



Series 2003 / 2013

Three-way control valve

INSTALLATION, MAINTENANCE & SAFETY INFORMATION

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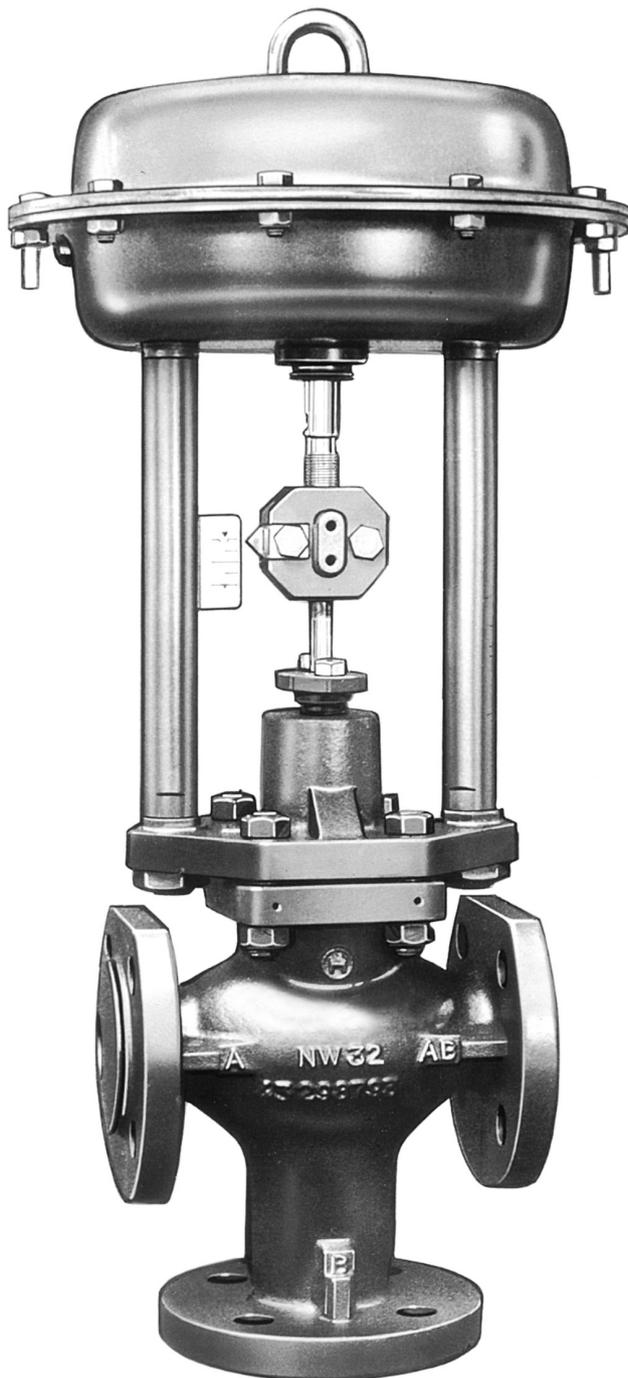
SPECIFICATIONS

The Series 2003 / 2013 comprises a range of skirt guided Three-way mixing (2003) and diverting valves (2013).

Available in a variety of sizes, they are applicable to most industrial processes.

FEATURES

- Rugged construction
- ANSI and DIN body patterns
- Convertible arrangements of plugs for mixing and diverting service
- Full accessory range





Specifications

Style	Top entry, Three-way mixing or diverting service												
Size	ANSI inch	1/2	3/4	1		1 1/2	2	2 1/2	3	4		6	
	DIN-DN mm	15	20	25	32	40	50	65	80	100	125	150	
Pressure ratings	Cast iron : PN 16												
	Steel : ANSI 300 ; PN 40												
End connections	<i>cast iron flanged</i>	DIN-raised face											
	<i>Steel flanged</i>	ANSI-small groove											
		ANSI-ring type joint											
		DIN-raised face											
DIN-2512 groove													
Bonnet and packing	<i>Bonnet type for pneumatic actuators</i>	<i>Packing type</i>	<i>Process temperature</i>										
			<i>Degrees C</i>										
			<i>Degrees F</i>										
	<i>Standard</i>	PFTE-V-ring	-10... + 250								+15... + 480		
		PFTE silk	-10... + 280								+15... + 536		
		Graphite	+200... + 450								+390... + 840		
<i>Extension and bellows seal</i>	PTE-V-ring	-60... + 350								-75... + 660			
	PTFE silk	-60... + 350								-75... + 660			
	Graphite	+200... + 450								+390... + 840			
Characteristic	<i>Linear for all valve sizes</i>												
Flow coefficients	Valve size	ANSI inch	1/2	3/4	1		1 1/2	2	2 1/2	3	4		6
		DIN mm	15	20	25	32	40	50	65	80	100	125	150
	Seat diameter	inch	.984	0.984	0.984	1.26	1.57	2.09	2.56	3.54	3.54	5.51	5.51
		mm	25	25	25	32	40	53	65	90	90	140	140
	Cv values	Full capacity	4.7	7.4	12	19	29	47	74	120	190	290	420
1st reduction			4.7	7.4					120			290	
2nd reduction				4.7									
Valve factor F_L and X_T	<i>Trim style</i>	<i>Flow direction</i>	<i>F_L</i>						<i>X_T</i>				
			<i>Full Cv</i>						<i>Reduced Cv</i>				
	V-Port for all valve sizes	<i>Flow to open</i>	0.90						0.92		0.72		
Rangeability	50 : 1												
Leakage rate	<i>Trim description</i>	<i>Leakage class in accordance with ANSI B 16.104</i>				<i>Approximate percentage of rated Cv</i>							
	Metal seat (standard)	III				0.1 %							
Trim type	V-Port for all valve sizes												
Pneum. actuators	Series 2000 - see specification sheet 62-86-03-10												
Electric std. motors	On request												
Manual actuators and handwheels	Details on request												

