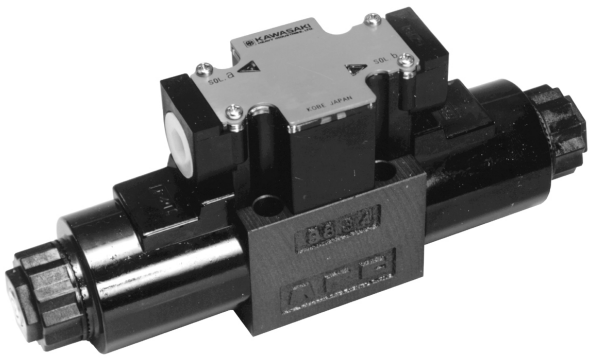
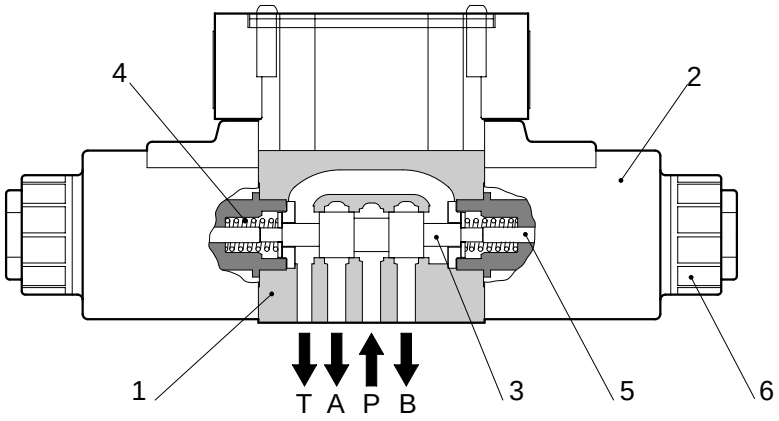
Size 6 up to 315 bar up to 63 L/min	Directional Spool Valve Sub-plate Mounted Type DE6, Series 20	Data Sheet D-1001/06.99 GB

Features

- ◊ Direct operated directional spool valve with solenoid operation.
- ◊ High durability.
- ◊ Various options.
- ◊ Oil immersed type valve with no oil leakage from solenoid pin.
- ◊ Porting pattern to DIN 24 340 form A ISO 4401 and CETOP-RP 121H.
- ◊ Wet pin AC & DC solenoids with removable coil.
- ◊ Individual electrical connection and central connections.
- ◊ Manual override (standard).
- ◊ Solenoid coil can be rotated through 90º.
- ◊ Coils can be replaced without releasing any fluid.





Valve DE6

Functional Description

Type DE6 Directional Spool Valves are solenoid operated directional spool valves that are used to control (start, stop and direction) fluid flow.

The valves basically comprise a housing (1), one or two solenoids (2), a control spool (3), and two springs (4).

When de-energised, the control spool (3) is held by the return springs (4) in a central or in the initial position (except for detented spools). The control spool (3) is actuated via wet pin solenoids (2).

Note: The pressure chamber must be filled with oil to ensure trouble free operation.

The force of the solenoid (2) acts on the plunger (5) causing the control spool (3) to move from its rest position to its desired end position. Thus, the required flow pattern from P to A and B to T or P to B, and A to T is selected.

A manual override (6), (standard), is provided for emergency operation of the control spool (3) without energising the solenoid.

Type DE 6..20 - 0** (only with spool type 001, 003 and 004) - directional valve with 2 switching positions and 2 solenoids without detent, and no defined switching position in the de-energised condition.

Type DE 6..20 - 1** (detent spool only with spools type 101, 103 and 104) - directional valve with 2 switching positions, 2 solenoids and a detent. Relevant switching positions are fixed and continuous solenoid energization is not necessary.

Throttle Inserts (type DE6..20..-P) - throttle inserts are required, if, due to the operating conditions, flows are expected to be higher than the stated maximum performance limits of the valve. Throttle inserts are inserted in the P channel of the directional valve.

Ordering Code – Directional Spool Valve, Direct Operated

DE	6	P	20	1	04	W	D	24	AL	PO8	V

Directional Valve, Solenoid Operated

Size
6

Type of Mounting
P: Sub-plate Mounting

Series Number
20

Spool Return
0: 2-position without Spring Return
1: 2-position without Spring Return with detent
2 2-position with Spring Return
OR
3-position with Spring Return

Spool Types
See spool symbols

Solenoid Type
W: Wet pin solenoids (with manual overrides)

Electrical supply
A: Alternating current (AC)
D: Direct current (DC)
R: Independent of frequency with built-in rectifier for AC

Voltage
12: 12V
24: 24V
100: 100V
200: 200V

Suitable Oil
No Code: Mineral Oil, Fatty Acid Ester, Water Glycol
V: Phosphate Ester

Plug-in Throttle in P Port

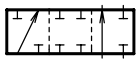
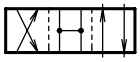
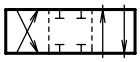
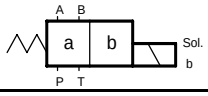
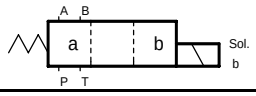
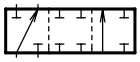
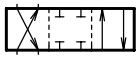
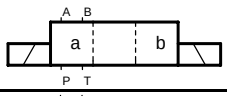
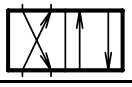
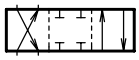
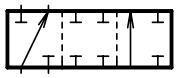
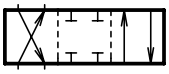
No code	No plug-in throttle
P08:	⌀0.8 mm
P10:	⌀1.0 mm
P12:	⌀1.2 mm
P15:	⌀0.8 mm
P20:	⌀2.0 mm
P25:	⌀0.8 mm
P30:	⌀3.0 mm
P40:	⌀4.0 mm

Electrical Connections

		Electrical supply		
Code	**Function**	**A**	**D**	**R**
AL	Central terminal and lamp	0	0	0
B	Angled plug to DIN 43650	0	0	-
C	Large angled plug	0	0	0
CL	Large angled plug with lamp	0	0	-

Spool types

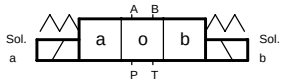
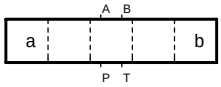
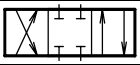
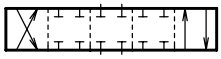
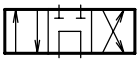
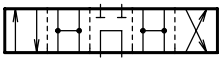
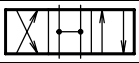
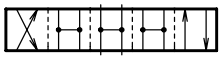
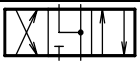
2-Position Valve

Spool return	Spool type	Hydraulic Symbol	Transient condition
Spring Return	201		
	203		
	204		
			
	202		
	225		
Spool return	**Spool type**	**Hydraulic Symbol**	**Transient condition**
Without spring return	001		
	003		
	004		
Spool return	**Spool type**	**Hydraulic Symbol**	**Transient condition**
Without spring return with detent	101		
	103		
	104		

Attention! -Take the pressure intensification into account when using differential cylinders!

Spool types (continued)

3-Position Valve

Spool return	Spool type	Hydraulic Symbol	Transient condition
			
Spring Return	205		
	206		
	207		
	208		
	210		
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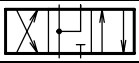
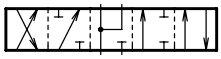
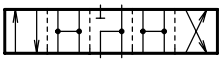
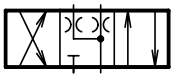
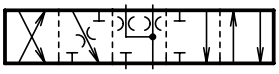
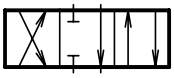
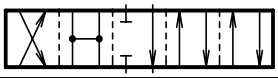
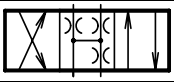
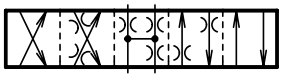
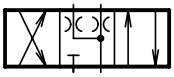
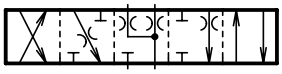
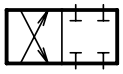
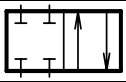
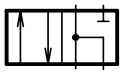
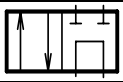
	213		
	216		
	217		
	221		
	222		
	223		

⚠ **Attention! -**Take the pressure intensification into account when using differential cylinders!

Spool types (continued)

3-Position Valve (using one switching position)

Spool return	Spool type	Hydraulic Symbol	Transient condition
	205A		
	205B		
	206A		
	206B		
	207A		
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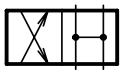
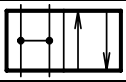
	208A		
	208B		
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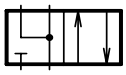
	210B		

Attention! -Take the pressure intensification into account when using differential cylinders!

Technical Data

For applications outside the following parameters, please consult Kawasaki Precision Machinery (UK) Ltd.

General

Installed Position	Optional
Ambient Temperature	Up to 50°C

Weight

Valve Type	AC Solenoid	DC Solenoid
Single solenoid valve	1.45 kg	1.6 kg
Valve with 2 solenoids	1.9 kg	2.2 kg

Hydraulic Data

Pressure Fluid	Mineral oil, phosphate ester, fatty acid ester and water glycol. Phosphate ester is only suitable for use with FPM seals.
Pressure Fluid Temperature Range	-20°C to +70°C
Degree of Contamination	Maximum permissible degree of contamination of fluid is to NAS 1638 class 9. Kawasaki recommend a filter with a retention rate of $ß_{10} \geq 75$.
Viscosity Range	3 to 380cSt

Operating Pressure

Ports A, B, P	Up to 315 bar (250 bar for spool type 07)
Port T	Up to 160 bar

With spool types 01, 02 and 03, Port T must be used as a drain port if the operating pressure is above the permitted tank pressure.

Flow Rate: Up to 63 L/min

Technical Data (continued)

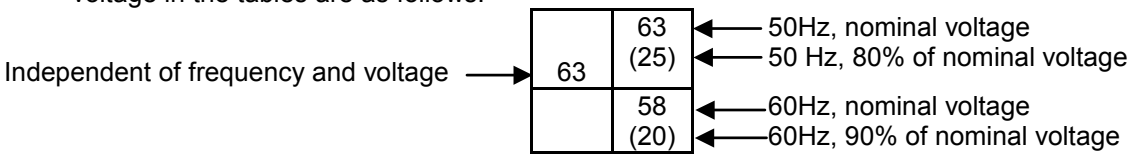
Electrical

Type of Voltage	DC	AC
Available Voltages	12, 24	120, 240 (50/60Hz)
Voltage Tolerance (nominal voltage)	±10%	±10% (50Hz) ±20% (60Hz)
Power Consumption	30 W	-
Holding current	-	50 VA
Startup current	-	240 VA
Duty Cycle	100%	100%
Switching Time	ON: 45 mS OFF: 20 mS	ON: 15 mS OFF: 25 mS
Switching Frequency	Up to 18,000 cycles/hour	Up to 18,000 cycles/hour
Insulation to DIN 40 050	IP65	IP65
Coil Temperature	Up to 180°C	Up to 180°C

Note: With electrical connections the earth (PE) must be correctly connected.

Switching Data for AC solenoid Valve

Note: The maximum flow VS frequency and voltage in the tables are as follows:

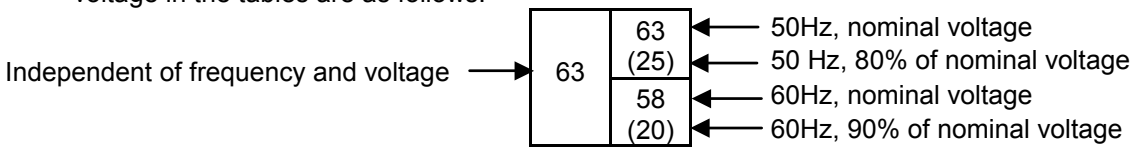


Three Position valves

Spool type	Maximum flow (L/min)														
	Direction Of flow P - A - B - T P - B - A - T					Direction Of flow P - A					Direction Of flow P - B				
	Operating pressure (bar)					Operating pressure (bar)					Operating pressure (bar)				
	50	100	160	250	315	50	100	160	250	315	50	100	160	250	315
205	63	63	63	63	63	63 (30)	62 (23)	63 (15)	50 (10)	40 (10)	63 (30)	62 (23)	63 (15)	50 (10)	40 (10)
						45 (25)	33 (18)	20 (10)	13 (5)	13 (5)	45 (25)	33 (18)	20 (10)	13 (5)	13 (5)
208	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
210	63	63	63	63	63 (48)	63 (25)	63 (23)	63 (20)	63 (13)	55 (10)	63 (25)	63 (23)	63 (20)	63 (13)	55 (10)
					63 (43)	58 (20)	48 (18)	35 (15)	20 (8)	13 (5)	58 (20)	48 (18)	35 (15)	20 (8)	13 (5)
223	63	63	63	63	63	63 (30)	62 23)	63 (15)	50 (10)	40 (10)	63 (30)	62 (23)	63 (15)	50 (10)	40 (10)
						45 (25)	33 (18)	20 (10)	13 (5)	13 (5)	45 (25)	33 (18)	20 (10)	13 (5)	13 (5)
207	45	43	40	40	-	45	43	40	40	-	45	43	40	40	-
213	63	63	63	63	63	28	20	15	10	10	28	20	15	10	10
221	63	63	63	63	63	63 (38)	63 (30)	63 (25)	63 (15)	63 (13)	63 (38)	63 (30)	63 (25)	63 (15)	63 (13)
						63 (33)	45 (25)	30 (20)	20 (10)	15 (18)	63 (33)	45 (25)	30 (20)	20 (10)	15 (8)
212	63	63	63	63	63	63 (30)	63 (28)	63 (23)	63 (18)	63 (15)	63 (30)	63 (28)	63 (23)	63 (18)	63 (15)
						63 (25)	35 (23)	25 (18)	18 (13)	15 (10)	63 (25)	35 (23)	25 (18)	18 (13)	15 (10)

