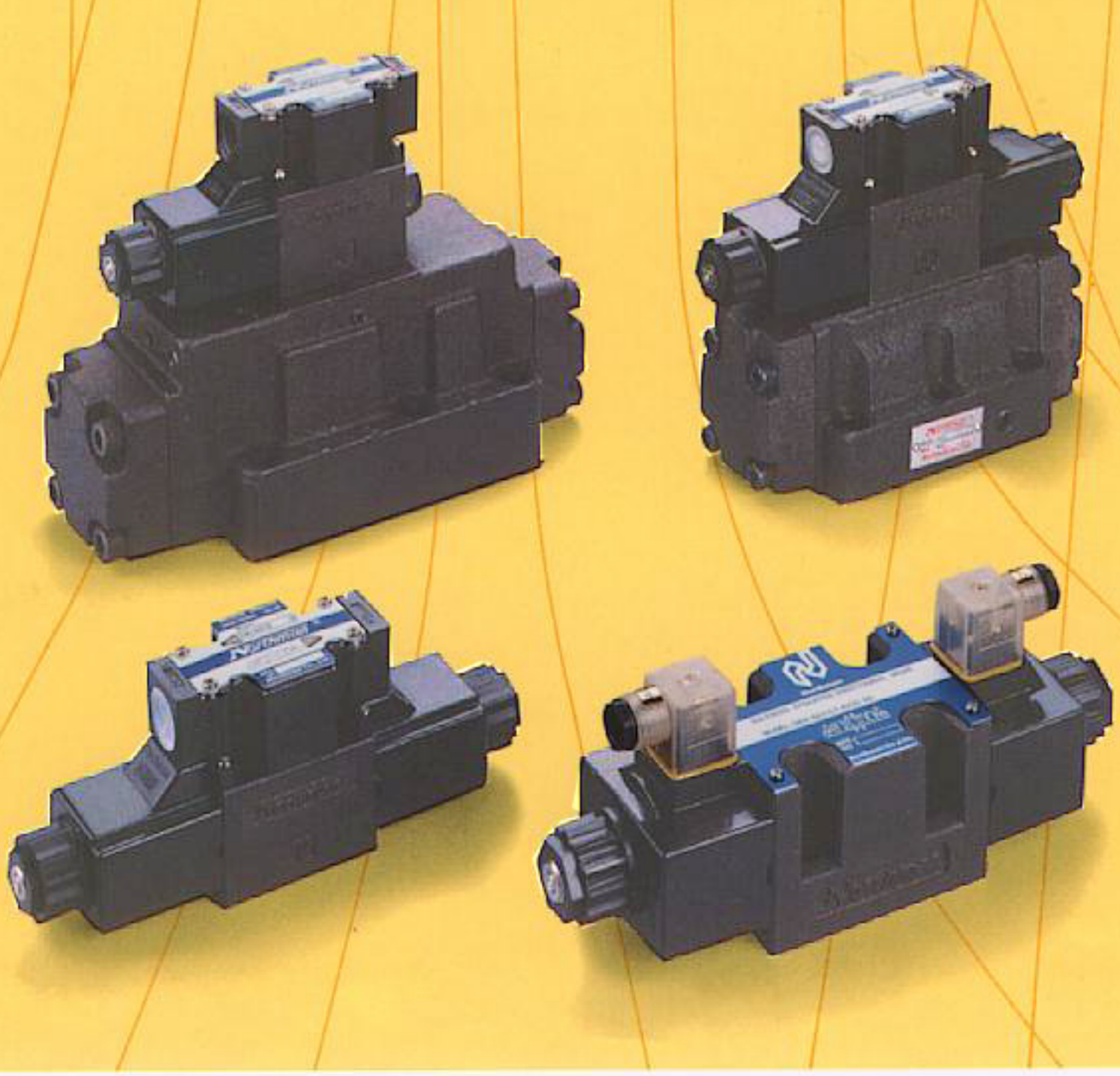
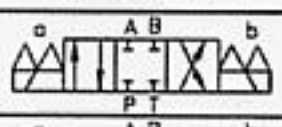
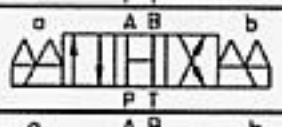
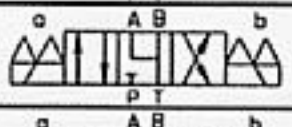
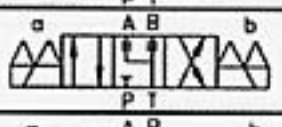
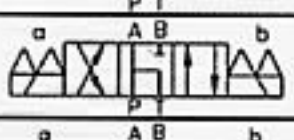
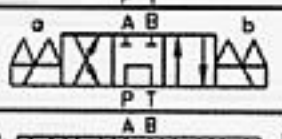
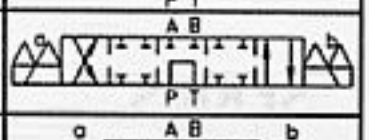
Northman



HYDRAULIC SOLENOID VALVE

INDEX

SPOOL TYPE

APPLICATION	TYPE	GRAPHIC SYMBOLS
THREE POSITION SPRING CENTERED	C2	
	C3	
	C4	
	C40	
	C5	
	C6	
	C60	
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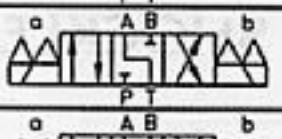
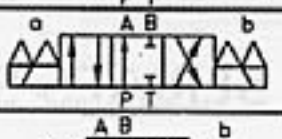
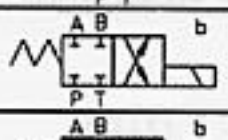
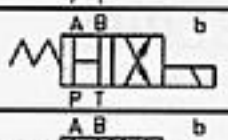
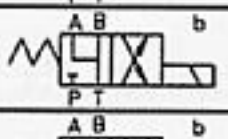
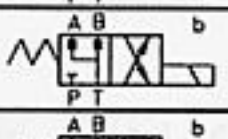
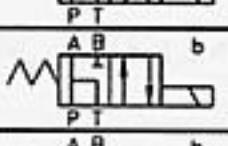
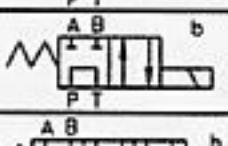
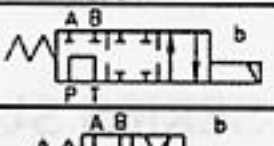
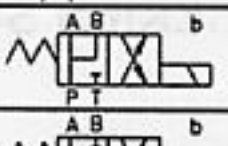
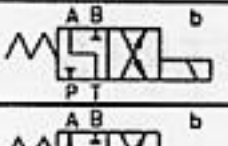
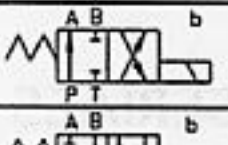
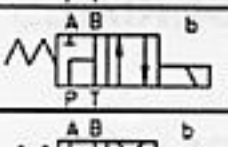
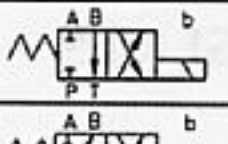
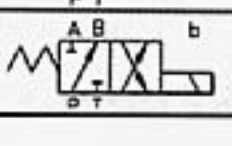
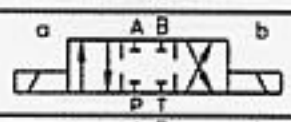
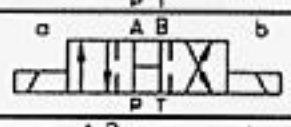
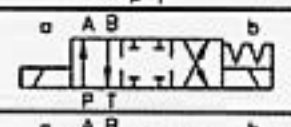
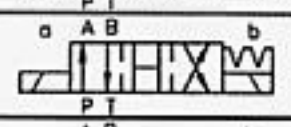
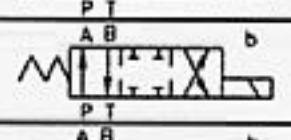
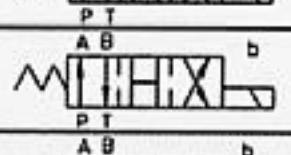
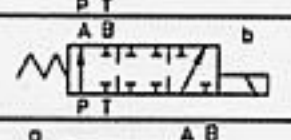
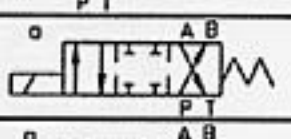
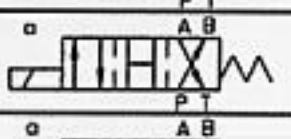
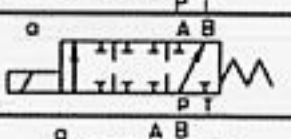
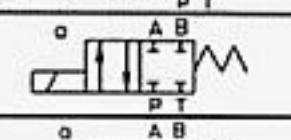
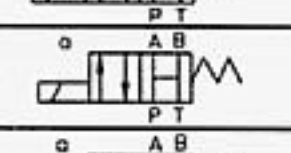
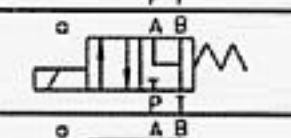
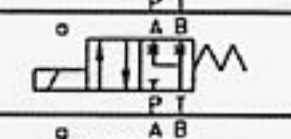
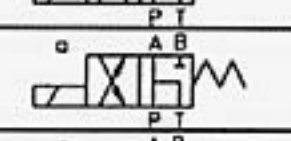
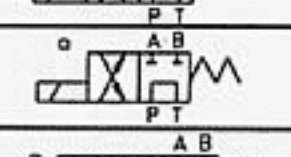
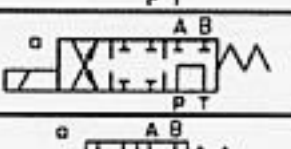
	C8	
	C9	
TWO POSITION SPRING OFFSET (SOENOID B)	C2B	
	C3B	
	C4B	
	C40B	
	C5B	
	C6B	
	C60B	
	C7B	
	C8B	
	C9B	
	C5SB	
	C8SB	
	C9SB	

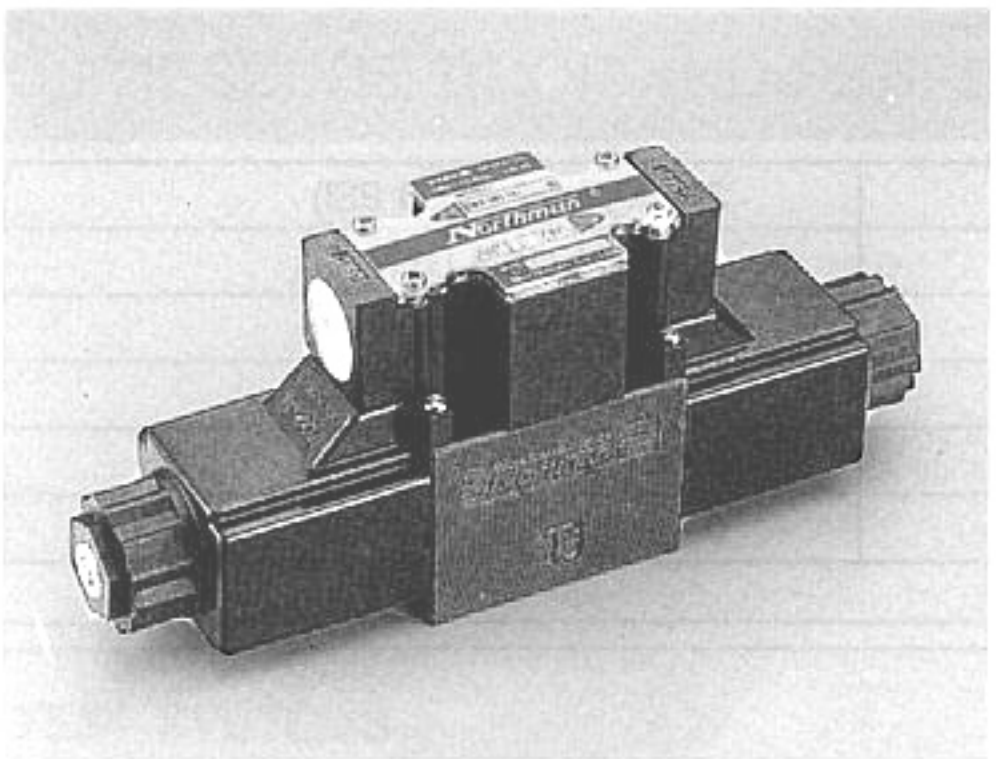
APPLICATION	TYPE	GRAPHIC SYMBOLS
TWO POSITION WITHOUT SPRING WITHOUT CENTERING	N2	
	N3	
TWO POSITION DETENT	D2	
	D3	
TWO POSITION SPRING OFFSET (SOLENOID B)	B2	
	B3	
	B20	
TWO POSITION SPRING OFFSET (SOLENOID A)	B2S	
	B3S	
	B20S	
	C2BS	
	C3BS	
	C4BS	
	C40BS	
	C5BS	
	C6BS	
	C60BS	
	C7BS	
	C8BS	
	C9BS	
THREE POSITION SPRING CENTERED	C5S	
	C8S	
	C9S	

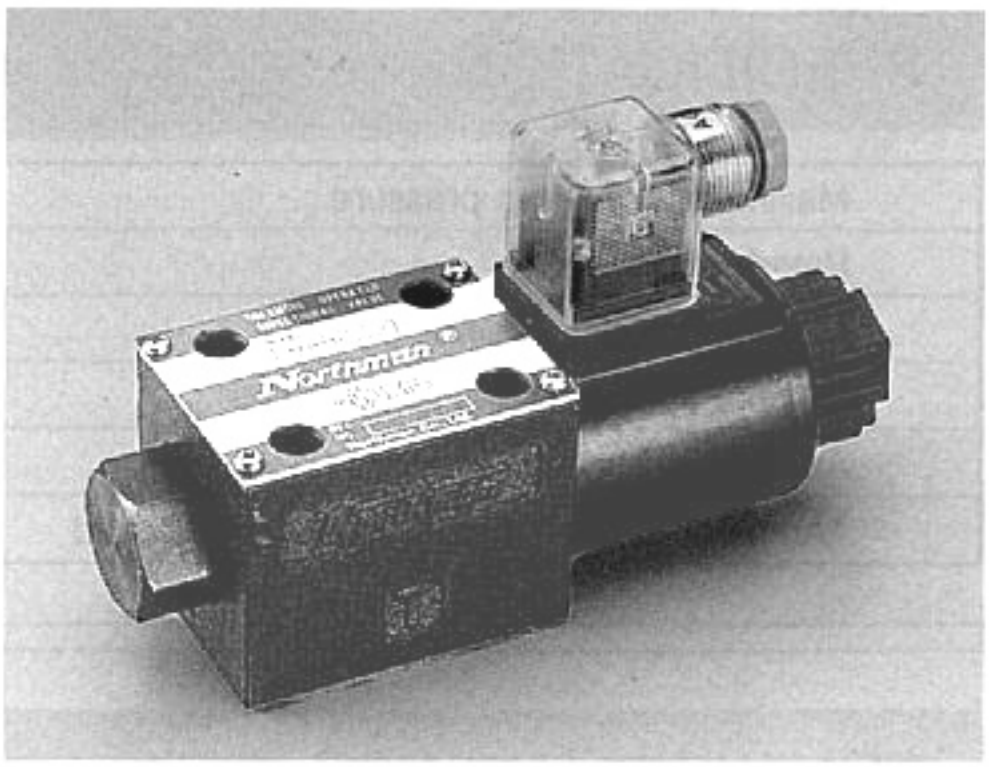
PORT INTERCONNECTION:

- WITH SOLENOID "A" ENERGIZED P- >A B- >T
- WITH SOLENOID "B" ENERGIZED P- >B A- >T
- BUT PORT INTERCONNECTIONS ARE REVERSED FOR C5,C6,C60 TYPE.

Northman

SOLENOID OPERATED DIRECTIONAL VALVE
SWH-G02 SERIES





FEATURES

- Armature operates in oil system. Impact is cushioned, noise is reduced, solenoid life is increased.
- Wet armature solenoid eliminates push pin seal, therefore no seal wear, drop or leakage for longer valve life.
- Molded coils for maximum insulating properties, which is impervious to moisture and dirt.
- Plug-in solenoid, for ease of maintenance.
- All spools and bodies are interchangeable, simplifying maintenance.
- Indicating signal lights are standard.
- High pressure, high flow rating, Provides low pressure drop, with maximum performance.
- Specially designed, balanced spool allows proper shifting force, for maximum reliability and long life.

HOW TO ORDER

SWH – G02 – C2 – A220 – 10 – LS

- SWH: HIGH PRESSURE HIGH FLOW SOLENOID DIRECTIONAL VALVE
- G02: SUBPLATE MOUNTED
- NOMINAL SIZE: 1/4'' (D03) 8m/m
- C2: SPOOL TYPE (SEE PAGE2)
- A220: COIL VOLTAGE:
  - A240: AC240V,60Hz ; AC220V,50Hz
  - A220: AC220V,60Hz ; AC200V,50Hz
  - A120: AC120V,60Hz ; AC110V,50Hz
  - A110: AC110V,60Hz ; AC100V,50Hz
  - R240: AC240V,60Hz ; AC220V,50Hz
  - R220: AC220V,60Hz ; AC200V,50Hz
  - R120: AC120V,60Hz ; AC110V,50Hz
  - R110: AC110V,60Hz ; AC100V,50Hz
  - D12: DC12V
  - D24: DC24V
- 10: WIRING:
  - 10: JOINT BOX WITH INDICATING LIGHT
  - 20: HIRSCHMANN TYPE WITH INDICATING LIGHT
  - 31: LEAD WIRE
  - 41: DUAL SPADES TYPE (SAE J858a)
- LS: NO CODE: STANDARD; LS: LOW SURGE VOLTAGE (SEE PAGE 8)

SPECIFICATIONS

Maximum operating pressure	315 kgf/cm² (4500 PSI)
Rated flow capacity	63 LPM (16.8 GPM)
Maximum tank line back pressure	140 kgf/cm² (2000 PSI)
Maximum frequencies of operation	300 CPM
Application recommended	25 Micron
*Ambient temperature range recommended	0 – 55°C

SOLENOID RATINGS

ELECTRIC SOURCE	COIL TYPE	Hz	VOLTAGE (V)		CURRENT & POWER AT RATED VOLTAGE		
			SOURCE RATED	RANGE	IN-RUSH CURRENT (A)	HOLDING CURRENT (A)	WATTAGE
A.C.	A110	50	100	90-110	1.6	0.46	
		60	100	90-110	1.4	0.32	
			110	99-121	1.5	0.39	
	A120	50	110	99-121	1.3	0.38	
		60	120	108-132	1.2	0.27	
	A220	50	200	180-220	0.80	0.23	
		60	200	180-220	0.70	0.16	
			220	198-242	0.75	0.19	
	A240	50	220	198-242	0.67	0.19	
		60	240	216-264	0.59	0.13	
	R110	50	100	90-110	0.3	0.44	
		60	110	99-121	0.3	0.3	
	R220	50	200	180-220	0.15	0.19	
		60	220	198-242	0.15	0.15	
D.C.	D12	12		10.8-13.2	2.2	2.2	26
	D24	24		21.6-26.4	1.1	1.1	

TECHNICAL DATA:

- Solenoid can be used within −10% to +10% of the rated voltage of the coil.
- Withstand voltage 1500 v/sec.
- Insulation resistance over 100MΩ.
- A momentary signal of approx. 0.1 second is required for shifting action.

ACCESSORIES:

- Mounting bolt kits are supplied with valve socket head cap screws
  M5×45L 4 pieces (#10-24UNC×1¾"L) for tightening torque 50-70 kgf-cm. (43.3-60.6 lbs-in).
- 0-ring AS568-012 4 pieces.

PRESSURE DROP AND PERFORMANCE CURVES

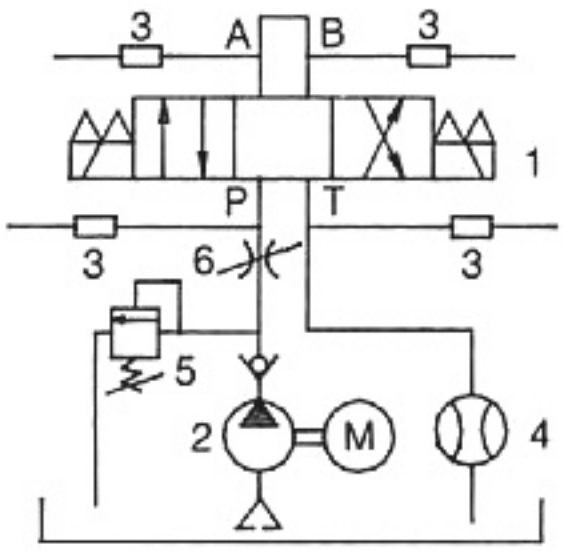
TEST SYSTEMS

1) Testing Valve
2) Pump
3) Pressure Sensor
4) Flow Sensor
5) Relief Valve
6) Throttle Valve

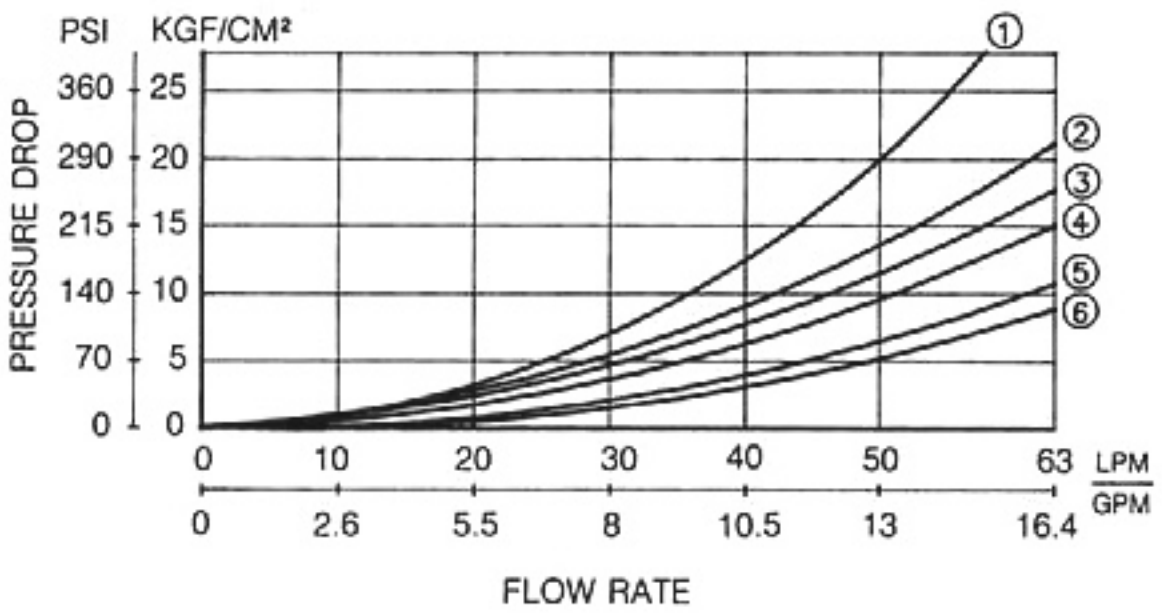
TEST CONDITIONS

Pressure: 70kgf/cm² (1000PSI)
Flow Rate: 63 LPM (16.8GPM)
Viscosity: 35 CST

TEST CIRCUIT



PERFORMANCE CURVES



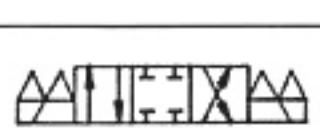
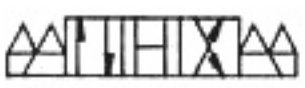
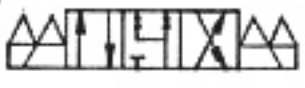
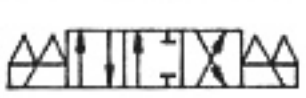
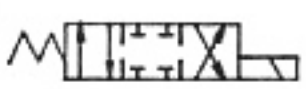
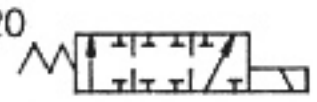
MODEL NO.	Pressure Drop Curve Number				
	P– >A	B– >T	P– >B	A– >T	P– >T
C2	5	5	5	5	–
C3	6	6	6	6	4
C4	5	6	5	6	–
C40	5	5	5	5	–
C5	2	2	2	2	4
C6	1	1	1	1	4
C60	1	1	1	1	3
C7	6	5	6	5	–
C8	5	5	5	6	–
C9	6	5	5	5	–
D2	5	5	5	5	–
D3	5	3	5	3	–
B2	4	5	4	5	–
B3	3	3	5	5	–
B20	2	–	5	–	–
B2S	4	5	4	5	–
B3S	5	5	3	3	–
B20S	5	–	2	–	–

CONTRAST CHART BETWEEN FACTORS AND VISCOSITIES

Viscosity	CST	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor (G')		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

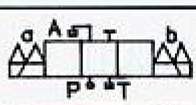
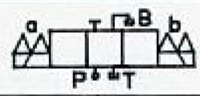
The pressure drop (△P') can be obtained from the formula △P' = △p(G'/0.85) for other specific gravity (G').

LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOWRATE LPM(GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI)								
SPOOL TYPE NORMAL POSITION	P->A,B->T P->B,A->T 						P->A	
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)
C2 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	40(10.7) 32 (8.5)	40(10.7) 25 (6.7)
C3 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)
C4 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	40(10.7) 32 (8.5)	40(10.7) 25 (6.7)
C40 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	40(10.7) 32 (8.5)	40(10.7) 25 (6.7)
C5 	50(13.3)	50(13.3)	50(13.3)	50(13.3)	50(13.3)	—	50(13.3)	50(13.3)
C6 	40(10.7)	40(10.7)	40(10.7)	40(10.7)	40(10.7)	—	40(10.7)	40(10.7)
C7 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	40(10.7) 32 (8.5)	40(10.7) 25 (6.7)
C8 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	40(10.7) 32 (8.5)	40(10.7) 25 (6.7)
C9 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	40(10.7) 32 (8.5)	40(10.7) 25 (6.7)
B2 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	20(5.3)	20(5.3)
B3 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)
B20 	—	—	—	—	—	—	35 (9.3)	32 (8.5)
D2 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	40(10.7)	30 (8)
D3 	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	40(10.7)	30 (8)

NOTE: 40(10.7) / 32(8.5)

1. The figures in the square shows the parameter among voltage & flow under saturated temperature and 90% applied voltage.
2. The upperside number in table describes the maximun flow under DC and RF. the lowerside number in table describes the maximun flow under AC.

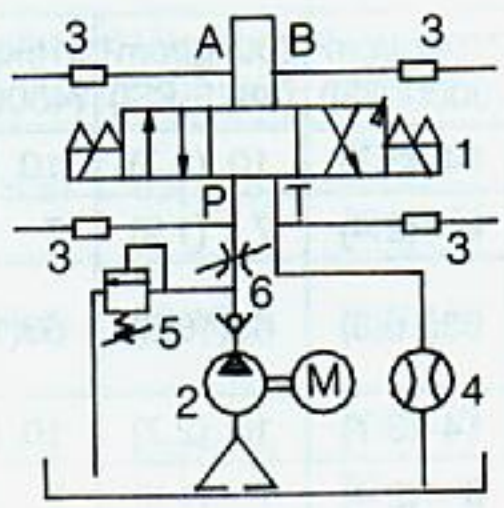
				P－>B 					
150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)	40(10.7)	40(10.7)	18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)
12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)	32 (8.5)	25 (6.7)	12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)
63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)
18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)	40(10.7)	40(10.7)	18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)
12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)	32 (8.5)	25 (6.7)	12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)
18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)	40(10.7)	40(10.7)	18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)
12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)	32 (8.5)	25(6.5)	12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)
50(13.3)	50(13.3)	50(13.3)	—	50(13.3)	50(13.3)	50(13.3)	50(13.3)	50(13.3)	—
40(10.7)	40(10.7)	40(10.7)	—	40(10.7)	40(10.7)	40(10.7)	40(10.7)	40(10.7)	—
18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)	40(10.7)	40(10.7)	18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)
12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)	32 (8.5)	25 (6.7)	12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)
18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)	40(10.7)	40(10.7)	18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)
12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)	32 (8.5)	25 (6.7)	12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)
18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)	40(10.7)	40(10.7)	18 (4.8)	14 (3.7)	10 (2.7)	10 (2.7)
12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)	32 (8.5)	25 (6.7)	12 (3.2)	9 (2.4)	7 (1.9)	7 (1.9)
20 (5.3)	20 (5.3)	20 (5.3)	20 (5.3)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)
63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	63(16.8)	37 (9.9)	30 (8)	28 (7.5)
				45 (12)	45 (12)	45 (12)	45 (12)	45 (12)	45 (12)
25 (6.7)	20 (5.3)	18 (4.8)	15 (4)	63(16.8)	50(13.3)	45 (12)	40(10.7)	32 (8.5)	25 (6.7)
				45 (12)	30 (8)	28 (7.5)	25 (6.7)	22 (5.9)	18 (4.8)
25 (6.7)	21 (5.6)	16 (4.3)	13 (3.5)	40(10.7)	30 (8)	25 (6.7)	21 (5.6)	16 (4.3)	13 (3.5)
25 (6.7)	21 (5.6)	16 (4.3)	13 (3.5)	40(10.7)	30 (8)	25 (6.7)	21 (5.6)	16 (4.3)	13 (3.5)

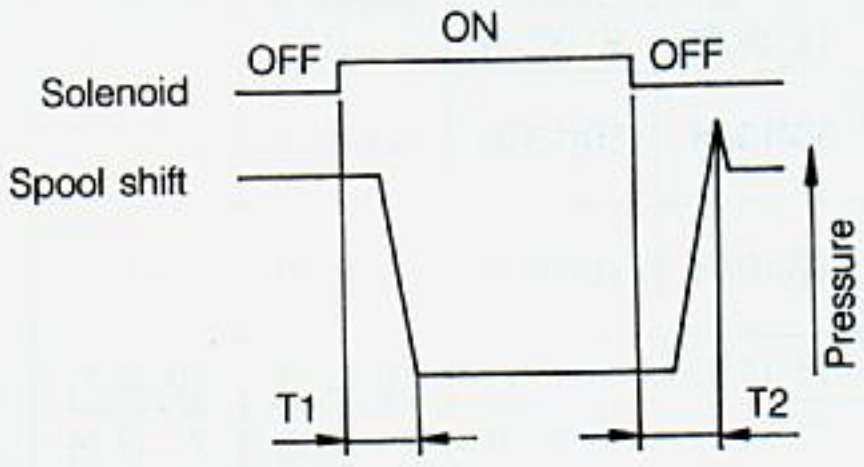
RESULT OF MEASUREMENTS

TEST SYSTEMS
1. Testing Valve
2. Pump
3. Pressure Sensor
4. Flow Sensor
5. Relief Valve
6. Throttle Valve

TEST CONDITIONS
Pressure: 140 kgf/cm² (2000 PSI)
Flow Rate: 30 LPM (8 GPM)
Viscosity: 35 CST

TEST CIRCUIT





MODEL	CHANGE OVER TIME (sec)	
	T1	T2
SWH-G02-AC SERIES	0.01-0.04	0.02-0.04
SWH-G02-DC SERIES	0.02-0.06	0.02-0.04

OPTION LS

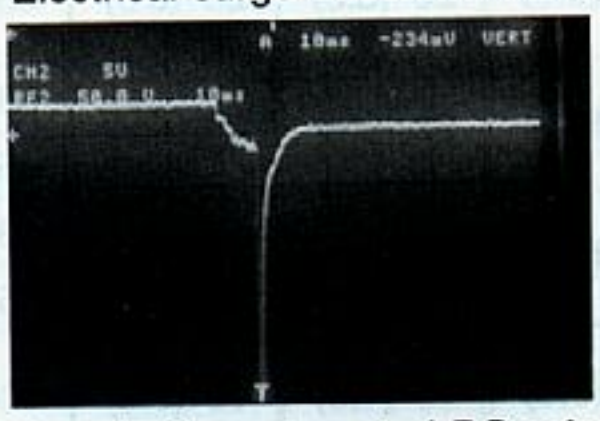
Electrical Surge Control Model

Valve model: SWH-G02- ※※※ -D ※※ - ※※ -LS

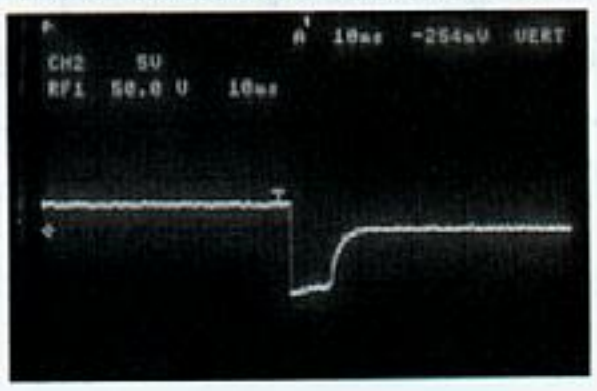
Features
- Suppresses the surge voltage.
- Eliminates sparks between relay contacts.
- Extends the life of the relay contact.