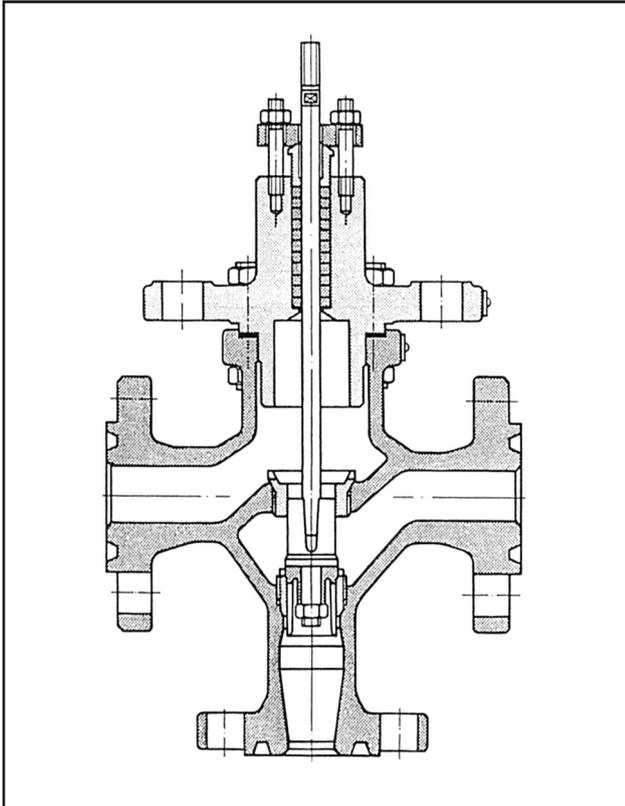


Fig. 1: Three way valve DN 25 ring type joint standard bonnet, mixing service

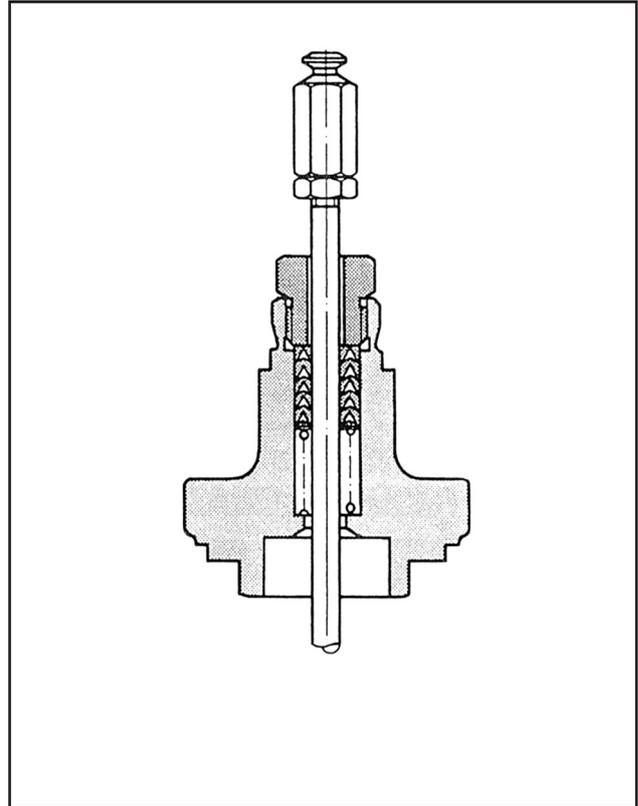


Fig. 2: Modified standard and extension bonnet for electric standard motors

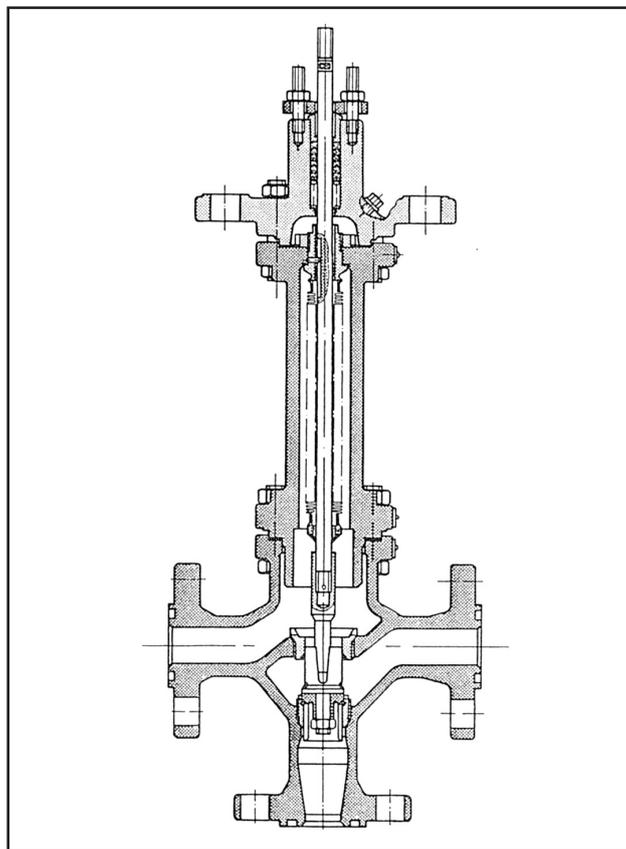


Fig. 3: Three way valve DN 25 small groove bellows seal bonnet mixing service

Materials of construction *

Body and bonnet material and temperature limits	Materials	Available material no acc. to DIN 17007		Equivalent ASTM specification	Temperature limit	
					Degrees C	Degrees F
	Cast iron			A-126 B	-10 to +250	+15 to +480
	Carbon steel			A-216 WCB	-10 to +450	+15 to +840
	Low temperature carbon steel			A-352 LCB	-50 to +340	-58 to +640
	Stainless steel			A-351 CF8M	-100 to +450	-150 to +840
Trim material* and recommended temperature limits	Trim type	Plugs (7)	Seat rings (5,6)	Stem (14)	Process temperature	
					Degrees C	Degrees F
	V-Port for all valves	410 316 316 HFS 316 HSO	410 316 316 HFS 316 HSO	316	-100 to +450	-150 to +840
Other parts*	Part description	Part number	Body and bonnet material			
			Cl and CS	LT CS	SS	
	Bonnet studs	19	Steel	B 7	316	
	Bonnet nuts	20	Steel ZP	B 7	316	
	Packing studs	13	Steel	Steel	316	
	Packing nuts	12	Steel ZP	Steel ZP	316	
	Packing follower	10	316	316	316	
	Packing flange	11	Steel ZP	Steel ZP	Steel ZP	
	Washer	17	316	316	316	
	Spring ¹⁾	18	316	316	316	
	Stem	14	316	316	316	
	Bellows	14	321	321	321	
	Lock nut	31	316	316	316	
	Gasket	21	Sil C 4400	Sil C 4400	1.4401+ Graphite	
	Nameplate	23	302	302	302	
	Flow direction indicator	33	302	302	302	
	Traverse ²⁾	3	Steel ZP	Steel ZP	Steel ZP	

¹⁾ Used only with PTFE-V-rings

²⁾ Used on SS bonnet ON 15-32

For detailed information see Parts list 64-85-14-16

References

*NB : All valve parts are made from materials which comply with DIN (German) standards. However for clarity the materials shown are closest equivalents in accordance with ASTM / AISI (American) standards.

- HFS = Hard faced seats
- HSO = Hard surfacing overlay
- ZP = Zinc plated
- Cl = Cast iron
- CS = Cast steel
- SS = Stainless steel
- LT = Low temperature
- HT = High temperature

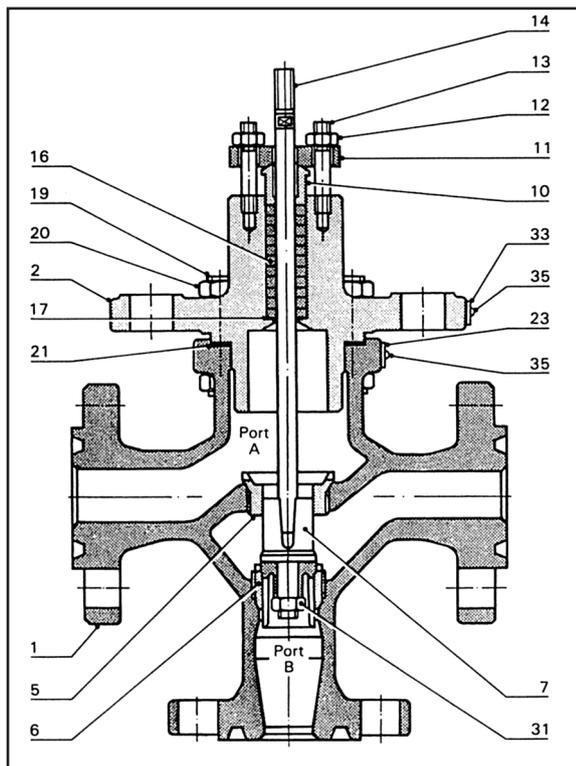


Fig.4: Valve assembly DN 25 three way

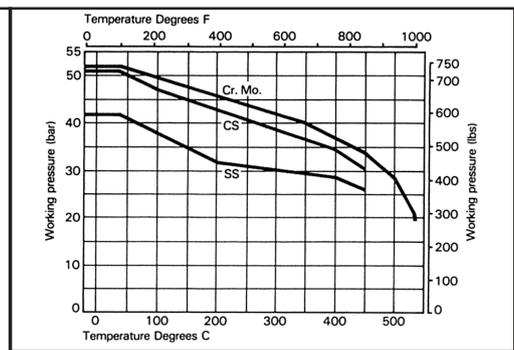


Fig.5: Pressure vs temperature (ANSI 300)

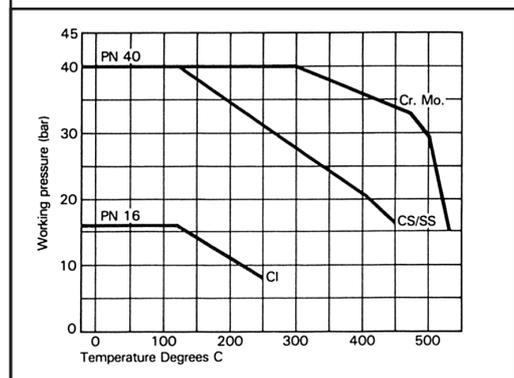


Fig.6: Pressure vs temperature (PN 16/40)

