other building materials. Moreover, screws, spindle and all plastic parts should never be painted to avoid their possible malfunction.

In steam plants, it is always advisable to install a thermodynamic or a floating condensate steam trap upstream of the isolation valves, to ensure the adequate condensate drainage in order to protect valves, equipment, downstream instruments and piping from damages due to waterhammer effects.

To remove any foreign bodies or impurities that may damage the gaskets surfaces, before commissioning the system all pipelines should be thoroughly washed and flushed with compressed air, with valves in fully open position.

## 5. Commissioning

Once installation and/or maintenance procedure is completed, compare materials instructions and valve pressure and temperature conditions with the operating conditions, in order to verify its resistance and capacity.

Before commissioning the unit, check that the system is fully operational and carry out functional tests on all the alarm and protective devices.

During commissioning procedure, always proceed with caution as the initial operations are critical and can present hazardous conditions. Gradually increase the pressure and progressively open the valves by turning the handwheel counter clockwise, in order to avoid any sudden variations in pressure and/or temperature. Simultaneously, check that there are no steam leaks at the valve or at the pipe connections until the normal operating pressure will be reached. In presence of leakage, immediately release the plant pressure and run the valve installation once again, replacing the seals. If the leakage is at the stuffing box gaskets, immediately replace the bellows assembly.

**Note:** the manual handwheel is designed proportionally to the force required to open and close the valve under all operating conditions (Usually, valves are utilized in fully open or fully closed positions). It is strongly discouraged the use of auxiliary levers or tools to open or close the valve, as this could involve excessive force causing damage. When the valve is in fully open position (with the spindle fully lifted), rotate it clockwise by  $\frac{1}{8} + \frac{1}{4}$  of a turn to eliminate any backlash and to prevent subsequent probable damage to the spindle, the bellows assembly and other valve components.

Carry out several opening and closing cycles of the isolation valve, to verify that is working properly. Check the stuffing box gaskets (especially when the valve is used for the first time at its design operating pressure and temperature) and check the correct tightness of bolts on the valve body/cover assembly, considering that bolts should be evenly cross-tightened, respecting the recommended tightening torques (as shown in the table on pag. 10), particularly when the valve is loaded or heated for the first time, or in presence of traces of leakage at valve body/cover gaskets.

**Note:** during long periods of plant shutdown, it is recommended to drain all fluids from the pipeline in view of the fact that, for their physical and chemical characteristics, they tend to modify their concentration, to polymerise, crystallise or undergo any other change of state. If necessary, all the pipelines should be flushed with the valves in fully open position.

## 6. Maintenance

**Note:** Before starting any maintenance work, read the "General Safety Instructions" in section 1.

Maintenance work on valves should be carried out only by authorised, qualified personnel and in full compliance with Accident Prevention Legislation.

BSK1 Valves are designed and manufactured to require minimal maintenance. To ensure proper and safe system operation, (particularly in case of reduced accessibility to the valve or when the valve is occasionally operated and has a limited use) it is recommended to carry out regular scheduled inspections. Inspections frequency should be determined by the maintenance manager (but it is advisable a monthly frequency, at least) and will depend on the specific valve use and the plant characteristics (nature of the media, operating temperature and pressure etc ...).

In addition to scheduled inspections, average operating lifetime of the valve may be extended by performing periodic replacement of seals and gaskets and by lubricating moving parts (Spindle).

Before uninstalling the valve from the pipeline or carrying out any repair/maintenance intervention always insulate any piping involved, then release the pressure to atmospheric levels and allow the valve to cool under safe conditions.

Before their handling or transporting, valves must be thoroughly cleaned and drained (any residual fluid must be suitably recovered and disposed).

**Note:** the gasket between valve body and cover has a stainless steel core which can cause physical damage if it is not removed and disposed with due caution.

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When reassembling the unit, carefully verify that the surfaces of the gaskets are clean and undamaged. With the plug in open position, fit a new gasket between the valve body and cover and evenly retighten the cover stud and bolts following the recommended cross-tightening sequence (As shown in the table below).

Before reinstalling the valve, check that all the connections are properly tightened and are properly performing.

After completing the valve installation, carry out the cold hydraulic test with a water pressure not exceeding 24 bar (equivalent to the maximum design pressure declared).

**Note:** Obsolete and/or unusable valves are recyclable and no ecological hazard is anticipated with the disposal of this product, providing due care is taken. (valve should not be disposed of as ordinary household waste).

