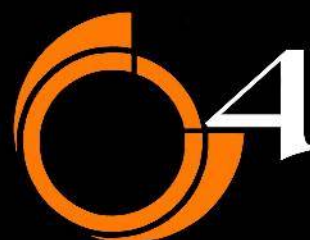




CONTROLES DE PRESIÓN



油研工業株式會社



C1



PRESSURE CONTROLS

Valve Type	Graphic Symbols	Maximum Operating Pressure MPa (PSI)	Maximum Flow														Page
			U.S.GPM														
			L/min														
Remote Cont. Relief Valves		25 (3630)	DT DG 01														203
Direct Type Relief Valves		21 (3050)	DT/DG 02														206
Pilot Operated Relief Valves		25 (3630)	BT/BG 03 06														209
Low Noise Type Pilot Operated Relief Valves		25 (3630)	S-BG 03 06 10														216
Sol. Cont. Relief Valves		25 (3630)	BST/BSG 03 06 10														220
Low Noise Type Sol. Cont. Relief Valves		25 (3630)	S-BSG 03 06 10														230
H TypePress. Cont. Valves / HC TypePress. Cont. Valves		21 (3050)	HT/HG HCT/HCG 03 06 10 HF HCF 16														237
Press. Reducing Valves / Press. Reducing & Check Valves		21 (3050)	RT/RG RCT/RCG 03 06 10 RF RCF 16														251
Pres. Reducing & Relieving Valves		03 : 14(2030) 06 : 25(3630)	RBG 03 06														260
Unloading Relief Valves		21 (3050)	BUCG 06 10														265
Brake Valves		25 (3630)	UBGR 03 06 10														271
Semiconductor Type Pressure Switches		35 (5080)	JT-02														272
Pressure Monitoring System		20(2900) 35(5080)															274

Hydraulic Fluids

Fluid Types

Any type of hydraulic fluids listed in the table below can be used.

Petroleum base oils	Use fluids equivalent to ISO VG 32 or VG 46.
Synthetic fluids	Use phosphate ester or polyol ester fluid. When phosphate ester fluid is used, prefix "F-" to the model number because the special seals (fluororubber) are required to be used.
Water containing fluids	Use water-glycol fluid.

Note: For use with hydraulic fluids other than those listed above, please consult your Yuken representatives in advance.

Recommended Fluid Viscosity and Temperature

Use under conditions where the viscosity and temperature of the hydraulic fluid remain in the ranges indicated in the following table.

Name	Viscosity	Temperature
Remote Control Relief Valves Direct Type Relief Valves Pilot Operated Relief Valves Low Noise Type Pilot Operated Relief Valves Solenoid Controlled Relief Valves * Low Noise Type Solenoid Controlled Relief Valves * H Type Pressure Control Valves HC Type Pressure Control Valves Pressure Reducing Valves Pressure Reducing and Check Valves Pressure Reducing and Relieving Valves Unloading Relief Valves Brake Valves	15 - 400 mm ² /s (88 - 1800 SSU)	-15 - +70°C (5 - 158°F)
Semiconductor Type Pressure Switches	15 - 400 mm ² /s (88 - 1800 SSU)	-20 - +70°C (- 4 - 158°F)

★ If the valve is provided with a vent restrictor (ex. : A-BSG-03), the viscosity range should be 15 - 200 mm²/s (80 - 900 SSU).

Control of Contamination

Due caution must be paid to maintaining control over contamination of the hydraulic fluids which may otherwise lead to breakdowns and shorten the life of the valves. Please maintain the degree of contamination within NAS 1638-Grade 12. Use 25 μm or finer line filter.

Interchangeability in Installation between Current and New Design

Model change has been made on the following products.

The difference between current and new design has been described on the paragraph of "Interchangeability in Installation between Current and New Design". Refer to relevant pages on each series.

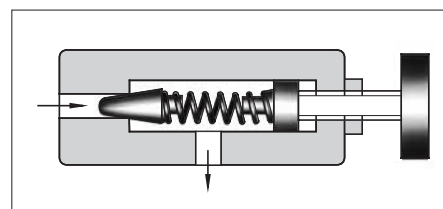
Name	Model Numbers		Mounting Interchangeability	Main Changes	Page
	Current	New			
Solenoid Controlled Relief Valve	BS*-03, -47*	BS*-03, -48*	Yes	Pilot valves (DSG-01) have been changed in the design numbers 70.	222
	BS*-06, -47*	BS*-06, -48*			
	BS*-10, -47*	BS*-10, -48*			
Low Noise Type Solenoid Controlled Relief Valve	S-BSG-03, -52*	S-BSG-03, -53*	Yes		231
	S-BSG-06, -52*	S-BSG-06, -53*			
	S-BSG-10, -52*	S-BSG-10, -53*			

Remote Control Relief Valves

This valve is used as a remote control valve for pilot operated type pressure control valves.

Specifications

Model Numbers		Max. Operating Pres. MPa (PSI)	Approx. Mass kg (lbs.)	
Threaded Connection	Sub-plate Mounting		DT type	DG type
DT-01-22*	DG-01-22*	25 (3630)	1.6 (3.5)	1.4 (3.1)



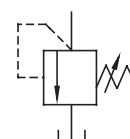
Model Number Designation

F-	D	T	-01	-22	*
Special Seals	Series Number	Type of Mounting	Valve Size	Design Number	Design Standards
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	D: Remote Control Relief Valves	T: Threaded Connection	01	22	None: Japanese Std. "JIS" 80: European Design Std. 90: N. American Design Std.
		G: Sub-plate Mounting		22	None: Japanese Std. "JIS" and European Design Std. 90: N. American Design Std.

Instructions

- To adjust the pressure, loosen the lock nut and turn the handle slowly clockwise for higher pressures or anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Piping of the tank line should not be connected to any tank line of the other valves, but connected directly to the reservoir.
- Pressure is limited by collars fitted. If a working pressure cannot be attained, remove some collars. One collar is equivalent to 10 MPa (1450 PSI).
- If the internal volume of the vent line is too large, chattering is likely to occur.

Graphic Symbol



Attachment

Mounting bolts

Valve Model Numbers	Socket Head Cap Screw		Qty.
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.	
DG-01	M5 × 45 Lg.	No.10-24 UNC × 1-3/4 Lg.	4

Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
DG-01	DGM-02-20	Rc 1/4	DGM-02-2080	1/4 BSP.F	DGM-02-2090	1/4 NPT	0.7 (1.5)

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.

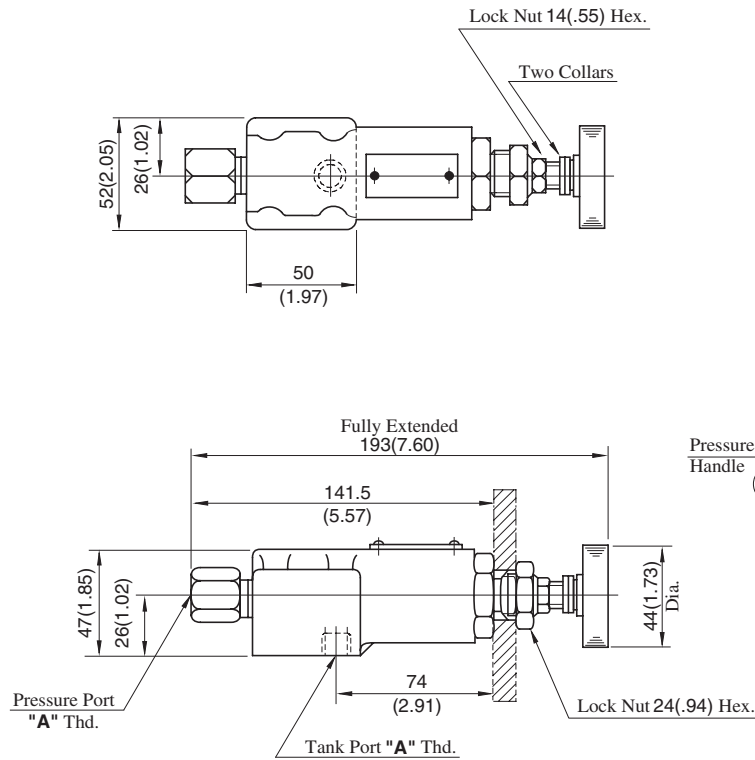
C



Remote Control Relief Valves

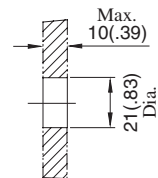
DT-01-22/2280/2290

**DIMENSIONS IN
MILLIMETRES (INCHES)**

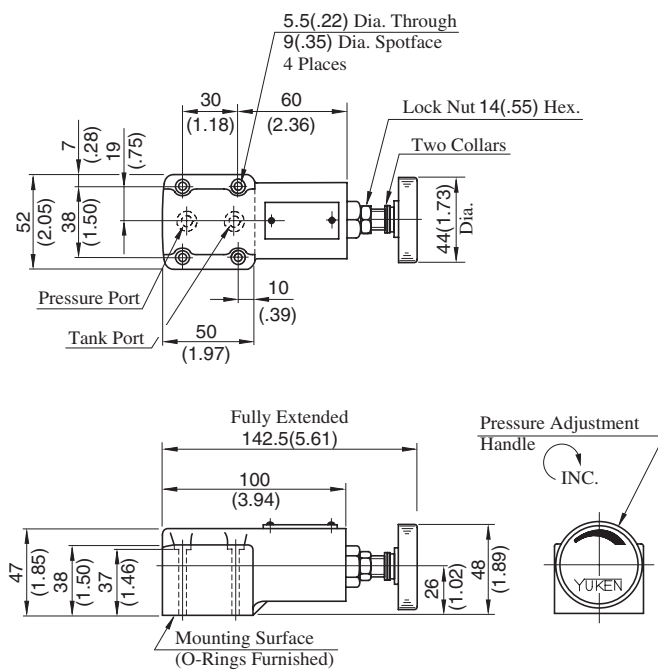


Model Numbers	"A" Thd.
DT-01-22	Rc 1/4
DT-01-2280	1/4 BSP.F
DT-01-2290	1/4 NPT

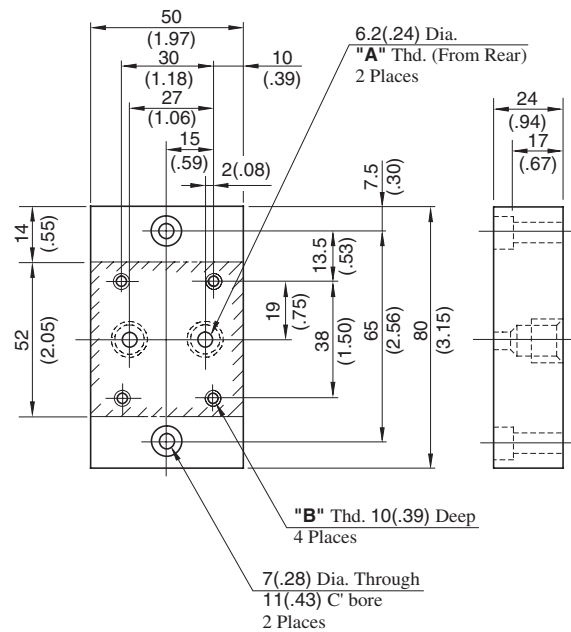
**Dimensions of
The Panel Mounting Hole**



DG-01-22/2290



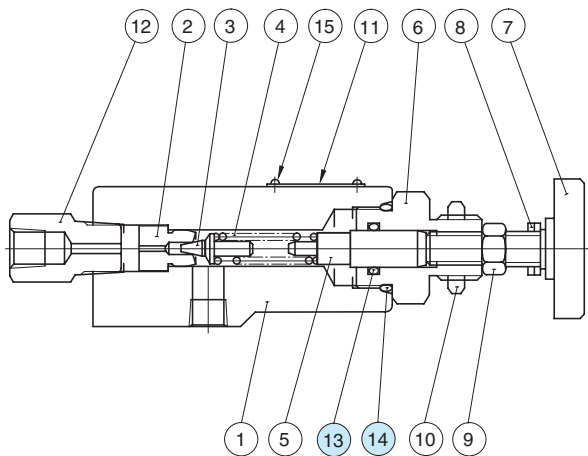
Sub-plate: DGM-02-20/2080/2090



Model Numbers	"A" Thd.	"B" Thd.
DGM-02-20	Rc 1/4	M5
DGM-02-2080	1/4 BSP.F	
DGM-02-2090	1/4 NPT	No. 10-24 UNC

Spare Parts List

DT-01-22/2280/2290



List of Seals

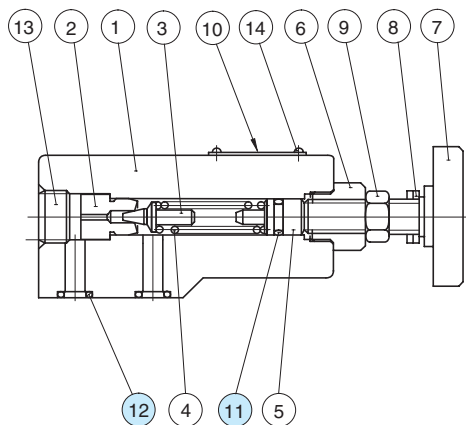
Item	Name of Parts	Part Numbers	Qty.
13	O-Ring	SO-NA-P12	1
14	O-Ring	SO-NB-P22.4	1

Note: When ordering the seals, please specify the seal kit number from the table below.

List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
DT-01	KS-DT-01-22
DG-01	KS-DG-01-22

DG-01-22/2290



List of Seals

Item	Name of Parts	Part Numbers	Qty.
11	O-Ring	SO-NA-P9	1
12	O-Ring	SO-NB-P9	2

Note: When ordering the seals, please specify the seal kit number from the table above.

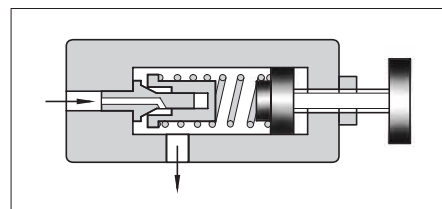
Direct Type Relief Valves

This valve is used in a hydraulic circuit to prevent damage due to over pressure and to adjust the maximum circuit pressure of small capacity.

Specifications

Model Numbers		Max. Operating Pressure MPa (PSI)	Pres. Adj. Range MPa (PSI)	Max. Flow L/min (U.S.GPM)	Approx. Mass kg (lbs.)	
Threaded Connection	Sub-plate Mounting				DT type	DG type
DT-02-*-22*	DG-02-*-22*	21 (3050)	Note)	16 (4.23)	1.5 (3.3)	1.5 (3.3)

Note: Refer to the Model Number Designation.



Model Number Designation

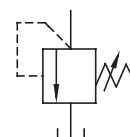
F-	D	T	-02	-B	-22	*
Special Seals	Series Number	Type of Mounting	Valve Size	Pres. Adj. Range MPa (PSI)	Design Number	Design Standards
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	D: Direct Type Relief Valves	T: Threaded Connection	02	B: ★-7 (★-1020)	22	None: Japanese Std. "JIS" 80: European Design Std. 90: N. American Design Std.
		G: Sub-plate Mounting		C: 3.5-14 (510-2030) H: 7-21 (1020-3050)	22	None: Japanese Std. "JIS" and European Design Std. 90: N. American Design Std.

★ Refer to the Minimum Adjustment Pressure Characteristics.

Instructions

- To adjust the pressure, loosen the lock nut and turn the handle slowly clockwise for higher pressures or anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Piping of the tank line should not be connected to any tank line of the other valves, but connected directly to the reservoir.

Graphic Symbol



Attachment

Mounting bolts

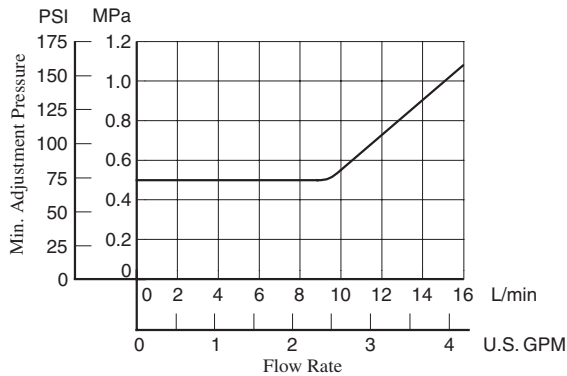
Valve Model Numbers	Socket Head Cap Screw		Qty.
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.	
DG-02	M5 × 45 Lg.	No.10-24 UNC × 1-3/4 Lg.	4

Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
DG-02	DGM-02-20	Rc 1/4	DGM-02-2080	1/4 BSP.F	DGM-02-2090	1/4 NPT	0.7 (1.5)

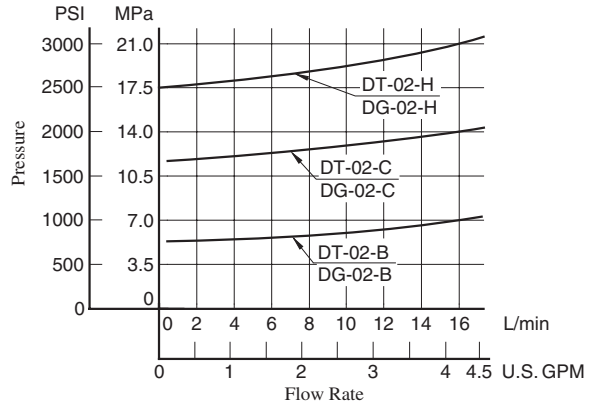
- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.
- The sub-plates are those for remote control relief valves. For dimensions, see [page 204](#).

Min. Adjustment Pressure

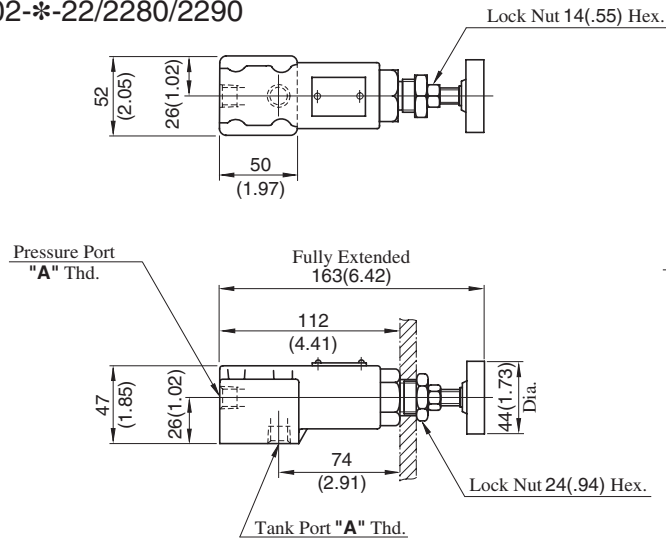


Nominal Override Characteristics

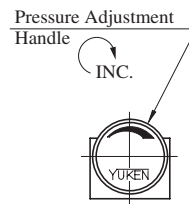
Hydraulic fluid
Viscosity : 35 mm²/s (164 SSU)
Specific Gravity : 0.850



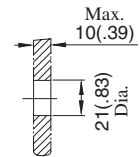
DT-02-*-22/2280/2290



Model Numbers	"A" Thd.
DT-02-*-22	Rc 1/4
DT-02-*-2280	1/4 BSP.F
DT-02-*-2290	1/4 NPT

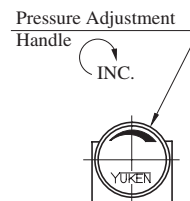
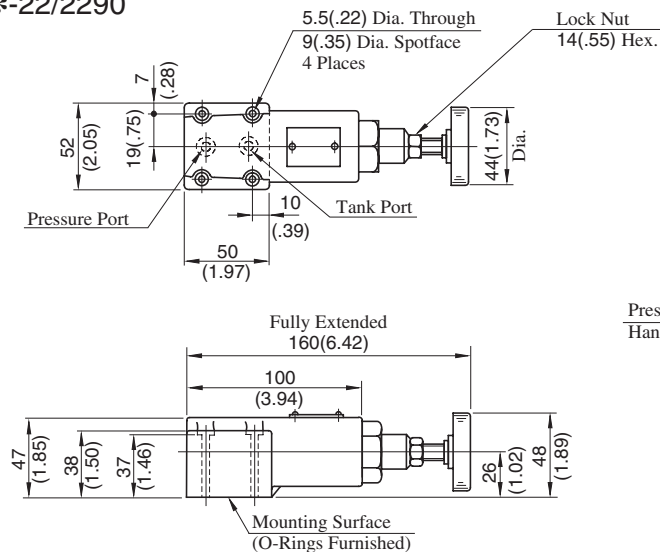


Dimensions of The Panel Mounting Hole



DIMENSIONS IN MILLIMETRES (INCHES)

DG-02-*-22/2290

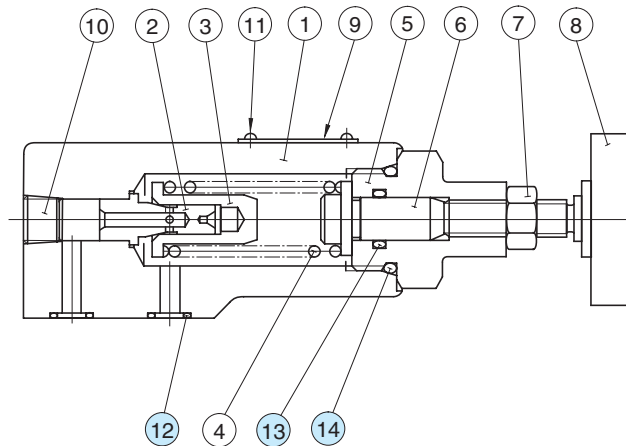


Note: For dimensions of the valve mounting surface, see the dimensional drawing (page 204) of the sub-plate used together.

■ Spare Parts List

DT-02-*-22/2280/2290

DG-02-*-22/2290



● List of Seals

Item	Name of Parts	Part Numbers	Qty.	Remarks
12	O-Ring	SO-NB-P9	2	Use only for DG-02
13	O-Ring	SO-NA-P12	1	———
14	O-Ring	SO-NB-P22.4	1	———

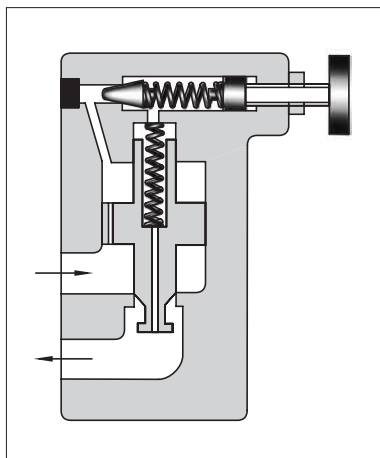
Note: When ordering the seals, please specify the seal kit number from the table below.

● List of Seal Kits

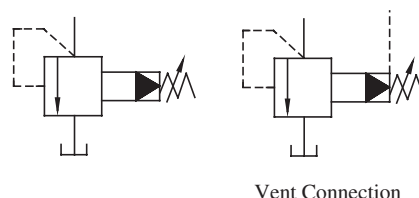
Valve Model Numbers	Seal Kit Numbers
DT-02	KS-DT-01-22
DG-02	KS-DG-02-22

Pilot Operated Relief Valves

These valves protect the hydraulic system from excessive pressure, and can be used to maintain constant pressure in a hydraulic system. Remote control and unloading are permitted by using vent circuits.



Graphic Symbols



Specifications

Model Numbers		Max. Operating Pressure MPa (PSI)	Pres. Adj. Range MPa (PSI)	Max. Flow L/min (U.S.GPM)	Approx. Mass kg (lbs.)	
Threaded Connection	Sub-plate Mounting				BT type	BG type
BT-03-*-32*	BG-03-*-32*	25 (3630)	Note) ★-25 (★-3630)	100 (26.4)	5.0 (11.0)	4.7 (10.4)
BT-06-*-32*	BG-06-*-32*			200 (52.8)	5.0 (11.0)	5.6 (12.3)
BT-10-*-32*	BG-10-*-32*			400 (106)	8.5 (18.7)	8.7 (19.2)

Note: Refer to the Minimum adjustment Pressure characteristics on [page 214](#).

Model Number Designation

F-	B	T	-03	-V	-32	*
Special Seals	Series Number	Type of Mounting	Valve Size	High Venting* Pres. Feature	Design Number	Design Standards
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	B: Pilot Operated Relief Valves	T: Threaded Connection	03	V: For High Venting Pressure Feature (Omit if not required)	32	None: Japanese Std. "JIS" 80: European Design Std. 90: N. American Design Std.
			06		32	
			10		32	
		G: Sub-plate Mounting	03		32	None: Japanese Std. "JIS" and European Design Std. 90: N. American Design Std.
			06		32	
			10		32	

★ Use high venting pressure type to reduce the response time from unload to onload.

■ Attachment

● Mounting Bolts

Valve Model Numbers	Socket Head Cap Screw	
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.
BG-03	M12 × 70 Lg. (2 pcs.), M12 × 95 Lg. (2 pcs.)	1/2-13UNC × 2-3/4 Lg. (2 pcs.), 1/2-13UNC × 3-3/4 Lg. (2 pcs.)
BG-06	M16 × 60 Lg. (2 pcs.), M16 × 80 Lg. (2 pcs.)	5/8-11UNC × 2-1/4 Lg. (2 pcs.), 5/8-11UNC × 3-1/4 Lg. (2 pcs.)
BG-10	M20 × 70 Lg. (2 pcs.), M20 × 90 Lg. (2 pcs.)	3/4-10UNC × 2-3/4 Lg. (2 pcs.), 3/4-10UNC × 3-1/2 Lg. (2 pcs.)

■ Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
BG-03	BGM-03-20	Rc 3/8	BGM-03-3080	3/8 BSP.F	BGM-03-2090	3/8 NPT	2.4(5.3)
	BGM-03X-20	Rc 1/2	BGM-03X-3080	1/2 BSP.F	BGM-03X-2090	1/2 NPT	3.1(6.8)
BG-06	BGM-06-20	Rc 3/4	BGM-06-3080	3/4 BSP.F	BGM-06-2090	3/4 NPT	4.7(10.4)
	BGM-06X-20	Rc 1	BGM-06X-3080	1 BSP.F	BGM-06X-2090	1 NPT	5.7(12.6)
BG-10	BGM-10-20	Rc 1-1/4	BGM-10-3080	1-1/4 BSP.F	BGM-10-2090	1-1/4 NPT	8.4(18.5)
	BGM-10X-20	Rc 1-1/2	BGM-10X-3080	1-1/2 BSP.F	BGM-10X-2090	1-1/2 NPT	10.3(22.7)

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.

■ Instructions

- If a remote control relief valve is used in the vent circuit, see [page 203](#). In addition, if the internal volume of the vent line is too large, chattering is likely to occur. Thus, as far as possible reduce the inside diameter and the length of the pipe.
- To adjust the pressure, loosen the lock nut and turn the handle slowly clockwise for higher pressures or anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Piping of the tank line should not be connected to any tank line of the other valves, but connected directly to the reservoir.
- Pressure is limited by collars fitted. If a working pressure cannot be attained, remove some collars. One collar is equivalent to 10 MPa (1450 PSI).
- With a small flow, the setting pressure may be unstable. Use models numbered 03 and 06 with a flow rate above 8 L/min (2.1 U.S. GPM) and model 10 with 15 L/min (4.0 U.S. GPM).

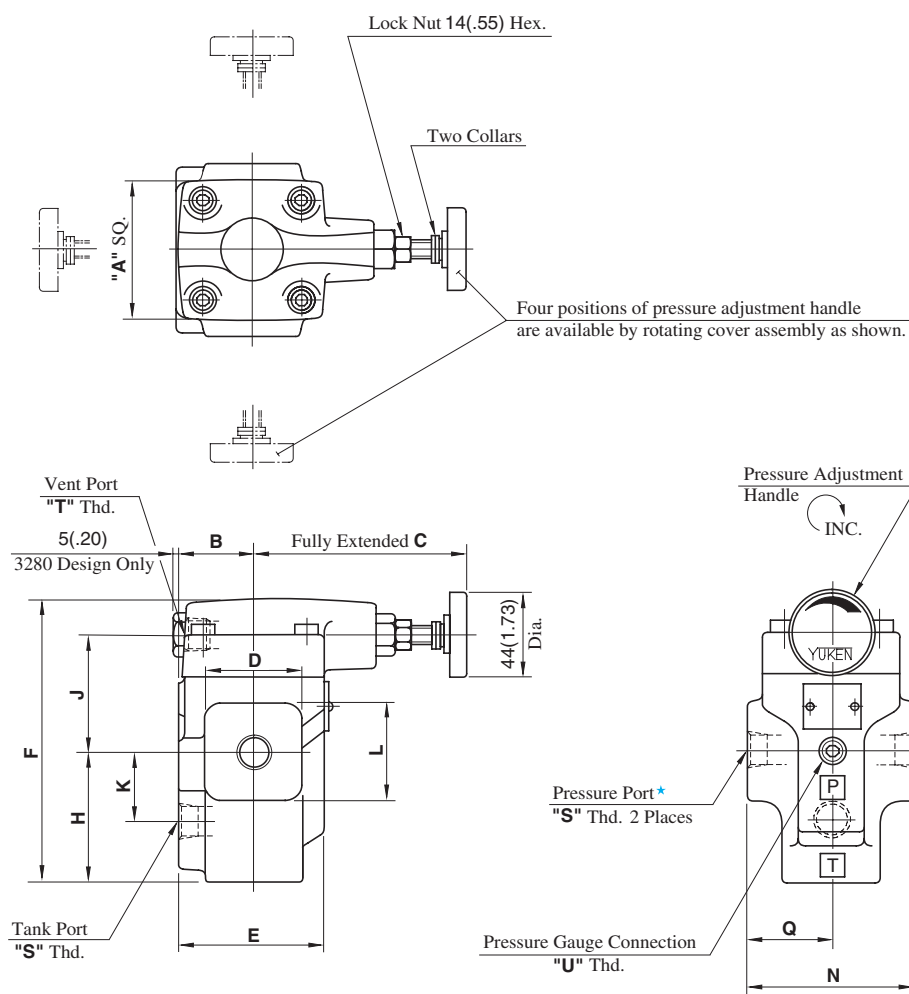


BT-03-*-32/3280/3290

BT-06-*-32/3280/3290

BT-10-*-32/3280/3290

DIMENSIONS IN
MILLIMETRES (INCHES)



★ There are two threaded connection pressure ports. They can be connected each other in-line; one as inlet and the other as an outlet or the valve can be used by plugging one of the pressure ports.