Switching Data for AC solenoid Valve (Continued)

Note: The maximum flow VS frequency and voltage in the tables are as follows:

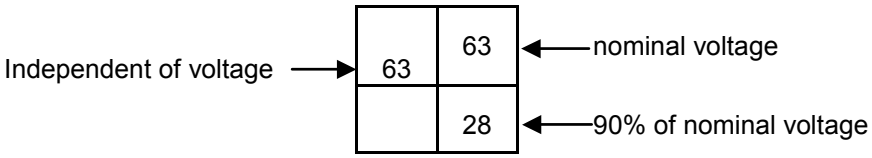


Two Position valves

	Maximum flow (L/min)														
Spool type	Direction Of flow P - A - B - T / P - B - A - T					Direction Of flow P - A					Direction Of flow P - B				
	Operating pressure (bar)					Operating pressure (bar)					Operating pressure (bar)				
	50	100	160	250	315	50	100	160	250	315	50	100	160	250	315
204	63	63	63	63	63	63	63	63	63	63	63	63 (55)	63 (50)	63 (50)	63 (45)
												63 (50)	63 (45)	63 (45)	63 (40)
203	63	63	63	63	63	50	50	50	50	50	63	63	63	63	63
		63 (60)	63 (60)	63 (60)	63 (60)						63 (55)	63 (55)	63 (55)	63 (55)	63 (55)
201	-	-	-	-	-	25	13	10	10	10	63 (28)	63 (25)	63 (20)	63 (13)	50 (10)
											63 (32)	35 (23)	23 (15)	15 (8)	10 (5)
104	63	63	63	63	63	45	45	45	45 (35)	45 (25)	45	45	45	45 (35)	45 (25)
									45 (30)	30 (20)				45 (30)	30 (20)

Switching Data for DC solenoid and AC/DC solenoid Valves

Note: The maximum flow VS voltage in the tables are as follows:



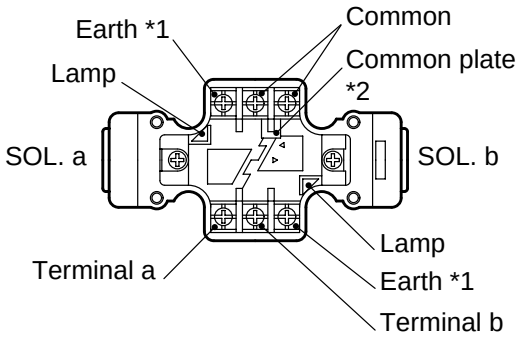
Three Position valves

	Maximum flow (L/min)														
Spool type	Direction Of flow P - A - B - T P - B - A - T					Direction Of flow P - A					Direction Of flow P - B				
	Operating pressure (bar)					Operating pressure (bar)					Operating pressure (bar)				
	50	100	160	250	315	50	100	160	250	315	50	100	160	250	315
205	63	63	63	63	63	45	30	20	15	13	45	30	20	15	13
						33	23	15	10	10	33	23	15	10	10
208	63	63	63	63	63	63	63	63	63	63	63	63	63	63	63
210	63	63	63	63	35	63	45	35	30	28	63	45	35	30	28
				28	23	50	30	23	15	13	50	30	23	15	13
223	63	63	63	63	63	45	30	20	15	13	45	30	20	15	13
						33	23	15	10	10	33	23	15	10	10
207	45	43	40	40	-	45	43	40	40	-	45	43	40	40	-
213	63	63	63	63	63	28	20	15	10	10	28	20	15	10	10
221	63	63	63	63	45	63	45	55	40	28	63	55	40	28	20
				33	23		23	40	28	13		40	28	18	13
212	63	63	63	63	38	63	60	40	25	20	63	60	40	25	20
				30	23		38	28	20	15		38	28	20	15
204	63	63	63	63	63	20	18	18	18	18	63	58	40	30	50
	53	53	53	53	53							40	28	25	25
203	38	38	38	38	38	48	48	45	45	40	63	63	63	63	63
	28	28	28	28	28	45	40	40	40	38		60	60	60	60
201	-	-	-	-	-	25	13	10	8	8	63	48	28	15	15
												30	20	13	10
104	63	63	63	63	63	45	45	45	40	30	45	45	45	40	30
	58	55	55	55	55				30	25				30	25

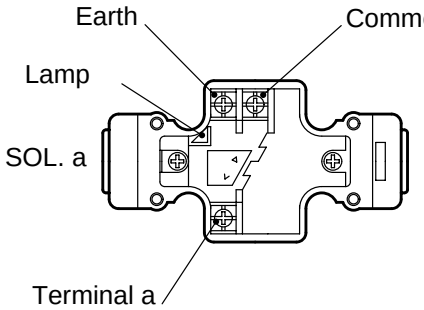
Valve wiring details

Central Terminal

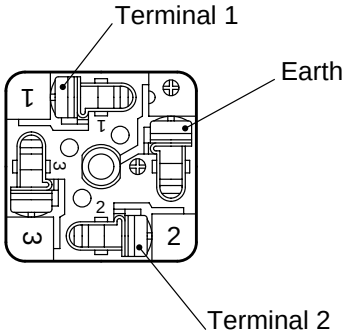
Double Solenoid



Single Solenoid (SOL. a)



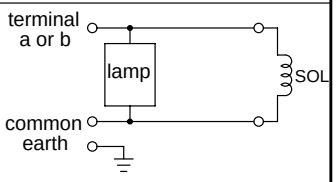
Plug-in Connector to DIN



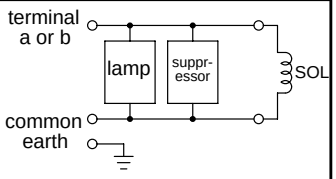
Note: *1. Either earth terminal can be used.
*2. When common plate is unnecessary (4 wires for 3 solenoids), it can be removed.
*3. No polarity in DC solenoid.

Central Terminal

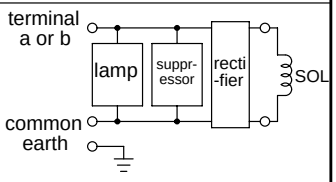
AC



DC

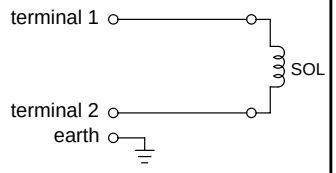


AC/DC

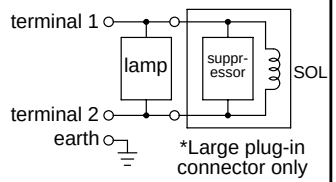


Plug-in Connector to DIN

AC

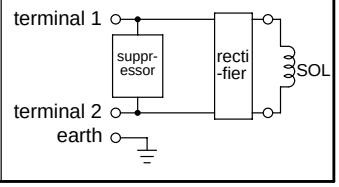


DC



*Large plug-in connector only

AC/DC

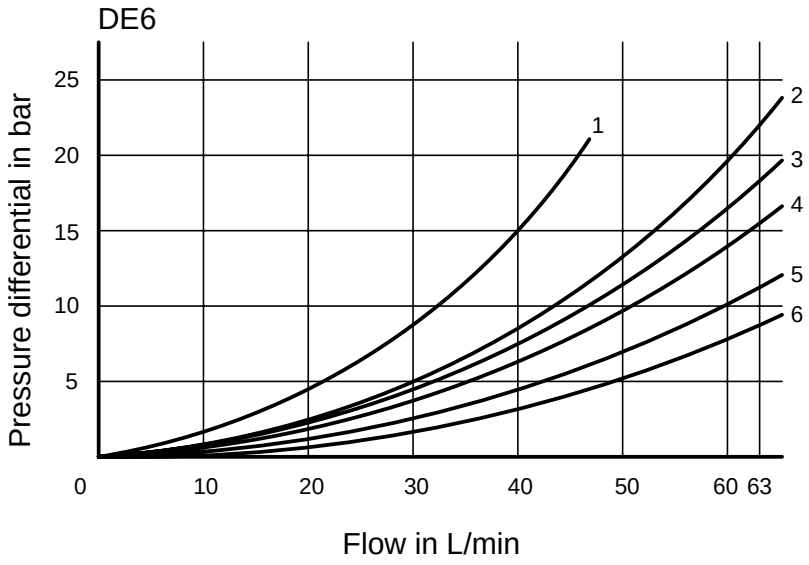


Model	Page	Data Sheet
DE6	12.18	D-1001/06.99

Kawasaki Hydraulic Products

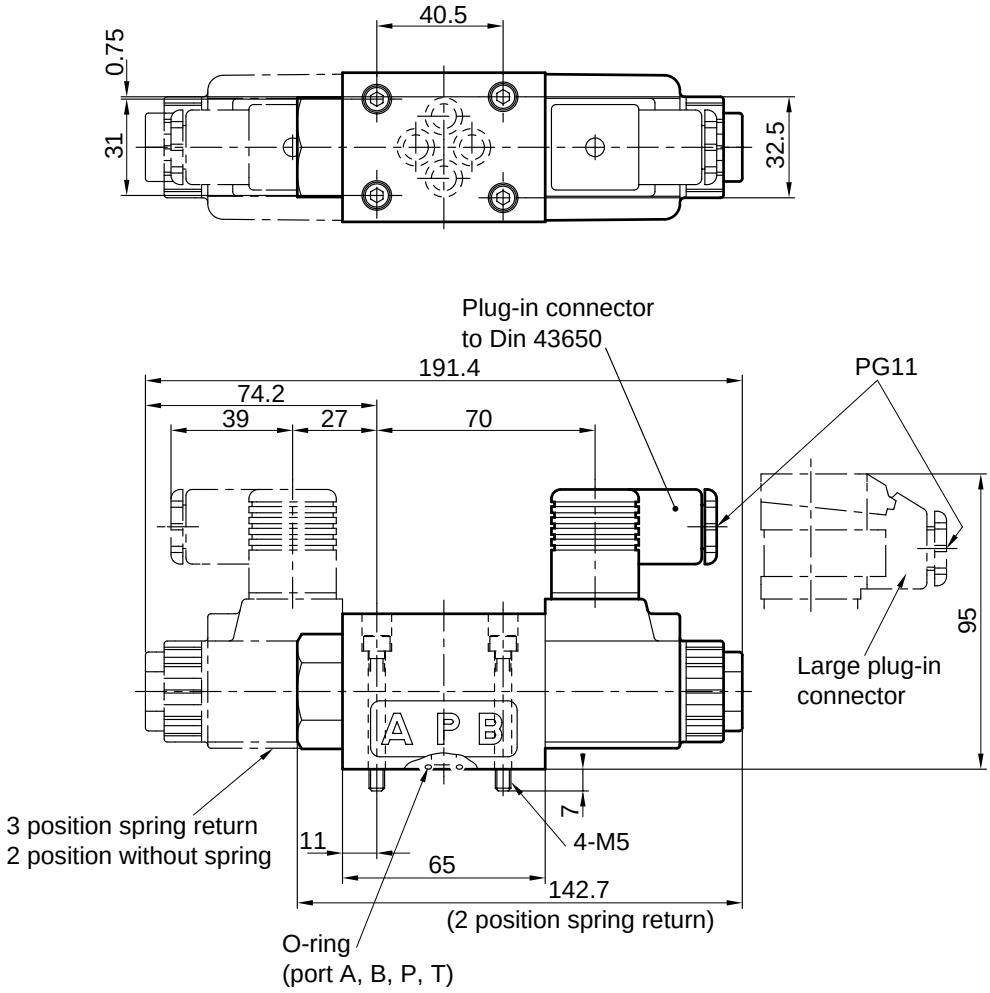
Characteristic Curves

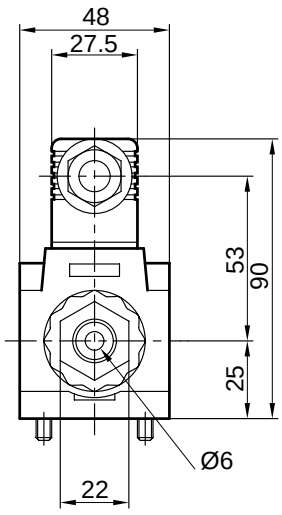
Measured at ν = 36cSt and t = 50°C



Spool type	Direction of flow				
	P → A	B → T	P → B	A → T	P → T
205	5	5	5	5	-
208	6	6	6	6	4
210	5	6	5	6	-
223	5	5	5	5	-
207	1	1	1	1	4
213	6	5	6	5	-
221	5	6	5	5	-
212	5	5	5	6	-
104	5	2	5	2	-
204	2	2	5	5	-
203	3	3	5	6	-
201	5	-	5	-	-

Unit Dimensions – Plug-in connector- AC solenoid (dimensions in mm)

