

**MANNESMANN  
REXROTH**

**2/2 and 3/2 Way Proportional  
Cartridge Valves, Type .WRC, Series 1X**

**RE  
29 135/04.93**

Sizes 32 to 160

Up to 420 bar

Up to 18 000 L/min

**Characteristics:**

- Proportional cartridge valve for use in manifolds
- Control by means of servo directional valve
- Feedback of the control spool position by means of an inductive positional transducer
- 2-way control element in poppet design
- 3-way control element in spool design
- Typical applications of: open or closed loop control of large flows, e.g. forging manipulators, press cylinders, pressure casting machines
- Control electronics:  
Optional control electronics for the relevant component (.WRC../S..) and for the relevant servo valve  
Control electronics to be ordered separately, see pages 10 to 12



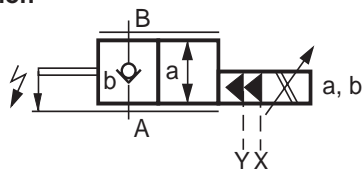
H/A 2542  
Type 2 WRC... -1X/S..  
with associated control electronics (to be ordered separately)

**Contents**

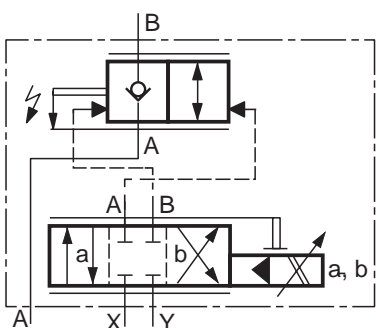
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**Symbols (simplified and detailed): main stage with pilot valve**

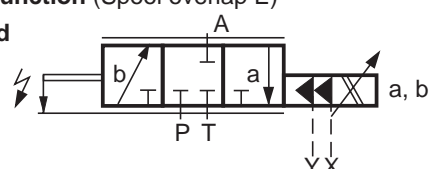
**2/2-way function  
simplified**



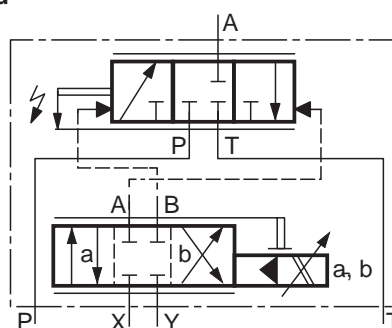
**detailed**



**3/2-way function (Spool overlap E)  
simplified**



**detailed**



## Mounting, Functional Description

### Proportional cartridge valve 2WRC...-1X/...

Stopless control of flow from A to B or B to A. The pilot valve (3) must be mounted directly on the cartridge valve.

#### Structure:

The valve consists of 4 main parts

- Control cover (1) with mounting surface (2)
- Control spool (4) with seat (7)
- Bush (5)
- Inductive positional transducer (6)

#### Functional description:

- Equal area control spool (4) with poppet function (7)
- Control by means of a pilot valve via pilot ports A and B (3)
- Flow from A to B completely blocked by means of seat (7) of control spool (4)
- Three types of control land design
- Feedback of control spool position by means of inductive positional transducer (6)
- Position control loop closed by means of external control electronics, see pages 10 to 12

**Warning:** Power failure at the pilot valve will cause the control spool to assume an undefined position .

**Solution:** Adjust the pilot valve to block connection A to B. For details see under Ordering Codes.

#### Commissioning:

- The pilot valve must be pressurised before input of any electrical signal.
- Connect components and control electronics in accordance with the circuit diagram on page 11.

**Warning:** Faulty connections will cause the control spool to move uncontrollably and can lead to casualties and damage!

When the control spool is closed, pressures A and B act in opposition on the differential area between the spool and seat areas. If pressure is lost at the pilot valve the valve will only remain closed if the pressure is higher at A.

