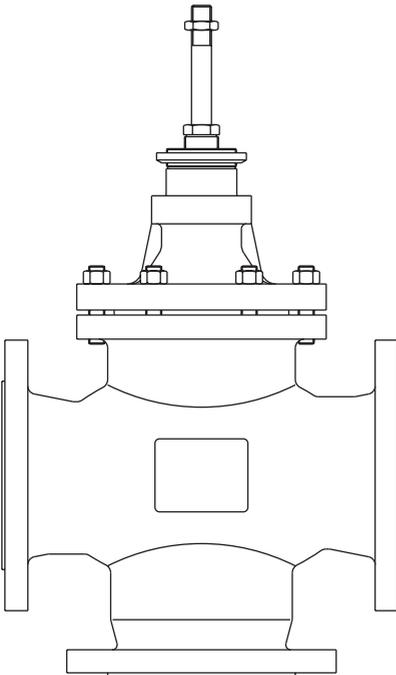

QLM and QLD Series DN125 to DN200 Three Port Control Valves

Installation and Maintenance Instructions



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

1. Safety information

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/EU. The products fall within the following Pressure Equipment Directive categories:

QL33, QL43, QL63 and QL73 DN125 to DN200 three port control valves:

Product	Size	Group 2 Gas	Group 2 Liquid
QL33 PN16 - Cast iron	DN125	1	SEP
QL43 PN16 - Carbon steel	DN150	1	SEP
QL63 PN16 - Stainless steel			
QL73 PN16 - SG iron	DN200	1	SEP
QL43 PN25 - Carbon steel	DN125	1	SEP
QL63 PN25 - Stainless steel	DN150	2	SEP
QL73 PN25 - SG iron	DN200	2	SEP
	DN125	2	SEP
QL43 PN40 - Carbon steel	DN150	2	SEP
QL63 PN40 - Stainless steel	DN200	2	SEP

- i) The products have been specifically designed for use on thermal oil, compressed air and steam or condensate which are in Group 2 of the above mentioned Pressure Equipment Directive. They can be used on other fluids in accordance with the above table. 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. Valves fitted with PTFE components must not be subjected to temperatures above 260°C. Above these temperatures toxic fumes may be given off. Avoid inhalation of fumes or skin contact.

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 out strictly following the correct procedure given in the Installation and Maintenance Instructions. 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 temperatures of 400°C. Many products are not self-draining. Take due care when dismantling or removing the product 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 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. However, if the valve is fitted with a PTFE component special care must be taken to avoid potential health hazards associated with decomposition / burning of these parts.

PTFE:

- Can only be disposed of by approved methods, not incineration.
- Keep PTFE waste in a separate container, do not mix it with other rubbish, and consign it to landfill site.

Please visit the Spirax Sarco product compliance web pages

<https://www.spiraxsarco.com/product-compliance>

for up to date information on any substances of concern that may be contained within this product. Where no additional information is provided on the Spirax Sarco product compliance web page, this product may be safely recycled and/or disposed providing due care is taken. Always check your local recycling and disposal regulations.

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.

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:

Pneumatic:	PN1000 series, PN2000 series, PN5000 series, PN6000 series, PN7000 series and the PN8000 series	Electric: EL5600 series
-------------------	--	--------------------------------

2.2 Sizes and pipe connections

All valve flanges referred to in this document are in accordance with EN 1092.

Type		Body material	Connection	Size range
QLM: Mixing service	QL33M	Cast iron	PN16	DN125 to DN200
	QL43M*	Carbon steel	PN25 / PN40	DN125 to DN200
	QL63M*	Stainless steel	PN25 / PN40	DN125 to DN200
	QL73M	SG iron	PN16 / PN25	DN125 to DN200
QLD: Diverting service	QL33D	Cast iron	PN16	DN125 to DN200
	QL43D*	Carbon steel	PN25 / PN40	DN125 to DN200
	QL63D*	Stainless steel	PN25 / PN40	DN125 to DN200
	QL73D	SG iron	PN16 / PN25	DN125 to DN200

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

2.3 Technical data

Plug design		"V" Port
Plug characteristic		Linear
Leakage class	Metal-to-metal seal	IEC 534-4 Class IV (0.01% of Kv)
Rangeability		30:1
Travel	DN125 - DN200	50 mm

QLM and QLD Series DN125 to DN200 Three Port Control Valves

2.4 Product limitations

Material		Body		Bonnet			
				Standard			
				PTFE		Graphite	
Cast iron (PN16)	Pressure (bar)	16	13	16	13	16	13
	Temperature (°C)	-5/+120	200	-5/+120	200	-5/+120	200
SG iron (PN25)	Pressure (bar)	25	15	25	18.7	25	18
	Temperature (°C)	-10/+120	300	-5/+120	232	-5/+120	250
Carbon steel (PN40)	Pressure (bar)	40	21	40	33	40	32
	Temperature (°C)	-29/+120	400	-5/+120	232	-5/+120	250
Stainless steel (PN40)	Pressure (bar)	40	22.1	40	26.8	40	26.2
	Temperature (°C)	-29/+120	400	-5/+120	232	-5/+120	250

Material		Body		Bonnet			
				Extended			
				PTFE		Graphite	
Cast iron (PN16)	Pressure (bar)	16	13	-	-	-	-
	Temperature (°C)	-5/+120	200	-	-	-	-
SG iron (PN25)	Pressure (bar)	25	15	25	18	25	15
	Temperature (°C)	-10/+120	300	-10/+120	250	-10/+120	300
Carbon steel (PN40)	Pressure (bar)	40	21	40	32	40	21
	Temperature (°C)	-29/+120	400	-29/+120	250	-29/+120	400
Stainless steel (PN40)	Pressure (bar)	40	22.1	40	26.2	40	22
	Temperature (°C)	-29/+120	400	-29/+120	250	-29/+129	400

Notes:

- Hydrostatic test pressure - 1.5 times the maximum working pressure.
- Maximum differential pressure - To establish maximum differential pressures see Spirax Sarco TIs for the relevant pneumatic or electric actuator.