Effects
- Improves the reliability of the control relay.
- Extends the life of conventional relays.
- Can be operated with a miniature relay.
- The RAC rectifier built-in DC model eliminate sparks at the control relay contact. It can be directly operated with a PLC (programmable logic controller).

Electrical surge waveform standard DC solenoid.



Electrical surge control DC solenoid.



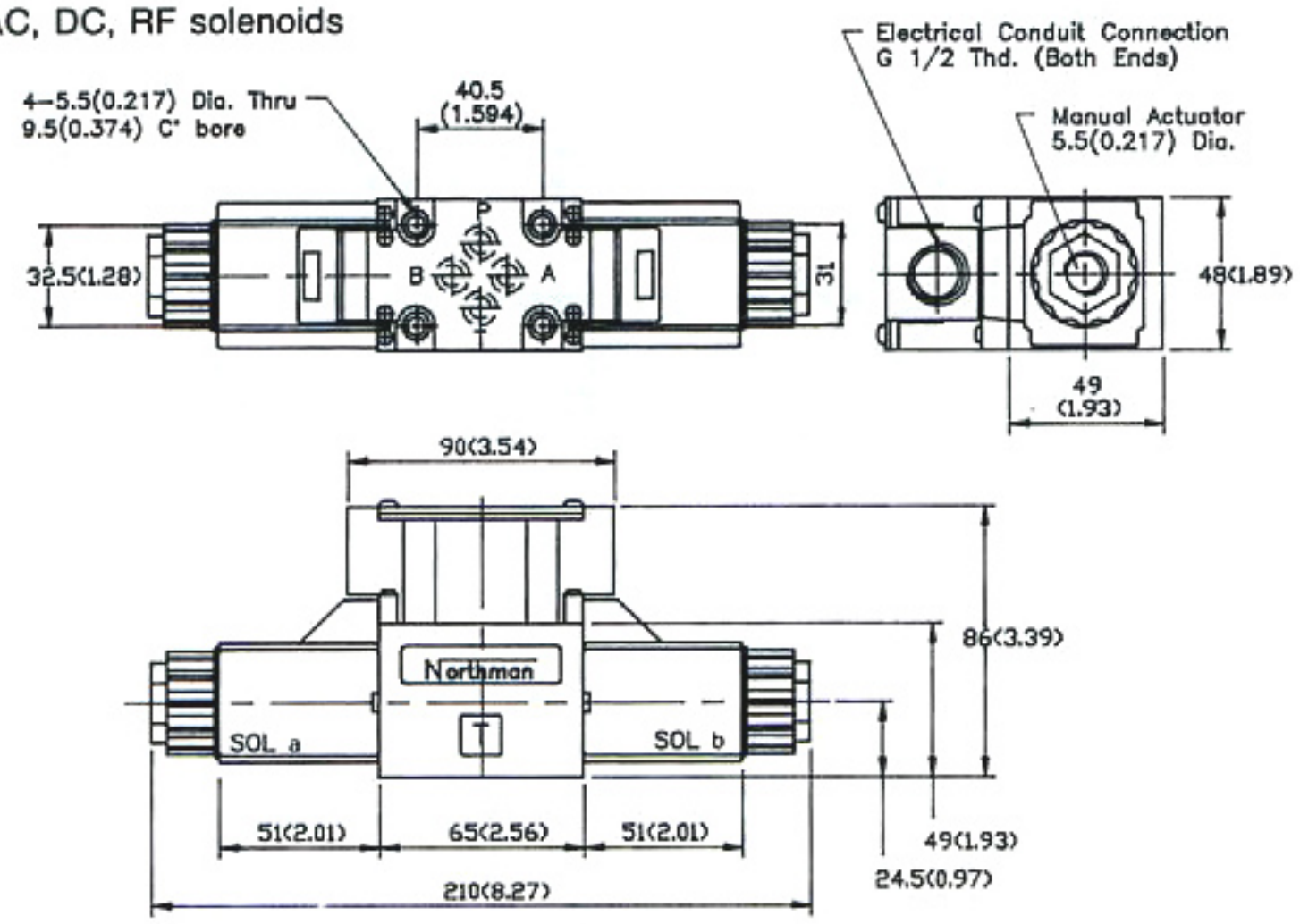
Mounting Surface: ISO 4401-AB-03-4-A

INSTALLATION DIMENSIONS

UNIT: mm (inch)
WEIGHT: 2.0 kgs (4.4 lbs)

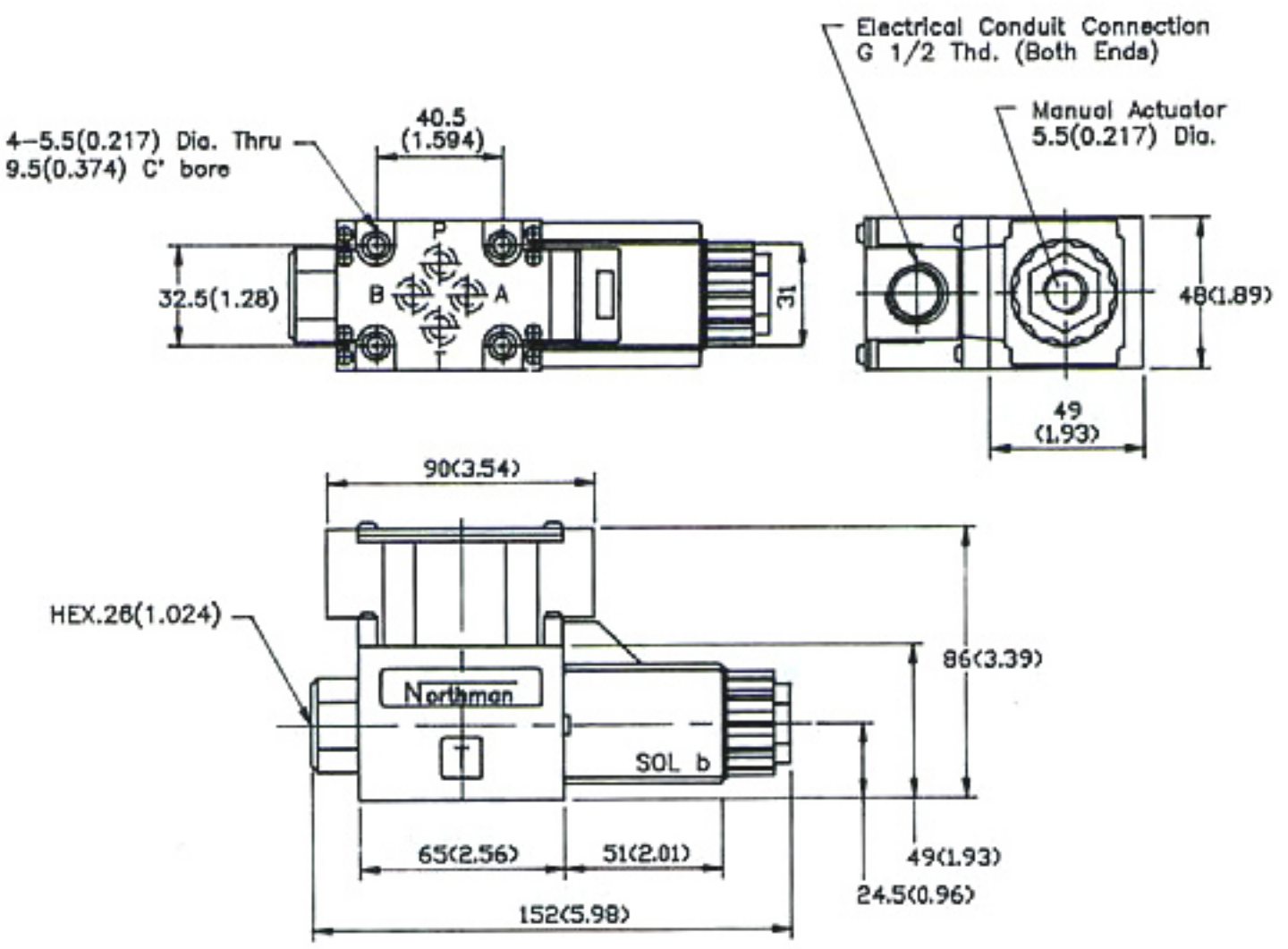
SWH-G02-C ※※ - ※※※※ -10- ※※

Models with AC, DC, RF solenoids



SWH-G02-B ※※ - ※※※※ -10- ※※

Models with AC, DC, RF solenoids

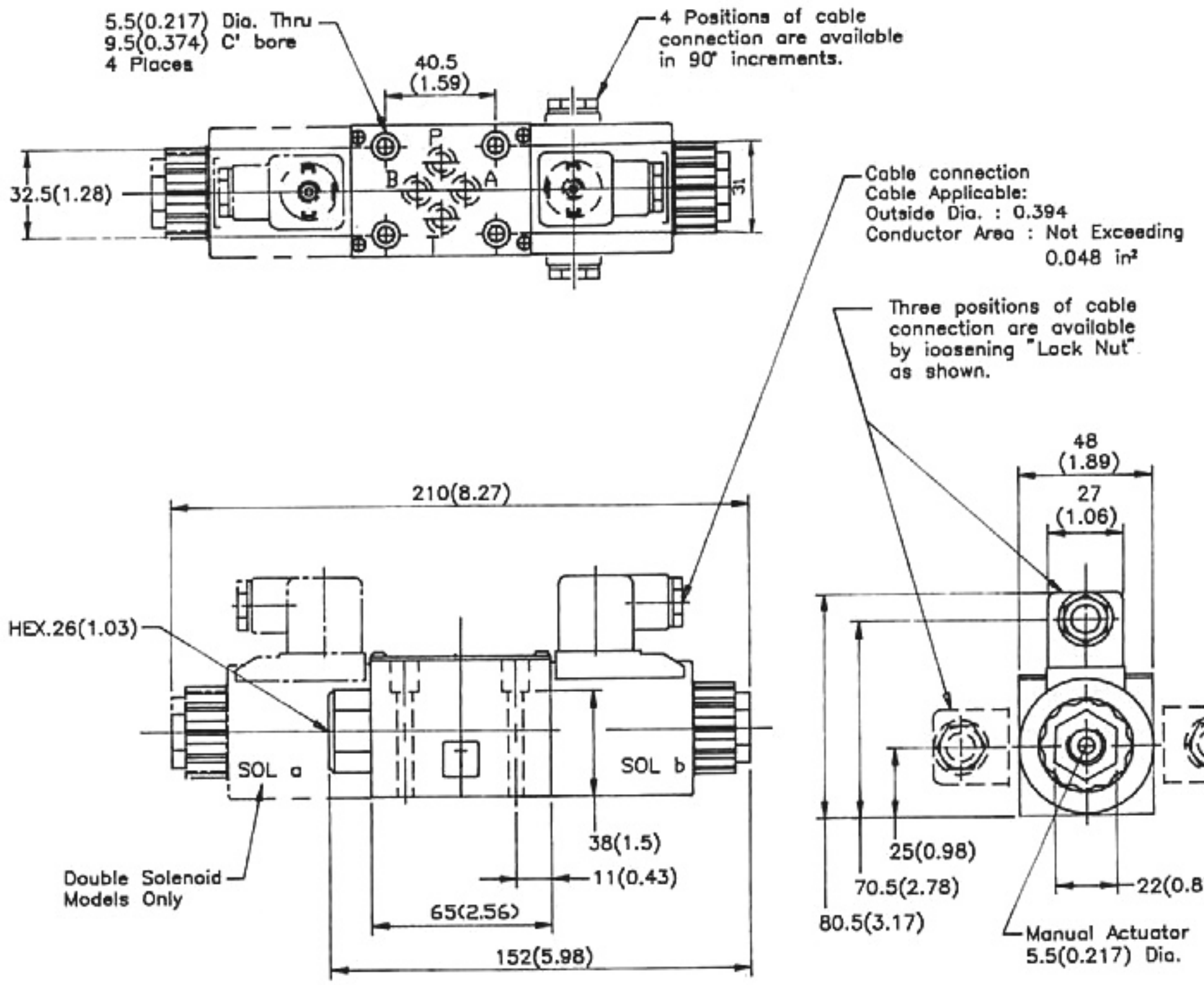


INSTALLATION DIMENSIONS

UNIT: mm (inch)
WEIGHT: 2.0kgs (4.4lbs)

SWH-G02-✻✻✻ - ✻✻✻✻ -20- ✻✻

Models with AC, DC, RF solenoids



MODEL AND WEIGHT

MODEL	WEIGHT kg(lb)	MODEL	WEIGHT kg(lb)
SWH-G02-C✻✻- A✻✻✻-10-✻✻	1.9(4.18)	SWH-G02-C - A✻✻✻-20-✻✻	1.9(4.18)
SWH-G02-B✻✻- A✻✻✻-10-✻✻	1.6(3.52)	SWH-G02-B - A✻✻✻-20-✻✻	1.5(3.3)
SWH-G02-C✻✻- D/R✻✻✻-10-✻✻	2.0(4.4)	SWH-G02-C - D/R✻✻✻-20-✻✻	2.0(4.4)
SWH-G02-B✻✻- D/R✻✻✻-10-✻✻	1.6(3.52)	SWH-G02-B - D/R✻✻✻-20-✻✻	1.6(3.52)
SWH-G02-D✻✻- A✻✻✻-10-✻✻	1.9(4.18)	SWH-G02-D - A✻✻✻-20-✻✻	1.9(4.18)
SWH-G02-D✻✻- D/R✻✻✻-10-✻✻	1.9(4.18)	SWH-G02-D - D/R✻✻✻-20-✻✻	1.9(4.18)

FEATURES

- Armature operates in oil system. Impact is cushioned, noise is reduced, solenoid life is increased.
- Wet armature solenoid eliminates push pin seal, therefore no seal wear, drop or leakage for longer valve life.
- Molded coils for maximum insulating properties, which is impervious to moisture and dirt.
- Plug-in solenoid, for ease of maintenance.
- All spools and bodies are interchangeable, simplifying maintenance.
- Indicating signal lights are standard.
- High pressure, high flow rating, Provides low pressure drop, with maximum performance.
- Specially designed, balanced spool allows proper shifting force, for maximum reliability and long life.
- Hydraulic shock caused by abrupt change in the flow condition at flow cut off is minimized by a specially machines spool.
- Specifically designed to control the shock or "bang" in hydraulic systems.
- Minimizes the effect of pressure spikes or instantaneous high flow rates common in many hydraulic systems.
- A.C. coil design with flexible timing characteristics when compared to rectified D.C. coil technology.

HOW TO ORDER

SWH – G02 – C2 – R220 – 10 – M

- M: HYDRAULIC SHOCKLESS TYPE
- WIRING:
  10: JOINT BOX WITH INDICATING LIGHT
  20: HIRSCHMANN TYPE WITH INDICATING LIGHT
- COIL VOLTAGE:
  R240: AC240V,60Hz ; AC220V,50Hz
  R220: AC220V,60Hz ; AC200V,50Hz
  R120: AC120V,60Hz ; AC110V,50Hz
  R110: AC110V,60Hz ; AC100V,50Hz
  D12: DC12V
  D24: DC24V
- SPOOL TYPE (SEE PAGE 2)
- NOMINAL SIZE: 1/4" (D03)
- SUBPLATE MOUNTED
- HIGH PRESSURE HIGH FLOW SOLENOID DIRECTIONAL VALVE

SHOCKLESS TYPE
SWH-G02 SERIES

SPECIFICATIONS

Maximum operating pressure	210 kgf/cm² (3000 PSI)
Rated flow capacity	40 LPM (10.5 GPM)
Maximum tank line back pressure	140 kgf/cm² (2000 PSI)
Maximum frequencies of operation	120 CPM
Application recommended *Filtration	25 Micron
*Ambient temperature range recommended	0 – 55°C

REMARK: Installation dimensions see page 9 , 10.

SOLENOID RATINGS

ELECTRIC SOURCE	COIL TYPE	Hz	VOLTAGE (V)		CURRENT & POWER AT RATED VOLTAGE		
			SOURCE RATED	RANGE	IN-RUSH CURRENT (A)	HOLDING CURRENT (A)	WATTAGE
R.F.	R220	50 60	AC220	198-242	0.30	0.30	26
	R110	50 60	AC110	99-121	0.15	0.15	
DC	D24		DC24	21.6-26.4	1.1	1.1	
	D12		D12	10.8-13.2	2.2	2.2	

TECHNICAL DATA:

- Solenoid can be used within −10% to +10% of the rated voltage of the coil.
- Withstand voltage 1500 v/sec.
- Insulation resistance over 100MΩ.
- A momentary signal of approx. 0.1 second is required for shifting action.

ACCESSORIES:

- Mounting bolt kits are supplied with valve socket head cap screws M5 × 45L 4 pieces (#10-24UNC × 1¾"L) for tightening torque 50-70 kgf-cm. (43.3-60.6 lbs-in).
- 0-ring AS568-012 4 pieces.

PRESSURE DROP AND PERFORMANCE CURVES

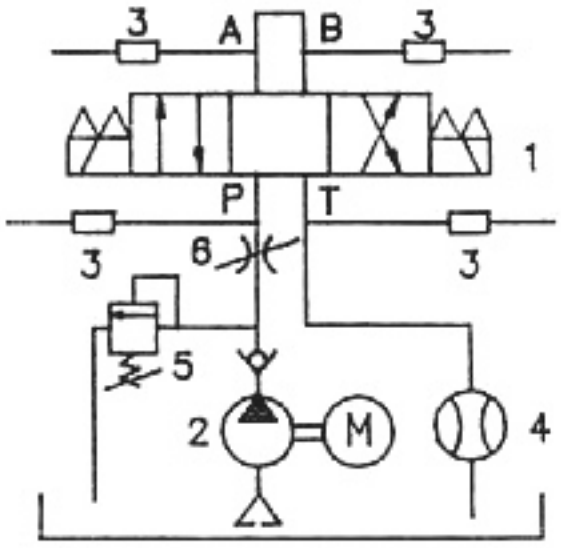
TESTE SYSTEMS

1) Testing Valve
2) Pump
3) Pressure Sensor
4) Flow Sensor
5) Relief Valve
6) Throttle Valve

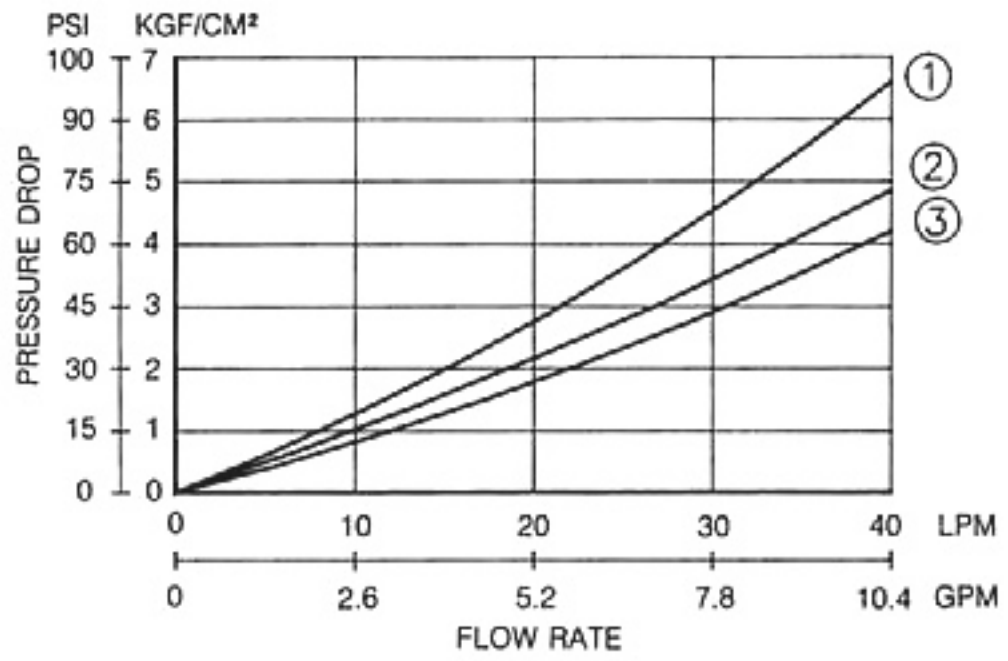
TEST CONDITIONS

Pressure: 70kgf/cm² (1000PSI)
Flow Rate: 63 LPM (16.8GPM)
Viscosity: 35 CST

TEST CIRCUIT



PERFORMANCE CURVES



MODEL NO.	Pressure Drop Curve Number			
	P– >A	B– >T	P– >B	A– >T
C2	2	2	2	2
C4	2	3	2	3
B3	1	1	2	2

CONTRAST CHART BETWEEN FACTORS AND VISCOSITIES

Viscosity	CST	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor (G')		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

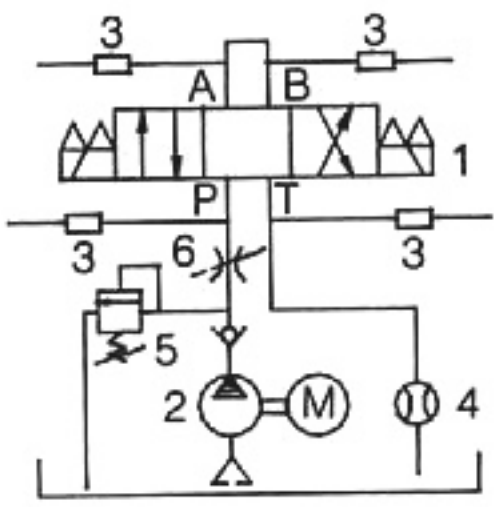
The pressure drop (△P') can be obtained from the formula
△P' = △p(G'/0.85) for other specific gravity (G').

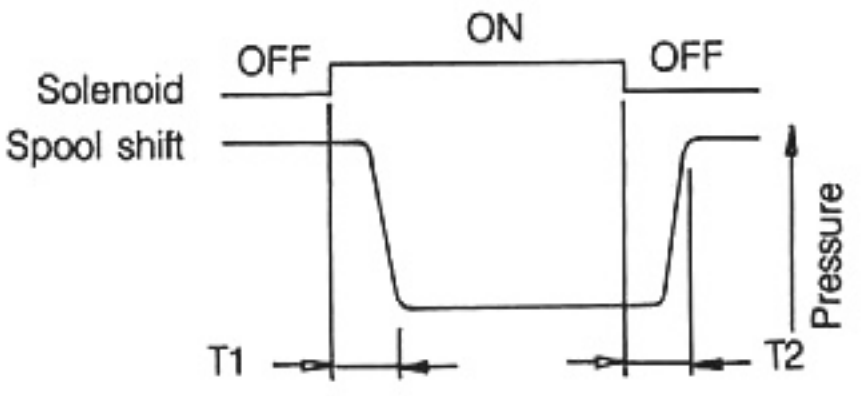
RESULT OF MEASUREMENTS

TEST SYSTEMS
1. Testing Valve
2. Pump
3. Pressure Sensor
4. Flow Sensor
5. Relief Valve
6. Throttle Valve

TEST CONDITIONS
Pressure: 140 kgf/cm² (2000 PSI)
Flow Rate: 30 LPM (8 GPM)
Viscosity: 35 CST

TEST CIRCUIT





MODEL	CHANGE OVER TIME (sec)	
	T1	T2
SWH-G02-RF-M SERIES	0.1-0.15	0.1-0.15
SWH-G02-DC-M SERIES	0.02-0.06	0.02-0.04

LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOW RATE LPM(GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI)

SPOOL TYPE NORMAL POSITION	P– >A,B– >T P– >B,A– >T				P– >A				P– >B			
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	140kgf/cm² (2000 PSI)	210kgf/cm² (3000 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	140kgf/cm² (2000 PSI)	210kgf/cm² (3000 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	140kgf/cm² (2000 PSI)	210kgf/cm² (3000 PSI)
C2	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	30 (8)	22 (5.9)	16 (4.3)	10 (2.7)	30 (8)	22 (5.9)	16 (4.3)	10 (2.7)
C4	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	30 (8)	22 (5.9)	16 (4.3)	10 (2.7)	30 (8)	22 (5.9)	16 (4.3)	10 (2.7)
B3	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)	40 (10.7)

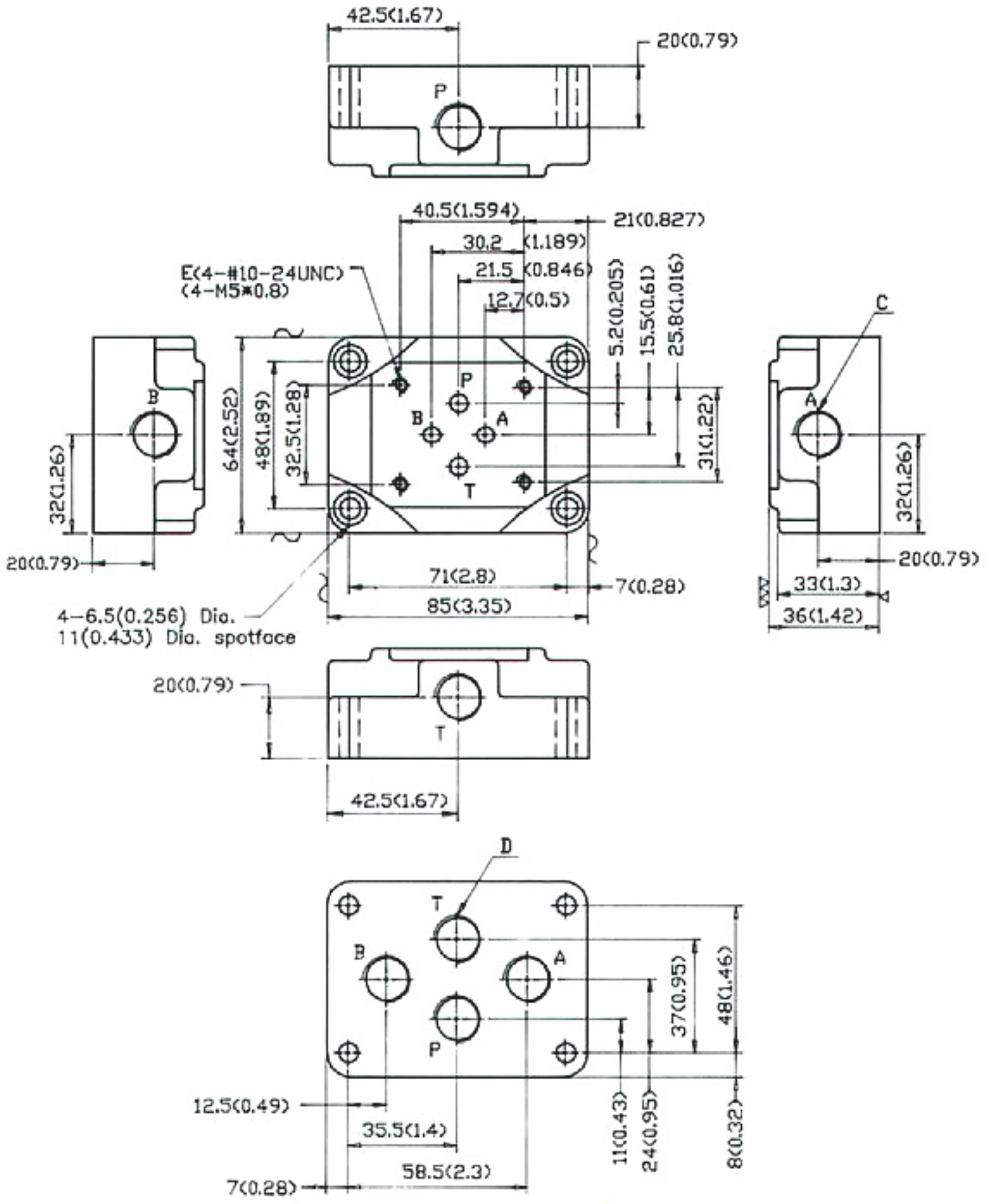
HOW TO ORDER

M02 - 02 - S - 1

- M02 - Subplate: 02
- 02 - Port Size: 02: 1/4" ; 03: 3/8"
- S - S: Side Ports ; B: Back Ports ; SB: Side and Back Ports
- 1 - Thread: 1: PT ; 2: NPT ; 3: SAE

INSTALLATION DIMENSIONS

UNIT: mm (inch)
WEIGHT: 1.07kgs (2.36lbs)

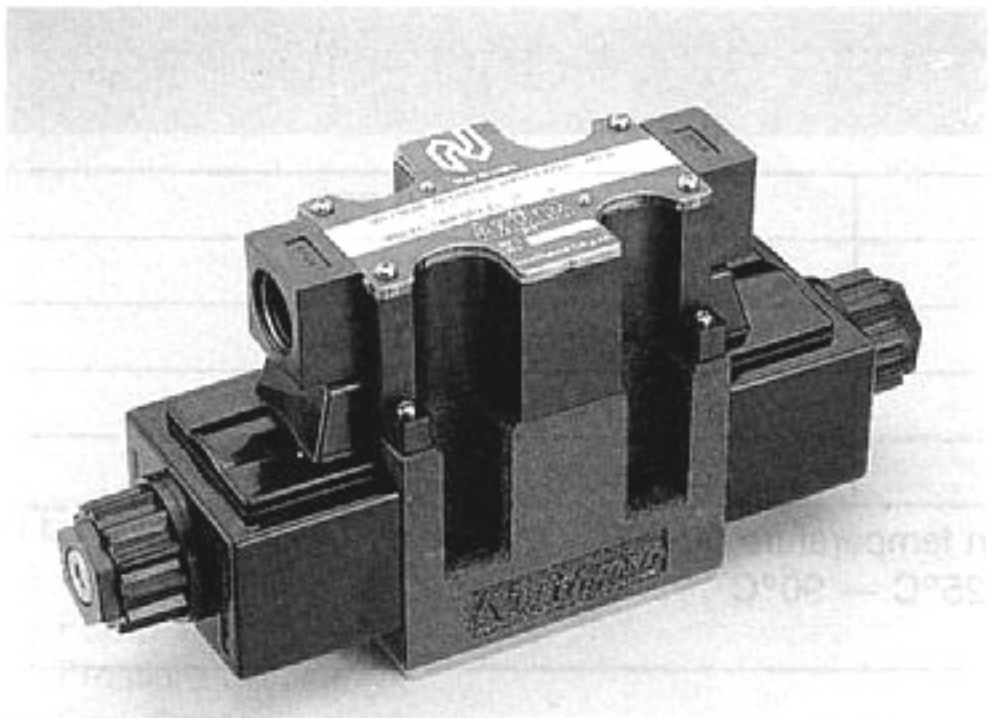


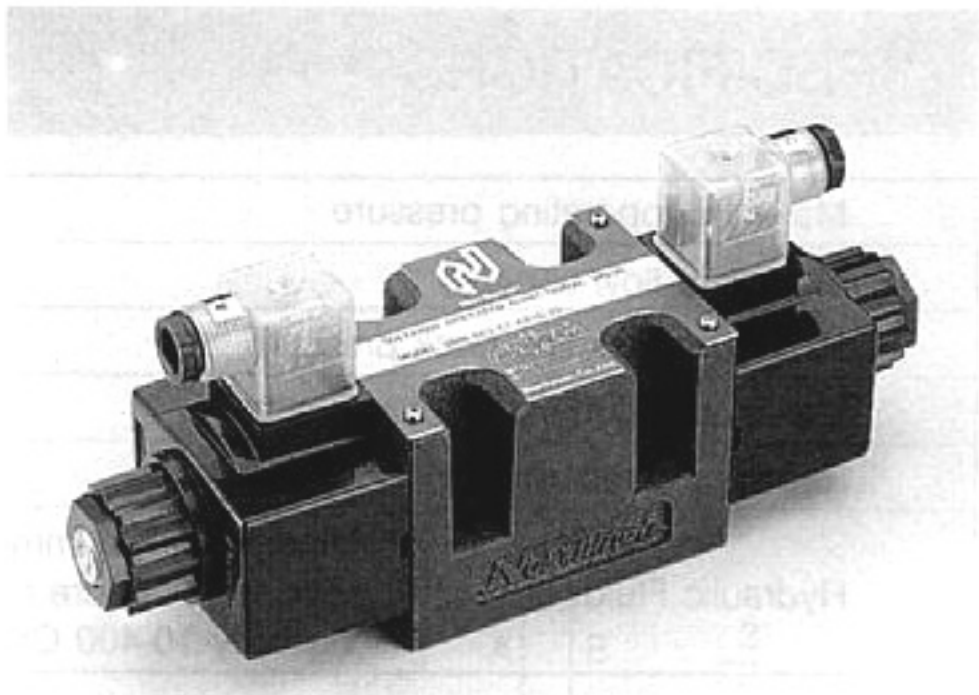
SUBPLATE
M02 SERIES

MODEL			PORT SIZE			MODEL			PORT SIZE		
			C	D	E				C	D	E
M02-02	-S	-1	4-1/4" PT	—	4-M5×0.8P	M02-03	-S	-1	4-3/8" PT	—	4-M5×0.8P
		-2	4-1/4 NPT	—	4-#10-24UNC			-2	4-3/8" NPT	—	4-#10-24UNC
		-3	4-1/4" SAE-2B	—	4-#10-24UNC			-3	4-3/8" SAE-2B	—	4-#10-24UNC
	-B	-1	—	4-1/4" PT	4-M5×0.8P		-B	-1	—	4-3/8" PT	4-M5×0.8P
		-2	—	4-1/4" NPT	4-#10-24UNC			-2	—	4-3/8" NPT	4-#10-24UNC
		-3	—	4-1/4" SAE-2B	4-#10-24UNC			-3	—	4-3/8" SAE-2B	4-#10-24UNC
	-SB	-1	4-1/4" PT	4-1/4" PT	4-M5×0.8P		-SB	-1	4-3/8" PT	4-3/8" PT	4-M5×0.8P
		-2	4-1/4" NPT	4-1/4" NPT	4-#10-24UNC			-2	4-3/8" NPT	4-3/8" NPT	4-#10-24UNC
		-3	4-1/4" SAE-2B	4-1/4" SAE-2B	4-#10-24UNC			-3	4-3/8" SAE-2B	4-3/8" SAE-2B	4-#10-24UNC

REMARK: Various thickness/port sizes/spec. are available on request.