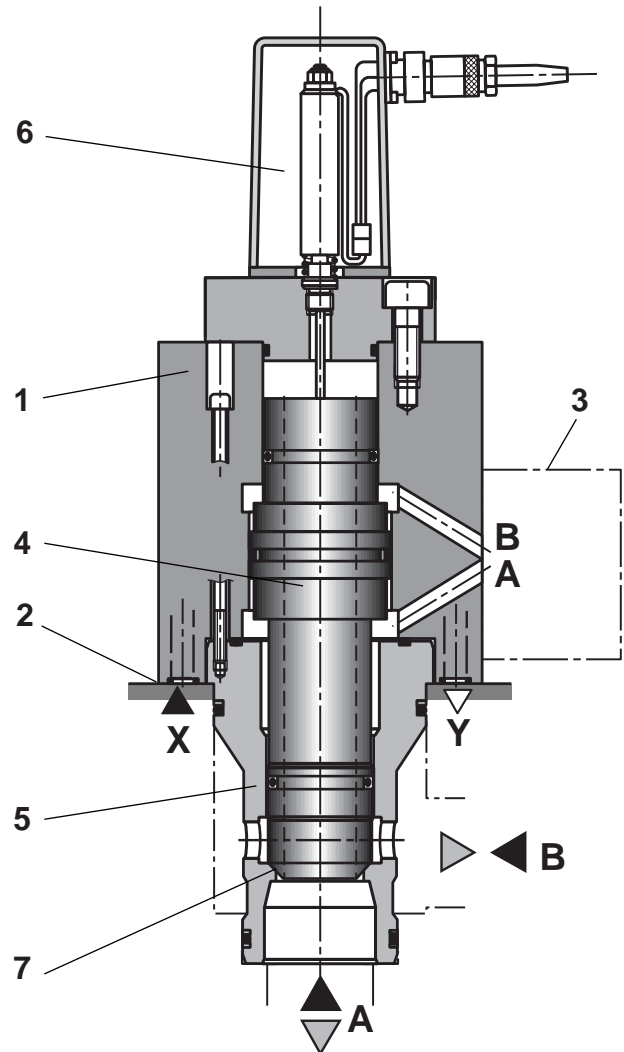


Fig. 1  
Type 2 WRC...1X/S... (2/2-way function)

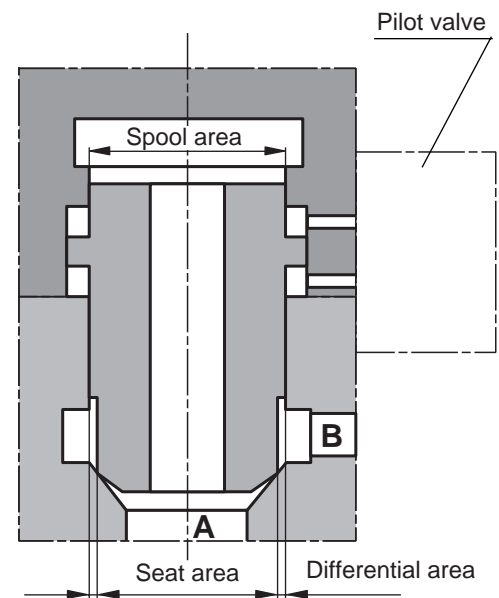


Fig. 2

## Mounting, Functional Description

### Proportional cartridge valve 3WRC...-1X/...

Stopless control of flow from P to A or A to T. The pilot valve (3) must be mounted directly on the cartridge valve.

#### Structure:

The valve consists of 4 main parts

- Control cover (1) with mounting surface (2)
- Control spool (4) with control land (8)
- Bush (5)
- Inductive positional transducer (6)

#### Functional description:

- Equal area control spool (4) with control land (8)
- Control by means of a pilot valve via pilot ports A und B (3)
- Control spool pressure compensated by means of through bore (7)
- Flow control from P to A and from A to T via the relevant control lands
- Three types of control land design
- Positioning of control spool by means of inductive positional transducer (6)
- Position control loop closed by means of external control electronics, see pages 10 to 12

**Warning:** Power failure at the pilot valve will cause the control spool to assume an undefined position!

**Solution:** Adjust the pilot valve so that connection A to B is closed and connection A to T is open. For details see under Ordering Codes.

#### Commissioning:

- The pilot valve must be pressurised prior to input of any electrical signal.
- Connect components and control electronics in accordance with the circuit diagram on page 12.

**Warning:** Faulty connections will cause the control spool to move uncontrollably and can lead to casualties and damage!

