DOFLUID®

WET TYPE SOLENOID OPERATED DIRECTIONAL CONTROL VALVES

MAX. FLOW OF NG6/D03: 100 ℓ/MIN.
MAX. FLOW OF NG10/D05: 160 ℓ/MIN.
MAX. HIGH PRESSURE: 350BAR
MAX. BACK PRESSURE: 210BAR

Wet Type (Oil Immersed) Solenoid

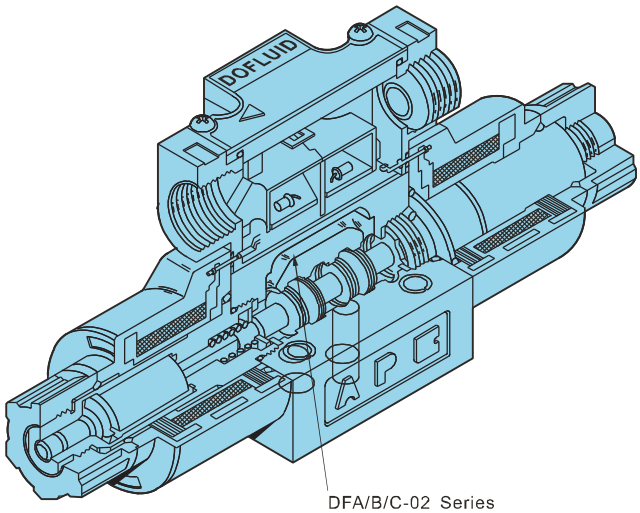
- Max. high pressure of 35 MPa (5,000 psi) & Max. high flow capacity of 160 ℓ/min (42 gpm).
- Oil immersed armature provides stable, quiet operation-even under high pressure & high cycle frequency, allowing for longer valve life.
- Valve mounting accomplished without disturbing valve nameplate or electrical box.
- High tank port back pressure upto 21 MPa/3040 psi (check each spool type for max. allowable).
- Shockless type coils are available-reducing voltage spikes, providing even quieter operation and extending relay contact life.
- Twin tank line design greatly reduces both pressure drop and system operating cost.

Joint Box/plug-In Coils

- Large electrical box supplied standard, with indicator lights and terminal strip including earth ground terminal.
- Simple design allows easy assembly and dismantling.
- Coils can be easily replaced without disturbing wiring and without risk of oil leakage.

Lead Wire Coils

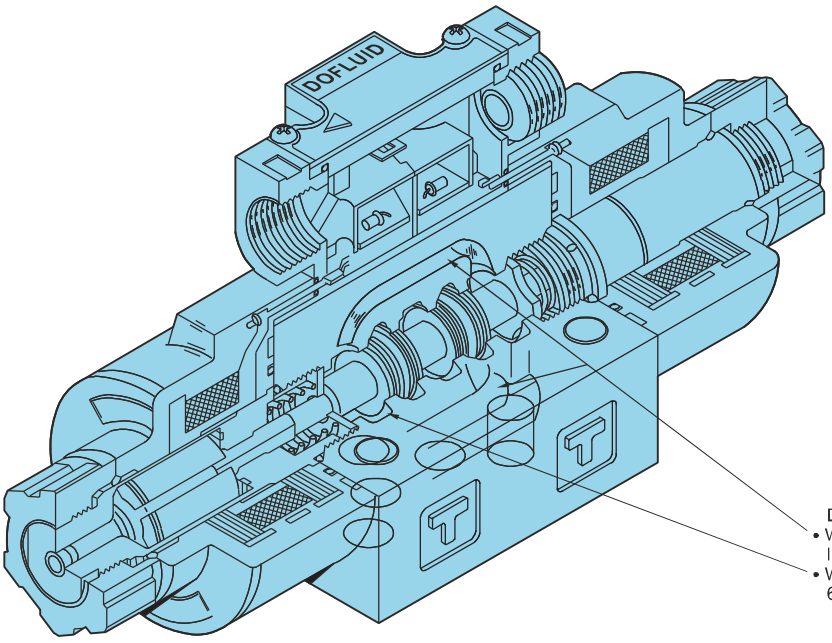
- Lead wire coils available popular with the mobile industry.
- Single spade DC coil also available for one wire "spade" connection.



DFA/B/C-02 Series
- With both upper & lower return line ports (to T port)

DIN Coils

- Manufactured to accept standard 3 pin DIN 43 650 and ISO 4400 connectors.
- AC coils are rated for both 50/60 Hz service-rewiring not required if switching frequencies.
- DC coils are not polarity sensitive.



DFA/B/C - 03 Series
- With both upper & lower return line ports (to T port)
- With special 5 channels and 6 teeth

DIN Connector

Conforms to standard 3 pin DIN 43 650 and ISO 4400 standard connectors. Clear lighted connectors are supplied standard for AC coils-optional lighted connectors available for DC coils.

AC Solenoid

50-60 Hz common service solenoids do not require re-wiring when the applied frequency is changed.

Electric Shockless

AC coils can be provided with optional RAC type to include rectified coils that convert AC to DC- this reduces voltage spikes, provides even quieter operation and extends relay contact life. Coil heat generation is much less in holding applications when using rectified coils. The rectifier is supplied either in the electrical box or provided in the DIN connector.

Hydraulic Shockless

Valves can be provided with option S to slow the shifting of the spool. Oil is metered as the armature moves in the large core tube causing increased shifting times, up to 4 times normal (depending on temperature). Note :
AC valves are always supply rectified to DC valve. Shockless valves will not operate as shockless until tank line has become filled with oil-this will occur automatically after a first few cycles.

Other Notice

Pressure ratings are reduced for the tank port-check each of spool types for maximum allowable pressure (including pressure spikes). Do not supply-electric power to the AC solenoid unless the coil is mounted to the valve. Electrical power should be maintained on detented valves when in operation-the detent only maintains the valve start-up condition. When plumbing valves for 1 way or 2 way operation-flow should be limited and unused ports should be plugged (do not plug the tank port on models 2B8, 2B8L, 2D8). Do not exceed voltage specifications shown in the catalog.