Pressure drop limitations (bar) $P_2 = 0$

Valve body size	Cv-values	Seat diameter	Actuator size/type	Direct acting		Reverse acting	
				Mixing	Port A closed without pressure	Mixing	Port B closed without pressure
		inch mm		Port A closed with pressure	Port A closed without pressure	Port B closed with pressure	Port B closed without pressure
				Diverting	Diverting	Diverting	Diverting
				Port A closed with pressure	Port B closed without pressure	Port A closed with pressure	Port A closed without pressure
				Spring range	Spring range	Spring range	Spring range
				3-15 psi	3-15 7-19 ⁽¹⁾ 7-25 11-31 3-15 psi	3-15 7-19 7-25 11-31	3-15 7-19 7-25 11-31
				0.2-1.0 bar	0.2- 0.5- 0.5- 0.8- 0.2-1.0 bar	0.2- 0.5- 0.8- 0.2-1.0 bar	0.2- 0.5- 0.5- 0.8- 1.0 1.3 1.7 2.2
		inch mm		Supply pressure	Supply pressure	Supply pressure	Supply pressure
				17 psi 34 50 86 0 0 0 0	17 psi 34 41 50 64 86 0 0 0 0	17 psi 34 41 50 64 86 0 0 0 0	17 psi 34 41 50 64 86 0 0 0 0
				1.2 bar 2.4 3.5 6.0 0 0 0 0	1.2 bar 2.4 2.9 ⁽²⁾ 3.5 ⁽⁴⁾ 4.5 ⁽⁶⁾ 6.0 ⁽¹⁰⁾	1.2 bar 2.4 2.9 ⁽²⁾ 3.5 ⁽⁴⁾ 4.5 ⁽⁶⁾ 6.0 ⁽¹⁰⁾	1.2 bar 2.4 2.9 ⁽²⁾ 3.5 ⁽⁴⁾ 4.5 ⁽⁶⁾ 6.0 ⁽¹⁰⁾
1/2 ⁽¹⁰⁾	4.7	.984 25	2109	1 51 51 51 3 23	43 1 51 51 51	43 1 51 51 51	3 23 43
3/4 ⁽¹⁰⁾	4.7 to 7.4		2112	45 ⁽¹⁾ 51 ⁽¹⁾ 51 ⁽¹⁾ 15 ⁽¹⁾ 51	51 ⁽³⁾ 51 ⁽³⁾ 13 ⁽²⁾ 51 ⁽²⁾ 51 ⁽²⁾	51 ⁽³⁾ 51 ⁽³⁾ 13 ⁽²⁾ 51 ⁽²⁾ 51 ⁽²⁾	50 ⁽²⁾ 51 51 ⁽⁴⁾
1	4.7 to 12		2109	0 43 51 51 0 12	25 0 43 51 51	25 0 43 51 51	0 12 25
	16	1.26 32	2112	26 ⁽¹⁾ 51 ⁽¹⁾ 51 ⁽¹⁾ 8 ⁽¹⁾ 31	51 ⁽³⁾ 6 ⁽²⁾ 51 ⁽³⁾ 51 ⁽²⁾	51 ⁽³⁾ 6 ⁽²⁾ 51 ⁽³⁾ 51 ⁽²⁾	29 ⁽²⁾ 31 51 ⁽⁴⁾
1 1/2	29	1.57 40	2112	3 51 51 51 4 19	34 3 51 51	34 3 51 51	4 19 34
	40		2112T	12 51 51 14 44	51 12 51	51 12 51	14 44 51
2	47	2.09 53	2112	0 32 51 51 1 10	18 0 32 42	18 0 32 42	1 10 18
	63	2.56 65	2112T	6 51 51 7 24	41 6 51	41 6 51	7 24 41
	74		2112	0 20 39 51 0 6	11 0 20 29	11 0 20 29	0 6 11
	100		2112T	3 45 51 4 15	27 3 45	27 3 45	4 15 27
3	120	3.54 90	2112-50	0 10 20 42 0	2 0 10 14	2 0 10 14	0 2
	120 to 190		2112-50I	1 22 42 1 7	1 22	1 22	1 7
	100 to 160		2016-50	9 ⁽⁹⁾ 34 ⁽⁵⁾ 51 ⁽⁵⁾ 1 ⁽⁵⁾	15 ⁽⁷⁾ 1 ⁽⁶⁾ 25 ⁽⁹⁾ 34 ⁽⁶⁾ 43 ⁽⁶⁾ 51 ⁽⁶⁾ 51 ⁽⁶⁾ 9 ⁽⁶⁾	15 ⁽⁷⁾ 1 ⁽⁶⁾ 25 ⁽⁹⁾ 34 ⁽⁶⁾ 43 ⁽⁶⁾ 51 ⁽⁶⁾ 51 ⁽⁶⁾ 9 ⁽⁶⁾	27 ⁽⁸⁾
			2016T-50	22 ⁽⁸⁾ 51 ⁽⁵⁾ 51 ⁽⁵⁾ 6 ⁽⁵⁾	32 ⁽⁷⁾ 5 ⁽⁶⁾ 51 ⁽⁶⁾ 51 ⁽⁶⁾ 21 ⁽⁶⁾	32 ⁽⁷⁾ 5 ⁽⁶⁾ 51 ⁽⁶⁾ 51 ⁽⁶⁾ 21 ⁽⁶⁾	51 ⁽⁸⁾
6	290	5.51 140	2112-50	0 3 7 17 0	0 0 3 5	0 0 3 5	0 0
	290 to 420		2112-50I	0 9 17 0 2	0 0 9	0 0 9	0 2
	250 to 360		2016-50	3 ⁽⁵⁾ 13 ⁽⁵⁾ 23 ⁽⁵⁾ 44 ⁽⁵⁾ 0 ⁽⁵⁾	5 ⁽⁷⁾ 0 ⁽⁶⁾ 10 ⁽⁶⁾ 14 ⁽⁶⁾ 19 ⁽⁶⁾ 28 ⁽⁶⁾ 41 ⁽⁶⁾ 4 ⁽⁶⁾	5 ⁽⁷⁾ 0 ⁽⁶⁾ 10 ⁽⁶⁾ 14 ⁽⁶⁾ 19 ⁽⁶⁾ 28 ⁽⁶⁾ 41 ⁽⁶⁾ 4 ⁽⁶⁾	12 ⁽⁸⁾
			2016T-50	8 ⁽⁸⁾ 29 ⁽⁷⁾ 47 ⁽⁷⁾ 2 ⁽⁵⁾	13 ⁽⁷⁾ 1 ⁽⁶⁾ 22 ⁽⁶⁾ 30 ⁽⁶⁾ 41 ⁽⁶⁾ 9 ⁽⁶⁾	13 ⁽⁷⁾ 1 ⁽⁶⁾ 22 ⁽⁶⁾ 30 ⁽⁶⁾ 41 ⁽⁶⁾ 9 ⁽⁶⁾	25 ⁽⁸⁾

Notes :

Differential pressures > 40 bar for ANSI 300 only

Effective spring range

¹⁾ 3 to 11 psi, 0.2 to 0.73 bar ; ²⁾ 7 to 15 psi, 0.47 to 1.0 bar ; ³⁾ 11 to 25 psi, 0.8 to 1.73 bar ; ⁴⁾ 18 to 31 psi, 1.27 to 2.2 bar ; ⁵⁾ 3 to 9 psi, 0.2 to 0.6 bar ; ⁶⁾ 9 to 15 psi, 0.6 to 1.0 bar ; ⁷⁾ 11 to 22 psi, 0.8 to 1.5 bar ; ⁸⁾ 22 to 31 psi, 1.5 to 2.2 bar ;

⁹⁾ Limited supply pressure at reverse acting actuators ; ¹⁰⁾ Same plug arrangement for mixing and diverting service in sizes 1/2 and 3/4 inch ; ¹¹⁾ Maximum preloaded spring range