Model Numbers	Dimensions mm (Inches)											
	A	B	C	D	E	F	H	J	K	L	N	Q
BT-03-*-32/3280/3290	75 (2.95)	40 (1.57)	105 (4.13)	52 (2.05)	78 (3.07)	150.5 (5.93)	68.5 (2.70)	62 (2.44)	36 (1.42)	52 (2.05)	90 (3.54)	45 (1.77)
BT-06-*-32/3280/3290												
BT-10-*-32/3280/3290	85 (3.35)	50 (1.97)	101 (3.98)	80 (3.15)	96 (3.78)	183 (7.20)	89 (3.50)	74 (2.91)	49 (1.93)	80 (3.15)	120 (4.72)	60 (2.36)

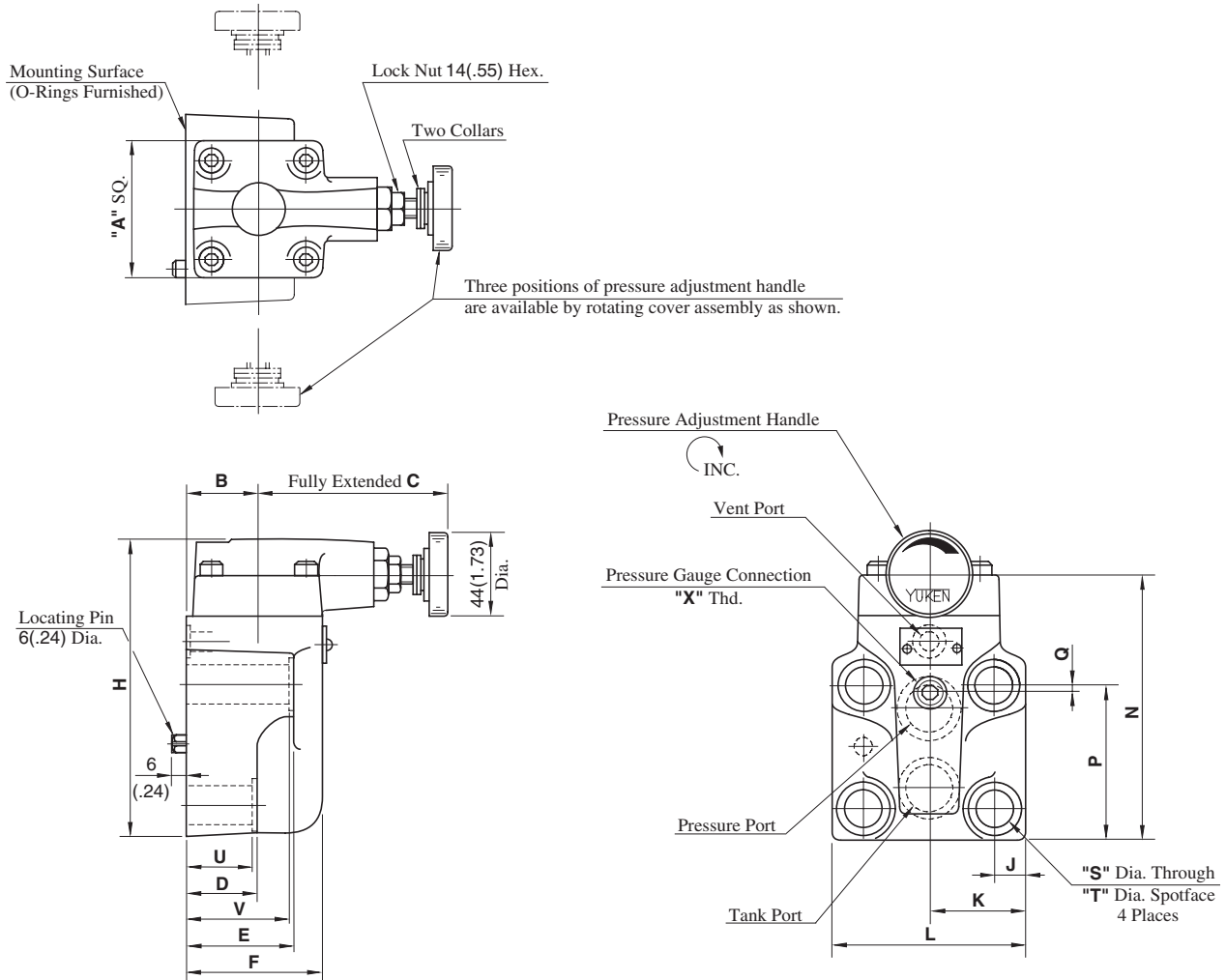
Model Numbers	Thread Size		
	"S" Thd.	"T" Thd.	"U" Thd.
BT-03-*-32	Rc 3/8	Rc 3/8	Rc 1/4
BT-03-*-3280	3/8 BSP.F	3/8 BSP.F	1/4 BSP.Tr
BT-03-*-3290	3/8 NPT	3/8 NPT	1/4 NPT
BT-06-*-32	Rc 3/4	Rc 3/8	Rc 1/4
BT-06-*-3280	3/4 BSP.F	3/8 BSP.F	1/4 BSP.Tr
BT-06-*-3290	3/4 NPT	3/8 NPT	1/4 NPT
BT-10-*-32	Rc 1-1/4	Rc 3/8	Rc 1/4
BT-10-*-3280	1-1/4 BSP.F	3/8 BSP.F	1/4 BSP.Tr
BT-10-*-3290	1-1/4 NPT	3/8 NPT	1/4 NPT

BG-03-*-32/3290

BG-06-*-32/3290

BG-10-*-32/3290

**DIMENSIONS IN
MILLIMETRES (INCHES)**

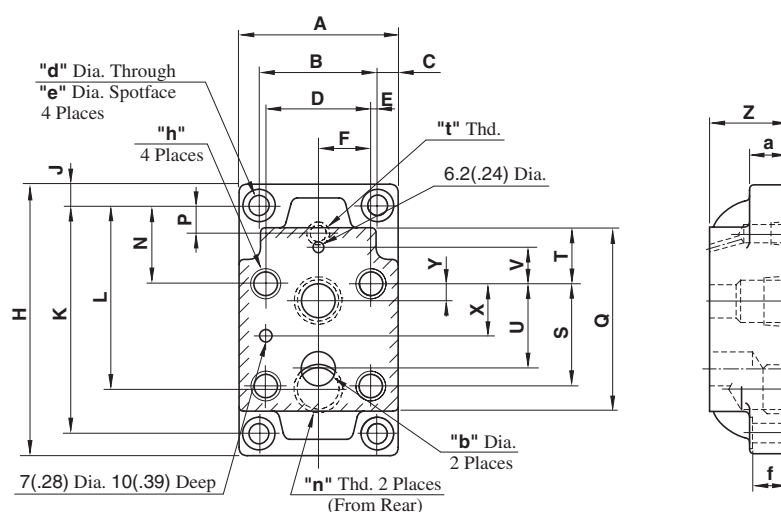


Model Numbers	Dimensions mm (Inches)															
	A	B	C	D	E	F	H	J	K	L	N	P	Q	S	T	V
BG-03-*-32/3290	75 (2.95)	40 (1.57)	105 (4.13)	57 (2.24)	78 (3.07)	78 (3.07)	137 (5.39)	14.1 (.56)	41 (1.61)	82 (3.23)	117 (4.61)	77 (3.03)	22 (.87)	13.5 (.53)	21 (.83)	77 (3.03)
BG-06-*-32/3290	75 (2.95)	40 (1.57)	105 (4.13)	40 (1.57)	60 (2.36)	78 (3.07)	161 (6.34)	17 (.67)	52 (2.05)	104 (4.09)	141 (5.55)	83.5 (3.29)	4.5 (.18)	17.5 (.69)	26 (1.02)	58 (2.28)
BG-10-*-32/3290	85 (3.35)	45 (1.77)	101 (3.98)	47 (1.85)	67 (2.64)	87.5 (3.44)	195 (7.68)	20.7 (.81)	62 (2.44)	124 (4.88)	175 (6.89)	110 (4.33)	6 (.24)	21.5 (.85)	32 (1.26)	65 (2.56)

Model Numbers	Thread Size	Mounting Surface
	"X" Thd	
BG-03-*-32	Rc 1/4 = 1/4 BSP.Tr	ISO 6264-AR-06-2-A
BG-03-*-3290	1/4 NPT	
BG-06-*-32	Rc 1/4 = 1/4 BSP.Tr	ISO 6264-AS-08-2-A
BG-06-*-3290	1/4 NPT	
BG-10-*-32	Rc 1/4 = 1/4 BSP.Tr	ISO 6264-AT-10-2-A
BG-10-*-3290	1/4 NPT	

BGM-03,03X-20 / 3080 / 2090
 BGM-06,06X-20 / 3080 / 2090
 BGM-10,10X-20 / 3080 / 2090

DIMENSIONS IN
MILLIMETRES (INCHES)



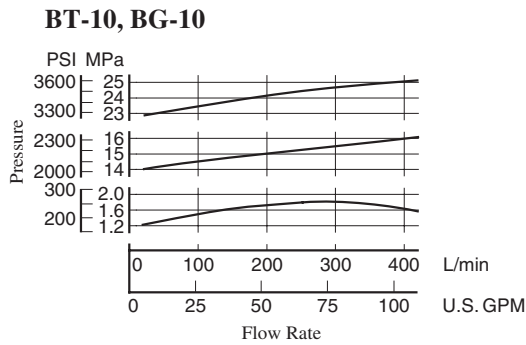
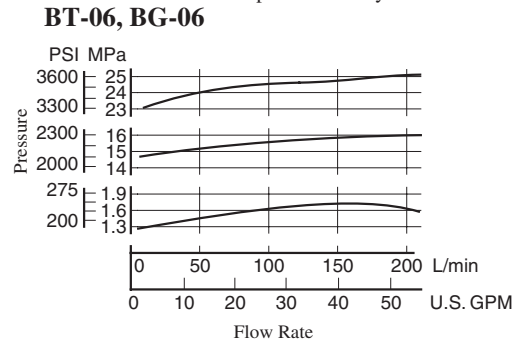
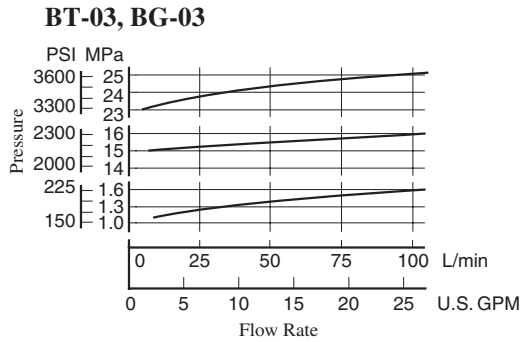
Model Numbers	Dimensions mm (Inches)													
	A	B	C	D	E	F	H	J	K	L	N	P	Q	S
BGM-03	86 (3.39)	60 (2.36)	13 (.51)	53.8 (2.12)	3.1 (.12)	26.9 (1.06)	149 (5.87)	13 (.51)	123 (4.84)	86 (3.39)	32 (1.26)	26 (1.02)	97 (3.82)	53.8 (2.12)
BGM-03X										95 (3.74)		21 (.83)		
BGM-06	108 (4.25)	78 (3.07)	15 (.59)	70 (2.76)	4 (.16)	35 (1.38)	180 (7.09)	15 (.59)	150 (5.91)	106.5 (4.19)	51 (2.01)	27.2 (1.07)	121 (4.76)	66.7 (2.63)
BGM-06X										119 (4.69)		18 (.71)		
BGM-10	126 (4.96)	94 (3.70)	16 (.63)	82.6 (3.25)	5.7 (.22)	41.3 (1.63)	227 (8.94)	16 (.63)	195 (7.68)	138.2 (5.44)	62 (2.44)	30.2 (1.19)	154 (6.06)	88.9 (3.50)
BGM-10X										158 (6.22)		17 (.67)		

Model Numbers	Dimensions mm (Inches)										
	T	U	V	X	Y	Z	a	b	d	e	f
BGM-03	19 (.75)	47.4 (1.87)	0 (0)	22 (.87)	22 (.87)	32 (1.26)	20 (.79)	14.5 (.57)	11 (.43)	17.5 (.69)	19 (.75)
BGM-03X						40 (1.57)					
BGM-06	37 (1.46)	55.5 (2.19)	23.8 (.94)	33.4 (1.31)	11 (.43)	40 (1.57)	25 (.98)	23 (.91)	13.5 (.53)	21 (.83)	24 (.94)
BGM-06X						50 (1.97)					
BGM-10	42 (1.65)	76.2 (3.00)	31.8 (1.25)	44.5 (1.75)	12.7 (.50)	50 (1.97)	32 (1.26)	28 (1.10)	17.5 (.69)	26 (1.02)	31 (1.22)
BGM-10X						63 (2.48)					

Model Numbers	Japanese Standard "JIS" Design "20"				European Design Standard Design "3080"			N. American Design Standard Design "2090"		
	"h"	"n" Thd.	"t" Thd.		"h"	"n" Thd.	"t" Thd.	"h"	"n" Thd.	"t" Thd.
BGM-03	M12 Thd.	Rc 3/8	Rc 1/4		M12 Thd.	3/8 BSP.F	1/4 BSP.F	1/2-13UNC Thd.	3/8 NPT	1/4 NPT
BGM-03X	20(.79) Deep	Rc 1/2			20(.79) Deep	1/2 BSP.F		22(.87) Deep	1/2 NPT	
BGM-06	M16 Thd.	Rc 3/4			M16 Thd.	3/4 BSP.F		5/8-11UNC Thd.	3/4 NPT	
BGM-06X	25(.98) Deep	Rc 1			25(.98) Deep	1 BSP.F		27(1.06) Deep	1 NPT	
BGM-10	M20 Thd.	Rc1-1/4			M20 Thd.	1-1/4 BSP.F		3/4-10UNC Thd.	1-1/4 NPT	
BGM-10X	28(1.10) Deep	Rc 1-1/2			28(1.10) Deep	1-1/2 BSP.F		28(1.10) Deep	1-1/2 NPT	

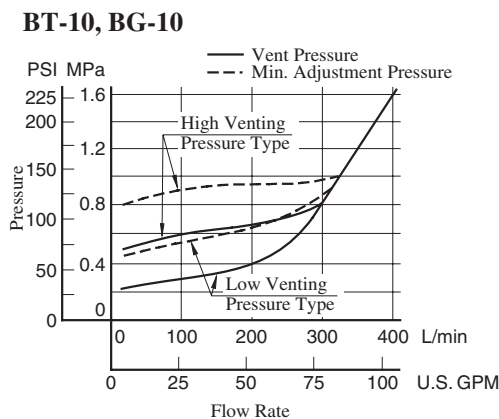
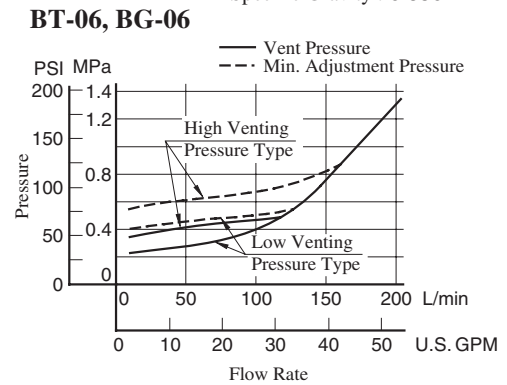
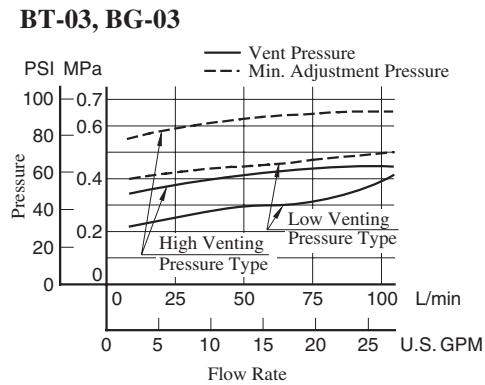
Nominal Override Characteristics

Hydraulic fluid: Viscosity : 35 mm²/s (164 SSU)
Specific Gravity : 0.850



Min. Adj. Pressure & Vent Pressure vs. Flow

Hydraulic fluid: Viscosity : 35 mm²/s (164 SSU)
Specific Gravity : 0.850

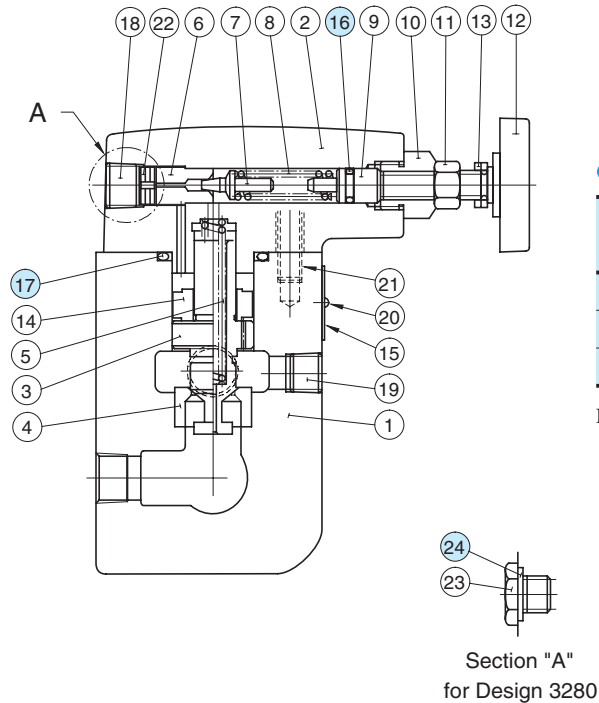


Spare Parts List

BT-03-*-32/3280/3290

BT-06-*-32/3280/3290

BT-10-*-32/3280/3290



List of Seals

Item	Name of Parts	Part Numbers			Qty.
		BT-03	BT-06	BT-10	
16	O-Ring	SO-NA-P9	SO-NA-P9	SO-NA-P9	1
17	O-Ring	SO-NB-P32	SO-NB-P42	SO-NB-P42	1
24	Bonded Seal	SG-FB-3/8	SG-FB-3/8	SG-FB-3/8	1

Note: When ordering the seals, please specify the seal kit number from the table below.

List of Seal Kits

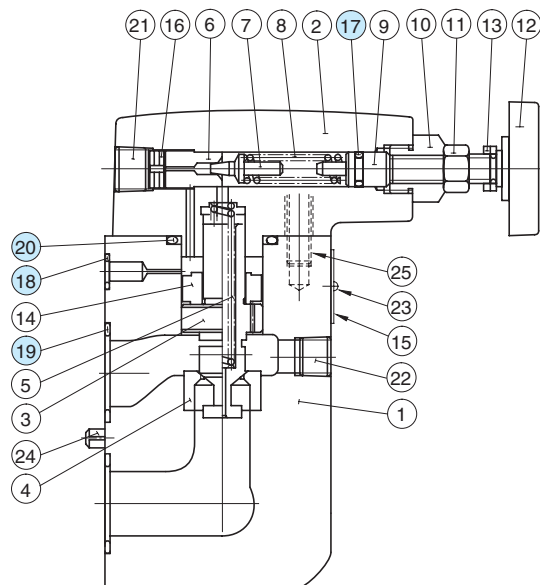
Valve Model Numbers	Seal Kit Numbers
BT-03	KS-BT-03-32
BT-06	
BT-10	KS-BT-10-32

Note: No bonded seals are included in the seal kits.

BG-03-*-32/3290

BG-06-*-32/3290

BG-10-*-32/3290



List of Seals

Item	Name of Parts	Part Numbers			Qty.
		BG-03	BG-06	BG-10	
17	O-Ring	SO-NA-P9	SO-NA-P9	SO-NA-P9	1
18	O-Ring	SO-NB-P9	SO-NB-P11	SO-NB-P9	1
19	O-Ring	SO-NB-P18	SO-NB-P28	SO-NB-P32	2
20	O-Ring	SO-NB-P32	SO-NB-P32	SO-NB-P42	1

Note: When ordering the seals, please specify the seal kit number from the table below.

List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
BG-03	KS-BG-03-32
BG-06	KS-BG-06-32
BG-10	KS-BG-10-32

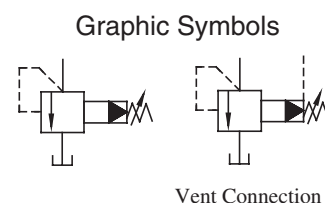
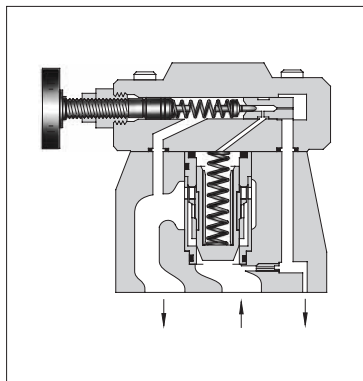
C



Pilot Operated
Relief Valves

Low Noise Type Pilot Operated Relief Valves

Pilot operated relief valves here have been particularly developed as low-noise types. Able to protect pumps and control valves against excessive pressures, they are used to control the pressure in the hydraulic system to a constant level. Remote control and unloading are permitted by using vent circuits.



Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Pres. Adj. Range MPa (PSI)	Max. Flow L/min (U.S.GPM)	Approx. Mass kg (lbs.)
S-BG-03-*-40*	25 (3630)	Note)	100 (26.4)	4.1 (9.0)
S-BG-06-*-40*		★ -25	200 (52.8)	5.0 (11.0)
S-BG-10-*-40*		(★ -3630)	400 (106)	10.5 (23.2)

Note: See minimum adjustment pressure characteristics on [page 218](#).

Model Number Designation

F-	S-	B	G	-03	-V	-L	-40	*
Special Seals	Low Noise Type	Series Number	Type of Mounting	Valve Size	High Venting ^{★1} Pres. Feature	Direction of Handle	Design Number	Design Std.
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	S: Low Noise Type	B: Pilot Operated Relief Valves	G: Sub-plate Mounting	03	V: For High Venting Pressure Feature (Omit if not required)	(Viewed from pressure gauge connection) L: Left (Normal) R: Right	40	Refer to ★2
				06			40	
				10			40	

★1. Use the high venting pressure type where it is necessary to reduce the response time from unloading to onloading.

★2. Design Standards: None Japanese Standard "JIS" and European Design Standard 90 N. American Design Standard

Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
S-BG-03	BGM-03-20	Rc 3/8	BGM-03-3080	3/8 BSP.F	BGM-03-2090	3/8 NPT	2.4 (5.3)
	BGM-03X-20	Rc 1/2	BGM-03X-3080	1/2 BSP.F	BGM-03X-2090	1/2 NPT	3.1 (6.8)
S-BG-06	BGM-06-20	Rc 3/4	BGM-06-3080	3/4 BSP.F	BGM-06-2090	3/4 NPT	4.7 (10.4)
	BGM-06X-20	Rc 1	BGM-06X-3080	1 BSP.F	BGM-06X-2090	1 NPT	5.7 (12.6)
S-BG-10	BGM-10-20	Rc 1-1/4	BGM-10-3080	1-1/4 BSP.F	BGM-10-2090	1-1/4 NPT	8.4 (18.5)
	BGM-10X-20	Rc 1-1/2	BGM-10X-3080	1-1/2 BSP.F	BGM-10X-2090	1-1/2 NPT	10.3 (22.7)

• Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.

• The sub-plates are those for pilot operated relief valves. For dimensions, see [page 213](#).

Attachment

Mounting Bolts

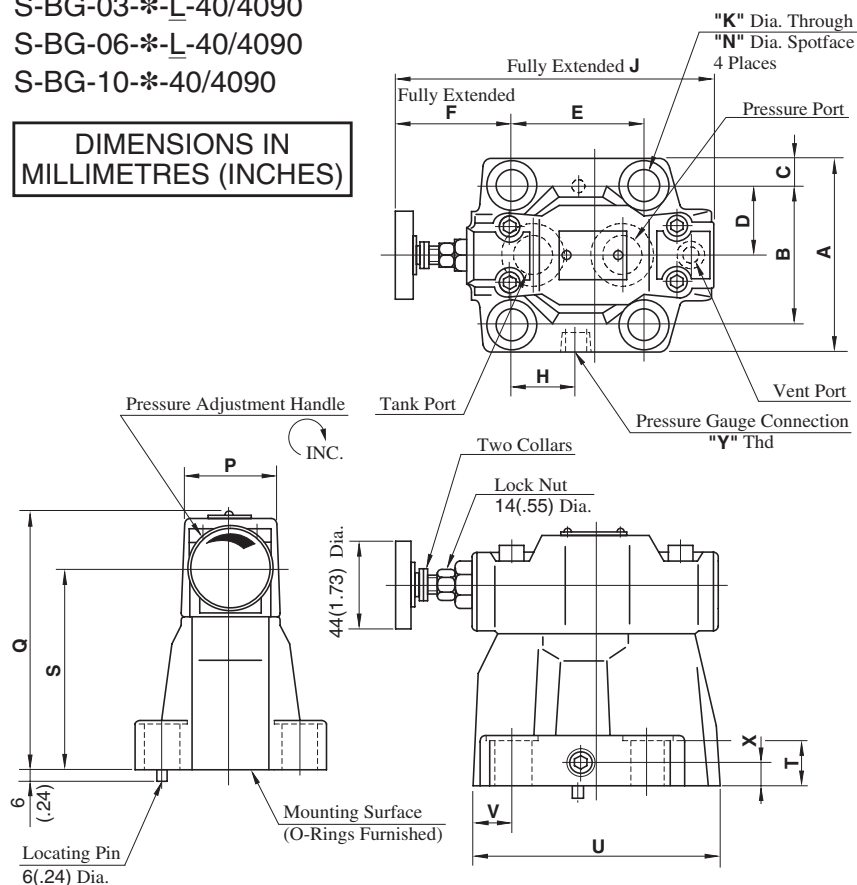
Valve Model Numbers	Socket Head Cap Screw		Qty.
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.	
S-BG-03	M12 × 40 Lg.	1/2-13 UNC × 1-1/2 Lg.	4
S-BG-06	M16 × 50 Lg.	5/8-11 UNC × 2 Lg.	4
S-BG-10	M20 × 60 Lg.	3/4-10 UNC × 2-1/4 Lg.	4

Instructions

- If a remote control relief valve is used in the vent circuit, see [page 203](#). In addition, if the internal volume of the vent line is too large, chattering is likely to occur. Thus, as far as possible reduce the inside Dia. and the length of the pipe.
- To adjust the pressure, loosen the lock nut and turn the handle slowly clockwise for higher pressures or anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Piping of the tank line should not be connected to any tank line of the other valves, but connected directly to the reservoir.
- Pressure is limited by collars fitted. If a working pressure cannot be attained, remove some collars. One collar is equivalent to 10 MPa (1450 PSI).
- With a small flow, the setting pressure may be unstable. Use models numbered 03 and 06 with a flow rate above 5 L/min (1.3 U.S. GPM) and model 10 with 8 L/min (2.1 U.S. GPM).

S-BG-03-**-L-40/4090
S-BG-06-**-L-40/4090
S-BG-10-**-40/4090

**DIMENSIONS IN
MILLIMETRES (INCHES)**



Mounting surface

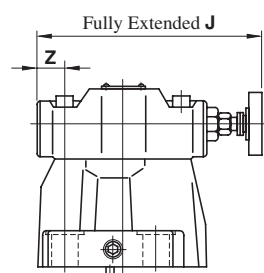
S-BG-03: ISO 6264-AR-06-2-A

S-BG-06: ISO 6264-AS-08-2-A

S-BG-10: ISO 6264-AT-10-2-A

Opposite Handle Position

S-BG-03-**-R
S-BG-06-**-R



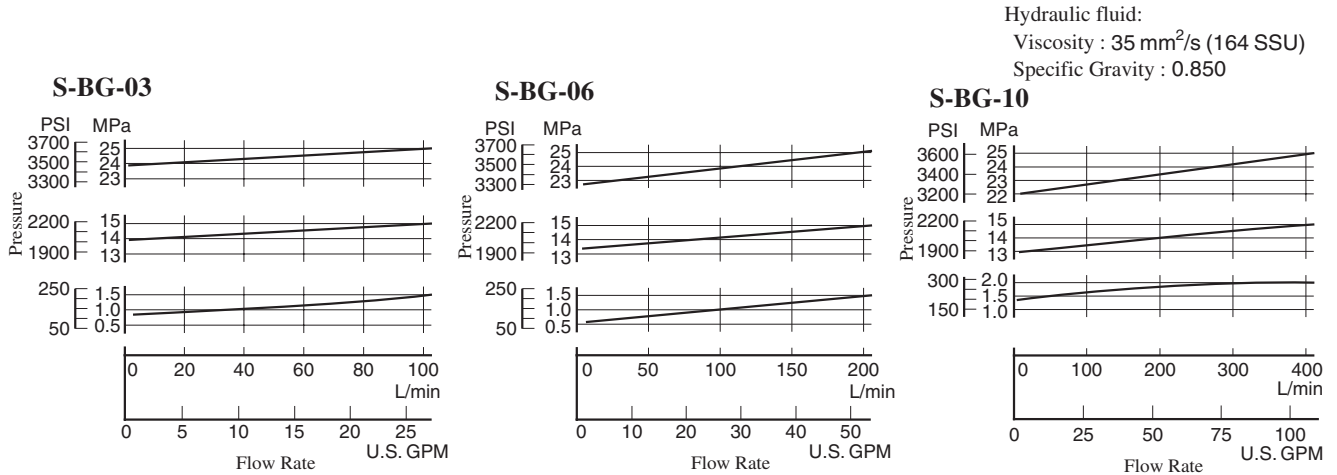
Note: For other dimensions, see the figures shown left.

Note: For dimensions of the valve mounting surface, see the dimensional drawing (P. 213) of the sub-plate used together.

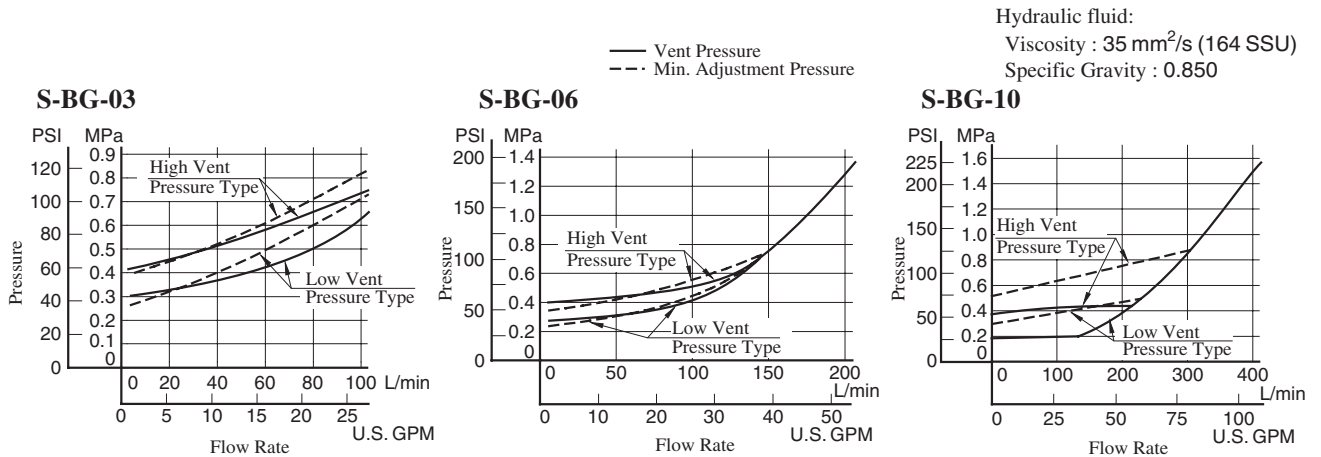
Model Numbers	"Y" Thd.
S-BG-03-**-40	Rc 1/4 = 1/4 BSP.Tr
S-BG-03-**-4090	1/4 NPT
S-BG-06-**-40	Rc 1/4 = 1/4 BSP.Tr
S-BG-06-**-4090	1/4 NPT
S-BG-10-40	Rc 1/4 = 1/4 BSP.Tr
S-BG-10-4090	1/4 NPT

Model Numbers	Dimensions mm (Inches)																	
	A	B	C	D	E	F	H	J	K	N	P	Q	S	T	U	V	X	Z
S-BG-03	76 (2.99)	53.8 (2.12)	11.1 (.44)	26.9 (1.06)	53.8 (2.12)	73.6 (2.90)	26.9 (1.06)	163.5 (6.44)	13.5 (.53)	21 (.83)	50 (1.97)	130 (5.12)	103 (4.06)	21.5 (.85)	106 (4.17)	26.1 (1.03)	13 (.51)	36.1 (1.42)
S-BG-06	98 (3.86)	70 (2.76)	14 (.55)	35 (1.38)	66.7 (2.63)	58.8 (2.31)	33.7 (1.33)	163.5 (6.44)	17.5 (.69)	26 (1.02)	50 (1.97)	130 (5.12)	103 (4.06)	26 (1.02)	122 (4.80)	19.3 (.76)	13 (.51)	21.3 (.84)
S-BG-10	120 (4.72)	82.6 (3.25)	18.7 (.74)	41.3 (1.63)	88.9 (3.50)	46.1 (1.81)	44.9 (1.77)	180 (7.09)	21.5 (.85)	32 (1.26)	65 (2.56)	167 (6.57)	135 (5.31)	33.5 (1.32)	155 (6.10)	21.1 (.83)	18 (.71)	—

Nominal Override Characteristics



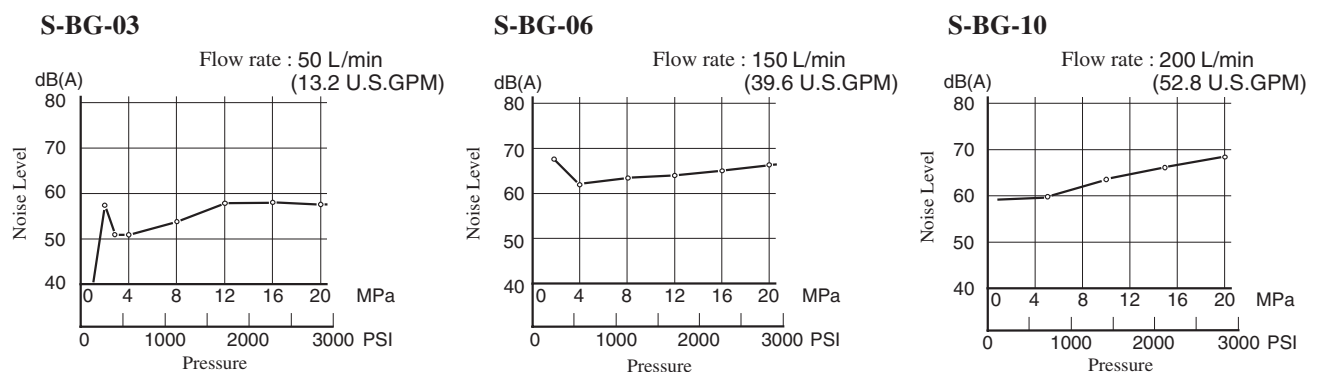
Min. Adj. Pressure and Vent Pressure vs. Flow



Noise Level

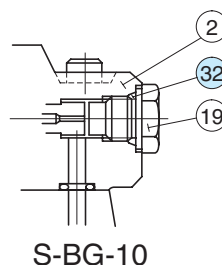
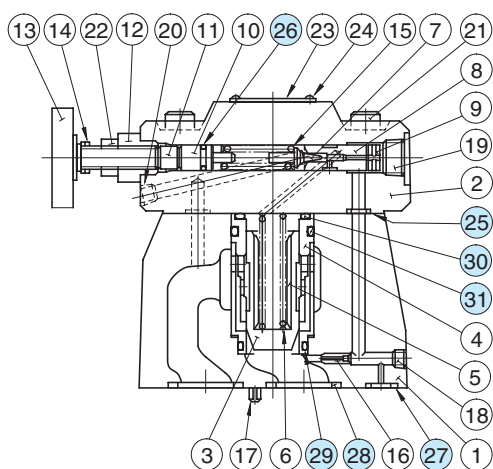
Measuring condition

Measuring position: At 1m (3.3 ft.) back from the valve front.
Viscosity : 35 mm²/s (164 SSU)
Back pressure : 0.1 MPa (14.5 PSI)



Spare Parts List

S-BG-03,06,10-*-40/4090



S-BG-10

List of Seals

Item	Name of Parts	Part Numbers			Qty.
		S-BG-03	S-BG-06	S-BG-10	
25	O-Ring	SO-NB-P9	SO-NB-P9	SO-NB-P9	2
26	O-Ring	SO-NA-P9	SO-NA-P9	SO-NA-P9	1
27	O-Ring	SO-NB-P9	SO-NB-P11	SO-NB-P9	1
28	O-Ring	SO-NB-P18	SO-NB-P28	SO-NB-P32	2
29	O-Ring	SO-NB-A024	SO-NB-A024	SO-NB-A128	1
30	O-Ring	SO-NB-P28	SO-NB-P28	SO-NB-P36	1
31	O-Ring	SO-NB-P32	SO-NB-P32	SO-NB-P42	1
32	O-Ring	—	—	SO-NB-P14	1

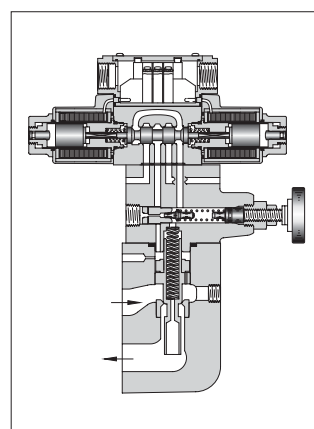
Note: When ordering the seals, please specify the seal kit number from the table below.