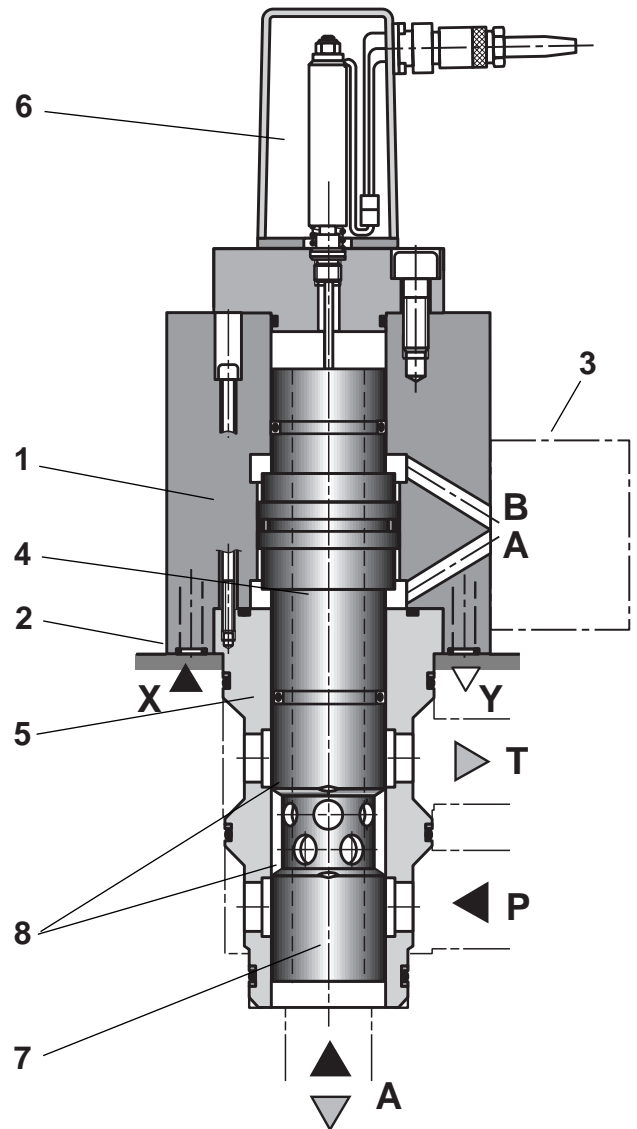


Fig 3  
Type 3 WRC...1X/S... (3/2-way function)

**Ordering code**

		WRC	- 1X/ S	*
2/2-way directional valve	= 2			Further details in clear text
3/2-way directional valve	= 3			
Proportional cartridge valve	= WRC			<b>M =</b> NBR seals, suitable for use with mineral oil (HL, HLP) to DIN 51 524
Size 32	= 32			<b>V =</b> FPM seals, suitable for use with phosphate ester (HFD-R)
Size 40	= 40			<b>Type of pilot control</b>
Size 50	= 50			
Size 63	= 63			<b>S =</b> Servo valve used as pilot valve mounted on cover of main stage (only pilot oil ports X and Y available)
Size 80	= 80			
Size 100	= 100			
Size 125	= 125			
Size 160	= 160			<b>1X =</b> Series 10 to 19 (10 to 19, externally interchangeable)

**Designation of spool operating curve**e.g. **K001** – consecutive numbers, factory set**2-way function:**

Spool with standard tapered seat	= K ...
Spool with tapered lands	= D ...
Spool with control window	= S ...

**3-way function:**

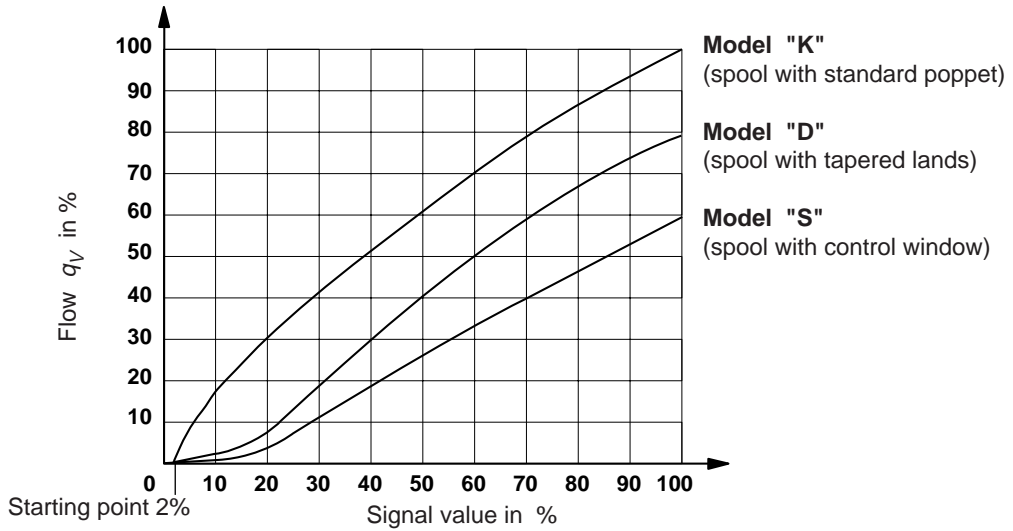
Spool with 10 % positive overlap	= E ...
Spool with 0... 0,5 % negative overlap	= V ...
Spool with 0... 0,5 % positive overlap	= L ...