Variety

There are various kinds of solenoid directional valves for your selection, which with different sizes of 1/4 & 3/8", different AC or DC solenoid, different wiring of joint box type or DIN (hirschmann) type, different spool types, with or without shockless type etc.

Fluid Types Recommended

1. Petroleum based mineral oil (conform to ISO VG 32 & 46)
2. Phosphate-esters based hydraulic oil.
3. Water-glycol group hydraulic oil.

Fluid Temperature Range

From +5℃ to +60℃(41℉ - 140℉) recommended

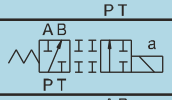
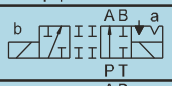
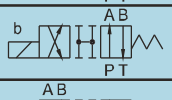
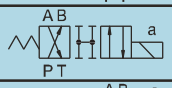
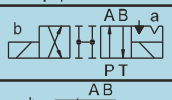
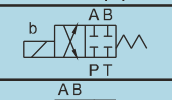
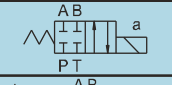
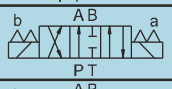
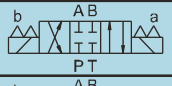
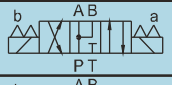
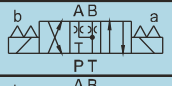
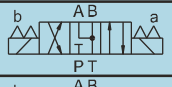
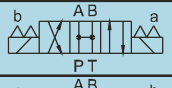
Fluid Viscosity Range

15-310 cSt (80-1400 SSU) recommended

Contamination Control

Fluid contamination should be kept at/above NAS 1638-12 class and adopt filtration of 25μm or even better filtration, otherwise, valves are easily to be damaged or shorten life.