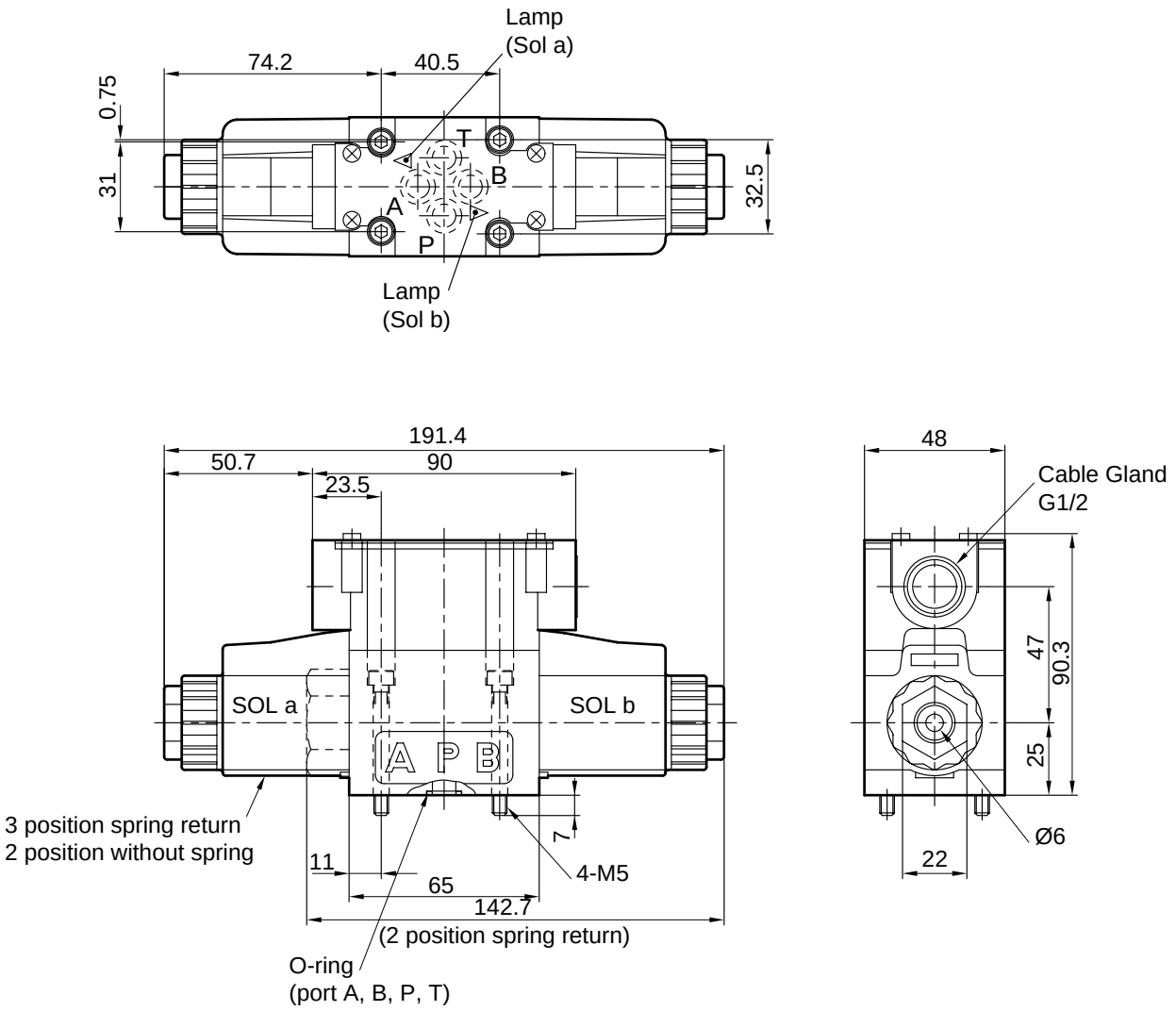




Model	Page	Data Sheet
DE6	14.18	D-1001/06.99

Kawasaki
Hydraulic Products

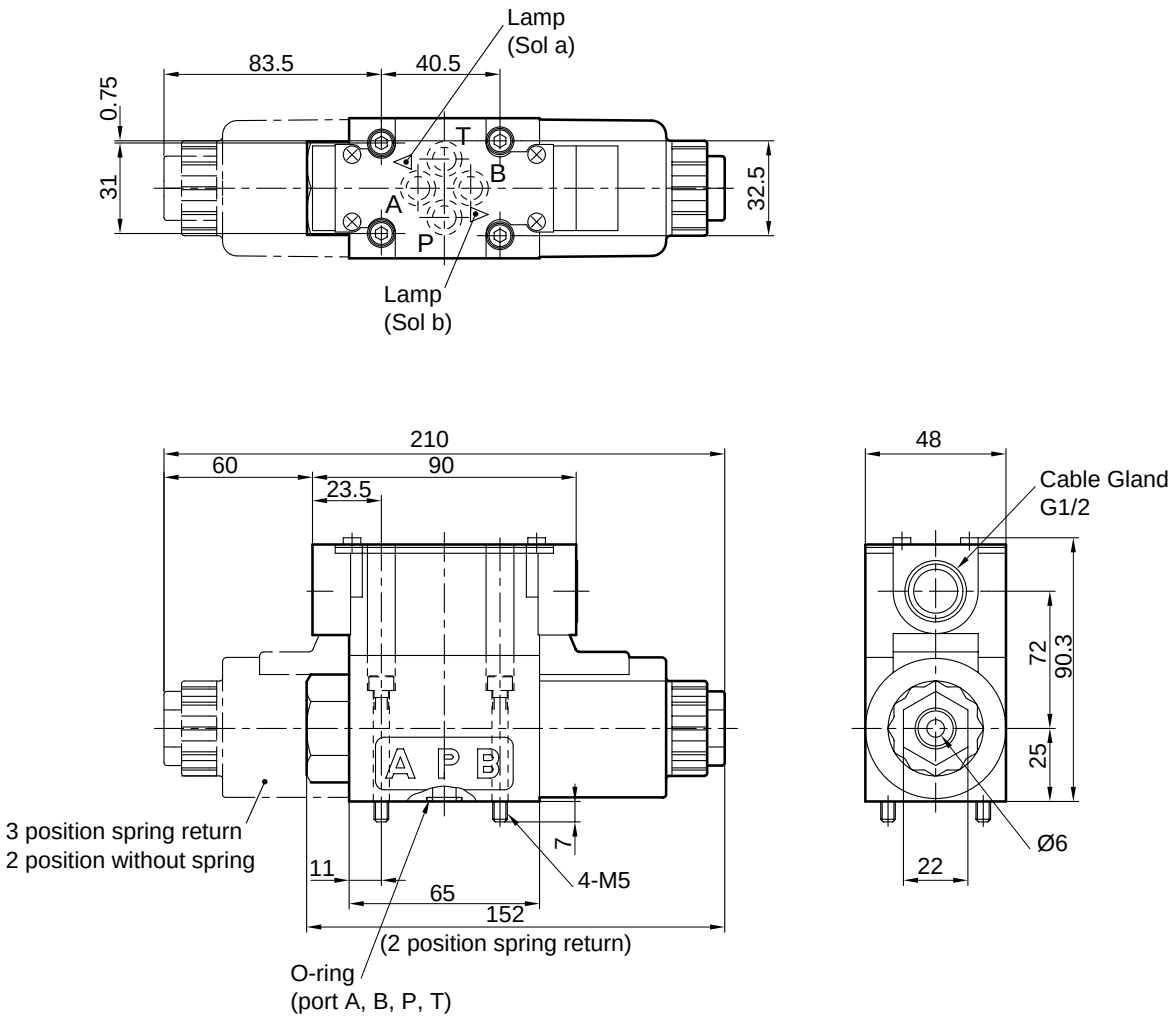
Unit Dimensions – Central Terminal- AC solenoid (dimensions in mm)



Model	Page	Data Sheet
DE6	15.18	D-1001/06.99

Kawasaki Hydraulic Products

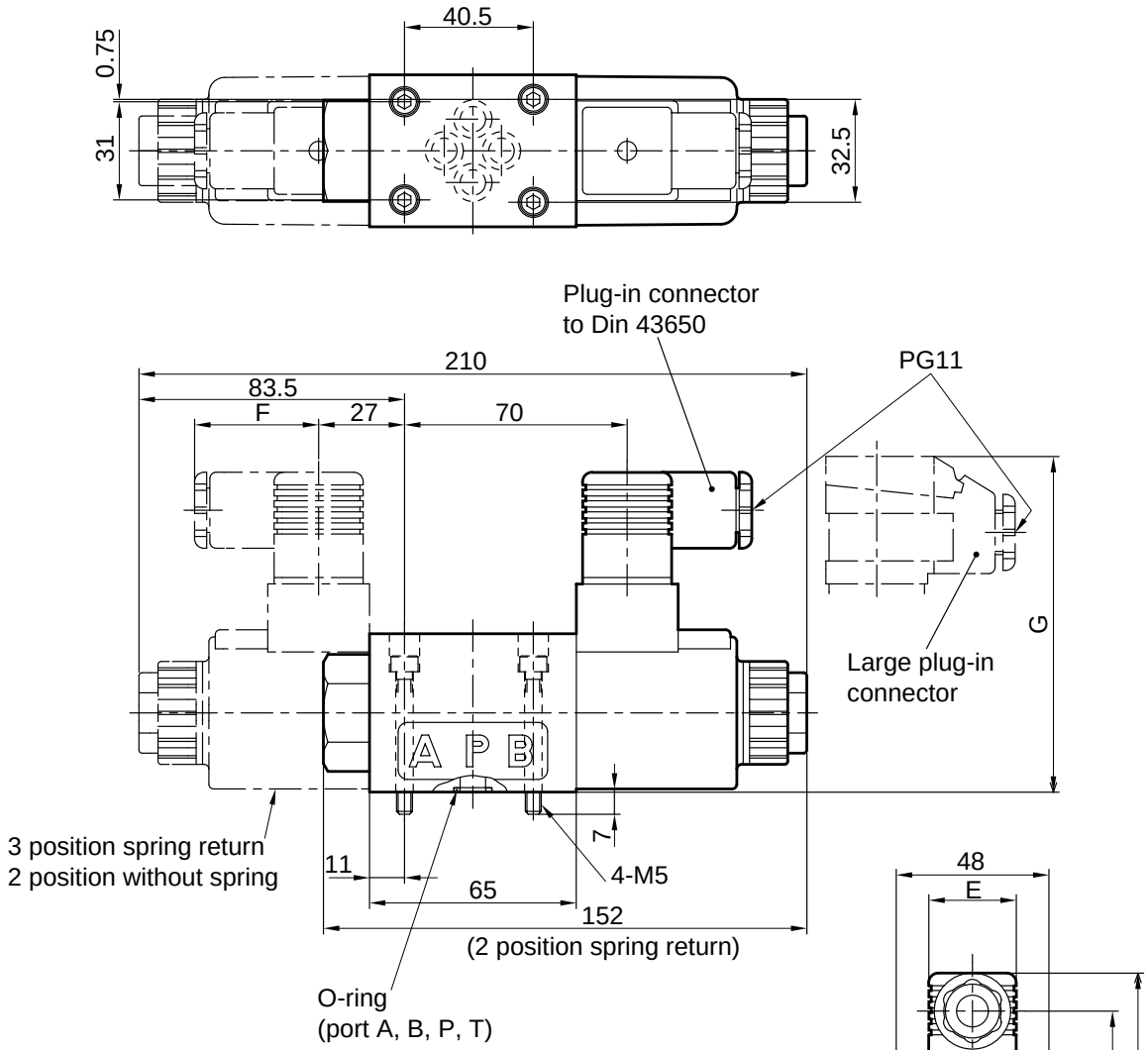
Unit Dimensions – Central terminal, DC, AC/DC Solenoid (dimensions in mm)



Model	Page	Data Sheet
DE6	16.18	D-1001/06.99

Kawasaki
Hydraulic Products

Unit Dimensions – Plug-in connector, DC, AC/DC Solenoid (dimensions in mm)



	C	D	E	F	G
DC Solenoids	101	64	27.5	39	106
AC/DC Solenoids	104	57.2	34	53	109

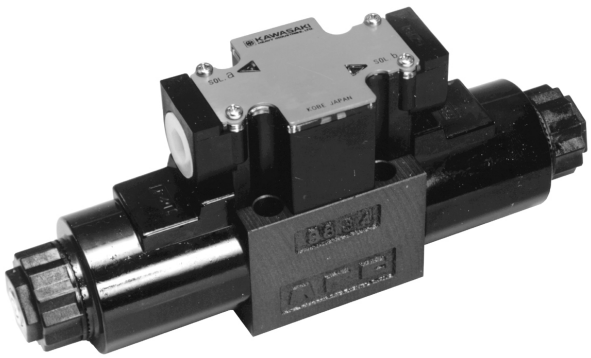
KAWASAKI PRECISION MACHINERY (UK) LTD
Ernesettle, Plymouth, Devon, PL5 2SA, England
Tel: +44 1752 364394 Fax: +44 1752 364816
E Mail:info@ kpm-uk.co.uk

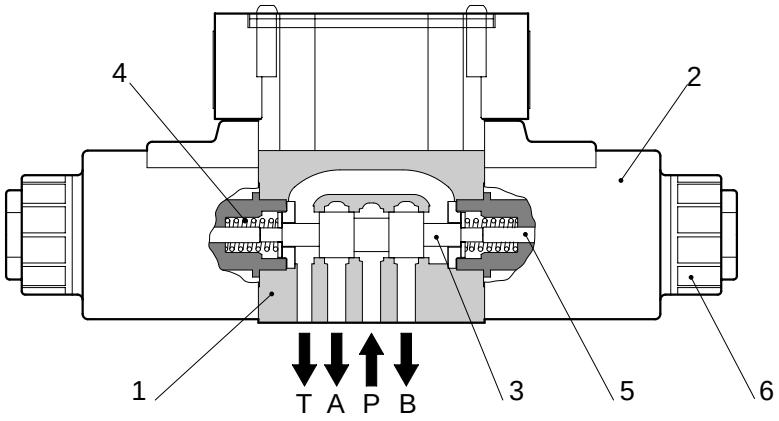
The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract

0 up to 315 bar up to 120 L/min	Directional Spool Valve Sub-plate Mounted Type DE10, Series 10	Data Sheet D-1002/06.99 GB

Features

- ◊ Direct operated directional spool valve with solenoid operation.
- ◊ High durability.
- ◊ Various options.
- ◊ Oil immersed type valve with no oil leakage from solenoid pin.
- ◊ Porting pattern to DIN 24 340 form A ISO 4401 and CETOP-RP 121H.
- ◊ Wet pin AC & DC solenoids with removable coil.
- ◊ Individual electrical connection and central connections.
- ◊ Manual override (standard).
- ◊ Solenoid coil can be rotated through 90º.
- ◊ Coils can be replaced without releasing any fluid.