<b>Technical data</b> (for applications outside these parameters please consult us )													
<b>General</b>													
Installation position			optional, preferably horizontal										
Ambient temperature			°C -20 to +50										
Weight			Size	32	40	50	63	80	100	125	160		
			kg	10	17	27	57	116	200	360	640		
<b>Hydraulic</b>													
Operating pressure			Pilot valve	bar	10 ... 315; Pressure peaks < 100								
			Main valve	2/2-way function	bar	≤ 420							
				3/2-way function	bar	≤ 315							
Size			32	40	50	63	80	100	125	160			
Nominal flow $q_V$ for main valve at $\Delta p = 5$ bar			2/2-way function	L/min	750	1100	1800	2800	4350	7200	11500	18000	
			3/2-way function	L/min	320	500	800	1250	2000	3000	4500	7500	
max. flow			L/min	1450	2200	3500	5500	9000	14000	22000	35000		
Nominal stroke			2/2-way function	mm	10	12	16	19	24	30	40	50	
			3/2-way function	mm	±5	±6	±8	±9,5	±12	±15	±20	±25	
Pilot oil flow			2/2-way function	cm <sup>3</sup>	4.52	8.48	18.5	36.3	67.9	132.5	313,4	565,5	
			3/2-way function	cm <sup>3</sup>	±2.26	±4.24	±9.25	±18.1	±33.9	±66.2	±156,7	±282,7	
Operating time at 200 bar			2/2-way function	Stroke 50%	ms	11	15	24	37	32	55	55	90
				Stroke 100%	ms	15	20	40	70	50	90	90	150
			3/2-way function	Stroke 50%	ms	6	9	12	20	18	35	40	65
				Stroke 100%	ms	11	15	24	37	32	55	55	90
Pilot valve (Pilot control using other pilot valves on request)			4 WS2EM6-1X/...F12ET315Z17EM to RE 29 563				4WS2EM10-4X/... B2ET315Z8EM to RE 29 586			4WS2EM16-2X/... B12ET315Z8EM to RE 29 591			
Direction of flow (reversible)			2/2-way function	A → B (low noise); (B → A)									
			3/2-way function	P → A; A → T									
Fluid			Mineral oil (HL, HLP) to DIN 51 524; phosphate ester (HFD-R)										
Cleanliness class			Pilot stage	See data sheet for relevant pilot valve									
			Main stage	Maximum permissible degree of contamination of fluid to NAS 1638 class 7 to 9. We therefore recommend a filter with a minimum retention rate of $\beta_{10} \geq 75\%$									
Fluid temperature range			°C -20 to +70										
Viscosity range			mm <sup>2</sup> /s 20 to 380										
Hysteresis			% < 0.5										
Repeatability			% < 0.2										
<b>Electrical, pilot valve</b>													
See data sheet for relevant pilot valve													
<b>Electrical, main stage</b> (inductive positional transducer)													
Matching of positional transducer to valve sizes			Size	32	40	50	63	80	100	125	160		
Nominal stroke (positional transducer)			mm	±5	±10			±25					
Coil resistance			Ω	red/black : 43 blue/brown:118		red/black : 47 blue/brown : 130		red/black : 30 blue/brown : 97					
Nominal supply				red - black		red - black		red - black					
Nominal sensitivity at 5 kHz and 10Vss			mV/Vmm	45		45		20					
Current consumption at 5kHz and 10Vss			mW	70		70		250					
<b>Control electronics</b>													
See pages 10 to 12													
<b>Electrical connections</b> (plug included)													
Pilot valve transducer		Order no.	005 414 (for size 6)				002 460 (for sizes 10; 16)						
Inductive positional		Order no.	013 159										

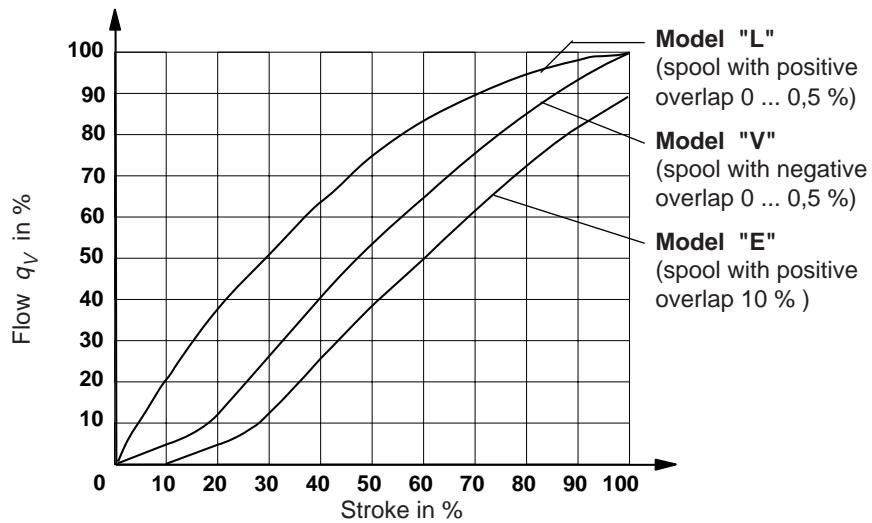
**Operating curves** (measured at  $\nu = 41\text{mm}^2/\text{s}$  and  $t = 50^\circ\text{C}$ )

