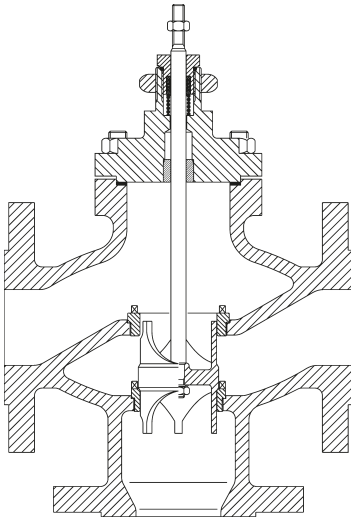


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## **Control Valves Series "Q" DN15 - DN100**

### **Installation and Maintenance Instructions**

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1. Safety Information
2. General product information
3. Installation and commissioning
4. Maintenance
5. Spares parts



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# 1. Safety Information

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## 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 European Pressure Equipment Directive 2014/68/UE. The products fall within the following Pressure Equipment Directive categories:

Product: Serie Q Valves	DN	PS	Gas Group 1	Liquid Group 1	Gas Group 2	Liquid Group 2
QL33 - Cast Iron	15 - 25	16 bar	-	-	SEP	SEP
	32 - 50		-	-	SEP	SEP
	65 - 100		-	-	1	SEP
QL73 - Sferoidal Cast Iron	15 - 25	25 bar	*SEP	*SEP	*SEP	*SEP
	32 - 40		1	*SEP	*SEP	*SEP
	50 - 80		2	*SEP	1	*SEP
	100		2	1	*SEP	
QL43 - Carbon Steel	15 - 25	40 bar	*SEP	*SEP	*SEP	*SEP
	32		2	*SEP	*SEP	*SEP
QL63 - Stainless Steel	40 - 50		2	*SEP	1	*SEP
	65 - 100		2	2	1	*SEP

**\*SEP= not subjected to CE marking as per para 3.3 of Directive 2014/68/UE.**

- I) The products have been specifically designed for use on compressed air or condensate which are in Group 2 of the above mentioned Pressure Equipment Directive. The products' use on other gas within Group 2 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 protection covers from all connections before installation.

## 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 some cases the product is provided with pre-compressed springs. Any operation to open the spring housing is to be carried on strictly following the correct procedure given in the Installation and 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 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.

## 1.16 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.

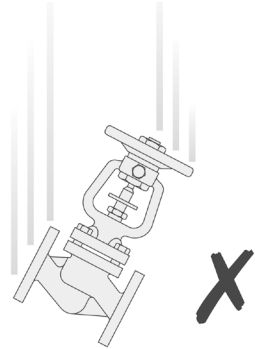
## 1.17 Working safely with cast iron products on steam

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

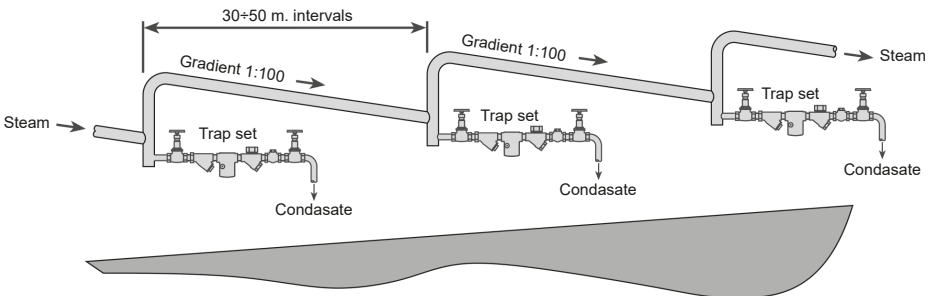
Cast Iron is a brittle material. If the product is dropped during installation and there is any risk of damage the product should not be used unless it is fully inspected and pressure tested by the manufacturer.

Please remove label before commissioning.

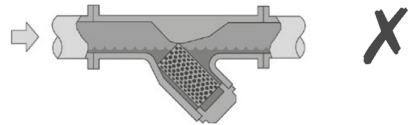
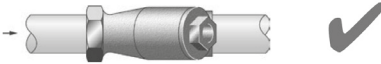
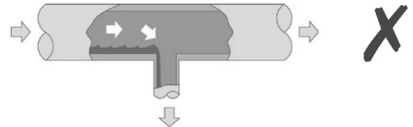
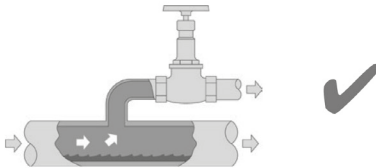
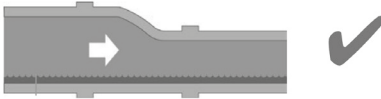
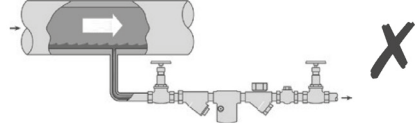
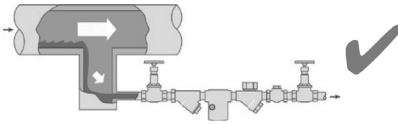


## Prevention of water hammer

Steam trapping on steam mains:



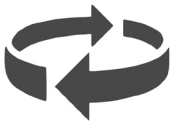
## Steam Mains - Do's and Dont's:



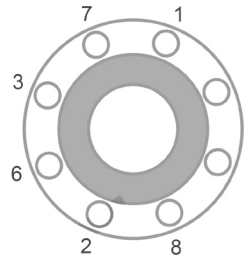
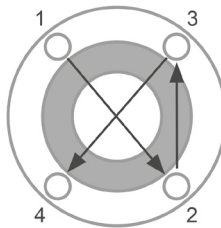
## Prevention of tensile stressing

Pipe misalignment:

Installing products or re-assembling after maintenance:



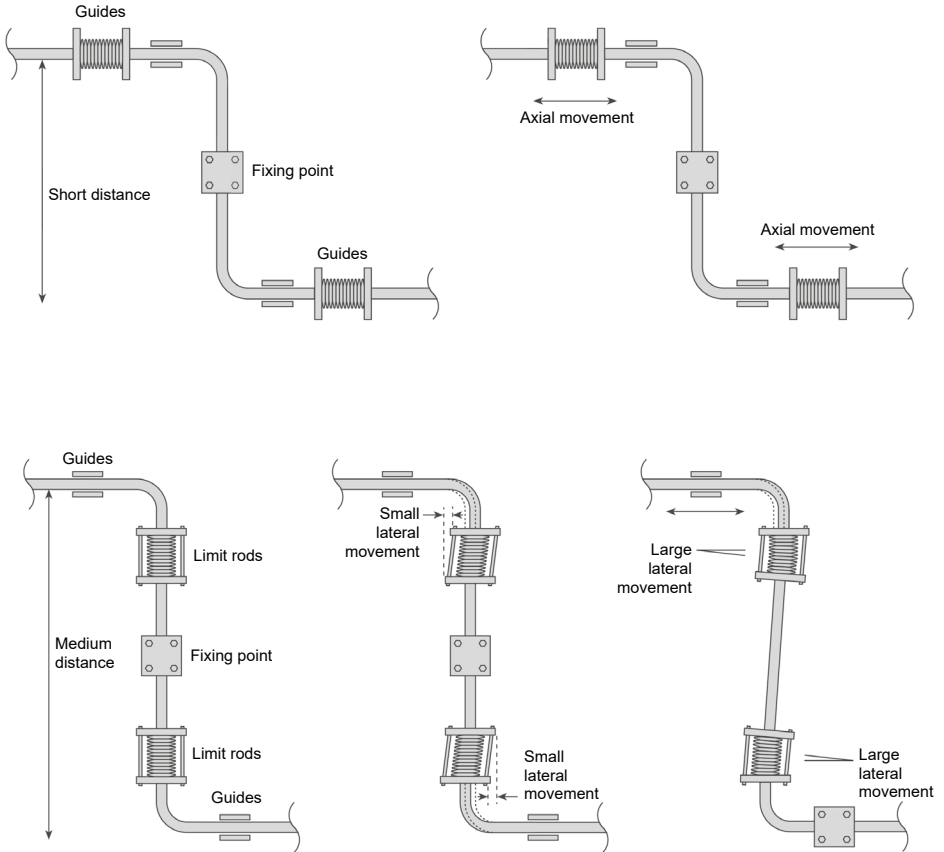
Do not over tighten.  
Use correct torque figures.



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 advice is sought from the bellows manufacturer.



## 2. General product information

### 2.1 Description

The QLM and QLD are three port control valves which have linear characteristics for mixing or diverting service. They are available in four body materials: cast iron, SG iron, carbon steel or stainless steel. All valves can be supplied with the standard metal-to-metal seats, stellite facing for increased resistance to wear or soft seats for tight shut-off. The standard stem sealing is by spring adjusted PTFE chevrons but high temperature graphite seals or metal bellows with supplementary safety packing may also be specified.

**The QLM and QLD three port control valves can be used with the following actuators:**

<b>Pneumatic:</b>	PN 3000 series
	PN 4000 series
	PN 5000 series
	PN 6000 series
	PN 7000 series
	PN 8000 series
<b>Electric:</b>	EL 3500 series
	EL 5600 series

### 2.2 Sizes and pipe connections

All valve flanges referred to in this document are in accordance with EN 1093.

	Type	Body material	Connection	Size range
<b>QLM: Mixing service</b>	<b>QL33M</b>	Cast iron	PN 16	DN15 to DN100
	<b>QL43M*</b>	Carbon steel	PN 25/40	DN15 to DN100
	<b>QL63M*</b>	Stainless steel	PN 25/40	DN15 to DN100
	<b>QL73M</b>	SG iron	PN 25	DN15 to DN100
<b>QLD: Diverting service</b>	<b>QL33D</b>	Cast iron	PN 16	DN25 to DN100
	<b>QL43D*</b>	Carbon steel	PN 25/40	DN25 to DN100
	<b>QL63D*</b>	Stainless steel	PN 25/40	DN25 to DN100
	<b>QL73D</b>	SG iron	PN 25	DN25 to DN100

\* **Note: QL43M, QL43D, QL63M and QL63D** three port control valves are also available with PN16 flanges by special order.



## 2.3 Technical data

Plug Type	"V" Port		
Leakage Class	Metal to metal seal	IEC 534-4 Class IV (0.01% of K <sub>v</sub> )	
Plug Characteristic	Linear		
Rangeability	50:1		
Travel	DN15 - DN50	20 mm	
	DN65 - DN100	30 mm	

## 2.4 Product limitations

Conneс.	Material		Body		Bonnet											
					Standard				Extended				Bellows			
					PTFE		Graphite		PTFE		Graphite		PN16	PN25		
UNI / DIN	Cast iron (PN16)	Press. (bar)	16	13	16	13	16	13	-	-	-	-	16	13	-	-
		Temp. (°C)	-5/+120	200	-5/+120	200	-5/+120	200	-	-	-	-	-5/+120	200	-	-
	SG iron (PN25)	Press. (bar)	25	15	25	18,7	25	18	25	18	25	15	16	11,0	25	15
		Temp. (°C)	-10/+120	300	-10/+120	300	-5/+120	232	-5/+120	250	-10/+120	300	-10/+120	300	-10/+120	300
	Carbon steel (PN40)	Press. (bar)	40	21	40	33	40	32	40	32	40	21	16	10	25	16
		Temp. (°C)	-29/+120	400	-5/+120	232	-5/+120	250	-29/+120	250	-29/+120	400	-10/+120	350	-10/+120	350
	Stainless steel (PN40)	Press. (bar)	40	22,1	40	26,8	40	26,2	40	26,2	40	22	16	10	25	16
		Temp. (°C)	-29/+120	400	-5/+120	232	-5/+120	250	-29/+120	250	-29/+120	400	-10/+120	350	-10/+120	350

**Hydrostatic Test Pressure:** 1.5 Times the maximum working pressure

### Differential Pressure

To establish maximum differential pressures see Spirax Sarco TIs of pneumatic actuators Series PN3000 and PN4000 (TI n° 7C.425) , PN5000 and PN6000 (TI n° 7C.435), PN7000 and PN8000 (TI n° 7C.445); and electric actuators Series EL3500 and EL5600 (TI n° 7C.480 and 7C.485).

## 2.5 Materials

### 2.5.1 Cast Iron, SG Iron and Carbon Steel Valves

Type	No.	Part.	Material	Material designation ASTM/DIN STD
Cast iron	1	Body	Cast iron	DIN 1691 GG 25
	2	Standard bonnet	SG iron	DIN 1693 GGG 40.3
		Extended bonnet	Carbon steel	DIN 17243 C22.8
SG iron	1	Body	SG iron	DIN 1693 GGG 40.3
	2	Standard bonnet	SG iron	DIN 1693 GGG 40.3
		Extended bonnet	Carbon steel	DIN 17243 C22.8
Carbon steel	1	Body	Carbon steel	DIN 17245 GG C25
	2	Standard bonnet		DIN 16 MnCr 5
		Extended bonnet		DIN 17243 C22.8
SG iron and Carbon steel	3	Plug (s)	Stainless steel	BS 970 431 S29
	4	Valve seats	Stainless steel	BS 970 431 S29
	5	Valve stem	Stainless steel	BS 970 431 S29
		Bellows		AISI 316 L
	6	Spacer	Stainless steel	AISI 304
	7	Stuffing box gasket	Graphite	
	8	Lock-nut	Stainless steel	AISI 304
	9	Stuffing box	Stainless steel	BS 970 431 S29
	10	Mounting nut	Stainless steel	NFA 35553 XC 18S
	11	Packing		PTFE / graphite
	12	Spring	Stainless steel	BS 2056 316 S42
	13	Bonnet gasket	Graphite	
	14	Stud	Carbon steel	A193 B7M
	15	Nut	Carbon steel	A194 Gr. 2H
	16	Lock-nut	Stainless steel	AISI 316
	17	Guide bush	PTFE	
	18	Stem guide bush	Stainless steel	Hardened AISI 440B
	19	Lock-nut	Stainless steel	AISI 304
	20	Pin	Stainless steel	AISI 316
	21	Gasket	Graphite	
	22	Anti-rotation screw	Stainless steel	AISI 304