2.4 Product limitations (continued)

Material		Body		Bonnet			
				Bellows			
				PN16		PN25	
Cast iron (PN16)	Pressure (bar)	16	13	16	13	-	-
	Temperature (°C)	-5/+120	200	-5/+120	200	-	-
SG iron (PN25)	Pressure (bar)	25	15	16	11	25	15
	Temperature (°C)	-10/+120	300	-10/+120	300	-10/+120	300
Carbon steel (PN40)	Pressure (bar)	40	21	16	10	25	16
	Temperature (°C)	-29/+120	400	-10/+120	350	-10/+120	350
Stainless steel (PN40)	Pressure (bar)	40	22.1	16	10	25	16
	Temperature (°C)	-29/+120	400	-10/+120	350	-10/+120	350

Notes:

1. Hydrostatic test pressure - 1.5 times the maximum working pressure.
2. Maximum differential pressure - To establish maximum differential pressures see Spirax Sarco TIs for the relevant pneumatic or electric actuator.

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	Carbon steel	DIN 16 MnCr 5
		Extended bonnet	Carbon steel	DIN 17243 C22.8
Cast iron SG iron 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	Stainless steel	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	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	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 316
	20	Pin	Stainless steel	AISI 316
	21	Gasket	Graphite	
	22	Anti-rotation screw	Stainless steel	AISI 304
	23	Washer	Stainless steel	AISI 304

Fig. 1a Mixing valve

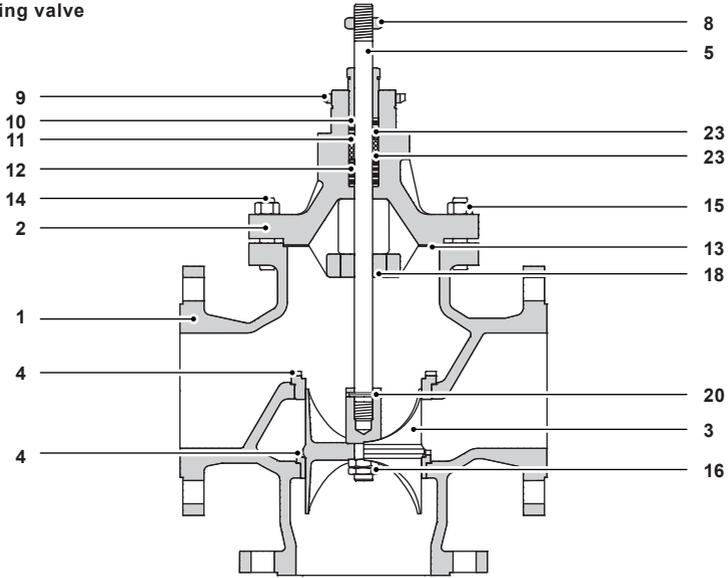
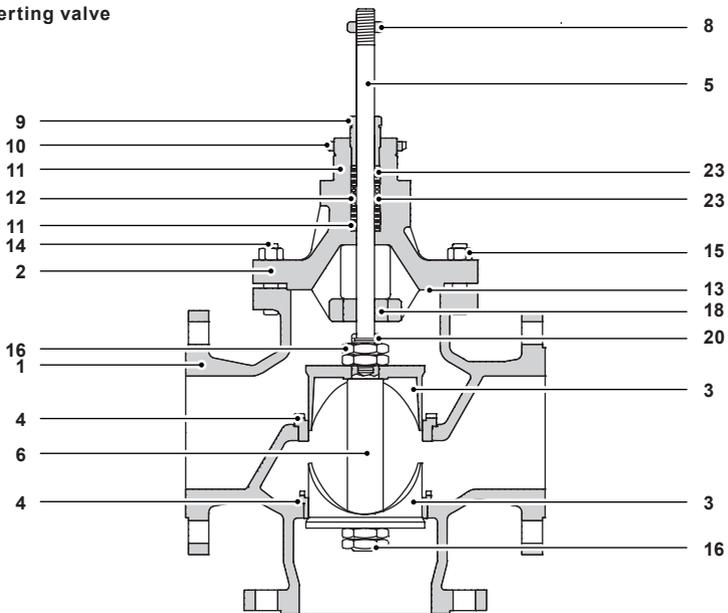


Fig. 2a Diverting valve



QLM and QLD Series DN125 to DN200 Three Port Control Valves

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 seat	Stainless steel	ASTM A276 316L
	5	Valve stem	Stainless steel	ASTM A276 316L
		Bellows	Stainless steel	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	
23	Washer	Stainless steel	AISI 304	