List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
S-BG-03	KS-S-BG-03-40
S-BG-06	KS-S-BG-06-40
S-BG-10	KS-S-BG-10-40

Solenoid Controlled Relief Valves

These valves are a combination of a pilot operated relief valve and a solenoid operated directional valve. Piping between the two is eliminated as the solenoid valve is directly mounted on the relief valve and connected with the relief valve vent. Pump pressure may be unloaded remotely by an electrical signal to the solenoid, or by connecting pilot relief valves to the solenoid valve ports.



Specifications

Model Numbers		Max. Operating Pressure MPa (PSI)	Pressure Adj. Range MPa (PSI)	Max. Flow L/min (U.S.GPM)	Approx. Mass kg (lbs.)		
					Double Sol.	Single Sol.	With Vent Restrictor
Threaded Connection	BST-03-*-**-*-48*	25 (3630)	Note) ★-25 (★-3630)	100 (26.4)	7.1 (15.7)	6.6 (14.6)	7.6 (16.8)
	BST-06-*-**-*-48*			200 (52.8)	7.1 (15.7)	6.6 (14.6)	7.6 (16.8)
	BST-10-*-**-*-48*			400 (106)	10.8 (23.8)	10.3 (22.7)	11.3 (24.9)
Sub-plate Mounting	BSG-03-*-**-*-48*	25 (3630)	Note) ★-25 (★-3630)	100 (26.4)	6.8 (15.0)	6.3 (13.9)	7.3 (16.1)
	BSG-06-*-**-*-48*			200 (52.8)	7.7 (17.0)	7.2 (15.9)	8.2 (18.1)
	BSG-10-*-**-*-48*			400 (106)	11.0 (24.3)	10.5 (23.2)	11.5 (25.4)

Note: For relief valves, standard pilot operated relief valves are used.

For minimum adjustment pressures and other characteristics, see [page 214](#).

Model Number Designation

F-	A-	BS	T	-03	-V	-2B3A	-A100	-N	-48	*
Special Seals	With Vent Restrictor	Series Number	Type of Mounting	Valve Size	High Venting Pres. Feature	Vent Type	Coil Type ^{★4}	Type of Electrical Con.	Design Number	Design Standards
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	A: With Vent Restrictor (Option-Omit if not required) ^{★1}	BS: Solenoid Controlled Relief Valves	T: Threaded Connection G: Sub-plate Mounting	03 06 10	V: For High Venting Pressure Feature (Omit if not required) ^{★2}	2B3A ^{★3} 2B3B 2B2B 2B2 3C2 3C3	AC: A100 , A120 A200 , A240 DC: D12 , D24 D48 AC→DC: R100 , R200	None: Terminal Box Type N: With Plug-in Connector (DIN) N: With Plug-in Connector (DIN)	48	None: Japanese Std. "JIS" 90: N. American Design Std. 80: European Design Std.

★1. Models with vent restrictor are applicable only for the vent type 2B3A and 2B3B. For details, see [page 222](#).

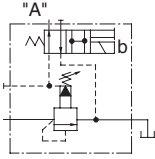
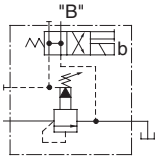
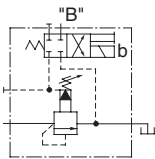
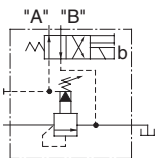
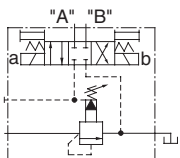
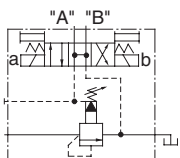
★2. Use high venting pressure types to reduce response time from unloading to onloading.

★3. For the details of the vent types, see the [following page](#).

★4. The coil codes are the same as for solenoid operated directional valve DSG-01. See the Solenoid Ratings on [page 345](#).

The coil type numbers in the shaded column are handled as optional extras. In case these coils are required to be chosen, please confirm the time of delivery with us before ordering.

Vent Types

Vent Type	Graphic Symbols	Solenoid Operated Directional Valve Model Number	Operation		
			SOL "a"	SOL "b"	Vent Connecting
2B3A		DSG-01-2B3A	—	OFF	Connected to port "A".
				ON	Connected to tank (no-load)
2B3B		DSG-01-2B3B	—	OFF	Connected to tank (no-load)
				ON	Connected to port "B".
2B2B		DSG-01-2B2B	—	OFF	Closed state (relief valve setting pressure)
				ON	Connected to port "B".
2B2		DSG-01-2B2	—	OFF	Connected to port "A".
				ON	Connected to port "B".
3C2		DSG-01-3C2	OFF	OFF	Closed state (relief valve setting pressure)
			ON	OFF	Connected to port "A".
			OFF	ON	Connected to port "B".
3C3		DSG-01-3C3	OFF	OFF	Connected to tank (no-load)
			ON	OFF	Connected to port "A".
			OFF	ON	Connected to port "B".

Attachment

Mounting Bolts

Valve Model Numbers	Socket Head Cap Screw	
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.
BSG-03	M12 × 70 Lg. (2 pcs.), M12 × 95 Lg. (2 pcs.)	1/2-13UNC × 2-3/4 Lg. (2 pcs.), 1/2-13UNC × 3-3/4 Lg. (2 pcs.)
BSG-06	M16 × 60 Lg. (2 pcs.), M16 × 80 Lg. (2 pcs.)	5/8-11UNC × 2-1/4 Lg. (2 pcs.), 5/8-11UNC × 3-1/4 Lg. (2 pcs.)
BSG-10	M20 × 70 Lg. (2 pcs.), M20 × 90 Lg. (2 pcs.)	3/4-10UNC × 2-3/4 Lg. (2 pcs.), 3/4-10UNC × 3-1/2 Lg. (2 pcs.)

Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
BSG-03	BGM-03-20	Rc 3/8	BGM-03-3080	3/8 BSP.F	BGM-03-2090	3/8 NPT	2.4(5.3)
	BGM-03X-20	Rc 1/2	BGM-03X-3080	1/2 BSP.F	BGM-03X-2090	1/2 NPT	3.1(6.8)
BSG-06	BGM-06-20	Rc 3/4	BGM-06-3080	3/4 BSP.F	BGM-06-2090	3/4 NPT	4.7(10.4)
	BGM-06X-20	Rc 1	BGM-06X-3080	1 BSP.F	BGM-06X-2090	1 NPT	5.7(12.6)
BSG-10	BGM-10-20	Rc 1-1/4	BGM-10-3080	1-1/4 BSP.F	BGM-10-2090	1-1/4 NPT	8.4(18.5)
	BGM-10X-20	Rc 1-1/2	BGM-10X-3080	1-1/2 BSP.F	BGM-10X-2090	1-1/2 NPT	10.3(22.7)

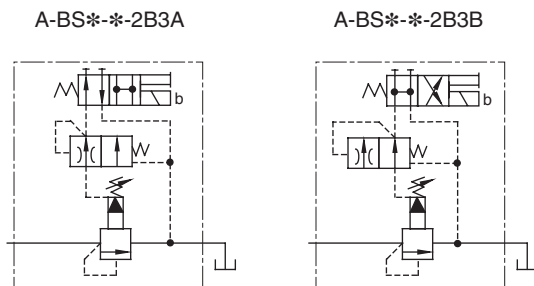
- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.
- The sub-plates are those for pilot operated relief valves. For dimensions, see [page 213](#).

Option

Models with vent restrictor

The type with a vent restrictor has a vent restrictor in vent types 2B3A and 2B3B added between a relief valve and a solenoid operated directional valve. It prevents shock to the main circuit by gradually lowering the venting pressure in the shift from the set pressure to unloading.

Unloading pressure are the same as without a vent restrictor.



Instructions

- If a remote control relief valve is used in the vent circuit, see [page 203](#). In addition, if the internal volume of the vent line is too large, chattering is likely to occur. Thus, as far as possible reduce the inside diameter and the length of the pipe.
- To adjust the pressure, loosen the lock nut and turn the handle slowly clockwise for higher pressures or anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Piping of the tank line should not be connected to any tank line of the other valves, but connected directly to the reservoir.
- Pressure is limited by collars fitted. If a working pressure cannot be attained, remove some collars. One collar is equivalent to 10 MPa (1450 PSI).
- With a small flow, the setting pressure may be unstable. Use models numbered 03 and 06 with a flow rate above 8 L/min (2.1 U.S. GPM) and model 10 with 15 L/min (4.0 U.S. GPM).

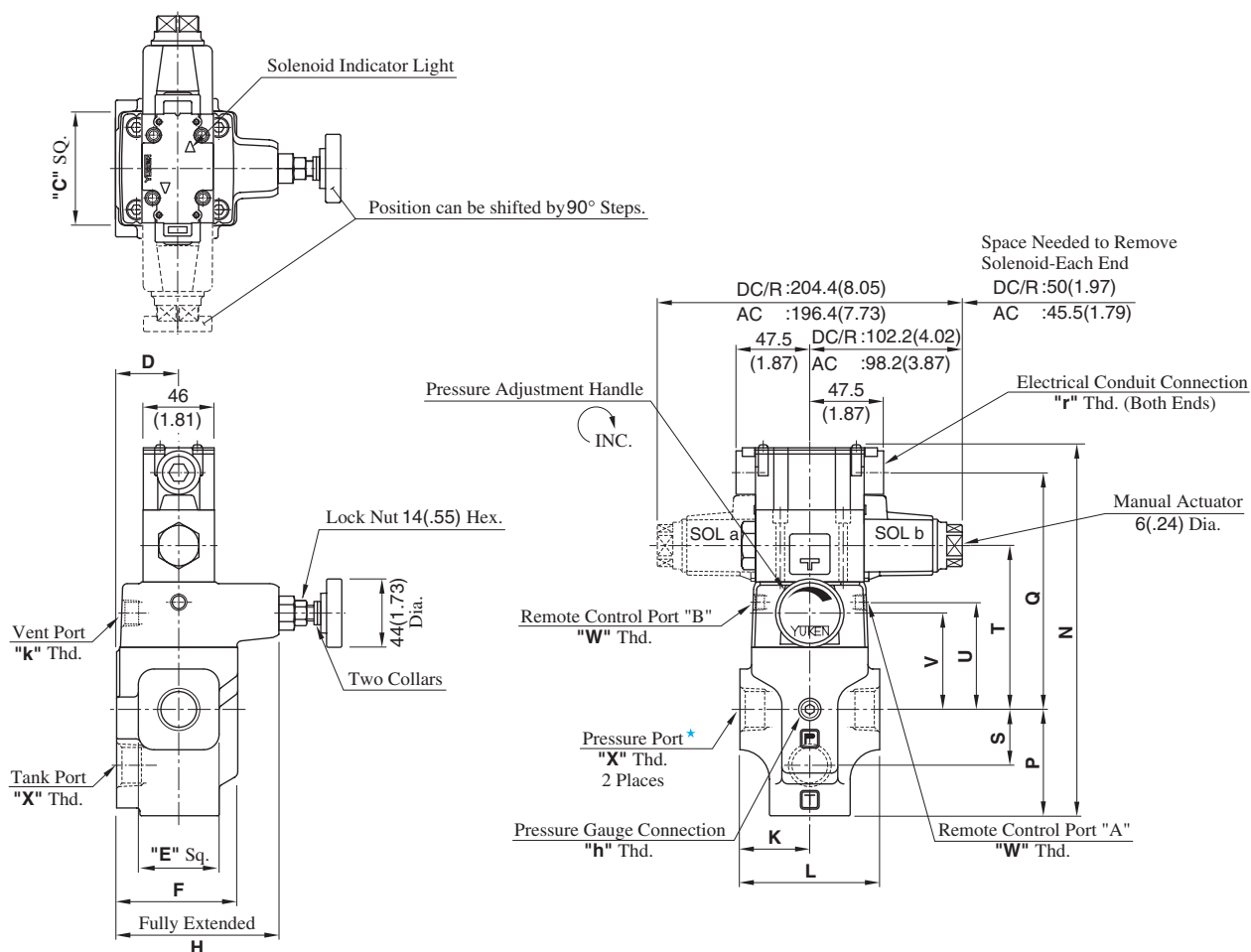
Interchangeability in Installation between Old and New Design.

Design 48 valve is one on which DSG-01, design 70 is mounted as a pilot valve. It is interchangeable with old design (design 47) with respect to specifications, exterior shape and mounting dimensions.

BST-03-**-**-48/4890
 BST-06-**-**-48/4890
 BST-10-**-**-48/4890

DIMENSIONS IN
MILLIMETRES (INCHES)

● Terminal Box Type



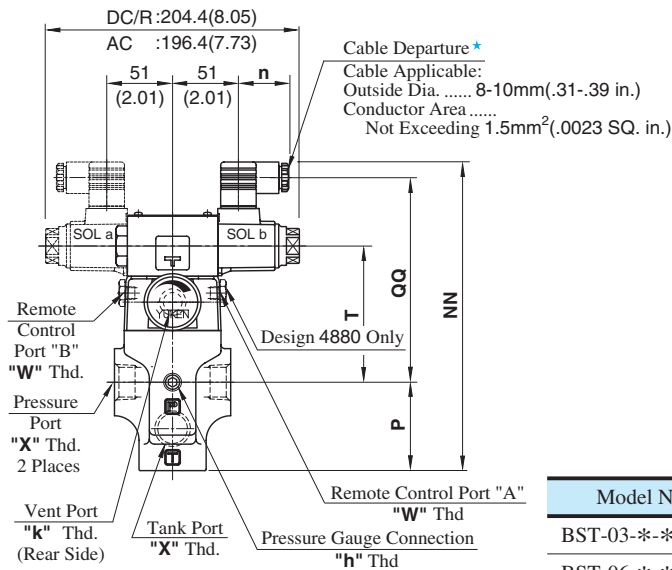
★ There are two threaded connection pressure ports. They can be connected each other in-line; one as inlet and the other as an outlet or the valve can be used by plugging one of the pressure ports.

Model Numbers	Dimensions mm (Inches)													
	C	D	E	F	H	K	L	N	P	Q	S	T	U	V
BST-03-**-48/4890	75 (2.95)	40 (1.57)	52 (2.05)	78 (3.07)	145 (5.71)	45 (1.77)	90 (3.54)	239.3 (9.42)	68.5 (2.70)	152.5 (6.00)	36 (1.42)	105.5 (4.15)	69 (2.72)	62 (2.44)
BST-06-**-48/4890														
BST-10-**-48/4890	85 (3.35)	50 (1.97)	80 (3.15)	96 (3.78)	151 (5.94)	60 (2.36)	120 (4.72)	271.8 (10.70)	89 (3.50)	164.5 (6.48)	49 (1.93)	117.5 (4.63)	81 (3.19)	74 (2.91)

Model Numbers	Japanese Standard "JIS" Design 48					N. American Design Standard Design 4890				
	"W" Thd.	"X" Thd.	"h" Thd.	"k" Thd.	"r" Thd.	"W" Thd.	"X" Thd.	"h" Thd.	"k" Thd.	"r" Thd.
BST-03	Rc 1/8	Rc 3/8	Rc 1/4	Rc 3/8	G 1/2	1/8 NPT	3/8 NPT	1/4 NPT	3/8 NPT	1/2 NPT
BST-06		Rc 3/4					3/4 NPT			
BST-10		Rc 1-1/4					1-1/4 NPT			

● **Models with Plug-in Connector**

03
BST-06-**-**-N-48/4880/4890
10



★ Position of cable departure can be changed. For details, refer to DSG-01 valve on [page 357](#).

DIMENSIONS IN MILLIMETRES (INCHES)

Model Numbers	Dimensions mm(Inches)				
	P	T	NN	QQ	n
BST-03-**-A*-N	68.5 (2.70)	105.5 (4.15)	239 (9.41)	158.5 (6.24)	39 (1.54)
BST-06-**-A*-N	89 (3.50)	117.5 (4.63)	271.5 (10.69)	170.5 (6.71)	
BST-10-**-A*-N	89 (3.50)	117.5 (4.63)	271.5 (10.69)	170.5 (6.71)	39 (1.54)
BST-03-**-D*-N	68.5 (2.70)	105.5 (4.15)	250 (9.84)	169.5 (6.67)	
BST-06-**-D*-N	89 (3.50)	117.5 (4.63)	282.5 (11.12)	181.5 (7.15)	53 (2.09)
BST-10-**-D*-N	89 (3.50)	117.5 (4.63)	282.5 (11.12)	181.5 (7.15)	
BST-03-**-R*-N	68.5 (2.70)	105.5 (4.15)	253 (9.96)	162.7 (6.41)	53 (2.09)
BST-06-**-R*-N	89 (3.50)	117.5 (4.63)	285.5 (11.24)	174.7 (6.88)	
BST-10-**-R*-N	89 (3.50)	117.5 (4.63)	285.5 (11.24)	174.7 (6.88)	

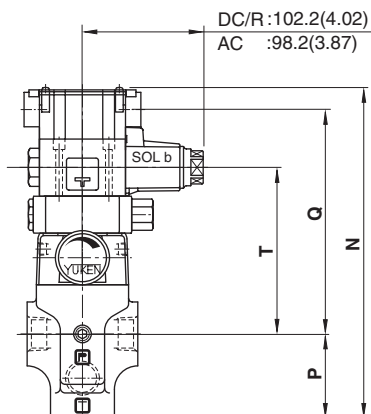
Model Numbers	"W" Thd.	"X" Thd.	"h" Thd.	"k" Thd.
BST-03-**-**-N-4880		3/8 BSP.F		
BST-06-**-**-N-4880	1/8 BSP.F	3/4 BSP.F	1/4 BSP.Tr	3/8 BSP.Tr
BST-10-**-**-N-4880		1-1/4 BSP.F		

See the installation drawing of terminal box type on [page 223](#) for design 48 and 4890 port thread and other dimensions.

■ **Options - Models with Vent Restrictor**

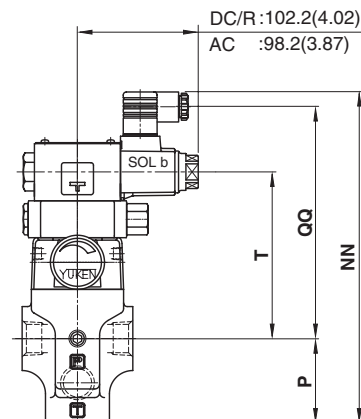
● **Terminal Box Type**

03
A-BST-06-**-2B3A-**-48/4880
10
2B3B



● **Plug-in Connector Type**

03
A-BST-06-**-2B3A-**-N-48/4880/4890
10
2B3B



Model Numbers	P	T	Terminal Box Type		Plug-in Connector Type					
					AC Solenoid		DC Solenoid		R (AC→DC) Solenoid	
			N	Q	NN	QQ	NN	QQ	NN	QQ
A-BST-03	68.5	135.5	269.3	182.5	269	188.5	280	199.5	283	192.7
A-BST-06	(2.70)	(5.33)	(10.60)	(7.19)	(10.59)	(7.42)	(11.02)	(7.85)	(11.14)	(7.59)
A-BST-10	89	147.5	301.8	194.5	301.5	200.5	312.5	211.5	315.5	204.7
	(3.50)	(5.81)	(11.88)	(7.66)	(11.87)	(7.89)	(12.30)	(8.33)	(12.42)	(8.06)

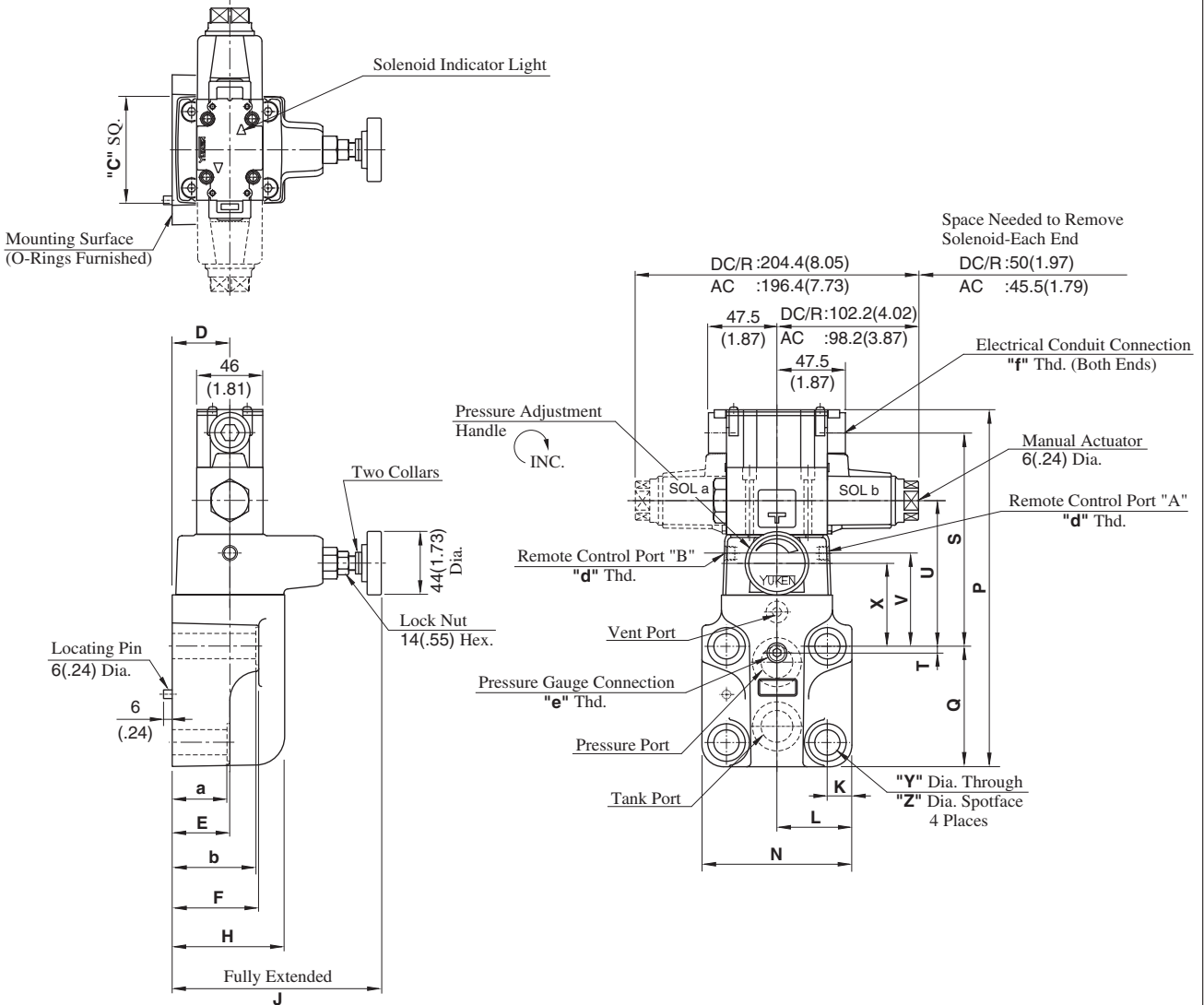
For other dimensions, see the models without vent restrictor type on [page 223](#) and [page 224](#).

BSG-03-***-48/4890
BSG-06-***-48/4890
BSG-10-***-48/4890

Mounting surface
BSG-03: ISO 6264-AR-06-2-A
BSG-06: ISO 6264-AS-08-2-A
BSG-10: ISO 6264-AT-10-2-A

● Terminal Box Type

DIMENSIONS IN
MILLIMETRES (INCHES)



Model Numbers	Dimensions mm (Inches)																		
	C	D	E	F	H	J	K	L	N	P	Q	S	T	U	V	X	Y	Z	a
BSG-03	75 (2.95)	40 (1.57)	57 (2.24)	78 (3.07)	78 (3.07)	145 (5.71)	14.1 (.56)	41 (1.61)	82 (3.23)	225.8 (8.89)	77 (3.03)	130.5 (5.14)	22 (.87)	83.5 (3.29)	47 (1.85)	40 (1.57)	13.5 (.53)	21 (.83)	55 (2.17)
BSG-06	75 (2.95)	40 (1.57)	40 (1.57)	60 (2.36)	78 (3.07)	145 (5.71)	17 (.67)	52 (2.05)	104 (4.09)	249.8 (9.83)	83.5 (3.29)	148 (5.83)	4.5 (.18)	101 (3.98)	64.5 (2.54)	57.5 (2.26)	17.5 (.69)	26 (1.02)	38 (1.50)
BSG-10	85 (3.35)	45 (1.77)	47 (1.85)	67 (2.64)	84 (3.31)	146 (5.75)	20.7 (.81)	62 (2.44)	124 (4.88)	283.8 (11.17)	110 (4.33)	155.5 (6.12)	6 (.24)	108.5 (4.27)	72 (2.83)	65 (2.56)	21.5 (.85)	32 (1.26)	45 (1.77)

Model Numbers	Japanese Standard "JIS" Design 48			N. American Design Standard Design 4890		
	"d" Thd.	"e" Thd.	"f" Thd.	"d" Thd.	"e" Thd.	"f" Thd.
BSG-03						
BSG-06	Rc 1/8	Rc 1/4	G 1/2	1/8 NPT	1/4 NPT	1/2 NPT
BSG-10						

Note: For dimensions of the valve mounting surface, see the installation drawing (P. 213) of the sub-plate used together.

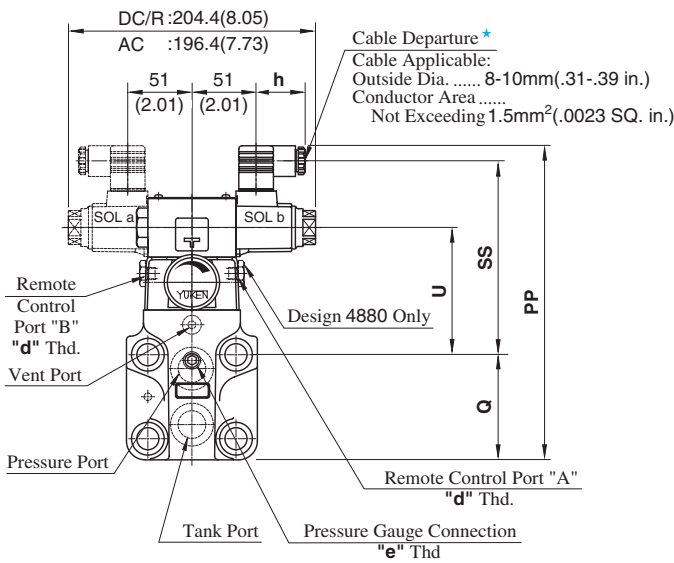
C



Solenoid Controlled Relief Valves

● **Models with Plug-in Connector**

03
BSG-06-*-N-48/4880/4890
10



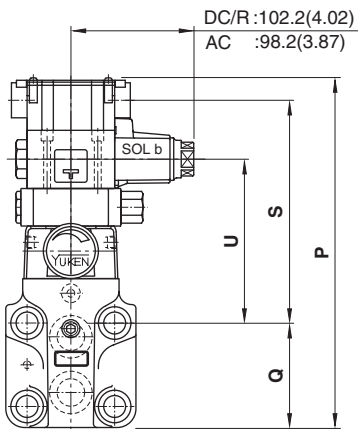
★ Position of cable departure can be changed. For details, refer to DSG-01 valve on [page 357](#).

**DIMENSIONS IN
MILLIMETRES (INCHES)**

■ **Options - Models with Vent Restrictor**

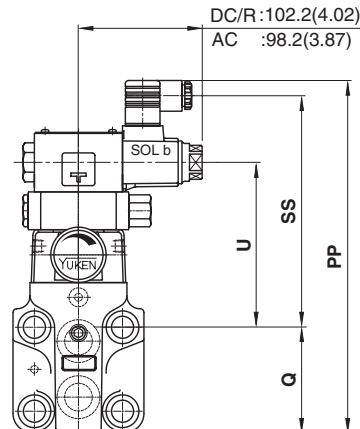
● **Terminal Box Type**

03
A-BSG-06-*-2B3A
10 2B3B *-48/4890



● **Plug-in Connector Type**

03
A-BSG-06-*-2B3A
10 2B3B *-N-48/4880/4890



Model Numbers	Dimensions mm(Inches)				
	Q	U	PP	SS	h
BSG-03-*-A*-N	77 (3.03)	83.5 (3.29)	225.5 (8.88)	136.5 (5.37)	
BSG-06-*-A*-N	83.5 (3.29)	101 (3.98)	249.5 (9.82)	154 (6.06)	39 (1.54)
BSG-10-*-A*-N	110 (4.33)	108.5 (4.27)	283.5 (11.16)	161.5 (6.36)	
BSG-03-*-D*-N	77 (3.03)	83.5 (3.29)	236.5 (9.31)	147.5 (5.81)	
BSG-06-*-D*-N	83.5 (3.29)	101 (3.98)	260.5 (10.26)	165 (6.50)	39 (1.54)
BSG-10-*-D*-N	110 (4.33)	108.5 (4.27)	294.5 (11.59)	172.5 (6.79)	
BSG-03-*-R*-N	77 (3.03)	83.5 (3.29)	239.5 (9.43)	140.7 (5.54)	
BSG-06-*-R*-N	83.5 (3.29)	101 (3.98)	263.5 (10.37)	158.2 (6.23)	53 (2.09)
BSG-10-*-R*-N	110 (4.33)	108.5 (4.27)	297.5 (11.71)	165.7 (6.52)	

Model Numbers	"d" Thd.	"e" Thd.
BSG-03-*-N-4880	1/8 BSP.F	1/4 BSP.Tr
BSG-06-*-N-4880		
BSG-10-*-N-4880		

See the installation drawing of terminal box type on [page 225](#) for design 48 and 4890 port threads and other dimensions.