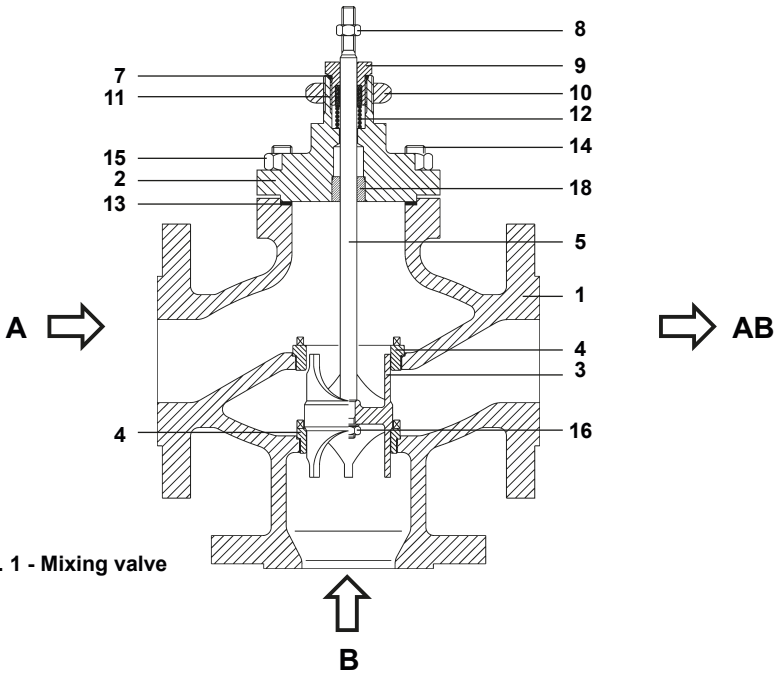


Fig. 1 - Mixing valve

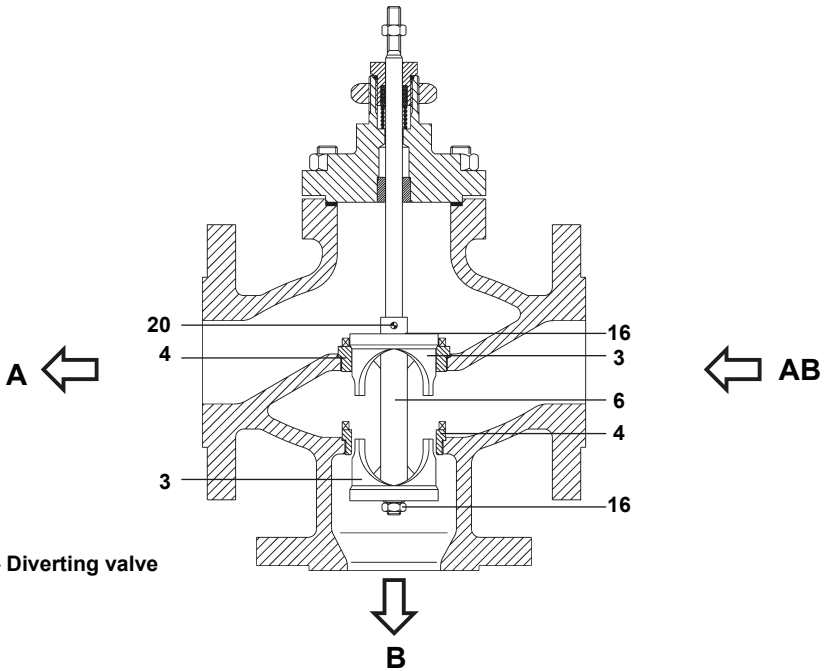


Fig. 2 - Diverting valve

## 2.5.2 Stainless Steel Valves

Type	No.	Part.	Material	Material designation ASTM/DIN STD
Stainless steel	1	Body	Stainless steel	DIN 17445 1.4581
	2	Standard bonnet	Stainless steel	DIN 17445 1.4581
		Extended bonnet	Stainless steel	ASTM A182 F316
	3	Valve plug	Stainless steel	ASTM A351 CF8M
	4	Valve seats	Stainless steel	ASTM A276 316L
	5	Valve stem	Stainless steel	ASTM A276 316L
		Bellows		AISI 316 L
	6	Spacer	Stainless steel	AISI 316
	7	Stuffing box gasket	Stainless steel	AISI 304
	8	Lock-nut	Stainless steel	AISI 316
	9	Stuffing box	Stainless steel	AISI 316
	10	Mounting nut	Zinc plated steel	NFA 35553 XC 18S
	11	Packing	PTFE/graphite	PTFE/graphite
	12	Spring	Stainless steel	BS 2056 316 S42
	13	Bonnet gasket	Graphite	
	14	Stud	Stainless steel	A193 B8
	15	Nut	Stainless steel	A194 Gr. 304
	16	Lock-nut	Stainless steel	AISI 316
	17	Guide bush	PTFE	
	18	Stem guide bush	Stainless steel	Hard faced AISI 316
	19	Lock-nut	Stainless steel	AISI 316
	20	Pin	Stainless steel	AISI 316
21	Gasket	Graphite		
22	Anti-rotation screw	Stainless steel	AISI 304	

<b>Gland Seal:</b> PTFE	with bonnet	standard	$t \leq 232^{\circ}\text{C}$
Graphite	with bonnet	standard	$t \leq 250^{\circ}\text{C}$
PTFE	with bonnet	extended	$232 < t \leq 250^{\circ}\text{C}$
Graphite	with bonnet	extended	$t > 250^{\circ}\text{C}$
Bellows seal plus safety graphite gland seal			$t \leq 350^{\circ}\text{C}$

## 2.6 Dimensions in mm and weights in kg (approximate)

Size	Dimensions				Weights	
	A	B	C	C1*	Standard bonnet	Extended bonnet
DN15	130	90	105	166	6.5	7.9
DN20	150	95	105	166	6.9	8.3
DN25	160	100	109	170	8.8	10.2
DN32	180	105	124	185	11.0	12.4
DN40	200	115	137	190	14.5	15.9
DN50	230	125	143	196	18.5	20.0
DN65	290	145	160	357	31.0	33.0
DN80	310	155	165	361	40.8	42.8
DN100	350	175	180	373	48.5	50.5

\* C1 dimension is relevant to valves with extended or bellows seal bonnet.