SOLENOID OPERATED DIRECTIONAL VALVE
SWH-G03 SERIES





FEATURES

- The indicating lights are the standard equipment.
- Coil screws are especially designed to prevent shocks.
- Electrical connections are with joint box type and Hirschmann DIN type plug-in connector.
- Join box is of water-proof and dust-resistance.
- The space for electrical connections is large enough for connection layout.
- Electrical connection points are aligned with the axial direction to be compatible with modular system.
- For ease of installation and repair, the valve mounting screws are on the outside of the body.
- To sustain high pressure up to 315 kgf/cm² (4500 PSI), allows for large flow rates up to 120 LPM (32 GPM).
- The ideal design of flow passages will minimize the pressure drop.
- The 4-WAY 4-LAND constructure design is applied, for reducing the flow force and system surging pressure.
- To sustain high back pressure up to 160 kgf/cm² (2350 PSI).
- Manufactured with unified specifications allows for parts and accessories interchangeably.

HOW TO ORDER

SWH – G03 – C2 – A220 – 10 – LS

- **SWH**: HIGH PRESSURE HIGH FLOW SOLENOID DIRECTIONAL VALVE
- **G03**: SUBPLATE MOUNTED
- **C2**: NOMINAL SIZE: 3/8'' (D05) 10m/m
- **A220**: SPOOL TYPE (SEE PAGE 2)
- **10**: COIL VOLTAGE:
  - A240: AC240V,60Hz; AC220V,50Hz
  - A220: AC220V,60Hz; AC200V,50Hz
  - A120: AC120V,60Hz; AC110V,50Hz
  - A110: AC110V,60Hz; AC100V,50Hz
  - R240: AC240V,60Hz; AC220V,50Hz
  - R220: AC220V,60Hz; AC200V,50Hz
  - R120: AC120V,60Hz; AC110V,50Hz
  - R110: AC110V,60Hz; AC100V,50Hz
  - D12: DC12V
  - D24: DC24V
- **LS**: WIRING:
  - 10: JOINT BOX WITH INDICATING LIGHT
  - 20: HIRSCHMANN TYPE WITH INDICATING LIGHT
- NO CODE: STANDARD
- LS: LOW SURGE VOLTAGE (SEE PAGE 24)

SPECIFICATIONS

Maximum operating pressure		315 kgf/cm² (4500 PSI)
Maximum flow capacity		120 LPM (32 GPM)
Maximum tank line back pressure		160 kgf/cm² (2350 PSI)
Maximum frequencies of operation		240 CPM
Recommended filtration		25 Micron
Hydraulic Fluids	Mineral oil, recommendation temperature 0-55°C Max. temperature range −25°C — 90°C Viscosity 10-400 CST	

SOLENOID RATINGS

ELECTRIC SOURCE	COIL TYPE	Hz	VOLTAGE (V)		CURRENT & POWER AT RATED VOLTAGE		
			SOURCE RATED	RANGE	IN-RUSH CURRENT (A)	HOLDING CURRENT (A)	WATTAGE
A.C.	A110	50	100	90-110	4.79	0.86	31
		60	100	90-115	3.71	0.62	23
			110	99-126	4.2	0.74	32
	A120	50	110	99-121	4.29	0.78	30
		60	120	108-138	3.99	0.70	32
	A220	50	200	180-220	2.31	0.42	30
		60	200	180-220	1.87	0.31	23
			220	198-253	2.05	0.36	32
	A240	50	220	198-242	2.04	0.37	29
		60	240	216-274	1.88	0.33	32
	R110	50	100	90-115	0.47	0.47	46
		60	110	99-126	0.47	0.47	46
	R220	50	200	180-220	0.24	0.24	46
		60	220	198-253	0.24	0.24	46
D.C.	D12	12		10.8-13.2	2.58	2.58	32
	D24	24		21.6-26.4	1.33	1.33	32

TECHNICAL DATA:

- Solenoid can be used within −10% to +10% of the rated voltage of the coil.
- Withstand voltage 1500 v/sec.
- Insulation resistance over 100MΩ.

ACCESSORIES:

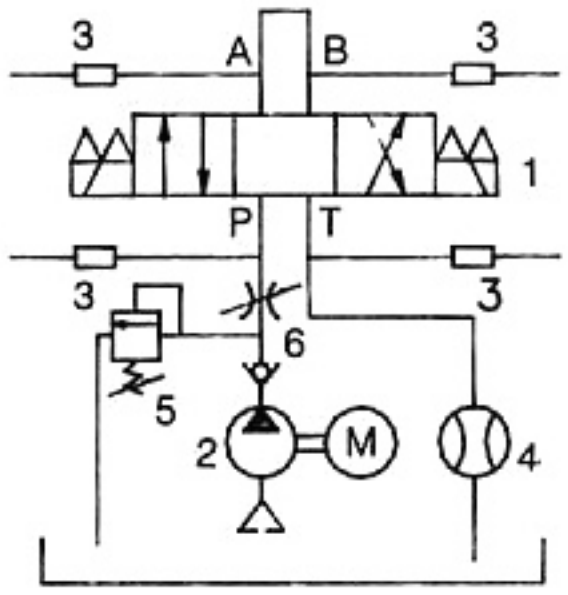
- Mounting bolt kits are supplied with valve socket head cap screws M6×35L 4 pieces (1/4"−20UNC × 1⅜"L) for tightening torque 120-150 kgf-cm. (104-130 lbs-in).
- O-ring AS568-014 5 pieces.

PRESSURE DROP AND PERFORMANCE CURVES

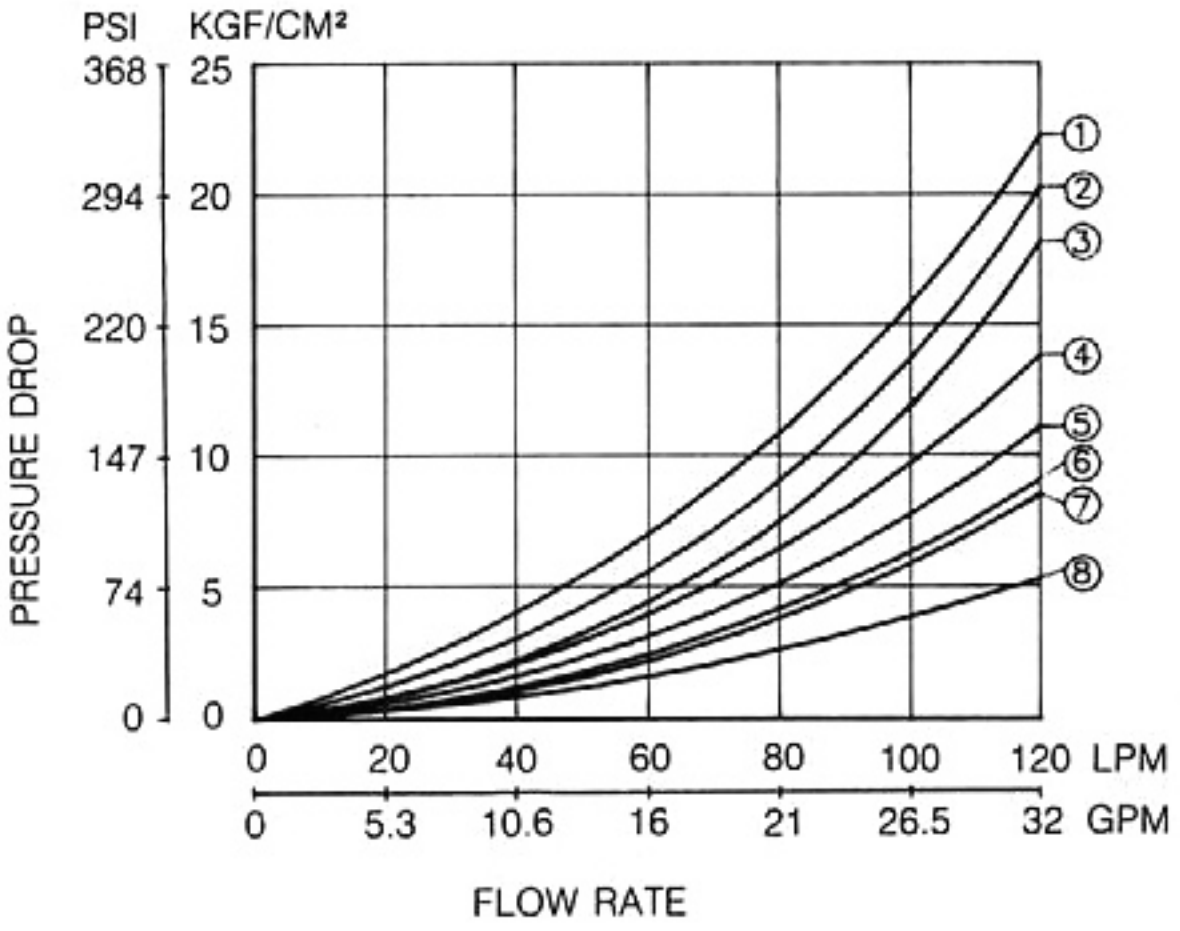
TEST SYSTEM
1) Testing Valve
2) Pump
3) Pressure Sensor
4) Flow Sensor
5) Relief Valve
6) Throttle Valve

TEST CONDITIONS
Pressure: 70kgf/cm² (1000PSI)
Flow Rate: 140 LPM (37GPM)
Viscosity: 35 CST

TEST CIRCUIT



PERFORMANCE CURVES



CONTRAST CHART BETWEEN FACTORS AND VISCOSITIES

Viscosity	CST	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor (G')		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

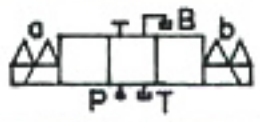
The pressure drop (△P') can be obtained from the formula △P' = △p(G'/0.85) for other specific gravity (G').

MODEL NO	Pressure Drop Curve Number				
	P– >A	B– >T	P– >B	A– >T	P– >T
C2	6	6	6	6	–
C3	7	7	7	7	5
C4	6	7	6	7	–
C40	6	7	6	7	–
C5	5	2	2	5	8
C6	2	2	2	2	5
C60	1	1	1	1	4
C7	7	6	7	6	–
C8	6	6	6	7	–
C9	7	6	6	6	–
B2	2	2	6	6	–
B3	3	3	6	6	–
B20	5	–	5	–	–
B2S	6	6	2	2	–
B3S	6	6	3	3	–
B20S	5	–	5	–	

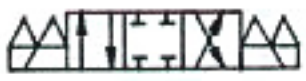
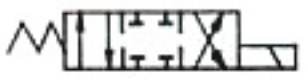
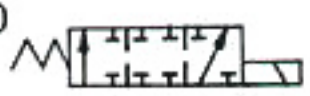
LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOW RATE LPM(GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI) SWH G03 AC TYPE								
SPOOL TYPE NORMAL POSITION	P->A,B->T P->B,A->T						P->A	
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)
C2	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	54 (14.3) 38 (10.0)
C3	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)
C4	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	54 (14.3) 42 (11.1)
C40	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4) 75 (19.8)
C5	88 (23.2) 82 (21.7)	88 (23.2) 82 (21.7)	88 (23.2) 82 (21.7)	88 (23.2) 82 (21.7)	88 (23.2) 82 (21.7)	–	100 (26.4)	100 (26.4)
C6	84 (22.2) 75 (19.8)	84 (22.2) 75 (19.8)	84 (22.2) 75 (19.8)	84 (22.2) 75 (19.8)	84 (22.2) 75 (19.8)	–	100 (26.4) 95 (25.1)	100 (26.4) 95 (25.1)
C7	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	63 (16.6)	63 (16.6)
C8	100 (26.4)	100 (26.4)	100 (26.4) 76 (20.1)	44 (11.6) 28 (7.4)	30 (7.9) 21 (5.5)	19 (5.0) 14 (3.7)	100 (26.4)	100 (26.4) 53 (14.0)
C9	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	57 (15.1)	57 (15.1)
B2	90 (23.8) 72 (19.0)	90 (23.8) 72 (19.0)	90 (23.8) 72 (19.0)	90 (23.8) 72 (19.0)	90 (23.8) 72 (19.0)	90 (23.8) 72 (19.0)	63 (16.6)	63 (16.6)
B3	89 (23.5) 81 (21.4)	89 (23.5) 81 (21.4)	89 (23.5) 81 (21.4)	89 (23.5) 81 (21.4)	89 (23.5) 81 (21.4)	89 (23.5) 81 (21.4)	100 (26.4)	100 (26.4)
B20	–	–	–	–	–	–	81 (21.4)	29 (7.7)
D2	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	60 (15.9)	40 (10.6)
D3	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	70 (18.5)	60 (15.9)

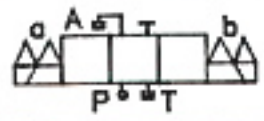
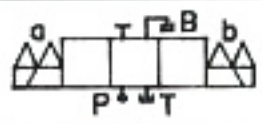
NOTE: The figures in the square shows the parameter among voltage & flow under saturated temperature and 90% applied voltage.

				P->B 					
150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
40 (10.6)	28 (7.4)	25 (6.6)	20 (5.3)	100 (26.4)	54 (14.3)	40 (10.6)	28 (7.4)	25 (6.6)	20 (5.3)
27 (7.1)	17 (4.5)	13 (3.4)	10 (2.6)		38 (10.0)	27 (7.1)	17 (4.5)	13 (3.4)	10 (2.6)
100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)
30 (7.9)	23 (6.1)	18 (4.8)	14 (3.7)	100 (26.4)	54 (14.3)	30 (7.9)	23 (6.1)	18 (4.8)	14 (3.7)
27 (7.1)	16 (4.2)	11 (2.9)	8 (2.1)		42 (11.1)	27 (7.1)	16 (4.2)	11 (2.9)	8 (2.1)
33 (8.7)	28 (7.4)	22 (5.8)	18 (4.8)	100 (26.4)	100 (26.4)	33 (8.7)	28 (7.4)	22 (5.8)	18 (4.8)
23 (6.1)	21 (5.5)	15 (4.0)	12 (3.2)		75 (19.8)	23 (6.1)	21 (5.5)	15 (4.0)	12 (3.2)
100 (26.4)	100 (26.4)	100 (26.4)	—	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)
100 (26.4)	100 (26.4)	100 (26.4)	—	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	—
95 (25.1)	95 (25.1)	95 (25.1)		95 (25.1)	95 (25.1)	95 (25.1)	95 (25.1)	95 (25.1)	
63 (16.6)	63 (16.6)	63 (16.6)	63 (16.6)	63 (16.6)	63 (16.6)	63 (16.6)	63 (16.6)	63 (16.6)	63 (16.6)
37 (9.8)	34 (9.0)	28 (7.4)	20 (5.3)	100 (26.4)	61 (16.1)	33 (8.7)	27 (7.1)	20 (5.3)	16 (4.2)
32 (8.5)	28 (7.4)	21 (5.5)	15 (4.0)		48 (12.7)	27 (7.1)	21 (5.5)	15 (4.0)	9 (2.4)
57 (15.1)	57 (15.1)	57 (15.1)	57 (15.1)	100 (26.4)	53 (14.0)	47 (12.4)	45 (11.9)	40 (10.6)	34 (9.0)
					40 (10.6)	37 (9.8)	34 (9.0)	29 (7.7)	25 (6.6)
63 (16.6)	63 (16.6)	63 (16.6)	63 (16.6)	100 (26.4)	78 (20.6)	45 (11.9)	43 (11.4)	38 (10.0)	32 (8.5)
					74 (19.6)	38 (10.0)	36 (9.5)	31 (8.2)	27 (7.1)
100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	95 (25.1)	82 (21.7)	75 (19.8)	65 (17.2)
					89 (23.5)	84 (22.2)	77 (20.3)	70 (18.5)	62 (16.4)
19 (5.0)	12 (3.2)	9 (2.4)	7 (1.8)	100 (26.4)	80 (21.1)	32 (8.5)	25 (6.6)	20 (5.3)	14 (3.7)
					42 (11.1)	28 (7.4)	22 (5.8)	17 (4.5)	12 (3.2)
40 (10.6)	40 (10.6)	30 (7.9)	28 (7.4)	60 (15.9)	40 (10.6)	40 (10.6)	40 (10.6)	30 (7.9)	28 (7.4)
60 (15.9)	60 (15.9)	42 (11.1)	36 (9.5)	70 (18.5)	60 (15.9)	60 (15.9)	60 (15.9)	42 (11.1)	36 (9.5)

LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOW RATE LPM(GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI) SWH G03 DC TYPE								
SPOOL TYPE	P->A,B->T P->B,A->T						P->A	
NORMAL POSITION	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)
C2 	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7) 100 (26.4)
C3 	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)
C4 	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7) 100 (26.4)
C40 	120 (31.7)	120 (31.7)	120 (31.7) 100 (26.4)	97 (25.6) 75 (19.8)	78 (20.6) 54 (14.3)	60 (15.9) 41 (10.8)	120 (31.7)	120 (31.7) 115 (30.4)
C5 	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)
C6 	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)
C7 	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	65 (17.2)	65 (17.2)
C8 	120 (31.7)	120 (31.7)	120 (31.7) 100 (26.4)	97 (25.6) 85 (22.5)	78 (20.6) 54 (14.3)	66 (17.4) 41 (10.8)	120 (31.7)	120 (31.7)
C9 	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	65 (17.2)	65 (17.2)
B2 	95 (25.1)	95 (25.1)	95 (25.1)	95 (25.1)	95 (25.1)	95 (25.1)	69 (18.2)	69 (18.2)
B3 	89 (23.5)	89 (23.5)	89 (23.5)	89 (23.5)	89 (23.5)	89 (23.5)	120 (31.7)	120 (31.7)
B20 	—	—	—	—	—	—	85 (22.5)	35 (9.2)
D2 	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	60 (15.9)	40 (10.6)
D3 	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	70 (18.5)	60 (15.9)

NOTE: The figures in the square shows the parameter among voltage & flow under saturated temperature and 90% applied voltage.

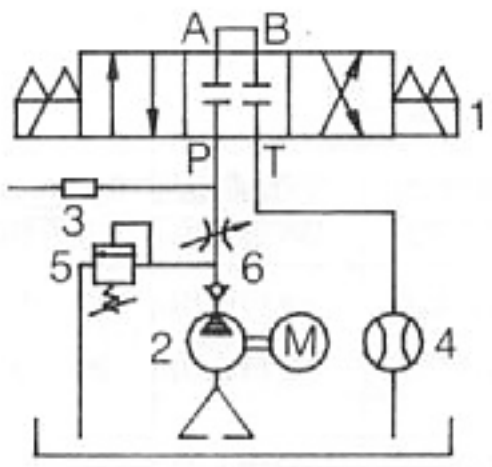
				P->B 					
150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
73 (19.3)	63 (16.6)	54 (14.3)	37 (9.8)	120 (31.7)	120 (31.7)	73 (19.3)	63 (16.6)	54 (14.3)	37 (9.8)
55 (14.5)	48 (12.7)	38 (10.0)	29 (7.7)		100 (26.4)	55 (14.5)	48 (12.7)	38 (10.0)	29 (7.7)
120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)
90 (23.8)	73 (19.3)	60 (15.9)	47 (12.4)	120 (31.7)	120 (31.7)	90 (23.8)	73 (19.3)	60 (15.9)	47 (12.4)
78 (20.6)	64 (16.9)	51 (13.5)	39 (10.3)		100 (26.4)	78 (20.6)	64 (16.9)	51 (13.5)	39 (10.3)
75 (19.8)	54 (14.3)	42 (11.1)	37 (9.8)	120 (31.7)	120 (31.7)	75 (19.8)	54 (14.3)	42 (11.1)	37 (9.8)
50 (13.2)	39 (10.3)	30 (7.9)	21 (5.5)		115 (30.4)	50 (13.2)	39 (10.3)	30 (7.9)	21 (5.5)
100 (26.4)	100 (26.4)	100 (26.4)	—	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	—
100 (26.4)	100 (26.4)	100 (26.4)	—	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	100 (26.4)	—
65 (17.2)	65 (17.2)	65 (17.2)	65 (17.2)	65 (17.2)	65 (17.2)	65 (17.2)	65 (17.2)	65 (17.2)	65 (17.2)
68 (18.0)	51 (13.5)	37 (9.8)	27 (7.1)	120 (31.7)	85 (22.5)	50 (13.2)	36 (9.5)	25 (6.6)	19 (5.0)
52 (13.7)	39 (10.3)	28 (7.4)	18 (4.8)		65 (17.2)	40 (10.6)	28 (7.4)	15 (4.0)	12 (3.2)
65 (17.2)	65 (17.2)	65 (17.2)	65 (17.2)	120 (31.7)	100 (26.4)	94 (24.8)	85 (22.5)	76 (20.1)	70 (18.5)
					85 (22.5)	80 (21.1)	74 (19.6)	54 (14.3)	49 (12.9)
69 (18.2)	69 (18.2)	69 (18.2)	69 (18.2)	120 (31.7)	120 (31.7)	77 (20.3)	63 (16.6)	57 (15.1)	45 (11.9)
						66 (17.4)	55 (14.5)	44 (11.6)	38 (10.0)
120 (31.7)	120 (31.7)	120 (31.7)	120 (31.7)	100 (26.4)	100 (26.4)	95 (25.1)	82 (21.7)	75 (19.8)	65 (17.2)
					89 (23.5)	84 (22.2)	77 (20.3)	70 (18.5)	62 (16.4)
28 (7.4)	19 (5.0)	15 (4.0)	10 (2.6)	120 (31.7)	120 (31.7)	95 (25.1)	74 (19.6)	61 (16.1)	43 (11.4)
					95 (25.1)	84 (22.2)	63 (16.6)	50 (13.2)	34 (9.0)
40 (10.6)	40 (10.6)	30 (7.9)	28 (7.4)	60 (15.9)	40 (10.6)	40 (10.6)	40 (10.6)	30 (7.9)	28 (7.4)
60 (15.9)	60 (15.9)	42 (11.1)	36 (9.5)	70 (18.5)	60 (15.9)	60 (15.9)	60 (15.9)	42 (11.1)	36 (9.5)

RESULT OF MEASUREMENTS

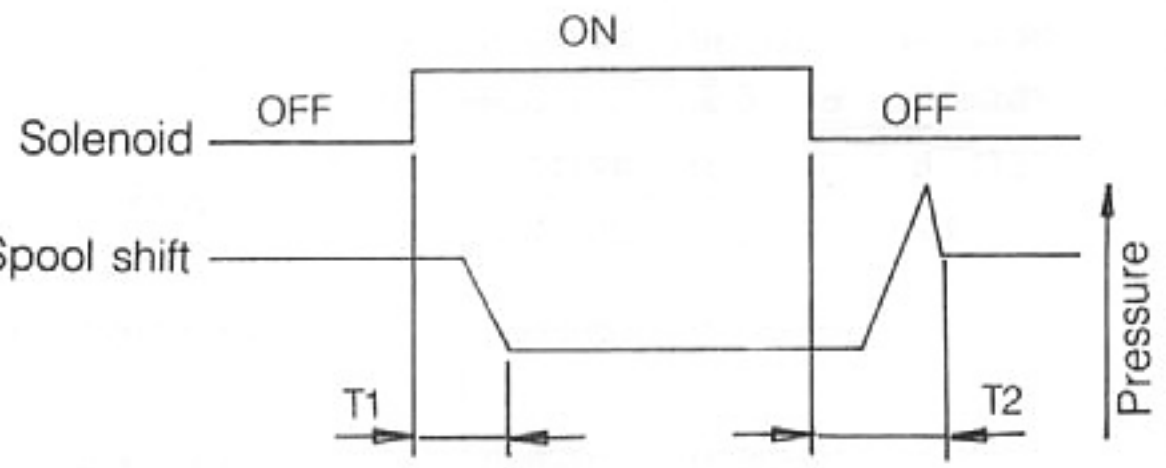
TEST SYSTEMS
1. Testing Valve
2. Pump
3. Pressure Sensor
4. Flow Meter
5. Relief Valve
6. Throttle Valve

TEST CONDITIONS
Pressure: 160 kgf/cm² (2350 PSI)
Flow Rate: 140 LPM (37 GPM)
Viscosity: 35 CST

TEST CIRCUIT



MODEL	CHANGE OVER TIME (sec)	
	T1	T2
SWH-G03-AC SERIES	0.02	0.02
SWH-G03-DC SERIES	0.07	0.07



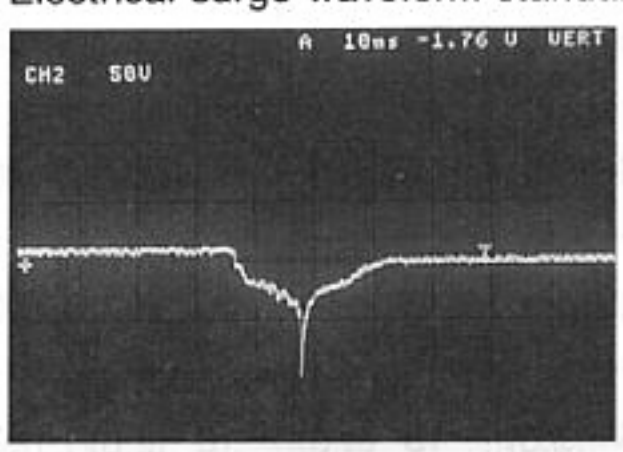
OPTION LS

Electrical Surge Control Model
Option LS
Valve model: SWH-G03- ※※※ - D ※※ - ※※ - LS

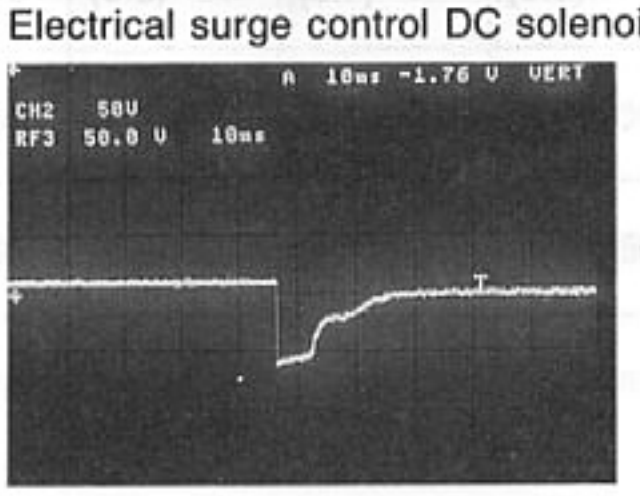
Features
- Suppresses the surge voltage.
- Eliminates sparks between relay contacts.
- Extends the life of the relay contact.

Effects
- Improves the reliability of the control relay.
- Extends the life of conventional relays.
- Can be operated with a miniature relay.
- The RAC rectifier built-in DC model eliminate sparks at the control relay contact. It can be directly operated with a PLC (programmable logic controller).

Electrical surge waveform standard DC solenoid.



Electrical surge control DC solenoid.