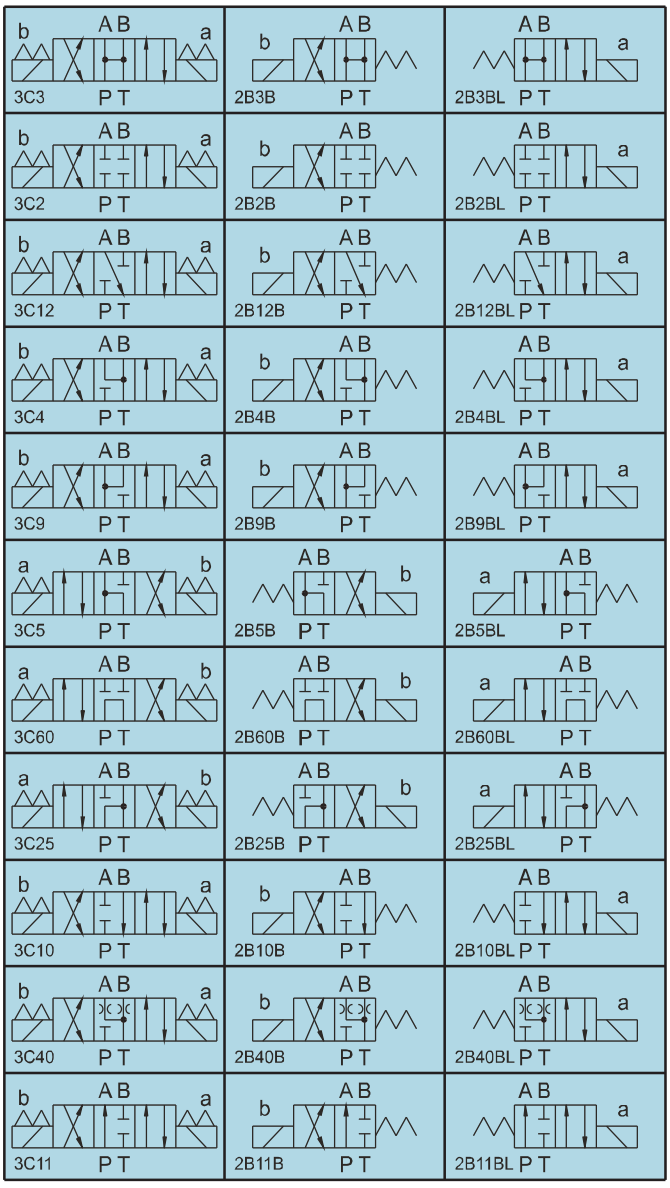
SPECIFICATIONS

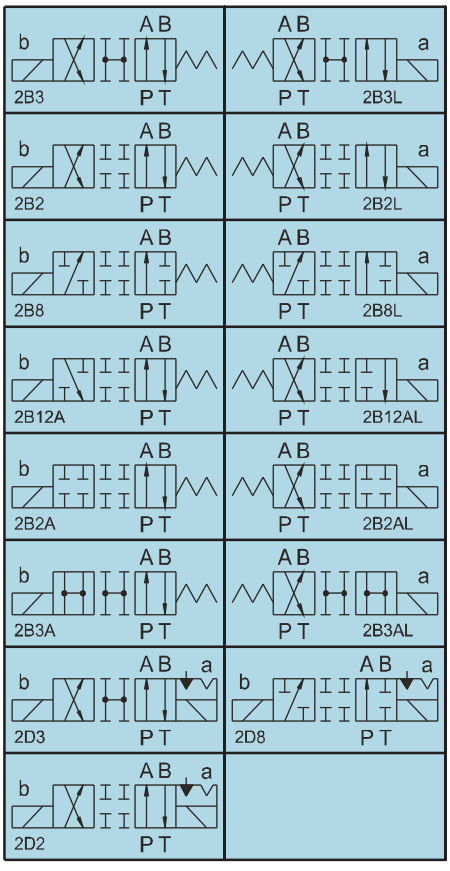
Model		DFA/B/C - 02 - 35(C) Series				DFA/B/C - 03 - 35(H) Series					
		Standard type		Shockless type		Standard type				Shockless type	
						AC		DC & RAC			
Symbol	Valve spool type	Max. operating pressure MPa (psi)	Max. flow ℓ/min (gpm)	Max. operating pressure MPa (psi)	Max. flow ℓ/min (gpm)	Max. operating pressure MPa (psi)	Max. flow ℓ/min (gpm)	Max. operating pressure MPa (psi)	Max. flow ℓ/min (gpm)	Max. operating pressure MPa (psi)	Max. flow ℓ/min (gpm)
	2B8	35 (5070)	30 (7.9)	25 (3620)	30 (7.9)	35 (5070)	40 (10.6)	35 (5070)	85 (22.5)	25 (3620)	85 (22.5)
	2B8L										
	2D8						85 (22.5)				
	2B2		80 (21.1)		50 (13.5)		130 (34.3)		160 (42.3)		130 (34.3)
	2B2L										
	2D2		100 (26.4)								
	2B3		65 (17.1)								
	2B3L										
	2D3										
	2B2B		100 (26.4)								
	2B2BL										
	3C11										
	3C2										
	3C9										
	3C41										
	3C40										
	3C12		AC: 65 (17.1) DC: 80 (21.1)								
	3C4										
	3C3		50 (13.2)								
	3C60	25 (3620) 35 (Specified)			40 (10.6)	25 (3620) 35 (Specified)	70 (18.5)	25 (3620) 35 (Specified)	100 (26.4)		85 (22.5)
	3C5										

			DFA/B/C - 02			DFA/B/C - 03		
			AC solenoid	DC solenoid		AC solenoid	DC solenoid	
				Built-in rectifier			Built-in rectifier	
			AC ※	RAC ※	DC ※	AC ※	RAC ※	DC ※
Max. operating pressure	P, A, B ports		35 MPa (5070 psi) (Note 1)					
Max. permissible back pressure	T port		35:21 MPa (3040 psi) 35C:16 MPa (2320 psi)			16 MPa (2320 psi)		
Changeover frequency (times/min)		Standard type	300	120	300	300	120	240
		Shockless type	—		120	—		120
Standard	Indicator light		L (Note 2)			L		
	Shockless		—	S		—	S	
Mass kg (lbs)	Double solenoids		1.8 (4.0)	2.0 (4.4)		4.2 (9.2)	5.0 (11)-35	5.6 (12.3)-35H
	Single solenoid		1.4 (3.1)	1.5 (3.3)		3.6 (7.9)	3.9 (8.6)-35	4.2 (9.2)-35H
Recommended operating conditions	Operating temperature range		-20 ~ 70 °C (-4 ~ 158 °F)			5 ~ 60 °C (41 ~ 140 °F)		
	Operating viscosity		15 ~ 300 mm²/s (80 ~ 1400 SUS)					
	Viscosity index		90 or above					
	Filtration		25 μm or less					

Note 1) Max. operating pressure differs depending on the valve type.
2) DFA : "L" is not standard.

SYMBOLS





Solenoid specifications

Solenoid classification			AC solonoid									
Power source			C1 / C3			C120		C2 / C4			C5 / C6	
Voltage(V)			AC110		AC120	AC120		AC220		AC240	AC240	
Frequency(Hz)			50	60	60	50	60	50	60	60	50	60
Size 02	Solenoid coil type	DFA-02-35	2AH-C1/C3			2AH-C120		2AH-C2/C4			2AH-C5/C6	
		DFB-02-35	2BH-C1/C3			2BH-C120		2BH-C2/C4			2BH-C5/C6	
	Starting current(A)		2.2	2.0	2.2	2.0	1.8	1.1	1.0	1.1	1.0	0.9
	Holding current(A)		0.54	0.41	0.47	0.45	0.35	0.25	0.19	0.23	0.23	0.18
	Holding electric power(W)		25	22	28	25	22	25	22	28	25	22
	Permissible voltage range(V)		80 ~ 120			90 ~ 130		180 ~ 240			200 ~ 260	
	Insulation resistance(MΩ)		100 or above (500V)									
Size 03	Solenoid coil type	DFA-03-35	3AH-C1/C3			3AH-C120		3AH-C2/C4			2AH-C5/C6	
		DFB-03-35	3BH-C1/C3			3BH-C120		3BH-C2/C4			2BH-C5/C6	
	Starting current(A)		5.5	4.6	5.0	5.0	4.2	2.7	2.3	2.5	2.5	2.1
	Holding current(A)		1.1	0.86	1.0	0.9	0.71	0.52	0.42	0.48	0.4	0.33
	Holding electric power(W)		36	34	42	36	34	36	34	32	36	34
	Permissible voltage range(V)		80 ~ 120			90 ~ 130		180 ~ 240			200 ~ 260	
	Insulation resistance(MΩ)		100 or above (500V)									

Solenoid classification			DC solenoid					
			Built-in rectifier					
Power source			R1 / R3		R2 / R4		D1	D2
Voltage(V)			AC110	AC120	AC220	AC240	DC12	DC24
Frequency(Hz)			50 / 60		50 / 60		—	—
Size 02	Solenoid coil type	DFA-02-35	2AF-R1/R3		2AF-R2/R4		2AF-D1	2AF-D2
		DFB-02-35	2BF-R1/R3		2BF-R2/R4		2BF-D1	2BF-D2
	Current(A)		0.31	0.32	0.15	0.16	2.5	1.25
	Holding electric power(W)		30	32	30	32	30	30
	Permissible voltage range(V)		80 ~ 130		180 ~ 250		10.8 ~ 13.2	21.6 ~ 26.4
	Insulation resistance(MΩ)		100 or above (500V)					
Size 03	Solenoid coil type	DFA-03-35	3EA-R1/R3		3EA-R2/R4		3EA-D1	3EA-D2
		DFB-03-35	3EB-R1/R3		3EB-R2/R4		3EB-D1	3EB-D2
	Current(A)		0.46	0.49	0.22	0.24	3.0	1.5
	Holding electric power(W)		31	34	30	33	31	36
	Permissible voltage range(V)		80 ~ 130		180 ~ 250		10.8 ~ 13.2	21.6 ~ 26.4
	Insulation resistance(MΩ)		100 or above (500V)					