Fig. 1b Mixing valve

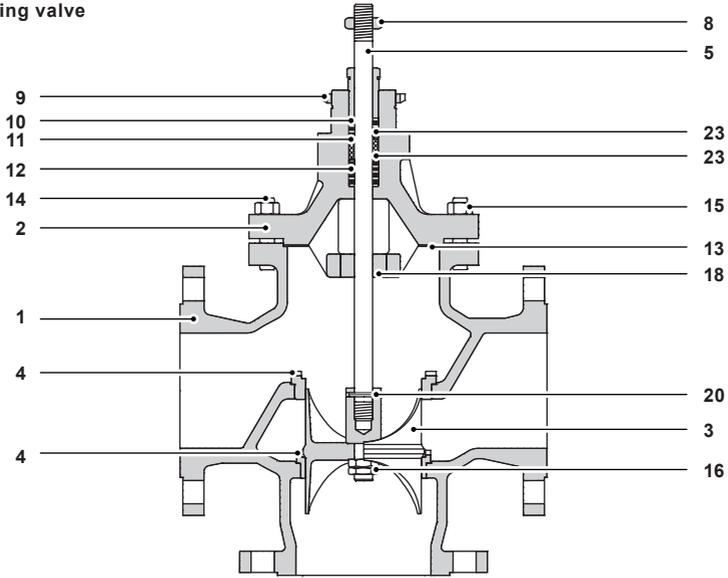
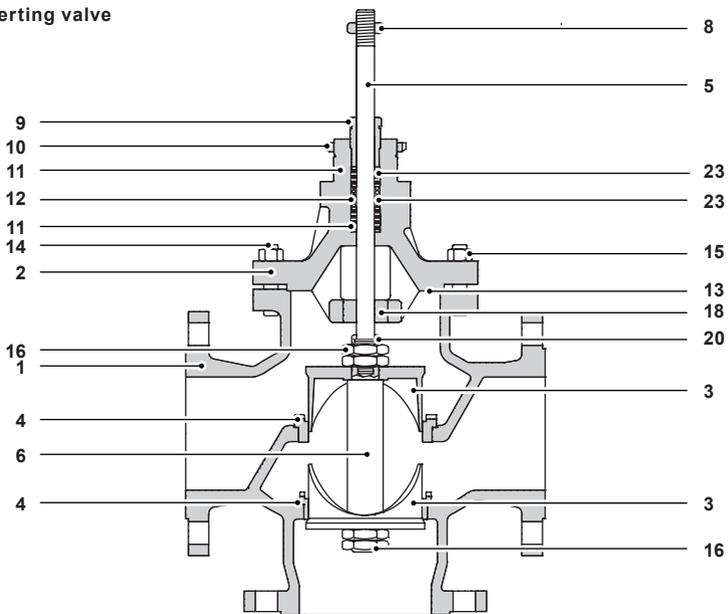


Fig. 2b Diverting valve

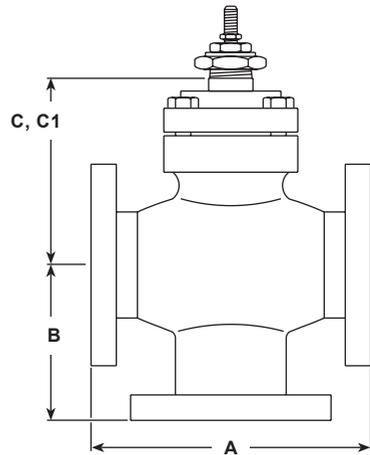


2.6 Dimensions and weights (approximate) in mm and kg

Sizes	Dimensions			
	A	B	C	C1*
DN125	400	200	280	445
DN150	480	225	300	463
DN200	600	275	370	554

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

Sizes	Weights	
	Standard bonnet	Extended bonnet
DN125	78	81
DN150	115	118
DN200	143	147



3. Installation and commissioning

Note: Before commencing any installation read the 'Safety information' in Section 1.

3.1 General rules

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

Remove the flange protectors and fit the valve into the pipeline ensuring that the direction of flow arrows on the body are correct.

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 Bypass 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 is isolated for maintenance.

3.3 Commissioning

For commissioning instructions refer to the Installation and Maintenance Instructions covering the Spirax Sarco actuators.

4. Maintenance

Note: Before commencing any installation read the 'Safety information' in Section 1.

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 of 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.

4.1 Periodic maintenance

After 24 hours of operation

After 24 hours of operation check the flange bolts for tightness.

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

Every 3 months of operation

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

- For valves with a PTFE gland seal renew the gland seal by following the procedure in Section 4.2.1
- For valves with a graphite stem seal packing compress 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 in Section 4.2.2.

Annually

Inspect the valve to check for wear or scale deposits. Worn or damaged parts, like the 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 packing rings annually

4.2 Valves with packing stem seal

4.2.1 Procedure for renewing the PTFE chevron gland seals and graphite ring gland seals (Refer to Figures 1, 2 and 4):

- a) Isolate the valve on three ports.
- b) Remove the actuator from the valve. Refer to Installation and Maintenance Instructions covering Spirax Sarco Actuators.
- c) Remove lock-nut (8).
CAUTION: Care should be taken when removing the stem seal or bonnet since fluid under pressure may be trapped between the isolating valves.
- d) Unscrew and remove the gland nut (9). Unscrew the bonnet nuts (15) and withdraw the bonnet (2) taking care not to damage the spindle surface.
- e) Using a soft metal (brass) hooked tool remove the packing (11), the washers (23) and the spring (12) from the bonnet (2).
- f) Examine parts for signs of damage or wear and renew as necessary. Note that score marks or scaly deposits on the valve stem (5) will lead to early failure of the seals. Clean the parts taking care to avoid scratching the stem or bore of the packing chamber.
- g) Using a new gasket (13) refit the bonnet. Replace and finger tighten the bonnet nuts (15) and while pushing the valve stem so that the valve plug is on the seat, finally tighten them to the recommended torque as given in Table 1.
- h) Insert washers, spring and new PTFE or graphite ring gland seals into the packing chamber following the sequence shown in Figure 4, care being taken to avoid damage to the sealing edges.
- i) Refit the gland nut (9) and tighten until resistance is felt and unscrew by two turns.
- j) Ensure that the stem (5) moves freely.
- k) Refit valve lock-nut (8).
- l) Bring the valve back into service.
- m) Check for leakage at the gland.