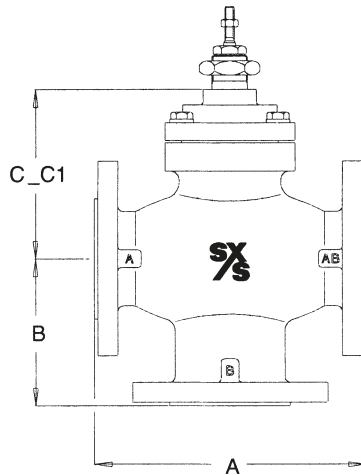


Fig. 3

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## 3. Installation

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### 3.1 General Rules

The valve should be installed in such a position as to allow full access to valve and actuator for maintenance purposes. Prior to fitting the valve the pipework should be flushed clear to remove any debris or other particles.

Remove the flange protectors and fit the valve into the pipeline taking notice of direction of flow arrows on the body.

Care should be taken to prevent any strain being imposed on the valve body due to pipe misalignment. Care should be taken to ensure that the valve/actuator spindle is not painted or coated with any other substance.

### 3.2 By-Pass Arrangements

It is recommended that isolating valves be fitted upstream and downstream of the control valve. A bypass can be fitted around the valve with a manual regulating valve allowing the process to be controlled whilst the control valve isolated for maintenance.

### 3.3 Commissioning

For commissioning instructions refer to the Operation, Installation and Maintenance Instructions, covering Spirax Sarco Actuators.

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## 4. Maintenance

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### 4.1 Periodic maintenance

#### After 24 hours of operation

After 24 hours of operation check flange bolts for tightness.

On valves with graphite stem seal packing compress the the gland seal packing by tightening the gland nut by  $\frac{1}{4}$  of a turn. Care should be taken not to overtightening as this may cause the spindle lock-up.

#### Every 3 months of operation

Every 3 months of normal operation check stem gland seal against leakage. In case of leakage proceed as follows:

- for valves with PTFE gland seal renew gland seal by following the procedure at paragraph 4.1.1.
- for valves with graphite stem seal packing compress the the gland seal packing by tightening the gland nut by  $\frac{1}{4}$  of a turn. If leakage cannot be eliminated, renew the graphite gland seal by following the procedure at paragraph 4.1.3.

#### Every year

Inspect the valve to verify the wear of parts or scale deposit. Worn or damager parts, like plug or seat may need to be replaced, as well as the gland seal packing.

The graphite packing is normally subject to wear. Therefore it is recommended to renew the graphite.

### Safety note - Handling precautions

#### PTFE

Within its working temperature range PTFE is a completely inert material, but when heated to its sintering temperature it gives rise to gaseous decomposition products or fumes which can produce unpleasant effects if inhaled. The inhalation of these fumes is easily prevented by applying local exhaust ventilation to atmosphere as near to their source as possible. Smoking should be prohibited in workshops where PTFE is handled because tobacco contaminated with PTFE will during burning give rise to polymer fumes. It is therefore important to avoid contamination of clothing, especially the pockets, with PTFE and to maintain a reasonable standard or personal cleanliness by washing hands and removing any PTFE particles lodged under the fingernails.

#### LAMINATED GASKETS

The metal foil sheet used to reinforce gaskets is very thin and sharp. Care should be taken when handling to avoid the possibility of cuts or lacerations to fingers or hands.

## 4.2 Valves with packing stem seal

### 4.2.1 Procedure for renewing PTFE chevron gland seal (Fig. 1, 2 and 4)

- a) Isolate valve on both sides.
- b) Remove actuator from valve. Refer to Installation and Maintenance Instructions covering Spirax Sarco actuators.  
**Caution:** Care should be taken in removing the gland nut since fluid under pressure may be trapped between the isolating valves
- c) Remove lock nut (8).
- d) Unscrew gland nut (9), withdraw spring (12) from the stem; remove and discard lower bush, gland seal set and upper bush (17a + 11 + 17b), and gland nut gasket (7).
- e) Examine parts for signs of damage or deterioration and renew as necessary. Note that score marks or scaly deposit on valve stem (5) will lead to early failure of the seals. Clean parts taking care to avoid scratching stem or bore of gland nut. In case valve stem (5) needs to be replaced, follow instructions from point f) to h) and point k).
- f) Unscrew the nuts (15) securing the bonnet to the body and remove the bonnet (2) complete with stem and plug (3 + 5).
- g) Fit the new valve stem and plug.
- h) Using new bonnet gasket (13) refit the bonnet (2) on the valve body, leaving the stem protruding. Replace the nuts (15) and finger tighten.
- i) To renew the gland seal set, first fit the spring (12) over valve stem, and replace gland nut gasket (7). The upper bush (17a) (only for valves DN15-50), the new gland seal set (11) and the lower bush (17b), must be firmly inserted into the gland seal nut (9), as indicated in Fig. 3, care being taken to avoid damage to the sealing edges. Refit gland nut (9) over the valve stem, screwing down with care to ensure the gasket is bedded down onto the bonnet. Tighten to the right torque as given in Table 1.
- j) Ensure the stem (5) moves freely.
- k) (Only if bonnet has been removed) While pushing the valve plug against the seat, tighten the nuts (15) to the right torque as given in Table 1.
- l) Refit valve lock-nut (8).
- m) Refit actuator, clamping nut and connect actuator to valve stem following actuator instructions.
- n) Bring valve back into service.
- o) Check for leakage at gland.

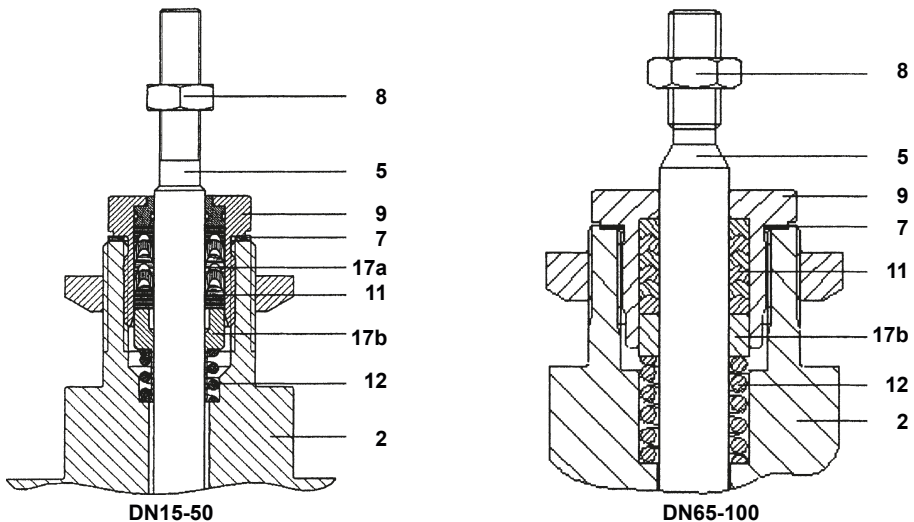


Fig. 4

#### 4.2.2 Procedure for renewing graphite gland seals (Fig. 1, 2 and 5)

- a) Isolate valve on both sides.
- b) Remove actuator from valve. Refer to Installation and Maintenance Instructions covering Spirax Sarco actuators.

