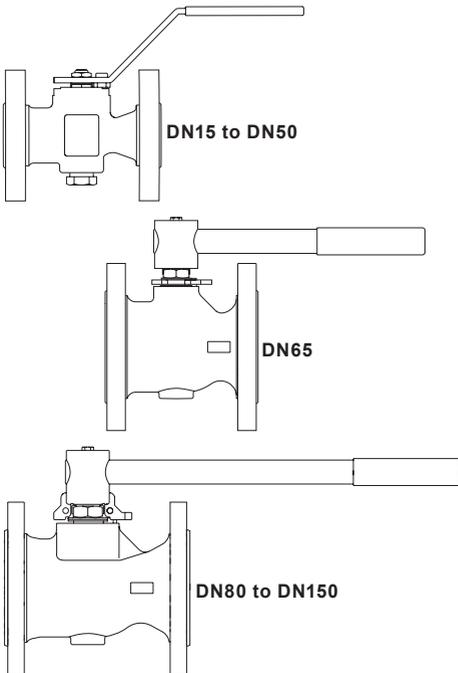


**M21Si ISO and M21Vi ISO**  
**Ball Valves DN15 to DN150**  
Installation and Maintenance Instructions

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1. Safety information
2. General product information
3. Installation
4. Commissioning
5. Operation
6. Maintenance
7. Spare parts



# 1. 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 1.11) 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

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 EU Pressure Equipment Directive/UK Pressure Equipment

(Safety) Regulations and carry the  mark when so required.

The products fall within the following Pressure Equipment Directive categories:

Product		Group 1 Gases	Group 2 Gases	Group 1 Liquids	Group 2 Liquids
<b>M21Si ISO and M21Vi ISO</b>	DN15 - DN25	SEP	SEP	SEP	SEP
	DN32	2	SEP	SEP	SEP
	DN40 - DN50	2	1	SEP	SEP
	DN65 - DN100	2	1	2	SEP
	DN150	3	2	2	SEP

- i) The product has 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.
- 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 protection covers from all connections and protective film from all name-plates, where appropriate, before installation on steam or other high temperature applications.

## 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.

## 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 these products may reach temperatures of:

- 260 °C (500 °F) for the M21Si
- 230 °C (446 °F) for the M21Vi

These products are not self-draining. Take due care when dismantling or removing them from an installation (refer to 'Maintenance instructions').

## 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 - Product specific

### Hydraulic locking

Ball valves are prone to lock-up when used on certain heating/cooling applications where both steam and liquid will pass through the valve. This is caused by liquid trapped in the ball during closure being heated to create a high hydraulic pressure inside the ball cavity. To prevent this, during manufacture, a minute hole is drilled in the ball, so, that in the closed position, any excess pressure will be relieved. Spirax Sarco ball valves for these applications are clearly marked to allow the valve to be correctly installed, such that, when closed, the hole is facing the steam source.

## 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.

## 2. General product information

### 2.1 Description

Both the M21Si and M21Vi are reduced bore ball valves, with a single piece body, having ISO mounting as standard. They are designed to be isolating valves, which can be used with the majority of industrial fluids, not control valves.

### ISO mounting

The integral ISO body mounting allows the valve to be automated without losing seal integrity, as the body does not require disassembly. Manual to remote control may therefore be easily accomplished by the ISO range of Spirax Sarco ball valves.

### Available types

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<b>M21Si2 ISO</b>	Zinc plated carbon steel body, PDR 0.8 seats.
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<b>M21Si3 ISO</b>	Stainless steel body, PDR 0.8 seats.
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<b>M21Vi2 ISO</b>	Zinc plated carbon steel body, PTFE seats.
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<b>M21Vi3 ISO</b>	Stainless steel body, PTFE seats.
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### Standards

These products fully comply with the requirements of the EU Pressure Equipment Directive/UK Pressure Equipment (Safety) Regulations and carry the  mark when so required.

### Certification

These product are available with certification to EN 10204 3.1.

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

**Note:** For further information on this product see Technical Information sheet TI-P133-77.

### Food contact

This product is not to be used on steam, liquid or gas that either forms an ingredient of, or comes into direct contact with food products in the EU.