**Nominal flow through main valve at  $\Delta p = 5$  bar**

**Type 2 WRC.../...**  
(2/2-way function)



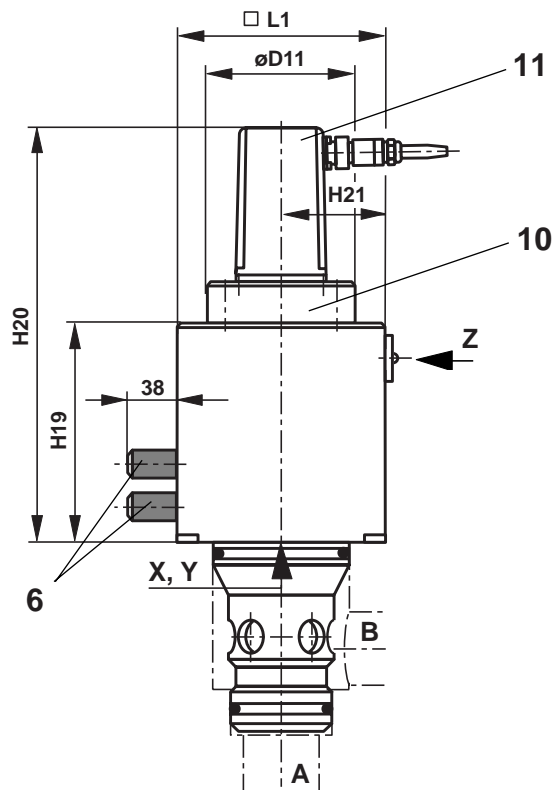
**Type 3 WRC.../...**  
(3/2-way function)



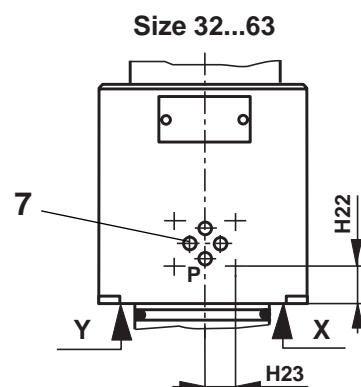
## Unit dimensions

(Dimensions in mm)

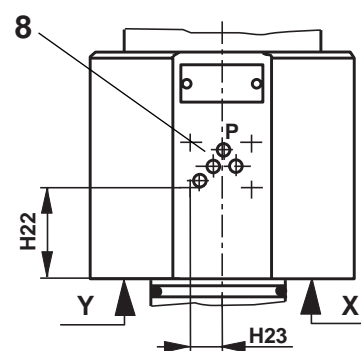
## Type 2 WRC...



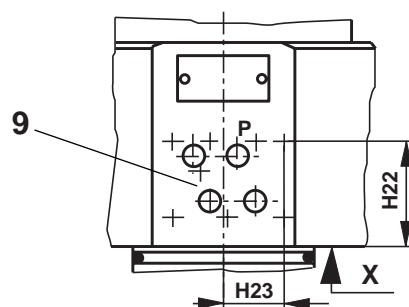
## Position of pilot valve when viewed in direction "Z"



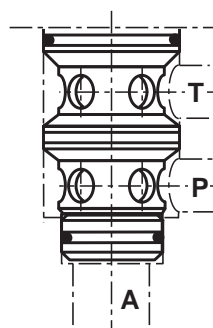
## Size 80, 100



## Size 125, 160



## Type 3 WRC...

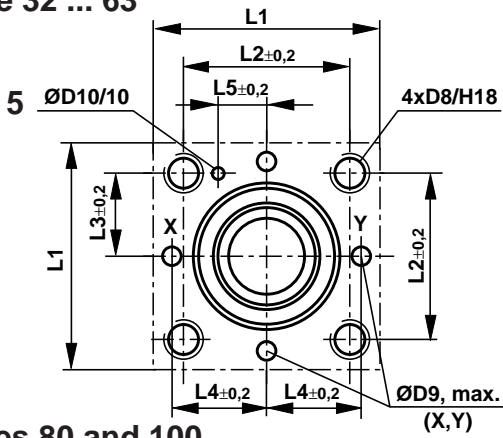


- 6 Threaded Sitting 1/4" BSP is used as measuring port for pilot pressure for sizes 32 to 50 (on centre line). Above size 63 ports are on top of the cover.
- 7 Mounting pattern DIN 24 340-A6
- 8 Mounting pattern DIN 24 340-A10
- 9 Mounting pattern DIN 24 340-A16
- 10 Cover can be rotated through 60°
- 11 Protective cap can be rotated through 90°

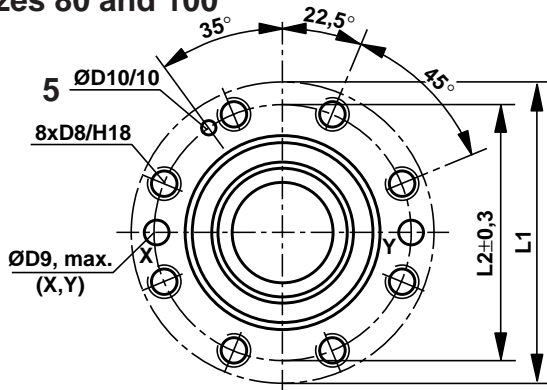
Size	32	40	50	63	80	100	125	160
□ L1	100	125	140	180	–	–	–	–
∅ L1	–	–	–	–	250	300	380	480
∅ D11	74	86	103	126	150	190	243	300
H19	100	120	141	190	211	262	320	350
H20	265	288	311	365	430	477	530	555
H21	50	62.5	75	90	115	139	178	227
H22	17.7	23.7	27.4	45.7	83.4	112.5	223.6	231.6
H23	19	19	19	19	24	21.7	56.5	65.5