Mounting Surface: ISO 4401-AC-05-4-A

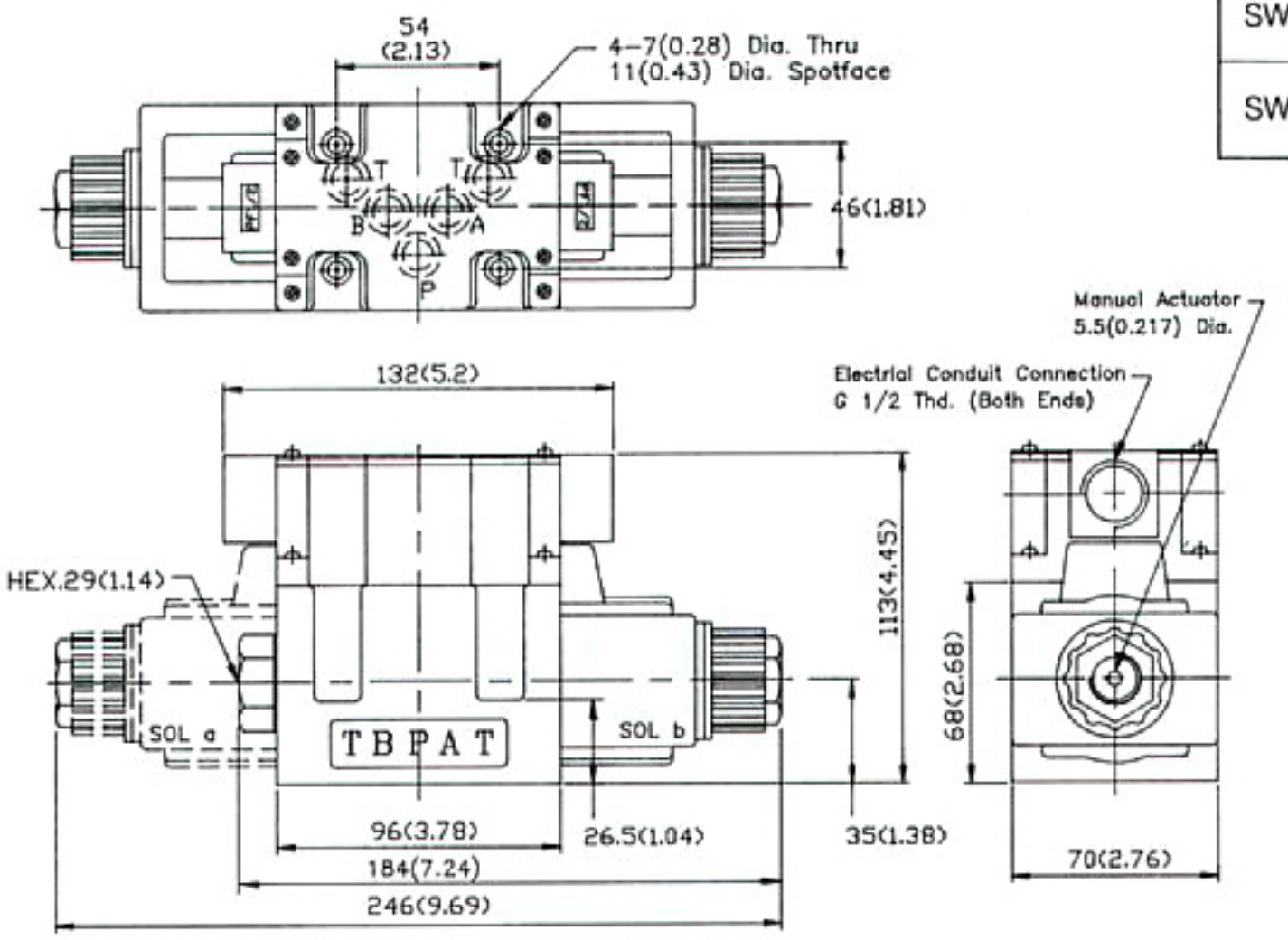
INSTALLATION DIMENSIONS

UNIT: mm (inch)

SWH-G03-※※※- A ※※※ -10- ※※

Models with AC solenoids

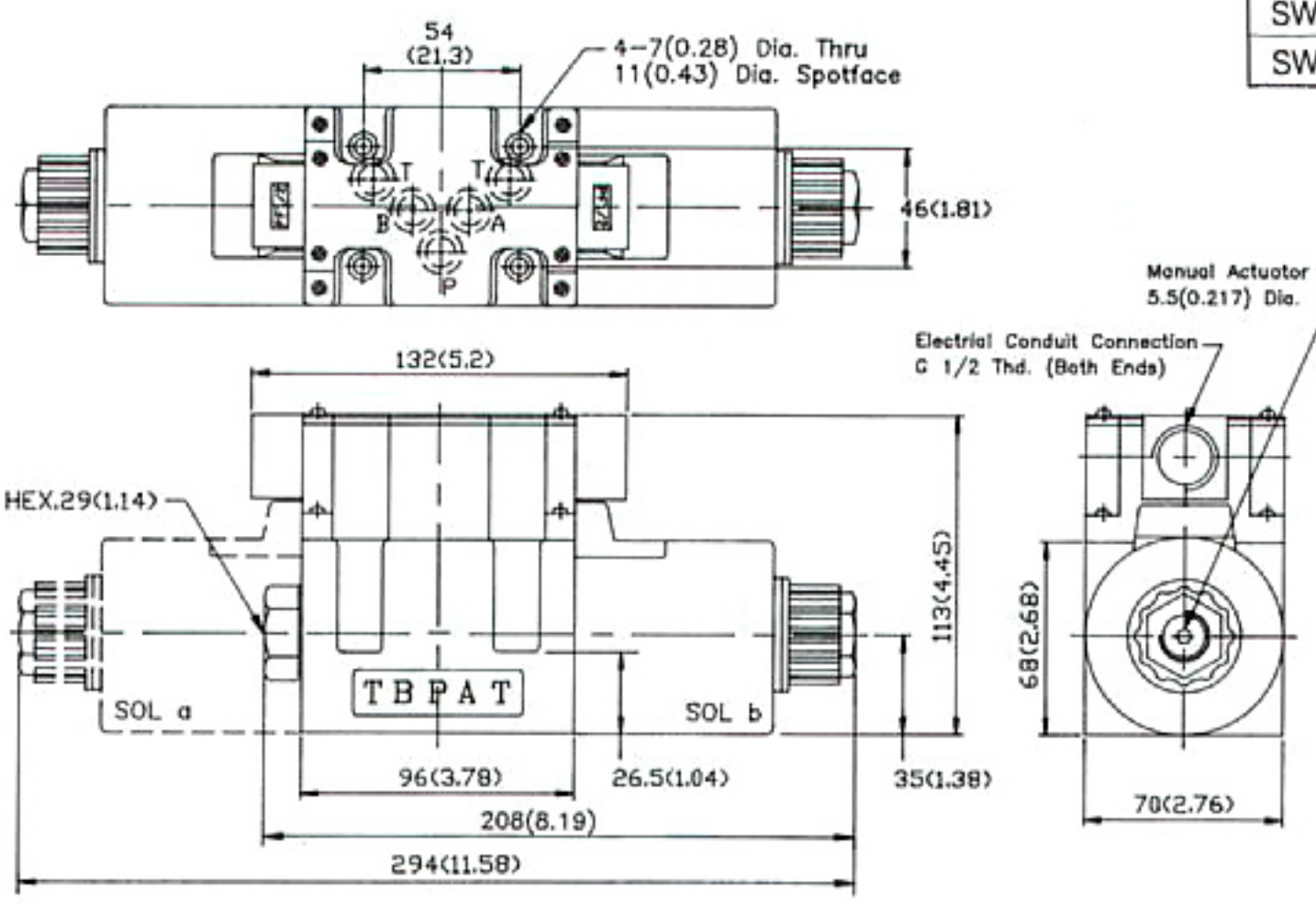
MODEL	WEIGHT Kg(lb)
SWH-G03-C※※-A-※※※※	4.1(9.02)
SWH-G03-B※※-A-※※※※	3.4(7.48)



SWH-G03-※※※-※※※※※-10-※※

Models with DC, RF solenoids

MODEL	WEIGHT Kg(lb)
SWH-G03-C※※-D-※※	5.5(12.1)
SWH-G03-C※※-R-※※※	
SWH-G03-B※※-D-※※	4.0(9.68)
SWH-G03-B※※-R-※※※	

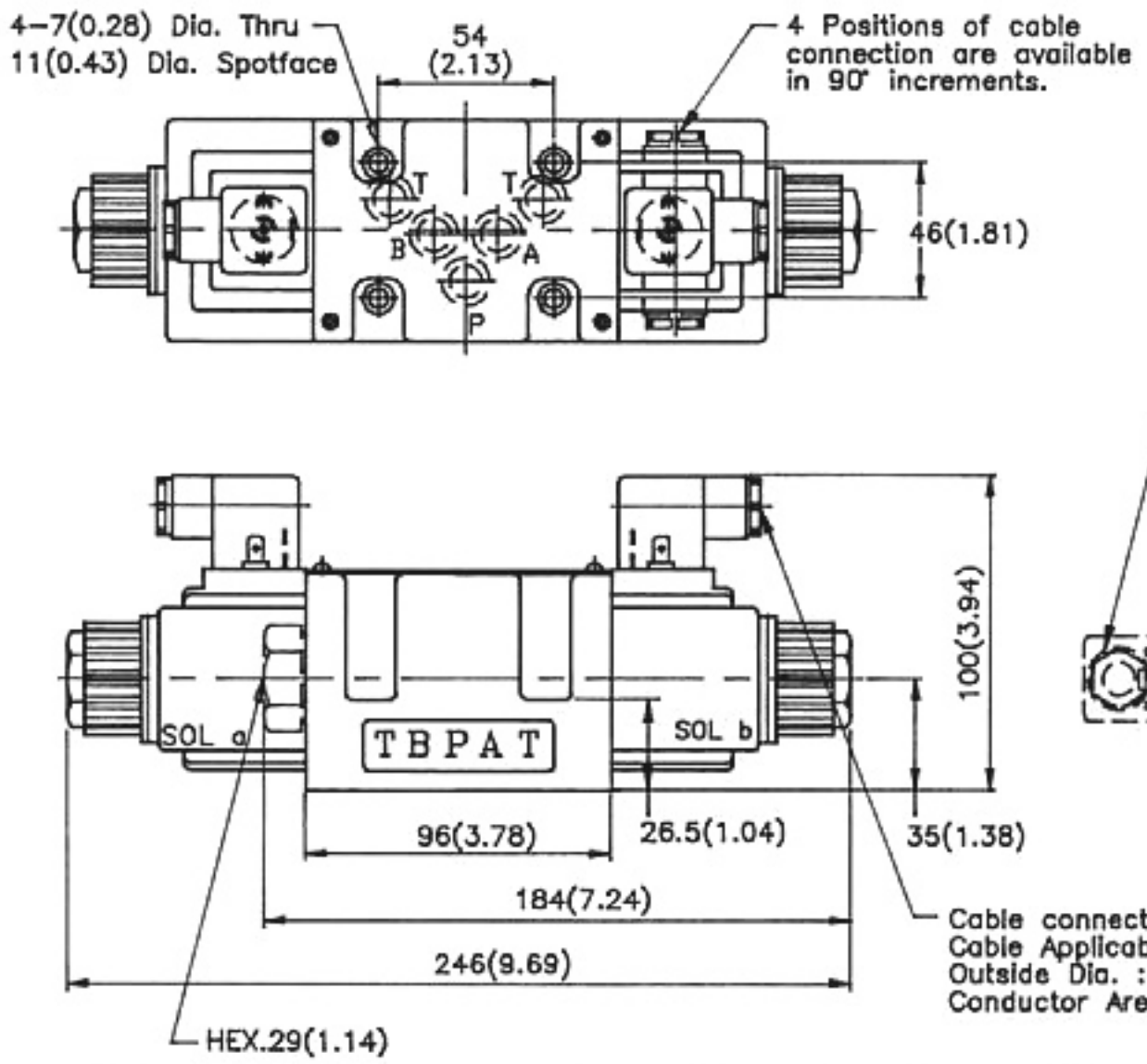


INSTALLATION DIMENSIONS

UNIT: mm (inch)

SWH-G03-※※※-A※※※-20-※※

Models with AC solenoids



MODEL	WEIGHT kg(lb)
SWH-G03-C※※-A※※※	4.1(9.02)
SWH-G03-B※※-A※※※	3.4(7.48)

SWH-G03-※※※-※※※※※-20-※※

Models with DC, RF solenoids

MODEL	WEIGHT kg(lb)
SWH-G03-C※※-D※※	5.5(12.1)
SWH-G03-C※※-R※※※	
SWH-G03-B※※-D※※	4.0(9.68)
SWH-G03-B※※-R※※※	

FEATURES

- The indicating lights are the standard equipment.
- Coil screws are especially designed to prevent shocks.
- Electrical connections are with joint box type and Hirschmann DIN type plug-in connector.
- Join box is of water-proof and dust-resistance.
- The space for electrical connections is large enough for connection layout.
- Electrical connection points are aligned with the axial direction to be compatible with modular system.
- For ease of installation and repair, the valve mounting screws are on the outside of the body.
- To sustain high pressure up to 210 kgf/cm² (3000 PSI), allows for large flow rates up to 80 LPM (21 GPM).
- The ideal design of flow passages will minimize the pressure drop.
- The 4-WAY 4-LAND constructure design is applied, for reducing the flow force and system surging pressure.
- To sustain high back pressure up to 160 kgf/cm² (2350 PSI).
- Manufactured with unified specifications allows for parts and accessories interchangeably.
- Specifically designed to control the shock or "bang" in hydraulic systems.
- Minimizes the effect of pressure peaks or instantaneous high flow rates common in many hydraulic systems.
- A.C. coil design with flexible timing characteristics when compared to rectified D.C. coil technology.

HOW TO ORDER

SWH – G03 – C2 – R220 – 10 – M

M: HYDRAULIC SHOCKLESS TYPE

WIRING:
10: JOINT BOX WITH INDICATING LIGHT
20: HIRSCHMANN TYPE WITH INDICATING LIGHT

COIL VOLTAGE:
R240: AC240V,60Hz ; AC220V,50Hz
R220: AC220V,60Hz ; AC200V,50Hz
R120: AC120V,60Hz ; AC110V,50Hz
R110: AC110V,60Hz ; AC100V,50Hz
D12: DC12V
D24: DC24V

SPOOL TYPE (SEE PAGE 2)

NOMINAL SIZE: 3/8" (D05)

SUBPLATE MOUNTED

HIGH FLOW HIGH PRESSURE SOLENOID DIRECTIONAL VALVE

SHOCKLESS TYPE
SWH-G03 SERIES

SPECIFICATIONS

Maximum operating pressure	210 kgf/cm² (3000 PSI)
Maximum flow capacity	80 LPM (21 GPM)
Maximum tank line back pressure	160 kgf/cm² (2350 PSI)
Maximum frequencies of operation	240 CPM
Recommended filtration	25 Micron
Hydraulic Fluids	Mineral oil, recommendation temperature 0-55°C Max. temperature range −25°C — 90°C Viscosity 10-400 CST

REMARK: Installation dimensions see page 25, 26.

SOLENOID RATINGS

ELECTRIC SOURCE	COIL TYPE	Hz	VOLTAGE (V)		CURRENT & POWER AT RATED VOLTAGE		
			SOURCE RATED	RANGE	IN-RUSH CURRENT (A)	HOLDING CURRENT (A)	WATTAGE
R.F.	R110	50	AC 110	99-126	0.47	0.47	46
		60					
	R220	50	AC 220	198-253	0.24	0.24	46
		60					
D.C.	D12	12		10.8-13.2	2.58	2.58	32
	D24	24		21.6-26.4	1.33	1.33	32

TECHNICAL DATA:

- Solenoid can be used within −10% to +10% of the rated voltage of the coil.
- Withstand voltage 1500 v/sec.
- Insulation resistance over 100MΩ.

ACCESSORIES:

- Mounting bolt kits are supplied with valve socket head cap screws M6×35L 4 pieces (1/4"-20UNC × 1⅜"L) for tightening torque 120-150 kgf-cm. (104-130 lbs-in).
- O-ring AS568-014 5 pieces.

PRESSURE DROP AND PERFORMANCE CURVES

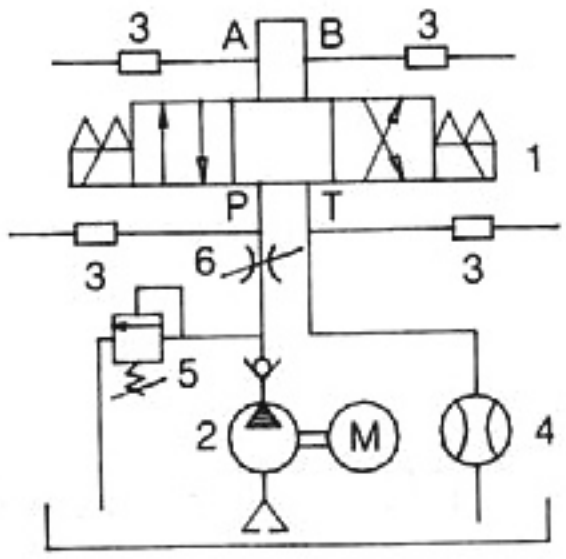
TEST SYSTEMS

1) Testing Valve
2) Pump
3) Pressure sensor
4) Flow sensor
5) Relief valve
6) Throttle valve

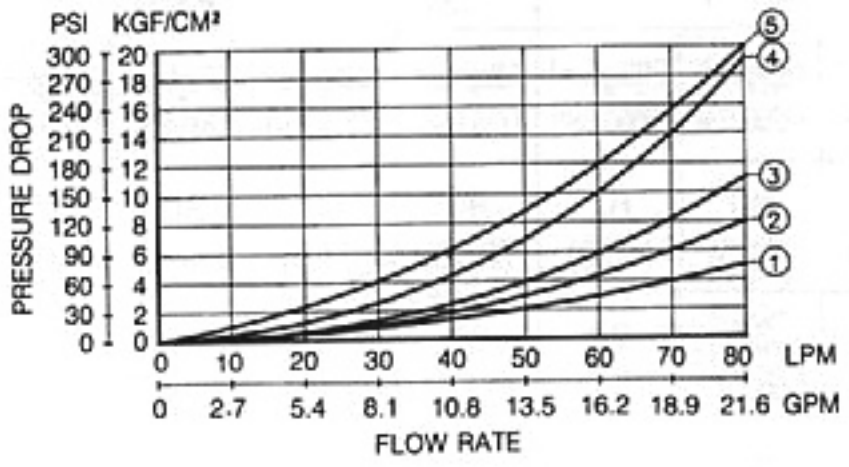
TEST CONDITIONS

Pressure: 70 kgf/cm² (1000 PSI)
Flow Rate: 80 LMP (21 GPM)
Viscosity: 35 CST

TEST CIRCUIT



PERFORMANCE CURVES



MODEL NO.	Pressure Drop Curve Number				
	P– >A	B– >T	P– >B	A– >T	P– >T
C2	1	1	1	1	—
C3	5	5	5	5	2
C4	1	1	1	1	—
C6	4	4	4	4	3
B2	2	2	2	2	—
B3	2	2	2	2	—

CONTRAST CHART BETWEEN FACTORS AND VISCOSITIES

Viscosity	CST	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor (G')		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

The pressure drop ($\triangle P'$) can be obtained from the formula
$\triangle P' = \triangle p(G'/0.85)$ for other specific gravity (G').

RESULT OF MEASUREMENTS

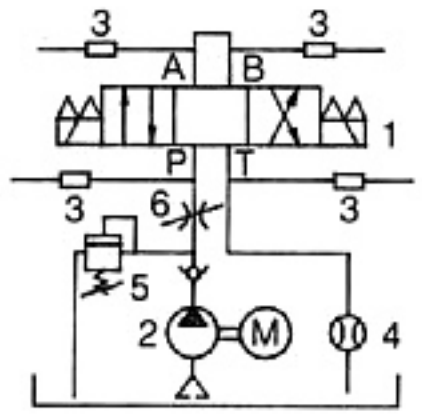
TEST SYSTEMS

1. Testing Valve
2. Pump
3. Pressure Sensor
4. Flow Sensor
5. Relief Valve
6. Throttle Valve

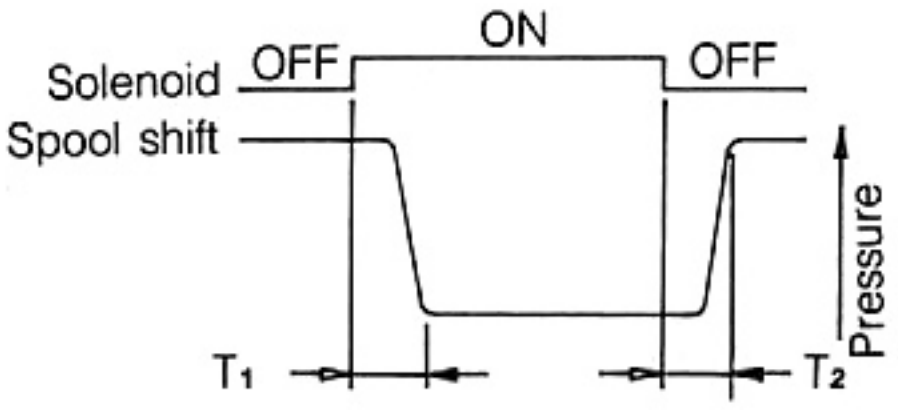
TEST CONDITIONS

Pressure: 140 kgf/cm² (2000 PSI)
Flow Rate: 30 LPM (8 GPM)
Viscosity: 35 CST

TEST CIRCUIT



MODEL	CHANGE OVER TIME (sec)	
	T1	T2
SWH-G03-RF-M SERIES	0.1-0.15	0.1-0.15
SWH-G03-DC-M SERIES	0.02-0.06	0.02-0.04



LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOW RATE LPM(GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI)

SPOOL TYPE NORMAL POSITION	P– >A,B– >T P– >B,A– >T				P– >A				P– >B			
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)
C2	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	67 (18.0)	80 (21.5)	80 (21.5)	80 (21.5)	67 (18.0)
C3	80 (21.5)	80 (21.5)	80 (21.5)	67 (18.0)	80 (21.5)	50 (13.5)	32 (8.5)	28 (7.5)	80 (21.5)	50 (13.5)	32 (8.5)	28 (7.5)
C4	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)
C6	80 (21.5)	30 (8)	28 (7.5)	20 (5.4)	80 (21.5)	35 (9.4)	30 (8)	20 (5.4)	80 (21.5)	35 (9.4)	30 (8)	20 (5.4)
B2	80 (21.5)	80 (21.5)	80 (21.5)	28 (7.5)	70 (18.5)	70 (18.5)	70 (18.5)	70 (18.5)	70 (18.5)	70 (18.5)	70 (18.5)	70 (18.5)
B2	80 (21.5)	80 (21.5)	80 (21.5)	28 (7.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)	80 (21.5)

HOW TO ORDER

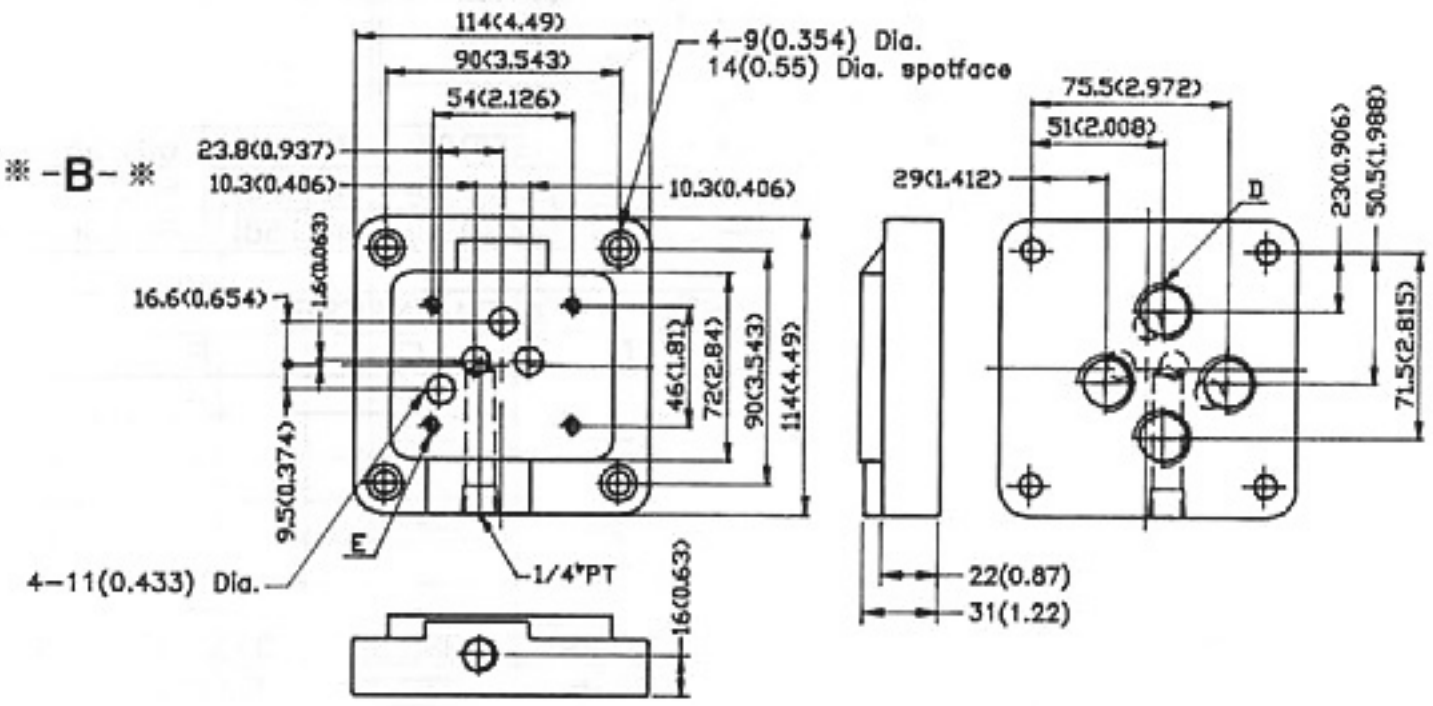
M03 - 03 - S - 1

- Thread
  1: PT
  2: NPT
  3: SAE
- S: Side Ports
  B: Back Ports
  SB: Side and Back Ports
- Port Size
  03:3/8"
  04:1/2"
  06:3/4"
- Subplate
  03

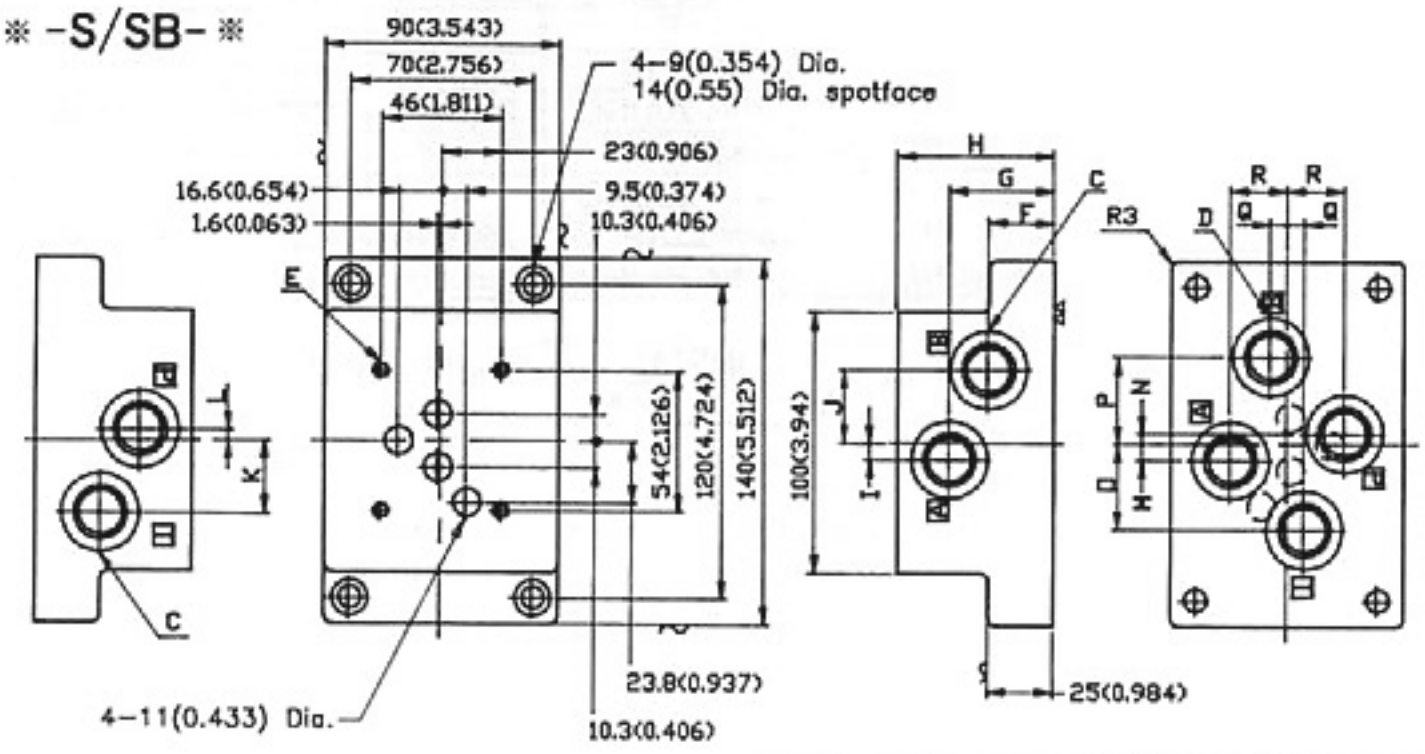
INSTALLATION DIMENSIONS

UNIT: mm (inch)
WEIGHT: 1kgs (2.31lbs)

M03-※※-B-※



M03-※※-S/SB-※



SUBPLATE
M03 SERIES

UNIT: mm (inch)

MODEL			PORT SIZE & INSTALLATION DIMENSIONS							
			C	D	E	F	G	H	I	J
M03-03	-S	-1	4-3/8" PT	—	4-M6×1P	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-2	4-3/8" NPT	—	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-3	4-3/8" SAE-2B	—	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
	-B	-1	—	4-3/8" PT	4-M6×1P	—	—	—	—	—
		-2	—	4-3/8" NPT	4-1/4-20UNC	—	—	—	—	—
		-3	—	4-3/8" SAE-2B	4-1/4-20UNC	—	—	—	—	—
	-SB	-1	4-3/8" PT	4-3/8" PT	4-M6×1P	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-2	4-3/8" NPT	4-3/8" NPT	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-3	4-3/8" SAE-2B	4-3/8" SAE-2B	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)

MODEL			INSTALLATION DIMENSIONS							
			K	L	M	N	O	P	Q	R
M03-03	-S	-1	28(1.1)	4.0(0.16)	—	—	—	—	—	—
		-2	28(1.1)	4.0(0.16)	—	—	—	—	—	—
		-3	28(1.1)	4.0(0.16)	—	—	—	—	—	—
	-B	-1	—	—	—	—	—	—	—	—
		-2	—	—	—	—	—	—	—	—
		-3	—	—	—	—	—	—	—	—
	-SB	-1	28(1.1)	4.0(0.16)	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)
		-2	28(1.1)	4.0(0.16)	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)
		-3	28(1.1)	4.0(0.16)	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)