### 2.2 Sizes and pipe connections

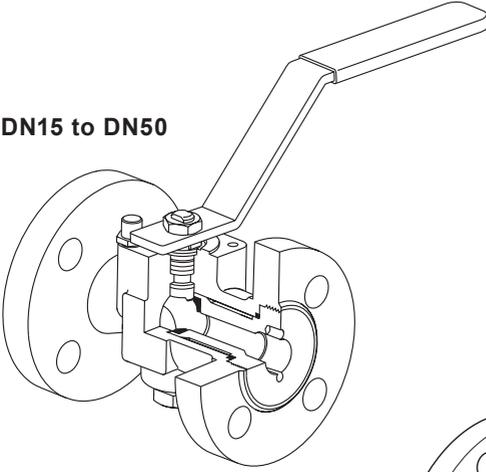
DN15, DN20, DN25, DN32, DN40, DN50, DN65, DN80, DN100 and DN150

**Standard flange:** EN 1092 PN40

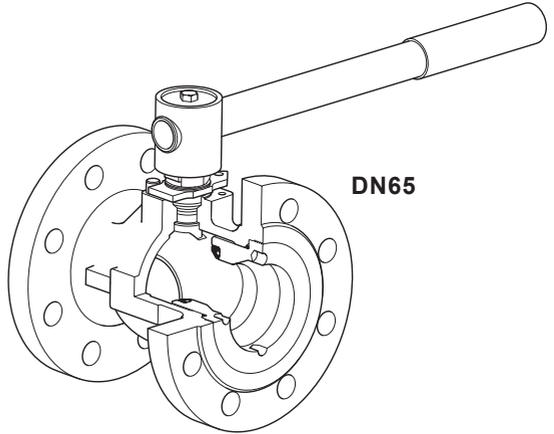
**Face-to-face dimensions:**

- DN15 to DN100 according to DIN 3202 F4.
- DN25 to DN150 according to BS 2080.

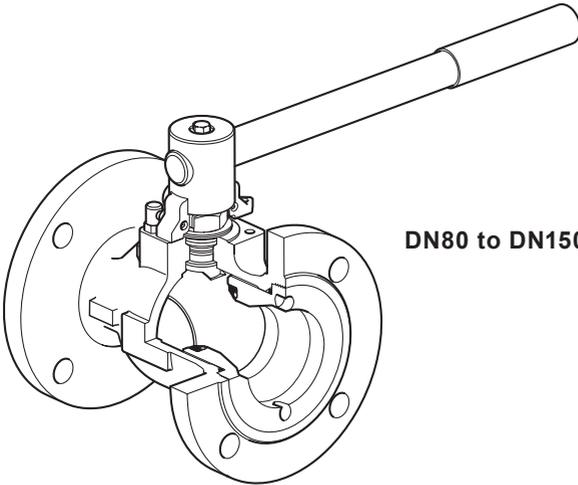
**DN15 to DN50**



**DN65**



**DN80 to DN150**



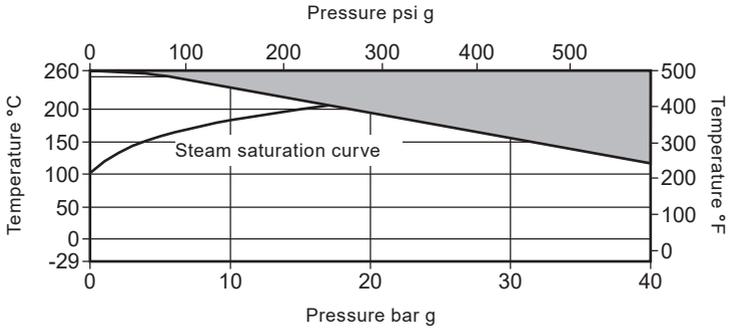
**Fig. 1**

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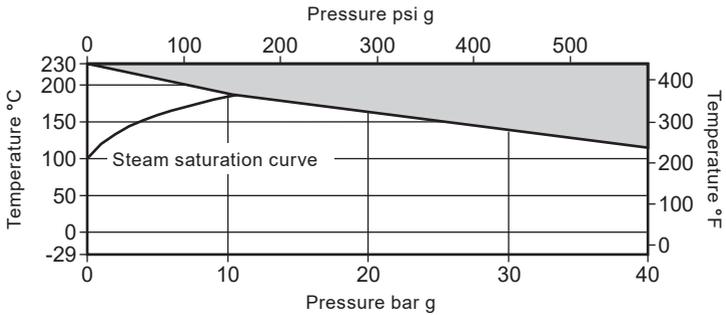
M21Si ISO and M21Vi ISO Ball Valves DN15 to DN150