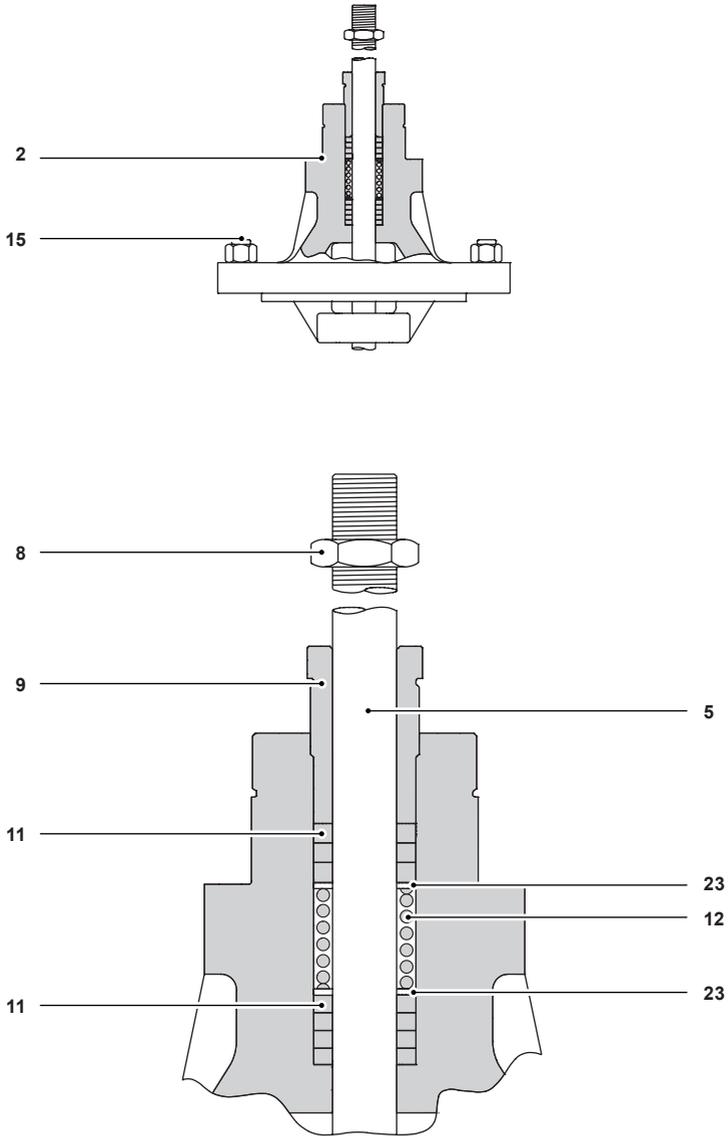


Fig. 4

QLM and QLD Series DN125 to DN200 Three Port Control Valves

4.2.2 Procedure for renewing the valve stem (Refer to Figures 4, 5 and 6):

Mixing valve

Follow the instructions given in Section 4.2.1 a) to f).

- g) Remove the lock pin (20) and unscrew the valve stem (5) from the spacer (6).
- h) Fit the new valve stem (5) into the spacer (6).

Drill a 5 mm diameter hole in the valve stem in line with that in the spacer. Refit the lock pin (20).

Complete the reassembly by following the instructions given in Section 4.2.1 i) to m).

Diverting valve

Follow the instructions given in Section 4.3.3 a) to f).

- g) Undo the lock-nuts (16) and remove the valve stem (5).
- h) Fit the new valve stem (5) by passing it through the upper plug (3a), the spacer (6) and the lower plug (3b) before refitting the locknuts (16).

Complete the reassembly by following the instructions given in Section 4.1.3 i) to m).

Fig. 5 Mixing valve

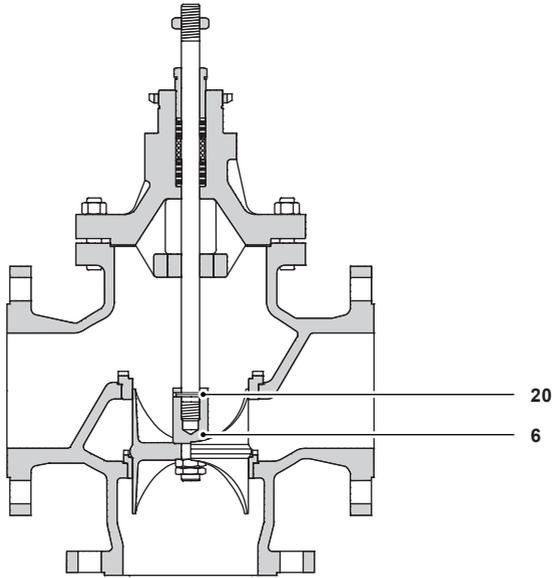
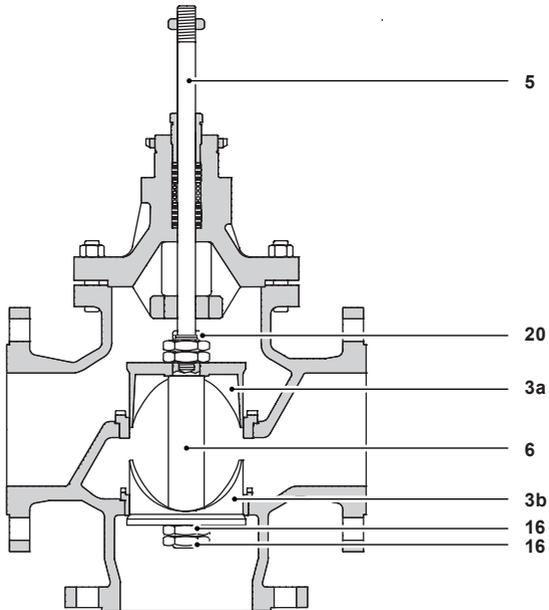


Fig. 6 Diverting valve



4.2.3 Procedure for renewing the valve stem, plug and seats on mixing valves (Refer to Figures 4 and 7):

- a) Isolate and remove the valve from the pipework.

CAUTION: Care should be taken when removing the valve since fluid under pressure may be trapped between the isolating valves.

- b) Remove the actuator from the valve. Refer to the Installation and Maintenance Instructions covering Spirax Sarco actuators.
- c) Remove the lock-nut (8).
- d) Unscrew the nuts (15) securing the bonnet and withdraw the bonnet (2).
- e) Remove the gland packing as per Section 4.2.1.
- f) Ensure that the valve stem (5) is held still by locating a spanner onto the machined flat then unscrew the plug lock-nut (16), from the valve stem (5). (When the flat on the valve stem is not easily accessible, lock two nuts onto the valve stem and use a spanner on these to prevent the stem from rotating).
- g) Unscrew and remove the top valve seat (4). Withdraw the valve plug (3), and then unscrew and remove the bottom valve seat (4).