**Caution:** Care should be taken in removing the gland nut since fluid under pressure may be trapped between the isolating valves

- c) Remove lock nut (8).
- d) Unscrew gland nut (9b) and stuffing box (9).
- e) Remove and gland seal set (17b), and gland nut gasket (7).
- f) Examine parts for signs of damage or deterioration and renew as necessary. Note that score marks or scaly deposit on valve stem (5) will lead to early failure of the seals.

**Note:** In case valve stem (5) needs to be replaced, follow instructions at point c) and g) of paragraph 5.2.

- g) Clean parts taking care to avoid scratching stem or bore of gland nut.
- h) Replace gland nut gasket (7). Refit stuffing box (9) over the valve stem, screwing down with care to ensure the gasket is bedded down onto the bonnet. Tighten to the right torque as given in Table 1.
- i) The replacement graphite gland seal should now be fitted. Note that the gland seal set contains a top and bottom support ring and a graphite pack. During fitting the order of the graphite pack should be maintained as supplied. Place the bottom support ring into the stuffing box (9). One by one add the graphite rings and each time use the gland nut (9b) to drive down into the stuffing box. Ensuring the junction of the ring ends are rotated by 90°. Leave the gland nut (9b) loosely assembled so that the seals are not compressed.

**Note:** if the plug stem has been replaced, and therefore the bonnet has been removed and refitted, it is necessary now tighten the nuts (15), as described in point i) of paragraph 5.2.

- j) Screw down the gland nut until it just starts to compress the packing. Compress the the gland seal packing by tightening the gland nut by  $\frac{1}{4}$  of a turn until  $1\frac{1}{2}$  turns. Rise and lower the valve stem after each tightening of the gland nut to encourage the seals to bed down correctly.
- k) Refit actuator, clamping nut and connect actuator to valve stem.
- l) Stroke the valve a minimum of 5 times to ensure smooth operation.
- m) Tighten the gland nut (9b) by  $\frac{1}{4}$  of a turn for DN15 to DN50 valves, and  $\frac{1}{2}$  of a turn for DN65 to DN100 valves.
- n) Commissioning the actuator according to the Installation and Maintenance Instructions.
- o) Bring valve back into service.
- p) Should there be a small amount of seepage from the valve stem, this may be stopped by carefully tightening the gland nut. Care should be taken not to overtightening as this may cause the spindle lock-up.

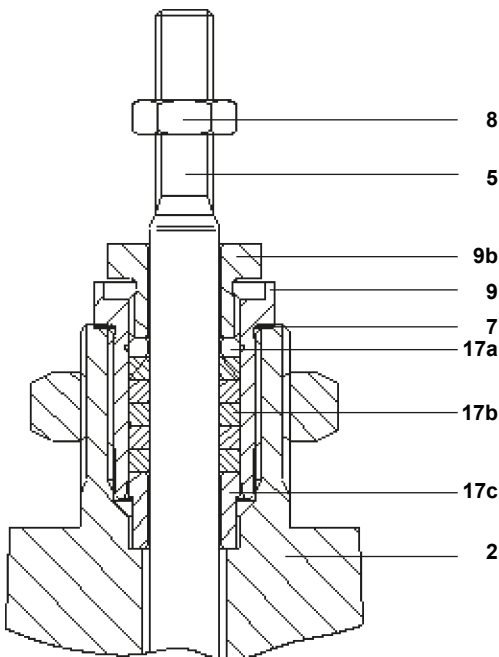


Fig. 5



### 4.2.3 Procedure for renewing stem, valve plug and seats on mixing valves (Fig. 4, 5 and 6)

- a) Isolate and remove valve from the pipeline.  
**Caution:** care should be taken in removing the valve since fluid under pressure may be trapped between the isolating valves.
- b) Remove actuator from valve. **Note:** take care not to rotate the valve stem when removing actuator from valve service, this will damage the bellows. Refer to Installation and Maintenance Instructions covering Spirax Sarco actuators.
- c) Remove lock nut (8).
- d) Ensure the spindle (5) is held still by locating a spanner onto the machined flat on the spindle (5) and unscrew the plug lock-nut (16) from the valve stem (5). In case the flat on the spindle is not easily accessible, fit the nut (8) and a lock nut onto the spindle, tighten firmly and locate the spanner.
- e) Unscrew the nuts (15) securing the bonnet (2). Remove the bonnet (2) and withdraw the stem (5). Remove the packing gland seal according to procedure in paragraph 4.1.1 or 4.1.2.
- f) Unscrew and remove the top valve seat (4). Withdraw the valve plug (3), unscrew and remove the bottom valve seat (4).  
**Note:** To remove and replace seat (4) a special tool is required which can be obtained from Spirax Sarco by quoting the valve size type.
- g) Lightly smear the threads of the new seats with silicon grease. Insert the new bottom seat (4) into the body. Tighten to the correct torque (see Table 1). Carefully insert the new valve plug and stem assembly (3 + 5). Insert the new top seat (4) into the body. Tighten to the correct torque (see Table 1).
- g) Insert the new spindle (5) into the plug (3). Ensure the spindle (5) is held still by locating a spanner on to the machined flat on the spindle. Replace the plug nut and lock-nut (16) and tighten to the correct torque (see Table 1, page 5)
- h) Using a new gasket (13) refit the bonnet (2), taking care not to damage the spindle (5). Replace and finger tighten the bonnet nuts (15).
- i) Fit the packing gland seal according to procedure in paragraph 4.1.1 or 4.1.2, ensuring the valve stem (5) moves freely after assembly.
- j) Loosen again the bonnet nuts (15) and, while pushing the valve stem so that the valve plug is on the bottom seat, finally tighten them to the correct torque (see Table 1).
- k) Refit actuator and connect actuator to valve stem.
- l) Bring valve back into service.  
Check for leakage around all gasket joints.