## 2.3 Pressure/temperature limits

### M21Si2 ISO and M21Si3 ISO - PDR 0.8 seats



### M21Vi2 ISO and M21Vi3 ISO - PTFE seats



The product **must not** be used in this region.

Body design conditions		PN40	
PMA	Maximum allowable pressure	40 bar g @ 120 °C (580 psi g @ 248 °F)	
TMA	Maximum allowable temperature	M21Si	260 °C @ 0 bar g (500 °F @ 0 psi g)
		M21Vi	230 °C @ 0 bar g (446 °F @ 0 psi g)
Minimum allowable temperature		-29 °C	(-20 °F)
PMO	Maximum operating pressure for saturated steam service	M21Si	17.5 bar g (254 psi g)
		M21Vi	10.0 bar g (145 psi g)
TMO	Maximum operating temperature	M21Si	260 °C @ 0 bar g (500 °F @ 0 psi g)
		M21Vi	230 °C @ 0 bar g (446 °F @ 0 psi g)
Minimum operating temperature		-29 °C	(-20 °F)
<b>Note:</b> For lower operating temperatures consult Spirax Sarco.			
ΔPMX	Maximum differential pressure is limited to the PMO		
Designed for a maximum cold hydraulic test pressure of:		60 bar g	(870 psi g)

# 3. Installation

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

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

Although the valve has great structural integrity, severe misalignment and/or the pulling effect of incorrect pipe length will have a detrimental effect on the valve and must be avoided. Particular attention should be paid to correct pipe alignment such that the inlet pipework and valve are all on the same axis.

Valves are for on/off applications and may be operated manually.

Wherever practicable, valves should be installed where there is adequate space available so that they can be conveniently operated and maintained.

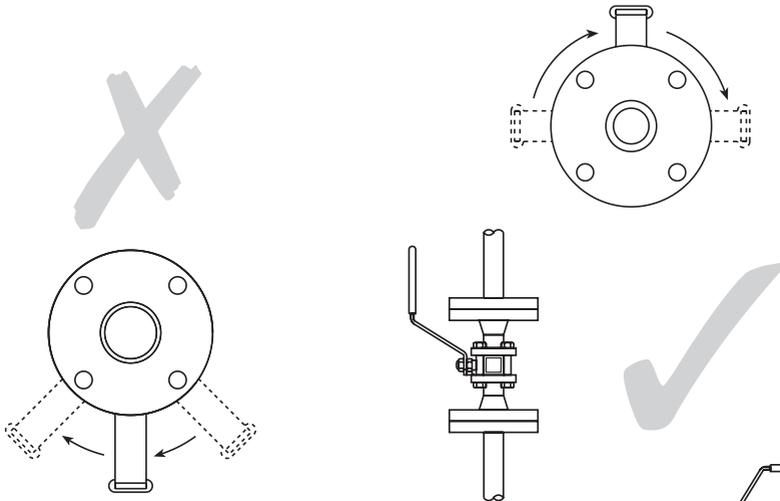
Before installing a valve, check to ensure that size, pressure rating, materials of construction, end connections, etc. are suitable for the service conditions of the particular application. Care must be taken to ensure that all dirt which may have accumulated in the valve during storage is removed before installation, maintain cleanliness during installation since the introduction of dirt can result in damage to the valve seats and operating mechanism. To minimise the danger of abrasive particles damaging the seats, pipeline strainers should be fitted upstream of the valves.

Install the valve with the handle in a suitable position. The preferred position is with the spindle vertical. The valve can be installed in any position for gas service (see Figure 3 below).