Valve DE10

Functional Description

Type DE10 Directional Spool Valves are solenoid operated directional spool valves that are used to control (start, stop and direction) fluid flow.

The valves basically comprise a housing (1), one or two solenoids (2), a control spool (3), and two springs (4).

When de-energised, the control spool (3) is held by the return springs (4) in a central or in the initial position (except for detented spools). The control spool (3) is actuated via wet pin solenoids (2).

Note: The pressure chamber must be filled with oil to ensure trouble free operation.

The force of the solenoid (2) acts on the plunger (5) causing the control spool (3) to move from its rest position to its desired end position. Thus, the required flow pattern from P to A and B to T or P to B, and A to T is selected.

A manual override (6), (standard), is provided for emergency operation of the control spool (3) without energising the solenoid.

Type DE 10..20 - 0** (only with spool type 001, 003 and 004) - directional valve with 2 switching positions and 2 solenoids without detent, and no defined switching position in the de-energised condition.

Type DE 10..20 - 1** (detent spool only with spools type 101, 103 and 104) - directional valve with 2 switching positions, 2 solenoids and a detent. Relevant switching positions are fixed and continuous solenoid energization is not necessary.

Throttle Inserts (type DE10..20..-P) - throttle inserts are required, if, due to the operating conditions, flows are expected to be higher than the stated maximum performance limits of the valve. Throttle inserts are inserted in the P channel of the directional valve.

Ordering Code – Directional Spool Valve, Direct Operated

DE	10	P	10	1	04	W	D	24	AL	PO8	V

Directional Valve, Solenoid Operated

Size
10

Type of Mounting
P: Sub-plate Mounting

Series Number
10

Spool Return
0: 2-position without Spring Return
1: 2-position without Spring Return with detent
2 2-position with Spring Return
OR
3-position with Spring Return

Spool Types
See spool symbols

Solenoid Type
W: Wet pin solenoids (with manual overrides)

Electrical supply
A: Alternating current (AC)
D: Direct current (DC)
R: Independent of frequency with built-in rectifier for AC

Voltage
12: 12V
24: 24V
120: 120V
240: 240V

Suitable Oil
No Code: Mineral Oil, Fatty Acid Ester, Water Glycol
V: Phosphate Ester

Plug-in Throttle in P Port

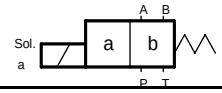
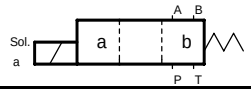
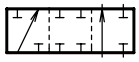
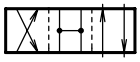
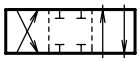
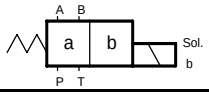
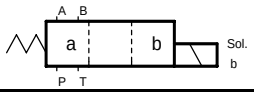
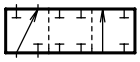
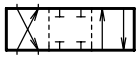
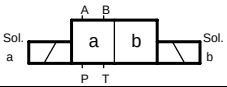
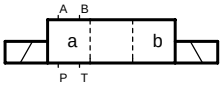
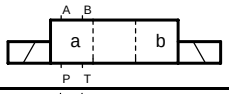
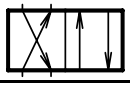
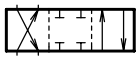
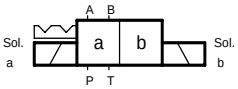
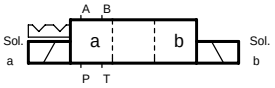
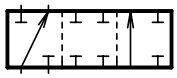
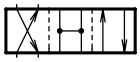
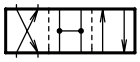
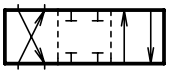
No code	No plug-in throttle
P08:	∅0.8 mm
P10:	∅1.0 mm
P12:	∅1.2 mm
P15:	∅0.8 mm
P20:	∅2.0 mm
P25:	∅0.8 mm
P30:	∅3.0 mm
P40:	∅4.0 mm

Electrical Connections

		Electrical supply		
Code	**Function**	**A**	**D**	**R**
AL	Central terminal and lamp	0	0	0
B	Angled plug to DIN 43650	0	0	-
C	Large angled plug	0	0	0
CL	Large angled plug with lamp	0	0	-

Spool types

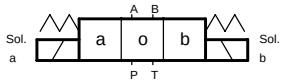
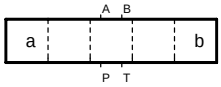
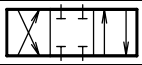
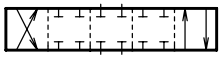
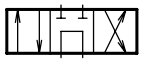
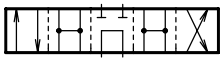
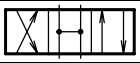
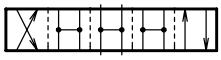
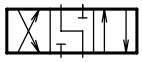
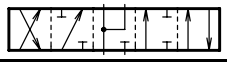
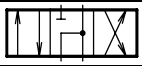
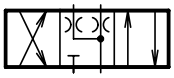
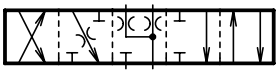
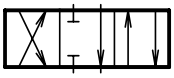
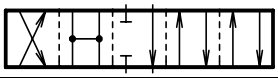
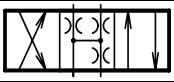
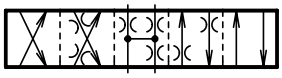
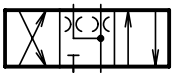
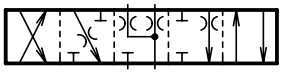
2-Position Valve

Spool return	Spool type	Hydraulic Symbol	Transient condition
			
Spring Return	201		
	203		
	204		
			
	202		
	225		
Spool return	**Spool type**	**Hydraulic Symbol**	**Transient condition**
			
Without spring return	001		
	003		
	004		
Spool return	**Spool type**	**Hydraulic Symbol**	**Transient condition**
			
Without spring return with detent	101		
	103		
	104		

Attention! -Take the pressure intensification into account when using differential cylinders!

Spool types (continued)

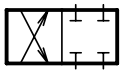
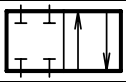
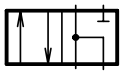
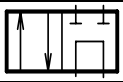
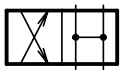
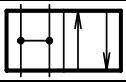
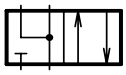
3-Position Valve

Spool return	Spool type	Hydraulic Symbol	Transient condition
			
Spring Return	205		
	206		
	207		
	208		
	210		
	212		
	213		
	216		
	217		
	221		
	222		
	223		

Attention! -Take the pressure intensification into account when using differential cylinders!

Spool types (continued)

3-Position Valve (using one switching position)

Spool return	Spool type	Hydraulic Symbol	Transient condition
	205A		
	205B		
	206A		
	206B		
	207A		
	207B		
	208A		
	208B		
	210A		
	210B		

 **Attention! -**Take the pressure intensification into account when using differential cylinders!

Technical Data

For applications outside the following parameters, please consult Kawasaki Precision Machinery (UK) Ltd.

General

Installed Position	Optional
Ambient Temperature	Up to 50°C

Weight

Valve Type	AC Solenoid	DC Solenoid
Single solenoid valve	2.9 kg	3.6 kg
Valve with 2 solenoids	3.6 kg	5 kg

Hydraulic Data

Pressure Fluid	Mineral oil, phosphate ester, fatty acid ester and water glycol. Phosphate ester is only suitable for use with FPM seals.
Pressure Fluid Temperature Range	-20°C to +70°C
Degree of Contamination	Maximum permissible degree of contamination of fluid is to NAS 1638 class 9. Kawasaki recommend a filter with a retention rate of $ß_{10} \geq 75$.
Viscosity Range	3 to 380cSt

Operating Pressure

Ports A, B, P	Up to 315 bar (250 bar for spool type 07)
Port T	Up to 160 bar

With spool types 01, 02 and 03, Port T must be used as a drain port if the operating pressure is above the permitted tank pressure.

Flow Rate: Up to 120 L/min

Technical Data (continued)

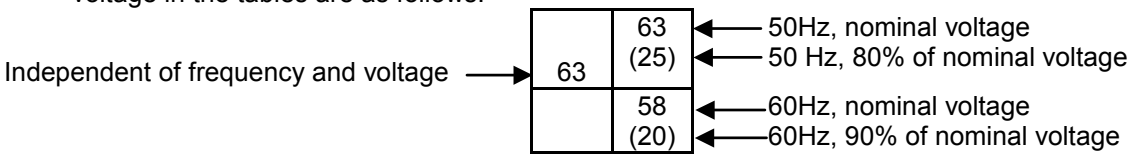
Electrical

Type of Voltage	DC	AC
Available Voltages	12, 24	120, 240 (50/60Hz)
Voltage Tolerance (nominal voltage)	±10%	±10% (50Hz); ±20% (60Hz)
Power Consumption	38 W	-
Holding current	-	90 VA
Startup current	-	540 VA
Duty Cycle	100%	100%
Switching Time	ON: 95 mS OFF: 30 mS	ON: 25 mS OFF: 20 mS
Switching Frequency	Up to 14,400 cycles/hour	Up to 14,400 cycles/hour
Insulation to DIN 40 050	IP65	IP65
Coil Temperature	Up to 180°C	Up to 180°C

Note: With electrical connections the earth (PE) must be correctly connected.

Switching Data for AC solenoid Valve

Note: The maximum flow VS frequency and voltage in the tables are as follows:

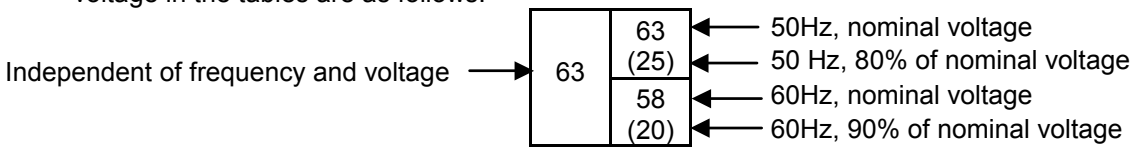


Three Position valves

Spool type	Maximum flow (L/min)														
	Direction Of flow P - A - B - T P - B - A - T					Direction Of flow P - A					Direction Of flow P - B				
	Operating pressure (bar)					Operating pressure (bar)					Operating pressure (bar)				
	50	100	160	250	315	50	100	160	250	315	50	100	160	250	315
205	100	100	100	100	100	100 (70)	100 (70)	100 (48)	96 (28)	65 (24)	100 (70)	100 (70)	100 (48)	96 (28)	65 (24)
						90 (49)	90 (49)	53 (30)	34 (19)	26 (15)	90 (48)	90 (48)	53 (30)	34 (19)	26 (15)
208	90	90	90	90	90	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)
						100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)	100 (81)
210	80	80	80	80 (65)	80 (25)	100 (58)	100 (58)	100 (33)	76 (22)	46 (19)	100 (58)	100 (58)	100 (33)	76 (22)	46 (19)
				75 (20)	30 (15)	90 (47)	90 (49)	50 (26)	28 (18)	22 (15)	90 (47)	90 (47)	50 (26)	28 (18)	22 (15)
223	100	100	100	100	100 (75)	100 (62)	100 (62)	100 (39)	84 (21)	48 (18)	100 (62)	100 (62)	100 (39)	84 (21)	48 (18)
					100 (25)	62 (40)	62 (40)	49 (26)	27 (16)	20 (12)	62 (40)	62 (40)	47 (26)	27 (16)	20 (12)
207	70	70	70	70	-	100	100	100	100	-	100	100	100	100	-
213	100	100	100	100	100	60	60	60	60	60	60	60	60	60	60
221	80	80	80	80 (30)	80 (20)	100 (55)	100 (55)	100 (36)	60 (21)	34 (16)	100 (55)	100 (55)	100 (36)	60 (21)	34 (16)
				30 (25)	20 (15)	60 (38)	45 (25)	47 (24)	23 (14)	17 (11)	60 (38)	60 (38)	47 (24)	24 (14)	17 (11)
212	90	90	90	90 (30)	90 (20)	100 (55)	100 (55)	100 (36)	60 (21)	34 (16)	100 (55)	100 (55)	100 (36)	60 (21)	34 (16)
				40 (20)	20 (15)	60 (38)	60 (38)	47 (24)	23 (14)	17 (11)	60 (38)	60 (38)	47 (24)	23 (14)	17 (11)