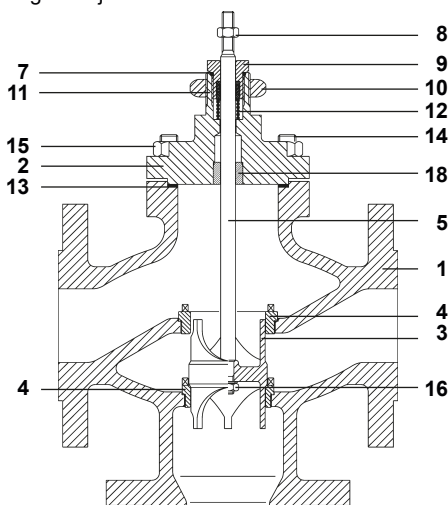


Fig. 6  
Mixing Valve

#### 4.2.4 Procedure for renewing stem, valve plug and seats on diverting valves (Fig. 4, 5 and 7)

- a) Isolate and remove valve from the pipeline.  
**Caution:** care should be taken in removing the valve since fluid under pressure may be trapped between the isolating valves.
- b) Remove actuator from valve. **Note:** take care not to rotate the valve stem when removing actuator from valve service, this will damage the bellows. Refer to Installation and Maintenance Instructions covering Spirax Sarco actuators.
- c) Remove lock nut (8).
- d) Ensure the spacer (6) is held still by locating a spanner onto the machined flat on the spacer and unscrew the plug lock-nut (16) of the lower valve plug (3) from the spacer (6). In case the flat on the spacer is not easily accessible, fit the nut (8) and a lock nut onto the spindle (5), tighten firmly and locate the spanner. Withdraw the lower valve plug (3).
- e) Unscrew the nuts (15) securing the bonnet (2). Remove the bonnet (2) with the stem and upper valve plug, and withdraw the stem (5). Remove the packing gland seal according to procedure in paragraph 4.1.
- f) Unscrew and remove the top and bottom valve seat (4).  
**Note:** To remove and replace seat (4) a special tool is required which can be obtained from Spirax Sarco by quoting the valve size type.
- g) Lightly smear the threads of the new seats with silicon grease. Insert the new bottom seat (4) into the body. Tighten to the correct torque (see Table 1). Insert the new top seat (4) into the body. Tighten to the correct torque (see Table 1).
- h) Unscrew the lock nut (16) and remove the bottom plug from the new spindle and plug assembly. Insert the new top plug (3) into the top seat (4). Insert the new bottom plug (3) into the bottom seat (4). Ensure the space (6) is held still by locating a spanner on to the machined flat on the spacer. Replace the plug nut and lock-nut (16) and tighten to the correct torque (see Table 1, page 5)
- i) Using a new gasket (13) refit the bonnet (2), taking care not to damage the spindle (5). Replace and finger tighten the bonnet nuts (15).
- j) Fit the packing gland seal according to procedure in paragraph 4.1.1 or 4.1.2, ensuring the valve stem (5) moves freely after assembly.
- k) Loosen again the bonnet nuts (15) and, while pushing the valve stem so that the valve plug is on the top seat, finally tighten them to the correct torque (see Table 1).
- l) Refit lock nut (8). Refit actuator and connect actuator to valve stem.
- m) Bring valve back into service.  
Check for leakage around all gasket joints.

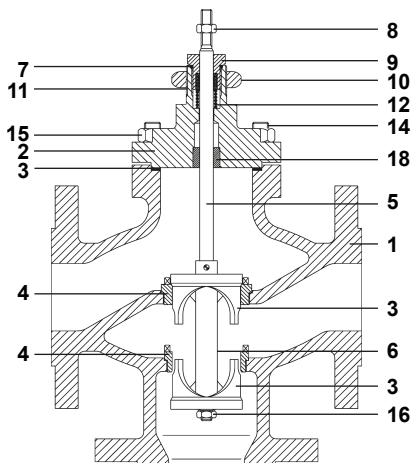


Fig. 7  
Diverting Valve

### 4.3 Bellows sealed valves

#### 4.3.1 Procedure for renewing bellows stem seals (Fig. 8)

- a) Isolate valve on three ports.
- b) Remove actuator from valve. Note: take care not to rotate the valve stem when removing actuator from valve service, this will damage the bellows. Refer to Installation and Maintenance Instructions covering Spirax Sarco actuators.
- c) Remove lock-nut (1).  
**Caution:** Care should be taken in removing the stem seal if the bellows has failed, since fluid under pressure may be trapped between the isolating valves.
- d) Unscrew gland nut (3), remove the gland bush (2), remove and discard the stem seal set (4).
- e) Examine parts for signs of damage or deterioration and renew as necessary. Note the stem seal set on this valve is intended for emergency use in the event of bellows failure. Score marks or scaly deposits on the valve stem (5) will impair sealing efficiency.
- f) Clean parts taking care to avoid scratching the stem or bore of the bellows assembly top end (6).
- g) New graphite stem seals (4) should be inserted into the bellows assembly top end (6), care being taken to avoid damage.
- h) Refit gland bush (2) and finger tighten the gland nut (3) over the valve stem (5).
- i) Ensure that the stem (5) moves freely.
- j) Refit valve lock-nut (1).
- k) Bring the valve back into service.

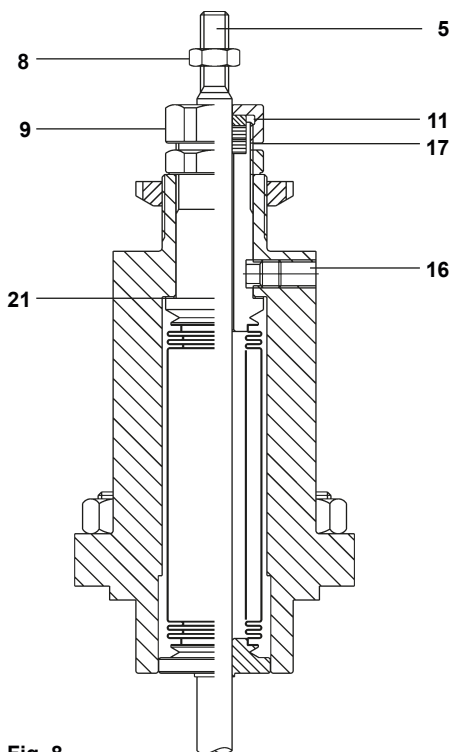


Fig. 8

Table 1 Recommended tightening torques (N m)

Valve size	Seat (4)	Bellows housing nuts (15)	Bellows lock-nut (19)	Plug lock-nut	
				Mixing (16)	Diverting (16)
DN15	150 - 155	25 - 30	25 - 30	15 - 20	-
DN20	150 - 155	25 - 30	25 - 30	15 - 20	-
DN25	180 - 190	25 - 30	25 - 30	25 - 30	45 - 50
DN32	180 - 190	25 - 30	25 - 30	25 - 30	45 - 50
DN40	180 - 190	36 - 40	25 - 30	25 - 30	45 - 50
DN50	180 - 190	36 - 40	25 - 30	25 - 30	45 - 50
DN65	200 - 220	42 - 48	40 - 45	40 - 45	70 - 80
DN80	200 - 220	60 - 65	40 - 45	40 - 45	70 - 80
DN100	200 - 220	90 - 95	40 - 45	40 - 45	70 - 80

### 4.3.2 Procedure for renewing valve plug, seats and bellows assembly on mixing valves (Fig. 9)

**Note:** Due to the delicate nature of the bellows assembly, it is highly recommended that for renewal of the stem/bellows assembly, valve plug and/or seats, the complete valve is returned to Spirax Sarco service department.

a) Isolate and remove valve from the pipeline.