Solenoid classification			AC solonoid									
Power source			C1 / C3			C120		C2 / C4			C5 / C6	
Voltage(V)			AC110		AC120	AC120		AC220		AC240	AC240	
Frequency(Hz)			50	60	60	50	60	50	60	60	50	60
Size 03	Solenoid coil type	DFA-03-35H	3EA-C1/C3			3EA-C120		3EA-C2/C4			3EA-C5/C6	
		DFB-03-35H	3EB-C1/C3			3EB-C120		3EB-C2/C4			3EB-C5/C6	
	Starting current(A)		5.3	4.5	5	5	4.2	2.6	2.2	2.4	2.5	2.1
	Holding current(A)		1.1	0.9	1.0	1.1	0.87	0.56	0.45	0.53	0.47	0.38
	Holding electric power(W)		36	34	42	36	34	36	34	32	36	34
	Permissible voltage range(V)		80 ~ 120			90 ~ 130		180 ~ 240			200 ~ 260	
	Insulation resistance(MΩ)		100 or above (500V)									

Solenoid classification			DC solenoid					
			Built-in rectifier					
Power source			R1 / R3		R2 / R4		D1	D2
Voltage(V)			AC110	AC120	AC220	AC240	DC12	DC24
Frequency(Hz)			50 / 60		50 / 60		—	—
Size 03	Solenoid coil type	DFA-03-35H	3AF-R1/R3		3AF-R2/R4		3AF-D1	3AF-D2
		DFB-03-35H	3BF-R1/R3		3BF-R2/R4		3BF-D1	3BF-D2
	Current(A)		0.42	0.46	0.21	0.23	3.2	1.6
	Holding electric power(W)		31	34	30	33	30	30
	Permissible voltage range(V)		80 ~ 130		180 ~ 250		10.8 ~ 13.2	21.6 ~ 26.4
	Insulation resistance(MΩ)		100 or above (500V)					

S-DFA/B/C-02-※-AC/DC※-※-35(35C)

DFA/B/C-03-※-AC※-※-35

DFA/B/C-03-※-AC※-※-35H

S-DFA/B/C-02-※-DC※-※-35

S-DFA/B/C-03-※-DC※-※-35

S-DFA/B/C-03-※-DC※-※-35H

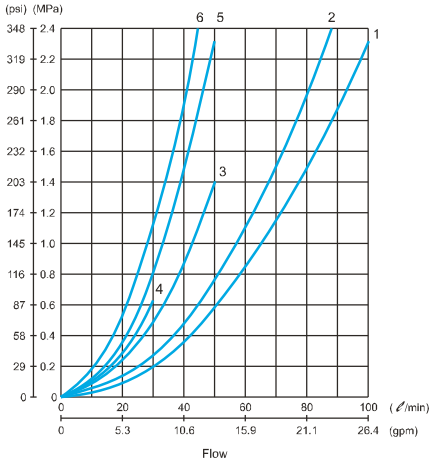
ORDERING CODE

S - DF - A - 02 - 3C2 - A110 - L - 35C - 00

- **00**: Manufacturing year
  02: 2002
  03: 2003
- **35C**: Designing number for high pressure & high flow type:
  35: Permissible back pressure 210bar
  35H: Specially specified
  35C: Permissible back pressure 160bar (only for size 02)
- **L**: L: With indicating light
  No code: Without indicating light
- **A110**: Coil voltage:
  AC: A110(50/60Hz) & A120(60Hz)=C1/C3
  A120(50/60Hz)=C120
  A220(50/60Hz) & A240(60Hz)=C2/C4
  A240(50/60Hz)=C5/C6
  DC: D12(D1), D24(D2), D36(D3) & D48(D4)
  other DC voltage as requested
  RAC:R110(50/60Hz) & R120(50/60Hz)=R1/R3
  R220(60/60Hz) & R240(50/60Hz)=R2/R4
  (W/Built-in rectifier, change AC into DC)
- **3C2**: Spool type (see spool symbol chart)
- **02**: Nominal size:
  02: 1/4"
  03: 3/8"
- **A**: Electrical conduit connection:
  A: Hirschmann/DIN type
  B: Joint box type
  C: Lead wire type
- **DF**: DF: Wet type solenoid operated directional valves
- **S**: S: Shockless type
  No code: Standard type

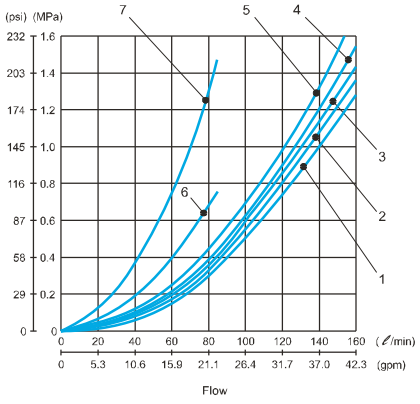
PERFORMANCE CURVE

Pressure drop characteristics



Model	Valve spool type	P→A	P→B	A→T	B→T	P→T
DFA-02 DFB-02 DFC-02 SERIES	2B8, 2B8L, 2D8	4	4	–	–	–
	2B2, 2B2L	2	2	2	2	–
	2D2	2	2	2	2	–
	2B3, 2B3L, 2D3	1	1	1	1	–
	3C3	1	1	1	1	1
	2B2B, 2B2BL, 3C2, 3C40	2	2	2	2	–
	3C12, 3C41	2	2	1	2	–
	3C11	1	2	2	2	–
	3C4	2	2	1	1	–
	3C60	6	6	5	5	3
	3C5	1	6	2	5	3
	3C9	1	1	2	2	–