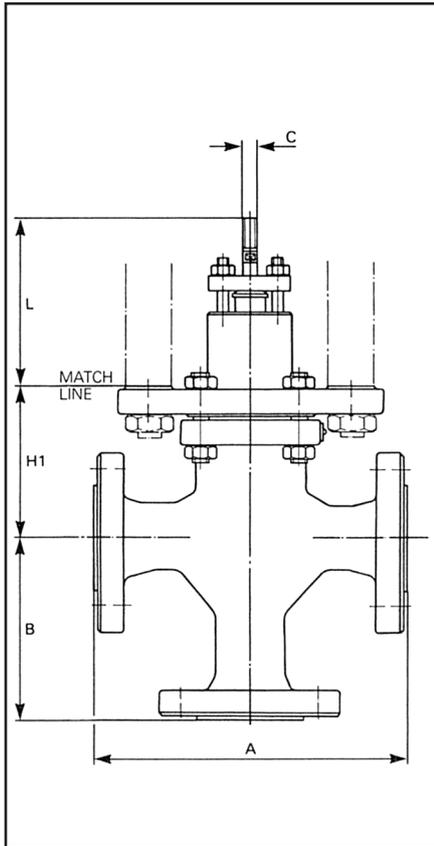


Fig.7: Three way valve with standard bonnet

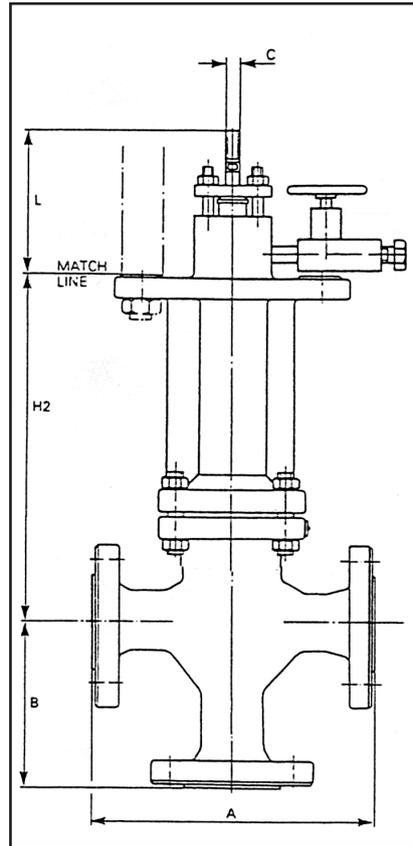


Fig.8: Three way valve with extension bonnet

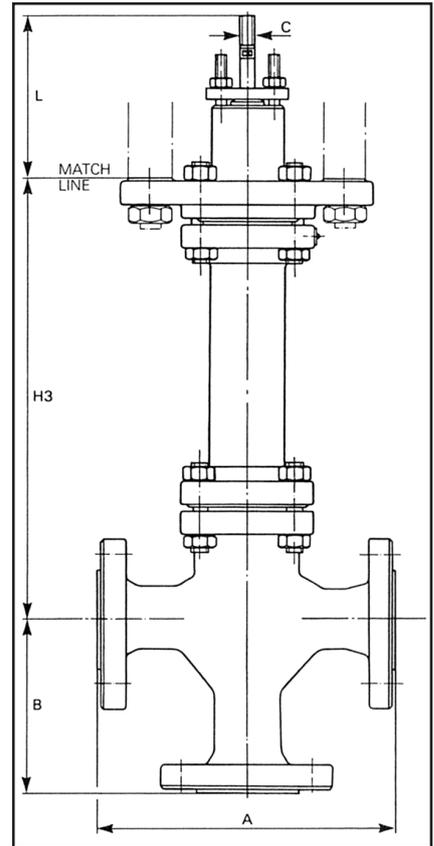


Fig.9: Three way valve with bellows seal bonnet

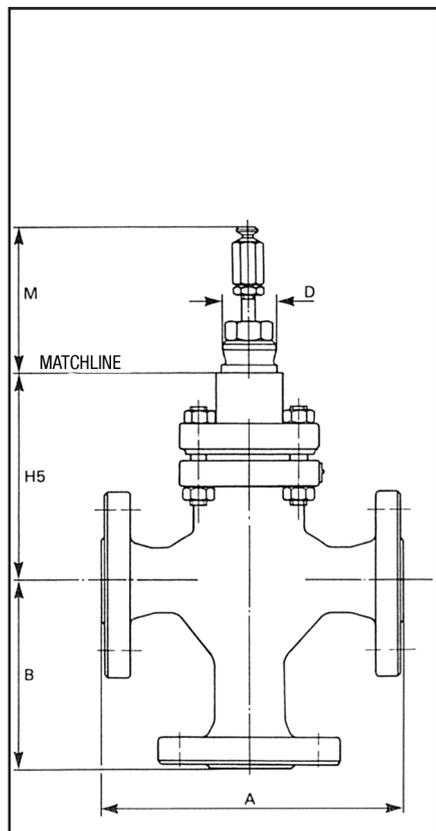


Fig.10: Three way valve with standard bonnet for electric standard motors

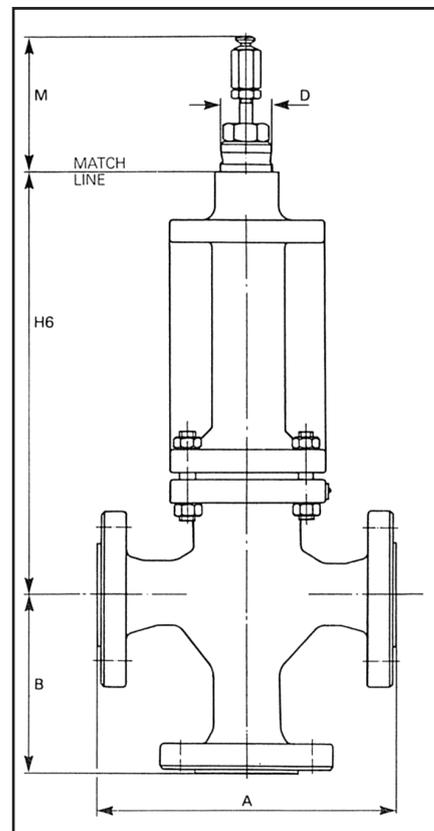


Fig.11: Three way valve with extension bonnet for electric standard motors



Dimensions

ANSI		B						DIN				
Valve size	A							Valve size	A	B		
inch	RF	300 small groove	300 RTJ	300	300	300	mm	PN 10 to PN 40 flanged				
1/2	191	200	202	120	125	126	15	130	120			
3/4	194	203	207	120	125	126	20	150	120			
1	197	206	210	120	125	126	25	160	120			
							32	180	135			
1 1/2	235	244	248	140	145	146	40	200	140			
2	267	276	283	150	155	158	50	230	150			
2 1/2	292	301	308	165	170	173	65	290	165			
3	318	327	334	220	225	228	80	310	220			
4	368	377	384	220	225	228	100	350	220			
							125	400	245			
6	473	482	489	270	275	278	150	480	270			
Valve size	C	D	H1	H2	H3	H5	H6	L	M	Valve stroke		
ANSI inch	DIN mm	Thread	Diameter	Standard bonnet	Extension bonnet	Bellows seal bonnet	Standard bonnet for electric motors	Extension bonnet for electric motors	Closed position Port B : Mixing Port A : Diverting			
1/2	15	M10x1	34.85	96	238	303	125	268	96	89 20		
3/4	20	M10x1	34.85	96	238	303	125	268	96	89 20		
1	25	M10x1	34.85	96	238	303	125	268	96	89 20		
	32	M10x1	34.85	96	238	303	125	268	96	89 20		
1 1/2	40	M12x1	47.6	136	303	372	152	317	109	130 30		
2	50	M12x1	47.6	136	303	372	152	317	109	130 30		
2 1/2	65	M12x1	47.6	136	303	372	152	317	109	130 30		
3	80	M16x1.5	47.6	238	533	548	240	535	104	128 50		
4	100	M16x1.5	47.6	238	533	548	240	535	104	128 50		
	125	M16x1.5	47.6	267	562	582	269	564	104	128 50		
6	150	M16x1.5	47.6	267	562	582	269	564	104	128 50		

**Shipping weights
Kg
(body assembly only)**

Valve size	Standard bonnet	Extension bonnet	Bellows seal bonnet
ANSI inch	DIN mm		
1/2	9	12	13
3/4	10	13	14
1	12	15	16
	13	16	17
1 1/2	24	30	34
2	28	34	38
2 1/2	33	39	43
3	62	68	83
4	74	80	95
	130	148	164
6	148	166	182

Dimensions and weights for Series 2000 actuators, see specification sheet 62-86-03-10.

Series 2003/2013

Three-way control valves, mixing/diverting

INSTALLATION

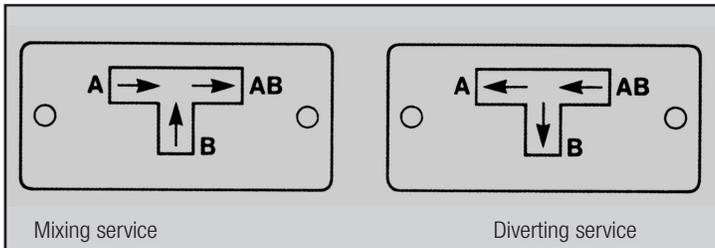


Fig. 1: Indication of flow direction

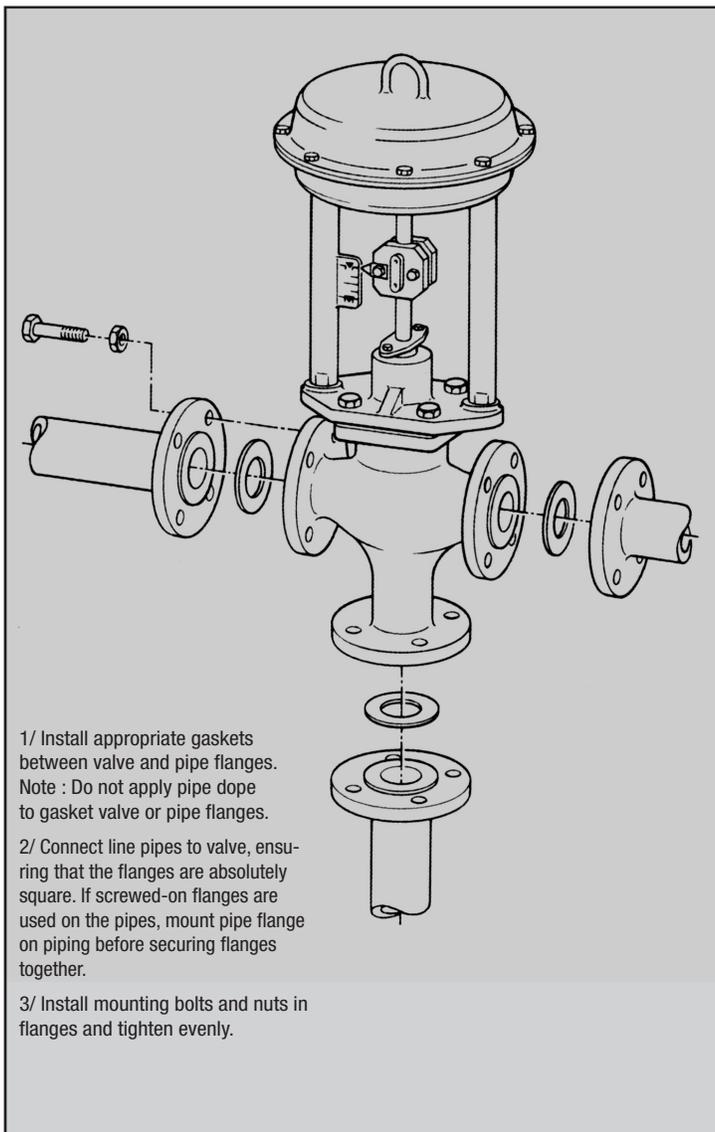


Fig. 2: Installing the valve

General instructions

The suitability of the Series 2003/2013 valve to meet alternative service conditions and the correct specification of spare parts can be determined by referring to the nameplate details or by contacting the A. Hock MSR- u. Electronic Service GmbH.

Before installing inspect the valve and associated accessories for any damage or accumulation of foreign material caused during transit or storage. Clean pipe bores and flange faces ensuring all traces of pipe scale, chips, welding slag etc are removed.

Every effort should be made to ensure a stress-free installation in order to avoid plug stiction or other operating faults.

The prescribed flow direction is indicated by the arrows on a special steel plate fixed to the side of the valve body (figure 2). For coordination, connection indications (A, B, AB) are cast on the valve body.

The normal flow direction is upwards toward the plug.

Install the valve (figure 2) according to normal piping practice. For flanged bodies, use a suitable gasket between the body and pipe-line flanges.

Series 2000 valves can be installed in any position, but the normal methods recommended are:

a/ Temperatures up to 400°C (750°F): Actuator vertically above valve body

b/ Temperatures above 400°C (750°F): Actuator vertically below valve body if unlagged.

If continuous operation is required during maintenance and inspection, install a conventional four-valve by-pass.

After installation check the valve to ensure that all screw connections are correctly tightened, all moving parts are free from excessive friction, the valve-travel completes a full stroke and the control action (air to open or air to close) matches the controlling instrument signal.

Checking packing (figure 3)

All valves fitted with adjustable gland packings are shipped with the packing in an uncompressed state. Prior to start-up tighten gland nuts at least finger-tight. After start-up the packing should be checked periodically for leakage. If leakage occurs, tighten the packing flange nuts until the leakage stops.

Connecting air supply

On actuators without positioner, the control air signal line is connected directly to the appropriate actuator air chamber. On a direct-acting actuator (air to close) the control air line is connected to the upper chamber, and on a reverse-acting actuator (air to open), to the lower actuator chamber. On actuators with positioner, the control air signal lines corresponding to the required action are factory installed. In the field, only the air supply must be piped to the supply port of the positioner via an airset. Connecting threads for actuator, positioner and airset are ¼ inch NPT. Use of non-matching fittings may result in damaged threads and leakage.

CAUTION

Do not tamper with pressure regulator bias- reduced outlet pressure may be insufficient for valve operation, while increased pressure may damage the valve.

Pressure limits for the various valve and actuator combinations are listed in specification sheet.

Checking operation

The valve is adjusted and tested at the factory before shipment and should require no further adjustment in the field. After installation, use a regulated air supply to stroke the valve through several cycles to ensure perfect operation.