### When used on steam services:

1. Fit a trapped drain pocket upstream of the valve.
2. Open valve slowly to prevent the risk of waterhammer damage.

**Do not mount the valve upside down for liquid service (Figure 2).**



**Fig. 2 Incorrect installation for liquid service**

**Caution:**  
Always open valves slowly to avoid system shocks.

**Fig. 3 Correct installation for gas service**

## 4. Commissioning

After installation or maintenance ensure that the system is fully functioning. Carry out tests on any alarms or protective devices.

## 5. Operation

The valve is operated manually by a handle, or automatically by an actuator. Special care must be taken to ensure that the movement is made in the correct direction.

The valve can be used as an on/off control valve, and can be operated fully open or fully closed.

# 6. Maintenance

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

## 6.1 Maintenance

As with all mechanical devices, regular maintenance is the most efficient means of ensuring continued operational efficiency. Regular scheduled inspection of all valves is essential especially on valves which are operated only occasionally.

## 6.2 General maintenance

Remove the complete flanged valve from the pipeline. The complete body assembly can then be removed and new parts fitted. **Please note:** A special tool, that is only available from Spirax Sarco, is required in order to remove the insert (2) - See Section 7, Available spares. When the seats have been replaced and the valve has been reassembled it is recommended that the following tests are conducted before commissioning back into service:

- Cold hydraulic test to the body at 60 bar g (870 psi g).
- Seat leakage test using compressed air at 7 bar g.

**Table 1 Recommended tightening torques**

Item no.	Part	Size	N m	lbf ft
2	Insert	DN15, DN20, DN25 and DN32	108 - 135	80 - 100
		DN40	135 - 160	100 - 120
		DN50	215 - 245	160 - 180
		DN65	245 - 270	180 - 200
		DN80	405 - 605	300 - 450
		DN100	540 - 740	400 - 550
		DN150	1000 - 1200	740 - 890
15 and 16	Stem nuts	DN15 and DN20	10.8 - 13.5	8 - 10
		DN25	17.5 - 20.3	13 - 15
		DN32, DN40, DN50 and DN65	34 - 40	25 - 30
		DN80 and DN100	54 - 61	40 - 45
		DN150	76 - 90	56 - 67

### 6.3 How to replace the seats (5):

- Remove the body as described in Section 6.2.
- With the body removed, remove the seats (5) and 'O' ring (6).
- Fit new seats (5) pushing them into the body chamber.
- Using a new 'O' ring (6) replace the ball valve insert (2) and tighten to the recommended torque - See Table 1.

### 6.4 How to replace the stem seals (9 and 10):

- Remove the body as described in Section 6.2.
- Remove the nuts (15 and 16).
- Replace the stem seals (9 and 10).
- Using a new 'O' ring (6) replace the ball valve insert (2) and tighten to the recommended torque - See Table 1.

### 6.5 Reassembly

Reassemble in reverse order to instructions given above. The stem nuts (15 and 16) and the ball valve insert (2) should be tightened to the recommended torques shown in Table 1.