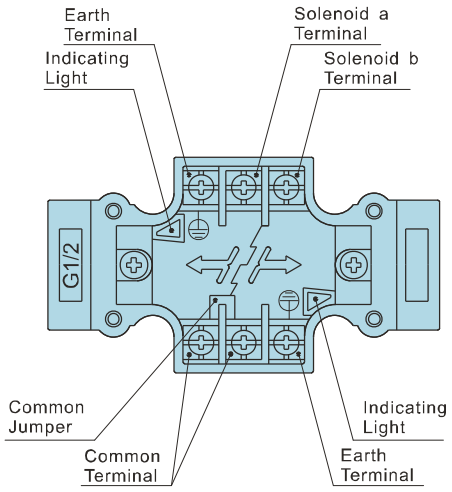
Viscosity of hydraulic fluid 32 mm^2/s {150 SUS}

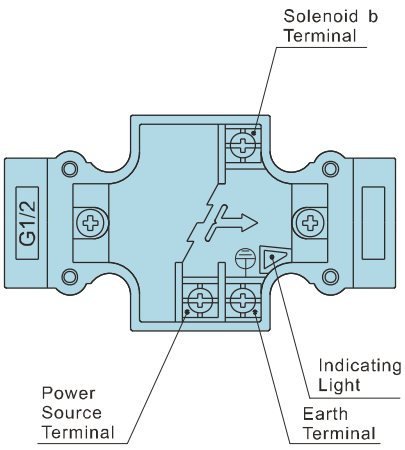


Model	Valve spool type	P→A	P→B	A→T	B→T	P→T
DFA-03 DFB-03 DFC-03 SERIES	2B8, 2B8L, 2D8	5	5	–	–	–
	2B2B	–	3	3	–	–
	2B2BL	3	–	–	3	–
	2B2, 2B2L, 2D2	3	3	4	4	–
	2B3, 2B3L	1	1	4	4	–
	2D3	2	2	1	1	–
	3C12	3	3	1	3	–
	3C11	1	3	3	3	–
	3C3	1	1	1	1	1
	3C2, 3C41, 3C40	3	3	3	3	–
	3C4	3	3	1	1	–
	3C60	7	7	7	7	6
	3C5	1	7	1	7	6
	3C9	1	1	3	3	–

Viscosity of hydraulic fluid 32 mm^2/s {150 SUS}

WIRING

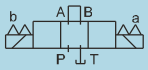
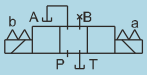
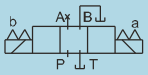
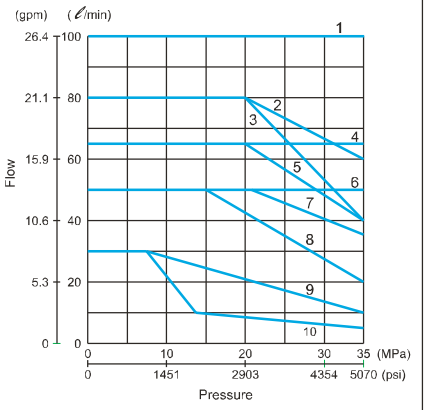


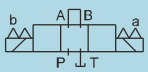
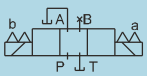
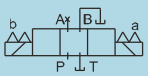
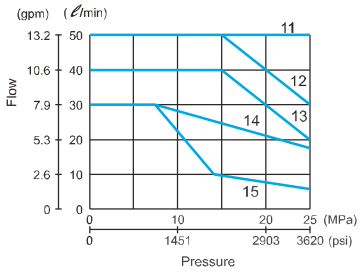


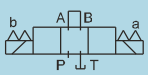
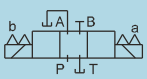
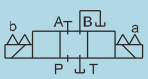
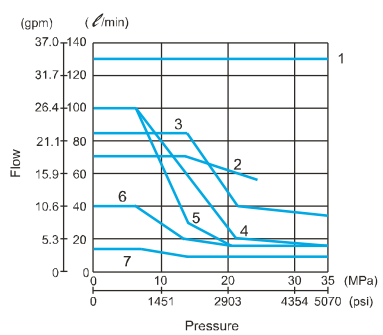
Notice:

1. Either one of two earth terminals can be used when ground wiring is necessary.
2. Common Jumper can be dismantled when unnecessary.
3. When using direct current solenoid, No polarity concerned.

Pressure-Flow characteristics

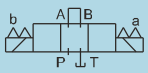
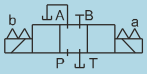
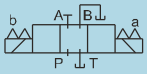
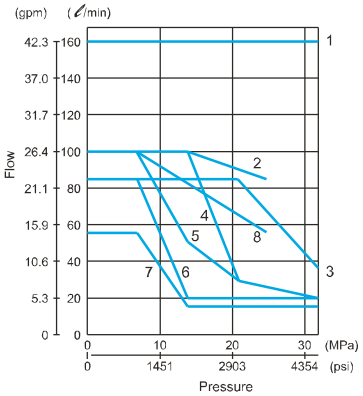
Size	Standard type			
	DFA/B/C-02-※-※-※-35(35C)			
Flow way / Spool type				
2B8, 2B8L	–	10	10	
2D8	–	9	9	
2B2, 2B2L	2	10	10	
2D2	1	9	9	
2B3, 2B3L	4	4	4	
2D3	4	4	4	
2B2B	1	–	10	
2B2BL	1	10	–	
3C12, 3C4	Note) 3(5)	10	10	
3C41, 3C11, 3C2, 3C40, 3C9	1	10	10	
3C3	6	6	6	
3C60, 3C5	Note) 7(8)	10	10	