**Caution:** Care should be taken in removing the valve since fluid under pressure may be trapped between the isolating valves.

b) Remove actuator from valve. **Note:** take care not to rotate the valve stem when removing actuator from valve service, this will damage the bellows. Refer to Installation and Maintenance Instructions covering Spirax Sarco actuators.

c) Remove lock-nut (8).

d) Ensure the spindle (5) is held still by locating a spanner onto the machined flat on the spindle (5) and unscrew the plug lock-nut (16) from the valve stem (5). In case the flat on the spindle is not easily accessible, fit the nut (8) and a lock nut onto the spindle, tighten firmly and locate the spanner. Unscrew the nuts (15) securing the bonnet (2).

e) Withdraw the bonnet (2) together with the stem/bellows assembly (5). Remove gland nut (9), gland bush (11), and stem seal set (17). Unscrew the stem/bellows assembly lock-nut (19), loosen completely the anti-rotation screw (20) and withdraw the assembly from the bonnet.

f) Unscrew and remove the top valve seat (4). Withdraw the valve plug (3), unscrew and remove the bottom valve seat (4). **Note:** To remove and replace top and bottom seat (4) a special tool is required which can be obtained from Spirax Sarco by quoting the valve size type.

g) Lightly smear the threads of the new seats with silicon grease. Insert the new bottom seat (4) into the body. Tighten to the correct torque (see Table 1). Carefully insert the new valve plug (3). Insert the new top seat (4) into the body. Tighten to the correct torque (see Table 1).

h) Insert replacement stem/bellows assembly (5) with new bellows flange gasket (21) into the bonnet (2) taking care not to damage the bellows. Replace and finger tighten lock-nut (19). Rotate the bellows assembly until the slot onto the top end of the bellows does correspond to the hole of the anti-rotation screw (20). Replace the anti-rotation screw (20) until it enters in the slot of the bellows end and finger tighten. Tighten the lock nut (19) to the correct torque (see table 1); firmly tighten the anti-rotation screw (20).

- i) Using a new gasket (13) refit the bonnet and stem/bellows assembly on the valve body ensuring that the spindle fits into the valve plug bore (3). Replace and finger tighten the bonnet nuts (15). Ensure the spindle (5) is held still by locating a spanner on to the machined flat on the spindle (5). Replace the plug nut (16) and lock-nut and tighten to the correct torque (see Table 1). Loosen again the bonnet nuts (15) and, while pushing the valve stem so that the valve plug is on the bottom seat, finally tighten them to the correct torque (see Table 1).
- j) Fit new stem seal assembly (17) as described in Paragraph 4.2.1, ensuring valve stem (5) moves freely after assembly.
- k) Refit actuator and connect actuator to valve stem. **Note:** take care not to rotate the valve stem when fitting actuator to valve since this will destroy the bellows.
- l) Bring valve back into service.
- m) Check for leakage around all gasket joints.

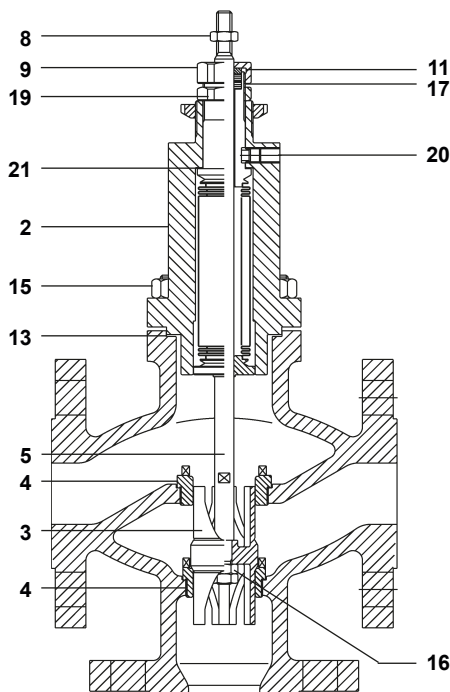


Fig. 9 - Mixing Valve

### 4.3.3 Procedure for renewing valve plug, seats and bellows assembly on diverting valves (Fig. 10)

**Note:** Due to the delicate nature of the bellows assembly it is highly recommended that for renewal of the stem / bellows assembly, valve plug and /or seats; the complete valve is returned to the Spirax Sarco service department.

- a) Isolate and remove valve from the pipeline.  
**Caution:** Care should be taken in removing the valve since fluid under pressure may be trapped between the isolating valves.
- b) Remove actuator from valve. **Note:** take care not to rotate the valve stem when removing actuator from valve service, this will damage the bellows. Refer to Installation and Maintenance Instructions covering Spirax Sarco actuators.
- c) Remove lock-nut (8).
- d) Ensure the spacer (6) is held still by locating a spanner onto the machined flat on the spacer and unscrew the bottom plug lock-nut (16). In case the flat on the spacer is not easily accessible, fit the nut (8) and a lock nut onto the spindle, tighten firmly and locate the spanner. Withdraw the bottom plug (3). Unscrew the nuts (15) securing the bonnet (2).
- e) Withdraw the bonnet (2) together with the stem/bellows assembly (5). Remove gland nut (9), gland bush (11), and stem seal set (17). Unscrew the stem/bellows assembly lock-nut (19), loosen completely the anti-rotation screw (20) and withdraw the assembly from the bonnet.
- f) Unscrew and remove the top valve seat (4), unscrew and remove the bottom valve seat (4). **Note:** To remove and replace top and bottom seat (4) a special tool is required which can be obtained from Spirax Sarco by quoting the valve size type.
- g) Lightly smear the threads of the new seats with silicon grease. Insert the new bottom seat (4) into the body. Tighten to the correct torque (see Table 1). Insert the new top seat (4) into the body. Tighten to the correct torque (see Table 1).
- h) Remove bottom valve plug (3) from the new stem/bellows assembly (5). Insert replacement stem/bellows assembly (5) with new bellows flange gasket (21) into the bonnet (2) taking care not to damage the bellows. Replace and finger tighten lock-nut (19). Rotate the bellows assembly until the slot onto the top end of the bellows does correspond to the hole of the anti-rotation screw (20). Replace the anti-rotation screw (20) until it enters in the slot of the bellows end and finger tighten. Tighten the lock nut (19) to the correct torque (see table 1); firmly tighten the anti-rotation screw (20).