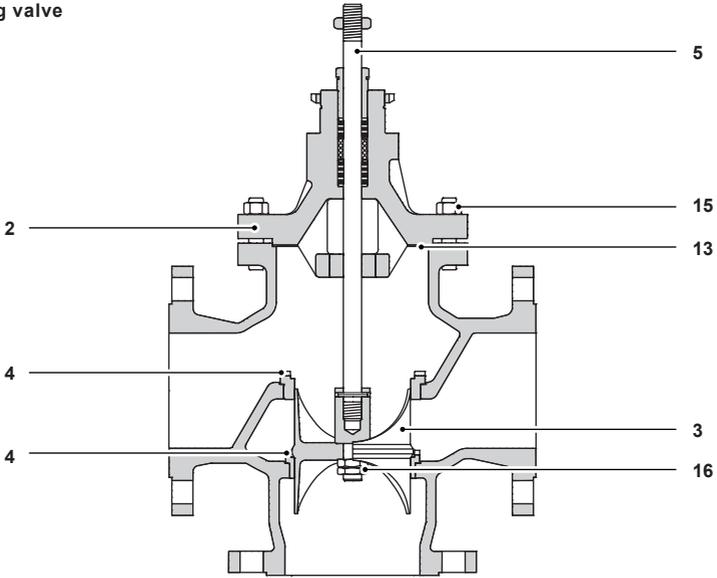
Note: To remove and replace the valve seats (4) a special tool is required which can be obtained from Spirax Sarco by quoting the valve type and size.

- h) Lightly smear the threads of the new valve seats with silicon grease. Insert the new bottom valve seat (4) into the body. Tighten to the recommended torque (see Table 1).

Carefully insert the valve plug (3). Fit the new top valve seat (4) into the body and tighten to the recommended torque (see Table 1).

- i) Insert the new valve stem (5) into the valve plug (3). Ensure the valve stem (5) is held still by locating a spanner on to the machined flat on the spindle. Replace the valve plug nut and lock-nut (16) and tighten to the recommended torque (see Table 1)
- j) Using a new gasket (13) refit the bonnet (2), taking care not to damage the valve stem (5). Replace and finger tighten the bonnet nuts (15).
- k) Fit the packing gland seal according to the procedure in Section 4.1.1, ensuring the valve stem (5) moves freely after assembly.
- l) Again loosen 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 recommended torque (see Table 1).
- m) Refit lock-nut (8). Refit the actuator and connect it to the valve stem.
- n) Bring the valve back into service.
- o) Check for leakage around all gasket joints.

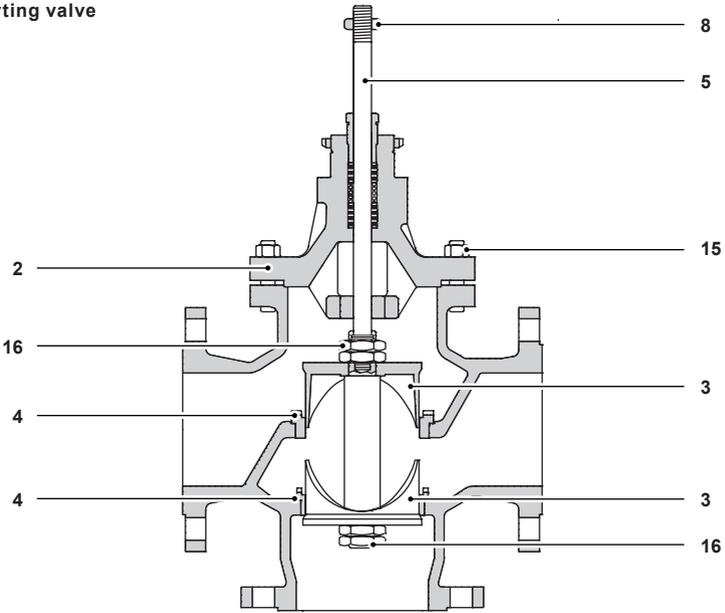
Fig. 7 Mixing valve



4.2.4 Procedure for renewing the valve stem, plug and seats on diverting valves (Refer to Figures 4 and 8):

- a) Isolate and remove the valve from the pipework.
CAUTION: Care should be taken when removing the valve since fluid under pressure may be trapped between the isolating valves.
- b) Remove the actuator from the valve. Refer to the Installation and Maintenance Instructions covering Spirax Sarco Actuators.
- c) Remove the lock-nut (8).
- d) Unscrew the nuts (15) securing the bonnet and withdraw the bonnet (2).
- e) Remove the gland packing as per Section 4.2.1.
- f) Ensure that the valve stem (5) is held still by locating a spanner onto the machined flat then unscrew the valve plug lock-nut (16) of the lower valve plug (3). Withdraw the lower valve plug (3). (When the flat on the valve stem is not easily accessible, lock two nuts onto the valve stem and use a spanner on these to prevent the stem from rotating).
- g) Withdraw the valve stem (5) with upper valve plug (3).
- h) Unscrew and remove the top and bottom valve seats (4).
Note: To remove and replace the valve seats (4) a special tool is required which can be obtained from Spirax Sarco by quoting the valve type and size.
- i) Lightly smear the threads of the new valve seats with silicon grease. Insert the new bottom valve seat (4) into the body. Tighten to the recommended torque (see Table 1). Insert the new top valve seat (4) into the body. Tighten to the recommended torque (see Table 1).
- j) Unscrew the lock-nut (16) and remove the bottom valve plug from the new spindle and plug assembly. Insert the new top valve plug (3) into the top valve seat (4). Insert the new bottom valve plug (3) into the bottom valve seat (4). Ensure the valve stem (5) is held still by locating a spanner on to the machined flat and fit the valve plug nut and lock-nut (16). Tighten to the recommended torque (see Table 1).
- k) Using a new gasket (13) refit the bonnet (2), taking care not to damage the valve stem (5). Replace and finger tighten the bonnet nuts (15).
- l) Fit the packing gland seal according to procedure in Section 4.2.1, ensuring the valve stem (5) moves freely after assembly.
- m) Again loosen 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).
- n) Refit lock-nut (8). Refit the actuator and connect it to the valve stem.
- o) Bring the valve back into service.
- p) Check for leakage around all gasket joints