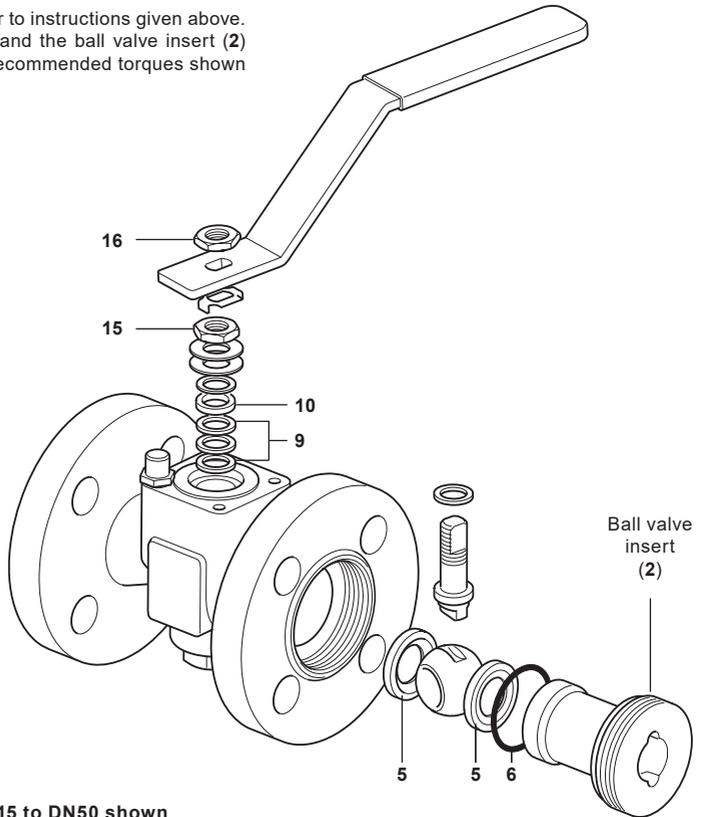


Fig. 4 DN15 to DN50 shown

# 7. Spare parts

## DN15 to DN50 Spare parts

The spare parts available are shown in solid outline. Parts drawn in a grey line are not supplied as spares.

### Available spares

Seats, insert 'O' ring and stem seals	5, 6, 9, 10
Insert tool - Required to aid the removal of the ball valve insert (2)	Not shown

### How to order spares

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

**Example:** 1 set of seats, insert 'O' ring and stem seals for a Spirax Sarco DN50 flanged PN40 M21Si2 ball valve.

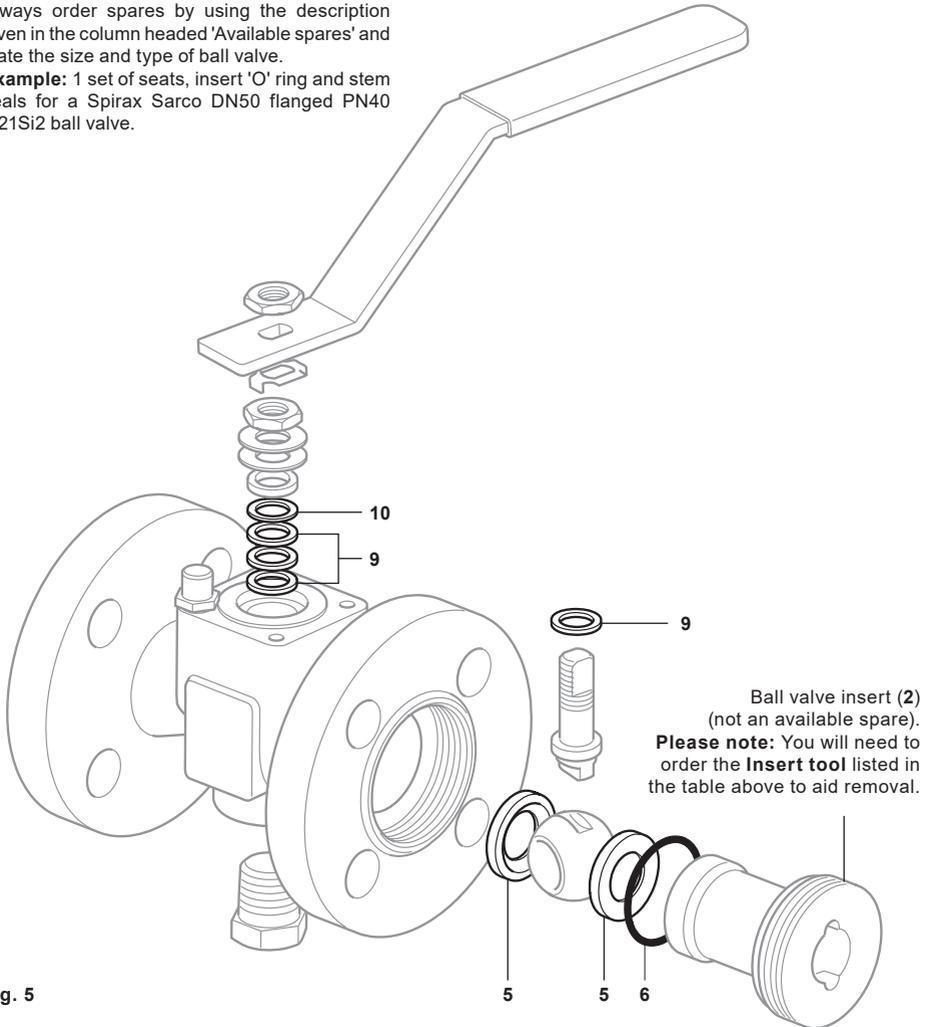


Fig. 5

## DN65 to DN150 Spare parts

The spare parts available are shown in solid outline. Parts drawn in a grey line are not supplied as spares.