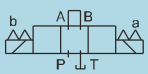
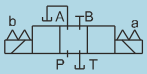
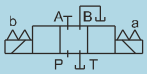
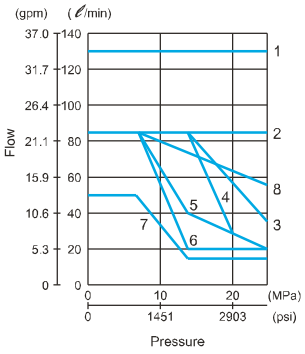
Size	Shockless type			
	S-DFA/B/C-02-※-※-※-35(35C)			
Flow way / Spool type				
2B8, 2B8L	–	15	15	
2D8	–	14	14	
2B2, 2B2L	11	15	15	
2D2	11	14	14	
2B3, 2B3L	11	11	11	
2D3	11	11	11	
2B2B	11	–	15	
2B2BL	11	15	–	
3C12, 3C4	12	15	15	
3C41, 3C11, 3C2, 3C40, 3C9	11	15	15	
3C3	11	11	11	
3C60, 3C5	13	15	15	

Size	Standard type			
	DFA/B/C-03-※-AC※-※-35/35H			
Flow way / Spool type				
2B8	–	6	5	
2B8L	–	5	6	
2D8	–	3	3	
2B2	1	5	5	
2B2L	1	5	5	
2B3	1	1	3	
2B3L	1	3	1	
2D2, 2D3	1	3	3	
2B2B	1	–	4	
2B2BL	1	4	–	
3C12, 3C41, 3C2, 3C4, 3C40	1	4	4	
3C11	1	7	4	
3C3	1	1	1	
3C9	1	7	7	
3C60, 3C5	2	2	2	

Note) In the case of rectifier built-in type solenoid valve, pressure-flow characteristics becomes (5), (8).

Pressure-Flow characteristics

Size	Standard type			
	DFA/B/C-03-※-DC※/RAC※-※-35/35H			
Flow way / Spool type				
2B8	–	5	6	
2B8L	–	6	5	
2D8	–	3	3	
2B2	1	4	6	
2B2L	1	6	4	
2B3	1	3	3	
2B3L	1	3	3	
2D2, 2D3	1	3	3	
2B2B	1	–	5	
2B2BL	1	5	–	
3C12, 3C41, 3C2, 3C4, 3C40	1	5	5	
3C11	1	7	5	
3C3	1	1	1	
3C9	1	7	7	
3C60, 3C5	Note) 2(8)	2(8)	2(8)	

Size	Shockless type			
	S-DFA/B/C-03-※-DC※/RAC※-※-35/35H			
Flow way / Spool type				
2B8	–	5	6	
2B8L	–	6	5	
2D8	–	3	3	
2B2	1	4	6	
2B2L	1	6	4	
2B3	1	3	3	
2B3L	1	3	3	
2D2, 2D3	1	3	3	
2B2B	1	–	5	
2B2BL	1	5	–	
3C12, 3C41, 3C2, 3C4, 3C40	1	5	5	
3C11	1	7	5	
3C3	1	1	1	
3C9	1	7	7	
3C60, 3C5	Note) 2(8)	2(8)	2(8)	

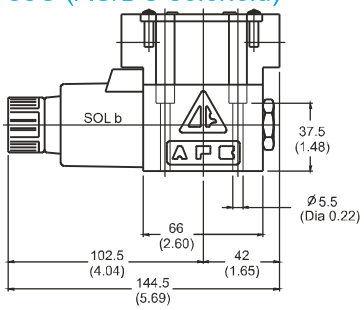
Note) In the case of rectifier built-in type solenoid valve, pressure-flow characteristics becomes (8).

Installation Dimensions

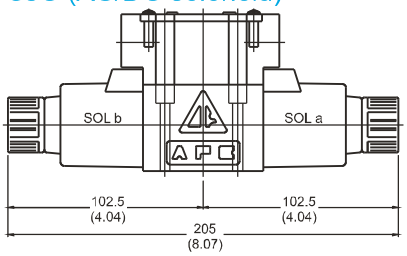
mm(inch)

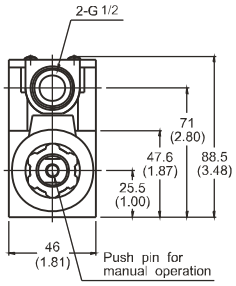
Joint Box Type
DFB-02-※-※-35(35C)

35 (AC solenoid)
35C (AC/DC solenoid)

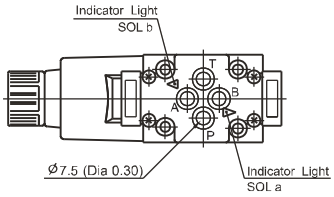


35 (AC solenoid)
35C (AC/DC solenoid)

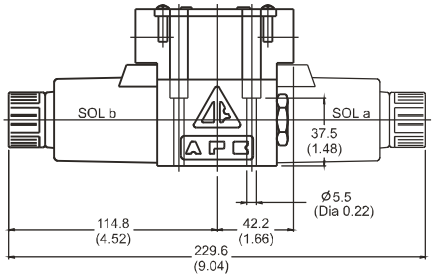




35 (AC solenoid)
35C (AC/DC solenoid)

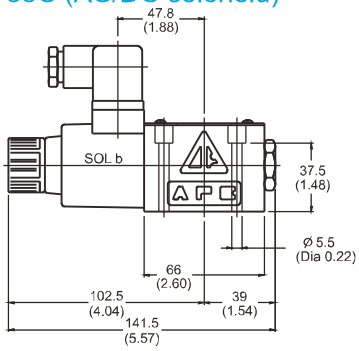


35 (DC solenoid)

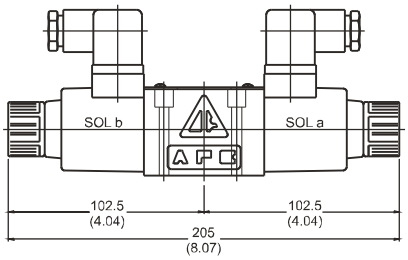


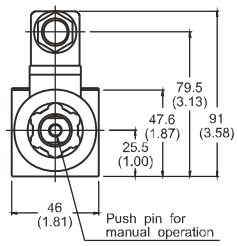
DIN Type
DFA-02-※-※-35(35C)