Fig. 8 Diverting valve



4.3 Bellows sealed valves

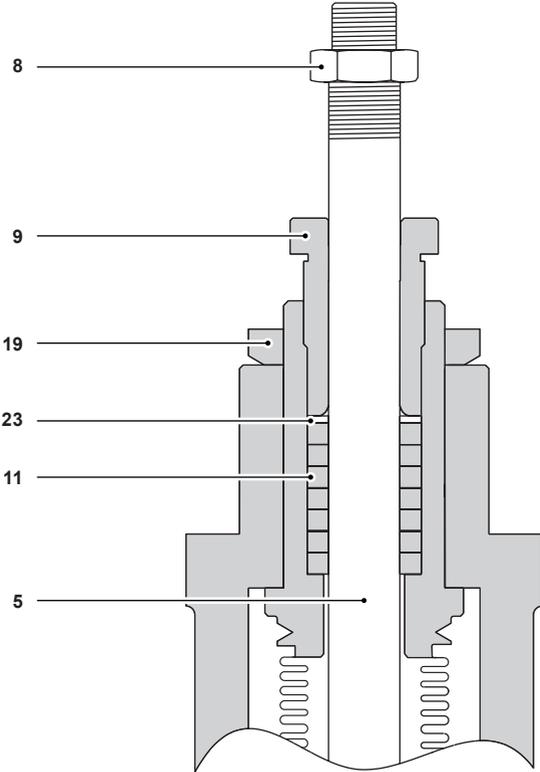
4.3.1 Procedure for renewing the bellows stem seals (Refer to Figure 9):

- a) Isolate the valves on all three ports.
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.
- b) Remove the actuator from the valve.
CAUTION: take care not to rotate the valve stem when removing the actuator from valve service, as this will damage the bellows. Refer to the Installation and Maintenance Instructions covering Spirax Sarco actuators.
- c) Remove the lock-nut (8).
- d) Unscrew the gland nut (9), remove the washer (23) and discard the stem seal set (11).
- 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 the parts taking care to avoid scratching the stem or bore of the bellows assembly top end.
- g) New graphite stem seals (11) should be inserted into the bellows assembly top end, care being taken to avoid damage.
- h) Refit the washer (23) and finger tighten the gland nut (9) over the valve stem (5).
- i) Ensure that the stem (5) moves freely.
- j) Refit the valve lock-nut (8).
- k) Refit the actuator and connect it to the valve stem.
- l) Bring the valve back into service.
- m) Check for leakage around all gasket joints

Table 1 Recommended tightening torques (N m)

Valve size	Seats (4)	Bonnet /Bellows housing nuts (15)	Bellows lock-nut (19)	Plug lock-nut	
				Mixing (16)	Diverting (16)
DN125	210 - 230	110 - 120	45 - 50	65 - 75	230 - 250
DN150	270 - 290	150 - 160	45 - 50	65 - 75	230 - 250
DN200	320 - 340	110 - 120	45 - 50	65 - 75	230 - 250