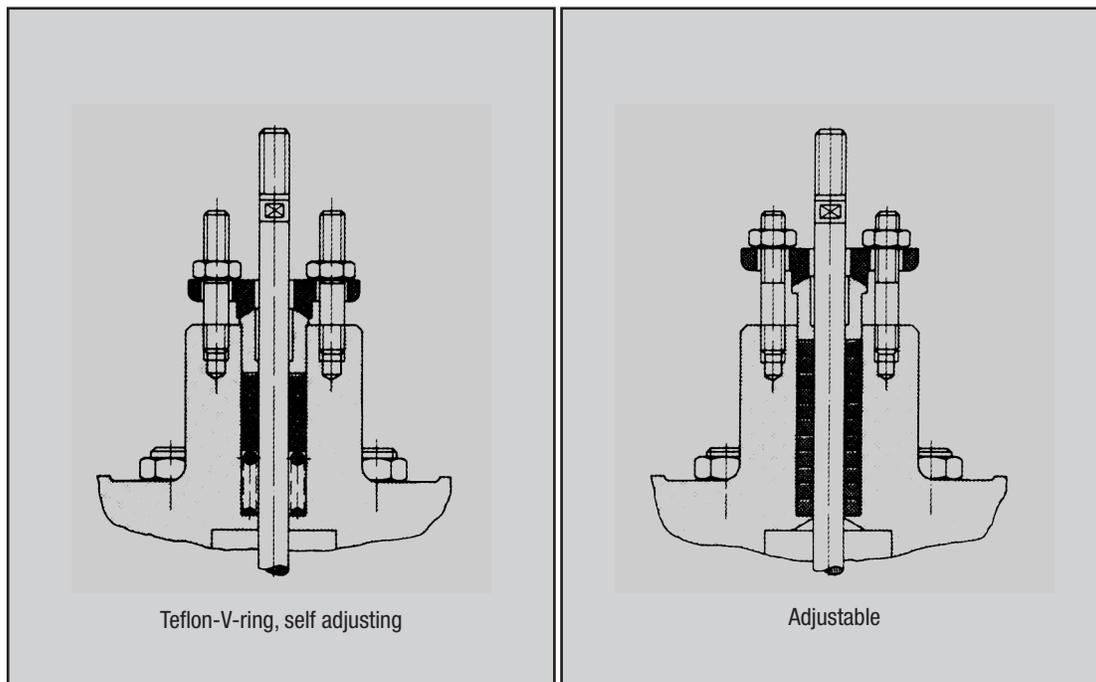


Fig. 3: Packing

Field mounting the actuator on the valve

Normally, valves and actuators are factory assembled and adjusted before shipment.

However, the actuator can be mounted and adjusted in the field as follows :

1. Push the valve stem down by hand to fully close the valve (gate B closed).
2. Replace actuator, locating the actuator rods in the holes on the bonnet bridge piece and fit the hexagon nuts to the rods without completely tightening the nuts.
3. Connect the adjustable air supply to the actuator.
4. On direct-acting actuators (figure 4) apply sufficient air pressure to the actuator to fully stroke the actuator to nominal travel $\pm 5\%$
5. On reverse-acting actuators (figure 5) apply sufficient air pressure to the actuator to start point (eg 0.5 bar).
6. Attach the stem connector (figure 6) at this point, making sure that there is full engagement of the threads on the stem and the stroke indicating pointer faces the lowest marking on the stroke indicator plate with the plug in fully closed position. Fully tighten the stem clamp cap screws.
7. Completely tighten the actuator rod nuts securing the actuator firmly to the valve.
8. Fine adjustment may be made (with the plug off the seat) by slightly slackening the stem connector screws and screwing the plug stem towards or away from the actuator stem using spanners fitted to the flats provided on both stems for this purpose.
9. If necessary, readjust the travel indicator plate when valve is closed.

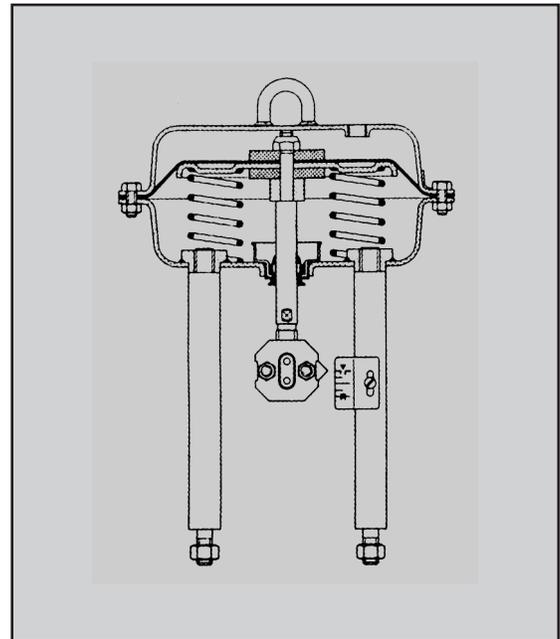


Figure 5: Reverse-acting actuator

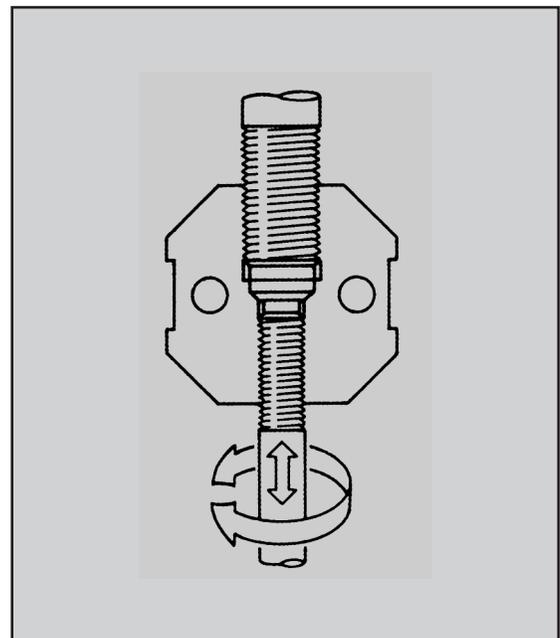


Figure 6: Stem clamp, connection between actuator and valve stem

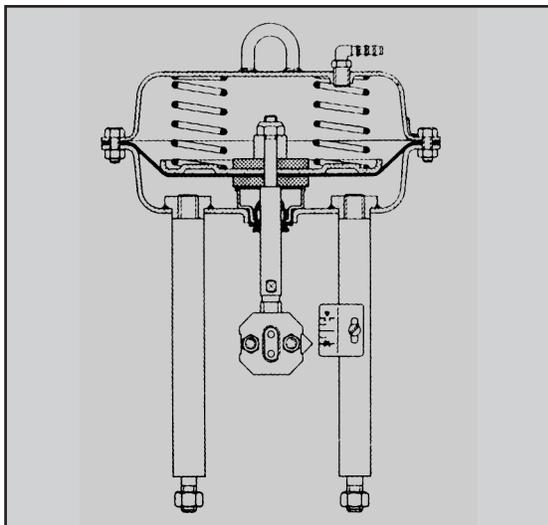


Figure 4: Direct-acting actuator

Series 2003/2013

Three-way Control Valve, mixing/diverting

SERVICE

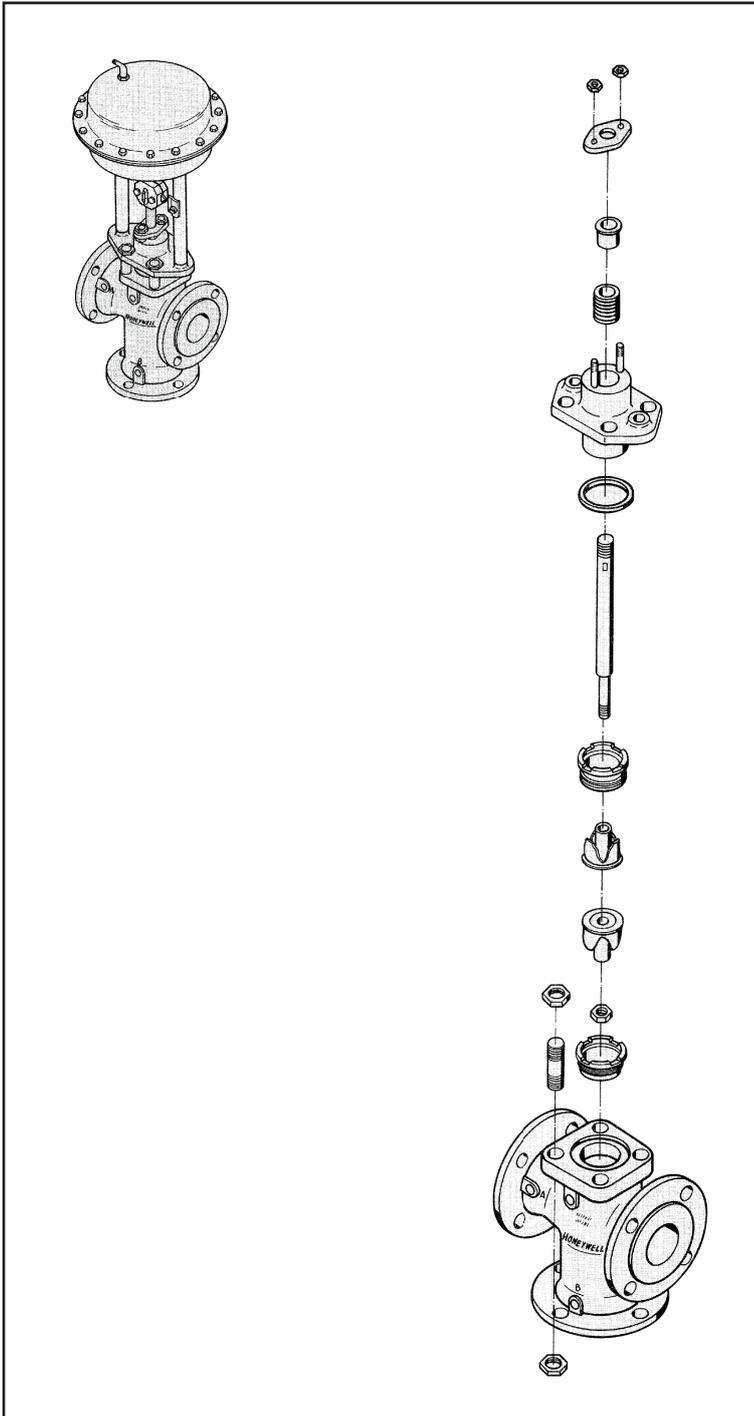


FIG1: Series 2003/13, control valve

Preventive maintenance

Preventive maintenance primarily consists of making a regular visual inspection of the valve assembly. This can reveal packing box leaks, loosening of air connections due to vibrations, and other visible defects. A suggested inspection includes the following:

1. Check packing box for leakages. If leakages are evident, do not tighten packing flange nuts beyond point required to stop leakage. If the packing box is too tight (and this can very easily happen when a wrench is used), excessive stem friction is created, due to the pressure of the packing against the stem. The excessive stem friction may cause the top of the diaphragm to require several additional pounds of air to stroke the valve. If tightening the packing flange nuts fails to stop the leakage, the packing box requires either additional packing or removal of the old packing and installation of new packing. Occasional cleaning of the valve stem will prevent dirt and grit from being carried into the packing.
2. Check all mechanical and air connections. In some applications, particularly where the valve is located in a line near a pump, vibrations may cause both mechanical and air connections to work loose.
3. If possible, stroke the valve through several cycles, noting the pressure required for stroking, and the normal action of the valve etc.
4. Check tightness of diaphragm case (seal and O-ring).
5. Check tightness of screws connecting body to bonnet.
6. Check tightness of actuator post nuts.
7. Check tightness of stem connector.

Overhauling procedure

To completely overhaul a pneumatically actuated valve, isolate the flow medium from the valve. Generally, when a valve is overhauled, the actuator and bonnet are removed from the valve body, the packing is removed from the valve body, the packing is removed from the packing box, and all parts are cleaned. Make a thorough inspection of the plug, seat rings, and stem to determine whether these parts should be re-used, re-worked, or replaced.

Note:

For a quick inspection of the valve trim, the bonnet may be removed from the valve body with the actuator still mounted and attached to the valve stem. To minimize the possibility of leakages, always replace the valve body gaskets whenever the valve is disassembled. For convenience sake, replacement kits are available that include these gaskets.

Removing actuator from valve

1. Loosen screws from the linking joint and remove it from actuator and valve stem.

Caution:

On three-way valves the pre-adjusted spring force is effective. Therefore, apply enough air pressure to the actuator to stroke the stem to middle position, before disconnecting the linking joint.

2. Reduce the loading pressure in the actuator to nil.

3. Disconnect the pneumatic connection to the actuator.

4. Remove the two hexagon nuts from the actuator rods.

5. Lift actuator off valve.

Mounting the actuator on to the valve

1. Push plug (that means the valve stem) by hand into lower position (= passage B closed).

2. Attach the actuator, without tightening the nuts at the bonnet bridge completely.

3. Connect the air supply to the actuator.

4. On direct-acting actuators, apply sufficient air pressure to fully stroke the actuator to nominal stroke + 5%.

5. On reverse-acting actuators adjust the desired starting point (e.g. 0.5 bar).

6. Attach stem connector at this point making sure that there is full engagement of the threads on the stems and that the stroke indicating pointer faces the lowest marking on the stroke indicator plate with the stem of the final control element in the fully closed position. Tighten screws of stem connector.

7. Completely tighten the actuator rod nuts, securing the actuator firmly to the bonnet.

8. Fine adjustments may be made (e.g. with the valve plug off the seat) by slightly slackening the stem connector screws and screwing the stem of the final control element towards or away from the actuator stem using spanners, fitted to the flats provided on both stems. Readjust the travel indicator plate when the valve is closed.

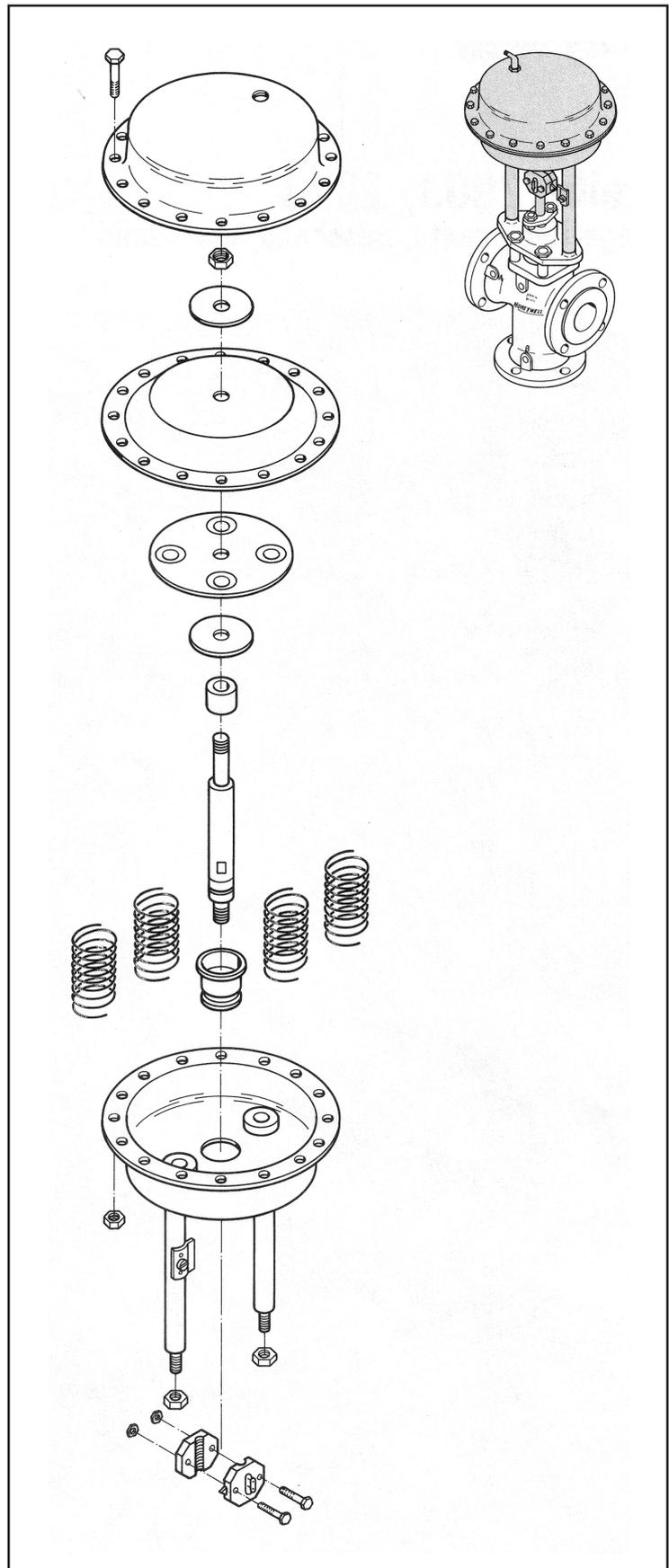


FIG2: Actuator, Series 2000

Servicing the valve

(A) Replacing the plug and seat rings in valves with standard or extended bonnets:

1. Loosen screws from the linking joint and remove it from actuator and valve stem.

Caution:

In three-way valves the pre-adjusted spring force is effective. Therefore, apply enough air pressure to the actuator to stroke the stem to the middle position, before disconnecting the linking joint.

2. Reduce the loading pressure in the actuator to nil.
3. Disconnect the pneumatic connections to the actuator.
4. Remove nuts securing bonnet to valve body.
5. Unscrew packing gland nuts until they are just finger-tight.
6. Remove actuator and bonnet vertically using a turning motion and without resorting to force to avoid damaging the packing.
7. Secure valve stem at the key faces using a spanner. Loosen the connecting nut at the valve stem using a wrench through the

lower valve outlet. On the nominal widths of 200 to 300 the connecting nut is secured by means of a pin. This must be removed first.

8. Pull out valve stem from above.

In mixing valves:

9. Unscrew upper seat ring using a seat ring tool and remove both halves of the plug from above.

10. Unscrew lower seat ring using a seat ring tool.

In diverting valves:

11. Pull out the upper part of the plug and unscrew the upper and lower seat ring using a seat ring tool. Remove lower part of the plug from above. On valves with nominal width 15 to 32, remove the spacer bush as well.

12. Reassemble valve in reverse order.

(B) Replacing the plug and seat rings in valves with bellows seal bonnet:

Caution:

In valves with bellows seal bonnet the valve stem must not be rotated to avoid damaging the bellows.

1. Loosen screws from linking joint end remove it from actuator end valve stem.

Caution:

In three-way valves the pre-adjusted spring force is effective. Therefore, apply enough air pressure to the actuator to stroke the stem to the middle position, before disconnecting the linking joint.

2. Reduce the loading pressure in the actuator to nil (spring closes).
3. Disconnect the pneumatic connections to the actuator.
4. Unscrew packing gland nuts until they are just finger-tight.
5. Remove nuts and bolts securing the bonnet to bellows housing.
6. Remove actuator end bonnet vertically using a turning motion end without resorting to force to avoid damaging the packing.
7. Loosen recessed head nut, which secures the bellows seal in the bellows seal bonnet
8. Remove nuts and bolts connecting the bellows seal bonnet to valve housing.
9. Remove bellows seal bonnet vertically.