Mounting pattern to DIN 24 342 (except sizes 125 and 160)

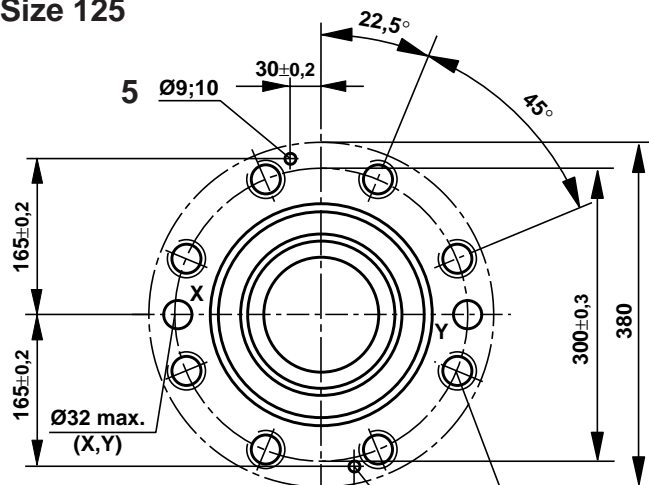
Size 32 ... 63



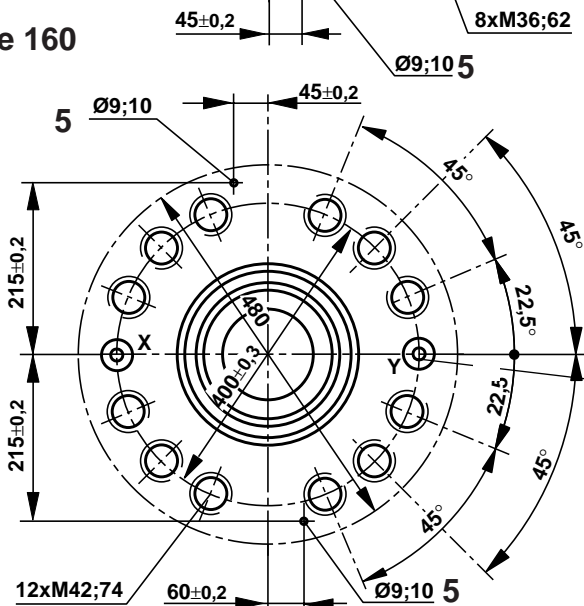
Sizes 80 and 100



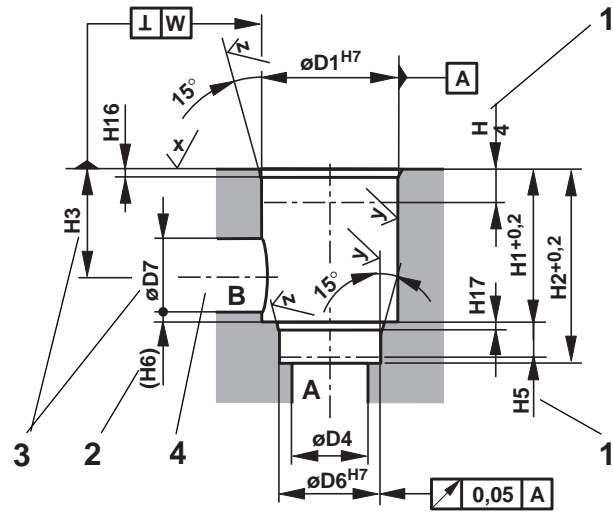
Size 125



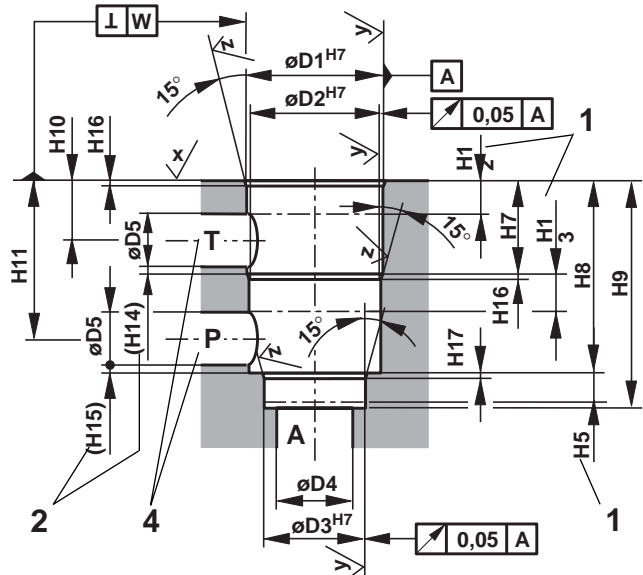
Size 160



Installation Cavity for Type 2  
WRC... to DIN 24 342

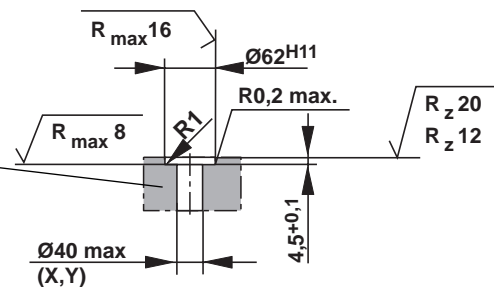


Installation Cavity for Type 3  
WRC...



$$x = \sqrt{R_{max4}}; \quad y = \sqrt{R_{max8}};$$

$$z = \sqrt{\frac{R_z 10}{z}}$$



For dimensions and description of item numbers see page 9



(Dimensions in mm)

Size	32	40	50	63	80	100	125	160
ØD1 <sup>H7</sup>	60	75	90	120	145	180	225	300
ØD2 <sup>H7</sup>	58	73	87	116	140	174	220	290
ØD3 <sup>H7</sup>	55	55	68	90	110	135	200	270
ØD4	32	40	50	63	80	100	max.150	max.200
ØD5	24	30	35	48	60	75	95	120
ØD6 <sup>H7</sup>	45	55	68	90	110	135	200	270
ØD7	32	40	50	63	80	100	125	200
D8	M16	M20	M20	M30	M24	M30	–	–
max. ØD9	8	10	10	12	16	20	–	–
ØD10	6	6	8	8	10	10	–	–
H1	70	87	100	130	175	210	257	370
H2	85	105	122	155	205	245	300	425
H3	52	64	72	95	130	155	192	268
H4	30	30	35	40	40	50	40	50
H5	13	15	17	20	25	29	31	45