Switching Data for AC solenoid Valve (Continued)

Note: The maximum flow VS frequency and voltage in the tables are as follows:

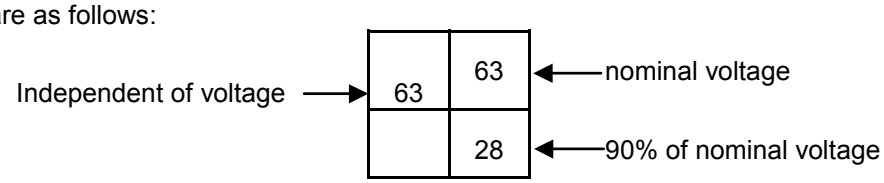


Two Position valves

	Maximum flow (L/min)														
Spool type	Direction Of flow P - A - B - T / P - B - A - T					Direction Of flow P - A					Direction Of flow P - B				
	Operating pressure (bar)					Operating pressure (bar)					Operating pressure (bar)				
	50	100	160	250	315	50	100	160	250	315	50	100	160	250	315
204	100	100	100	100	100	34	34	34	20	19	100 (62)	100 (62)	100 (62)	100 (44)	94 (37)
	100 (90)	100 (90)	100 (90)	100 (90)	100 (90)						80 (42)	80 (42)	73 (36)	63 (34)	51 (33)
203	100	100	100	100	100	57	57	57	57	57	100 (79)	100 (79)	100 (72)	100 (64)	100 (59)
	100 (75)	100 (75)	100 (75)	100 (75)	100 (75)						92 (55)	92 (55)	89 (46)	78 (28)	70 (27)
201	-	-	-	-	-	26	26	19	18	16	100 (35)	100 (35)	87 (15)	61 (9)	49 (7)
											45 (21)	45 (21)	34 (12)	15 (9)	11 (6)
104	100	100	100	100	100	40	40	40	38	28	60	60	60	40	35

Switching Data for DC solenoid and AC/DC solenoid Valves

Note: The maximum flow VS voltage in the tables are as follows:



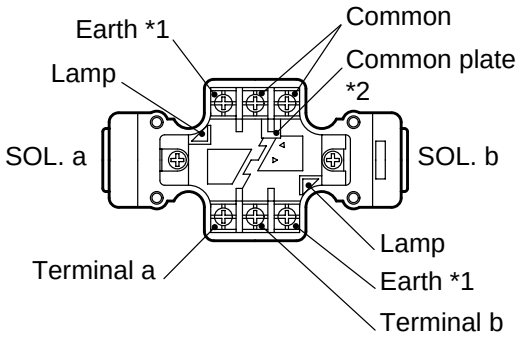
Three Position valves

Spool type	Maximum flow (L/min)														
	Direction Of flow P - A - B - T P - B - A - T					Direction Of flow P - A					Direction Of flow P - B				
	Operating pressure (bar)					Operating pressure (bar)					Operating pressure (bar)				
	50	100	160	250	315	50	100	160	250	315	50	100	160	250	315
205	120	120	120	120	120	120	120	120	80	55	120	120	120	80	55
								100	54	43			100	54	43
208	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120
210	120	120	120	120	120	120	120	120	84	64	120	120	120	84	64
									65	53				65	53
223	120	120	120	120	120	120	120	120	62	49	120	120	120	62	49
								104	57	42			104	57	42
207	120	120	120	120	-	120	120	120	120	-	120	120	120	120	-
213	120	120	120	120	120	100	100	100	100	100	100	100	100	100	100
221	120	120	120	120	65	120	120	112	60	51	120	120	112	60	51
				65	50			69	46	40			69	46	40
212	120	120	120	120	65	120	120	120	62	51	120	120	120	62	51
				65	50			86	47	40			86	47	40
204	110	110	110	110	110	68	68	47	38	38	120	120	114	75	63
	100	100	100	100	100								83	58	48
203	120	120	120	120	120	77	77	77	77	77	120	120	120	120	120
															103
201	-	-	-	-	-	53	53	33	24	23	120	120	120	62	47
													62	40	37
104	120	120	120	120	120	45	45	37	30	28	60	60	60	40	35

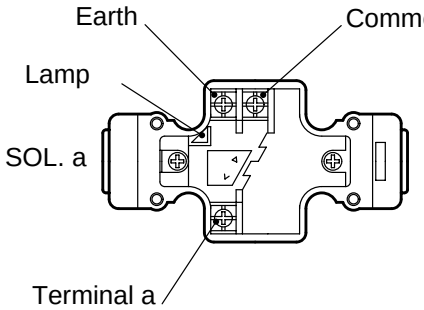
Valve wiring details

Central Terminal

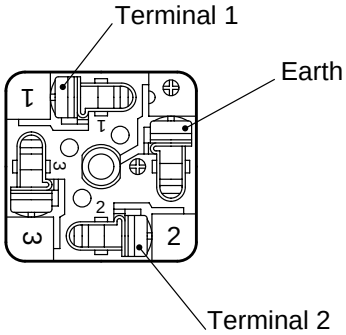
Double Solenoid



Single Solenoid (SOL. a)



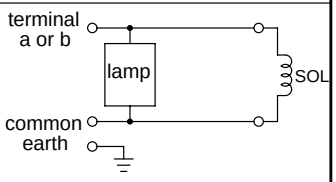
Plug-in Connector to DIN



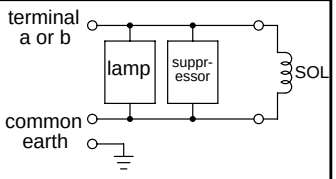
Note: *1. Either earth terminal can be used.
*2. When common plate is unnecessary (4 wires for 3 solenoids), it can be removed.
*3. No polarity in DC solenoid.

Central Terminal

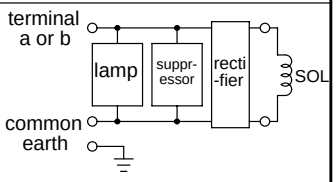
AC



DC

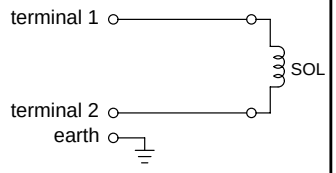


AC/DC



Plug-in Connector to DIN

AC



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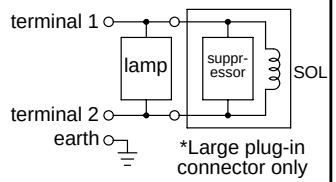
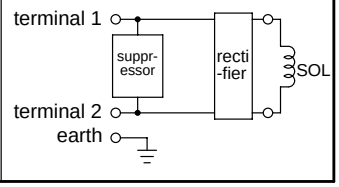


*Large plug-in connector only

AC/DC

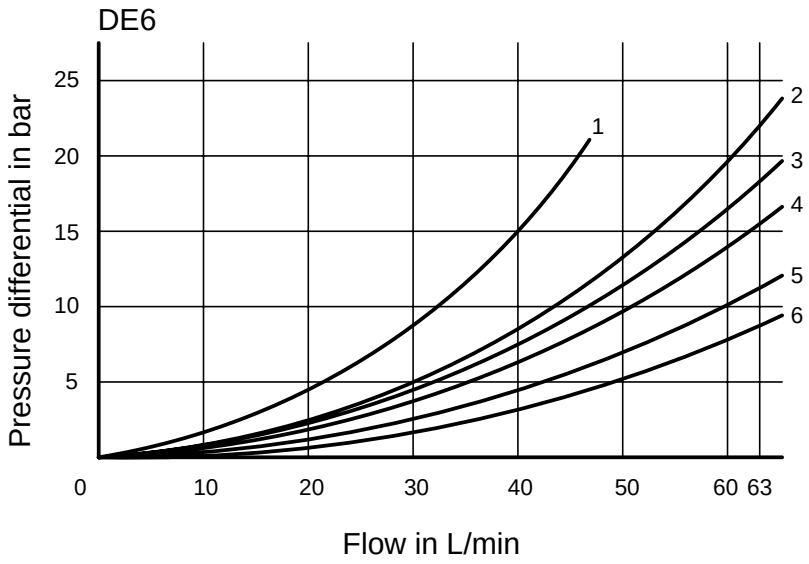


Model	Page	Data Sheet
DE10	12.17	D-1002/06.99

Kawasaki Hydraulic Products

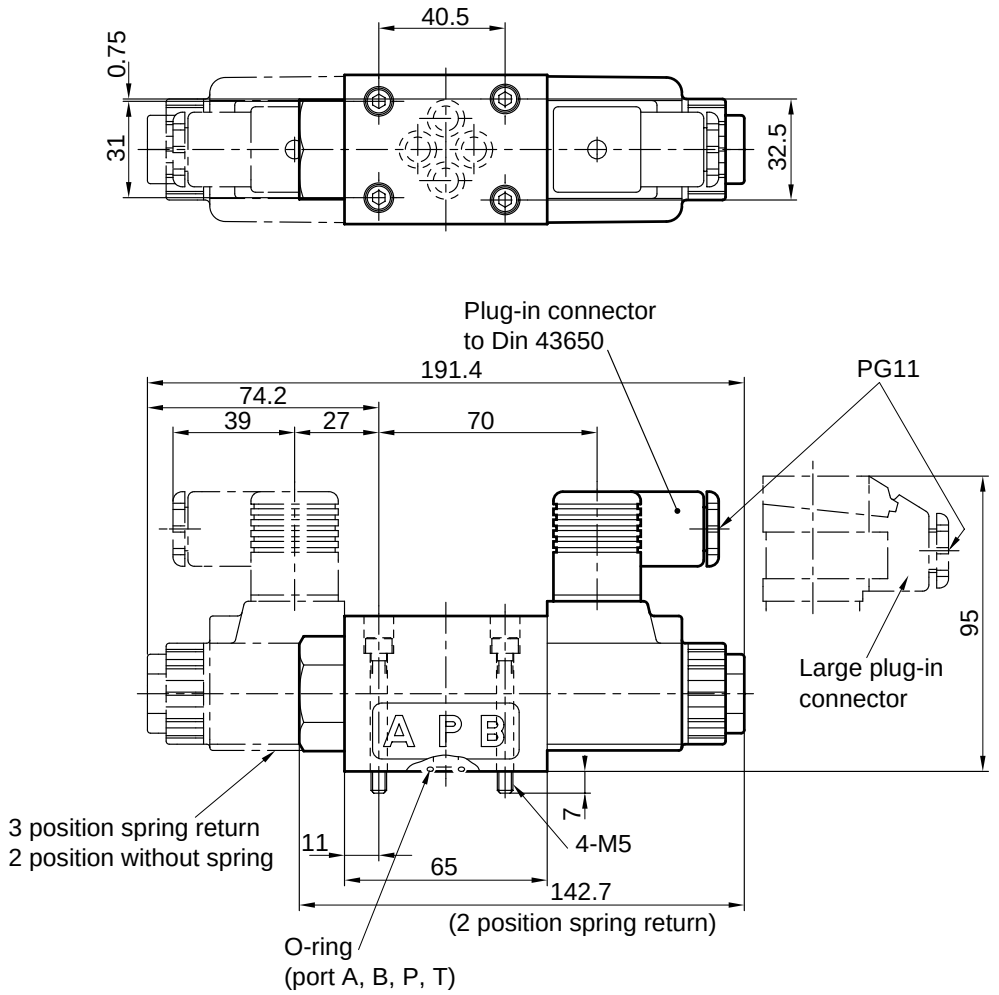
Characteristic Curves

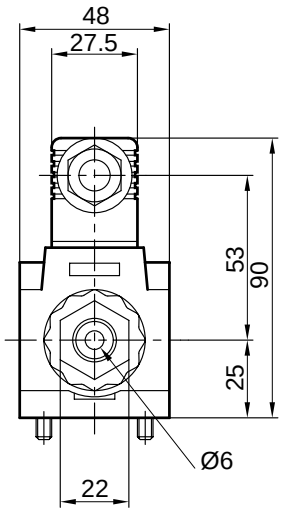
Measured at ν = 36cSt and *t* = 50°C



Spool type	Direction of flow				
	P → A	B → T	P → B	A → T	P → T
205	5	5	5	5	-
208	6	6	6	6	4
210	5	6	5	6	-
223	5	5	5	5	-
207	1	1	1	1	4
213	6	5	6	5	-
221	5	6	5	5	-
212	5	5	5	6	-
104	5	2	5	2	-
204	2	2	5	5	-
203	3	3	5	6	-
201	5	-	5	-	-

Unit Dimensions – Plug-in connector- AC solenoid (dimensions in mm)