### Available spares

Seats, insert 'O' ring, seat 'O' ring, stem 'O' ring, lower stem seals and upper stem packaging 5, 6, 7, 8, 11, 12

Insert tool - Required to aid the removal of the ball valve insert (2)

Not shown

### How to order spares

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

**Example:** 1 set of seats, insert 'O' ring, seat 'O' ring, stem 'O' ring, lower stem seals and upper stem packaging for a Spirax Sarco DN50 flanged PN40 M21Si2 ball valve.

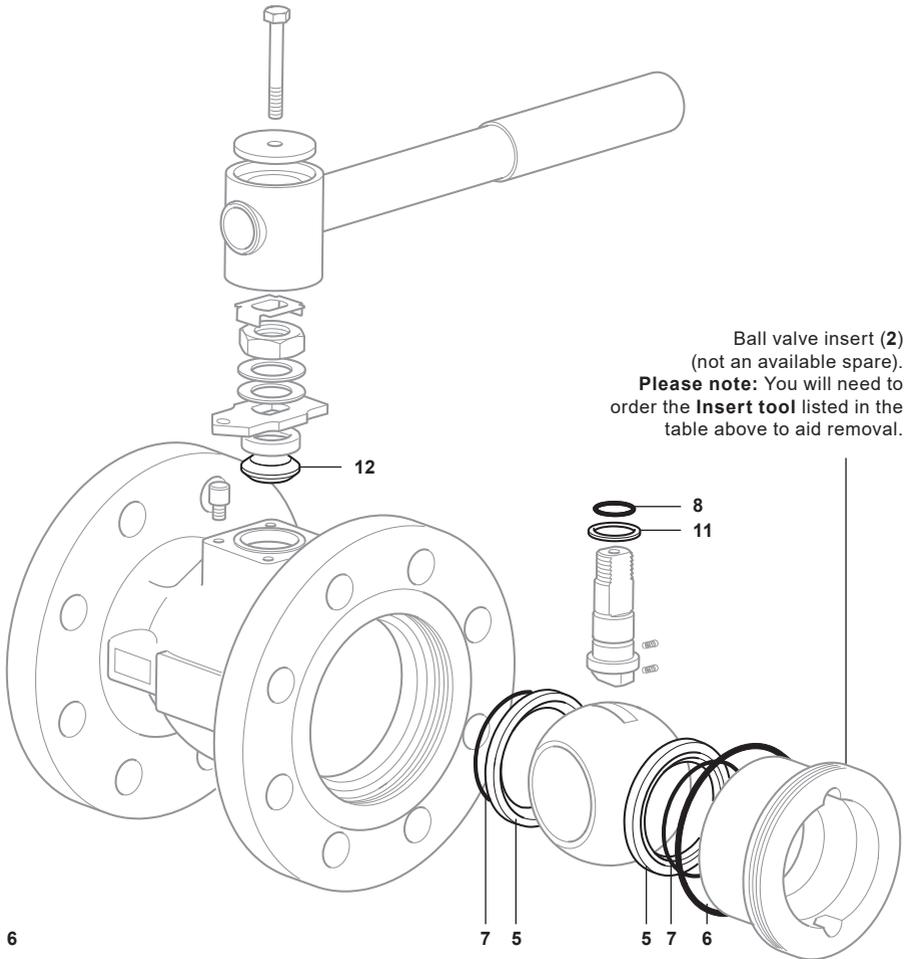


Fig. 6

M21Si ISO and M21Vi ISO Ball Valves DN15 to DN150