(H6)	1.5	2.5	2.5	3	4.5	4.5	2	2
H7	43.5	54	87	85	125	155	195	245
H8	85	105	143	165	215	270	335	420
H9	100	125	165	195	245	305	380	480
H10	30	36	66	57	90	112	140	175
H11	70.5	87	122	137	180	225	280	350
H12	18	21	48	33	60	75	93	115
H13	15	18	18	28	25	32	37	45
(H14)	1.5	3	3.5	4	5	5.5	7.5	10
(H15)	2.5	3	3.5	4	5	5.5	7.5	10
H16	2.5	3	4	4	5	5	5.5	5.5
H17	2.5	3	3	4	5	5	7	8
H18	35	45	45	65	50	63	–	–
L1	100	125	140	180	250	300	–	–
L2	70	85	100	125	200	245	–	–
L3	35	42.5	50	62.5	–	–	–	–
L4	41	50	58	75	–	–	–	–
L5	17	23	30	38	–	–	–	–
W	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2

- 1 Clearance depth, min. dimension
- 2 Control dimension, min. dimension
- 3 If a different diameter is used for port ØD7, the distance from the cover mounting surface to the hole centre needs to be calculated.
- 4 Ports P, T and B may be arranged around the mid axis of port A. However, care must be taken to ensure that the fixing holes and control cavities are not damaged.
- 5 Drilling for locating pin

**Control electronics for valve types 2/3 WRC.../S..., amplifier SR3..., Series 1X****Ordering code** (control electronics to be ordered separately)