MODEL			PORT SIZE & INSTALLATION DIMENSIONS							
			C	D	E	F	G	H	I	J
M03-04	-S	-1	4-1/2" PT	—	4-M6×1P	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-2	4-1/2" NPT	—	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-3	4-1/2" SAE-2B	—	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
	-B	-1	—	4-1/2" PT	4-M6×1P	—	—	—	—	—
		-2	—	4-1/2" NPT	4-1/4-20UNC	—	—	—	—	—
		-3	—	4-1/2" SAE-2B	4-1/4-20UNC	—	—	—	—	—
	-SB	-1	4-1/2" PT	4-1/2" PT	4-M6×1P	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-2	4-1/2" NPT	4-1/2" NPT	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-3	4-1/2" SAE-2B	4-1/2" SAE-2B	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)

MODEL			INSTALLATION DIMENSIONS							
			K	L	M	N	O	P	Q	R
M03-04	-S	-1	28(1.1)	4.0(0.16)	—	—	—	—	—	—
		-2	28(1.1)	4.0(0.16)	—	—	—	—	—	—
		-3	28(1.1)	4.0(0.16)	—	—	—	—	—	—
	-B	-1	—	—	—	—	—	—	—	—
		-2	—	—	—	—	—	—	—	—
		-3	—	—	—	—	—	—	—	—
	-SB	-1	28(1.1)	4.0(0.16)	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)
		-2	28(1.1)	4.0(0.16)	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)
		-3	28(1.1)	4.0(0.16)	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)

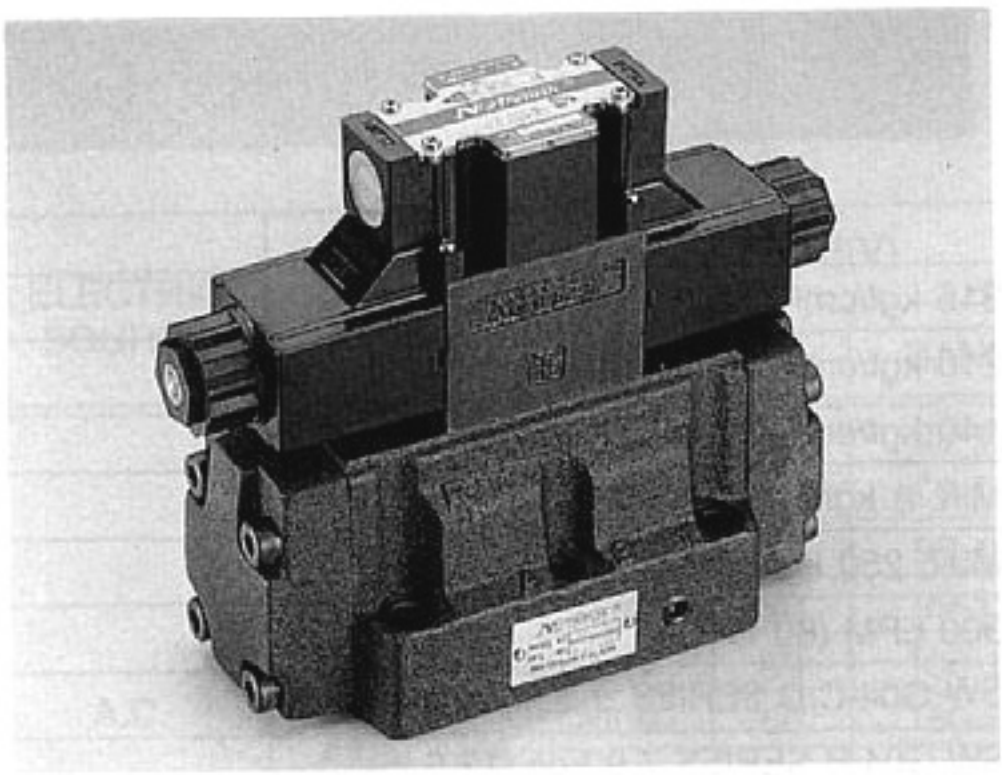
MODEL			PORT SIZE & INSTALLATION DIMENSIONS							
			C	D	E	F	G	H	I	J
M03-06	-S	-1	4-3/4" PT	—	4-M6×1P	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-2	4-3/4" NPT	—	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
	-B	-1	—	4-3/4" PT	4-M6×1P	—	—	—	—	—
		-2	—	4-3/4" NPT	4-1/4-20UNC	—	—	—	—	—
	-SB	-1	4-3/4" PT	4-3/4" PT	4-M6×1P	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)
		-2	4-3/4" NPT	4-3/4" NPT	4-1/4-20UNC	25(0.98)	40(1.58)	60(2.36)	6.5(0.26)	28(1.1)

MODEL			INSTALLATION DIMENSIONS							
			K	L	M	N	O	P	Q	R
M03-06	-S	-1	28(1.1)	4.0(0.16)	—	—	—	—	—	—
		-2	28(1.1)	4.0(0.16)	—	—	—	—	—	—
	-B	-1	—	—	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)
		-2	—	—	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)
	-SB	-1	28(1.1)	4.0(0.16)	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)
		-2	28(1.1)	4.0(0.16)	6.5(0.26)	4.0(0.16)	33(1.3)	33.5(1.32)	6.5(0.26)	22(0.87)

REMARK: Various thickness/port sizes/spec. are available on request.

Northman

SOLENOID CONTROLLED PILOT OPERATED DIRECTIONAL VALVE SW-G04 SERIES



FEATURES

- Armature operates in system oil. Impact is decreased and cushioning added,making noise lowered & solenoid life Prolnged.
- Wet armature solenoid eliminates push pin seal, reducing seal wear or leakage for longer avlve life.
- Molded coil gives maximum insulating properties. Then are protected by a special resin and impervious to moisture and dirt for ease of maintenance.
- Plug-in solenoiad, easy to change coil.
- Change of pilot and drain can be easily accomplished by plug-ging or unplugging.
- Spool is designed to avoid creating jet flow or turbulence un-der high pressure and flow.

HOW TO ORDER

SW - G04 - C2 - ET - A220 - 10 - AB - K

K: WITH KNOB
NO CODE: WITHOUT KNOB

NO CODE: STANADRD TYPE
AB: WITH STROKE ADJUSTMEMT BOTH ENDS
A: WITH STROKE ADJUSTMENT PORT "A" END
B: WITH STROKE ADJUSTMENT PORT "B" END

WIRING:
10: WITH JOINTION BOX WITH INDICATING LIGHT
20: HIRSCHMANN TYPE WITH NIDICATING LIGHT

COIL VOLTAGE:
A240: AC240V, 60Hz; AC220V, 50Hz
A220: AC220V, 60Hz; C220V, 50Hz R220: AC220V 50/60Hz
A120: AC120V, 60Hz; AC110V, 50Hz
A110: AC110V, 60Hz; AC110V, 50Hz R110: AC110V 50/60Hz
D24: DC24V
D12: DC12V

T: EXTERNAL DRAIN (See page 34)
NO CODE: FOR STANDARD INTERNAL DRAIN TYPE

E: EXTERNAL PILOT (See page 34)
NO CODE: FOR STANDARD INTERNAL PILOT TYPE

SPOOL TYPE (See page2)

NOMINAL SIZE: 1/2" (D07)

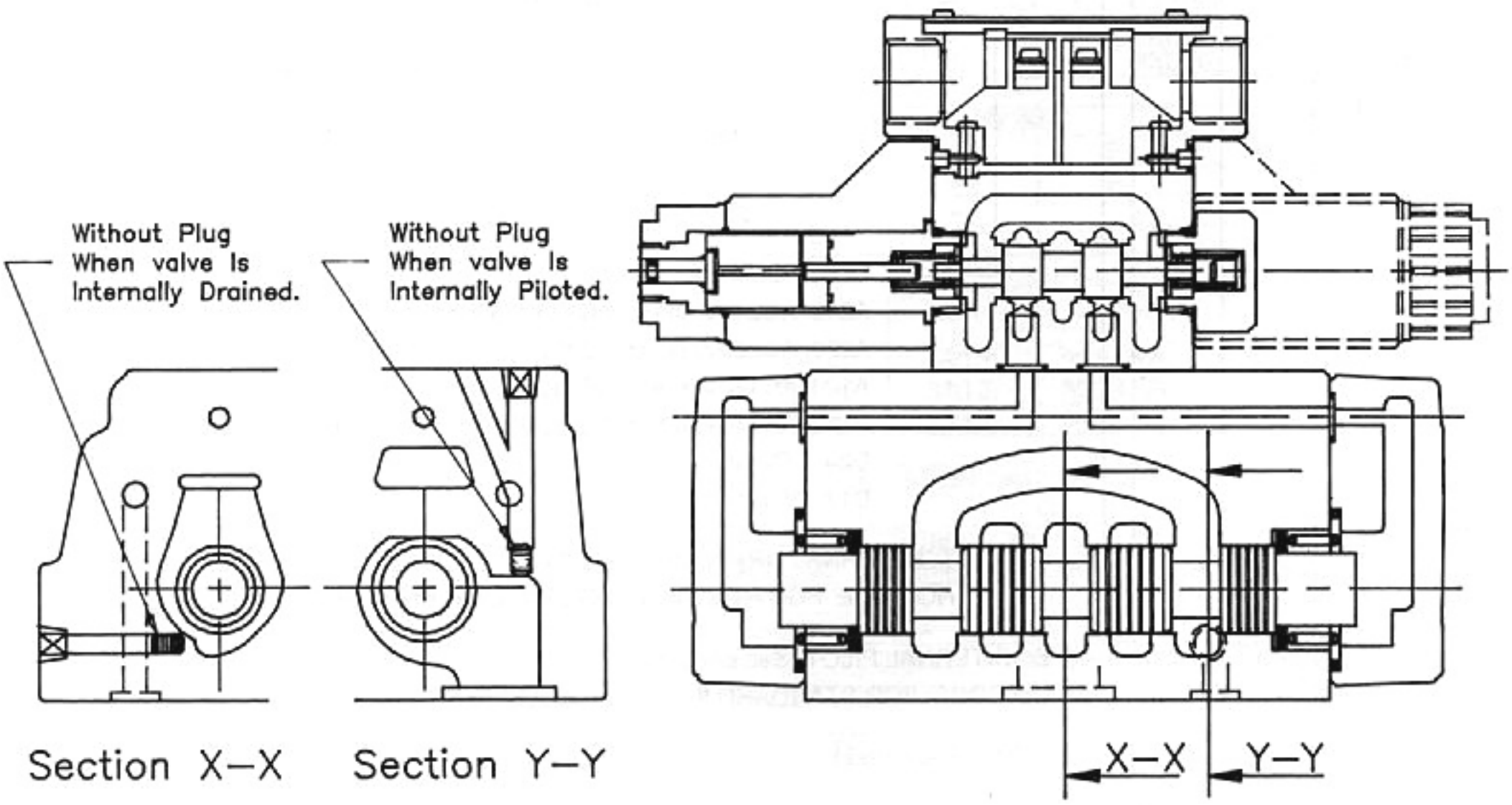
SUBPLATE MOUNTED

HIGH PRESSURE HIGH FLOW SOLENOID DIRECTIONAL VALVE

SPECIFICATIONS

Maximum operating pressure	315 kgf/cm² (4500 PSI)
Maximum tank line back pressure	210 kgf/cm² (3000 PSI) externally drained
	140 kgf/cm² (2000 PSI) internally drained
Pilot pressure	Min. 8 kgf/cm² (113 PSI)
	Max. 250 kgf/cm² (3550 PSI)
Maximum flow	300 LPM (80 GPM)
Weight	SW-G04-C,D SERIES 8.2 kgs (18lbs)
	SW-G04-B SERIES 7.9 kgs (17.5 lbs)

OPTION ET



SOLENOID RATINGS

ELECTRIC SOURCE	COIL TYPE	VOLTAGE(V)			CURRENT & POWER AT RATED VOLTAGE		
		SOURCE RATED	Hz	RANGE	IN-RUSH CURRENT(A)	HOLDING CURRENT(A)	WATTAGE
A.C.	A110	AC100V	50	90-110	1.6	0.46	
		AC100V	60	90-110	1.4	0.36	
		AC110V		99-121	1.5	0.39	
	A120	AC110V	50	99-121	1.3	0.38	
		AC120V	60	108-132	1.2	0.27	
	A220	AC200V	50	180-220	0.80	0.23	
		AC220V	60	198-242	0.75	0.19	
	A240	AC220V	50	198-242	0.67	0.19	
		AC240V	60	216-264	0.59	0.13	
	R110	AC110V	50/60	99-121	0.3	0.3	
	R220	AC220V	50/60	198-242	0.15	0.15	
D.C.	D12	DC12V		10.8-13.2	2.2	2.2	26
	D24	DC24V		21.6-26.4	1.1	1.1	

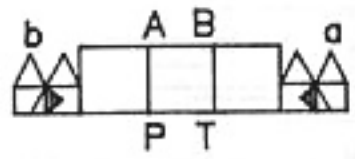
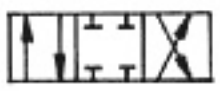
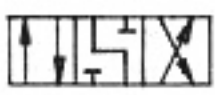
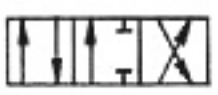
TECHNICAL DATA:

- Solenoid can be used within - 10% to + 10% of the rated voltage of the coil.
- Withstand voltage 1500 v/sec.
- Insulation resistance over 100MΩ.
- A momentary signal of approx 0.1 second is required for shifting action.
- Pilot pressure of internally drained valves must always exceed tank port pressure by a minimum of 8.0 kgf/cm^2 (113 PSI) Valve must be externally drained if there is a possibility of tank line persuader surges overcoming this differential.
- Open center spools C3, C5, C6, C60 must be externally piloted.

ACCESSORIES:

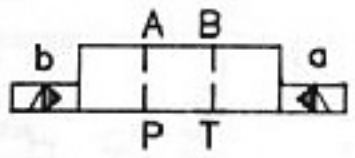
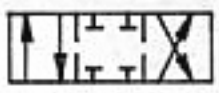
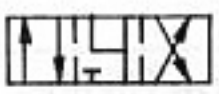
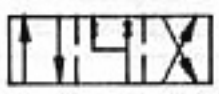
- Mounting bolt kits are supplied with valve socket head cap screws
  M6 x 45 L 2 pieces (1/4" - 20 UNC - 2B x 1 3/4"L) for tightening torque 120-150 kgf-cm.(104-130 lbs-in).
  M10 x 50 L 4 pieces (3/8" - 16 UNC-2B x 2"L) for tightening torque 580-720 kgf-cm.(502-624 lbs-in).
- O-ring P22A 90° 4 pieces, P9 90° 2 pieces.

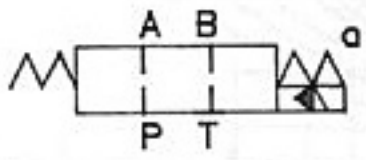
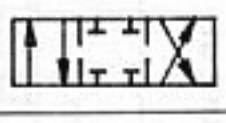
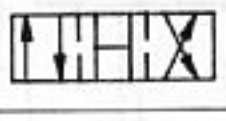
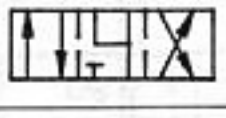
LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOW RATE LPM (GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI)						
SPOOL TYPE NORMAL POSITION	SPRING CENTERED 					
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
C2 	300 (80.0)	300 (80.0)	300 (80.0)	260 (69.3)	200 (53.3)	140 (37.3)
	300 (80.0)	300 (80.0)	260 (69.3)	155 (41.3)	120 (32.0)	110 (29.3)
C3 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
C4 	300 (80.0)	300 (80.0)	300 (80.0)	260 (69.3	245 (65.3)	160 (42.7)
	300 (80.0)	300 (80.0)	260 (69.3)	185 (49.3)	140 (37.3)	110 (29.3)
C40 	300 (80.0)	300 (80.0)	300 (80.0)	260 (69.3)	200 (53.3)	145 (38.7)
	300 (80.0)	300 (80.0)	260 (69.3)	155 (41.3)	120 (32.0)	110 (29.3)
C5 	260 (69.3)	255 (68.0)	250 (66. 6)	245 (65.3)	240 (64.0)	240 (64.0)
C6 	300 (80.0)	300 (80.0)	265 (80.0)	255 (68.0)	245 (65.3)	235 (62.7)
C60 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
C7 	300 (80.0)	300 (80.0)	300 (80.0)	290 (80.0)	280 (74.7)	255 (68.0)
C8 	300 (80.0)	300 (80.0)	285 (76.0)	230 (61.3)	170 (45.3)	135 (36.0)
	300 (80.0)	300 (80.0)	255 (68.0)	165 (44.0)	120 (32.0)	110 (29.3)
C9 	300 (80.0)	300 (80.0)	270 (72.0)	200 (53.3)	160 (42.7)	140 (37.3)

NOTE: The upperside number in table describes the maximum flow for standard type.
The lowerside number in table describes the maximun flow for shock-less type.

LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOW RATE LPM (GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI)						
SPOOL TYPE NORMAL POSITION	NO SPRING 					
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
N2 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
N3 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
N4 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
N40 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)

SPOOL TYPE NORMAL POSITION	SPRING OFFSET 					
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
B2 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
B3 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
B4 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)
B40 	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)	300 (80.0)

PRESSURE DROP AND PERFORMANCE CURVES

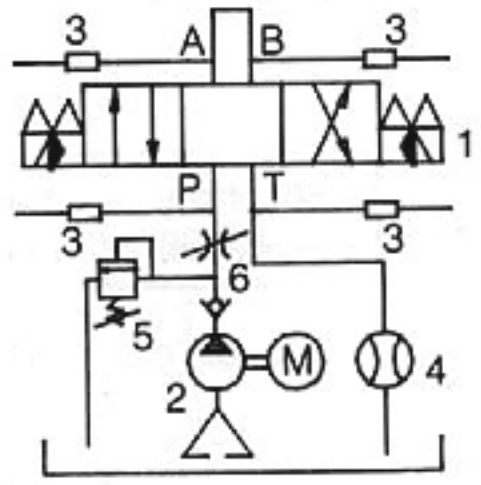
TEST SYSTEMS

1) Testing Valve
2) Pump
3) Pressure sensor
4) Flow sensor
5) Relief valve
6) Throttle valve

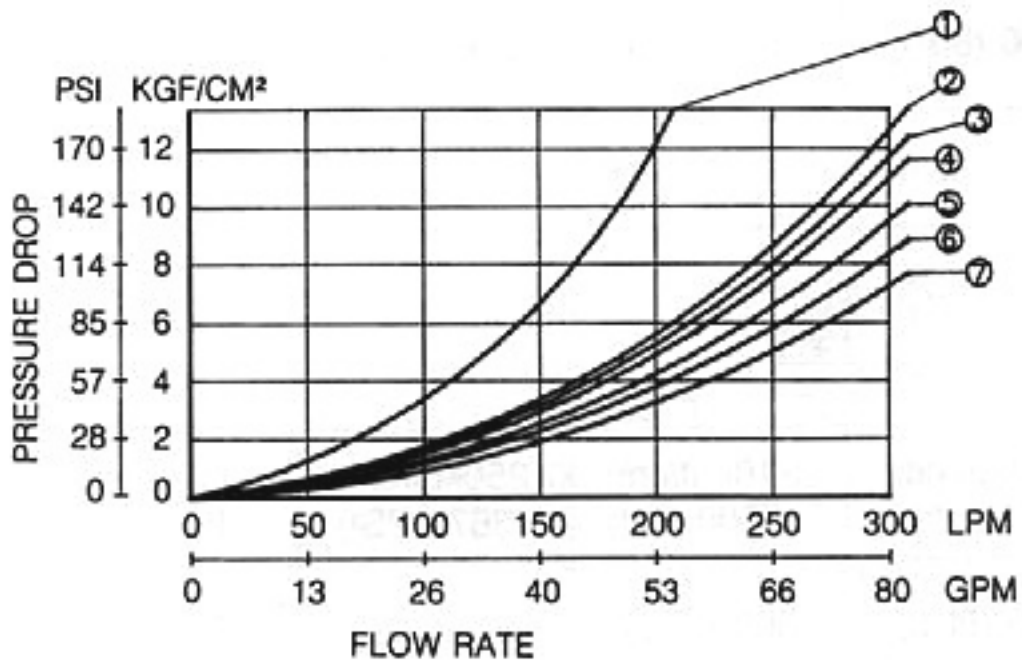
TEST CONDITIONS

Pressure: 70 kgf/cm² (1000 PSI)
Flow Rate: 300 LPM (80 GPM)
Viscosity: 35 CST

TEST CIRCUIT



PERFORMANCE CURVES



MODEL NO.	Pressure Drop Curve Number				
	P– >A	B– >T	P– >B	A– >T	P– >T
C2	5	4	5	6	—
C3	5	3	5	5	7
C4	5	3	5	5	–
C40	5	4	5	6	–
C5	7	4	5	5	5
C6	5	3	5	6	1
C60	7	5	7	7	2
C7	5	4	5	6	–
C8	5	4	5	5	–
C9	6	4	5	6	–

CONTRAST CHART BETWEEN FACTORS AND VISCOSITIES

Viscosity	CST	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor (G')		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

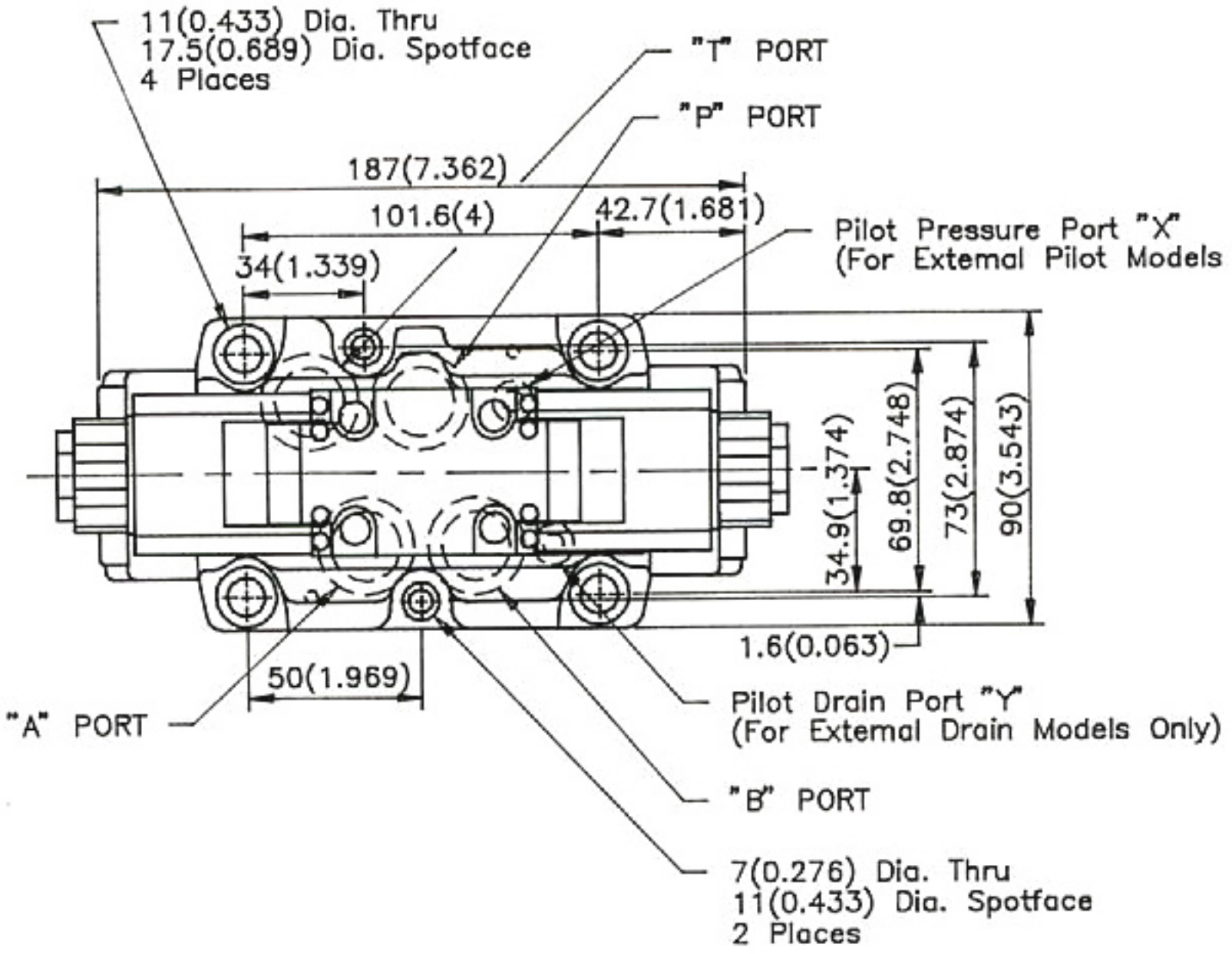
The pressure drop ($\triangle P'$) can be obtained from the formula
$\triangle P' = \triangle p(G'/0.85)$ for other specific gravity (G').

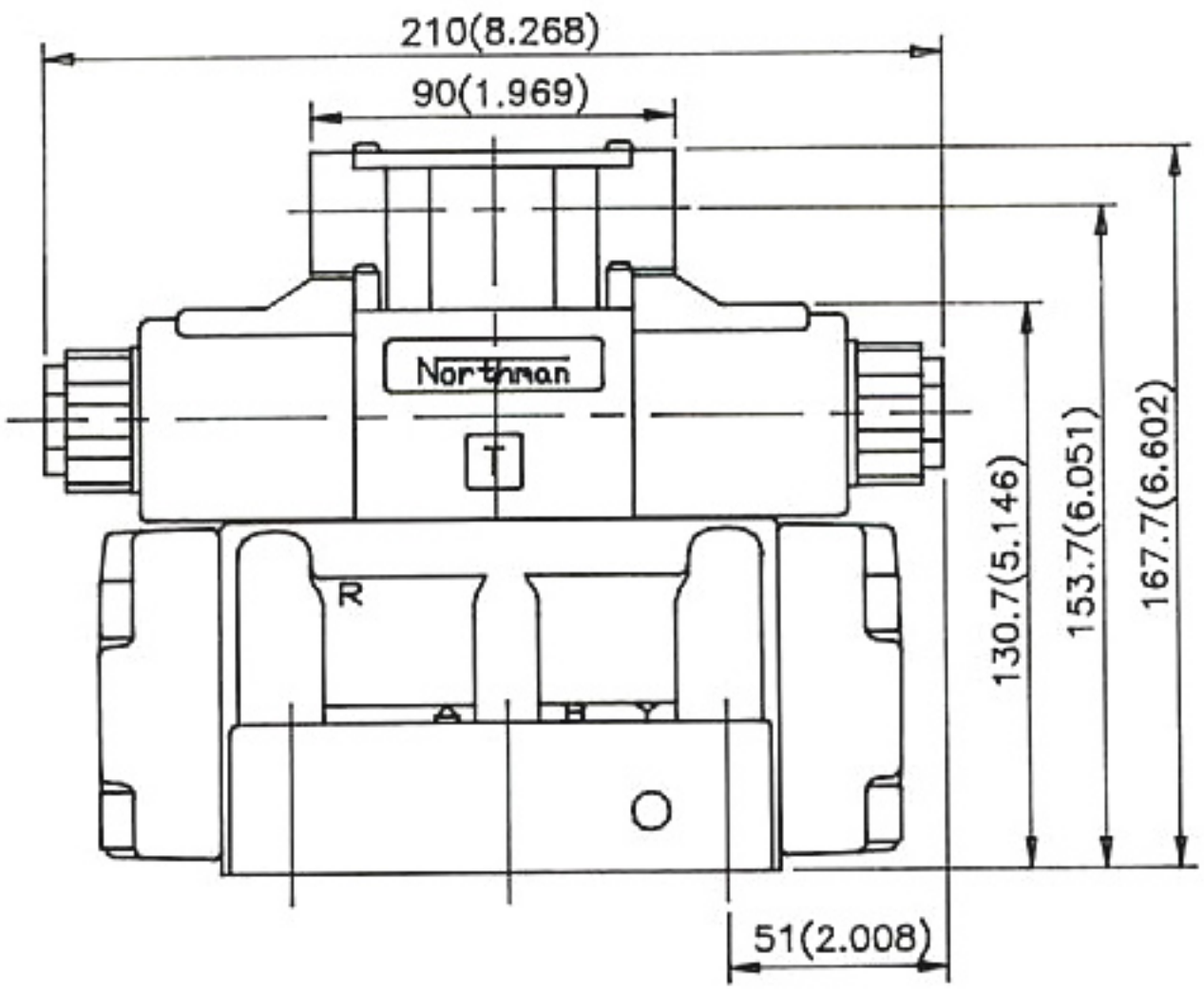
Mounting Surface: ISO 4401-AD-07-4-A

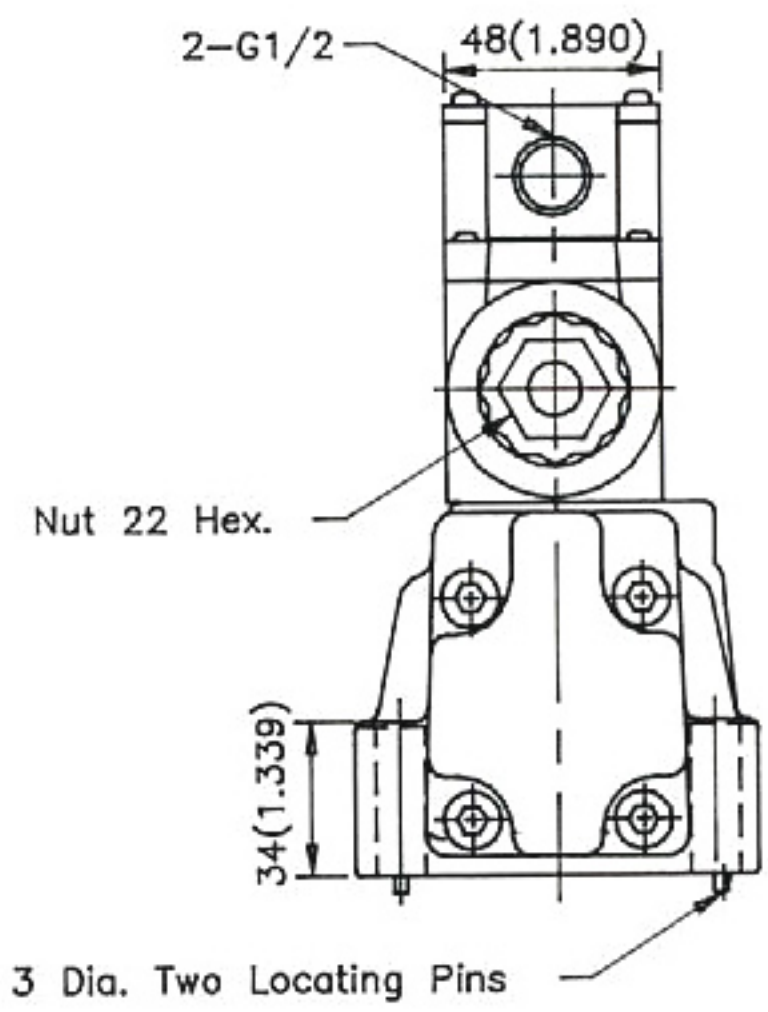
INSTALLATION DIMENSIONS

UNIT: mm (inch)