Model Numbers \ Dimensions mm (Inches)	Q	U	Terminal Box Type		Plug-in Connector Type					
					AC Solenoid		DC Solenoid		R (AC→DC) Solenoid	
			P	S	PP	SS	PP	SS	PP	SS
A-BSG-03	77 (3.03)	113.5 (4.47)	255.8 (10.07)	160.5 (6.32)	255.5 (10.06)	166.5 (6.56)	266.5 (10.49)	177.5 (6.99)	269.5 (10.61)	170.7 (6.72)
A-BSG-06	83.5 (3.29)	131 (5.16)	279.8 (11.02)	178 (7.01)	279.5 (11.00)	184 (7.24)	290.5 (11.44)	195 (7.68)	293.5 (11.56)	188.2 (7.41)
A-BSG-10	110 (4.33)	138.5 (5.45)	313.8 (12.35)	185.5 (7.30)	313.5 (12.34)	191.5 (7.54)	324.5 (12.78)	202.5 (7.97)	327.5 (12.89)	195.7 (7.70)

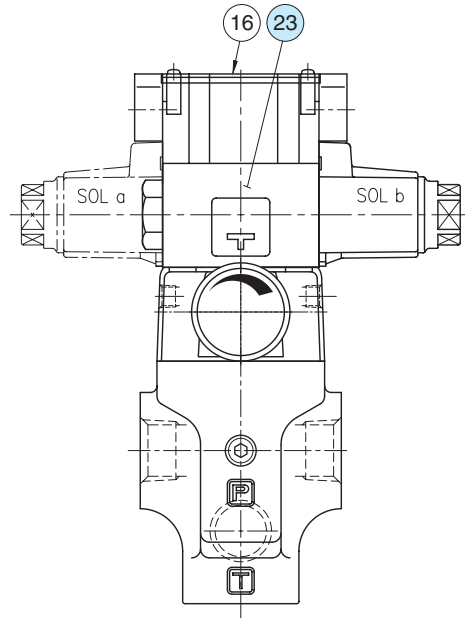
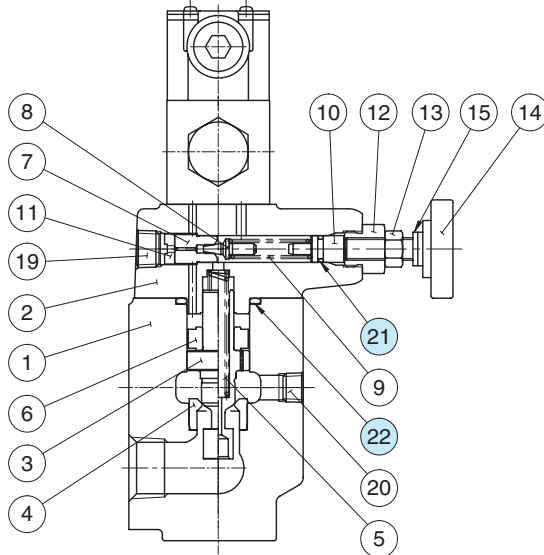
For other dimensions, see the models without vent restrictor type on [page 225](#) and [page 226](#).

Spare Parts List

Threaded Connections

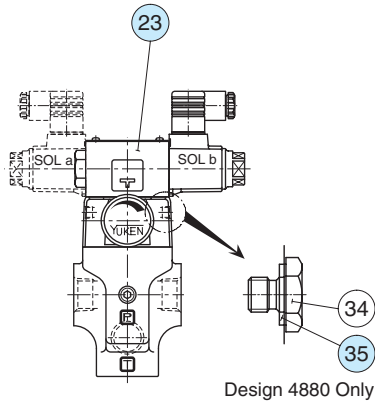
Terminal Box Type

03
BST-06 -*-48/4890
10



Models with Plug-in Connector

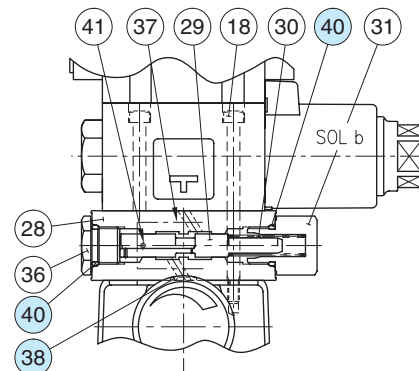
03
BST-06 -*-N-48/4880/4890
10



Option

Models with Vent Restrictor

03
A-BST-06 -*-48/4890
10
N-48/4880/4890



List of Seals

Item	Name of Parts	Part Numbers			Qty.
		BST-03	BST-06	BST-10	
21	O-Ring	SO-NA-P9	SO-NA-P9	SO-NA-P9	1
22	O-Ring	SO-NB-P32	SO-NB-P42	SO-NB-P42	1
35	Bonded Seal	SG-FB-1/8	SG-FB-1/8	SG-FB-1/8	2
38*	O-Ring	SO-NB-P8			2
40*	O-Ring	SO-NB-P14			2

★ The O-Rings for Item 38,40 are used only for the models with the vent restrictor.

Note: When ordering the seals, please specify the seal kit number from the table right. In addition to the above seals, seals for the pilot valves are included in the seal kit.

For the detail of the pilot valve seals, see the [page 359](#).

List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
BST-03	KS-BST-03-48
BST-06	
BST-10	KS-BST-10-48
A-BST-03	KS-A-BST-03-48
A-BST-06	
A-BST-10	KS-A-BST-10-48

Note: No bonded seals are included in the seal kits.

Pilot Valves

See [page 229](#) for the pilot valve model numbers to be used.

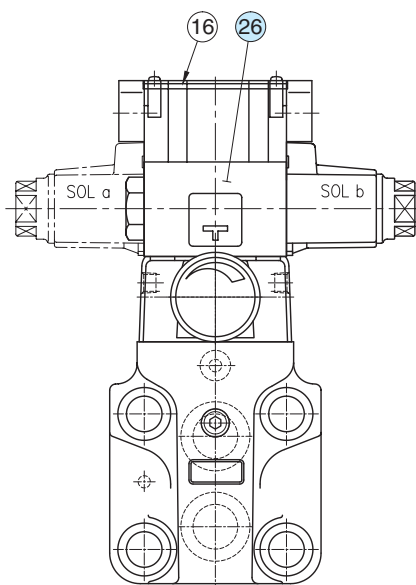
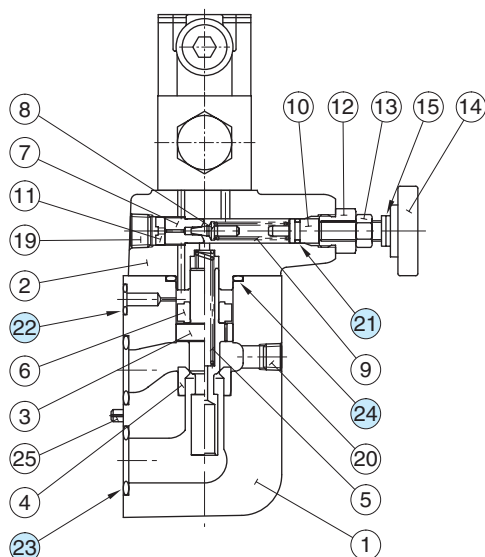


Spare Parts List

Sub-plate Mounting

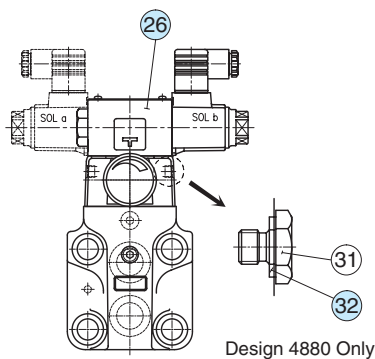
Terminal Box Type

03
BSG-06-***-48/4890
10



Models with Plug-in Connector

03
BSG-06-***-N-48/4880/4890
10

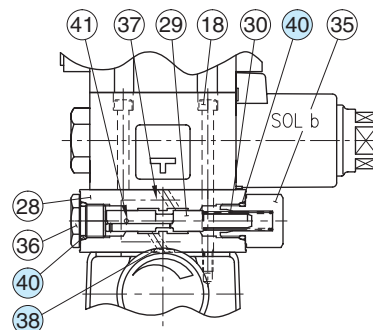


Design 4880 Only

Option

Models with Vent Restrictor

03
A-BSG-06-***-48/4890
10
N-48/4880/4890



List of Seals

Item	Name of Parts	Part Numbers			Qty.
		BSG-03	BSG-06	BSG-10	
21	O-Ring	SO-NA-P9	SO-NA-P9	SO-NA-P9	1
22	O-Ring	SO-NB-P9	SO-NB-P11	SO-NB-P9	1
23	O-Ring	SO-NB-P18	SO-NB-P28	SO-NB-P32	2
24	O-Ring	SO-NB-P32	SO-NB-P32	SO-NB-P42	1
32	Bonded Seal	SG-FB-1/8	SG-FB-1/8	SG-FB-1/8	2
38*	O-Ring	SO-NB-P8			2
40*	O-Ring	SO-NB-P14			2

★ The O-Rings for item 38, 40 are used only for the models with the vent restrictor.

Note: When ordering the seals, please specify the seal kit number from the table right. In addition to the above seals, seals for the pilot valves are included in the seal kit.

For the detail of the pilot valve seals, see [page 359](#).

List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
BSG-03	KS-BSG-03-48
BSG-06	KS-BSG-06-48
BSG-10	KS-BSG-10-48
A-BSG-03	KS-A-BSG-03-48
A-BSG-06	KS-A-BSG-06-48
A-BSG-10	KS-A-BSG-10-48

Note: No bonded seals are included in the seal kits.

Pilot Valves

See [page 229](#) for the pilot valve model numbers to be used.

Spare Parts List

List of Pilot Valves

Type of Electrical Conduit Connection	Valve Model Numbers	Pilot Valve Model Numbers	Remarks
Terminal Box Type	*-BST/BSG-03/06/10-*2B3A-★-48	DSG-01-2B3A-★-70	Japanese Standard "JIS"
	*-BST/BSG-03/06/10-*2B3B-★-48	DSG-01-2B3B-★-70	
	*-BST/BSG-03/06/10-*2B2B-★-48	DSG-01-2B2B-★-70	
	*-BST/BSG-03/06/10-*2B2-★-48	DSG-01-2B2-★-70	
	*-BST/BSG-03/06/10-*3C2-★-48	DSG-01-3C2-★-70	
	*-BST/BSG-03/06/10-*3C3-★-48	DSG-01-3C3-★-70	
	*-BST/BSG-03/06/10-*2B3A-★-4890	DSG-01-2B3A-★-7090	N. American Design Std.
	*-BST/BSG-03/06/10-*2B3B-★-4890	DSG-01-2B3B-★-7090	
	*-BST/BSG-03/06/10-*2B2B-★-4890	DSG-01-2B2B-★-7090	
	*-BST/BSG-03/06/10-*2B2-★-4890	DSG-01-2B2-★-7090	
	*-BST/BSG-03/06/10-*3C2-★-4890	DSG-01-3C2-★-7090	
	*-BST/BSG-03/06/10-*3C3-★-4890	DSG-01-3C3-★-7090	
Plug-in Connector Type	*-BST/BSG-03/06/10-*2B3A-★-N-48	DSG-01-2B3A-★-N-70	Japanese Standard "JIS"
	*-BST/BSG-03/06/10-*2B3B-★-N-48	DSG-01-2B3B-★-N-70	
	*-BST/BSG-03/06/10-*2B2B-★-N-48	DSG-01-2B2B-★-N-70	
	*-BST/BSG-03/06/10-*2B2-★-N-48	DSG-01-2B2-★-N-70	
	*-BST/BSG-03/06/10-*3C2-★-N-48	DSG-01-3C2-★-N-70	
	*-BST/BSG-03/06/10-*3C3-★-N-48	DSG-01-3C3-★-N-70	
	*-BST/BSG-03/06/10-*2B3A-★-N-4880	DSG-01-2B3A-★-N-70	European Design Std.
	*-BST/BSG-03/06/10-*2B3B-★-N-4880	DSG-01-2B3B-★-N-70	
	*-BST/BSG-03/06/10-*2B2B-★-N-4880	DSG-01-2B2B-★-N-70	
	*-BST/BSG-03/06/10-*2B2-★-N-4880	DSG-01-2B2-★-N-70	
	*-BST/BSG-03/06/10-*3C2-★-N-4880	DSG-01-3C2-★-N-70	
	*-BST/BSG-03/06/10-*3C3-★-N-4880	DSG-01-3C3-★-N-70	
	*-BST/BSG-03/06/10-*2B3A-★-N-4890	DSG-01-2B3A-★-N-7090	N. American Design Std.
	*-BST/BSG-03/06/10-*2B3B-★-N-4890	DSG-01-2B3B-★-N-7090	
	*-BST/BSG-03/06/10-*2B2B-★-N-4890	DSG-01-2B2B-★-N-7090	
	*-BST/BSG-03/06/10-*2B2-★-N-4890	DSG-01-2B2-★-N-7090	
	*-BST/BSG-03/06/10-*3C2-★-N-4890	DSG-01-3C2-★-N-7090	
	*-BST/BSG-03/06/10-*3C3-★-N-4890	DSG-01-3C3-★-N-7090	

Note: 1. Fill a coil type (a symbol representing current/voltage) in section marked ★.

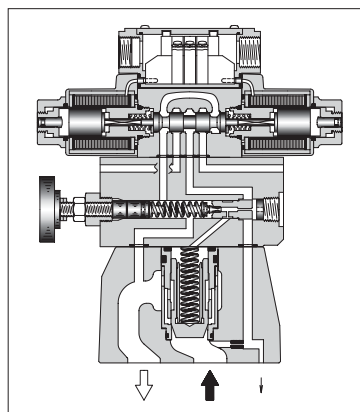
2. For the details of the pilot valves, see [page 359](#).



Solenoid Controlled Relief Valves

Low Noise Type Solenoid Controlled Relief Valves

The low-noise solenoid controlled relief valve is a combination of a low-noise type pilot operated relief valve and a solenoid operated directional valve. It is used for no-load pump operation by using electric signals or, together with a remote control relief valve, for two or three pressure control of the hydraulic system.



Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Pressure Adj. Range MPa (PSI)	Max. Flow L/min (U.S.GPM)	Approx. Mass kg (lbs.)		
				Double Sol.	Single Sol.	With Vent Restrictor
S-BSG-03-*-53*	25 (3630)	★ - 25 (★ - 3630)	100 (26.4)	6.0 (13.2)	5.5 (12.1)	6.5 (14.3)
S-BSG-06-*-53*			200 (52.8)	6.9 (15.2)	6.4 (14.1)	7.4 (16.3)
S-BSG-10-*-53*			400 (106)	12.6 (27.8)	12.1 (26.7)	12.9 (28.4)

★ For relief valves, low-noise type pilot operated relief valves are used.
For minimum adjustment pressures and other characteristics, see [page 218](#).

Model Number Designation

F-	A-	S-	BS	G	-03	-V	-2B3A	-A100	-N	-L	53	*
Special Seals	With Vent Restrictor	Low Noise Type	Series Number	Type of Mtg.	Valve size	High Venting Pres. Feature	Vent Type	Coil Type	Type of Electrical Connections	Direction of Handle	Design Number	Design Standards
F: Special Seals for Phosphate Ester Fluids (Omit if not required)	A: ★ ¹ With Vent Restrictor (Option-Omit if not required)	S: Low Noise Type	BS: Solenoid Controlled Relief Valves	G: Sub-plate Mtg.	03 06 10	V: ★ ² For High Venting Pressure Feature (Omit if not required)	2B3A ★ ³ 2B3B 2B2B 2B2 3C2 3C3	AC: ★ ⁴ A100 A120 A200 A240 DC: D12 D24 D48 AC → DC: R100 R200	None: Terminal Box Type N: With Plug-in Connector (DIN) N: With Plug-in Connector (DIN)	L: Left (Normal) R: Right	53	None: Japanese Std. "JIS" 90: N. American Design Std. 80: European Design Std.

- ★¹. Models with vent restrictor are applicable only for the vent type 2B3A and 2B3B. For details, see [page 231](#).
★². Use high venting pressure types to reduce response time from unloading to onloading.
★³. The vent types are the same as for the conventional type solenoid controlled relief valves. For the details of the vent types, see [page 221](#).
★⁴. The coil codes are the same as for solenoid operated directional valve DSG-01 valve. See the solenoid ratings on [page 345](#).

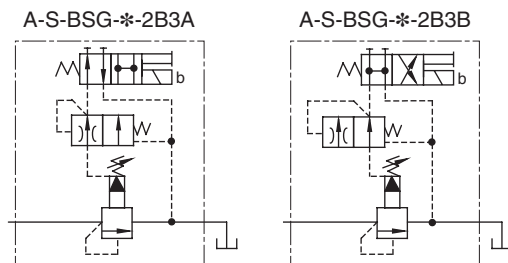
The coil type numbers in the shaded column are handled as optional extras.
In case these coils are required to be chosen, please confirm the time of delivery with us before ordering.

Option

Models with vent restrictor

The type with a vent restrictor has a vent restrictor in vent types 2B3A and 2B3B added between a relief valve and a solenoid operated directional valve. It prevents shock to the main circuit by gradually lowering the venting pressure in the shift from the setting pressure to unloading.

Unloading pressures are the same as without a vent restrictor.



Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
S-BSG-03	BGM-03-20	Rc 3/8	BGM-03-3080	3/8 BSP.F	BGM-03-2090	3/8 NPT	2.4(5.3)
	BGM-03X-20	Rc 1/2	BGM-03X-3080	1/2 BSP.F	BGM-03X-2090	1/2 NPT	3.1(6.8)
S-BSG-06	BGM-06-20	Rc 3/4	BGM-06-3080	3/4 BSP.F	BGM-06-2090	3/4 NPT	4.7(10.4)
	BGM-06X-20	Rc 1	BGM-06X-3080	1 BSP.F	BGM-06X-2090	1 NPT	5.7(12.6)
S-BSG-10	BGM-10-20	Rc 1-1/4	BGM-10-3080	1-1/4 BSP.F	BGM-10-2090	1-1/4 NPT	8.4(18.5)
	BGM-10X-20	Rc 1-1/2	BGM-10X-3080	1-1/2 BSP.F	BGM-10X-2090	1-1/2 NPT	10.3(22.7)

• Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.

• The sub-plates are those for pilot operated relief valves. For dimensions, see [page 213](#).

Attachment

Mounting Bolts

Valve Model Numbers	Socket Head Cap Screw		Qty.
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.	
S-BSG-03	M12 × 40 Lg.	1/2-13 UNC × 1-1/2 Lg.	4
S-BSG-06	M16 × 50 Lg.	5/8-11 UNC × 2 Lg.	4
S-BSG-10	M20 × 60 Lg.	3/4-10 UNC × 2-1/4 Lg.	4

Instructions

- If a remote control relief valve is used in the vent circuit, see [page 203](#). In addition, if the internal volume of the vent line is too large, chattering is likely to occur. Thus, as far as possible reduce the inside diameter and the length of the pipe.
- To adjust the pressure, loosen the lock nut and turn the handle slowly clockwise for higher pressures or anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Piping of the tank line should not be connected to any tank line of the other valves, but connected directly to the reservoir.
- Pressure is limited by collars fitted. If a working pressure cannot be attained, remove some collars. One collar is equivalent to 10 MPa (1450 PSI).
- With a small flow, the setting pressure may be unstable. Use models numbered 03 and 06 with a flow rate above 5 L/min (1.3 U.S. GPM) and model 10 with 8 L/min (2.1 U.S. GPM).

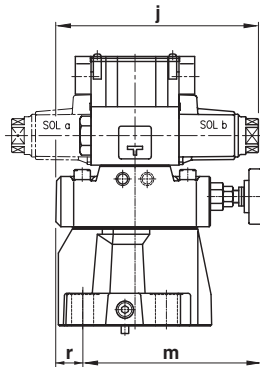
Interchangeability in Installation between Old and New Design.

Design 53 valve is one on which DSG-01, design 70 is mounted as a pilot valve. It is interchangeable with old design (design 52) with respect to specifications, exterior shape and mounting dimensions.

■ Terminal Box Type

Opposite Handle Position

S-BSG-⁰³₀₆ -*-R-53/5390

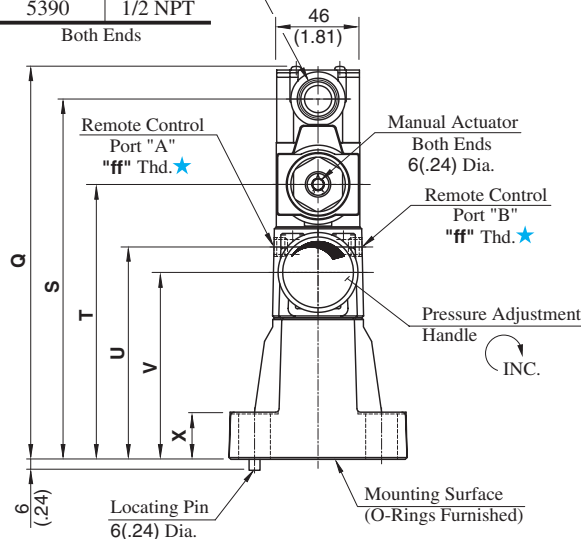


Note: For other dimensions, see the figures shown below.

Electrical Conduit Connection

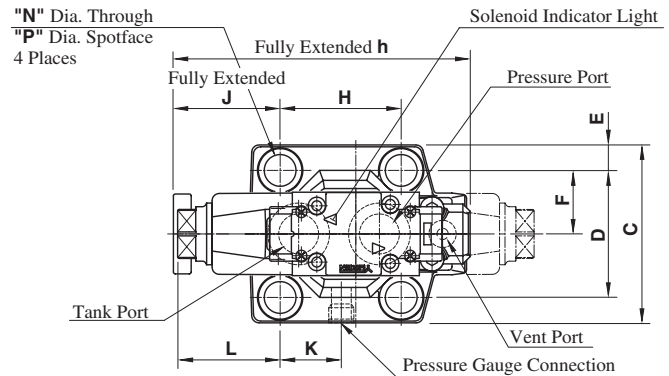
Design Std.	Thd. Size
53	G 1/2
5390	1/2 NPT

Both Ends

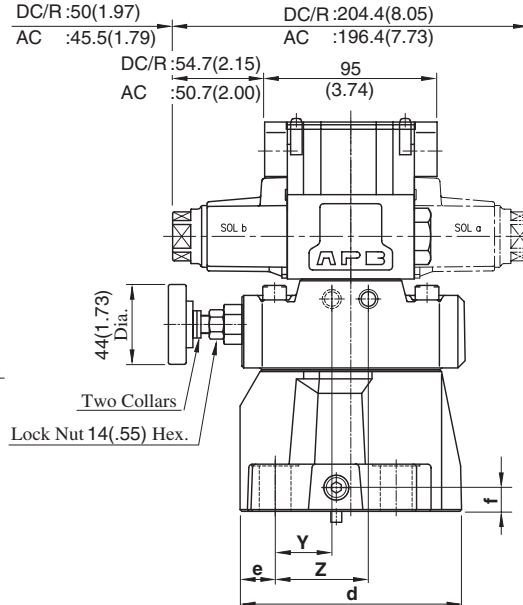


S-BSG-⁰³₀₆ -*-L-53/5390

S-BSG-10-**-53/5390



Space Needed to Remove Solenoid-Each End



Model Numbers	Dimensions mm (Inches)																			
	C	D	E	F	H	J	K	N	P	Q	S	T	U	V	X	Y	Z	d	e	f
S-BSG-03	76 (2.99)	53.8 (2.12)	11.1 (.44)	26.9 (1.06)	53.8 (2.12)	73.6 (2.90)	26.9 (1.06)	13.5 (.53)	21 (.83)	216.8 (8.54)	198.5 (7.81)	151.5 (5.96)	117 (4.61)	103 (4.06)	21.5 (.85)	17.1 (.67)	36.6 (1.44)	106 (4.17)	26.1 (1.03)	13 (.51)
S-BSG-06	98 (3.86)	70 (2.76)	14 (.55)	35 (1.38)	66.7 (2.63)	58.8 (2.31)	33.7 (1.33)	17.5 (.69)	26 (1.02)	216.8 (8.54)	198.5 (7.81)	151.5 (5.96)	117 (4.61)	103 (4.06)	26 (1.02)	31.9 (1.26)	51.4 (2.02)	122 (4.80)	19.3 (.76)	13 (.51)
S-BSG-10	120 (4.72)	82.6 (3.25)	18.7 (.74)	41.3 (1.63)	88.9 (3.50)	46.1 (1.81)	44.9 (1.77)	21.5 (.85)	32 (1.26)	251.8 (9.91)	233.5 (9.19)	186.5 (7.34)	149 (5.87)	135 (5.31)	33.5 (1.32)	43.2 (1.70)	62.7 (2.47)	155 (6.10)	21.1 (.83)	18 (.71)

Model Numbers	AC Solenoid		DC/R Solenoid	
	L	j	L	j
S-BSG-03	71.3 (2.81)	161.2 (6.35)	75.3 (2.96)	165.2 (6.50)
S-BSG-06	56.5 (2.22)	161.2 (6.35)	60.5 (2.38)	165.2 (6.50)
S-BSG-10	44.3 (1.74)	—	48.3 (1.90)	—

DIMENSIONS IN MILLIMETRES (INCHES)

★ For the port screws, see the Plug-in Connector type on page 233.

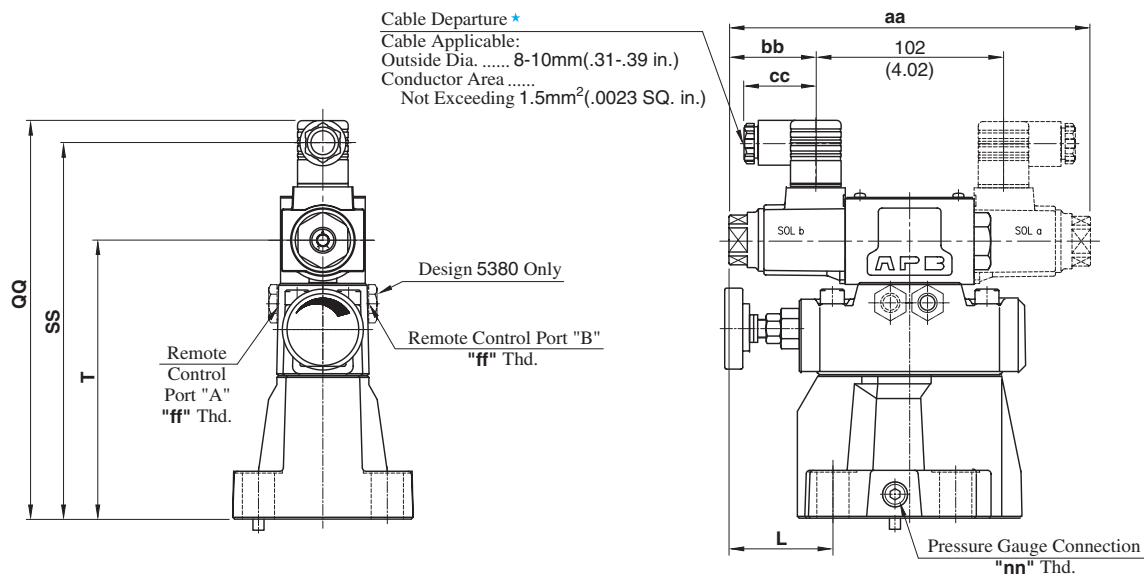
Note: For dimensions of the valve mounting surface, see the installation drawing (P. 213) of the sub-plate used together.

■ Plug-in Connector Type

S-BSG-⁰³₀₆-*-*-N-L-53/5380/5390

S-BSG-10-*-*-N-L-53/5380/5390

DIMENSIONS IN
MILLIMETRES (INCHES)



★ Position of cable departure can be changed. For details, refer to DSG-01 valve on [page 357](#).

Model Numbers	Dimensions mm (Inches)							Remarks
	L	QQ	SS	T	aa	bb	cc	
S-BSG-03-*-*-A*-N	71.3 (2.81)	216.5 (8.52)	204.5 (8.05)	151.5 (5.96)	196.4 (7.73)	47.2 (1.86)	39 (1.54)	With AC Solenoid
S-BSG-06-*-*-A*-N	56.5 (2.22)	216.5 (8.52)	204.5 (8.05)	151.5 (5.96)				
S-BSG-10-*-*-A*-N	44.3 (1.74)	251.5 (9.90)	239.5 (9.43)	186.5 (7.34)				
S-BSG-03-*-*-D*-N	75.3 (2.96)	227.5 (8.96)	215.5 (8.48)	151.5 (5.96)	204.4 (8.05)	51.2 (2.02)	39 (1.54)	With DC Solenoid
S-BSG-06-*-*-D*-N	60.5 (2.38)	227.5 (8.96)	215.5 (8.48)	151.5 (5.96)				
S-BSG-10-*-*-D*-N	48.3 (1.90)	262.5 (10.33)	250.5 (9.86)	186.5 (7.34)				
S-BSG-03-*-*-R*-N	75.3 (2.96)	230.5 (9.07)	208.7 (8.22)	151.5 (5.96)	204.4 (8.05)	51.2 (2.02)	53 (2.09)	With AC → DC Solenoid
S-BSG-06-*-*-R*-N	60.5 (2.38)	230.5 (9.07)	208.7 (8.22)	151.5 (5.96)				
S-BSG-10-*-*-R*-N	48.3 (1.90)	265.5 (10.45)	243.7 (9.59)	186.5 (7.34)				

Model Numbers	Thread Size					
	Japanese Standard "JIS" Design 53		European Design Standard Design 5380		N. American Design Standard Design 5390	
	"ff" Thd.	"nn" Thd.	"ff" Thd.	"nn" Thd.	"ff" Thd.	"nn" Thd.
S-BSG-03-*-*-N	Rc 1/8	Rc 1/4	1/8 BSP.F	1/4 BSP.F	1/8 NPT	1/4 NPT
S-BSG-06-*-*-N						
S-BSG-10-*-*-N						

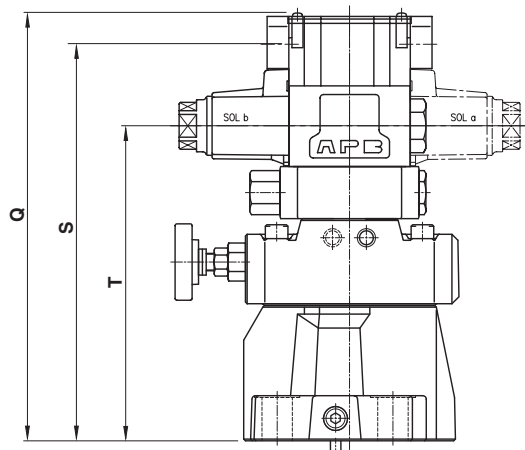
Options-Models with Vent Restrictor

DIMENSIONS IN
MILLIMETRES (INCHES)

Terminal Box Type

A-S-BSG-⁰³/₀₆ -*-L-53/5390

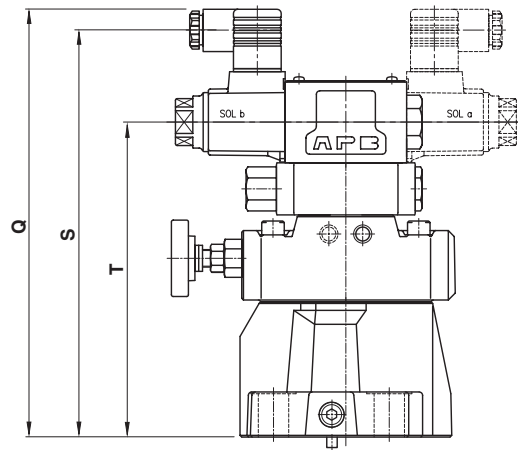
A-S-BSG-10-*-L-53/5390



Plug-in Connector Type

A-S-BSG-⁰³/₀₆ -*-N-L-53/5380/5390

A-S-BSG-10-*-N-53/5380/5390

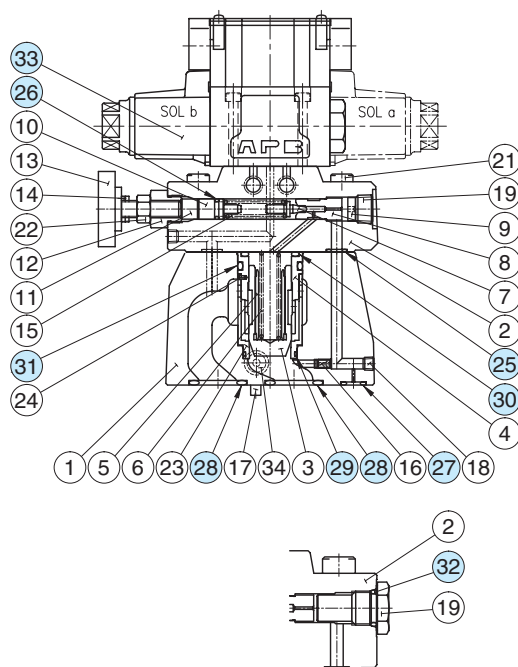


Model Numbers	Dimensions mm (Inches)			Remarks
	Q	S	T	
A-S-BSG-03-*-A*/D*/R*-L	246.8(9.72)	228.5(9.00)	181.5(7.15)	Terminal Box Type
A-S-BSG-06-*-A*/D*/R*-L				
A-S-BSG-10-*-A*/D*/R*				
A-S-BSG-03-*-A*-N-L	246.5(9.70)	234.5(9.23)	181.5(7.15)	Plug-in Connector with AC Solenoid
A-S-BSG-06-*-A*-N-L				
A-S-BSG-10-*-A*-N				
A-S-BSG-03-*-D*-N-L	257.5(10.14)	245.5(9.67)	181.5(7.15)	Plug-in Connector with DC Solenoid
A-S-BSG-06-*-D*-N-L				
A-S-BSG-10-*-D*-N				
A-S-BSG-03-*-R*-N-L	260.5(10.26)	238.7(9.40)	181.5(7.15)	Plug-in Connector with R Type Solenoid
A-S-BSG-06-*-R*-N-L				
A-S-BSG-10-*-R*-N				

Spare Parts List

Terminal Box Type

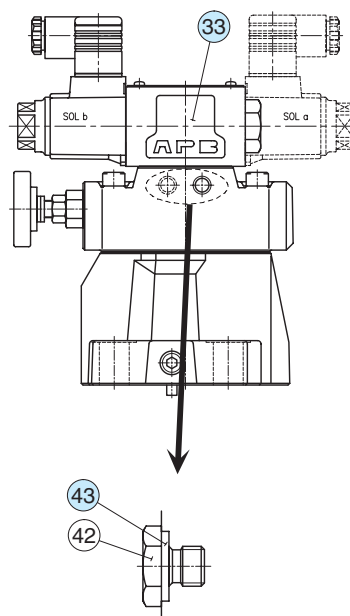
S-BSG-03,06,10-**-**-53/5390



*-S-BSG-10

Plug-in Connector Type

S-BSG-03,06,10-**-**-N-53/5380/5390



Design 5380 Only

List of Seals

Item	Name of Parts	Part Numbers			Qty.
		S-BSG-03	S-BSG-06	S-BSG-10	
25	O-Ring	SO-NB-P9	SO-NB-P9	SO-NB-P9	2
26	O-Ring	SO-NA-P9	SO-NA-P9	SO-NA-P9	1
27	O-Ring	SO-NB-P9	SO-NB-P11	SO-NB-P9	1
28	O-Ring	SO-NB-P18	SO-NB-P28	SO-NB-P32	2
29	O-Ring	SO-NB-A024	SO-NB-A024	SO-NB-A128	1
30	O-Ring	SO-NB-P28	SO-NB-P28	SO-NB-P36	1
31	O-Ring	SO-NB-P32	SO-NB-P32	SO-NB-P42	1
32	O-Ring	—	—	SO-NB-P14	1
38*	O-Ring	SO-NB-P8			2
40*	O-Ring	SO-NB-P14			2
43	Bonded Seal	SG-FB-1/8	SG-FB-1/8	SG-FB-1/8	2

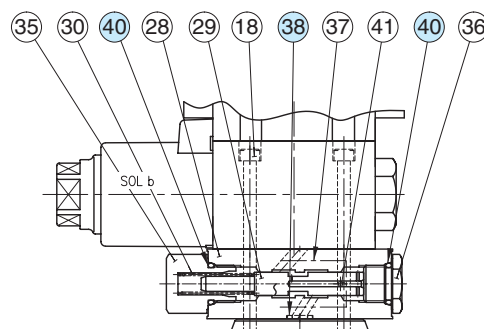
★ The O-Rings for item 38, 40 are used only for the models with the vent restrictor.