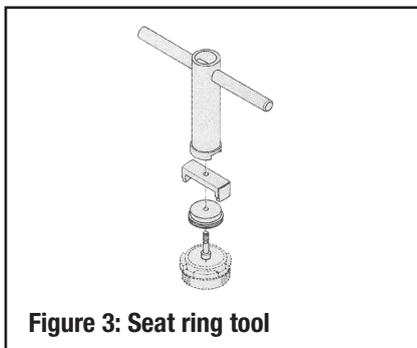


Figure 3: Seat ring tool

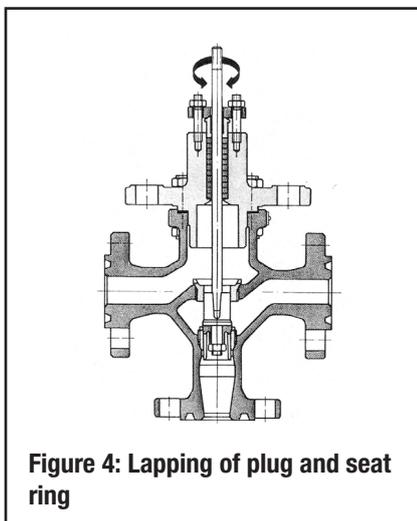
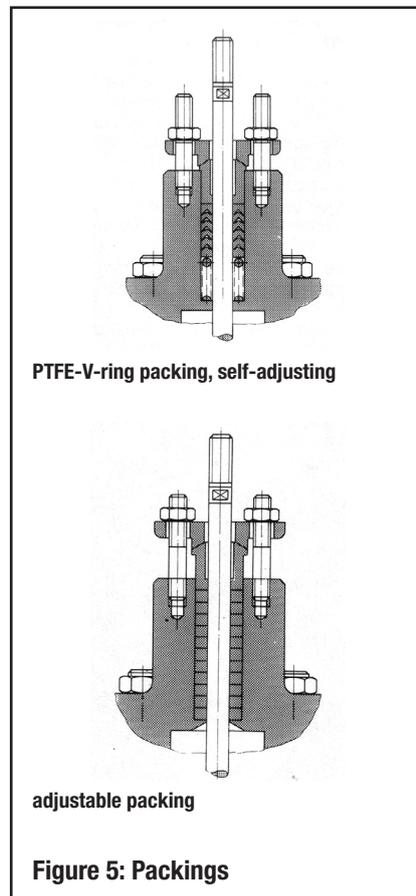


Figure 4: Lapping of plug and seat ring



PTFE-V-ring packing, self-adjusting

adjustable packing

Figure 5: Packings

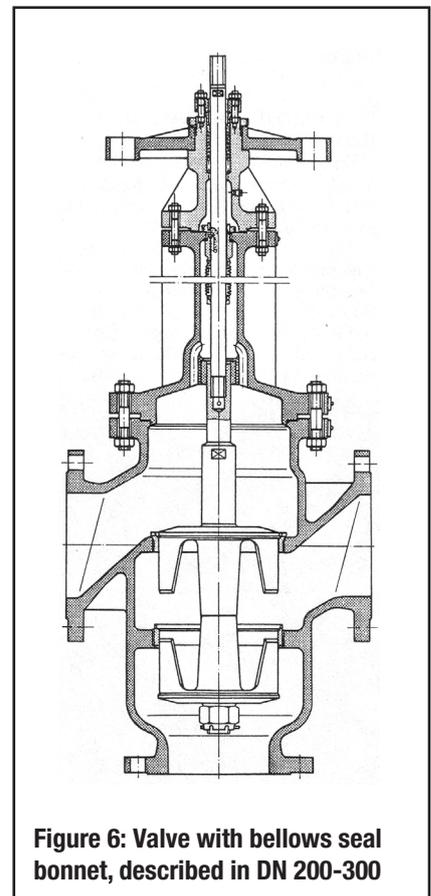


Figure 6: Valve with bellows seal bonnet, described in DN 200-300

10. Secure valve stem at the key faces using a spanner. Loosen the connecting nut at the valve stem through the lower valve outlet using a wrench.

On nominal widths of 200 to 300 the connecting nut is secured by a pin.

This must be removed first.

11. Pull out valve stem with bellows seal from above.

In mixing valves:

12. Unscrew upper seat ring using a seat ring tool and remove both halves of the plug from above.

13. Unscrew lower seat ring using a seat ring tool.

In diverting valves:

14. Pull out the upper part of the plug and unscrew the upper and lower seat ring using a seat ring tool. Remove lower part of the plug from above. On valves with nominal width 15 to 32 remove the spacer bush as well.

15. Reassemble valve in reverse order.

Lapping the plug and seat ring

1. The sealing of the surfaces can be improved by lapping, using a good quality carborundum paste with 280 grit size.

2. Apply lapping compound to seating surfaces of plug and seat ring.

3. Lap plug into seat ring (Figure 4), so that both have good seating surfaces. Do not remove too much metal; stop the lapping after seating surfaces of 1/32 inch (0.8 mm) wide have been obtained. Check that seating of plug is good.

4. Thoroughly remove all traces of lapping compound.

Replacing the packing

1. Disconnect actuator from valve stem (see „Replacing plug“ 1 to 2);

2. Remove the packing gland nuts, flange and follower. Pull out the old packing with a hook, being careful to avoid scratching the wall of the packing box.

3. Clean packing box and all metal pans.

4. Install new packing and associated parts in the correct sequence (Figure 5).

Replace the follower, flange and nuts.

With PTFE spring loaded packing, tighten gland nuts fully until limited by the travel stop, fitted to the packing follower in this type of packing. In the case of PTFE-asbestos or graphite-asbestos packing, tighten just enough to prevent gland leakage.

Replacing the bellows seal in valves with bellows sealbonnet

Caution:

*The stem must **not** be rotated.*

1. Remove bellows seal bonnet (Figure 6) with actuator and plug from housing (see „Replacing plug and seat rings“ B.1. to B.11.).

2. The bellows seal stem is screwed to the plug stem and secured by a pin. Remove the pin and unscrew the plug stem from the bellows seal stem.

3. Exchange bellows seal (incl. bellows seal stem) and assemble valve in reverse order.

4. Test valve for efficiency of bellows seal prior to refitting it into the pipeline by applying approx. 5 bar air supply to the valve body and checking for any leakages at the test connection below the packing

chamber.

Reversing valve action

1. Remove the stem clamp and disconnect the air supply (see “Replacing plug“ A.1. to A.3.)

2. Remove the short bolts around the diaphragm chamber. Gradually loosen each of the long bolts, slackening each bolt alternatively by one or two turns, to progressively relieve the compression of the actuator springs inside the chamber.

Warning:

Long bolts must always be removed last to ensure that the spring compression is fully released before the diaphragm upper casing is removed.

3. Remove diaphragm upper casing.

4. Remove actuator stem nut, using a spanner on the flats provided on the lower end of the stem to prevent rotation. The spring plate, clamp plates, springs, spacer and diaphragm may now be removed.

5. Assemble the internal parts in accordance with Figure 7 (direct-acting) or Figure 8 (reverse-acting). To reassemble, follow points 1 to 4 in reverse order. Ensure that the actuator springs are evenly distributed inside the casing and vertically located by the spring buttons of the diaphragm plate.

Replacing the actuator diaphragm

1. Remove the stem clamp and disconnect the air supply (see “Replacing plug“ A.1. to A.3.).

2. Remove the short bolts around the diaphragm chamber. Gradually loosen each of the long bolts, slackening each bolt alter-

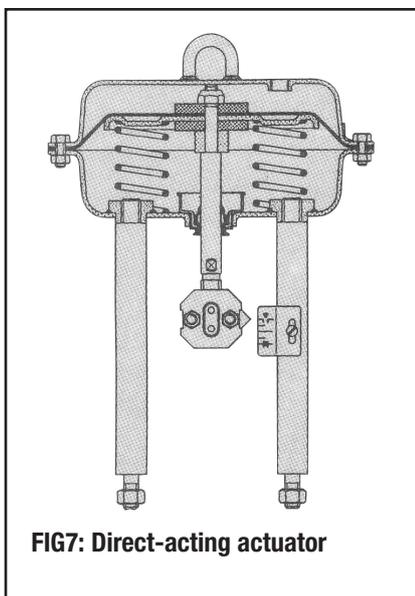


FIG7: Direct-acting actuator

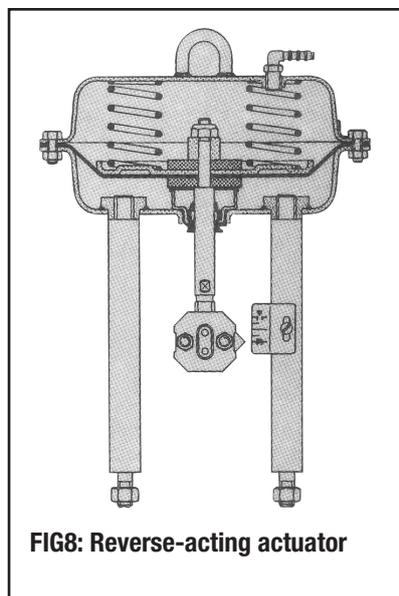


FIG8: Reverse-acting actuator

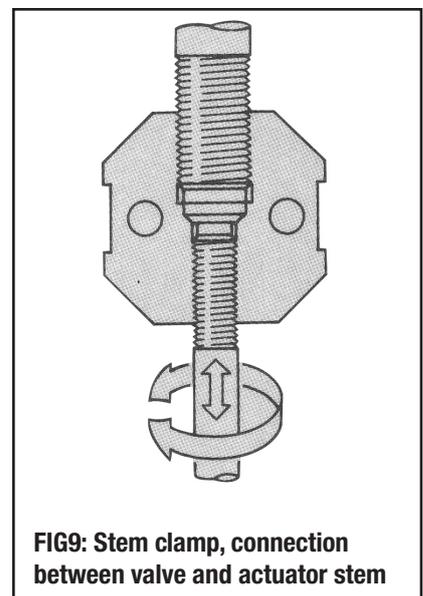


FIG9: Stem clamp, connection between valve and actuator stem

natively by one or two turns, to progressively relieve the compression of the actuator springs inside the chamber.