35 (AC solenoid)
35C (AC/DC solenoid)

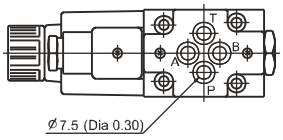


35 (AC solenoid)
35C (AC/DC solenoid)

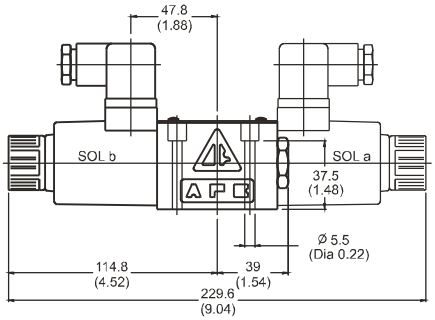




35 (AC solenoid)
35C (AC/DC solenoid)

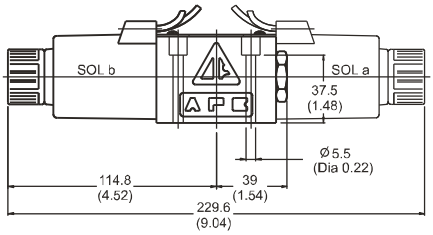


35 (DC solenoid)



Lead Wire Type
DFC-02-※-※-35

Lead Wire Type

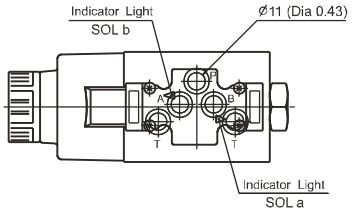


Installation Dimensions

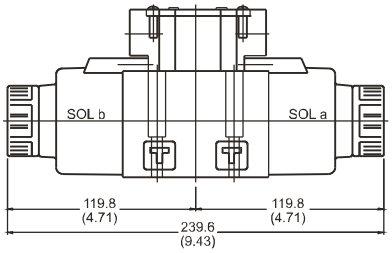
mm(inch)