Note: When ordering the seals, please specify the seal kit number from the table right. In addition to the above seals, seals for the pilot valves are included in the seal kit.

For the detail of the pilot valve seals, see [page 359](#).

Option-Models with Vent Restrictor

A-S-BSG-03,06,10-**-**-53/5390
N-53/5380/5390



List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
S-BSG-03	KS-S-BSG-03-53
S-BSG-06	KS-S-BSG-06-53
S-BSG-10	KS-S-BSG-10-53
A-S-BSG-03	KS-A-S-BSG-03-53
A-S-BSG-06	KS-A-S-BSG-06-53
A-S-BSG-10	KS-A-S-BSG-10-53

Note: No bonded seals are included in the seal kits.

Pilot Valves

See [page 236](#) for the pilot valve model numbers to be used.

Spare Parts List

List of Pilot Valves

Type of Electrical Conduit Connection	Valve Model Numbers	Pilot Valve Model Numbers	Remarks
Terminal Box Type	*-S-BSG-03/06/10-*2B3A-★-53	DSG-01-2B3A-★-70	Japanese Standard "JIS"
	*-S-BSG-03/06/10-*2B3B-★-53	DSG-01-2B3B-★-70	
	*-S-BSG-03/06/10-*2B2B-★-53	DSG-01-2B2B-★-70	
	*-S-BSG-03/06/10-*2B2-★-53	DSG-01-2B2-★-70	
	*-S-BSG-03/06/10-*3C2-★-53	DSG-01-3C2-★-70	
	*-S-BSG-03/06/10-*3C3-★-53	DSG-01-3C3-★-70	
	*-S-BSG-03/06/10-*2B3A-★-5390	DSG-01-2B3A-★-7090	N. American Design Std.
	*-S-BSG-03/06/10-*2B3B-★-5390	DSG-01-2B3B-★-7090	
	*-S-BSG-03/06/10-*2B2B-★-5390	DSG-01-2B2B-★-7090	
	*-S-BSG-03/06/10-*2B2-★-5390	DSG-01-2B2-★-7090	
	*-S-BSG-03/06/10-*3C2-★-5390	DSG-01-3C2-★-7090	
	*-S-BSG-03/06/10-*3C3-★-5390	DSG-01-3C3-★-7090	
Plug-in Connector Type	*-S-BSG-03/06/10-*2B3A-★-N-53	DSG-01-2B3A-★-N-70	Japanese Standard "JIS"
	*-S-BSG-03/06/10-*2B3B-★-N-53	DSG-01-2B3B-★-N-70	
	*-S-BSG-03/06/10-*2B2B-★-N-53	DSG-01-2B2B-★-N-70	
	*-S-BSG-03/06/10-*2B2-★-N-53	DSG-01-2B2-★-N-70	
	*-S-BSG-03/06/10-*3C2-★-N-53	DSG-01-3C2-★-N-70	
	*-S-BSG-03/06/10-*3C3-★-N-53	DSG-01-3C3-★-N-70	
	*-S-BSG-03/06/10-*2B3A-★-N-5380	DSG-01-2B3A-★-N-70	European Design Std.
	*-S-BSG-03/06/10-*2B3B-★-N-5380	DSG-01-2B3B-★-N-70	
	*-S-BSG-03/06/10-*2B2B-★-N-5380	DSG-01-2B2B-★-N-70	
	*-S-BSG-03/06/10-*2B2-★-N-5380	DSG-01-2B2-★-N-70	
	*-S-BSG-03/06/10-*3C2-★-N-5380	DSG-01-3C2-★-N-70	
	*-S-BSG-03/06/10-*3C3-★-N-5380	DSG-01-3C3-★-N-70	
	*-S-BSG-03/06/10-*2B3A-★-N-5390	DSG-01-2B3A-★-N-7090	N. American Design Std.
	*-S-BSG-03/06/10-*2B3B-★-N-5390	DSG-01-2B3B-★-N-7090	
	*-S-BSG-03/06/10-*2B2B-★-N-5390	DSG-01-2B2B-★-N-7090	
	*-S-BSG-03/06/10-*2B2-★-N-5390	DSG-01-2B2-★-N-7090	
	*-S-BSG-03/06/10-*3C2-★-N-5390	DSG-01-3C2-★-N-7090	
	*-S-BSG-03/06/10-*3C3-★-N-5390	DSG-01-3C3-★-N-7090	

Note: 1. Fill a coil type (a symbol representing current/voltage) in section marked ★.

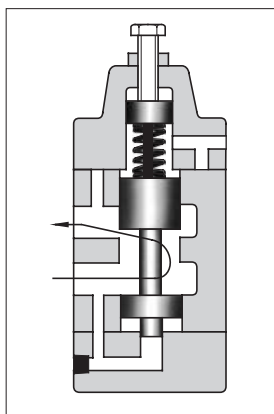
2. For the details of the pilot valves, see [page 359](#).

H/HC Type Pressure Control Valves

These valves are hydraulically damped, direct operated, pressure control valves which can be actuated by internal or external pilot pressure.

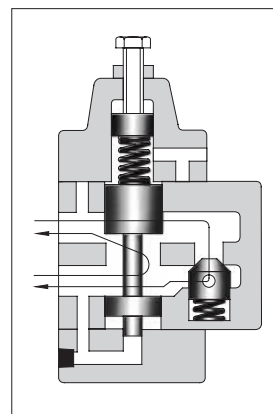
H Type Pressure Control Valves

There are various types of valve including sequence, unloading and low pressure relief valves, all of which are operated by a pressure rise in the circuit, sensed either internally or remotely.



HC Type Pressure Control Valves

They are available with integral check valves for use when free reverse flow from secondary port to the primary port is desired. There are various types of valve including sequence and counterbalance valves, all of which are operated by a pressure rise in the circuit, sensed either internally or remotely.



C



H / HC Type
Pressure Control Valves

Specifications

Series	Model Numbers		Max. Operating Pres. MPa (PSI)	Max. Flow L/min (U.S.GPM)	Approx. Mass kg (lbs.)	
	Threaded Connection	Sub-plate Mounting			Threaded Connection	Sub-plate Mounting
H Type Pressure Control Valves	HT-03-***-22/2280/2290	HG-03-***-22/2290	21(3050)	50 (13.2)	3.7 (8.2)	4.0 (8.8)
	HT-06-***-22/2280/2290	HG-06-***-22/2290		125 (33)	6.2 (13.7)	6.1 (13.5)
	HT-10-***-22/2280/2290	HG-10-***-22/2290		250 (66)	12.0 (26.5)	11.0 (24.3)
HC Type Pressure Control Valves	HCT-03-***-22/2280/2290	HCG-03-***-22/2290	21(3050)	50 (13.2)	4.1 (9.0)	4.8 (10.6)
	HCT-06-***-22/2280/2290	HCG-06-***-22/2290		125 (33)	7.1 (15.7)	7.4 (16.3)
	HCT-10-***-22/2280/2290	HCG-10-***-22/2290		250 (66)	13.8 (30.4)	13.8 (30.4)

● For check valve pressure drops of HC type, see free flow pressure drop characteristics described on [page 247](#).

Yuken can offer flanged connection valves described below.
For details, contact us.

Model Numbers	Max. Operating Pressure MPa (PSI)	Max. flow L/min (U.S.GPM)
HF/HCF-10-***-22/2290	21 (3050)	250(66)
HF/HCF-16-***-20/2090		500(132)

Model Number Designation

F-	H	T	-03	-C	3	-P	-22	*	
Special Seals	Series Number	Type of Mounting	Valve Size	Pres. Adj. Range MPa (PSI)	Valve Type★ ¹	With Auxiliary Pilot Pressure	Design Number	Design Standards	
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	H: H Type Pressure Control Valves	T: Threaded Connection	03	L: 0.25 - 0.45 (36 - 65) M: 0.45 - 0.9 (65 - 130) N: 0.9 - 1.8 (130 - 260) A: 1.8 - 3.5 (260 - 510) B: 3.5 - 7.0 (510 - 1020) C: 7.0 - 14 (1020 - 2030)	1★ ² 2 3 4	P: With Auxiliary Pilot Pressure★ ³	22	None: Japanese Std. "JIS" 80: European Design Std. 90: N. American Design Std.	
			06				22		
			10				22		
		G: Sub-plate Mounting	03				22	None: Japanese Std. "JIS" & European Design Std. 90: N. American Design Std.	
			06				22		
			10				22		
		HC: HC Type Pressure Control Valves	T: Threaded Connection		03		1 2 3 4	22	None: Japanese Std. "JIS" 80: European Design Std. 90: N. American Design Std.
					06			22	
					10			22	
	G: Sub-plate Mounting		03	22	None: Japanese Std. "JIS" & European Design Std. 90: N. American Design Std.				
			06	22					
			10	22					

★1. For the details of valve types, see the following page.

★2. Type 1 is only possible for pressure adjustment ranges L and M.

★3. Models with auxiliary pilots are used where valves must be operated under a lower external pilot pressure than the adjusted pressure (types N, A, and B: about 1/8 of adjusted pressure; type C: about 1/16). This does not apply to pressure adjustment ranges L and M and valve type 1.

Instructions

- To adjust the pressure, loosen the lock nut and turn the pressure adjustment screw slowly clockwise to increase pressures or anti-clockwise to decrease pressures. After adjustments, do not forget to tighten the lock nut.
- Connect the secondary side pressure ports of types 1 and 4 (internal drain) and the drain ports of types 2 and 3 (external drain) directly to the reservoir with a back pressure close to the atmospheric pressure.
- There are two threaded connection primary pressure ports. They can be connected each other in-line; one as inlet and the other as an outlet or the valve can be used by plugging one of the pressure ports.

Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N.American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
HG HCG ^{-03-**-*}	HGM-03-20	Rc 3/8	HGM-03-2080	3/8 BSP.F	HGM-03-2090	3/8 NPT	1.6 (3.5)
	HGM-03X-20	Rc 1/2	HGM-03X-2080	1/2 BSP.F	HGM-03X-2090	1/2 NPT	1.6 (3.5)
HG HCG ^{-03-***-P}	HGM-03-P-20	Rc 3/8	HGM-03-P-2080	3/8 BSP.F	HGM-03-P-2090	3/8 NPT	2.0 (4.4)
	HGM-03X-P-20	Rc 1/2	HGM-03X-P-2080	1/2 BSP.F	HGM-03X-P-2090	1/2 NPT	2.0 (4.4)
HG HCG ^{-06-**-*}	HGM-06-20	Rc 3/4	HGM-06-2080	3/4 BSP.F	HGM-06-2090	3/4 NPT	2.4 (5.3)
	HGM-06X-20	Rc 1	HGM-06X-2080	1 BSP.F	HGM-06X-2090	1 NPT	3.0 (6.6)
HG HCG ^{-06-***-P}	HGM-06-P-20	Rc 3/4	HGM-06-P-2080	3/4 BSP.F	HGM-06-P-2090	3/4 NPT	2.4 (5.3)
	HGM-06X-P-20	Rc 1	HGM-06X-P-2080	1 BSP.F	HGM-06X-P-2090	1 NPT	3.0 (6.6)
HG HCG ^{-10-**-*}	HGM-10-20	Rc 1-1/4	HGM-10-2080	1-1/4 BSP.F	HGM-10-2090	1-1/4 NPT	4.8 (10.6)
	HGM-10X-20	Rc 1-1/2	HGM-10X-2080	1-1/2 BSP.F	HGM-10X-2090	1-1/2 NPT	5.7 (12.6)
HG HCG ^{-10-***-P}	HGM-10-P-20	Rc 1-1/4	HGM-10-P-2080	1-1/4 BSP.F	HGM-10-P-2090	1-1/4 NPT	4.8 (10.6)
	HGM-10X-P-20	Rc 1-1/2	HGM-10X-P-2080	1-1/2 BSP.F	HGM-10X-P-2090	1-1/2 NPT	5.7 (12.6)

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.

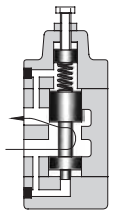
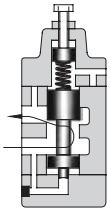
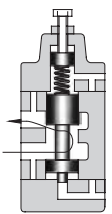
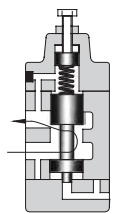
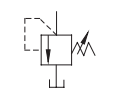
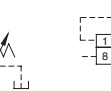
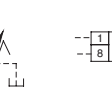
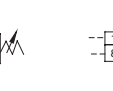
■ Attachment

● Mounting Bolts

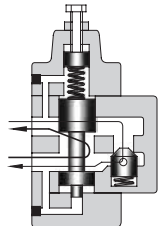
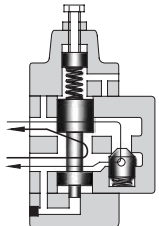
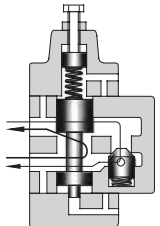
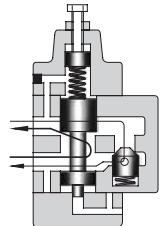
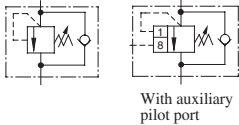
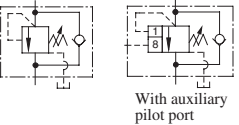
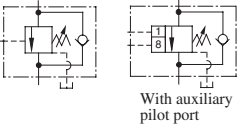
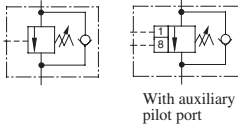
Valve Model Numbers	Socket Head Cap Screw		Qty.
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.	
HG-03	M10×50 Lg.	3/8 -16 UNC×2 Lg.	4
HG-06	M10×50 Lg.	3/8 -16 UNC×2 Lg.	4
HG-10	M10×50 Lg.	3/8 -16 UNC×2 Lg.	6
HCG-03	M10×70 Lg.	3/8 -16 UNC×2-3/4 Lg.	4
HCG-06	M10×80 Lg.	3/8 -16 UNC×3-1/4 Lg.	4
HCG-10	M10×90 Lg.	3/8 -16 UNC×3-1/2 Lg.	6

■ Valve Types

● H Type

Valve Type	Type 1: Low Pres. Relief Valve	Type 2: Sequence Valve	Type 3: Sequence Valve	Type 4: Unloading Valve
Pilot-Drain Type	Internal Pilot-Internal Drain	Internal Pilot-External Drain	External Pilot-External Drain	External Pilot-Internal Drain
Operations				
Graphic Symbols				
Description	Can be used as low-pressure relief valve, but be careful to occurrence of surge pressure.	Used to control the operational sequence of two or more actuators. If primary pressure exceeds the pressure setting, effective fluid is delivered to the secondary side.	Used for the same purpose as for the type 2. Operated by external pilot pressure irrespective of primary pressure.	Used as unloading valve. If external pilot pressure exceeds the pressure setting, the pump is turned no-load by releasing all fluid to the tank.

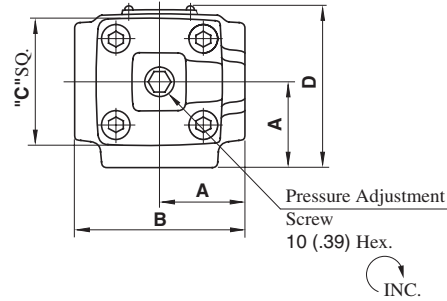
● HC Type

Valve Type	Type 1: Counterbalance Valve	Type 2: Sequence and Check Valve	Type 3: Sequence and Check Valve	Type 4: Counterbalance Valve
Pilot-Drain Type	Internal Pilot-Internal Drain	Internal Pilot-External Drain	External Pilot-External Drain	External Pilot-Internal Drain
Operations				
Graphic Symbols				
Descriptions	Used to prevent gravitational falls by generating a pressure on the actuator return side. If primary pressure exceeds the pressure setting, fluid is released to keep the pressure constant.	Used to control the operating sequence of two or more actuators. If primary pressure exceeds the pressure setting, effective fluid is delivered to the secondary side. Reversed flow is free by a check valve.	Used for the same purpose as for type 2. Operated by external pilot pressure irrespective of primary pressure. Reversed flow is free by a check valve.	Used for the same purpose as for type 1. Operated by external pilot pressure irrespective of primary pressure. Reversed flow is free by a check valve.

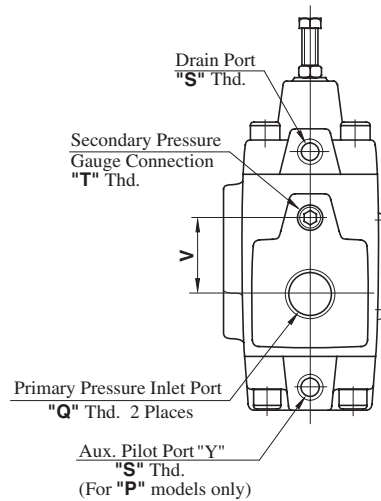
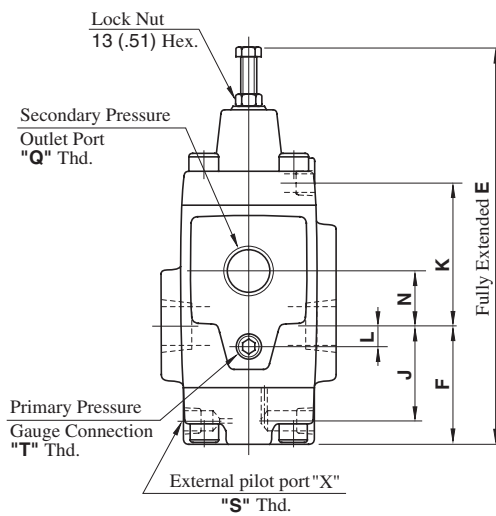
HT-03, 06, 10-**-22/2280/2290

Type 3: Sequence Valve
(External Pilot, External Drain)

**DIMENSIONS IN
MILLIMETRES (INCHES)**

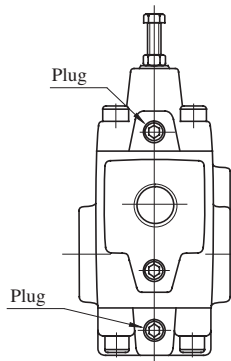


Model Numbers	Thread Size		
	"Q" Thd.	"S" Thd.	"T" Thd.
HT-03, 22	Rc 3/8	Rc 1/4	Rc 1/4
HT-06, 22	Rc 3/4		
HT-10, 22	Rc 1-1/4		
HT-03, 2280	3/8 BSP.F	1/4 BSP.F	1/4 BSP.Tr
HT-06, 2280	3/4 BSP.F		
HT-10, 2280	1-1/4 BSP.F		
HT-03, 2290	3/8 NPT	1/4 NPT	1/4 NPT
HT-06, 2290	3/4 NPT		
HT-10, 2290	1-1/4 NPT		

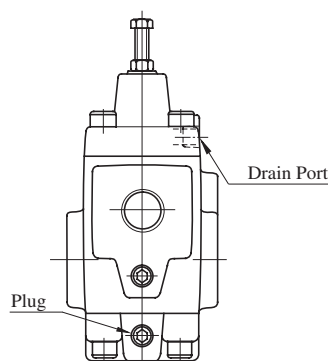


Model Numbers	Dimensions mm (Inches)										
	A	B	C	D	E	F	J	K	L	N	V
HT-03	41 (1.61)	82 (3.23)	60 (2.36)	74 (2.91)	191 (7.52)	57 (2.24)	43 (1.69)	70 (2.76)	0 (0)	28 (1.10)	28 (1.10)
HT-06	48 (1.89)	96 (3.78)	73 (2.87)	87 (3.43)	221 (8.70)	64.5 (2.54)	50.5 (1.99)	80.5 (3.17)	9 (.35)	33 (1.30)	42 (1.65)
HT-10	66 (2.60)	132 (5.20)	86 (3.39)	112 (4.41)	272 (10.71)	84 (3.31)	66 (2.60)	98 (3.86)	12 (.47)	40 (1.57)	52 (2.05)

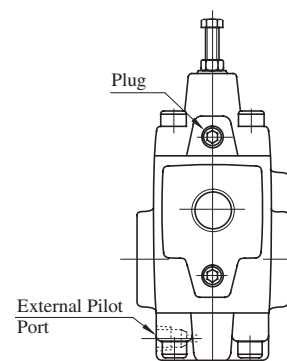
Type 1: Low Pressure Relief Valve
(Internal Pilot, Internal Drain)



Type 2: Sequence Valve
(Internal Pilot, External Drain)



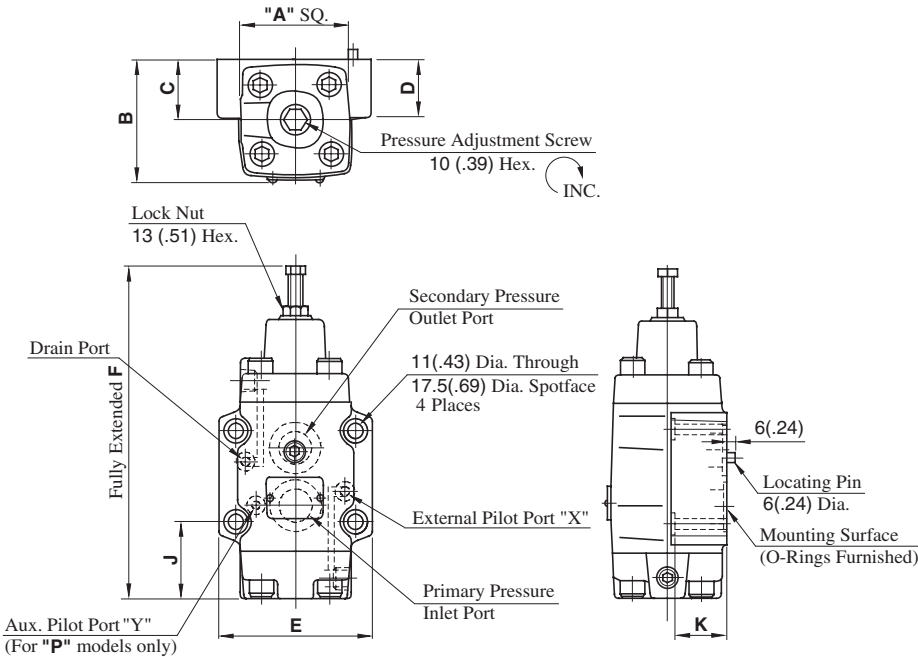
Type 4: Unloading Valve
(External Pilot, Internal Drain)



HG-03, 06-**-22/2290

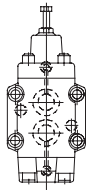
Type 3: Sequence Valve
(External Pilot, External Drain)

Mounting Surface
HG-03: ISO 5781-AG-06-2-A
HG-06: ISO 5781-AH-08-2-A

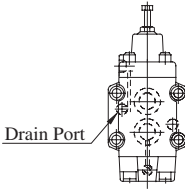


Model Numbers	Dimensions mm (Inches)							
	A	B	C	D	E	F	J	K
HG-03	60 (2.36)	67 (2.64)	35 (1.38)	39 (1.54)	89 (3.50)	191 (7.52)	49.6 (1.95)	38 (1.50)
HG-06	73 (2.87)	79 (3.11)	40 (1.57)	39 (1.54)	102 (4.02)	221 (8.70)	51 (2.01)	38 (1.50)

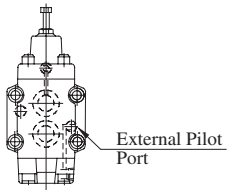
Type 1: Low Pressure Relief Valve
(Internal Pilot, Internal Drain)



Type 2: Sequence Valve
(Internal Pilot, External Drain)



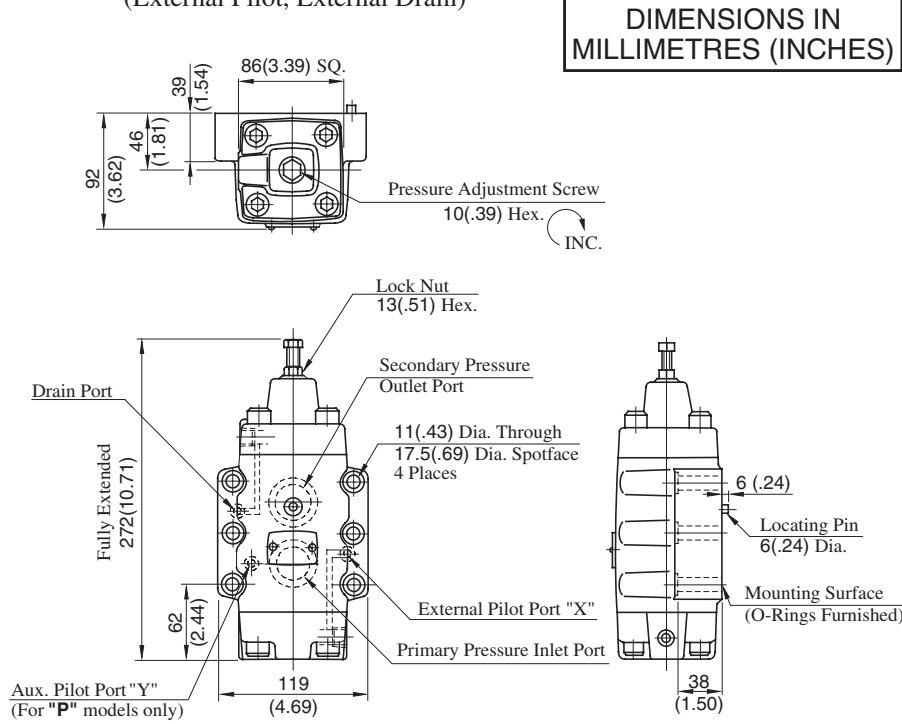
Type 4: Unloading Valve
(External Pilot, Internal Drain)



HG-10-**-22/2290

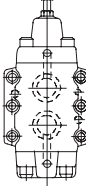
Type 3: Sequence Valve
(External Pilot, External Drain)

Mounting Surface
ISO 5781-AJ-10-2-A

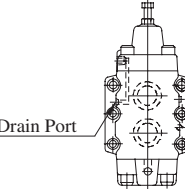


**DIMENSIONS IN
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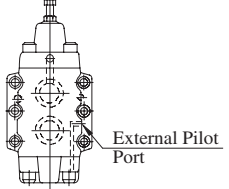
Type 1: Low Pressure Relief Valve
(Internal Pilot, Internal Drain)



Type 2: Sequence Valve
(Internal Pilot, External Drain)



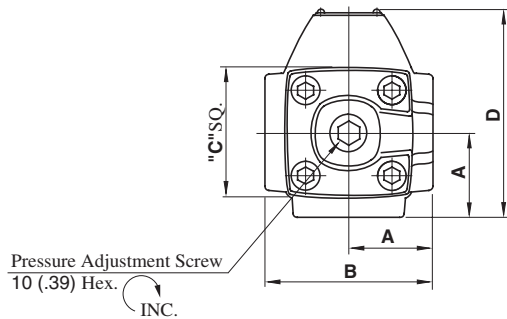
Type 4: Unloading Valve
(External Pilot, Internal Drain)



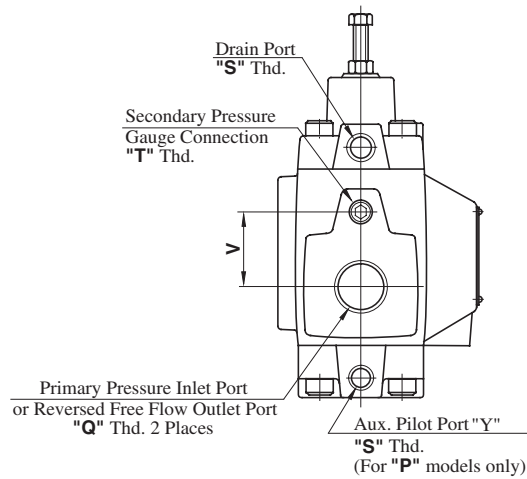
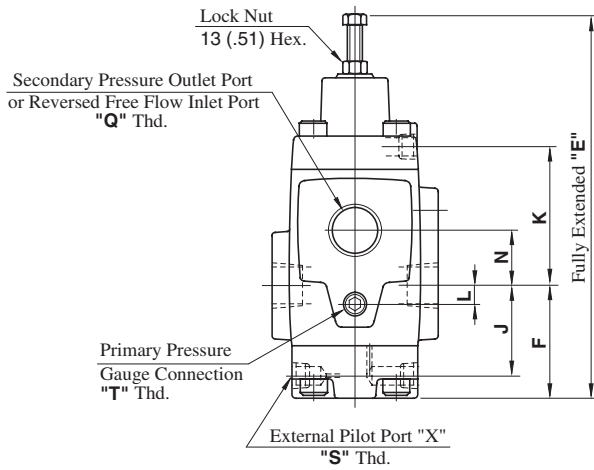
HCT-03, 06, 10-**-22/2280/2209