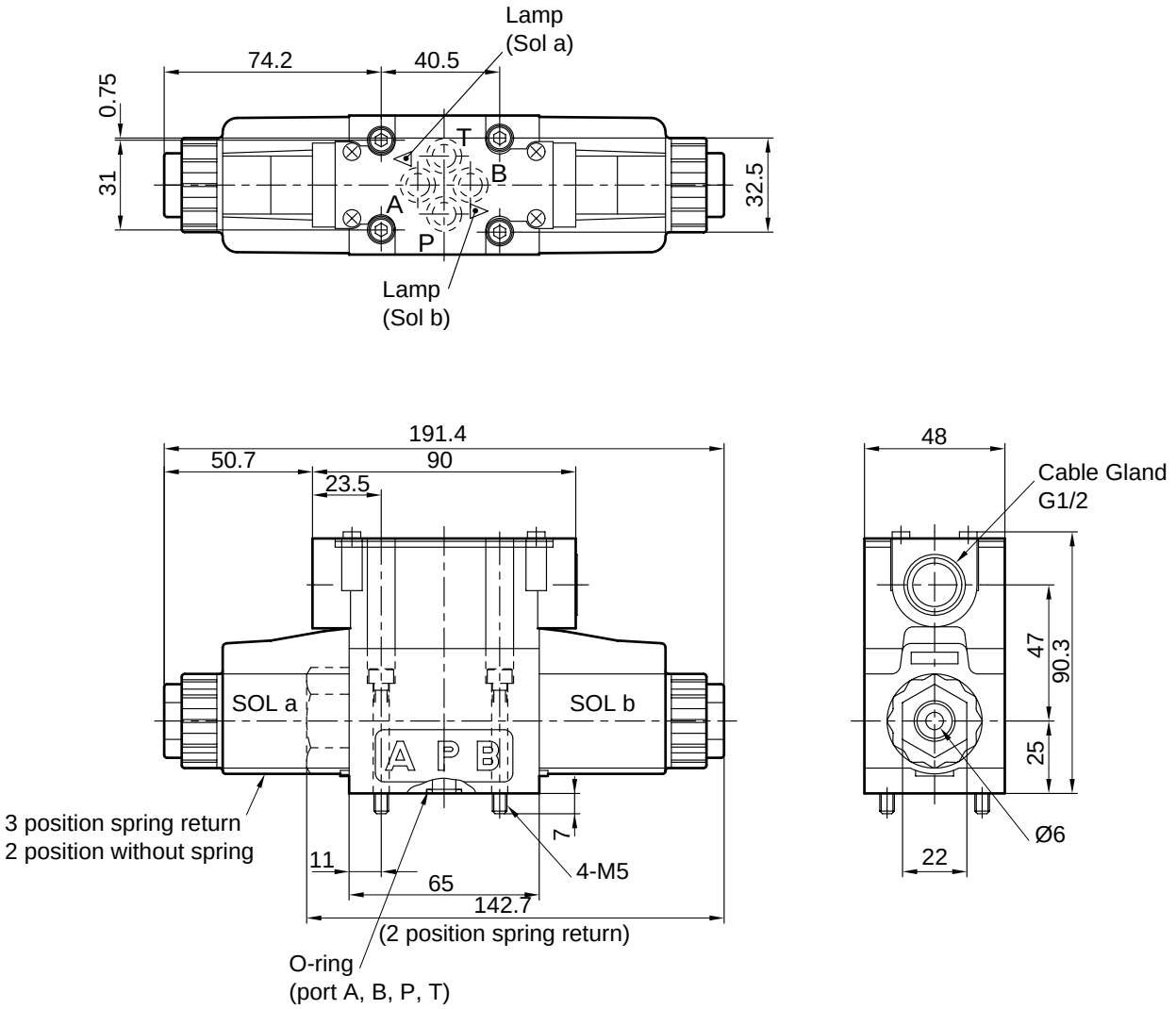




Model	Page	Data Sheet
DE10	14.17	D-1002/06.99

Kawasaki
Hydraulic Products

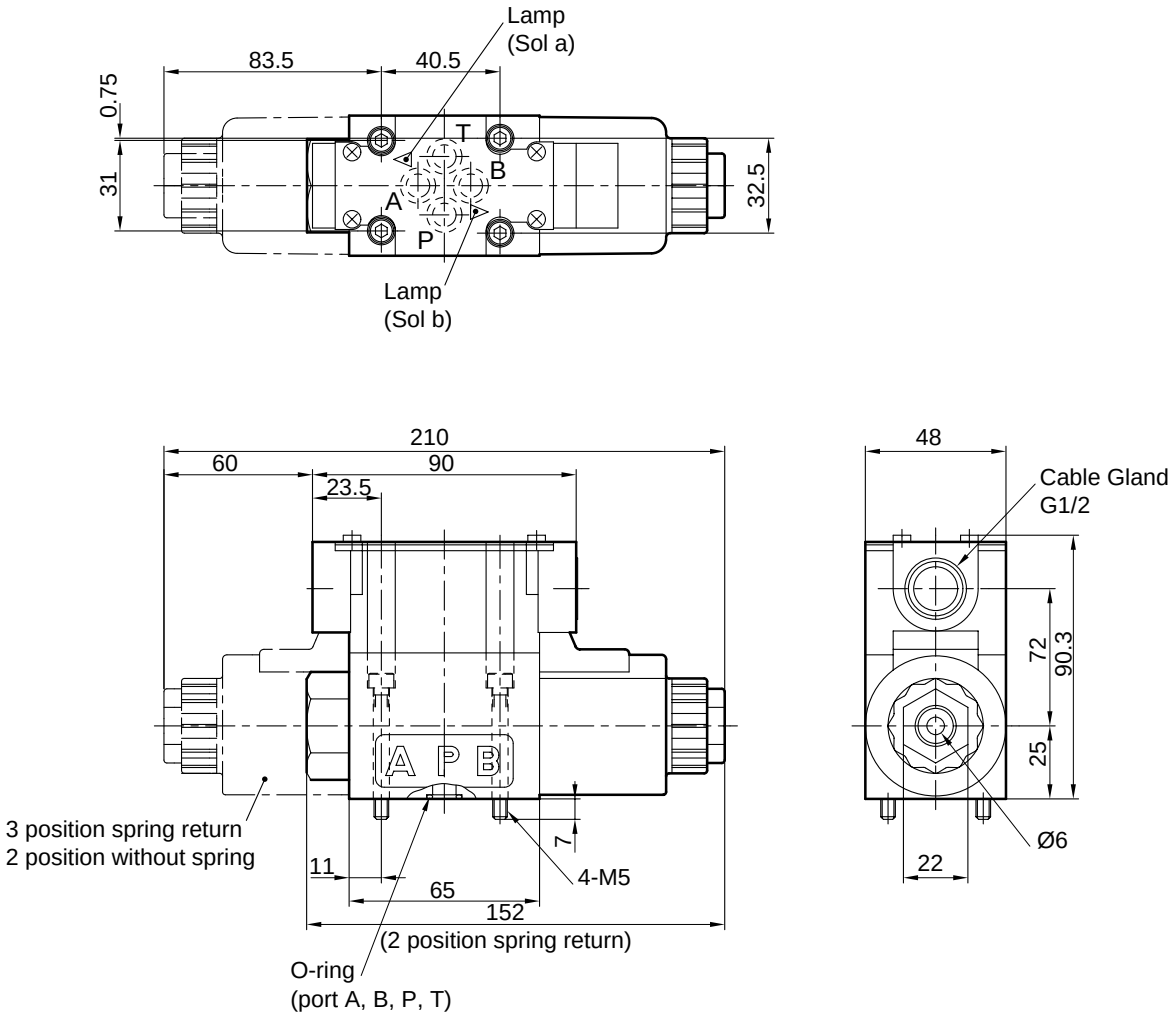
Unit Dimensions – Central Terminal- AC solenoid (dimensions in mm)



Model	Page	Data Sheet
DE10	15.17	D-1002/06.99

Kawasaki Hydraulic Products

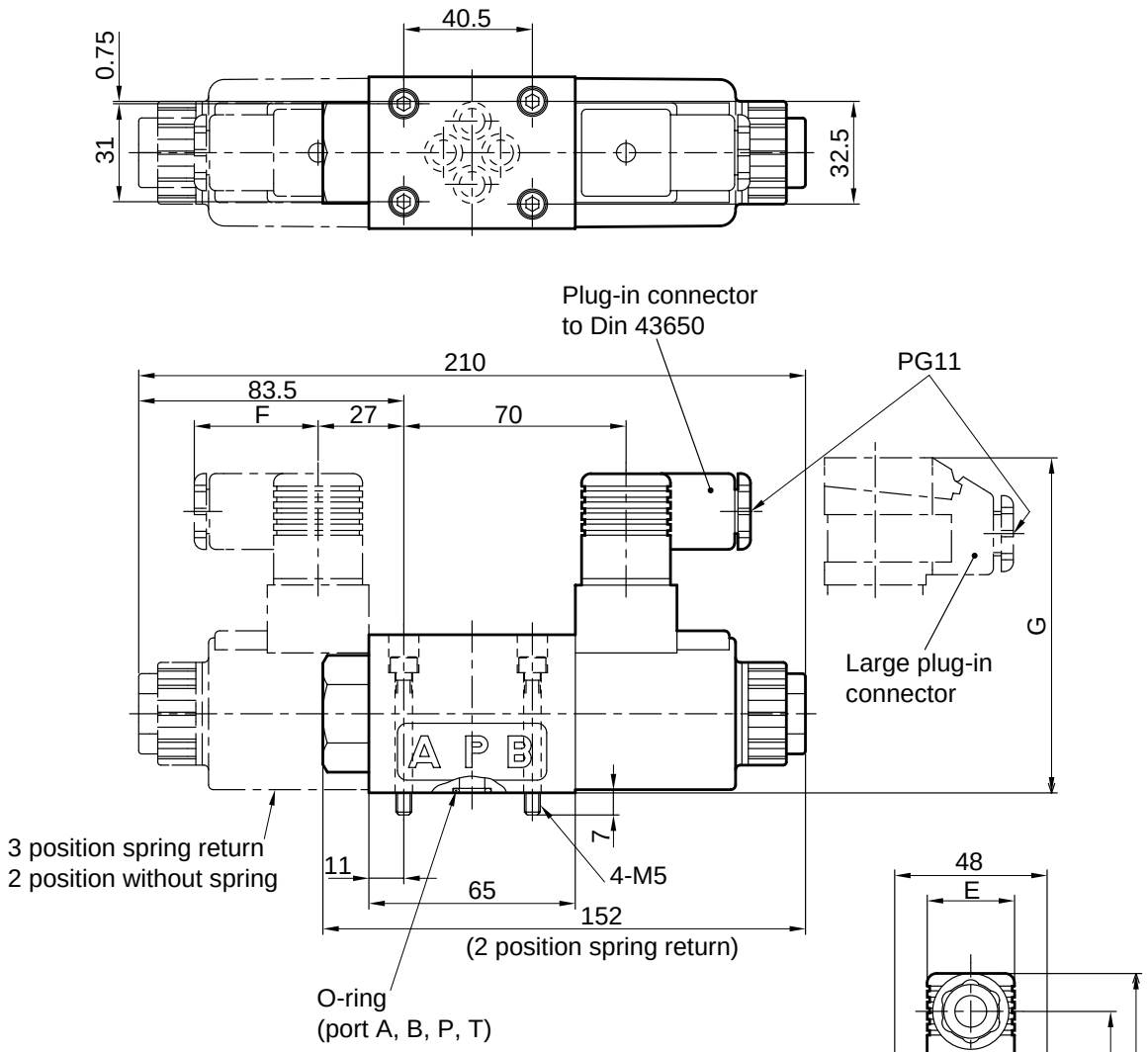
Unit Dimensions – Central terminal, DC, AC/DC Solenoid (dimensions in mm)



Model	Page	Data Sheet
DE10	16.17	D-1002/06.99

Kawasaki
Hydraulic Products

Unit Dimensions – Plug-in connector, DC, AC/DC Solenoid (dimensions in mm)



	C	D	E	F	G
DC Solenoids	101	64	27.5	39	106
AC/DC Solenoids	104	57.2	34	53	109

The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract

Model	Page	Data Sheet
DE10	17.17	D-1002/06.99

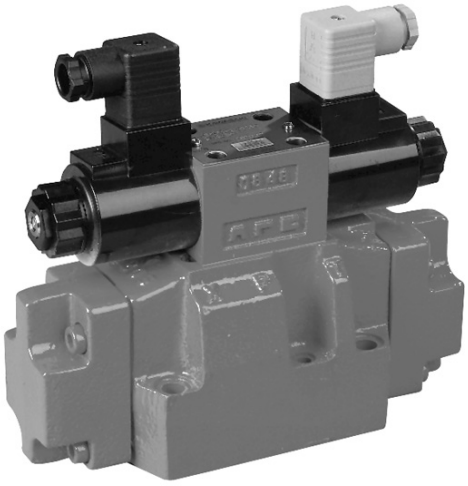
Kawasaki Hydraulic Products

SAMT HYDRAULICS
Factory 19 / 5 Lyn Parade PRESTONS NSW 2170
Ph: (02) 9607 4100 Fax: (02) 9607 4200

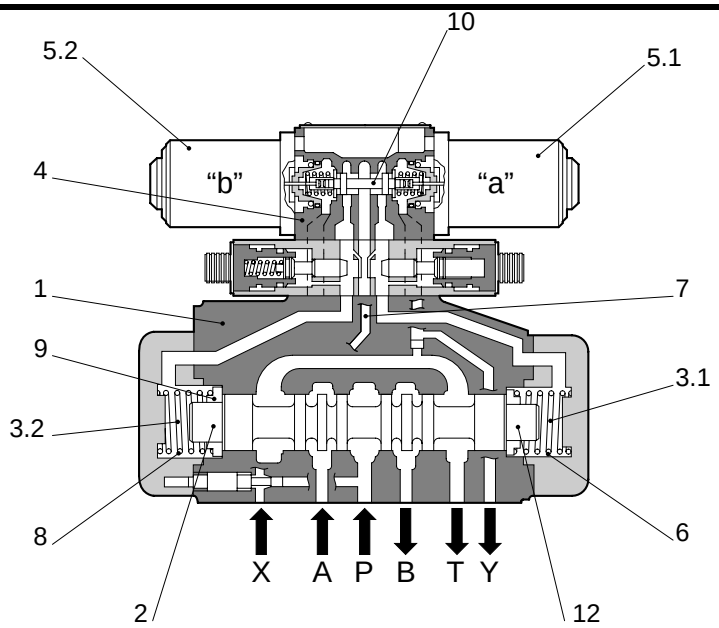
Size 16 up to 350 bar up to 240 L/min	Directional Spool Valve Pilot Operated Type DEH, Series 20	Data Sheet D-1003/10.98 GB

Features

- ◊ Modified casing and spool shape to increase pressure flow.
- ◊ Pilot operated by Electro-hydraulics.
- ◊ Selector plug to set Internal or external pilot.
- ◊ Sub-plate mounting.
- ◊ Porting pattern to DIN 24 340 form A ISO 4401 and CETOP-RP 121H.
- ◊ Spring and pressure centred versions to return the valve to the neutral position.
- ◊ Spring or pressure offset versions available.
- ◊ Wet-pin DC or AC solenoids available.
- ◊ Individual electrical connection.
- ◊ Manual override (standard).
- ◊ Optional time shift adjustment.
- ◊ Optional stroke adjustment at the main spool.