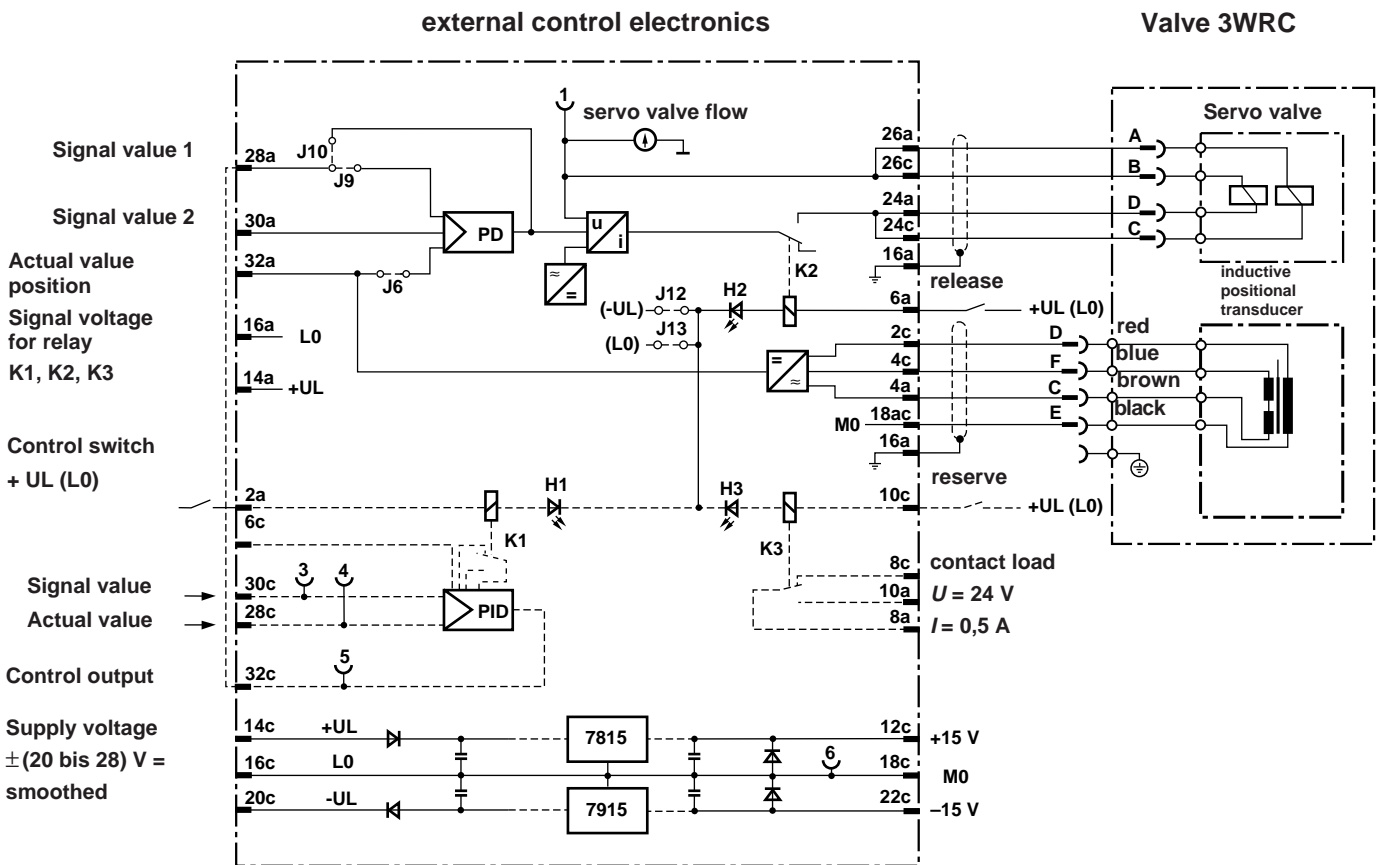
	SR	S	1X	/	/	W	*	
Valve size 32	= 31							Further details in clear text
Valve size 40	= 32					2 =	Valve with 2/2 function	
Valve size 50	= 33					3 =	Valve with 3/2 function	
Valve size 63	= 34					0 =	without $\pm 15V$ voltage regulator	
Valve size 80	= 35					1 =	with $\pm 15V$ voltage regulator	
Valve size 100	= 36					1X =	Series 10 to 19	
Valve size 125	= 37						(10 to 19 externally interchangeable)	
Valve size 160	= 38							
32-pin plug board DIN 41 612 Type C	= S							

**Technical data** (For operation outside these parameters please consult us.)

Supply voltage	$U$	$\pm 22$ to $28$ V smoothed ( $\pm UL$ )
Supply voltage (without voltage regulator)	$U$	$\pm 15$ V ( $\pm UM$ )
Current required $\pm UL$	$U$	$< 150$ mA
Input voltage	$U$	$0$ to $\pm 10$ V
Output current	$I_{max}$	$\pm 60$ mA
Oscillator frequency	$f$	$\sim 2.5$ kHz / $\sim 5$ kHz depending on valve type
Dither	$f$	340 Hz / 3 mA <sub>SS</sub>
Relay data:		
– Relay signal voltage	$U$	$\pm 22$ to $28$ V ( $\pm UL$ )
– Switching time	$t$	$< 4$ ms
– Coil resistance	$R$	700 $\Omega$
Plug connection		indirect / DIN 41 612 / Type D / 32-pin
Dimensions		Eurocard 100 x 160 mm DIN 41 494
Dimensions of front plate		
– height		3 HE (128.4 mm)
– width conductor side		1 TE (5.08 mm)
– width component side		7 TE
Ambient temperature range	$t$	$0^\circ$ to $50^\circ C$
Weight	$m$	0.3 kg



## Block diagram for valve Type 3WRC / Terminal connections



Positive signal value at **connection 30a** causes flow from P to A on the main stage.  
 Negative signal value at **connection 30a** causes flow from A to T on the main stage.

**Note:** Electrical signals (e. g. actual value – feedback signals) taken via the valve electronics must not be used to switch off the machine safety functions. This is in accordance with the regulations to the European standard (Safety requirements of fluid technology systems and components – hydraulics, draft pEN 982 !)



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