Type 3: Sequence and Check Valve
(External Pilot, External Drain)

**DIMENSIONS IN
MILLIMETRES (INCHES)**

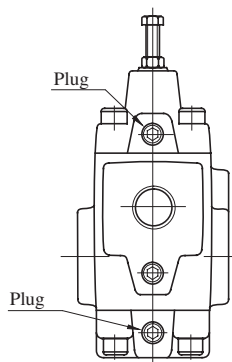


Model Numbers	Thread Size		
	"Q" Thd.	"S" Thd.	"T" Thd.
HCT-03, 22	Rc 3/8	Rc 1/4	Rc 1/4
HCT-06, 22	Rc 3/4		
HCT-10, 22	Rc 1-1/4		
HCT-03, 2280	3/8 BSP.F	1/4 BSP.F	1/4 BSP.Tr
HCT-06, 2280	3/4 BSP.F		
HCT-10, 2280	1-1/4 BSP.F		
HCT-03, 2290	3/8 NPT	1/4 NPT	1/4 NPT
HCT-06, 2290	3/4 NPT		
HCT-10, 2290	1-1/4 NPT		

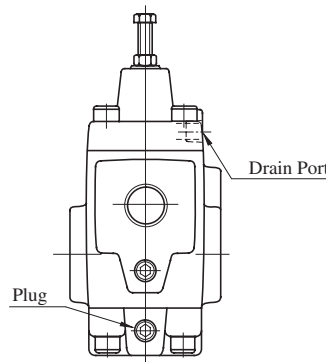


Model Numbers	Dimensions mm (Inches)										
	A	B	C	D	E	F	J	K	L	N	V
HCT-03	41 (1.61)	82 (3.23)	60 (2.36)	96 (3.78)	191 (7.52)	57 (2.24)	43 (1.69)	70 (2.76)	0 (0)	28 (1.10)	28 (1.10)
HCT-06	48 (1.89)	96 (3.78)	73 (2.87)	116 (4.57)	221 (8.70)	64.5 (2.54)	50.5 (1.99)	80.5 (3.17)	9 (.35)	33 (1.30)	42 (1.65)
HCT-10	66 (2.60)	132 (5.20)	86 (3.39)	152 (5.98)	272 (10.71)	84 (3.31)	66 (2.60)	98 (3.86)	12 (.47)	40 (1.57)	52 (2.05)

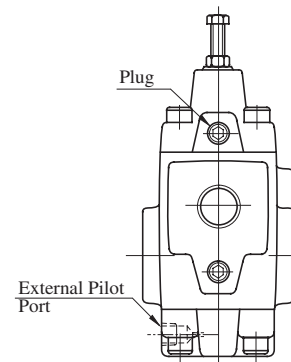
Type 1: Counterbalance Valve
(Internal Pilot, Internal Drain)



Type 2: Sequence and Check Valve
(Internal Pilot, External Drain)



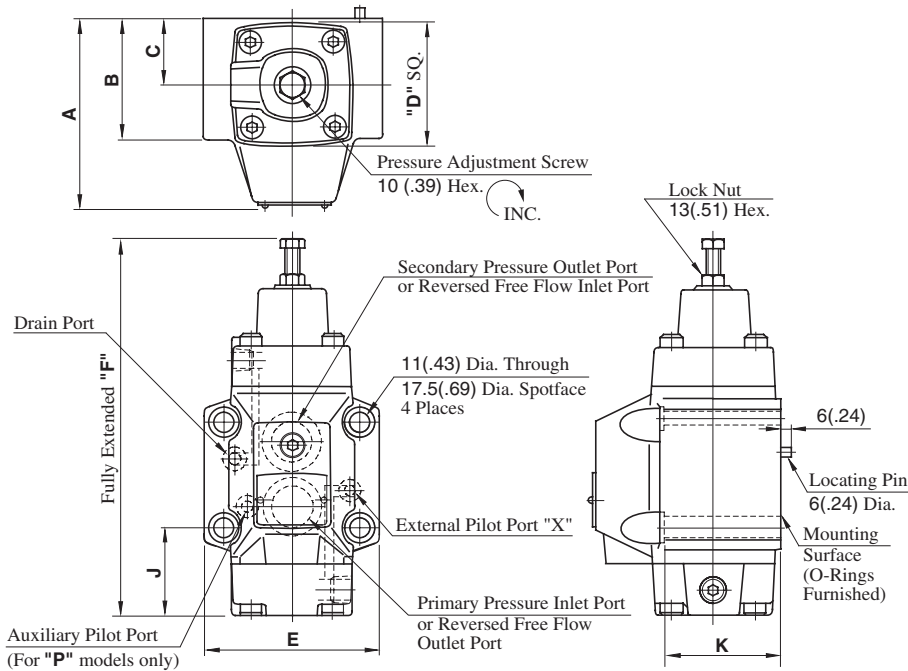
Type 4: Counterbalance Valve
(External Pilot, Internal Drain)



HCG-03, 06-**-22/2290

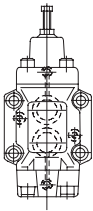
Type 3: Sequence and Check Valve
(External Pilot, External Drain)

Mounting Surface
HCG-03: ISO 5781-AG-06-2-A
HCG-06: ISO 5781-AH-08-2-A

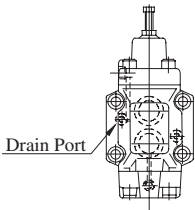


Model Numbers	Dimensions mm (Inches)							
	A	B	C	D	E	F	J	K
HCG-03	90 (3.54)	59 (2.32)	35 (1.38)	60 (2.36)	89 (3.50)	191 (7.52)	49.6 (1.95)	58 (2.28)
HCG-06	108 (4.25)	69 (2.72)	40 (1.57)	73 (2.87)	102 (4.02)	221 (8.70)	51 (2.01)	68 (2.68)

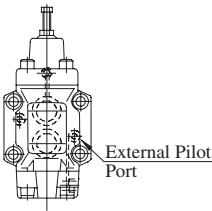
Type 1: Counterbalance Valve
(Internal Pilot, Internal Drain)



Type 2: Sequence and Check Valve
(Internal Pilot, External Drain)



Type 4: Counterbalance Valve
(External Pilot, Internal Drain)

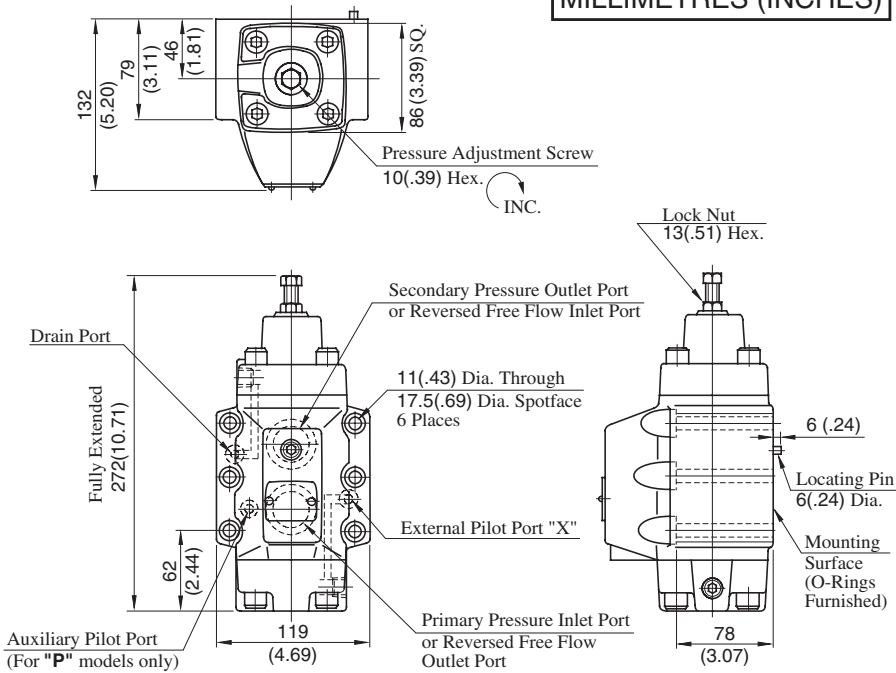


HCG-10-**-22/2290

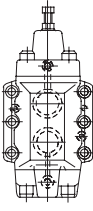
Type 3: Sequence and Check Valve
(External Pilot, External Drain)

Mounting Surface
ISO 5781-AJ-10-2-A

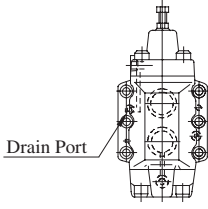
DIMENSIONS IN
MILLIMETRES (INCHES)



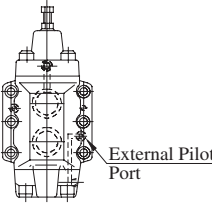
Type 1: Counterbalance Valve
(Internal Pilot, Internal Drain)



Type 2: Sequence and Check Valve
(Internal Pilot, External Drain)

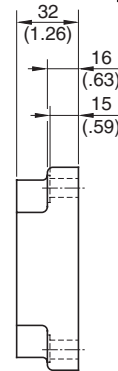
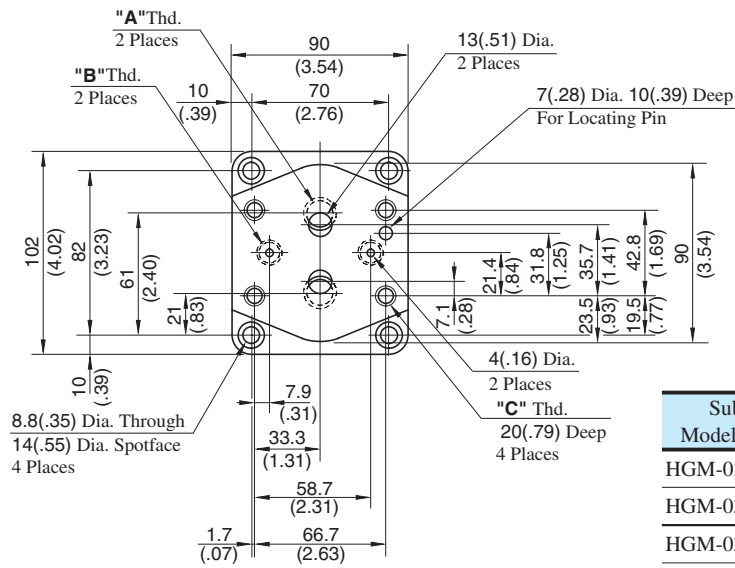


Type 4: Counterbalance Valve
(External Pilot, Internal Drain)



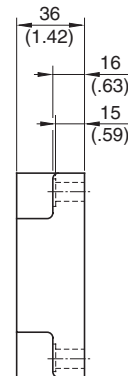
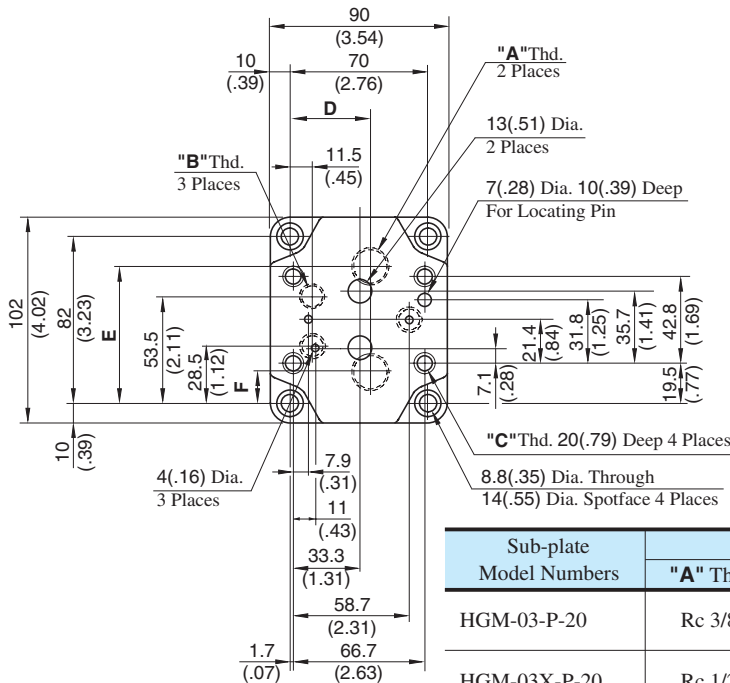
● HGM-03-20/2080/2090
HGM-03X-20/2080/2090

DIMENSIONS IN
MILLIMETRES (INCHES)



Sub-plate Model Numbers	"A" Thd.	"B" Thd.	"C" Thd.
HGM-03-20	Rc 3/8	Rc 1/4	M10
HGM-03X-20	Rc 1/2		
HGM-03-2080	3/8 BSP.F	1/4 BSP.F	
HGM-03X-2080	1/2 BSP.F		
HGM-03-2090	3/8 NPT	1/4 NPT	3/8-16 UNC
HGM-03X-2090	1/2 NPT		

● With Auxiliary Pilot Pressure Port
HGM-03-P-20/2080/2090
HGM-03X-P-20/2080/2090

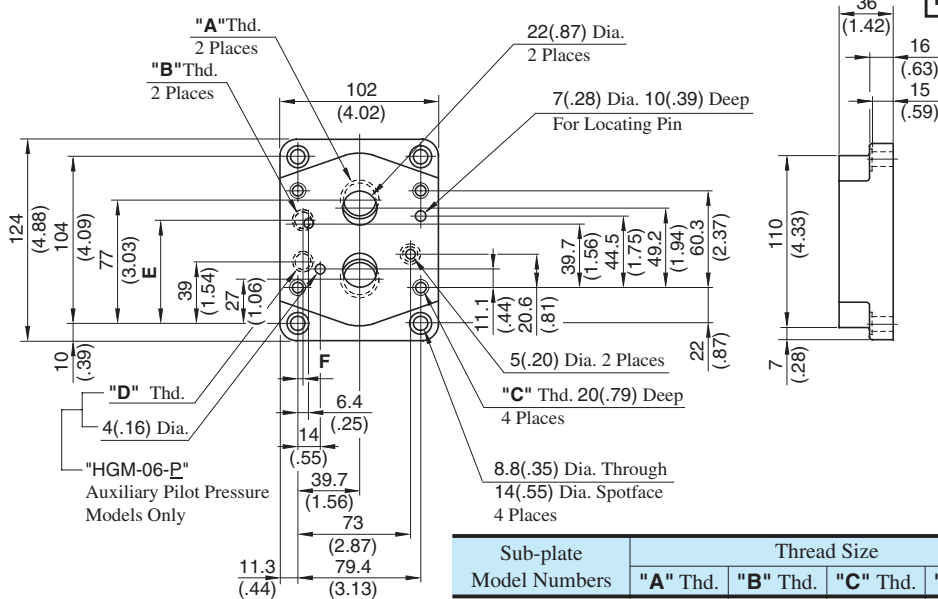


Sub-plate Model Numbers	Thread Size			Dimensions mm(Inches)		
	"A" Thd.	"B" Thd.	"C" Thd.	D	E	F
HGM-03-P-20	Rc 3/8	Rc 1/4	M 10	35 (1.38)	69.5 (2.74)	12.5 (.49)
HGM-03X-P-20	Rc 1/2			41 (1.61)	67.5 (2.66)	14.5 (.57)
HGM-03-P-2080	3/8 BSP.F	1/4 BSP.F		35 (1.38)	69.5 (2.74)	12.5 (.49)
HGM-03X-P-2080	1/2 BSP.F			41 (1.61)	67.5 (2.66)	14.5 (.57)
HGM-03-P-2090	3/8 NPT	1/4 NPT	3/8-16 UNC	35 (1.38)	69.5 (2.74)	12.5 (.49)
HGM-03X-P-2090	1/2 NPT			41 (1.61)	67.5 (2.66)	14.5 (.57)



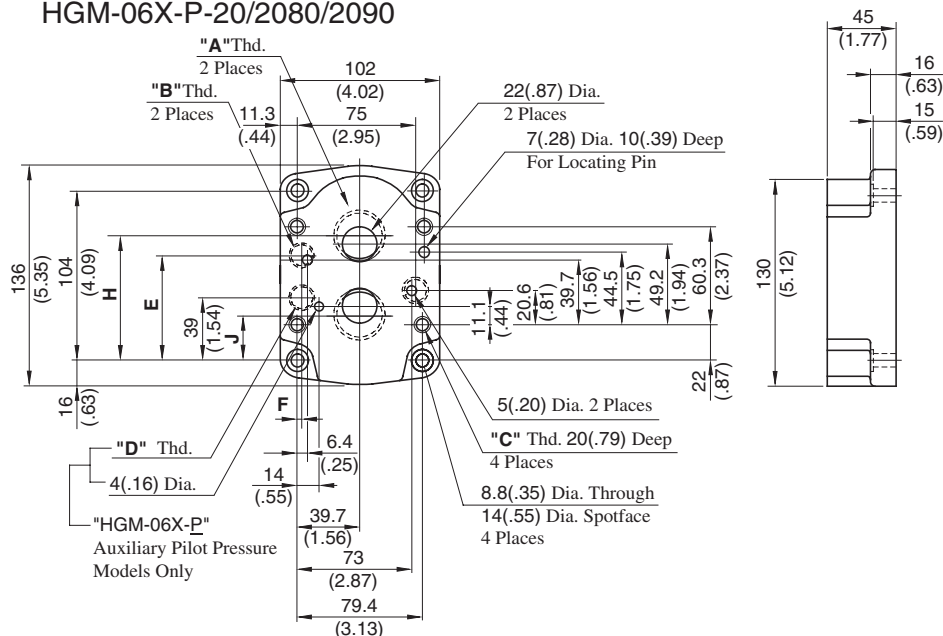
● HGM-06-20/2080/2090 HGM-06-P-20/2080/2090

DIMENSIONS IN
MILLIMETRES (INCHES)



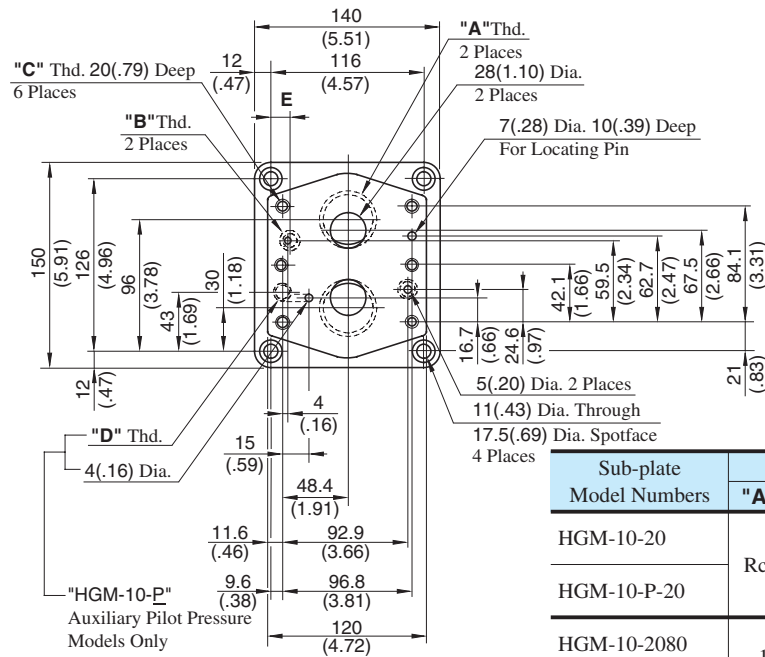
Sub-plate Model Numbers	Thread Size				Dimensions mm(Inches)	
	"A" Thd.	"B" Thd.	"C" Thd.	"D" Thd.	E	F
HGM-06-20	Rc 3/4	Rc 1/4	M10	Rc 1/4	61.7 (2.43)	6.4 (.25)
HGM-06-P-20					64 (2.52)	3 (.12)
HGM-06-2080	3/4 BSP.F	1/4 BSP.F	M10	1/4 BSP.F	61.7 (2.43)	6.4 (.25)
HGM-06-P-2080					64 (2.52)	3 (.12)
HGM-06-2090	3/4 NPT	1/4 NPT	3/8-16 UNC	1/4 NPT	61.7 (2.43)	6.4 (.25)
HGM-06-P-2090					64 (2.52)	3 (.12)

● HGM-06X-20/2080/2090 HGM-06X-P-20/2080/2090

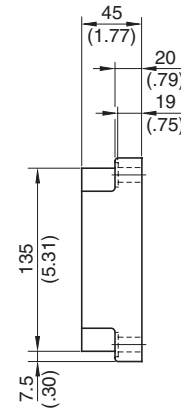


Sub-plate Model Numbers	Thread Size				Dimensions mm(Inches)			
	"A" Thd.	"B" Thd.	"C" Thd.	"D" Thd.	E	F	H	J
HGM-06X-20	Rc 1	Rc 1/4	M10	Rc 1/4	61.7 (2.43)	6.4 (.25)	82.3 (3.24)	22 (.87)
HGM-06X-P-20					64 (2.52)	3 (.12)		
HGM-06X-2080	1 BSP.F	1/4 BSP.F	M10	1/4 BSP.F	61.7 (2.43)	6.4 (.25)	80 (3.15)	24 (.94)
HGM-06X-P-2080					64 (2.52)	3 (.12)	82.3 (3.24)	22 (.87)
HGM-06X-2090	1 NPT	1/4 NPT	3/8-16 UNC	1/4 NPT	61.7 (2.43)	6.4 (.25)	80 (3.15)	24 (.94)
HGM-06X-P-2090					64 (2.52)	3 (.12)	82.3 (3.24)	22 (.87)

● HGM-10-20/2080/2090
HGM-10-P-20/2080/2090

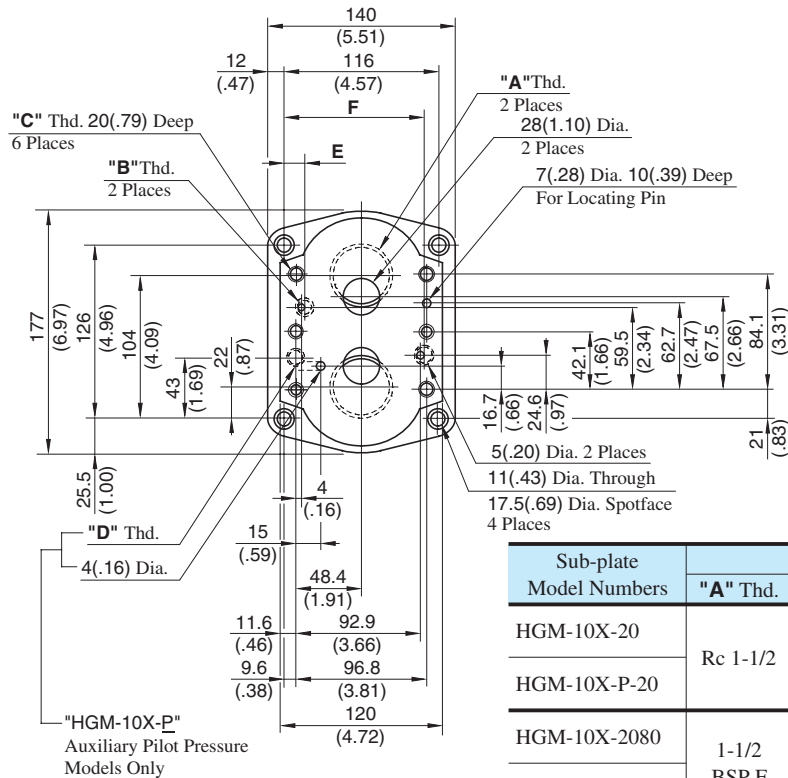


DIMENSIONS IN
MILLIMETRES (INCHES)



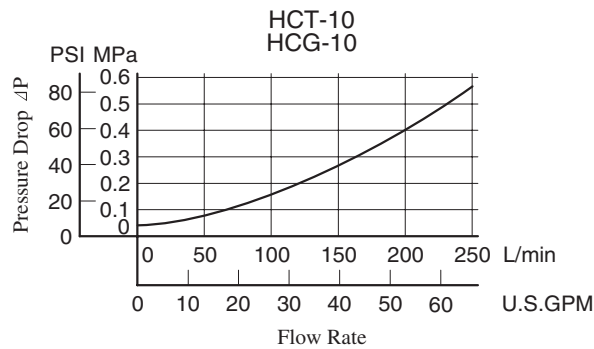
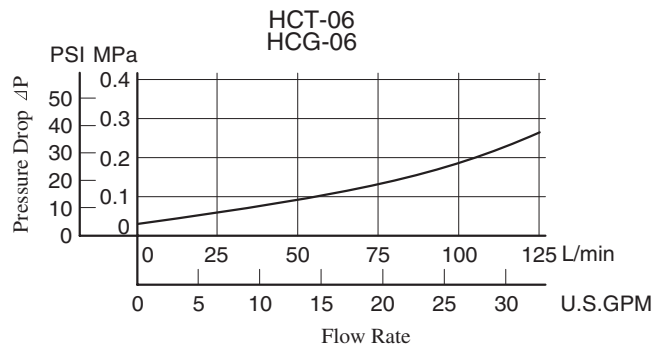
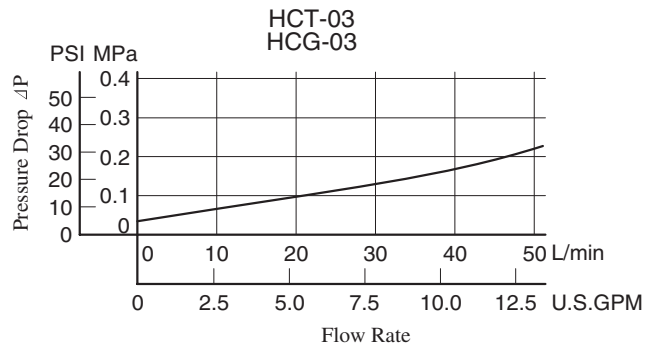
Sub-plate Model Numbers	Thread Size				mm(Inches)
	"A" Thd.	"B" Thd.	"C" Thd.	"D" Thd.	E
HGM-10-20	Rc 1-1/4	Rc 1/4	M10	Rc 1/4	13.6 (.54)
HGM-10-P-20					9.6 (.38)
HGM-10-2080	1-1/4 BSP.F	1/4 BSP.F		1/4 BSP.F	13.6 (.54)
HGM-10-P-2080					9.6 (.38)
HGM-10-2090	1-1/4 NPT	1/4 NPT	3/8-16 UNC	1/4 NPT	13.6 (.54)
HGM-10-P-2090					9.6 (.38)

● HGM-10X-20/2080/2090
HGM-10X-P-20/2080/2090



Pressure Drop for Reversed Free Flow

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



- For any other viscosity, multiply the factors in the table below.

Viscosity	mm ² /s	15	20	30	40	50	60	70	80	90	100
SSU		77	98	141	186	232	278	324	371	417	464
Factor		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

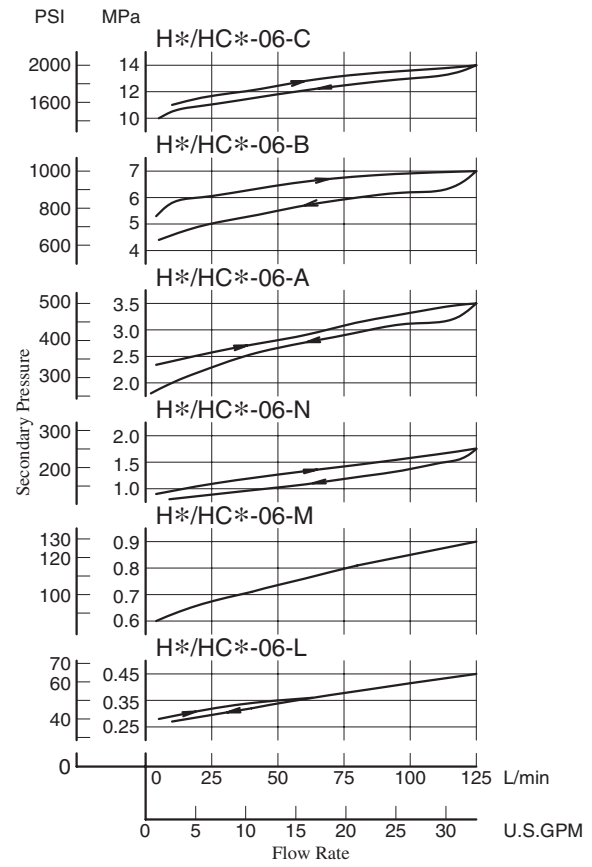
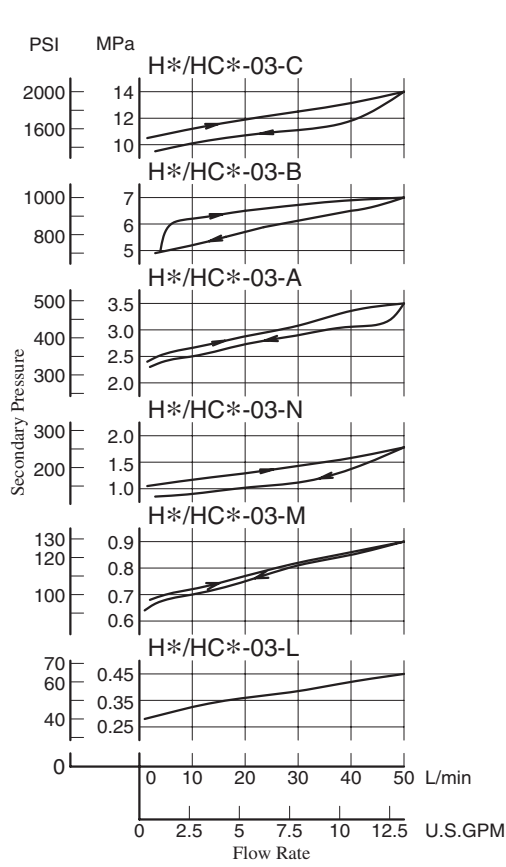
- For any other specific gravity (G'), the pressure drop (ΔP') may be obtained from the formula below.

$$\Delta P' = \Delta P (G'/0.850)$$



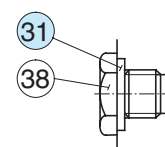
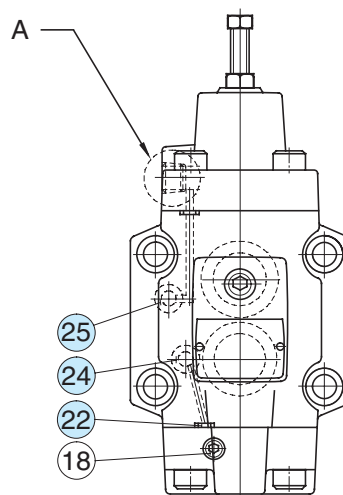
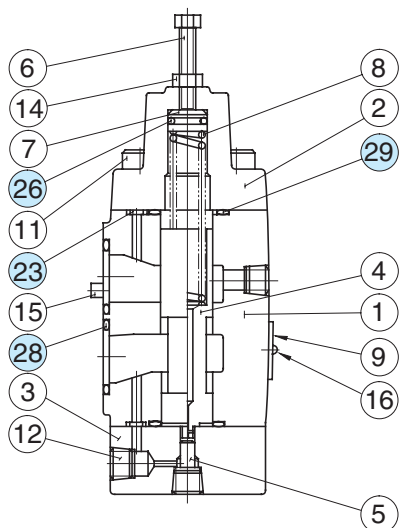
Nominal Override Characteristics

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



Spare Parts List

HT-03, 06, 10-***-22/2280/2290
HG-03, 06, 10-***-22/2290



Section "A" for
HT-***-2280 Models

List of Seals

Item	Name of Parts	Part Numbers			Quantity	
		HT HG -03	HT HG -06	HT HG -10	HT-*	HG-*
22	O-Ring	SO-NB-P4	SO-NB-P4	SO-NB-P4	—	3 *
23	O-Ring	SO-NB-P6	SO-NB-P6	SO-NB-P6	4	4
24	O-Ring	SO-NB-P9	SO-NB-P9	SO-NB-P9	—	1 *
25	O-Ring	SO-NB-P9	SO-NB-P9	SO-NB-P9	—	2
26	O-Ring	SO-NA-P11	SO-NA-P15	SO-NA-P20	1	1
28	O-Ring	SO-NB-P18	SO-NB-P28	SO-NB-P32	—	2
29	O-Ring	SO-NB-P22	SO-NB-P28	SO-NB-P36	2	2
31	Bonded Seal	SG-FB-1/4	SG-FB-1/4	SG-FB-1/4	2	—

* Used only for HG type with auxiliary pilot pressure (P).