Type DEH



Type DEH 16 4/3-Way Directional Valve with Spring Centring Control Spool

Functional Description

Type DEH Directional Spool Valves are electro-hydraulic pilot operated directional spool valves that are used to control (start, stop and direction) fluid flow.

The valves comprise a housing (1), main control spool (2), one or two return springs (3.1) and (3.2), pilot valve (4) with one or two solenoids "a"(5.1) and/or "b"(5.2).

The main control spool (2) in the valve is held in the neutral or the initial position by the springs.

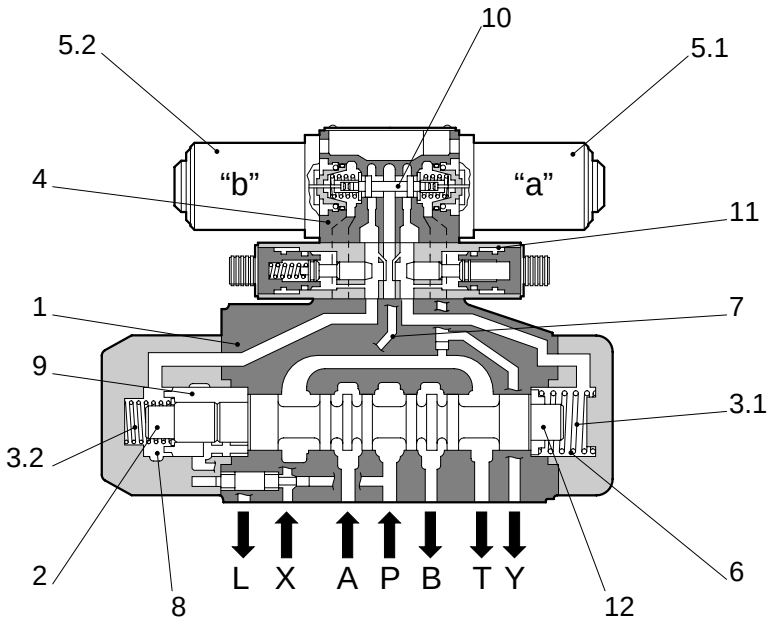
Initially the two spring chambers (6) and (8) are connected to the tank without pressure via the pilot valve (4). The pilot valve is supplied with fluid via the pilot line (7). The pilot oil supply can be either internal or external (external via port X). When the pilot valve is operated, e.g. solenoid "a", the pilot spool (10) is moved to the left and the spring chamber (6) remains un-pressurised.

The pilot pressure acts on the left side of the main control spool (2) and pushes it against the spring (3.1). Consequently the ports P to B and A to T are connected in the main valve.

When the solenoid is de-energized, the pilot spool returns to its initial position (with the exception of the "detented spool"). The fluid in the spring chamber (8) is unloaded into the tank.

The pilot oil is expelled from the spring chamber via the pilot valve into the Y channel. The pilot oil drain is internal or external (external via port Y).

A manual override permits pilot spool (10) to be operated without energising the solenoid.



Type DEH 16 4/3-Way Directional Valve with Pressure Centring Main Control Spool

Functional Description (continued)

4/3-Way Directional Valve with Pressure Centring Main Control Spool, Type DEH….2

The main control spool in the main valve is held in the neutral position by pressurisation of the surfaces of spool, centering pin (2) and centering bush (9).

Springs (3.1) and (3.2) hold the main control spool central with no pressure applied.

If solenoid "a" is energised, the pilot spool moves to the left and the chamber (6) is unloaded to the tank, while the chamber (8) remains connected with the control pressure.

The centering bush (9) touches the housing and the centering pin (2) pushes the main control spool to the right until it reaches the stop. When solenoid "a" is de-energised, the pilot spool returns to the central position and the chamber (6) is connected to pressure. The spool surface is larger than the surface of the centering pin (2) and the spool moves to the left until it touches the centering bush (9). The surfaces of the centering bush and pin are larger than the spool and the spool remains in the central position.

If solenoid "b" is energised, the chamber (8) is unloaded to the tank while the chamber (6) remains connected with the control pressure, the main control spool moves to the left until it touches the centering pin (2) at the cover and the centering bush (9) also moves.

When solenoid "b" is de-energised, the chamber (8) is connected to the pressure and the surface of the centering bush (9) and pin (2) under pressure are larger than the spool surface. The spool moves to the right until it touches the centering bush (9) at the housing. The spool surface on the right side is now greater than the surface of the centering pin (2) acting on the left side and the spool remains in the central position.

A drain port is necessary to unload pressure in the chamber between the main spool and the centering bush.

Ordering Code – Type DEH Series 20

DEH	16	P	20	2	05	2	W	A	100	AL	PO8	ET	S2	R	10	V

Directional Valve, Electro-Hydraulic Operated

Size
16

Type of Mounting
P: Sub-plate Mounting

Series Number
20

Spool Return

No	Description
2	Spring-offset(2-position)
	Spring-centre (3-position)
3	Hydraulic-offset (2-position)
	Pressure-centre (3-postion)

Spool Type
For spool type see symbols

Spool Return in Pilot Valve

No	Description
0	No spring return (2-position)
1	No spring return with detent (2-position)
2	Spring-return (2 and 3-position)

Type of Solenoid
W: Wet pin solenoids (with manual overrides)

Electrical Sources
A: Alternating
D: Direct
R: Independent of frequency with built-in rectifier for AC

Voltage

12:	12V	D12=DC12V
24:	24V	D24=DC24V
100:	100	W100=AC100V 50/60Hz AC110V 60Hz
200:	200	W200=AC200V 50/60Hz AC220V 60Hz

In case of R, order in Voltage unrelated with frequency

Suitable Oil
No Code: Mineral Oil
V: Phosphate Ester
W: Fatty Acid Ester,
W1 Water Glycol

Auxiliary Equipment
No code: Without auxiliary equipment
10: Stroke limiter on ends A & B
11: Stroke limiter on end A
12: Stroke limiter on end B

Pressure Reducing Valve
No code: Without reducing valve
R: With reducing valve

Pilot Choke Adjustment
No code: Without pilot choke adjustment
S1: Meter-in pilot choke adjustment
S2: Meter-out pilot choke adjustment

Pilot Oil Supply, Drain Line

Code	Oil Feed	Oil Drain
No code	External	External
E	Internal	External
ET	Internal	Internal
T	External	Internal

Plug-in Throttle in P Port (Pilot Valve)

Code	Function
No code	Without plug-in throttle
P08	0.8mm diameter throttle
P10	1.0mm diameter throttle
P12	1.2mm diameter throttle
P15	0.8mm diameter throttle
P20	2.0mm diameter throttle
P25	0.8mm diameter throttle
P30	3.0mm diameter throttle
P40	4.0mm diameter throttle

Electrical Connections

Code	Function
AL	Central terminal and lamp
B	Angled plug to DIN 43650
C	Large angled plug
CL	Large angled plug with lamp

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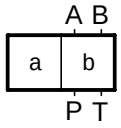
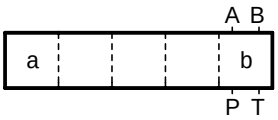
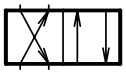
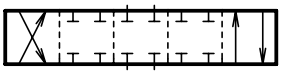
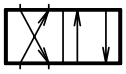
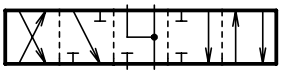
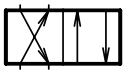
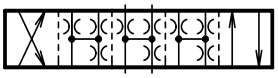
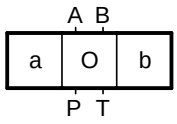
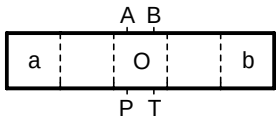
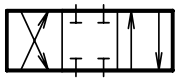
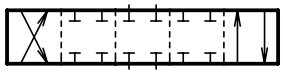
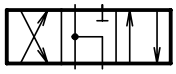
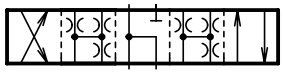
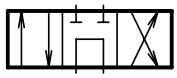
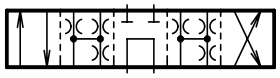
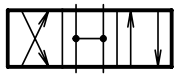
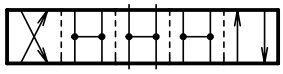
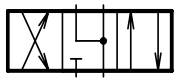
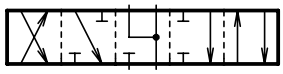
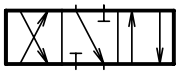
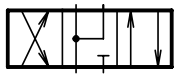
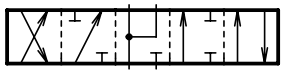
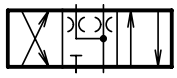
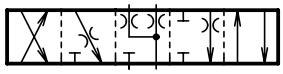
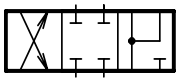
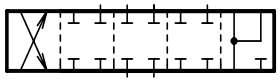
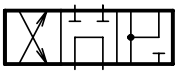
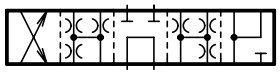
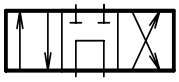
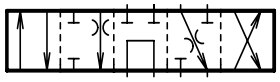
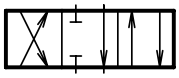
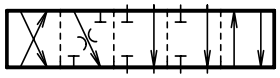
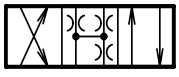
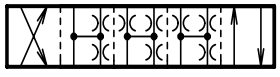
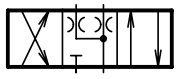
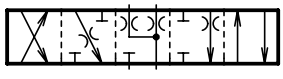
Symbols

2-Position Valves

Spool type	Hydraulic symbol	Transient condition
		
03		
04		
11		
26		

Symbols (continued)

3-Position Valves

Spool type	Hydraulic symbol	Transient condition
		
05		
06		
07		
08		
10		
12		
13		
17		
18		
19		
20		
21		
22		
23		

Technical Data

For applications outside the following parameters, please consult Kawasaki Precision Machinery (UK) Ltd.

Size 16

Operating Pressure, Maximum

Port P, A, B	350 bar
Port T - Pilot Oil Drain Y External	250 bar
Port T - Pilot Oil Drain Y Internal[1]	160 bar
Port Y - Pilot Oil Drain External	250 bar

Pilot Pressure, Maximum

(With higher pilot pressures, a pressure reducing valve is required)	250 bar

Pilot Pressure, Minimum

Pilot Oil Supply X External,
Pilot Oil Supply X Internal
(not with Spools 03, 06, 07, 08, 16, 20, 22

3-Position Valve, Spring-Centred	8 bar
3-Position Valve, Pressure-Centred	8 bar
2-Position Valve, with Spring Offset	10 bar
2-Position Valve, with Hydraulic Offset	5 bar

Hydraulic Fluid

Mineral oil, phosphate ester, fatty acid ester and water glycol. Phosphate ester is only suitable for use with FPM seals.

Fluid Temperature Range

-20°C to +70°C

Viscosity Range

2.8 to 380cSt

Cleanliness

Maximum permissible degree of contamination of fluid is to NAS 1638 class 9. Kawasaki recommend a filter with a minimum retention rate of $ß_{10} \geq 75$

Technical Data (Continued)

Pilot Oil Volume for Shifting Operation

3-Position Valve, Spring-Centred	4.45 cm³
2-Position Valve	8.9 cm³
3-Position Valve, Pressure-Centred:	
from neutral position to shifted position "a"	2.3 cm³
from shifted position "a" to neutral position	2.15 cm³
from neutral position to shifted position "b"	4.45 cm³
from shifted position "b" to neutral position	2.3 cm³

Pilot Oil Flow for Shortest Shifting Time 27 L/min

Weight

Valve with one Solenoid	8.3 kg
Valve with two Solenoids, Spring-Centred	8.6 kg
Valve with two Solenoids, Pressure-Centred	8.6 kg

Shifting Times[1]

[1] Shifting time = Contacting at pilot valve up to start of opening of the control land in the main valve.