Warning:

The long bolts must always be removed last to ensure that the spring compression is fully released before the diaphragm upper casing is removed.

3. Remove the diaphragm upper casing.
4. Remove the actuator stem nut, using a spanner on the flats provided on the lower end of the stem to prevent rotation. The spring plate, clamp plates, springs, spacer and diaphragm may now be removed.
5. A new actuator diaphragm and assemble the internal parts in accordance with Figure 7 (direct-acting) or Figure 8 (reverse-acting). To reassemble, follow points 1 to 4 in reverse order. Ensure that the actuator springs are evenly distributed inside the casing and vertically located by the spring buttons of the diaphragm plate.

Replacing the stem seal

1. Disassemble actuator as described in “Replacing the actuator diaphragm” procedures 1 to 4.
2. Remove actuator from the valve by removing the hexagon nuts from the two actuator rods.
3. Remove the actuator stem through the bottom of the lower case of the diaphragm.
4. Renew the stem seal and replace actuator stem from below through the bottom of the lowercase, after applying silicone based grease to the two chambers in the stem seal.
5. Reassemble the actuator as described in “Reversing valve action”, point 5.

Adjusting starting point

The start point is adjusted simply by altering the distance between the ends of the valve stem and actuator stem within the split stem clamp (Figure 9):

1. Remove the stem clamp (see “Removing actuator from valve”, points 1 to 3).
2. Adjust the starting point by following “Mounting actuator on to valve”, points 1, 3 to 6 and 8.

GENERAL SAFETY INFORMATION

Using of Valves and Actuator, manufactured by A. Hock MSR- u. Electronic Service GmbH (shortened "HOCK") in accordance regulations.

Terms concerning safety

The safety terms DANGER, WARNING, CAUTION and NOTE are used instructions to highlight particular danger and/or to provide additional information on aspects that may not be readily apparent.

DANGER: indicates that death, severe personal injury and/or substantial property damage will occur if proper precautions are not taken.

WARNING: indicates that death, severe personal injury and/or substantial property damage can occur if proper precautions are not taken.

CAUTION: indicates that minor personal injury and/or property damage can occur if proper precautions are not taken.

NOTE: indicates and provides additional technical information, which may not be very obvious even to qualified personnel. Compliance with other, not particularly emphasised notes, with regard to transport, assembly, operation and maintenance and with regard to technical documentation (e.g. in the operation instruction, product documentation or on the product itself) is essential, in order to avoid faults, which in themselves might directly or indirectly cause severe personal injury or property damage.

Using

The following instructions are designed to assist in unpacking, installing and performing maintenance. Product users and maintenance personnel should thoroughly review this bulletin prior to installing, operating or performing any maintenance.



In most cases HOCK-valves and actuators are designed for specific applications (e.g. with regard to medium, pressure, temperature). For this reason they should not be used in other applications without first consulting the manufacturer.

Protective clothing

HOCK-valves and actuators are often used in problematic applications (e.g. extremely high pressures, dangerous, toxic or corrosive mediums). In particular valves with bellows seals point to such applications. When performing

service, inspection or repair operations always ensure, that the valve and actuator are depressurised and that the valve has been cleaned and is free from harmful substances. In such cases pay particular attention to personal protecting (protective clothing, gloves, glasses etc.).

Qualified personnel

Qualified personnel are people who, on account of their training, experience and instruction and their knowledge of relevant standards, specifications, accident prevention regulations and operating conditions, have been authorized by those responsible for the safety of the plant to perform the necessary work and who can recognize and avoid possible dangers.

Spare parts

Use only HOCK original parts. HOCK cannot accept responsibility for any damages that occur from using spare parts or fastening materials from other manufactures. If HOCK products (especially sealing materials) have been on store for longer periods check these for corrosion or deterioration before using these products.

Unpacking

Each delivery includes a packing slip. When unpacking, check all delivered valves and accessories using this packing slip.

Larger valves can be lifted using slings in the yoke or if present, using the lifting lugs or eyebolt connections provided for the purpose. If slings are used, attach them so that the other tubing or attaching parts are not damaged.

WARNING

If slings are used, be aware that the centre of gravity of the valve be above the lifting point. In this case, secure or support the valve rotating, to prevent damage or personal injury.

Report transport damage to the carrier immediately.

In case of discrepancies, please contact A. Hock MSR-u. Electronic Service GmbH.

Installation

DANGER

Before installation check the order-no. and/or the tag-no. to that the valve/actuator is correct for the intended application.

Do not insulate extensions that are provided for hot or cold services.

Pipelines must be correctly aligned to ensure that the valve is not fitted under tension. Fire protecting for HOCK products must be provide by the end user.

NOTE

According to the Pressure Equipment Directive the HOCK Valves must not be installed as an accessory with safety function.

Commisioning

Clean tubing prior to installing.

If possible, install the valve in an upright position (actuator on top), to ease maintenance. An upright installation position is important with low-temperature applications, in order to keep the distance between the packing material and the medium as large as possible. The packing material then retains the ambient temperature as much as possible.

NOTE

Observe the diminished pressure curve when overstepping the specified border temperature.

NOTE

Do not insulate extensions bonnets that are provided for hot or cold services.

Make sure that sufficient overhead clearance above the actuator is maintained, to follow for disassembly of plug from the valve body. See installation, Operating and Maintenance manual (IOM) for detailed information.

After installing, check direction of flow again. The direction of flow is shown by the arrow on the valve.

If the valve is to be welded into the line, make sure that the valve is shielded from excessive heat. Welding must be performed by qualified welders.

Connecting supply pressure and signal lines

Control valves are supplied with a positioner. The end connections for supply pressure and signal are clearly marked. Actuator and positioner are suitable for max. supply pressure as detailed on the product and within the applicable IOM's. If the supply pressure exceeds the pressure specified, a pressure reducing station is required. If instrument air is not available, install an oil

separator/air filter in the air inlet line. All connections must be leak free.

QUICK CHECK

Before operating, check the valve as follows:

Open and close the valve, and observe the moment of the actuator stem. The movement must be smooth.

Check maximum stroke trough change of signal (ie pneumatic/electrical signal).

Check all air connections for leaks.

Check packing nut(s) for proper tightness. Packing nut(s) should be slightly over finger-tight; however, tighten only as necessary to prevent stem leakage (see appropriate IOM for details).

NOTE

An excessively tightened packing can cause excessive packing wear and can hinder of the plug stem.

Check fail-safe position. To do this, close supply pressure and/or electrical signal and observe whether the valve open or closes defined.

If temperature cycling occurs, re-tighten all bolt connections and packing as necessary and check for leaks.

General maintenance

To avoid possible injury to personnel or damage to products, safety requirements and local health and safety rules must be strictly adhered to. Modifying this product, substituting non-factory parts, or using maintenance procedures other than outlined in this instruction could drastically affect performance and be hazardous to personnel and equipment, and will void existing warranties.



DANGER
RISK OF INJURY!

Between actuator and valve there are moving parts. To avoid injury all handy, hair and clothing away from all moving parts when operating valve.

Welding to repair or the connect the valve may only be performed by trained and qualified welding personnel.

Apart from the operating instructions and the obligatory accident prevention directives valid in the country of use, all recognised regulations for safety and good engineering practices must be followed.

WARNING

BEFORE valves are returned to HOCK for repair or maintenance take care that the product is free of medium and clean.

Storage

HOCK products are manufactured from various materials. Products not manufactured resistant materials are provided with an appropriate protection. This means that HOCK products are well protected from corrosion. Nevertheless HOCK products must always be adequately stored in clean, dry environment. Plastic caps fitted to the flange faces to prevent the ingress for foreign materials. These caps should not be removed until the valve actually mounted into the system.

Valve and actuator variations

These instructions cannot claim to cover all details of all possible product variations, nor in particular can they provide information for every possible example of installation, operation or maintenance. This means that the instructions normally include only the directions to be followed by qualified personnel where the product is being used for its defined purpose. If there are any uncertainties in this respect particularly in the event of missing product-related information, clarification must be obtained at HOCK.

Periodic maintenance

Check valves for correct functioning at regular intervals (depending on the application and criticality) as follows. This check can be made when installed and in many cases without interrupting production.

Examine gaskets for leaks and if necessary retighten fasteners.

Check bellow gaskets and test connection - if present - for external leaks.

Check valve for damage caused by corrosive residues or corrosive vapours.

Clean valves and if necessary repaint.

Check glands for leakage. Adjust as necessary. See Installation, Operating and Maintenance manual (IOM) for detailed information.

NOTE

An excessively tightened gland nut can cause excessive packing wear and can hinder the free movement of the plug stem.

If possible, open and close valve and check for maximum stroke and smooth movement of the plug stem. Irregular movement of the plug stem may indicate internal defects.

NOTE

With graphite packing, irregular movement of the plug

stem is possible.

 **DANGER
RISK OF INJURY!**

Keep hands, hair, clothing, etc. away from all moving parts. Failure to do so can lead to serious injury.

Check all accessories for firm seating.

If possible, close supply pressure and check the fail-safe position.

Check stems boot wear.

Check actuator for leaks. To do this, spray housing, air connections and plug stem guide with leak spray and check for any bubble formation.

Clean plug stem.

Check air filter, if present, and if necessary replace insert.

NOTE

For further information please contact A. HOCK MSR- u. ELECTRONIC SERVICE GMBH. IOM's are available in English, German, French and various other languages.



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Authorized **FLOWSERVE** distributor

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