Note: When ordering the seals, please specify the seal kit number from the table below.

List of Seal Kits

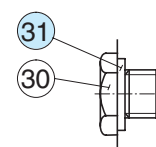
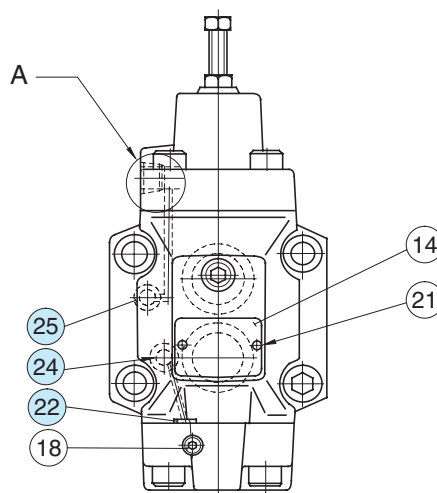
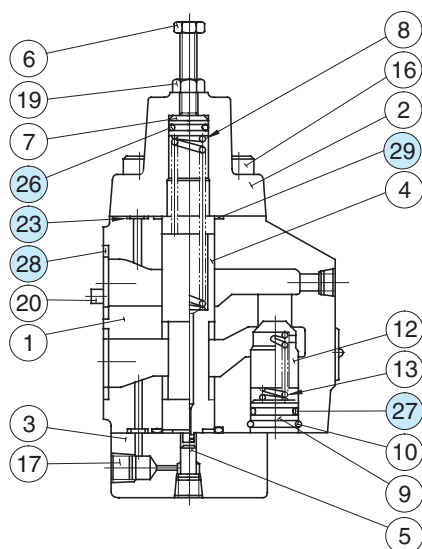
Valve Model Numbers	Seal Kit Numbers
HT-03-***-22/2280/2290	KS-HT-03-22
HT-06-***-22/2280/2290	KS-HT-06-22
HT-10-***-22/2280/2290	KS-HT-10-22
HG-03-***-22/2290	KS-HG-03-22
HG-03-***-P-22/2290	KS-HG-03-P-22
HG-06-***-22/2290	KS-HG-06-22
HG-06-***-P-22/2290	KS-HG-06-P-22
HG-10-***-22/2290	KS-HG-10-22
HG-10-***-P-22/2290	KS-HG-10-P-22

Note: No bonded seals are included in the seal kits.



Spare Parts List

HCT-03, 06, 10-***-22/2280/2290
HCG-03, 06, 10-***-22/2290



Section "A" for
HCT-***-2280 Models

List of Seals

Item	Name of Parts	Part Numbers			Quantity	
		HCT HCG -03	HCT HCG -06	HCT HCG -10	HCT-*/ HCG-*	
22	O-Ring	SO-NB-P4	SO-NB-P4	SO-NB-P4	—	3 *
23	O-Ring	SO-NB-P6	SO-NB-P6	SO-NB-P6	4	4
24	O-Ring	SO-NB-P9	SO-NB-P9	SO-NB-P9	—	1 *
25	O-Ring	SO-NB-P9	SO-NB-P9	SO-NB-P9	—	2
26	O-Ring	SO-NA-P11	SO-NA-P15	SO-NA-P20	1	1
27	O-Ring	SO-NB-P12	SO-NB-P18	SO-NB-P22A	1	1
28	O-Ring	SO-NB-P18	SO-NB-P28	SO-NB-P32	—	2
29	O-Ring	SO-NB-P22	SO-NB-P28	SO-NB-P36	2	2
31	Bonded Seal	SG-FB-1/4	SG-FB-1/4	SG-FB-1/4	2	—

* Used only for HCG type with auxiliary pilot pressure (P).

Note: When ordering the seals, please specify the seal kit number from the table below.

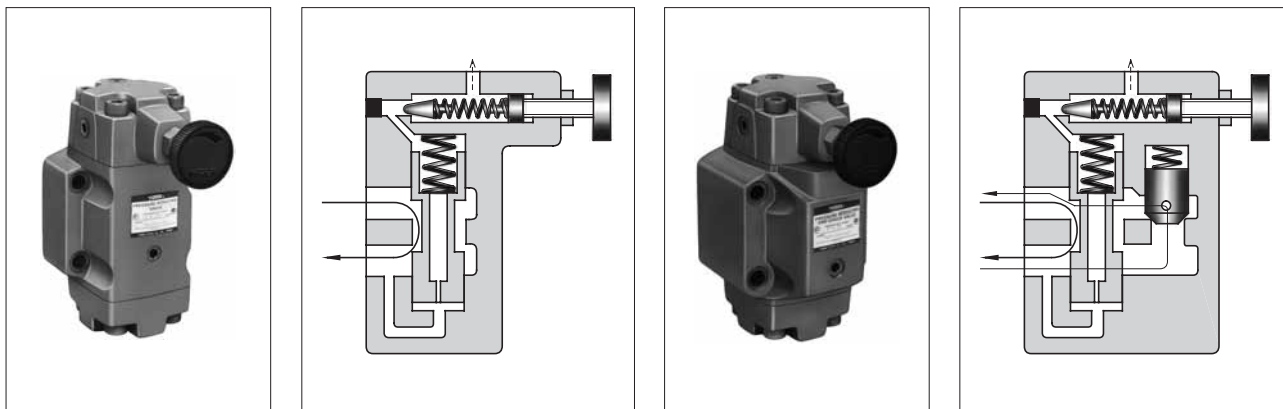
List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
HCT-03-***-22/2280/2290	KS-HCT-03-22
HCT-06-***-22/2280/2290	KS-HCT-06-22
HCT-10-***-22/2280/2290	KS-HCT-10-22
HCG-03-***-22/2290	KS-HCG-03-22
HCG-03-***-P-22/2290	KS-HCG-03-P-22
HCG-06-***-22/2290	KS-HCG-06-22
HCG-06-***-P-22/2290	KS-HCG-06-P-22
HCG-10-***-22/2290	KS-HCG-10-22
HCG-10-***-P-22/2290	KS-HCG-10-P-22

Note: No bonded seals are included in the seal kits.

Pressure Reducing Valves / Pressure Reducing and Check Valves

Pressure reducing valves are used to set the pressure of a hydraulic circuit below that of the main circuit. In addition, operation under remote control is possible by using the remote control port. Pressure reducing and check valves have check valves, which allow a free flow from the secondary side to the primary.



Specifications

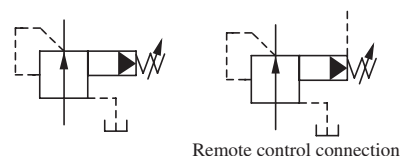
Valve Name	Model Numbers		Max. Operating Pressure MPa (PSI)	Max. Flow ^{★1}		Drain Flow ^{★2} L/min (U.S.GPM)	Approx. Mass kg (lbs.)	
	Threaded Connection	Sub-plate Mounting		Setting Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)		Threaded Connection	Sub-plate Mounting
Pressure Reducing Valve	RT-03-*-22*	RG-03-*-22*	21 (3050)	0.7 - 1.0 (102 - 145)	40 (10.6)	0.8 - 1.0 (.21 - .26)	4.3 (9.5)	4.5 (9.9)
				1.0 - 20.5 (145 - 2970)	50 (13.2)			
	RT-06-*-22*	RG-06-*-22*	21 (3050)	0.7 - 1.0 (102 - 145)	50 (13.2)	0.8 - 1.1 (.21 - .29)	6.9 (15.2)	6.8 (15.0)
				1.0 - 1.5 (145 - 220)	100 (26.4)			
				1.5 - 20.5 (220 - 2970)	125 (33.0)			
	RT-10-*-22*	RG-10-*-22*	21 (3050)	0.7 - 1.0 (102 - 145)	130 (34.3)	1.2 - 1.5 (.32 - .40)	12.0 (26.5)	11.0 (24.3)
				1.0 - 1.5 (145 - 220)	180 (47.6)			
				1.5 - 10.5 (220 - 1520)	220 (58.1)			
				10.5 - 20.5 (1520 - 2970)	250 (66.0)			
Pressure Reducing and Check Valve	RCT-03-*-22*	RCG-03-*-22*	21 (3050)	0.7 - 1.0 (102 - 145)	40 (10.6)	0.8 - 1.0 (.21 - .26)	4.8 (10.6)	5.4 (11.9)
				1.0 - 20.5 (145 - 2970)	50 (13.2)			
	RCT-06-*-22*	RCG-06-*-22*	21 (3050)	0.7 - 1.0 (102 - 145)	50 (13.2)	0.8 - 1.1 (.21 - .29)	7.8 (17.2)	8.1 (17.9)
				1.0 - 1.5 (145 - 220)	100 (26.4)			
				1.5 - 20.5 (220 - 2970)	125 (33.0)			
	RCT-10-*-22*	RCG-10-*-22*	21 (3050)	0.7 - 1.0 (102 - 145)	130 (34.3)	1.2 - 1.5 (.32 - .40)	13.8 (30.4)	13.8 (30.4)
				1.0 - 1.5 (145 - 220)	180 (47.6)			
				1.5 - 10.5 (220 - 1520)	220 (58.1)			
				10.5 - 20.5 (1520 - 2970)	250 (66.0)			

★1. The max. flow rates are those shown at the primary pressure at 21 MPa (3050 PSI).

★2. The drain flow rates are equal to pilot flow rates when differential pressure between primary and secondary pressure is at 20.5 MPa (2970 PSI).

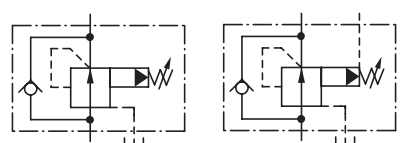
Graphic Symbols

● RT / RG



Remote control connection

● RCT / RCG



Remote control connection

Yuken can offer flanged connection valves described below.

For details, contact us.

Model Numbers	Max. Operating Pressure MPa (PSI)	Max. Flow L/min (U.S.GPM)
RF/RCF-10-*-22*	21 (3050)	250 (66)
RF/RCF-16-*-20*		500 (132)

Model Number Designation

F-	R	T	-03	-B	-22	*
Special Seals	Series Number	Type of Mounting	Valve Size	Pres. Adj. Range MPa (PSI)	Design Number	Design Standards
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	R: Pressure Reducing Valves	T: Threaded Connection	03	B: 0.7-7 (102-1020) C: 3.5-14 (510-2030) H: 7-20.5 (1020-2970)	22	None: Japanese Std. "JIS" 80: European Design Std. 90: N.American Design Std.
			06		22	
			10		22	
		G: Sub-plate Mounting	03		22	
			06		22	
			10		22	
	RC: Pressure Reducing and Check Valves	T: Threaded Connection	03		22	None: Japanese Std. "JIS" 80: European Design Std. 90: N.American Design Std.
			06		22	
			10		22	
		G: Sub-plate Mounting	03		22	
			06		22	
			10		22	

Attachment

Mounting bolts

Valve Model Numbers	Socket Head Cap Screw		Qty.
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.	
RG-03	M10 × 50 Lg.	3/8-16 UNC × 2 Lg.	4
RG-06	M10 × 50 Lg.	3/8-16 UNC × 2 Lg.	4
RG-10	M10 × 50 Lg.	3/8-16 UNC × 2 Lg.	6
RCG-03	M10 × 70 Lg.	3/8-16 UNC × 2-3/4 Lg.	4
RCG-06	M10 × 80 Lg.	3/8-16 UNC × 3-1/4 Lg.	4
RCG-10	M10 × 90 Lg.	3/8-16 UNC × 3-1/2 Lg.	6

Sub-plate

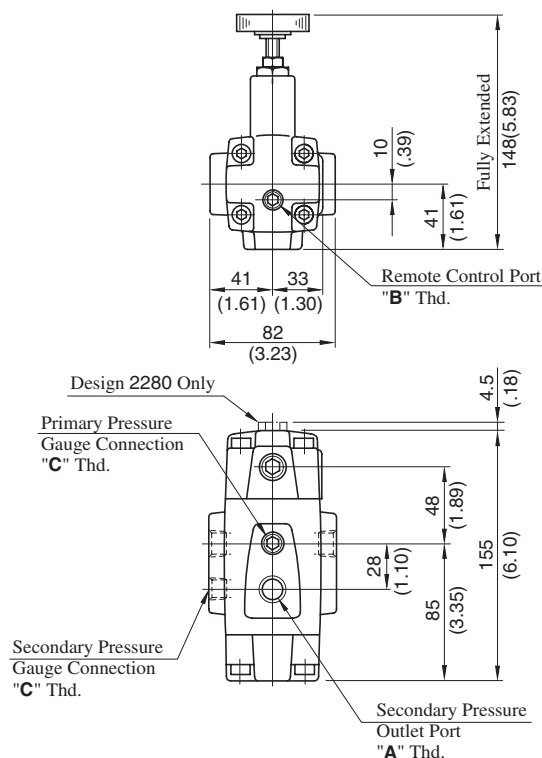
Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
RG RCG-03	HGM-03-20	Rc 3/8	HGM-03-2080	3/8 BSP.F	HGM-03-2090	3/8 NPT	1.6 (3.5)
	HGM-03X-20	Rc 1/2	HGM-03X-2080	1/2 BSP.F	HGM-03X-2090	1/2 NPT	
RG RCG-06	HGM-06-20	Rc 3/4	HGM-06-2080	3/4 BSP.F	HGM-06-2090	3/4 NPT	2.4 (5.3)
	HGM-06X-20	Rc 1	HGM-06X-2080	1 BSP.F	HGM-06X-2090	1 NPT	3.0 (6.6)
RG RCG-10	HGM-10-20	Rc 1-1/4	HGM-10-2080	1-1/4 BSP.F	HGM-10-2090	1-1/4 NPT	4.8 (10.6)
	HGM-10X-20	Rc 1-1/2	HGM-10X-2080	1-1/2 BSP.F	HGM-10X-2090	1-1/2 NPT	5.7 (12.6)

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.
- The sub-plates are the same as those for H type pressure control valves. With the reducing and check valve, the sub-plate is used in a position 180° turned (upside down) from the normal position. When mounting the sub-plate, be sure to bring the valve locating pin to the sub-plate pin hole. For dimensions, see [page 244 to 246](#).

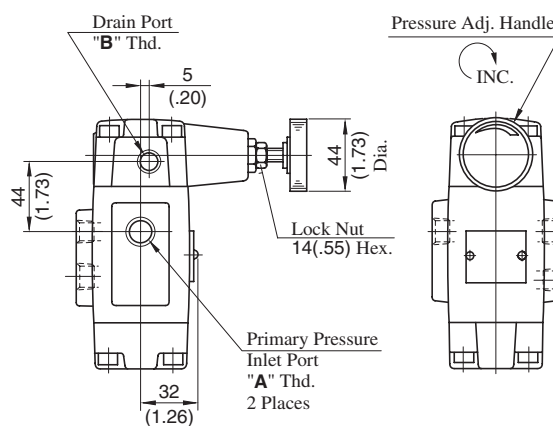
Instructions

- To adjust the pressure, loosen the lock nut and turn the pressure adjustment handle slowly clockwise for higher pressures and anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Connect the drain port directly to the reservoir in which case the pressure at the drain port should be kept at a low back pressure close to the atmospheric pressure.
- In case of "Threaded Connections", there are two threaded connection type primary pressure ports. They can be connected each other in-line; one as an inlet and the other as an outlet or the valve can be used by plugging one of the pressure ports.

RT-03-*-22/2280/2290

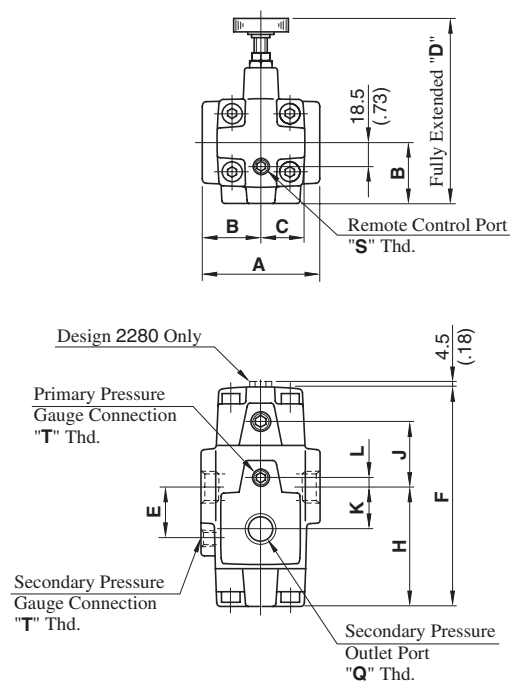


Model Numbers	Thread Size		
	"A" Thd.	"B" Thd.	"C" Thd.
RT-03-*-22	Rc 3/8	Rc 1/4	Rc 1/4
RT-03-*-2280	3/8 BSP.F	1/4 BSP.F	1/4 BSP.Tr
RT-03-*-2290	3/8 NPT	1/4 NPT	1/4 NPT

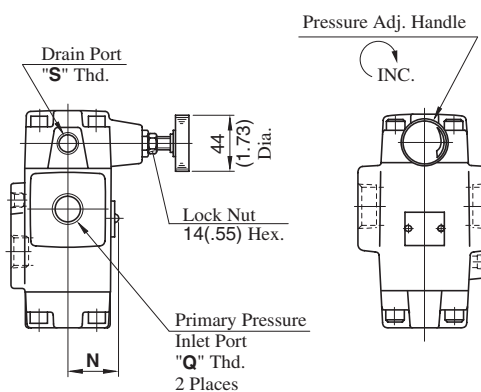


**DIMENSIONS IN
MILLIMETRES (INCHES)**

RT-06-10-*-22/2280/2290

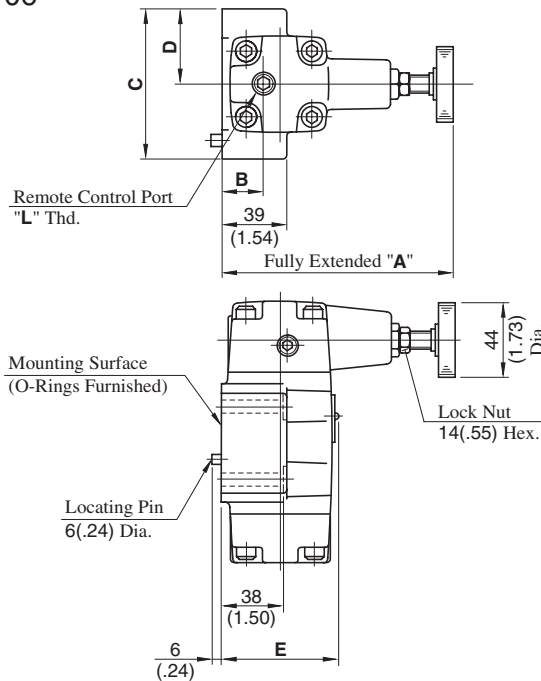


Model Numbers	Thread Size		
	"Q" Thd.	"S" Thd.	"T" Thd.
RT-06-*-22	Rc 3/4	Rc 1/4	Rc 1/4
RT-06-*-2280	3/4 BSP.F	1/4 BSP.F	1/4 BSP.Tr
RT-06-*-2290	3/4 NPT	1/4 NPT	1/4 NPT
RT-10-*-22	Rc 1-1/4	Rc 1/4	Rc 1/4
RT-10-*-2280	1-1/4 BSP.F	1/4 BSP.F	1/4 BSP.Tr
RT-10-*-2290	1-1/4 NPT	1/4 NPT	1/4 NPT



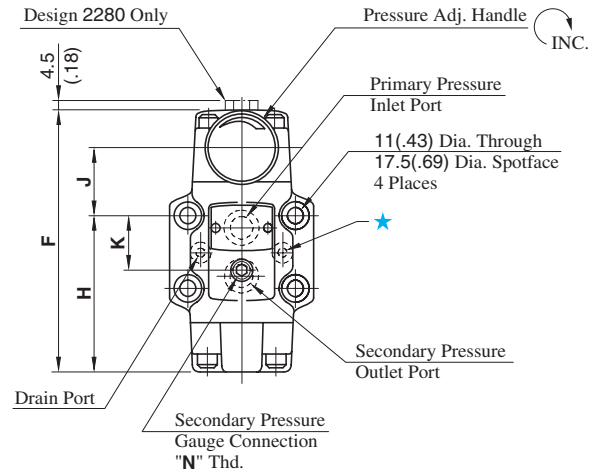
Model Numbers	Dimensions mm (Inches)										
	A	B	C	D	E	F	H	J	K	L	N
RT-06	96 (3.78)	48 (1.89)	36.5 (1.44)	149 (5.87)	42 (1.65)	179 (7.05)	97.5 (3.84)	53.5 (2.11)	33 (1.30)	9 (.35)	39 (1.54)
RT-10	132 (5.20)	66 (2.60)	43 (1.69)	167 (6.57)	52 (2.05)	216 (8.50)	124 (4.88)	64 (2.52)	40 (1.57)	12 (.47)	46 (1.81)

RG-03/06-*-22/2280/2290



Model Numbers	Thread Size	
	"L" Thd.	"N" Thd.
RG-03/06-*-22	Rc 1/4	Rc 1/4
RG-03/06-*-2280	1/4 BSP.F	1/4 BSP.Tr
RG-03/06-*-2290	1/4 NPT	1/4 NPT

★ Port connection is not required for RG models but an O-ring should be furnished.

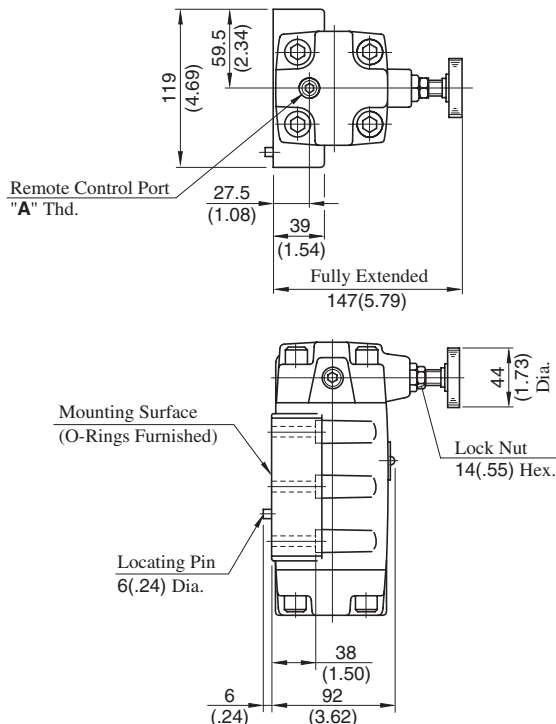


Model Numbers	Dimensions mm (Inches)								
	A	B	C	D	E	F	H	J	K
RG-03	142 (5.59)	25 (.98)	89 (3.50)	44.5 (1.75)	67 (2.64)	155.5 (6.12)	92.4 (3.64)	40.6 (1.60)	34.9 (1.37)
RG-06	141 (5.55)	21.5 (.85)	102 (4.02)	51 (2.01)	79 (3.11)	179 (7.05)	111 (4.37)	40 (1.57)	48 (1.89)

Note: For dimensions of the valve mounting surface see the dimensional drawing (page 244 & 245) of the sub-plate used together.

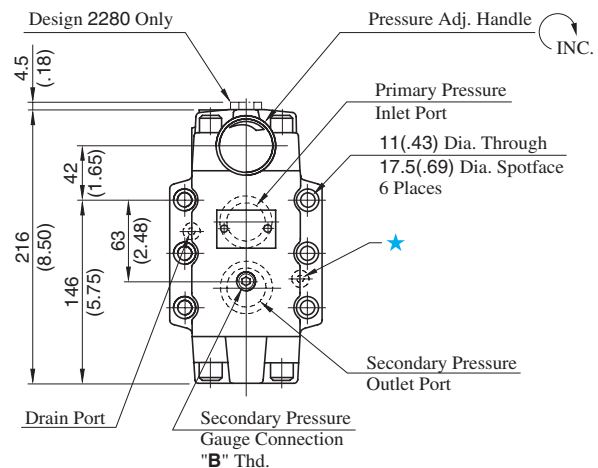
DIMENSIONS IN MILLIMETRES (INCHES)

RG-10-*-22/2280/2290



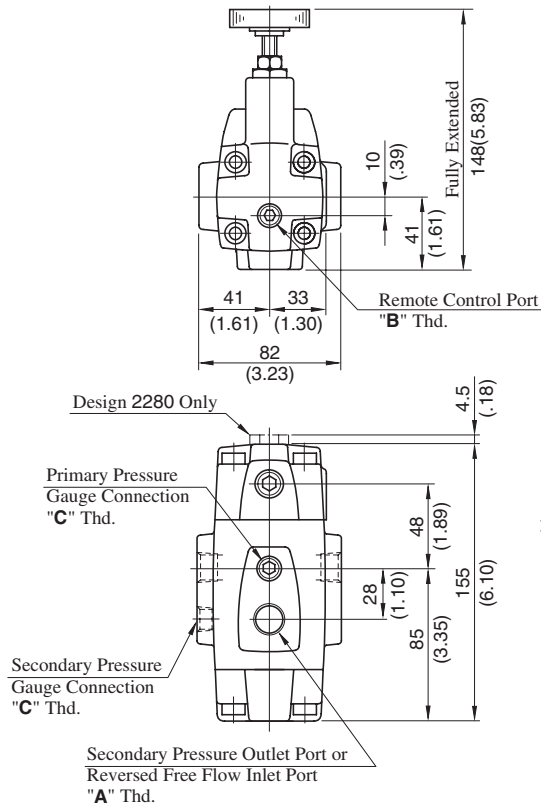
Model Numbers	Thread Size	
	"A" Thd.	"B" Thd.
RG-10-*-22	Rc 1/4	Rc 1/4
RG-10-*-2280	1/4 BSP.F	1/4 BSP.Tr
RG-10-*-2290	1/4 NPT	1/4 NPT

★ Port connection is not required for RG models but an O-ring should be furnished.

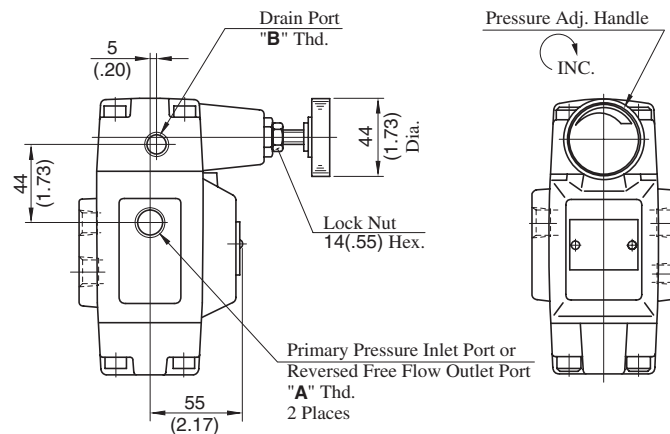


Note: For dimensions of the valve mounting surface see the dimensional drawing (page 246) of the sub-plate used together.

RCT-03-*-22/2280/2290

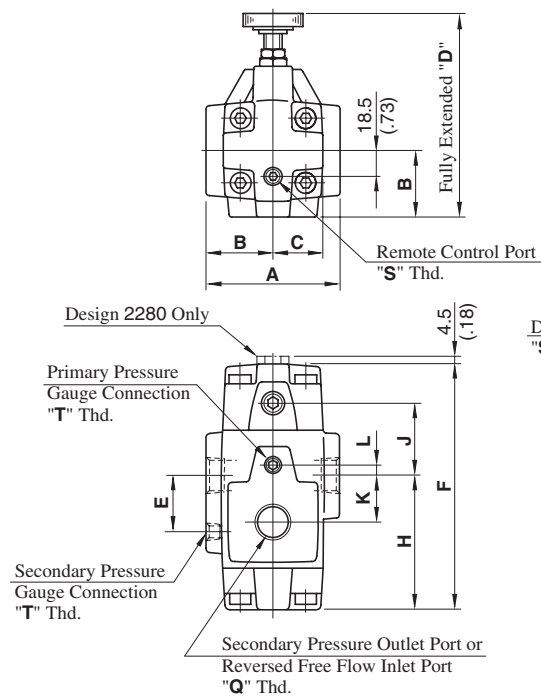


Model Numbers	Thread Size		
	"A" Thd.	"B" Thd.	"C" Thd.
RCT-03-*-22	Rc 3/8	Rc 1/4	Rc 1/4
RCT-03-*-2280	3/8 BSP.F	1/4 BSP.F	1/4 BSP.Tr
RCT-03-*-2290	3/8 NPT	1/4 NPT	1/4 NPT

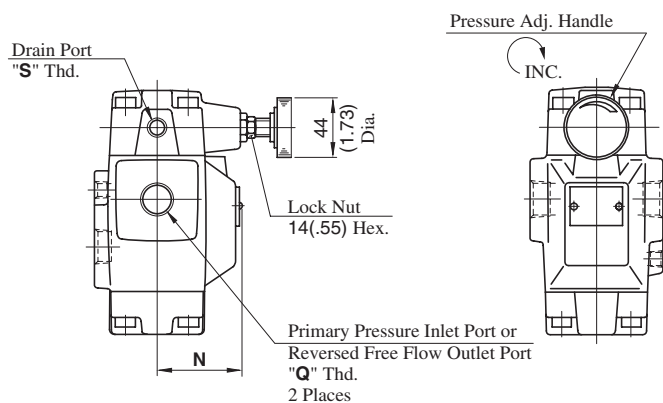


**DIMENSIONS IN
MILLIMETRES (INCHES)**

RCT-06-10-*-22/2280/2290

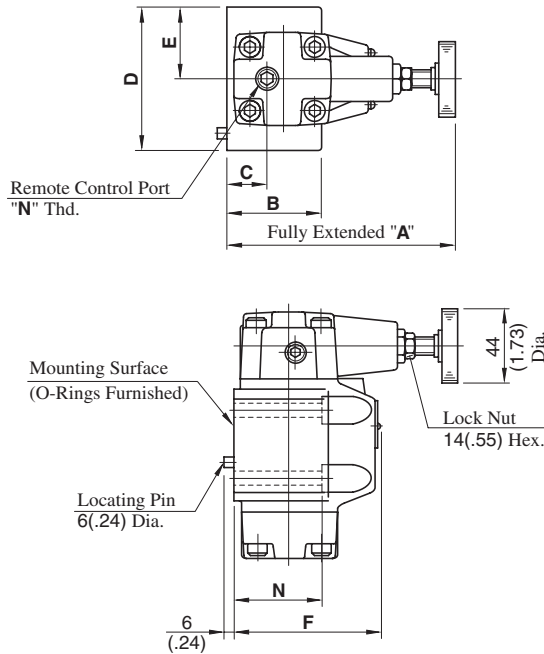


Model Numbers	Thread Size		
	"Q" Thd.	"S" Thd.	"T" Thd.
RCT-06-*-22	Rc 3/4	Rc 1/4	Rc 1/4
RCT-06-*-2280	3/4 BSP.F	1/4 BSP.F	1/4 BSP.Tr
RCT-06-*-2290	3/4 NPT	1/4 NPT	1/4 NPT
RCT-10-*-22	Rc 1-1/4	Rc 1/4	Rc 1/4
RCT-10-*-2280	1-1/4 BSP.F	1/4 BSP.F	1/4 BSP.Tr
RCT-10-*-2290	1-1/4 NPT	1/4 NPT	1/4 NPT



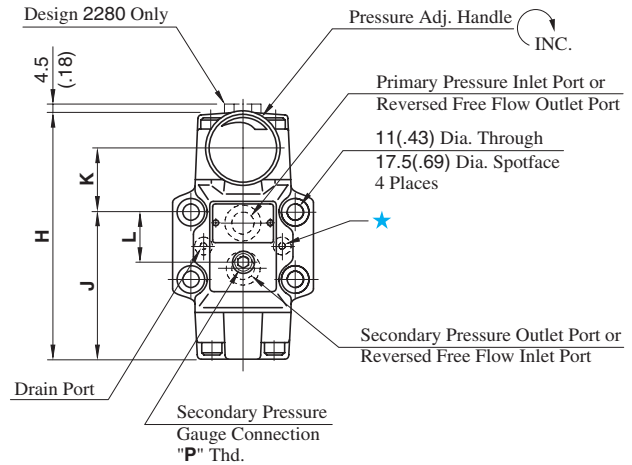
Model Numbers	Dimensions mm (Inches)										
	A	B	C	D	E	F	H	J	K	L	N
RCT-06	96 (3.78)	48 (1.89)	36.5 (1.44)	149 (5.87)	42 (1.65)	179 (7.05)	97.5 (3.84)	53.5 (2.11)	33 (1.30)	9 (.35)	68 (2.68)
RCT-10	132 (5.20)	66 (2.60)	43 (1.69)	167 (6.57)	52 (2.05)	216 (8.50)	124 (4.88)	64 (2.52)	40 (1.57)	12 (.47)	86 (3.39)

RCG-03/06-*-22/2280/2290



Model Numbers	Thread Size	
	"N" Thd.	"P" Thd.
RCG-03/06-*-22	Rc 1/4	Rc 1/4
RCG-03/06-*-2280	1/4 BSP.F	1/4 BSP.Tr
RCG-03/06-*-2290	1/4 NPT	1/4 NPT

★ Port connection is not required for RCG models but an O-ring should be furnished.