SW-G04-✻✻✻ - ✻✻ - ✻✻✻✻ -10



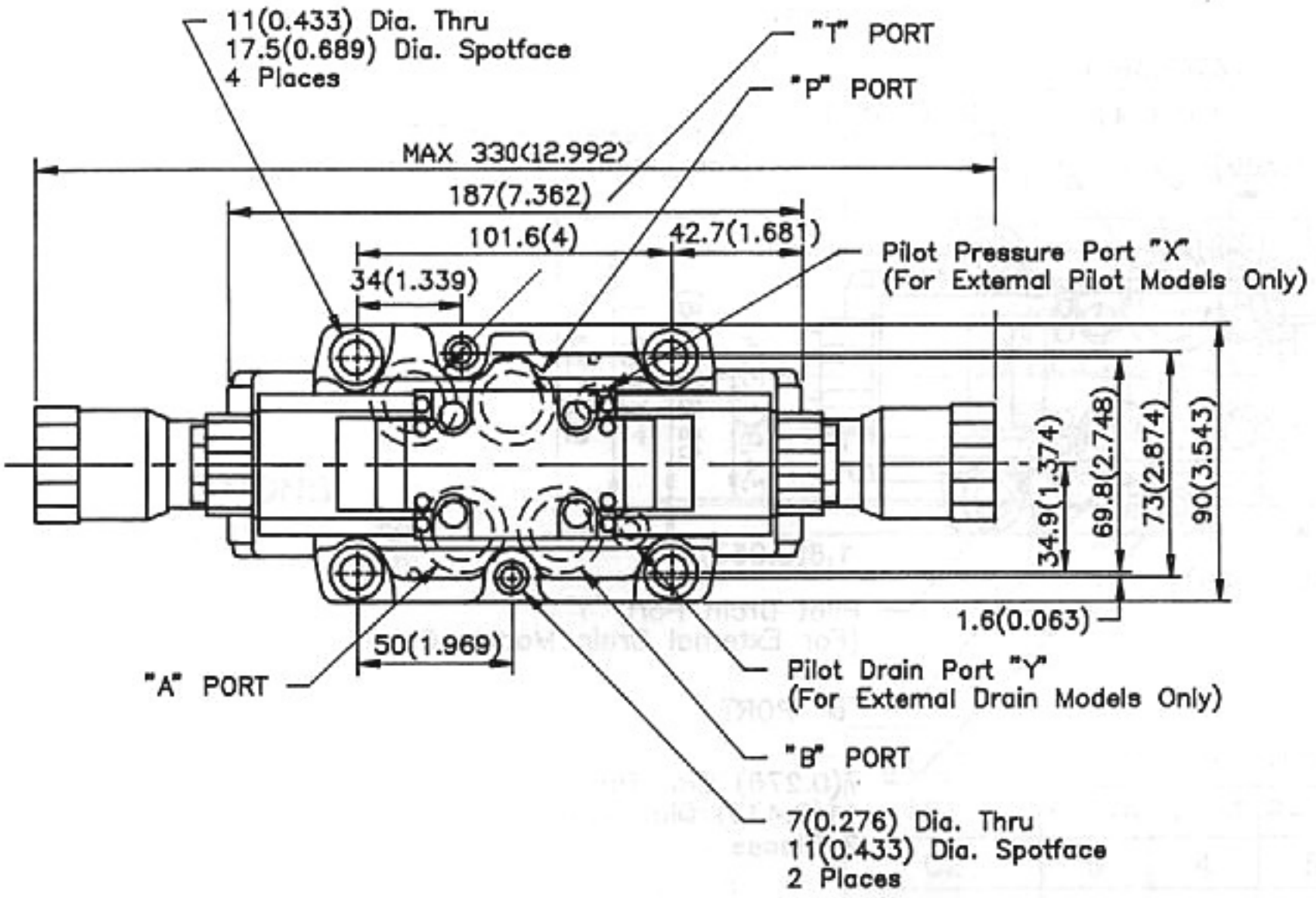


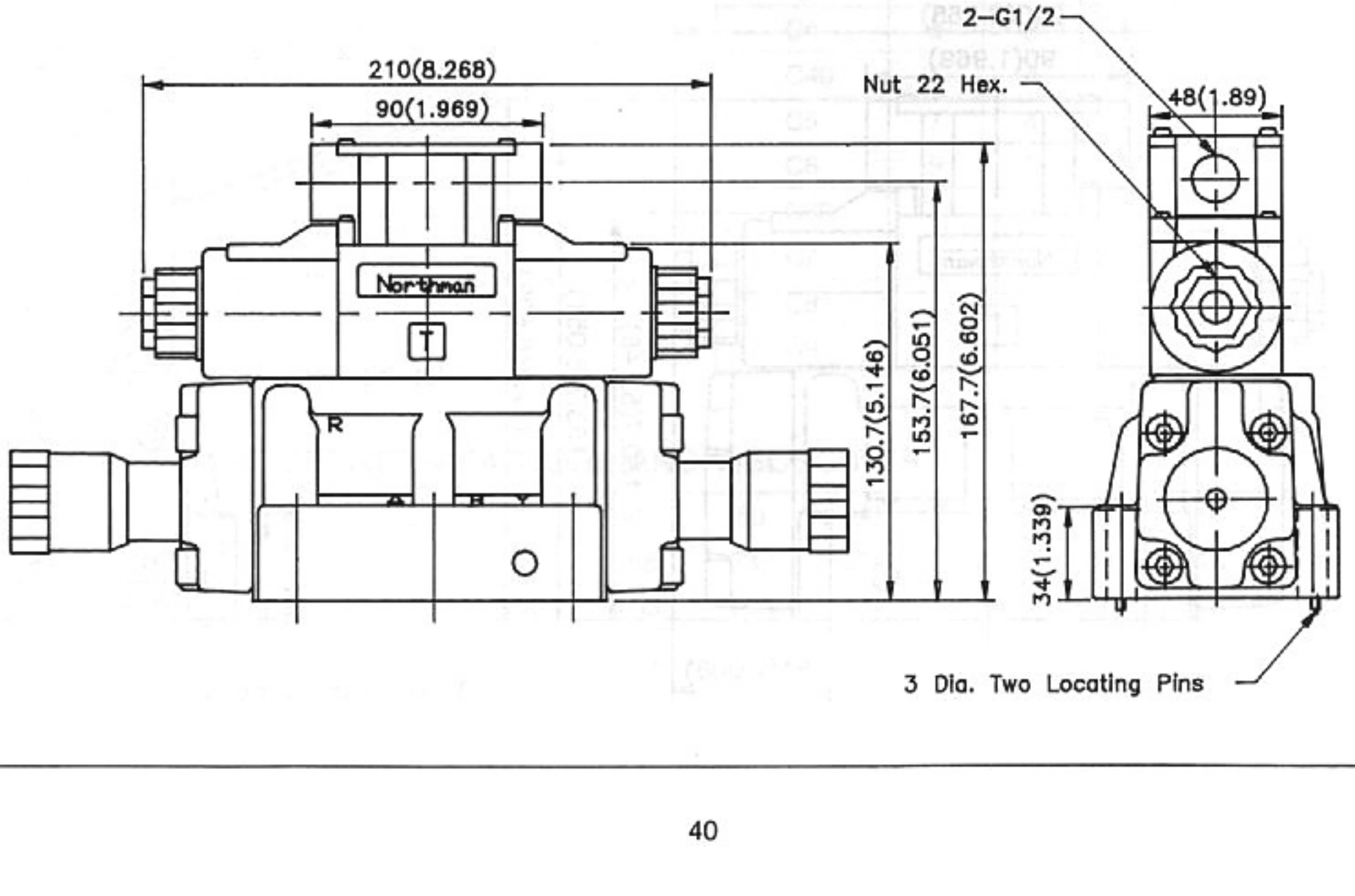


INSTALLATION DIMENSIONS

UNIT: mm (inch)

SW-G04-✻✻✻ - ✻✻ - ✻✻✻✻ - 10-AB-K





HOW TO ORDER

M04-04-S-1

- Subplate: 04
- Port size: 04: 1/2″; 06: 3/4″
- S: Side ports; B: Back ports; SB: Side and back ports
- Thread: 1: PT; 2: NPT; 3: SAE

INSTALLATION DIMENSIONS

UNIT: mm (inch)
WEIGHT: 8.4 kgs (18.5 lbs)

UNIT: mm (inch)

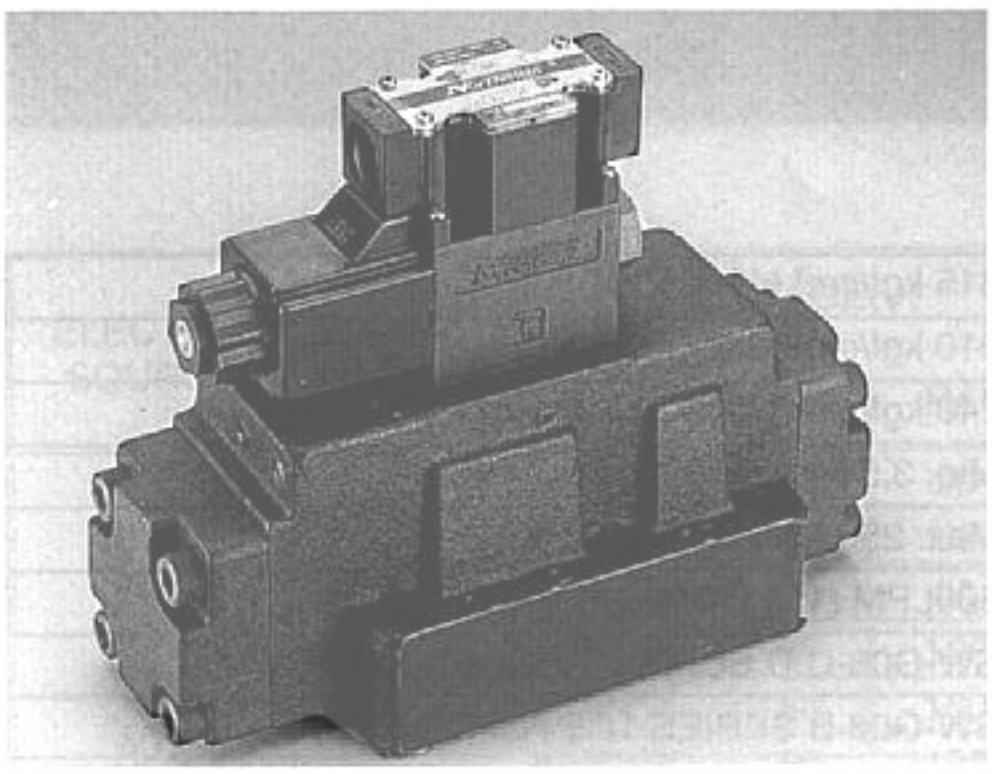
MODEL			PORT SIZE & INSTALLATION DIMENSIONS						
			C	D	E	F	G	H	I
M04-04	-S	-1	4-1/2" PT	—	4-M10×1.5P	2-M6×1.0P	2-1/4" PT	—	36 (1.417)
		-2	4-1/2" NPT	—	4-3/8-16UNC-2B	2-1/4-20UNC-2B	2-1/4" NPT		
		-3	4-1/2" SAE-2B	—	4-3/8-16UNC-2B	2-1/4-20UNC-2B	2-1/4" SAE-2B		
	-B	-1	—	4-1/2" PT	6-M12×1.75P	2-M6×1.0P	2-1/4" PT	30 (1.181)	60 (2.362)
		-2	—	4-1/2" NPT	6-1/2-13UNC-2B	2-1/4-20UNC-2B	2-1/4" NPT		
		-3	—	4-1/2" SAE-2B	6-1/2-13UNC-2B	2-1/4-20UNC-2B	2-1/4" SAE-2B		
	-SB	-1	4-1/2" PT	4-1/2" PT	6-M12×1.75P	2-M6×1.0P	4-1/4" PT	30 (1.181)	60 (2.362)
		-2	4-1/2" NPT	4-1/2" NPT	6-1/2-13UNC-2B	2-1/4-20UNC-2B	4-1/4" NPT		
		-3	4-1/2" SAE-2B	4-1/2" SAE-2B	6-1/2-13UNC-2B	2-1/4-20UNC-2B	4-1/4" SAE-2B		

MODEL			PORT SIZE & INSTALLATION DIMENSIONS						
			C	D	E	F	G	H	I
M04-06	-S	-1	4-3/4" PT	—	4-M10×1.5P	2-M6×1.0P	2-1/4" PT	—	36 (1.417)
		-2	4-3/4" NPT	—	4-3/8-16UNC-2B	2-1/4-20UNC-2B	2-1/4" NPT		
		-3	4-3/4" SAE-2B	—	4-3/8-16UNC-2B	2-1/4-20UNC-2B	2-1/4" SAE-2B		
	-B	-1	—	4-3/4" PT	6-M12×1.75P	2-M6×1.0P	2-1/4" PT	30 (1.181)	60 (2.362)
		-2	—	4-3/4" NPT	6-1/2-13UNC-2B	2-1/4-20UNC-2B	2-1/4" NPT		
		-3	—	4-3/4" SAE-2B	6-1/2-13UNC-2B	2-1/4-20UNC-2B	2-1/4" SAE-2B		
	-SB	-1	4-3/4" PT	4-3/4" PT	6-M12×1.75P	2-M6×1.0P	4-1/4" PT	30 (1.181)	60 (2.362)
		-2	4-3/4" NPT	4-3/4" NPT	6-1/2-13UNC-2B	2-1/4-20UNC-2B	4-1/4" NPT		
		-3	4-3/4" SAE-2B	4-3/4" SAE-2B	6-1/2-13UNC-2B	2-1/4-20UNC-2B	4-1/4" SAE-2B		

REMARK: Various thickness/port sizes/spec. are available on request.

Northman

SOLENOID CONTROLLED PILOT OPERATED DIRECTIONAL VALVE SW-G06 SERIES



FEATURES

- Armtaure operates in system oil. Impact is decreased and cushioning added, making noise lowered & solenoid life Prolnged.
- Wet armature solenoid eliminates push pin seal, reducing seal wear or leakage for longer valve life.
- Molded coil gives maximum insulating properties. They are protected by a special resin and impervious to moisture and dirt for ease of maintenance.
- Plug-in solenoiad, easy to change coil.
- Change of pilot and drain can be easily accomplished by plugging or unplugging.
- Spool is designed to avoid creating jet flow or turbulence under high pressure and flow.

HOW TO ORDER

SW - G06 - C2 - ET - A220 - 10 - AB - K

- **SW** — HIGH PRESSURE HIGH FLOW SONENOLD DIRECTIONAL VALVE
- **G06** — SUBPLATE MOUNTED
- **C2** — NOMINAL SIZE: 3/4" (D08)
- **ET** — SPOOL TYPE (See page2)
- **A220** — COIL VOLTAGE:
  A240: AC240V, 60Hz; AC220V, 50Hz
  A220: AC220V, 60Hz; C220V, 50Hz R220:AC220V 50/60Hz
  A120: AC120V, 60Hz; AC110V, 50Hz
  A110: AC110V, 60Hz; AC100V, 50Hz R110:AC110V 50/60Hz
  D12: DC12V
  D24: DC24V
- **10** — WIRING:
  10: WITH JOINTION BOX WITH INDICATING LIGHT
  20: HIRSCHMANN TYPE WITH INDICATING LIGHT
- **AB** — NO CODE: STANADARD TYPE
  AB: WITH STROKE ADJUSTMEMT BOTH ENDS
  A: WITH STROKE ADJUSTMENT PORT "A" END
  B: WITH STROKE ADJUSTMET PORT "B" END
- **K** — K: WITH KNOB
  NO CODE: WITHOUT KNOB

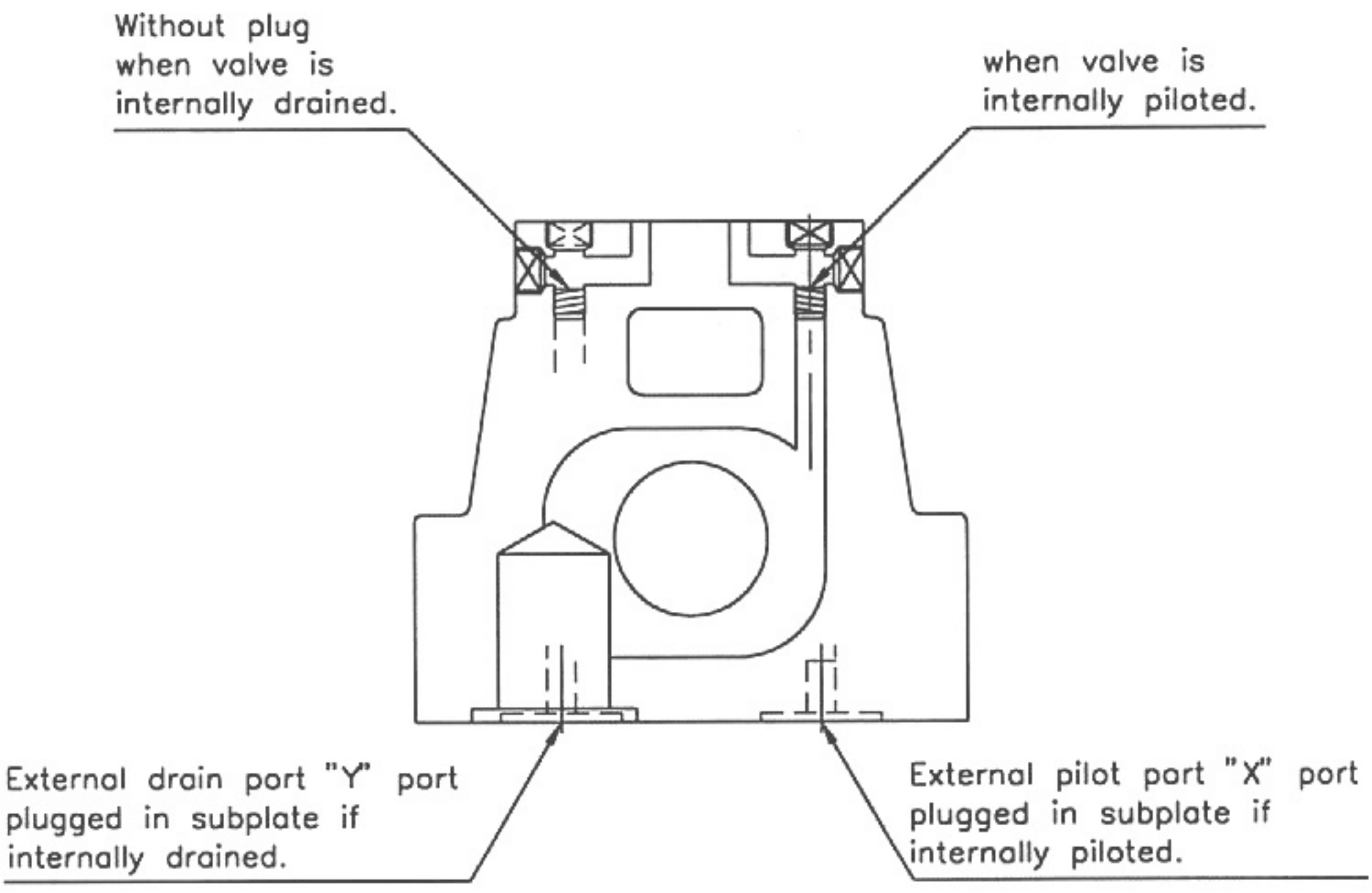
T: EXTERNAL DRAIN (See page 44)
NO CODE: STANDARD INTERNAL DRAIN TYPE

E: EXTERNAL PILOT (See page 44)
NO CODE: FOR STANDARD INTERNAL PILOT TYPE

SPECIFICATIONS

Maximum operating pressure	315 kgf/cm² (4500 PSI)
Maximum tank line back pressure	210 kgf/cm² (3000 PSI) externally drained
	140 kgf/cm² (2000 PSI) internally drained
Pilot pressure	Min. 3.5 kgf/cm² (50 PSI)
	Max. 250 kgf/cm² (3550 PSI)
Maximum flow	500LPM (133 GPM)
Weight	SW-G06-C,D SERIES 12.8kgs (28 lbs)
	SW-G06-B SERIES 12.5 kgs (27.5 lbs)

OPTION ET



SOLENOID RATINGS

ELECTRIC SOURCE	COIL TYPE	VOLTAGE(V)			CURRENT & POWER AT RATED VOLTAGE		
		SOURCE RATED	Hz	RANGE	IN-RUSH CURRENT(A)	HOLDING CURRENT(A)	WATTAGE
A.C.	A110	AC100V	50	90-110	1.6	0.46	
		AC110V	60	99-121	1.5	0.39	
	A120	AC110V	50	99-121	1.3	0.38	
		AC120V	60	108-132	1.2	0.27	
	A220	AC200V	50	180-220	0.80	0.23	
		AC220V	60	198-242	0.75	0.19	
	A240	AC220V	50	198-242	0.67	0.19	
		AC240V	60	216-264	0.59	0.13	
	R110	AC110V	50/60	99-121	0.3	0.3	
	R220	AC220V	50/60	198-242	0.15	0.15	
D.C.	D12	DC12V		10.8-13.2	2.2	2.2	26
	D24	DC24V		21.6-26.4	1.1	1.1	

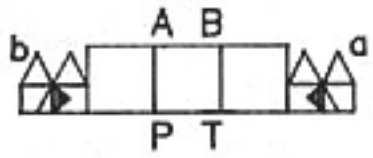
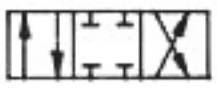
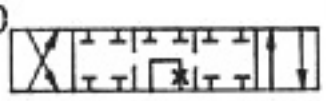
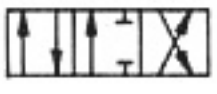
TECHNICAL DATA:

- Solenoid can be used within - 10% to + 10% of the rated voltage of the coil.
- Withstand voltage 1500 v/sec.
- Insulation resistance over 100MΩ.
- A momentary signal of approx 0.1 second is required for shifting action.
- Pilot pressure of internally drained valves must always exceed tank port pressure by a minimum of 3.5 kgf/cm² (50 PSI) Valve must be externally drained if there is a possibility of tank line pressure surges overcoming this differential.
- Open center spools C3, C5, C6, C60 must be externally piloted.

ACCESSORIES:

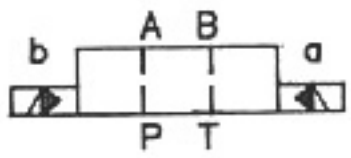
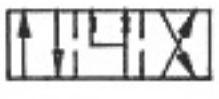
- Mounting bolt kits are supplied with valve socket head cap screws
  M12 x 60 L 6 pieces (1/2" - 13 UNC-2B x 2 3/8"L) for tightening torque 1000-1230 kgf-cm.(886-1066 lbs-in).
- O-ring P28 90° 4 pieces, P21 90° 2 pieces.

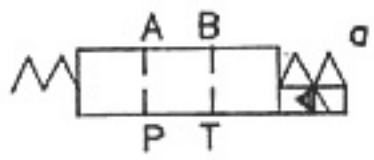
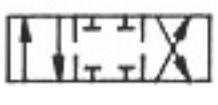
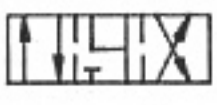
LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOW RATE LPM (GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI)						
SPOOL TYPE NORMAL POSITION	SPRING CENTERED 					
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
C2 	500 (133.0)	500 (133.0)	500 (133.0)	450 (120.0)	410 (109.3)	310 (82.6)
	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
C3 	500 (133.0)	500 (133.0)	500 (133.0)	480 (128.0)	460 (122.6)	360 (96.0)
C4 	500 (133.0)	500 (133.0)	500 (133.0)	450 (120.0)	410 (109.3)	310 (82.6)
	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
C40 	500 (133.0)	500 (133.0)	500 (133.0)	450 (120.0)	410 (109.3)	310 (82.6)
	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
C5 	500 (133.0)	500 (133.0)	500 (133.0)	450 (120.0)	420 (112.0)	350 (93.3)
C6 	500 (133.0)	470 (125.3)	400 (106.6)	350 (93.3)	300 (80.0)	230 (61.3)
C60 	500 (133.0)	470 (125.3)	425 (113.3)	385 (102.6)	340 (90.6)	280 (74.6)
	500 (133.0)	470 (125.3)	425 (113.3)	385 (102.6)	340 (90.6)	280 (74.6)
C7 	500 (133.0)	500 (133.0)	500 (133.0)	480 (128.0)	450 (120.0)	360 (96.0)
C8 	500 (133.0)	500 (133.0)	500 (133.0)	450 (120.0)	410 (109.3)	310 (82.6)
	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
C9 	500 (133.0)	500 (133.0)	500 (133.0)	450 (120.0)	410 (109.3)	310 (82.6)
	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)

NOTE: The upperside number in table describes the maximum flow for standard type.
The lowerside number in table describes the maximun flow for shock-less type.

LIST OF SPOOL FUNCTIONS

THE MAXIMUM FLOW RATE LPM (GPM) UNDER DIFFERENT PRESSURE KGF/CM² (PSI)						
SPOOL TYPE NORMAL POSITION	NO SPRING 					
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
N2 	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
N3 	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
N4 	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
N40 	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)

SPOOL TYPE NORMAL POSITION	SPRING OFFSET 					
	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)	250kgf/cm² (3675 PSI)	315kgf/cm² (4500 PSI)
B2 	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
B3 	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
B4 	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)
B40 	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)	500 (133.0)

PRESSURE DROP AND PERFORMANCE CURVES

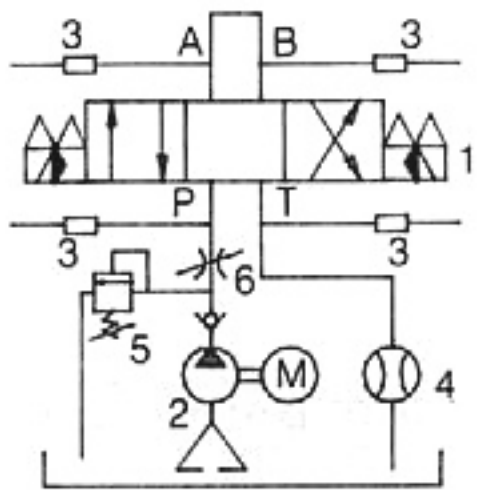
TEST SYSTEMS

1) Testing Valve
2) Pump
3) Pressure sensor
4) Flow sensor
5) Relief valve
6) Throttle valve

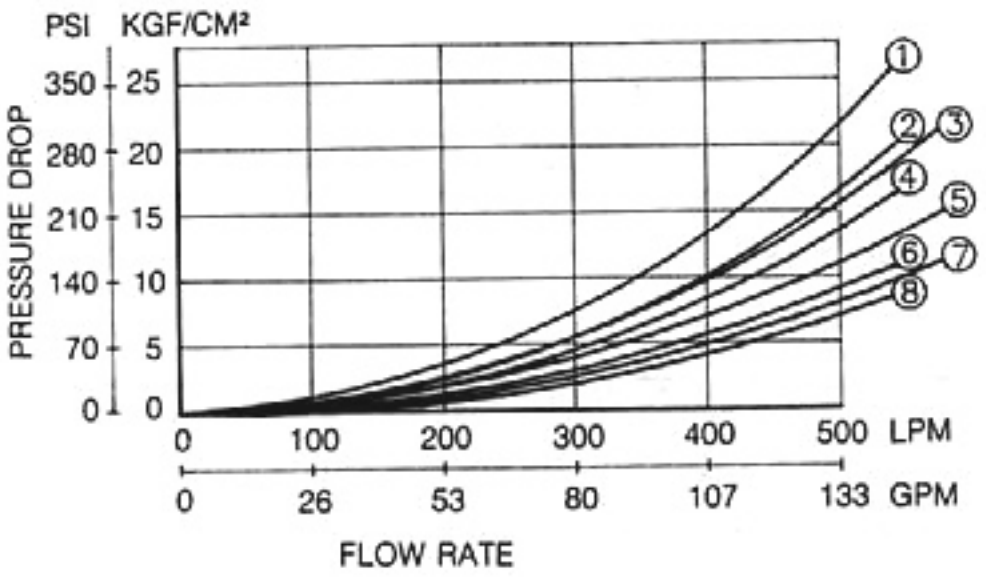
TEST CONDITIONS

Pressure: 70 kgf/cm² (1000 PSI)
Flow Rate: 600 L/min (189 GPM)
Viscosity: 35 CST

TEST CIRCUIT



PERFORMANCE CURVES



MODEL NO.	Pressure Drop Curve Number				
	P– >A	B– >T	P– >B	A– >T	P– >T
C2	8	5	8	7	—
C3	6	4	6	7	6
C4	8	5	8	7	—
C40	8	5	8	7	—
C5	8	4	5	7	2
C6	5	1	5	4	3
C60	6	5	6	7	3
C7	6	5	6	7	—
C8	8	5	8	7	—
C9	8	4	5	7	—
D2	8	5	8	7	—
D3	6	4	6	7	—
B2	8	5	8	7	—
B3	6	4	6	7	—
B20	5	—	8	—	—
B2S	8	5	8	7	—
B3S	6	4	6	7	—
B20S	8	—	5	—	—

CONTRAST CHART BETWEEN FACTORS AND VISCOSITIES

Viscosity	CST	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor (G')		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

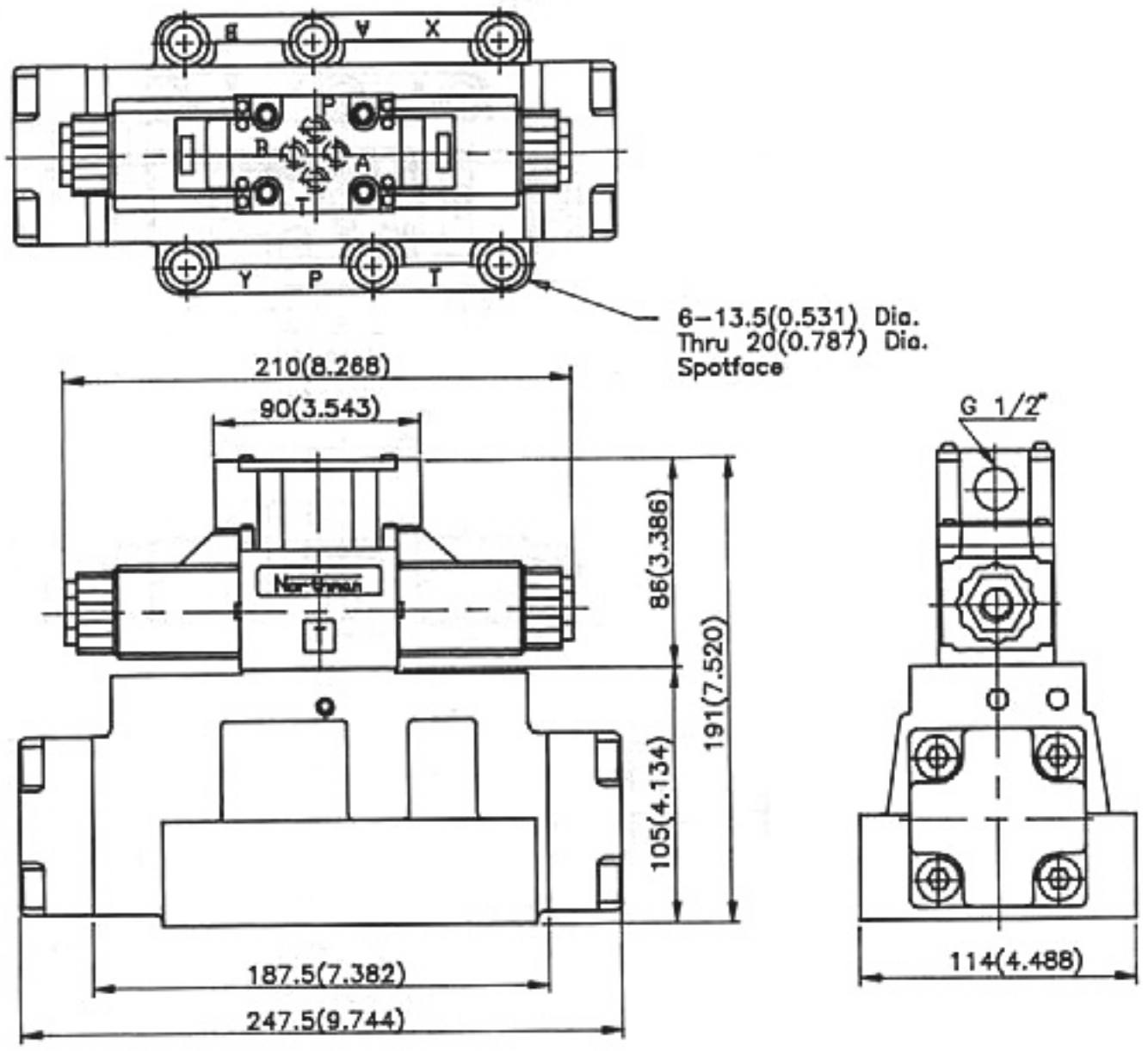
The pressure drop ($\triangle P'$) can be obtained from the formula
$\triangle P' = \triangle p(G'/0.85)$ for other specific gravity (G').