**Table - Recommended tightening torques for valve body/cover bolts**

<b>M8</b>	15 - 20 Nm
<b>M10</b>	35 - 40 Nm
<b>M12</b>	65 - 70 Nm
<b>M16</b>	140 - 150 Nm

# 7. Spare parts

## Spare parts

Spare parts are available according to the groups in the following table.

### Available spares

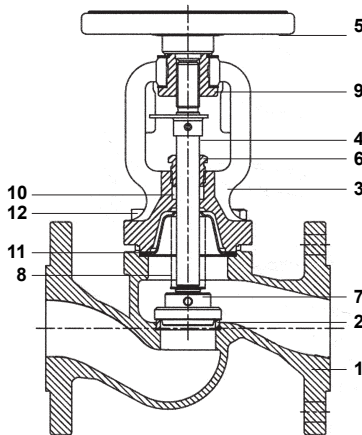
Stuffing box body (1 piece) cover (1 piece) gaskets assembly (1 piece)	<b>10, 11.1 and 11.2</b>
Spindle and bellows gaskets assembly (1 piece)	<b>4 and 8</b>
Plug (with balancing disc for BSK1/BSK2 DN150 and DN200; BSK1 DN250 only)	<b>7</b>

**Note:** always handle the valve body/cover gaskets with care as it has a metal core that can be sharp.

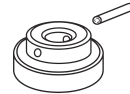
### How to order spares

Always order spares by using the description given in the column headed 'Available spares' and state type and size of valve and its nominal diameter.

**Example:** N° 1 stuffing box and body/cover gasket assembly for a Spirax Sarco BSK1 PN16 DN50 bellows sealed globe valve.



**Plug with  
balancing disc group  
(for DN150, DN200 and 250 only)**



## 8. Fault finding

Even though valves are very robust, they can be damaged by inappropriate commands, neglected maintenance or by being used for purposes other than their intended use. All maintenance and/or repairs should be carried out by expert, qualified personnel. However, first and foremost, it is always advisable to consult Spirax Sarco.

Symptom	Possible cause	Action
<b>No flow</b>	Valve closed.	Open the valve.
	Protective covers of the flange are not removed.	Remove the flange protections.
<b>Reduced flowrate</b>	Valve is not open enough.	Open the valve.
	Filter upstream the valve is dirty.	Clean or replace the filter.
	Pipeline is obstructed.	Check and unclog the pipeline.
<b>The stuffing box is leaking</b>	The stuffing box and/or the bellows gasket are damaged for one or more of the following reasons: - material wear - poor temperature resistance - poor resistance to the operating fluid - poor maintenance	Check and tighten the stuffing box and, if necessary, add/replace graphite rings to restore the tightness. Pay attention not to excessively increase the friction against the spindle. Immediately replace the bellows.
<b>Leakage between seat and plug assembly</b>	Incorrect closure.	Close the valve by turning the wheel anti-clockwise. Do not use additional tools as levers.
	Differential pressure is too high.	Use a plug with a balancing disc. Check that the direction of flow is correct.
	Presence of impurities/solid particles in the operating fluid.	Thoroughly clean the gasket surfaces. Fit a filter upstream the valve.
	Plug and/or seat have been damaged for one or more of the following reasons: - wear due to erosion/corrosion - wear due to abrasion - excessive mechanical stress due to piping load and thermal stress.	Thoroughly clean the gasket surfaces. If necessary replace the valve and/or contact Spirax Sarco.
<b>Leakage at the body/cover assembly</b>	Gasket between the valve body and cover is damaged for one or more of the following reasons: - wide temperature variations - non-allowable pressure values - poor temperature resistance - poor resistance to the operating fluid - poor maintenance	Replace the gasket between body and cover.
<b>Leaks at connections</b>	Flange bolts are not tightened enough.	Retighten the flange bolts. If necessary, renew the gaskets.
<b>Breaking of the connecting flanges.</b>	Bolts have not been tightened evenly.	Replace the valve.

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## **SERVICE**

For technical support, please contact our local Sales Engineer or our Head Office directly:

**Spirax Sarco S.r.l.** - Technical Assistance

Via per Cinisello, 18 - 20834 Nova Milanese (MB) - Italy

Tel.: (+39) 0362 4917 257 - (+39) 0362 4917 211 - Fax: (+39) 0362 4917 315

E-mail: [support@it.spiraxsarco.com](mailto:support@it.spiraxsarco.com)

## **LOSS OF GUARANTEE**

**Total or partial disregard of above instructions involves loss of any rights to guarantee.**

**Spirax-Sarco S.r.l.** - Via per Cinisello, 18 - 20834 Nova Milanese (MB) - Tel.: 0362 49 17.1 - Fax: 0362 49 17 307