Fig. 9

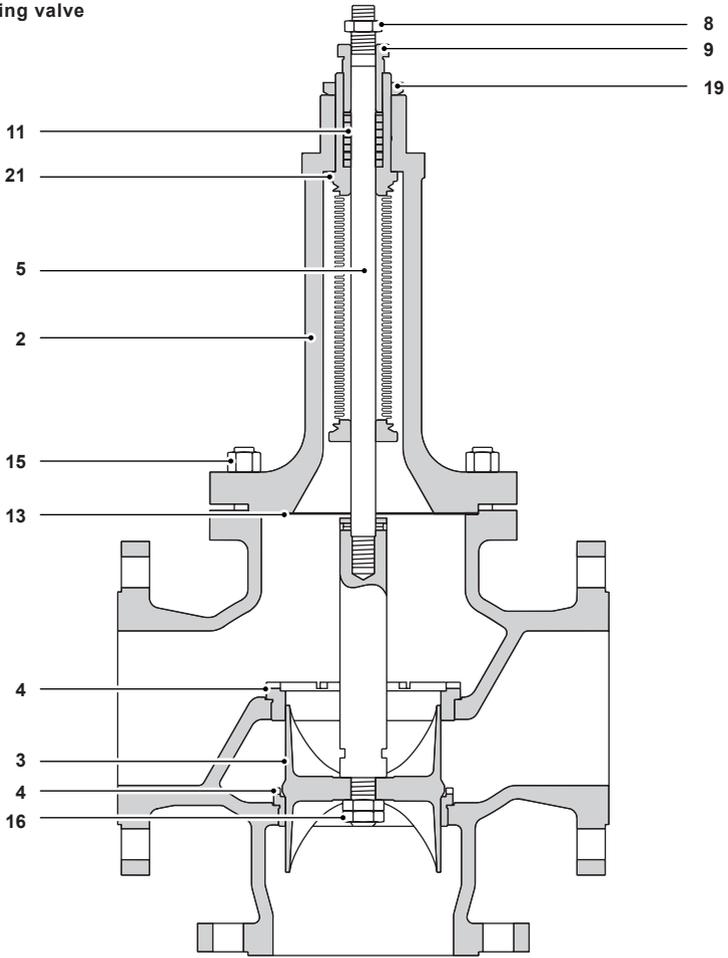


4.3.2 Procedure for renewing the valve plug, seats and bellows assembly on mixing valves (Refer to Figure 10):

CAUTION: 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 the 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 the actuator from the valve. Caution: take care not to rotate the valve stem (5) when removing the actuator from the valve, since this will damage the bellows. Refer to the Installation and Maintenance Instructions covering Spirax Sarco actuators.
- c) Remove the lock-nut (8).
- d) Ensure that the valve stem (5) is held still by locating a spanner onto the machined flat on the valve stem (5) and unscrew the plug lock-nut (16) from the valve stem (5). (When the flat on the valve stem is not easily accessible, lock two nuts onto the valve stem and use a spanner on these to prevent the stem from rotating). Unscrew the nuts (15) securing the bonnet (2).
- e) Withdraw the bonnet (2) together with the stem /bellows assembly (5). Remove the gland nut (9) and stem seal set (11). Unscrew the stem / bellows assembly lock-nut (19) 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 valve seats (4) a special tool is required which can be obtained from Spirax Sarco by quoting the valve type and size.
- g) Lightly smear the threads of the new seats with silicon grease. Insert the new bottom valve seat (4) into the body. Tighten to the recommended torque (see Table 1). Carefully insert the new valve plug (3). Insert the new top seat (4) into the body. Tighten to the recommended torque (see Table 1).
- h) Insert the replacement stem / bellows assembly (5) with a new bellows flange gasket (21) into the bonnet (2) taking care not to damage the bellows.
Refit the lock-nut (19) and tighten to the recommended torque (see Table 1).
- i) Using a new gasket (13) refit the bonnet and stem / bellows assembly on the valve body ensuring that the valve stem fits into the valve plug bore (3). Replace and finger tighten the bonnet nuts (15). Ensure that the valve stem (5) is held still by locating a spanner on to the machined flat on the valve stem (5). Replace the valve plug nut (16), then tighten to the recommended torque (see Table 1).
- j) Again loosen 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 recommended torque (see Table 1).
- k) Fit a new stem seal assembly (11) as described in Section 4.2.1, ensuring the valve stem (5) moves freely after assembly.
- l) Refit the actuator and connect it to the valve stem. **CAUTION:** take care not to rotate the valve stem when fitting the actuator to the valve since this will destroy the bellows.
- m) Bring the valve back into service.
- n) Check for leakage around all gasket joints.

Fig. 10 Mixing valve

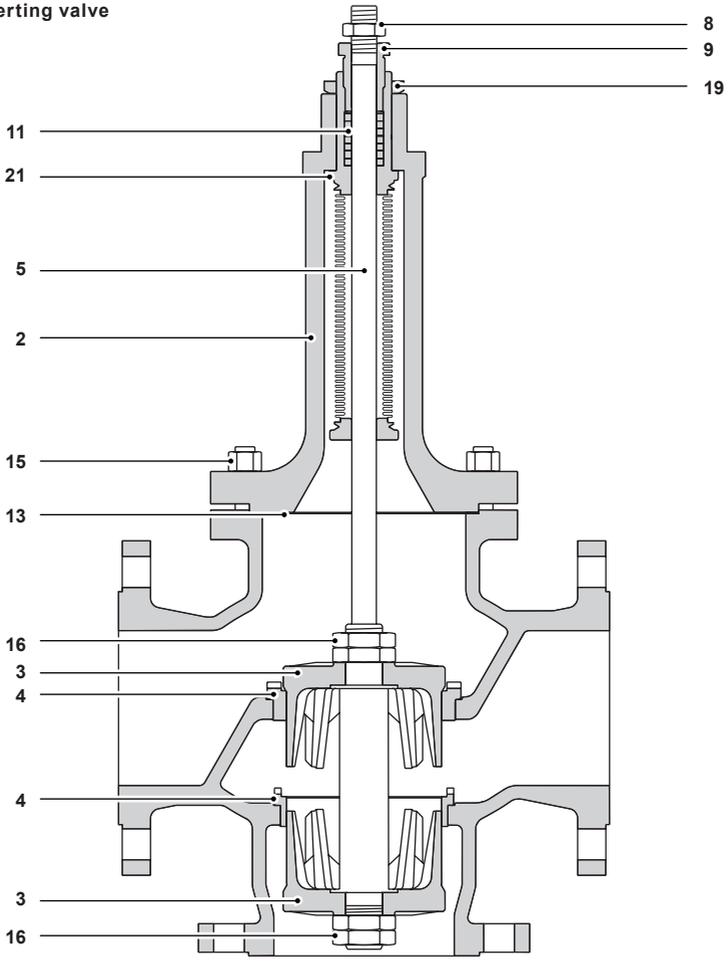


4.3.3 Procedure for renewing the valve plug, seats and bellows assembly on diverting valves (Refer to Figure 11):

CAUTION: 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 the 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 the actuator from the valve. Caution: take care not to rotate the valve stem (5) when removing the actuator from the valve, since this will damage the bellows. Refer to the Installation and Maintenance Instructions covering Spirax Sarco actuators.
- c) Remove the lock-nut (8).
- d) Ensure that the valve stem (5) is held still by locating a spanner onto the machined flat on the spacer and unscrew the bottom plug lock-nut (16). (When the flat on the valve stem is not easily accessible, lock two nuts onto the valve stem and use a spanner on these to prevent the stem from rotating). Unscrew the nuts (15) securing the bonnet (2).
- e) Withdraw the bonnet (2) together with the stem /bellows assembly (5). Remove the gland nut (9) and stem seal set (11). Unscrew the stem / bellows assembly lock-nut (19) 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 the top and bottom valve seats (4) a special tool is required which can be obtained from Spirax Sarco by quoting the valve type and size.
- g) Lightly smear the threads of the new seats with silicon grease. Insert the new bottom valve seat (4) into the body. Tighten to the recommended torque (see Table 1). Insert the new top valve seat (4) into the body. Tighten to the recommended torque (see Table 1).
- h) Remove the bottom valve plug (3) from the new stem / bellows assembly (5). Insert the replacement stem / bellows assembly (5) with the new bellows flange gasket (21) into the bonnet (2) taking care not to damage the bellows. Refit the lock-nut (19) and tighten to the recommended torque (see Table 1).
- 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 valve seat (4). Replace and finger tighten the bonnet nuts (15). Refit the bottom plug (3) and lock-nuts (16). Note: Ensure that the valve stem is prevented from rotating by locating a spanner on to the machined flat on the stem and tighten to the recommended torque (see Table 1).
- j) Again loosen 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 recommended torque (see Table 1).
- k) Fit a new stem seal assembly (11) as described in Section 4.2.1, ensuring the valve stem (5) moves freely after assembly.
- l) Refit the actuator and connect it to the valve stem.
CAUTION: take care not to rotate the valve stem when fitting the actuator to the valve, since this will destroy the bellows.
- m) Bring the valve back into service.
- n) Check for leakage around all gasket joints.