- i) Using a new gasket (13) refit the bonnet and stem/bellows assembly on the valve body ensuring that the top valve plug fits into the seat (4). Replace and finger tighten the bonnet nuts (15). Refit the bottom plug (3) and lock nuts (16). Ensure the spacer (6) is held still by locating a spanner on to the machined flat on the spacer and tighten to the correct torque (see Table 1). Loosen again the bonnet nuts (15) and, while pushing the valve stem so that the valve plug is on the top seat, finally tighten them to the correct torque (see Table 1).
- k) Fit new stem seal assembly as described in paragraph 4.2.1, ensuring valve stem (5) moves freely after assembly.
- l) Refit actuator and connect actuator to valve stem. **Note:** take care not to rotate the valve stem when fitting actuator to valve, since this will destroy the bellows.
- m) Bring valve back into service.
- n) Check for leakage around all gasket joints.

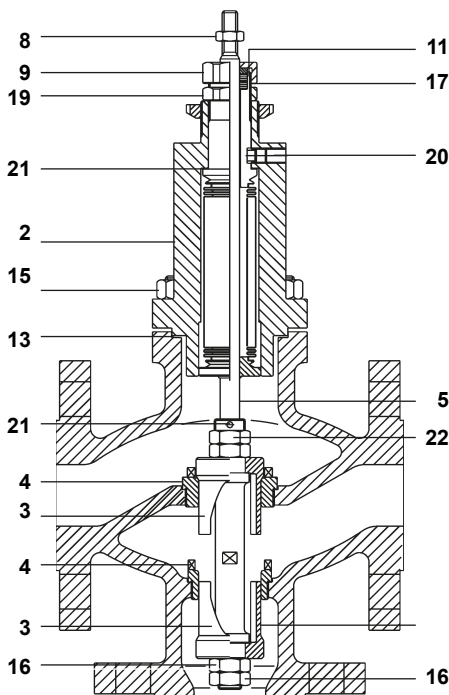


Fig. 10 - Diverting Valve

# 5. Spares parts

## 5.1 Valves with packing gland seal

The spare parts available are in heavy outline. Parts drawn in broken line are not supplied as spares. These spares are for the following valves:

<b>QL33M, QL43M, QL63M, QL73M</b>	Mixing	DN15 to DN100
<b>QL33D, QL43D, QL63D, QL73D</b>	Diverting	DN25 to DN100

### Available spares (Fig. 11)

PTFE Gland seal kit (spring, bushes, packing set)	<b>B</b>
Graphite Gland seal kit ( bush, packing set)	<b>C</b>
Stem plug gasket	<b>D</b>
Seats (2 items)	<b>F, G</b>
Bonnet gasket (packet of 3)	<b>E</b>

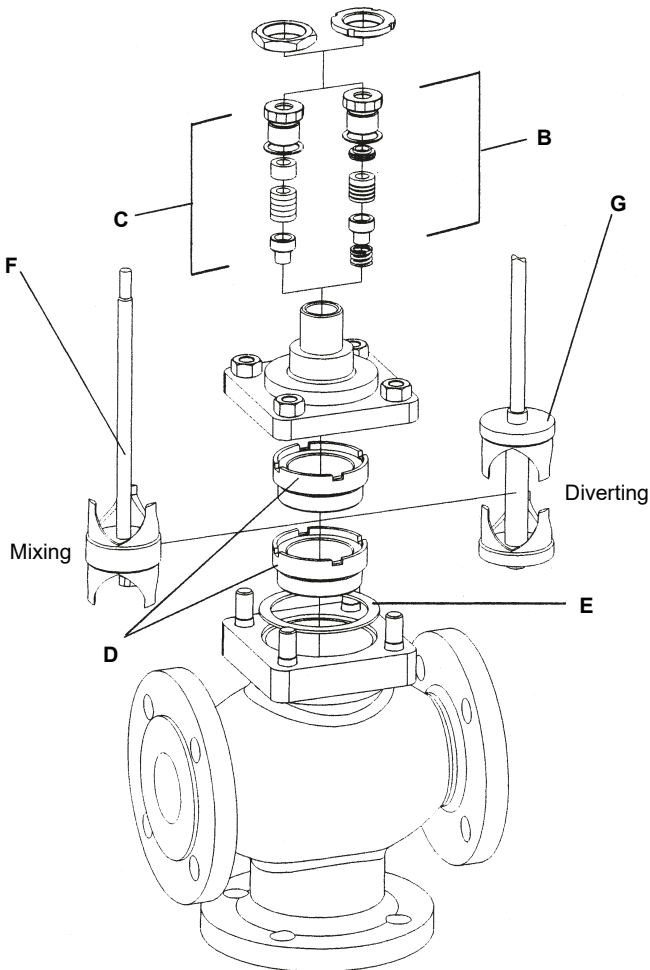


Fig. 11

## 5.2 Valves with bellows seal

### Available spares (Fig. 12)

Graphite Gland seal kit ( packing set)	AS
Bellows gasket (packet of 3)	DS
Bonnet gasket (packet of 3)	CS
Seats (2 items)	BS
Confezione guarnizione cappello (3 pezzi)	E
Spindle/bellows and plug assembly, gasket, for diverting valves	ES, CS, DS

### How to order spares

Always order spares by using the description given in the column headed "Available spares" and stating the size and type of valve.

**Example:** 1 - Gland seal kit for DN25 QL73DB1 K<sub>Vs</sub> 10 PN25.

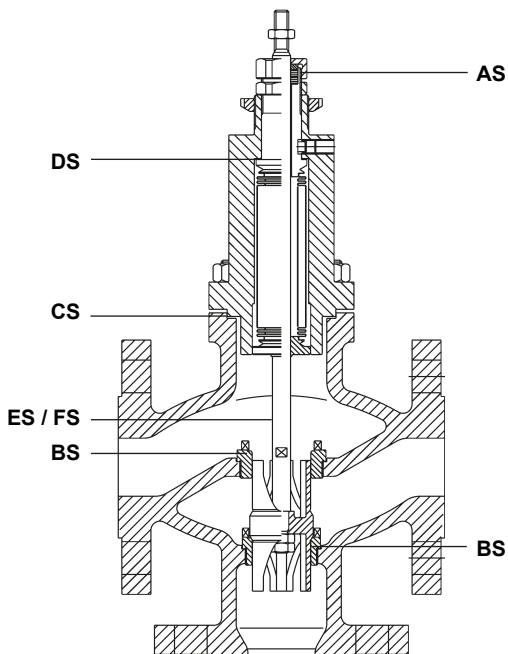


Fig. 12

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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

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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 17307

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