Mounting Surface: ISO 4401-AE-08-4-A

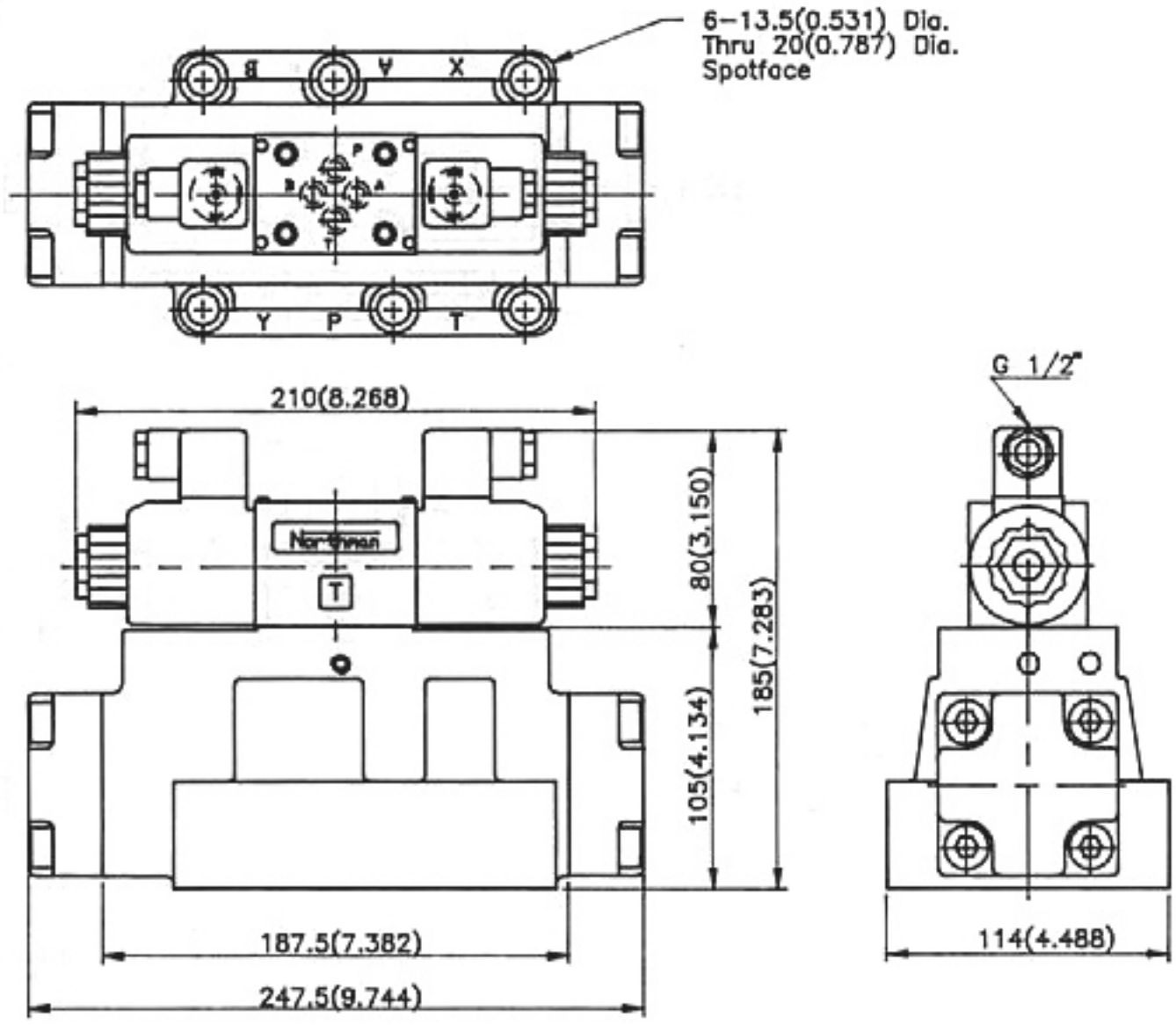
INSTALLATION DIMENSIONS

UNIT: mm (inch)

SW-G06-※※※-※※-※※※※-10



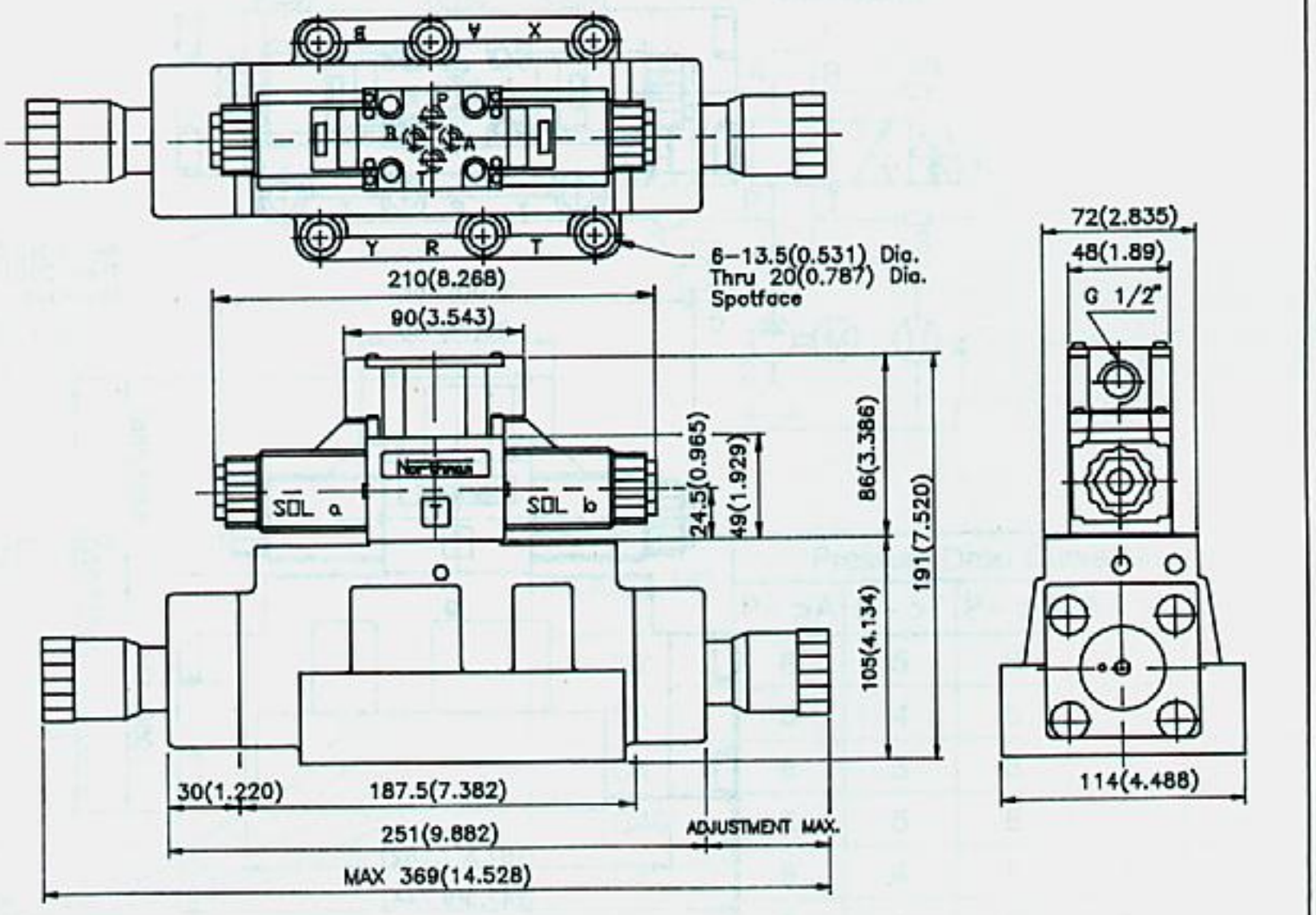
SW-G06-※※※-※※-※※※※-20



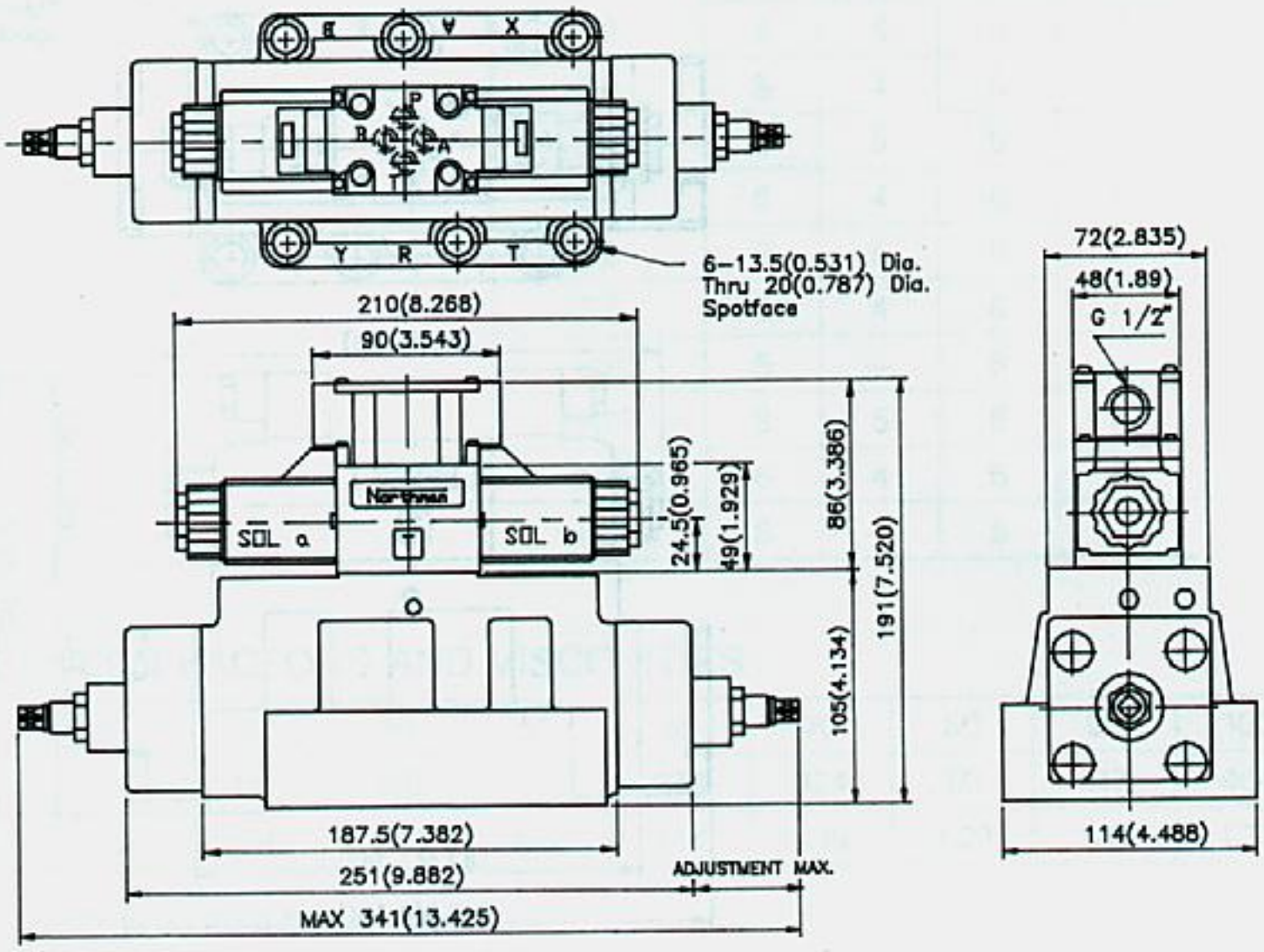
INSTALLATION DIMENSIONS

UNIT: mm (inch)

SWH-G06-***-**-****-10-AB-K



SWH-G06-***-**-****-10-AB



HOW TO ORDER

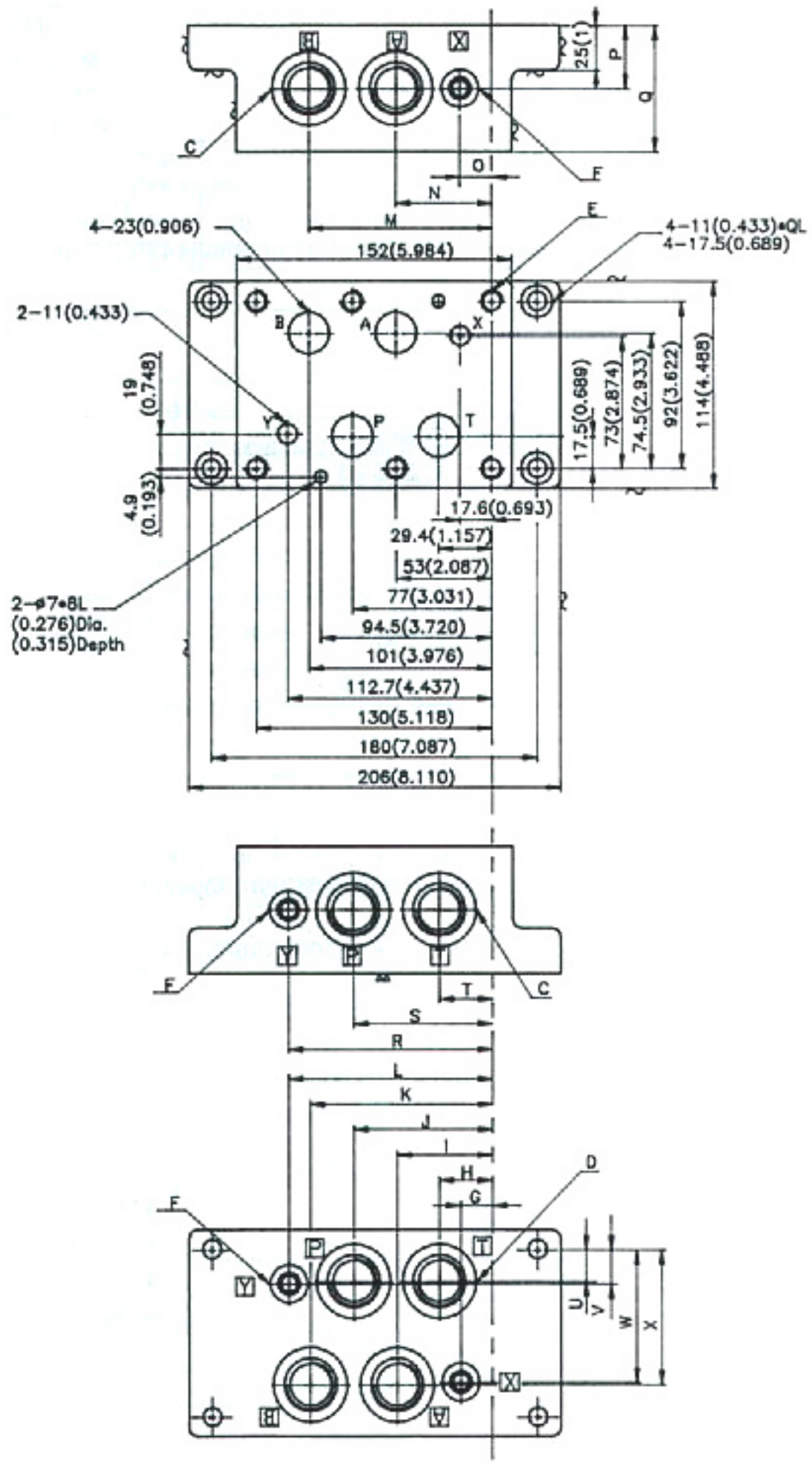
M06-06-S-1

- Thread
  - 1: PT
  - 2: NPT
  - 3: SAE
- S: Side ports
  B: Back ports
  SB: Side and back ports
- Port size
  06: 3/4"
  08: 1"
  10: 1-1/4"
- Subplate
  06

INSTALLATION DIMENSIONS

UNIT: mm (inch)

WEIGHT: 10 kgs (22lbs)



SUBPLATE
M06 SERIES

UNIT: mm (inch)

MODEL			PORT SIZE & INSTALLATION DIMENSIONS			
			C	D	E	F
M06-06	-S	-1	4-3/4" PT	—	6-M12×1.75P	2-1/4" PT
		-2	4-3/4" NPT	—	6-1/2-13UNC-2B	2-1/4" NPT
		-3	4-3/4" SAE-2B	—	6-1/2-13UNC-2B	2-1/4" SAE-2B
	-B	-1	—	4-3/4" PT	6-M12×1.75P	2-1/4" PT
		-2	—	4-3/4" NPT	6-1/2-13UNC-2B	2-1/4" NPT
		-3	—	4-3/4" SAE-2B	6-1/2-13UNC-2B	2-1/4" SAE-2B
	-SB	-1	4-3/4" PT	4-3/4" PT	6-M12×1.75P	4-1/4" PT
		-2	4-3/4" NPT	4-3/4" NPT	6-1/2-13UNC-2B	4-1/4" NPT
		-3	4-3/4" SAE-2B	4-3/4" SAE-2B	6-1/2-13UNC-2B	4-1/4" SAE-2B

MODEL		INSTALLATION DIMENSIONS																
		G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
M06-06	-S	—	—	—	—	—	—	101 (3.976)	53 (2.087)	17.6 (0.693)	35 (1.378)	70 (2.756)	112.7 (4.437)	77 (3.031)	29.4 (1.157)	—	—	—	—
	-B	17.6 (0.693)	29.4 (1.157)	53 (2.087)	77 (3.031)	101 (3.976)	112.7 (4.437)	—	—	—	—	—	—	—	—	17.5 (0.689)	19 (0.748)	73 (2.874)	74.5 (2.933)
	-SB	17.6 (0.693)	29.4 (1.157)	53 (2.087)	77 (3.031)	101 (3.976)	112.7 (4.437)	101 (3.976)	53 (2.087)	17.6 (0.693)	35 (1.378)	70 (2.756)	112.7 (4.437)	77 (3.031)	29.4 (1.157)	17.5 (0.689)	19 (0.748)	73 (2.874)	74.5 (2.933)

MODEL			PORT SIZE & INSTALLATION DIMENSIONS			
			C	D	E	F
M06-08	-S	-1	4-1" PT	—	6-M12×1.75P	2-1/4" PT
		-2	4-1" NPT	—	6-1/2-13UNC-2B	2-1/4" NPT
		-3	4-1" SAE-2B	—	6-1/2-13UNC-2B	2-1/4" SAE-2B
	-B	-1	—	4-1" PT	6-M12×1.75P	2-1/4" PT
		-2	—	4-1" NPT	6-1/2-13UNC-2B	2-1/4" NPT
		-3	—	4-1" SAE-2B	6-1/2-13UNC-2B	2-1/4" SAE-2B
	-SB	-1	4-1" PT	4-1" PT	6-M12×1.75P	4-1/4" PT
		-2	4-1" NPT	4-1" NPT	6-1/2-13UNC-2B	4-1/4" NPT
		-3	4-1" SAE-2B	4-1" SAE-2B	6-1/2-13UNC-2B	4-1/4" SAE-2B

MODEL		INSTALLATION DIMENSIONS																
		G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
M06-08	-S	—	—	—	—	—	—	106 (4.173)	53 (2.087)	17.6 (0.693)	35 (1.378)	70 (2.756)	112.7 (4.437)	77 (3.031)	24.4 (0.961)	—	—	—	—
	-B	17.6 (0.693)	24.4 (0.961)	53 (2.087)	77 (3.031)	101 (3.976)	112.7 (4.437)	—	—	—	—	—	—	—	—	17.5 (0.689)	19 (0.748)	73 (2.874)	74.5 (2.933)
	-SB	17.6 (0.693)	24.4 (0.961)	53 (2.087)	77 (3.031)	101 (3.976)	112.7 (4.437)	106 (4.173)	53 (2.087)	17.6 (0.693)	35 (1.378)	70 (2.756)	112.7 (4.437)	77 (3.031)	24.4 (0.961)	17.5 (0.689)	19 (0.748)	73 (2.874)	74.5 (2.933)

MODEL			PORT SIZE & INSTALLATION DIMENSIONS			
			C	D	E	F
M06-10	-S	-1	4-1¼" PT	—	6-M12×1.75P	2-1/4" PT
		-2	4-1¼" NPT	—	6-1/2-13UNC-2B	2-1/4" NPT
		-3	4-1¼" SAE-2B	—	6-1/2-13UNC-2B	2-1/4" SAE-2B
	-B	-1	—	4-1¼" PT	6-M12×1.75P	2-1/4" PT
		-2	—	4-1¼" NPT	6-1/2-13UNC-2B	2-1/4" NPT
		-3	—	4-1¼" SAE-2B	6-1/2-13UNC-2B	2-1/4" SAE-2B
	-SB	-1	4-1¼" PT	4-1¼" PT	6-M12×1.75P	4-1/4" PT
		-2	4-1¼" NPT	4-1¼" NPT	6-1/2-13UNC-2B	4-1/4" NPT
		-3	4-1¼" SAE-2B	4-1¼" SAE-2B	6-1/2-13UNC-2B	4-1/4" SAE-2B

MODEL		INSTALLATION DIMENSIONS																
		G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X
M06-10	-S	—	—	—	—	—	—	106 (4.173)	48 (1.890)	8.5 (0.335)	45 (1.772)	90 (3.543)	121.5 (4.783)	82 (3.228)	24.4 (0.961)	—	—	—	—
	-B	8.5 (0.335)	24.4 (0.961)	48 (1.890)	82 (3.228)	106 (4.173)	121.5 (4.783)	—	—	—	—	—	—	—	—	17.5 (0.689)	19 (0.748)	73 (0.874)	74.5 (2.933)
	-SB	8.5 (0.335)	24.4 (0.961)	48 (1.890)	82 (3.228)	106 (4.173)	121.5 (4.783)	106 (4.173)	48 (1.890)	8.5 (0.335)	45 (1.772)	90 (3.543)	121.5 (4.783)	82 (3.228)	24.4 (0.961)	17.5 (0.689)	19 (0.748)	73 (2.874)	74.5 (2.933)

REMARK: Various thickness/port sizes/spec. are available on request.

Northman

SOLENOID CONTROLLED PILOT OPERATED DIRECTIONAL VALVE SW-G10 SERIES

FEATURES

- Armature operates in system oil. Impact is decreased and cushioning added,making noise lowered & solenoid life prolonged.
- Wet armature solenoid eliminates push pin seal, reducing seal wear or leakage for longer valve life.
- Molded coil gives maximum insulating properties. They are protected by a special resin and impervious to moisture and dirt for ease of maintenance.
- Plug-in solenoid, easy to change coil.
- Change of pilot and drain can be easily accomplished by plugging or unplugging.
- Spool is designed to avoid creating jet flow or turbulence under high pressure and flow.

HOW TO ORDER

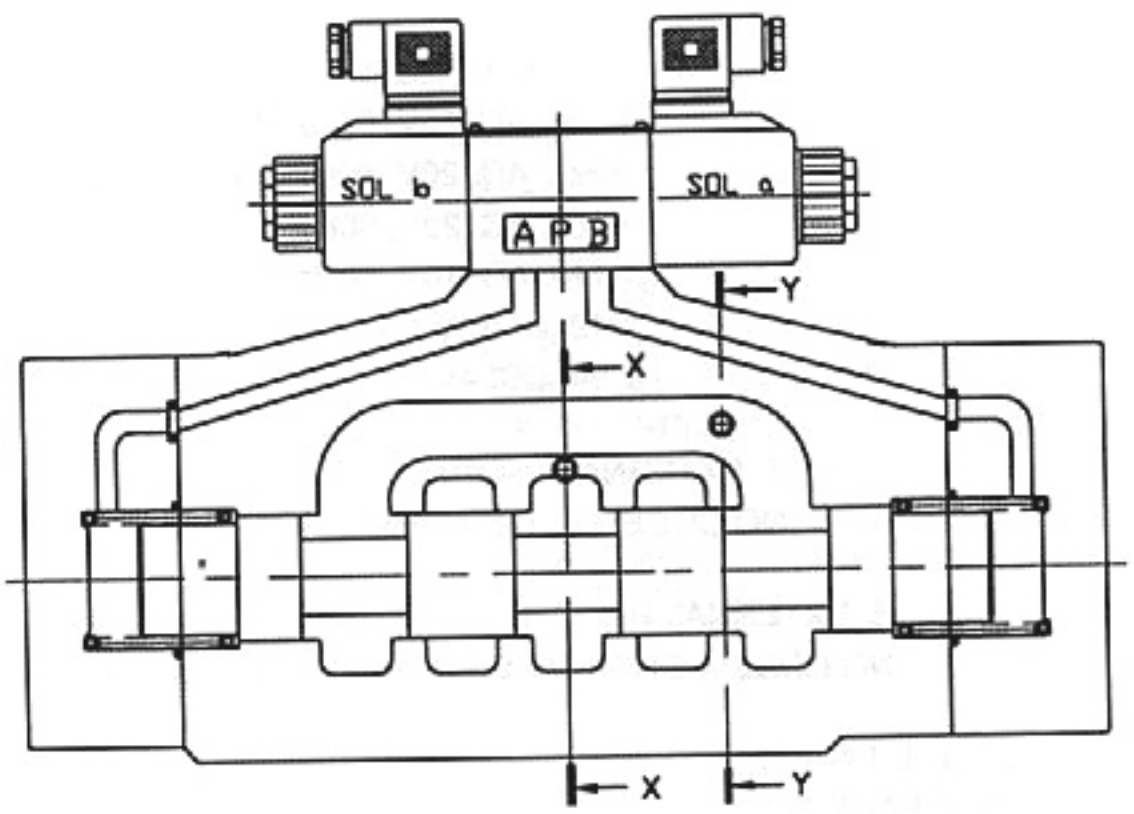
SW - G10 - C2 - ET - A220 - 10

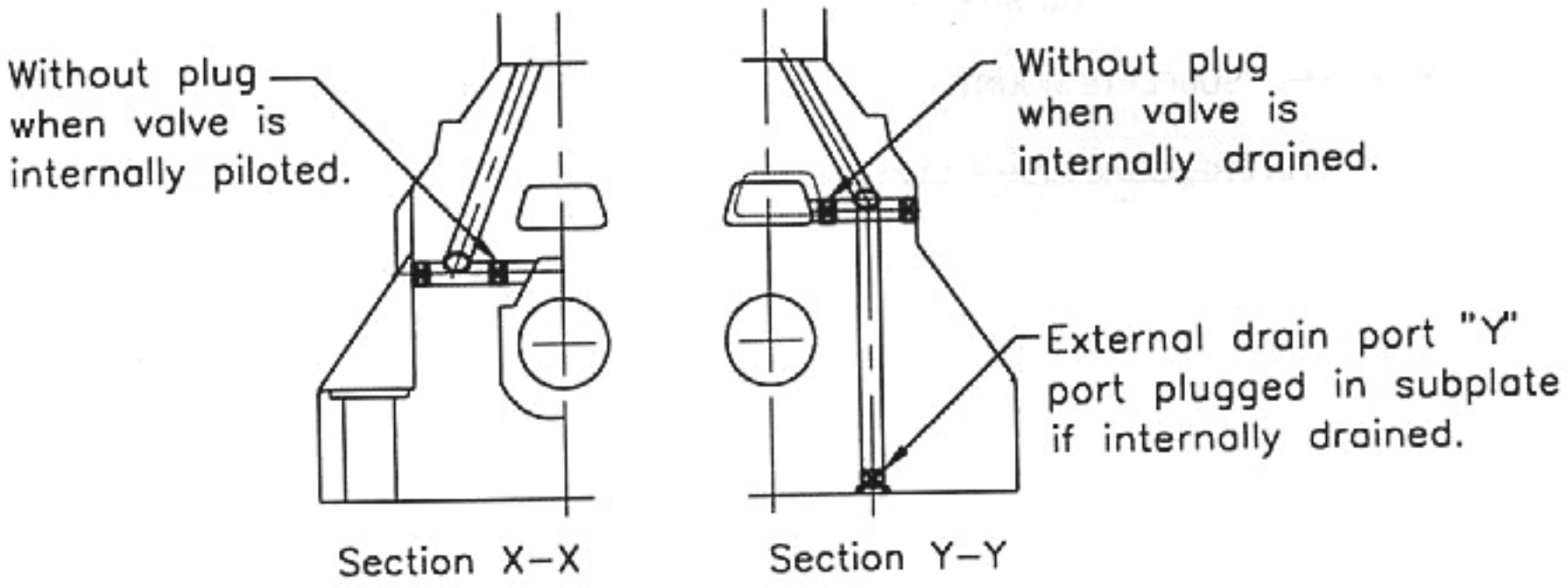
- **SW**: HIGH PRESSURE HIGH FLOW SOLENOID DIRECTIONAL VALVE
- **G10**: SUBPLATE MOUNTED
- **C2**: NOMINAL SIZE: 1-1/4" (D10)
- **ET**: SPOOL TYPE (SEE PAGE 56)
- **E**: E: EXTERNAL PILOT
  NO CODE: FOR STANDARD INTERNAL PILOT TYPE
- **T**: T: EXTERNAL DRAIN
  NO CODE: FOR STANDARD INTERNAL DRAIN TYPE
- **A220**: COIL VOLTAGE:
  A240: AC240V, 60Hz: 220V, 50Hz
  A220: AC220V, 60Hz: 200V, 50Hz
  A120: AC120V, 60Hz: 110V, 50Hz
  A110: AC110V, 60Hz: 100V, 50Hz
  D12: DC12V
  D24: DC24V
- **10**: WIRING:
  10: WITH JUNCTION BOX WITH INDICATING LIGHT
  20: HIRSCHMANN TYPE WITH INDICATING LIGHT

SPECIFICATIONS

Nominal size	1-1/4"
Maximum operating pressure	210 kgf/cm² (3000 PSI)
Maximum tank line back pressure	140 kgf/cm² (2000 PSI) externally drained
	70 kgf/cm² (1000 PSI) internally drained
Pilot pressure	Min. 10 kgf/cm² (140 PSI)
	Max. 210 kgf/cm² (3000 PSI)
Maximum flow	1100 LPM/min (292 GPM)
	SW-G10-$\frac{C*}{D*}$ SERIES 50 kgs (110 LBS)
Weight	SW-G10-B* SERIES 49.7 Kgs (109LBS)

OPTION ET





SOLENOID RATINGS

ELECTRIC SOURCE	COIL TYPE	VOLTAGE(V)			CURRENT & POWER AT RATED VOLTAGE		
		Hz	SOURCE RATED	RANGE	IN-RUSH CURRENT(A)	HOLDING CURRENT(A)	WATTAGE
A.C.	A110	50	100	90-110	1.6	0.46	
		60	100	90-110	1.4	0.32	
			110	99-121	1.5	0.39	
	A120	50	110	99-121	1.3	0.38	
		60	120	108-132	1.2	0.27	
	A220	50	200	180-220	0.80	0.23	
		60	200	180-220	0.70	0.16	
			220	198-242	0.75	0.19	
	A240	50	220	198-242	0.67	0.19	
		60	240	216-264	0.59	0.13	
D.C.	D12	12		10.8-13.2		2.2	26
	D24	24		21.6-26.4		1.1	

TECHNICAL DATA:

- Solenoid can be used within - 10% to + 10% of the rate voltage of the coil.
- Withstand voltage 1500 v/sec.
- Insulation resistance over 100MΩ.
- A momentary signal of approx 0.1 sencond is required for shifting remove.
- Pilot pressure of internally drained valves must always exceed tank port pressure by a minimum of 10 kgf/cm² (140 PSI). Valve must be exeternally drained if there is a possibility of tank line pressure surges overcoming this differential.
- Open center spools C3, C5, C6, C60 must be externally piloted.