Fig. 11 Diverting valve



5. Spare parts

5.1 Valves with packing gland seal

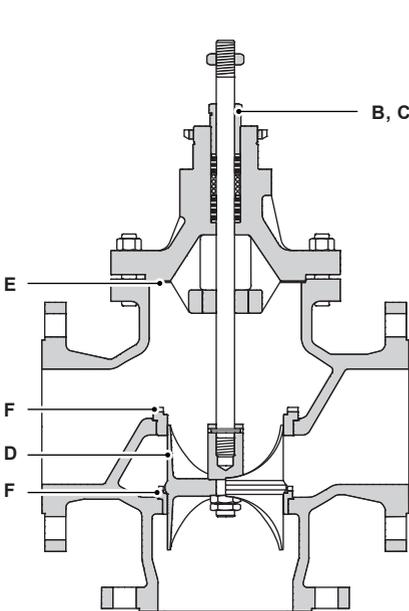
Available spares

PTFE gland seal kit	(spring, bushes and packing set)	B
Graphite gland seal kit	(bush and packing set)	C
Stem, plug and bonnet gasket.		D, E
Note: state if the spares ordered are for a mixing or diverting valve		
Bonnet gasket	(packet of 3)	E
Seats	(2 items)	F

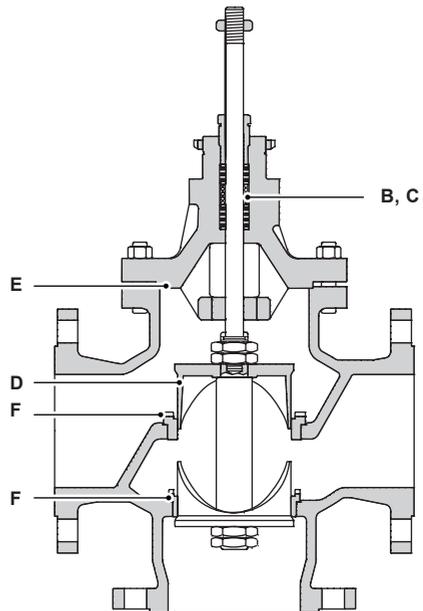
How to order spares

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

Example: 1 - Gland seal kit for a DN150 QL73D Kvs 300 PN25.



Mixing valve
Fig. 12



Diverting valve
Fig. 13

5.2 Valves with bellows seal

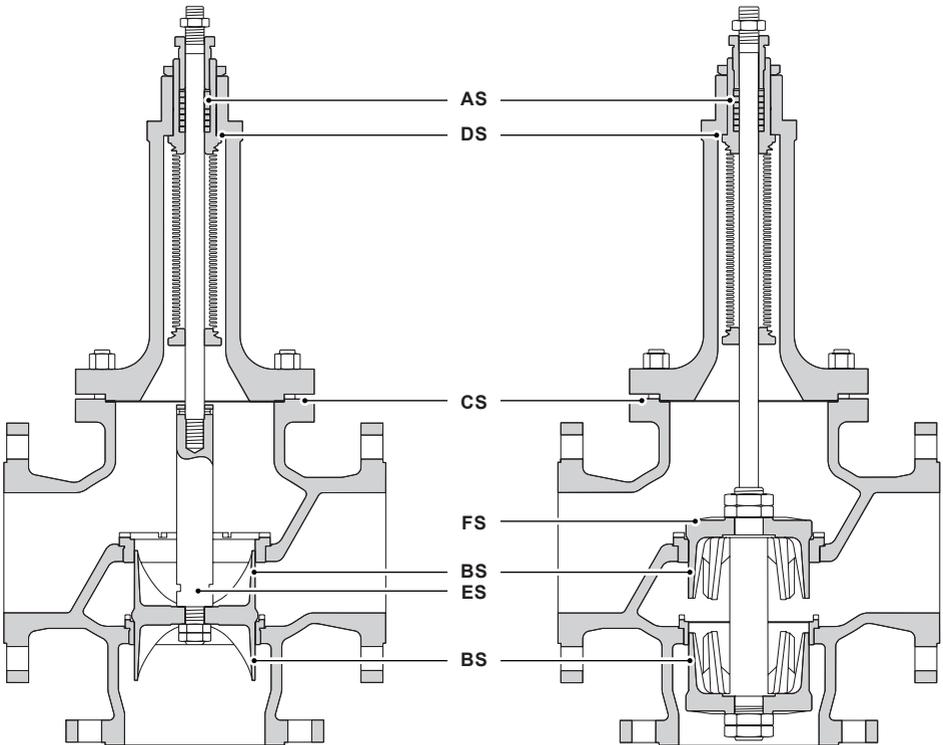
Available spares

Graphite gland seal kit (packing set)	AS
Seats (2 items)	BS
Bonnet gasket (packet of 3)	CS
Bellows gasket (packet of 3)	DS
Spindle/ bellows and plug assembly, gasket, for mixing valves	ES, CS, DS
Spindle/ bellows and plug assembly, gasket, for diverting valves	FS, CS, DS

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 valve.

Example: 1 - Gland seal kit for a DN150 QL73DB1 Kvs 300 PN25.



Mixing valve
Fig. 14

Diverting valve
Fig. 15

QLM and QLD Series DN125 to DN200 Three Port Control Valves