Shifting time of valve from neutral position to shifted position with AC (~) and DC (=) operation

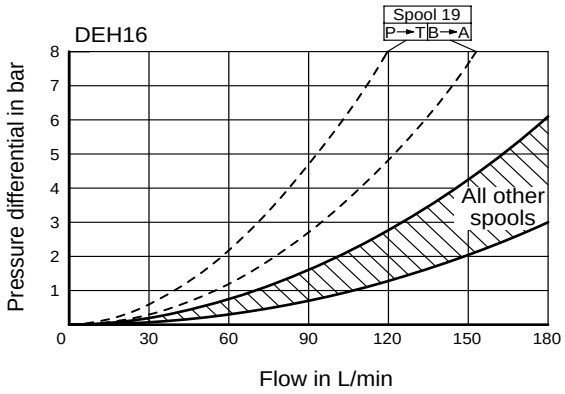
~ At Pilot Pressure	AC 50 bar		DC 50 bar		AC 150 bar		DC 150 bar		AC 250 bar		DC 250 bar	
3-Position Valve, Spring-Centred	30 mS		50 mS		25 mS		45 mS		20 mS		40 mS	
2-Position Valve	35 mS		55 mS		30 mS		50 mS		25 mS		45 mS	
3-Position Valve, Solenoid Operated Pressure-Centred	a	b	a	b	a	b	a	b	a	b	a	b
	20 mS	30 mS	40 mS	50 mS	20 mS	25 mS	40 mS	45 mS	20 mS	20 mS	40 mS	40 mS

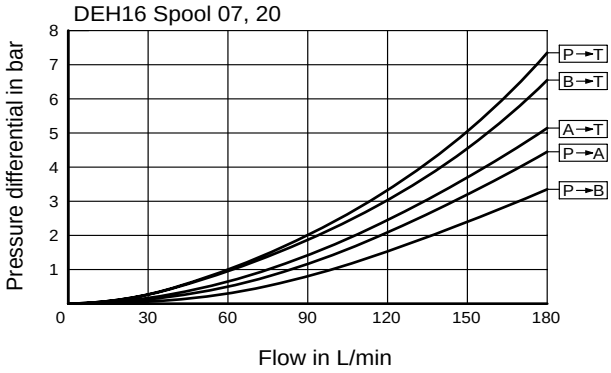
Shifting time of valve from shifted position to neutral position

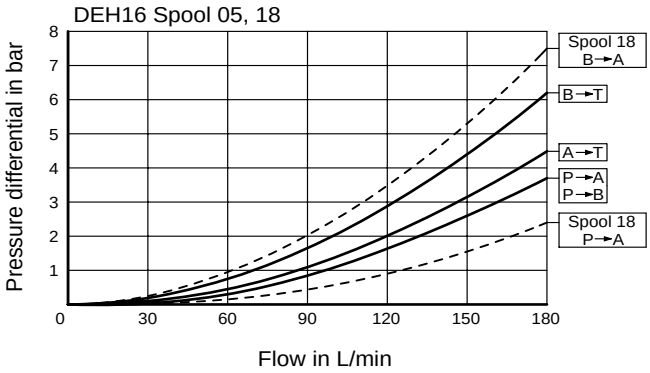
3-Position Valve, Spring-Centred	40 mS for AC (~) and 60 mS for DC (=)											
2-Position Valve	35 mS		55 mS		30 mS		50 mS		25 mS		45 mS	
3-Position Valve from Pressure-Centred	a	b	a	b	a	b	a	b	a	b	a	b
	30-40 mS		50-60 mS		25-35 mS		45-55 mS		20-25 mS		40-45 mS	

Characteristic Curves - Type DEH16

Measured at *v* = 36cSt and *t* = 50°C







Performance Limits - Type DEH16

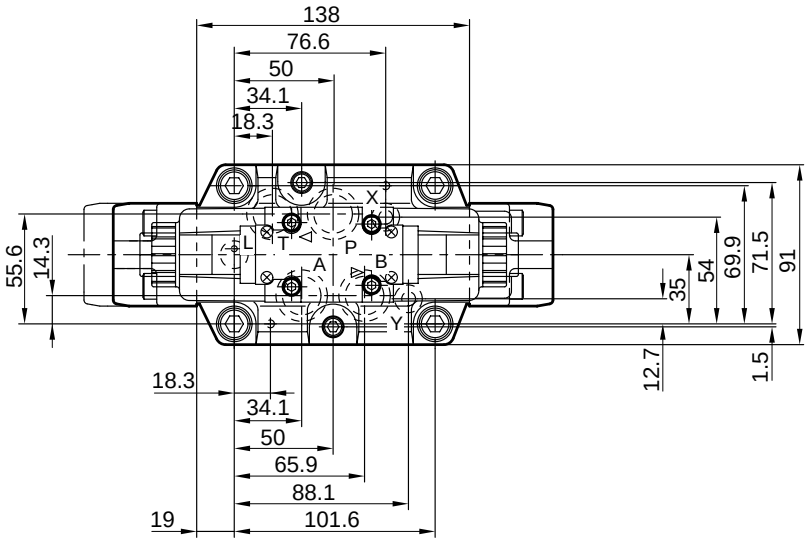
Measured at ν = 36cSt and t = 50°C

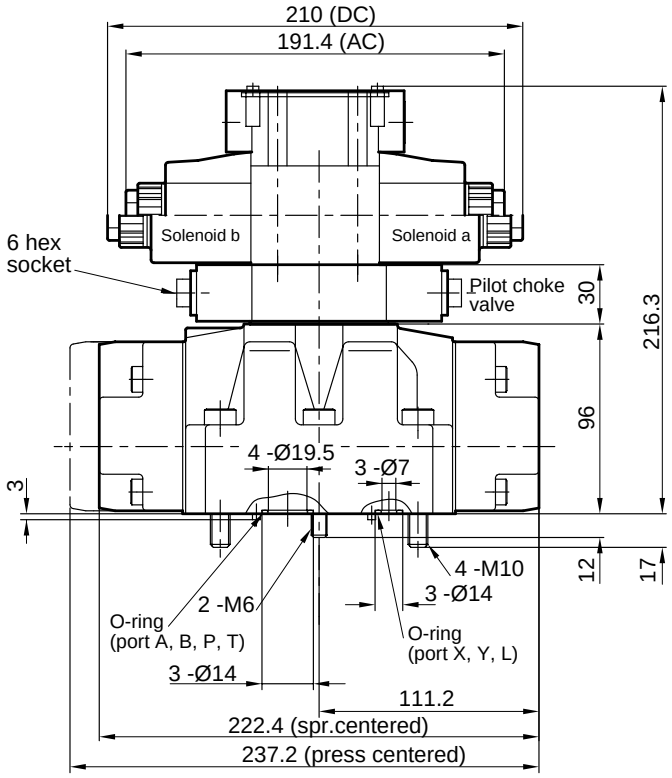
2-Position Valves, Spring offest 3-Position Valves Spring centred Permissible Flow					
	Operating Pressure - bar				
Spool	70	140	210	280	350
(A) 05, 10, 12, 13, 17, 18, 21, 22, 23, 03, 04, 11, 26	240	240	205	180	170
06	200	145	115	100	90
07, 08, 19, 20	220	160	130	110	100

Notes: The flow values given are achieved when the minimum pilot pressure is present.

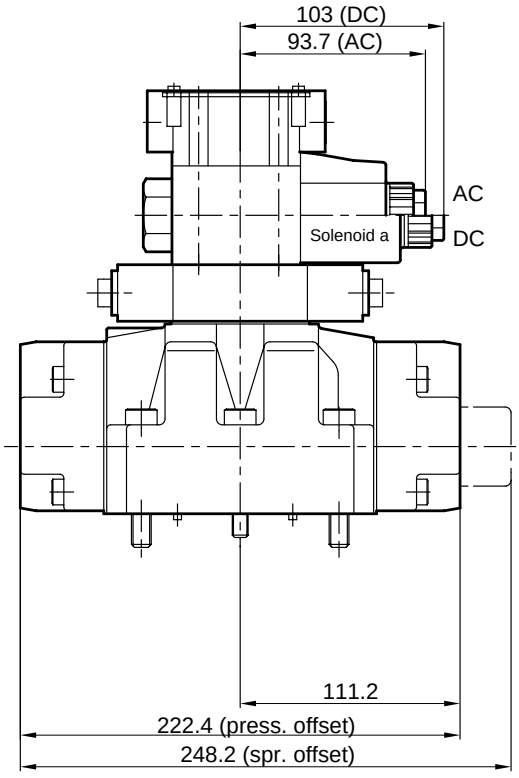
In the case of the 2-position hydraulic offset and the 3-position pressure centred, the permissible flow is as shown on the upper line (A), independent of spool type. When the pilot pressure is over 15 bar the flow becomes 240 litres per minuute and is independant of spool type and operating pressure.

Unit Dimensions - Type 4DEH16P-20 (dimensions in mm)



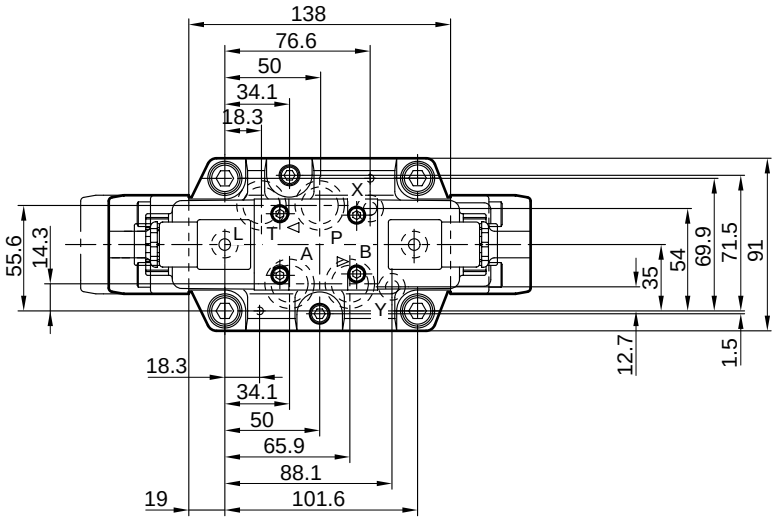


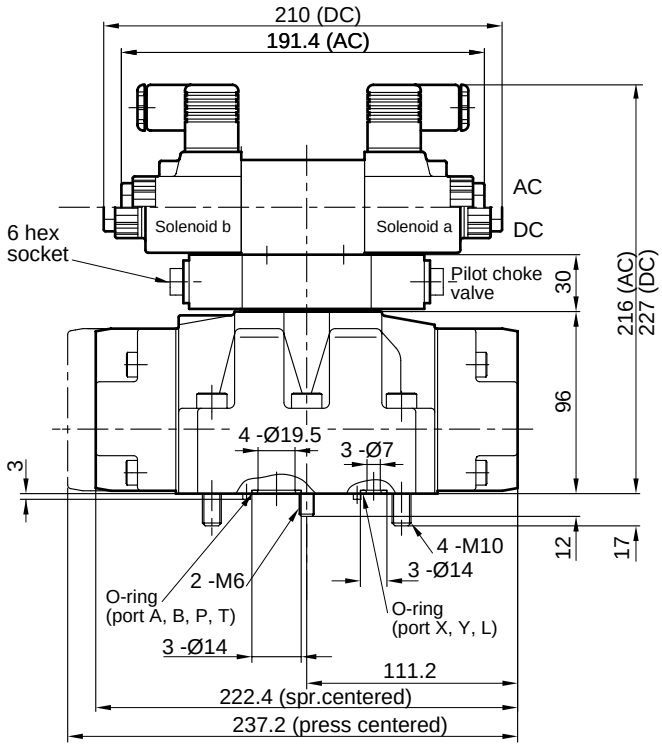
3 POSITION VALVE



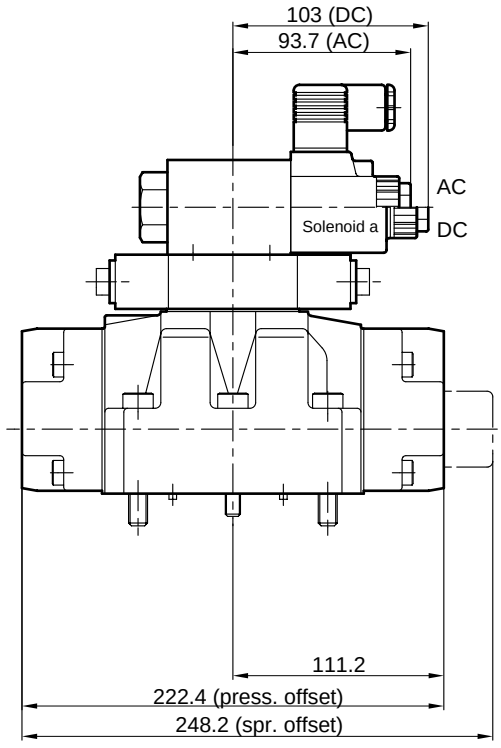
2 POSITION VALVE

Unit Dimensions - Type DEH16P-20 (dimensions in mm) (continued)





3 POSITION VALVE



2 POSITION VALVE

The specified data is for product description purposes only and may not be deemed to be guaranteed unless expressly confirmed in the contract