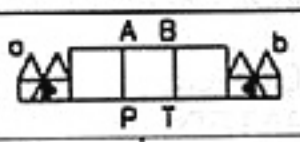
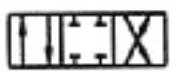
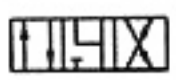
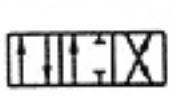
PORT INTERCONNECTION:

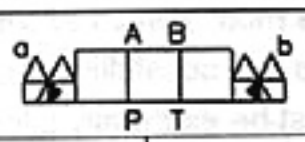
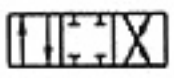
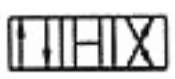
- With solenoid "b" energized P- ->A B- ->T
- With solenoid "a" energized P- ->B A- ->T
- (But port interconnections are revered for C5, C6, C60 type.)

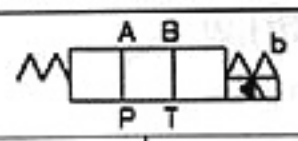
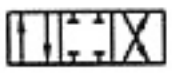
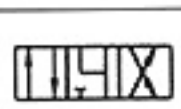
ACCECCORIES:

- Mounting bolt kit are supplied with valve socket head cap screws.
  M20 x 75L 6 pieces (3/4" - 10 UNC x 3")
  Tightening torque 4730-5850 kgf-cm (4100-5060 lbs-in).
- O-ring P41 90° 4 pieces, P20 90° 2 pieces.

LIST OF SPOOL FUNCTION

THE MAXIMUM FLOW RATE LPM (GPM) UNDER DIFFERENT PRESSURES KGF/CM² (PSI)				
SPOOL TYPE	SPRING CENTERED 			
NORMAL POSITION	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)
C2 	1100 (292)	1100 (292)	1100 (292)	1030 (274)
C3 	1100 (292)	1100 (292)	1100 (292)	1090 (290)
C4 	1100 (292)	1100 (292)	1100 (292)	1030 (274)
C5 	1100 (292)	1100 (292)	1100 (292)	1040 (276)
C6 	1100 (292)	1050 (278)	880 (234)	800 (212)
C7 	1100 (292)	1100 (292)	1100 (292)	1060 (282)
C8 	1100 (292)	1100 (292)	1100 (292)	1060 (282)
C9 	1100 (292)	1100 (292)	1100 (292)	1060 (282)

THE MAXIMUM FLOW RATE LPM (GPM) UNDER DIFFERENT PRESSURES KGF/CM² (PSI)				
SPOOL TYPE	NO SPRING 			
NORMAL POSITION	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)
N2 	1100 (292)	1100 (292)	1100 (292)	1100 (292)
N3 	1100 (292)	1100 (292)	1100 (292)	1100 (292)
N4 	1100 (292)	1100 (292)	1100 (292)	1100 (292)

THE MAXIMUM FLOW RATE LPM (GPM) UNDER DIFFERENT PRESSURES KGF/CM² (PSI)				
SPOOL TYPE	SPRING OFFSET 			
NORMAL POSITION	50kgf/cm² (735 PSI)	100kgf/cm² (1470 PSI)	150kgf/cm² (2200 PSI)	210kgf/cm² (3000 PSI)
B2 	1100 (292)	1100 (292)	1100 (292)	1100 (292)
B3 	1100 (292)	1100 (292)	1100 (292)	1100 (292)
B4 	1100 (292)	1100 (292)	1100 (292)	1100 (292)

PRESSURE DROP AND PERFORMANCE CURVES

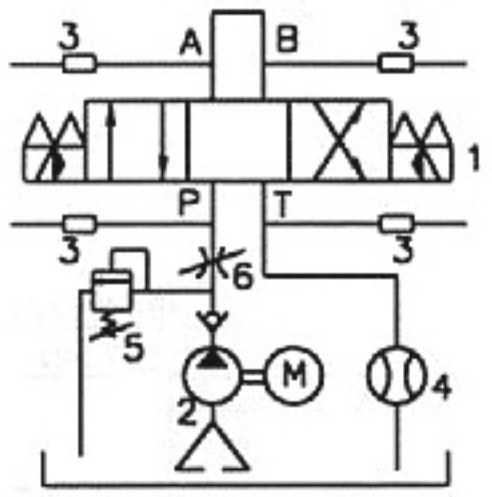
TEST SYSTEM

1. TESTING VALVE
2. PUMP
3. PRESSURE SENSOR
4. FLOW SENSOR
5. RELIEF VALVE
6. THROTTLE VALVE

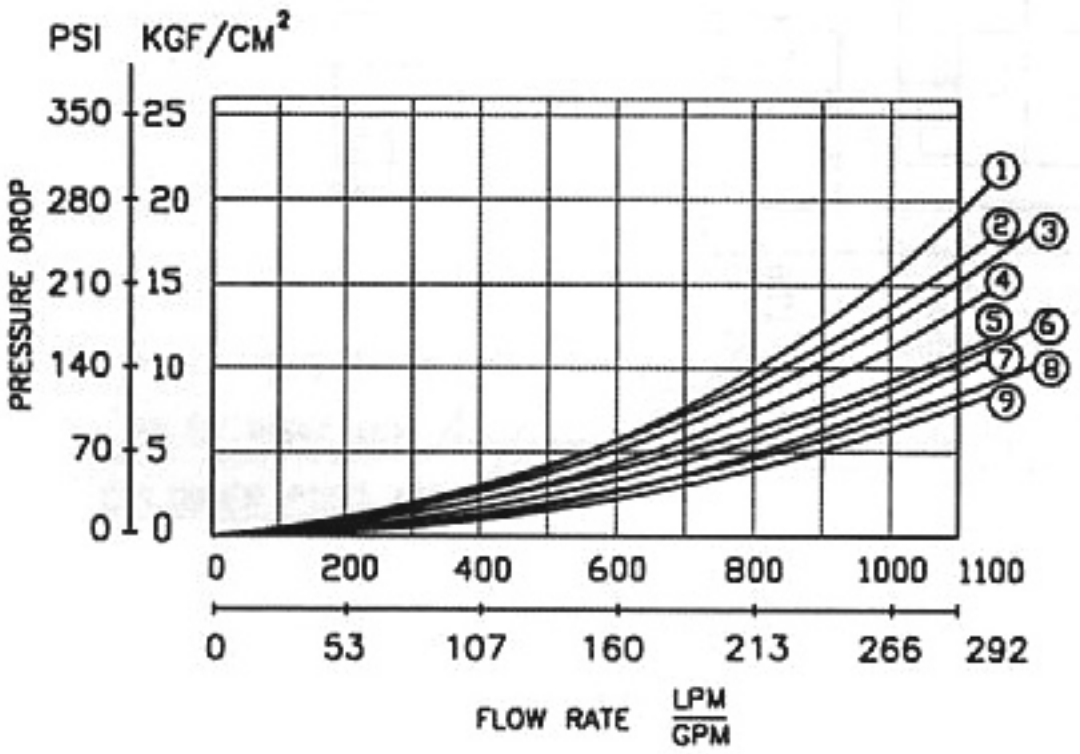
TEST CONDITION

PRESSURE: 70 KGF/CM² (1000 PSI)
FLOW RATE: 1100 L/min (192 GMP)
VISCOSITY: 35 CST

TEST CIRCUIT



PERFORMANCE CURVES



spool type	PRESSURE DROP CURVE				
	P→A	B→T	P→B	A→T	P→T
C2	9	6	9	8	_
C3	7	6	7	7	5
C4	9	6	9	6	_
C40	9	6	9	8	_
C5	9	6	8	6	1
C6	5	3	5	4	2
C60	8	5	8	5	3
C7	7	6	7	7	_
C8	7	6	7	7	_
C9	7	6	7	8	_

CONTRAST CHART BETWEEN FACTOR AND VISCOSITIES

Viscosty	CST(mm²/s)	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor (G')		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

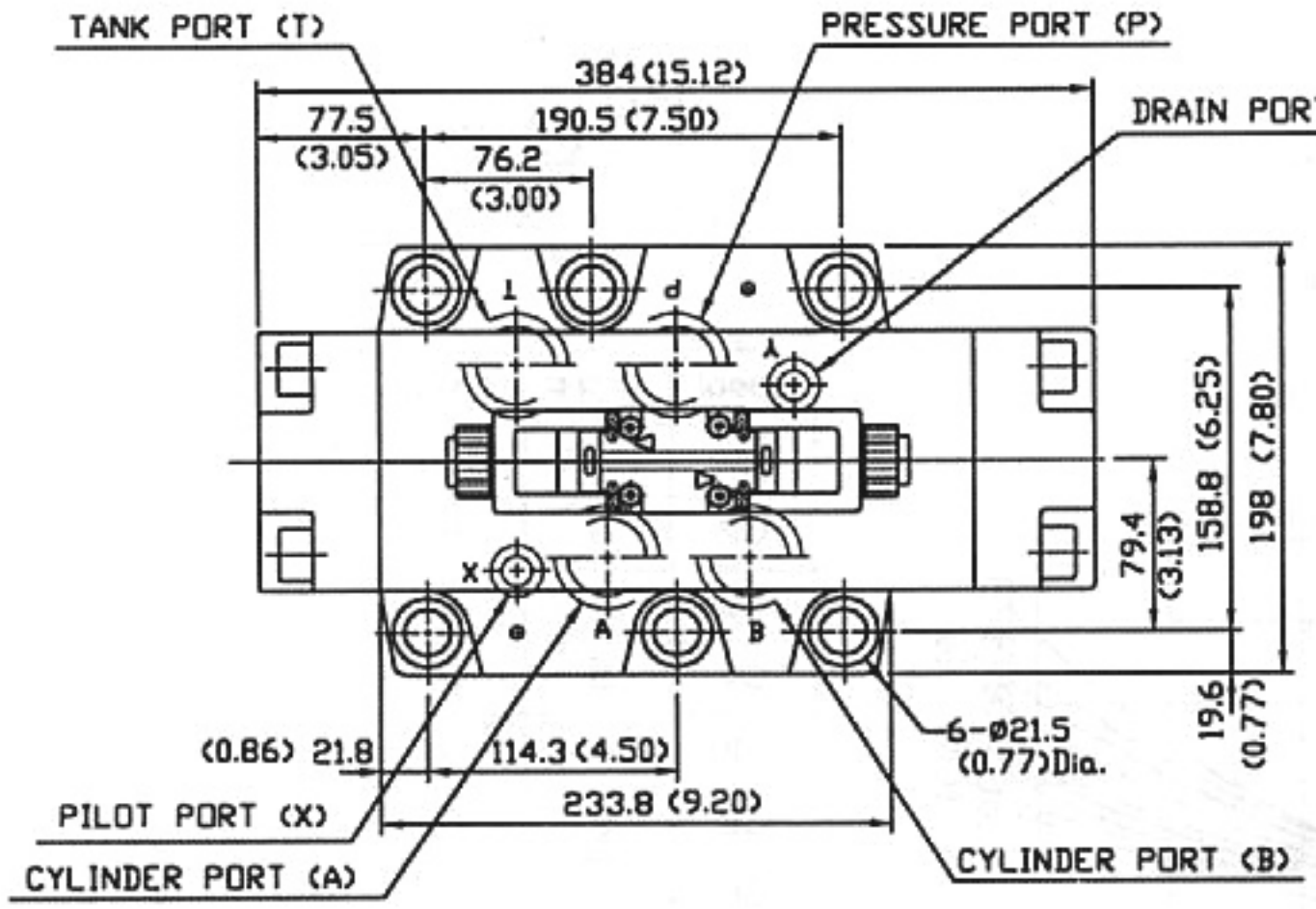
The pressure drop (ΔP') can be obtained form the formula
ΔP'=ΔP(G'/0.850) for other specific gravity (G').

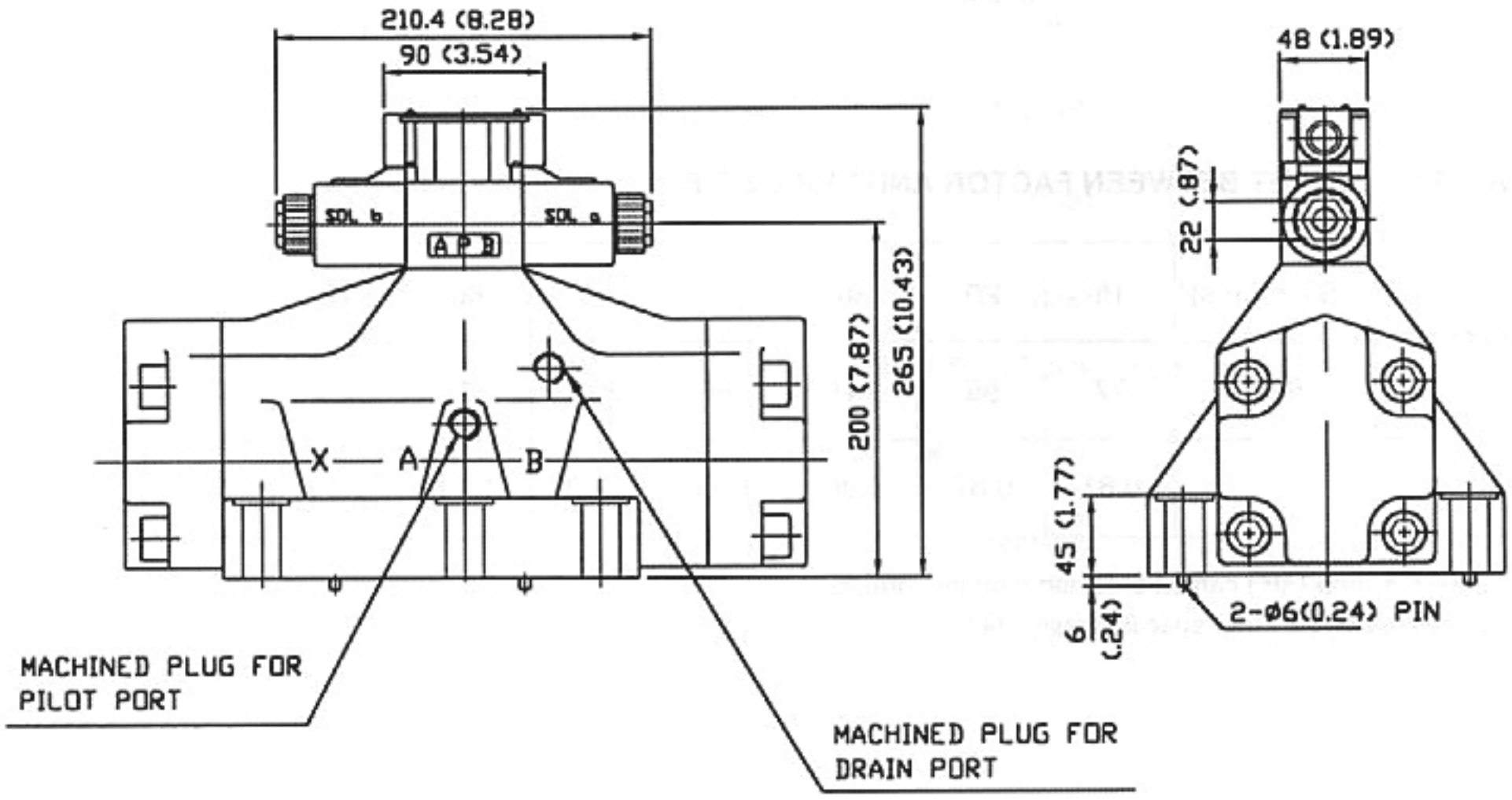
Mounting Surface: ISO 4401-AE-10-4-A

INSTALLATION DIMENSIONS

UNIT:mm (inch)

SW-G10-※※※-※※-※※※※-10



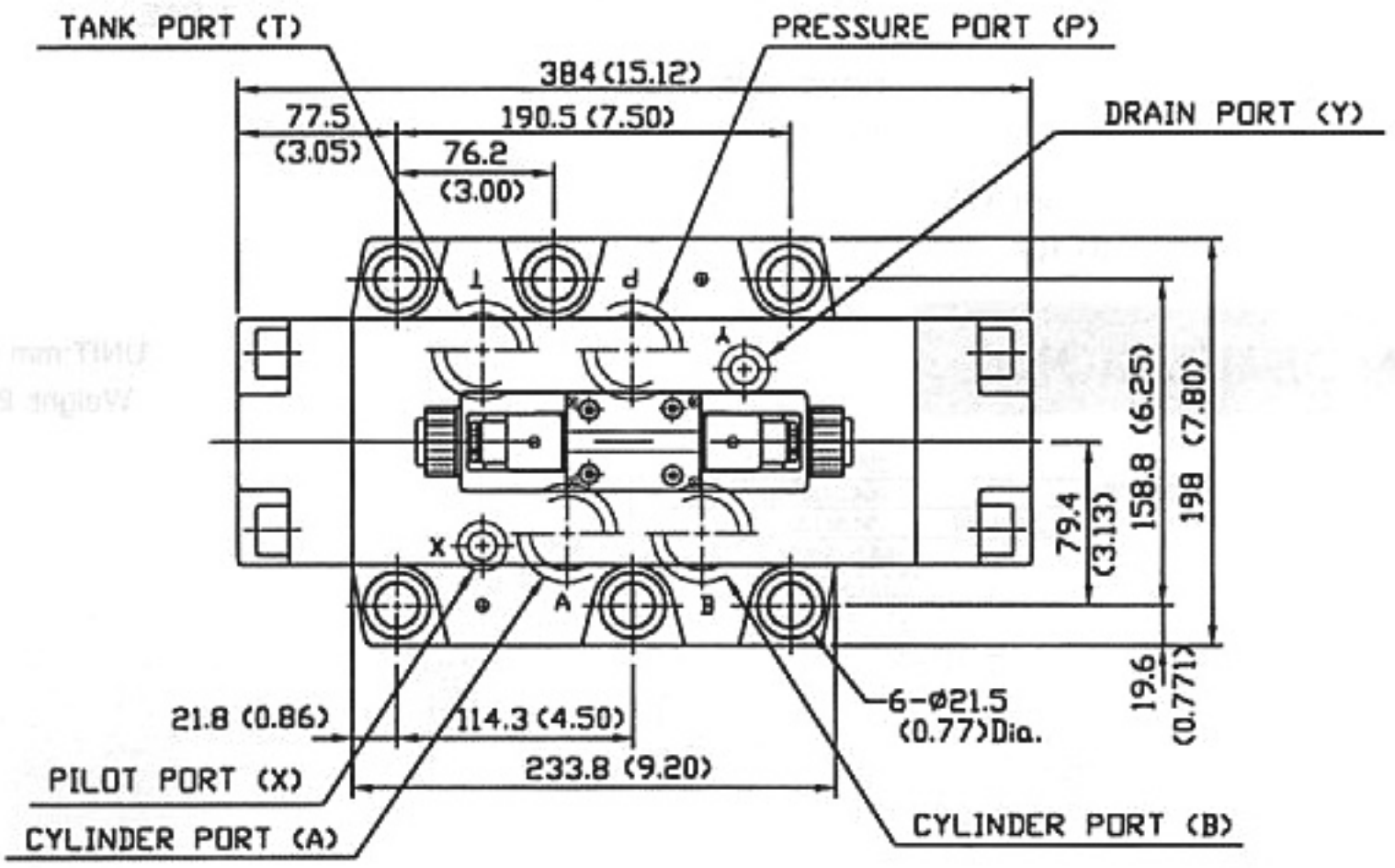


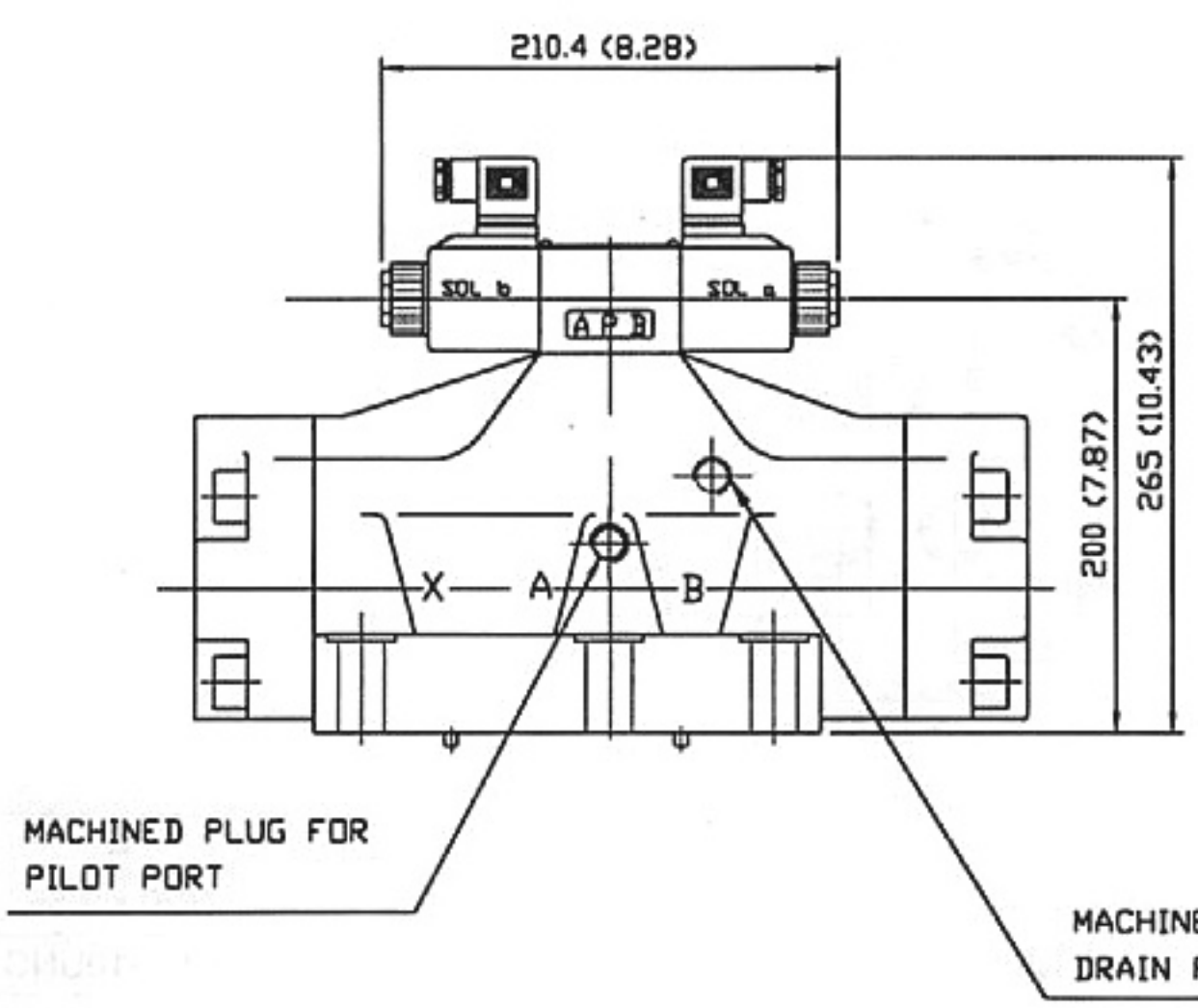
Mounting Surface: ISO 4401-AE-10-4-A

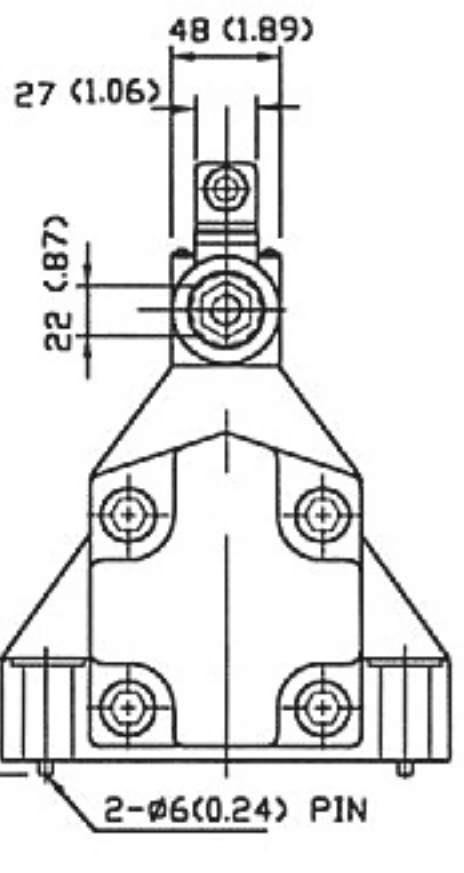
INSTALLATION DIMENSIONS

UNIT:mm (inch)

SW-G10- ※※※ - ※※ - ※※※※※ -20







SUBPLATE
M10 SERIES

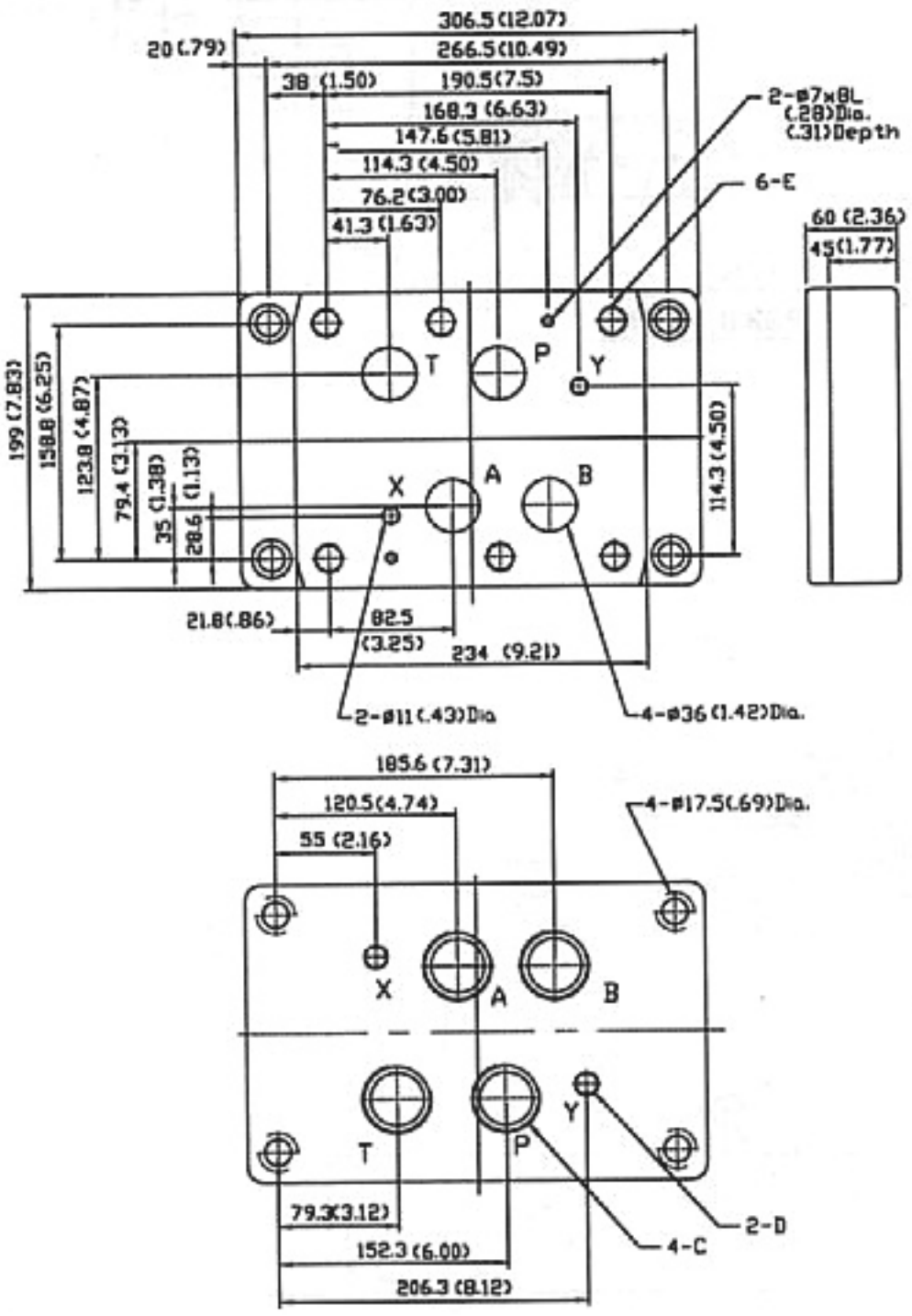
HOW TO ORDER

M10 - 10 - B - 1

- M10: SUBPLATE (D-10)
- 10: PORT SIZE 10:1-1/4"
- B: BACK PORTS
- 1: THREAD
  - 1: PT
  - 2: NPT
  - 3: SAE

INSTALLATION DIMENSIONS

UNIT:mm (inch)
Weight: 27 kgs



MODEL		C	D	E
M10-10-B	-1	1-1/4" PT	3/8" PT	M20 x 2.5P
	-2	1-1/4" NPT	3/8" NPT	3/4" -10UNC
	-3	1-1/4" SAE-2B	3/8" SAE-2B	3/4" -10UNC