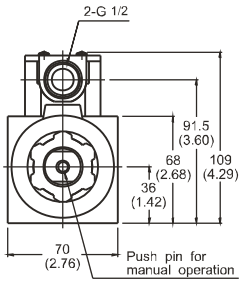
Joint Box Type
DFB-03-※-※-35

AC solenoid

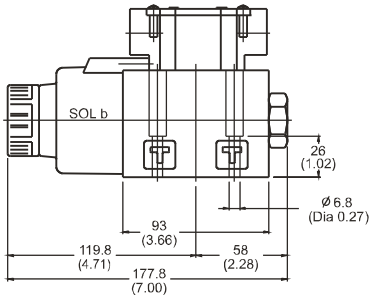


AC solenoid

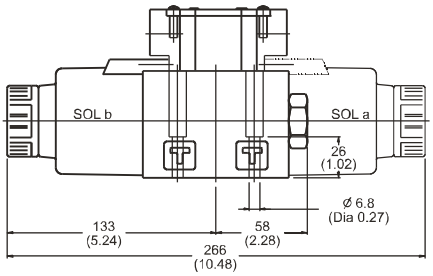




AC solenoid

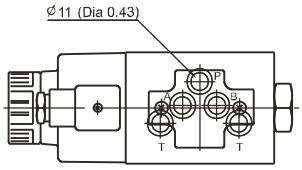


DC solenoid

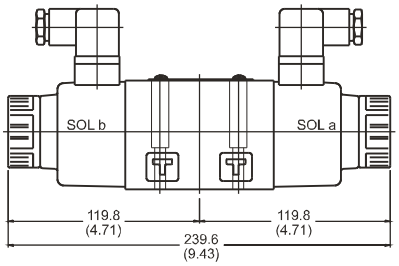


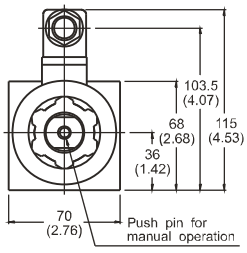
DIN Type
DFA-03-※-※-35

AC solenoid

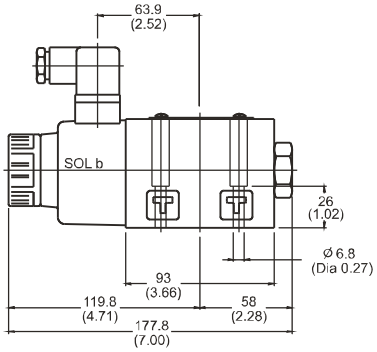


AC solenoid

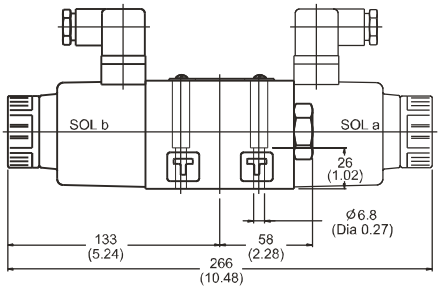




AC solenoid

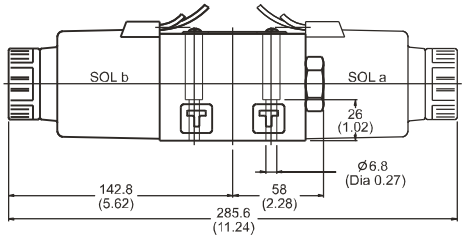


DC solenoid

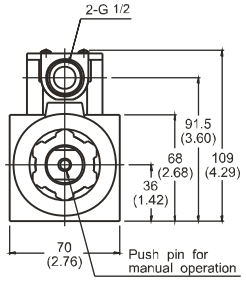


Lead Wire Type
DFC-03-※-※-35H

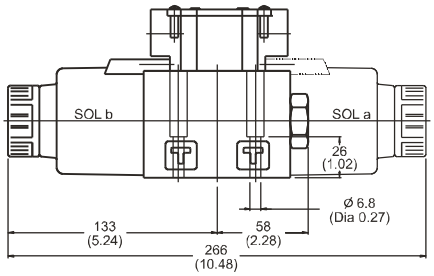
Lead Wire Type



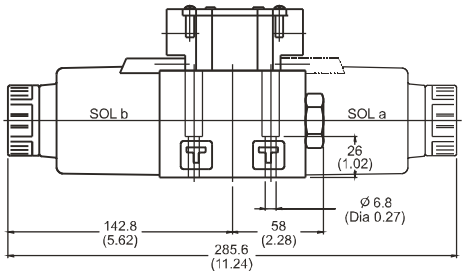
Joint Box Type
DFB-03-※-※-35H

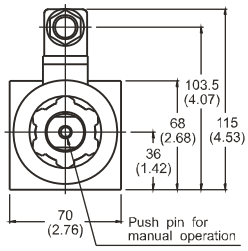


AC solenoid

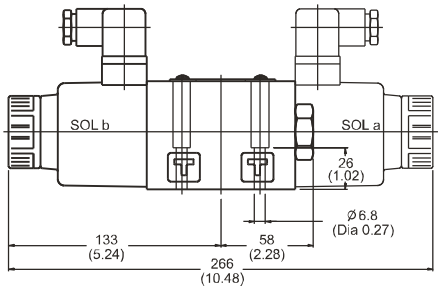


DC solenoid

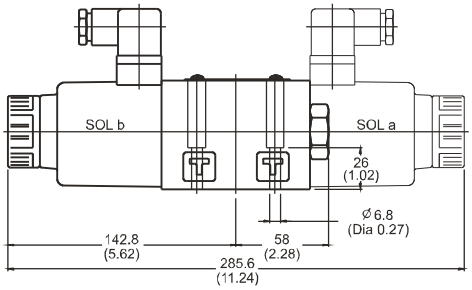




AC solenoid

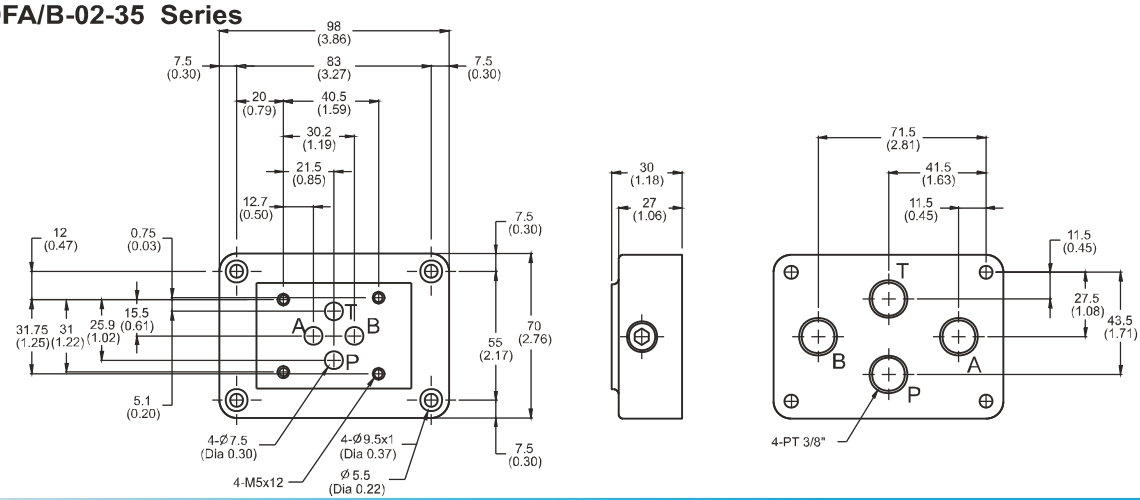


DC solenoid

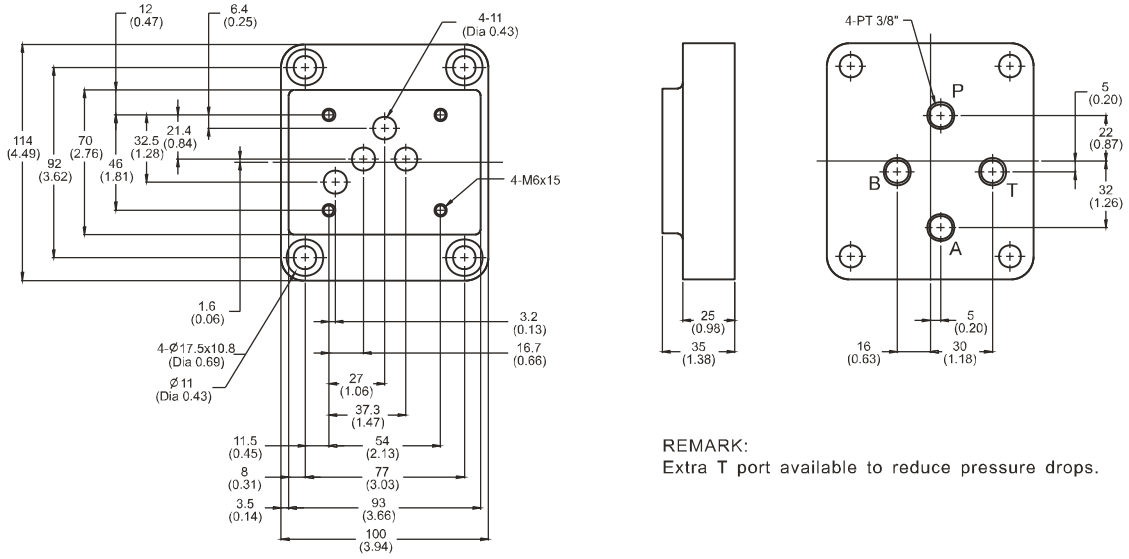


SUBPLATE mm(inch)

For DFA/B-02-35 Series



For DFA/B-03-35(H) Series



REMARK:
Extra T port available to reduce pressure drops.