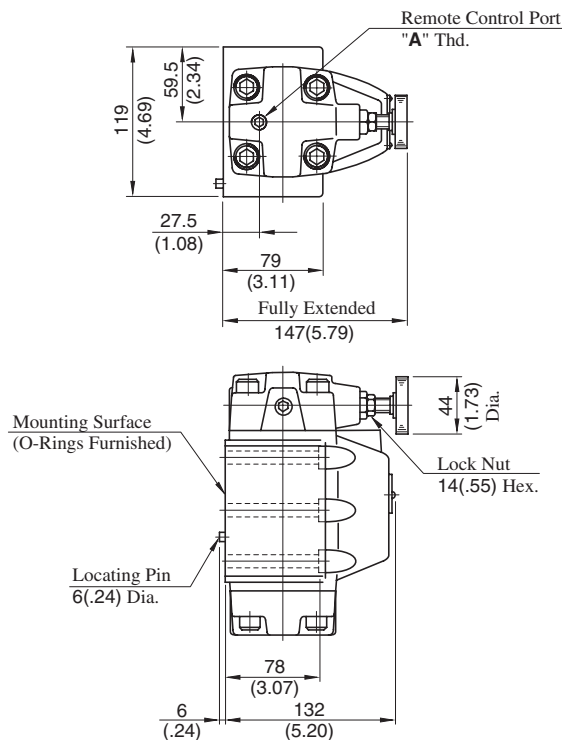


Model Numbers	Dimensions mm (Inches)										
	A	B	C	D	E	F	H	J	K	L	N
RCG-03	142 (5.59)	59 (2.32)	25 (.98)	89 (3.50)	44.5 (1.75)	90 (3.54)	155 (6.10)	92.4 (3.64)	40.6 (1.60)	34.9 (1.37)	58 (2.28)
RCG-06	141 (5.55)	69 (2.72)	21.5 (.85)	102 (4.02)	51 (2.01)	108 (4.25)	179 (7.05)	111 (4.37)	40 (1.57)	48 (1.89)	68 (2.68)

Note: For dimensions of the valve mounting surface see the dimensional drawing (page 244 & 245) of the sub-plate used together.

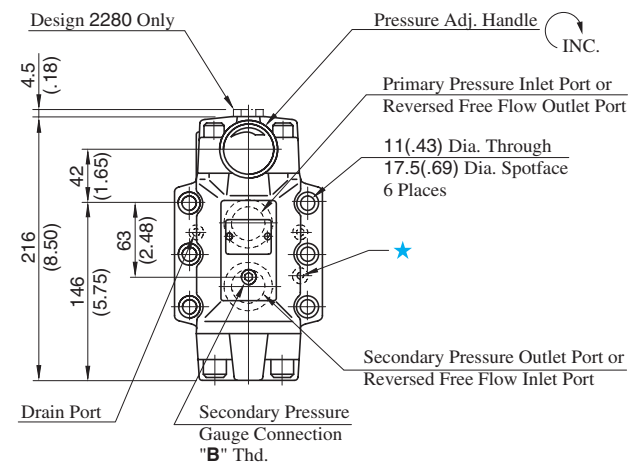
DIMENSIONS IN MILLIMETRES (INCHES)

RCG-10-*-22/2280/2290



Model Numbers	Thread Size	
	"A" Thd.	"B" Thd.
RCG-10-*-22	Rc 1/4	Rc 1/4
RCG-10-*-2280	1/4 BSP.F	1/4 BSP.Tr
RCG-10-*-2290	1/4 NPT	1/4 NPT

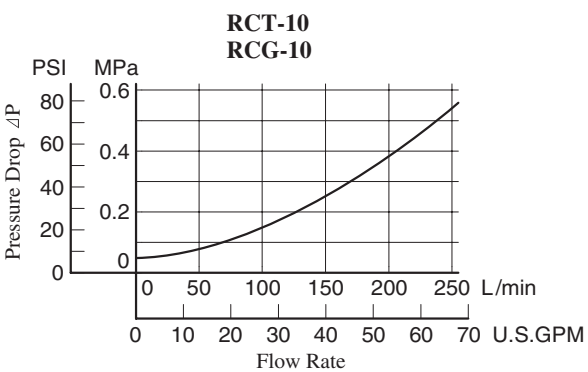
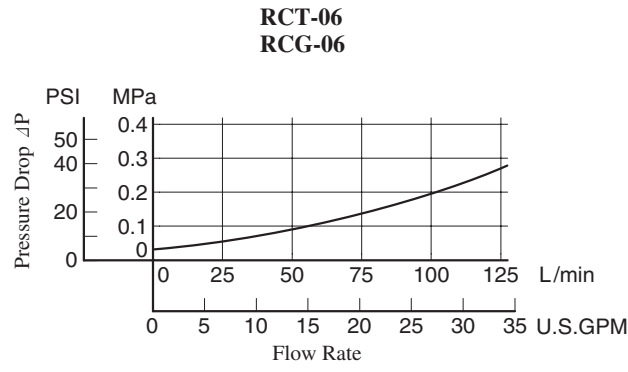
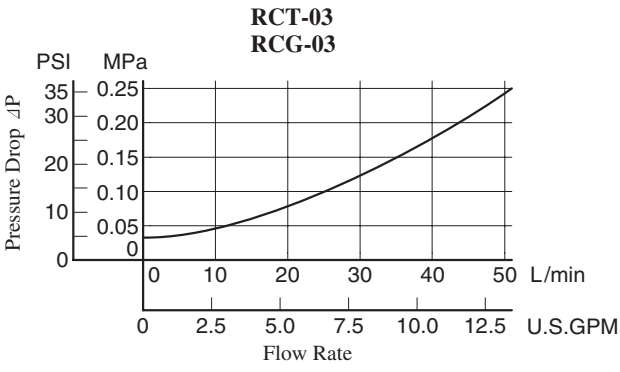
★ Port connection is not required for RCG models but an O-ring should be furnished.



Note: For dimensions of the valve mounting surface see the dimensional drawing (page 246) of the sub-plate used together.

■ Pressure Drop for Reversed Free Flow

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



● For any other viscosity, multiply the factors in the table below.

Viscosity	mm ² /s	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

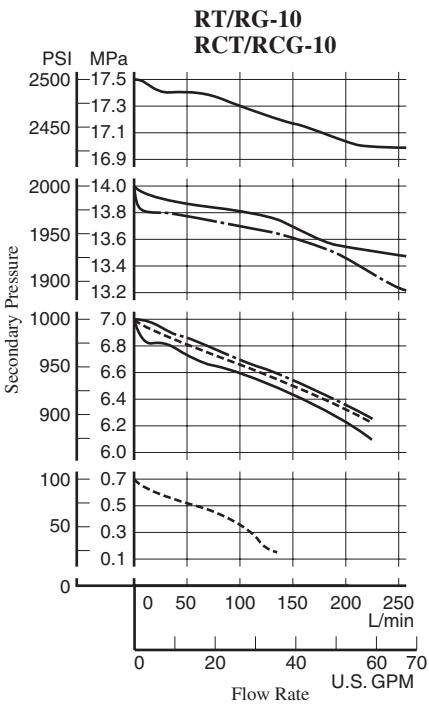
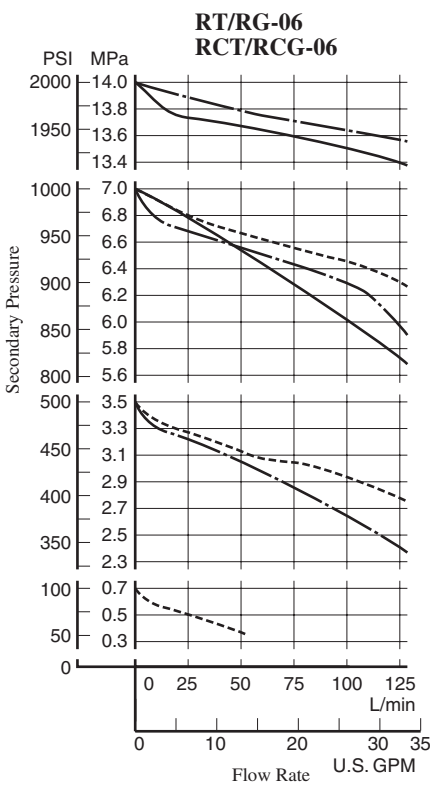
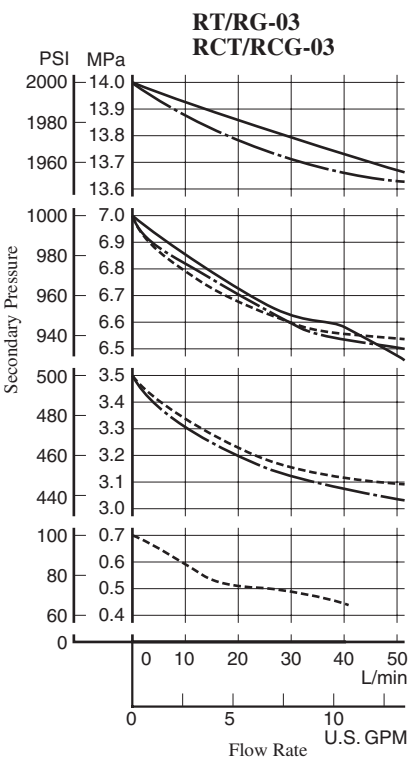
● For any other specific gravity (G'), the pressure drop (ΔP') may be obtained from the formula below.

$$\Delta P' = \Delta P (G'/0.850)$$

■ Flow Rate vs. Secondary Pressure

Primary Pressure : 21 MPa (3050 PSI)
Hydraulic Fluid : Viscosity 35 mm²/s (164 SSU)

Pressure Adj. Range
----- : "B"
----- : "C"
----- : "H"

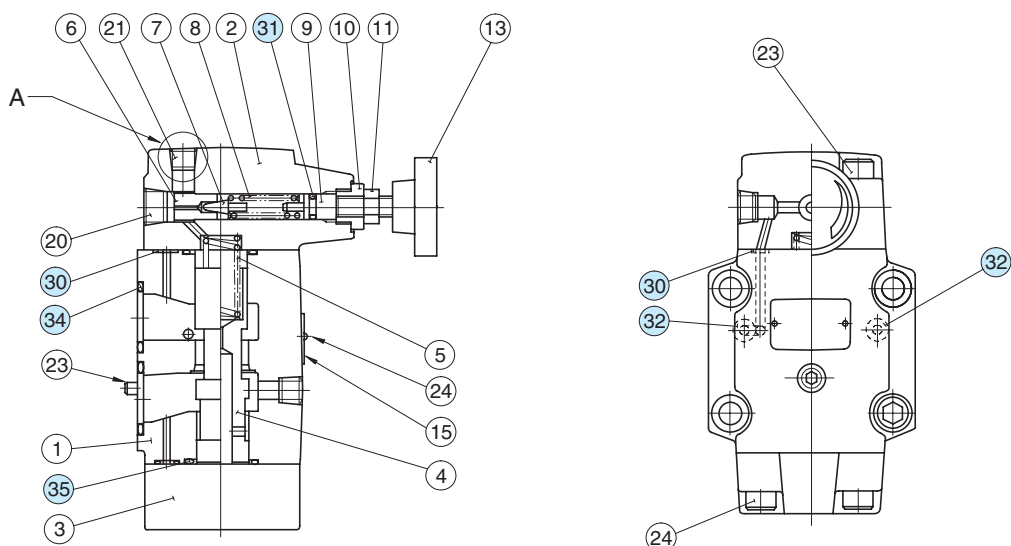


■ Spare Parts List

RT/RG-03-*/-22/2280/2290

RT/RG-06-*/-22/2280/2290

RT/RG-10-*/-22/2280/2290



● List of Seals

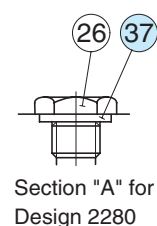
Item	Name of Parts	Part Numbers			Quantity	
		RT RG -03	RT RG -06	RT RG -10	RT-*	RG-*
30	O-Ring	SO-NB-P6	SO-NB-P6	SO-NB-P6	4	4
31	O-Ring	SO-NA-P9	SO-NA-P9	SO-NA-P9	1	1
32	O-Ring	SO-NB-P9	SO-NB-P9	SO-NB-P9	—	2
34	O-Ring	SO-NB-P18	SO-NB-P28	SO-NB-P32	—	2
35	O-Ring	SO-NB-P22	SO-NB-P28	SO-NB-P36	2	2
37	Bonded Seal	SG-FB-1/4	SG-FB-1/4	SG-FB-1/4	1	1

Note: When ordering the seals, please specify the seal kit number from the table below.

● List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
RT-03-*/-22/2280/2290	KS-RT-03-22
RT-06-*/-22/2280/2290	KS-RT-06-22
RT-10-*/-22/2280/2290	KS-RT-10-22
RG-03-*/-22/2280/2290	KS-RG-03-22
RG-06-*/-22/2280/2290	KS-RG-06-22
RG-10-*/-22/2280/2290	KS-RG-10-22

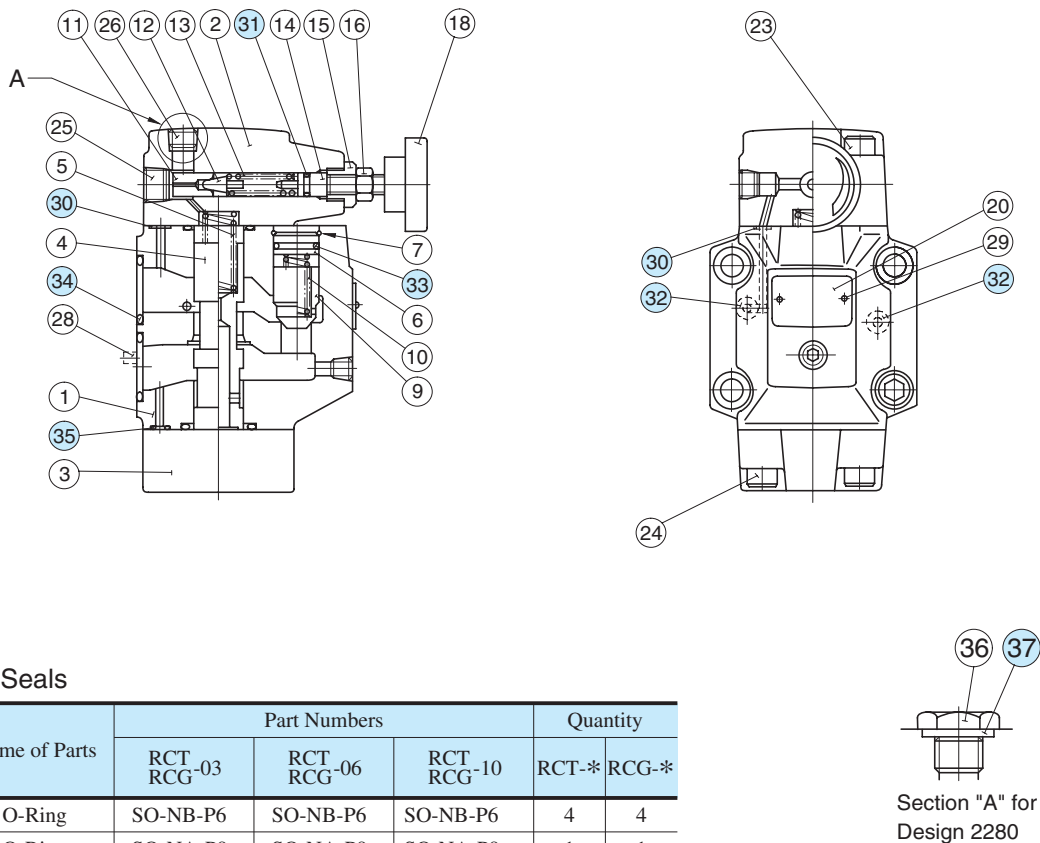
Note: No bonded seals are included in the seal kits.



Section "A" for
Design 2280

Spare Parts List

RCT/RCG-03-*22/2280/2290
RCT/RCG-06-*22/2280/2290
RCT/RCG-10-*22/2280/2290



List of Seals

Item	Name of Parts	Part Numbers			Quantity	
		RCT RCG-03	RCT RCG-06	RCT RCG-10	RCT-*	RCG-*
30	O-Ring	SO-NB-P6	SO-NB-P6	SO-NB-P6	4	4
31	O-Ring	SO-NA-P9	SO-NA-P9	SO-NA-P9	1	1
32	O-Ring	SO-NB-P9	SO-NB-P9	SO-NB-P9	—	2
33	O-Ring	SO-NB-P12	SO-NB-P18	SO-NB-P22A	1	1
34	O-Ring	SO-NB-P18	SO-NB-P28	SO-NB-P32	—	2
35	O-Ring	SO-NB-P22	SO-NB-P28	SO-NB-P36	2	2
37	Bonded Seal	SG-FB-1/4	SG-FB-1/4	SG-FB-1/4	1	1

Note: When ordering the seals, please specify the seal kit number from the table below.

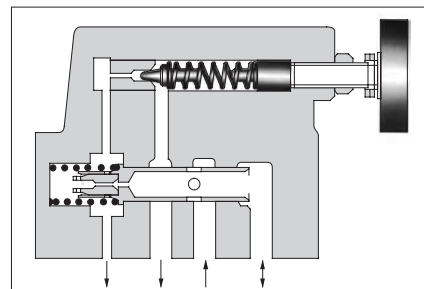
List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
RCT-03-*22/2280/2290	KS-RCT-03-22
RCT-06-*22/2280/2290	KS-RCT-06-22
RCT-10-*22/2280/2290	KS-RCT-10-22
RCG-03-*22/2280/2290	KS-RCG-03-22
RCG-06-*22/2280/2290	KS-RCG-06-22
RCG-10-*22/2280/2290	KS-RCG-10-22

Note: No bonded seals are included in the seal kits.

Pressure Reducing and Relieving Valves

Pressure reducing and relieving valves are composite pressure control valves having pressure reducing and counterbalancing functions developed for hydraulic balancing circuits.



Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Pres. Adj. Range MPa (PSI)	Max. Flow L/min (U.S.GPM)	Relieving Flow L/min (U.S.GPM)	Drain Flow L/min (U.S.GPM)	Approx. Mass kg (lbs.)
RBG-03-*-10*	14 (2030)	0.6-13.5 (90-1960)	50 (13.2)	50 (13.2)	0.6-1 (.16-.26)	4.2 (9.3)
RBG-06-*-10*	25 (3630)	0.8-24.5 (120-3550)	125 (33)	125 (33)	1.5-2 (.40-.53)	11 (24.3)

Model Number Designation

F-	RB	G	-03	-R	-10	*
Special Seals	Series Number	Type of Mounting	Valve Size	Drain Type	Design Number	Design Standards
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	RB: Pressure Reducing and Relieving Valves	G: Sub-plate Mounting	03 06	None: Internal Drain R: External Drain	10 10	Refer to ★

- ★ Design Standards: None Japanese Standard "JIS"
80 European Design Standard
90 N. American Design Standard

Attachment

Mounting Bolts

Valve Model Numbers	Socket Head Cap Screw (4 pcs.)	
	Japanese Standard "JIS" European Design Standard	N. American Design Standard
RBG-03	M10 × 65 Lg.	3/8-16 UNC × 2-1/2 Lg.
RBG-06	M10 × 70 Lg.	3/8-16 UNC × 2-3/4 Lg.

Sub-plate

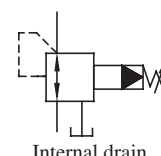
Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
RBG-03	RBGM-03-10	Rc 3/8	RBGM-03-1080	3/8 BSP.F	RBGM-03-1090	3/8 NPT	1.6 (3.5)
	RBGM-03X-10	Rc 1/2	RBGM-03X-1080	1/2 BSP.F	RBGM-03X-1090	1/2 NPT	
RBG-06	RBGM-06-10	Rc 3/4	RBGM-06-1080	3/4 BSP.F	RBGM-06-1090	3/4 NPT	4.8 (10.6)
	RBGM-06X-10	Rc 1	RBGM-06X-1080	1 BSP.F	RBGM-06X-1090	1 NPT	

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.

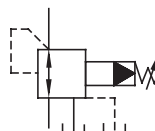
Instructions

- To use remote control relief valve in the venting circuit, see [page 203](#). If the internal volume of the vent line is too large, chattering is likely to occur. Thus, as far as possible reduce the inside diameter and the length of the pipe.
- To adjust the pressure, loosen the lock nut and turn the pressure adjustment handle slowly clockwise for higher pressures and anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Pressure is limited by collars fitted. If a working pressure cannot be attained, remove some collars. One collar is equivalent to 10 MPa (1450 PSI).
- Connect the tank pipe not to any other line but directly to the reservoir.

Graphic Symbols

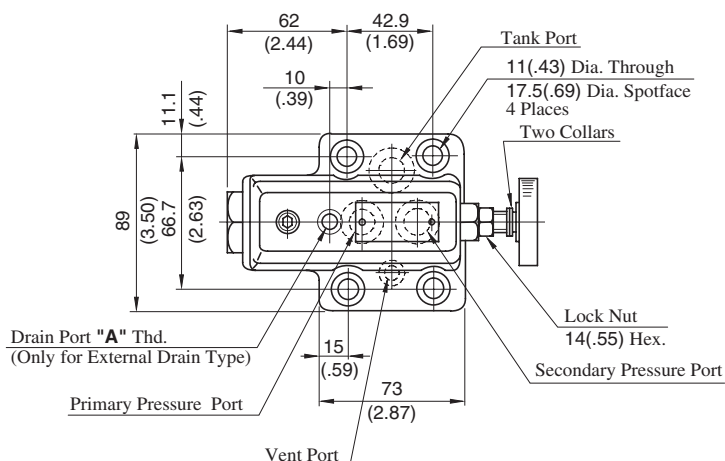


Internal drain

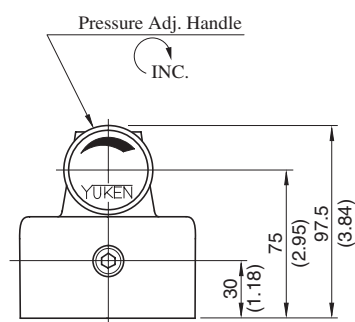
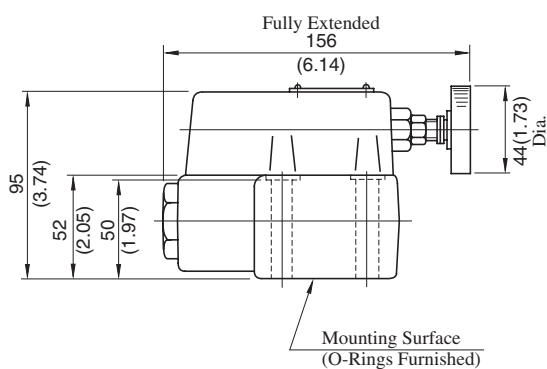


External drain

RBG-03-*-10/1080/1090

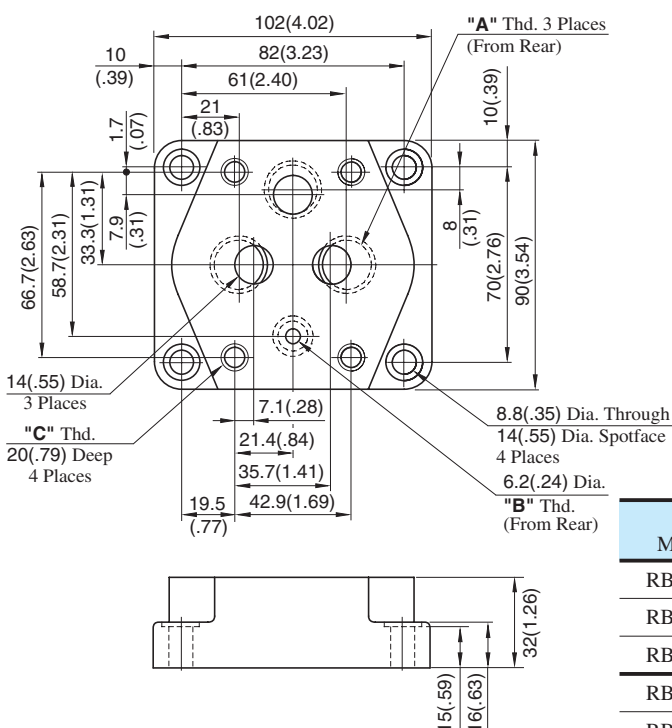


Model Numbers	"A" Thd.
RBG-03-*-10	Rc 1/4
RBG-03-*-1080	1/4 BSP.F
RBG-03-*-1090	1/4 NPT



DIMENSIONS IN MILLIMETRES (INCHES)

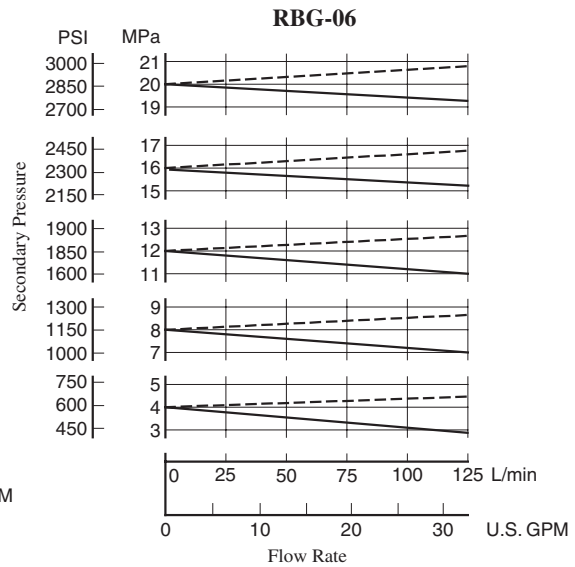
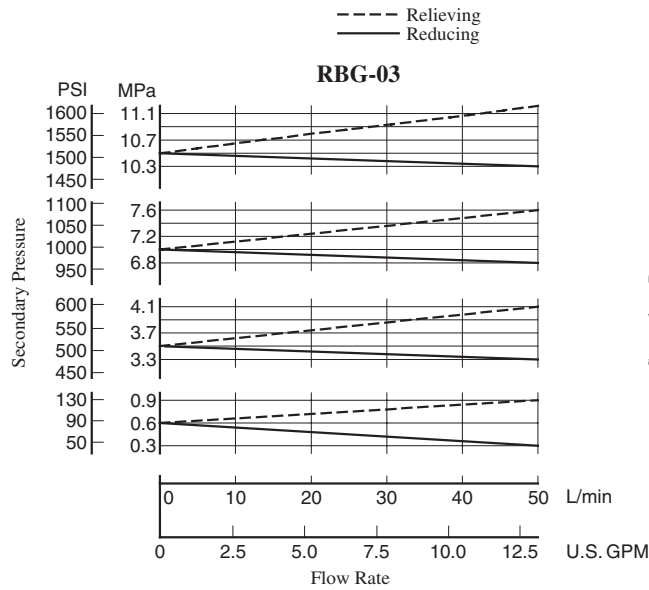
Sub-plate : RBGM-03-10/1080/1090



Sub-plate Model Numbers	"A" Thd.	"B" Thd.	"C" Thd.
RBGM-03-10	Rc 3/8	Rc 1/4	M10
RBGM-03-1080	3/8 BSP.F	1/4 BSP.F	
RBGM-03-1090	3/8 NPT	1/4 NPT	3/8-16 UNC
RBGM-03X-10	Rc 1/2	Rc 1/4	M10
RBGM-03X-1080	1/2 BSP.F	1/4 BSP.F	
RBGM-03X-1090	1/2 NPT	1/4 NPT	3/8-16 UNC

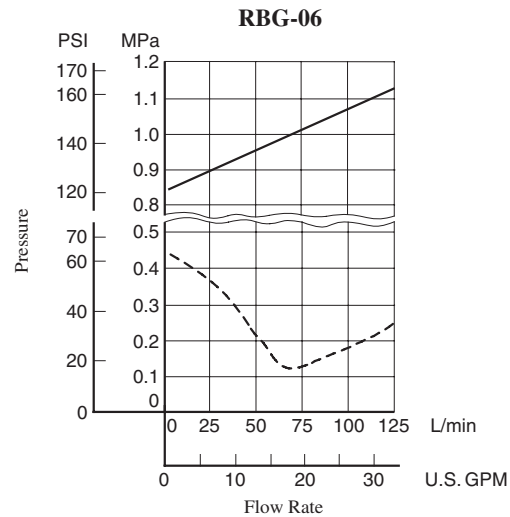
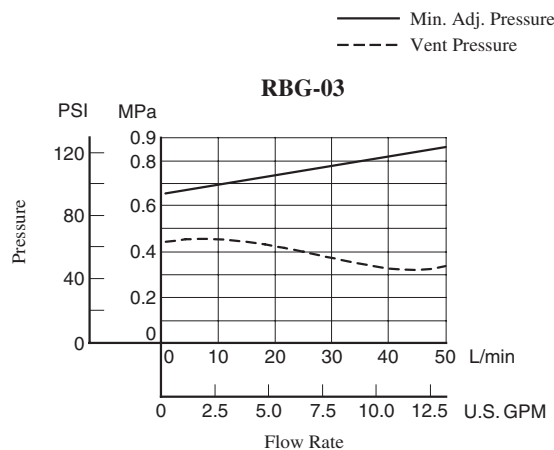
Nominal Override Characteristics

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



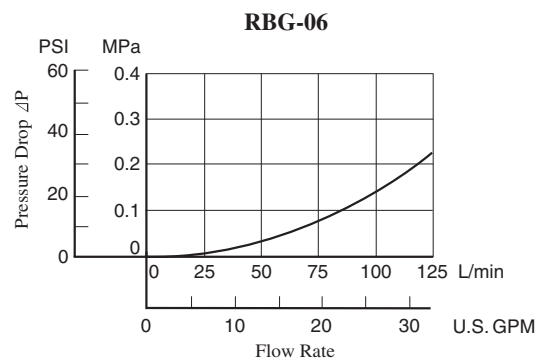
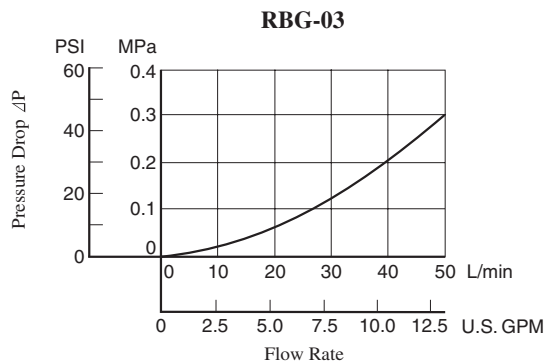
Min. Adj. Pressure & Vent Pressure

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



Pressure Drop

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



● For any other viscosity, multiply the factors in the table below.

Viscosity	mm ² /s	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

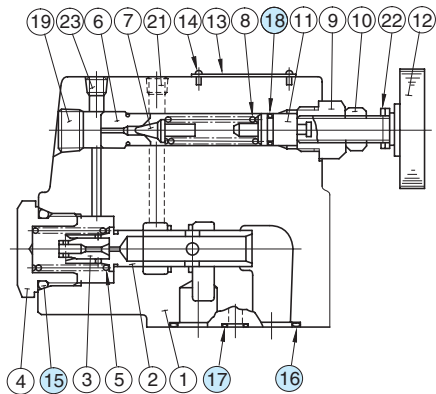
● For any other specific gravity (G'), the pressure drop (ΔP') may be obtained from the formula below.

$$\Delta P' = \Delta P (G'/0.850)$$



■ Spare Parts List

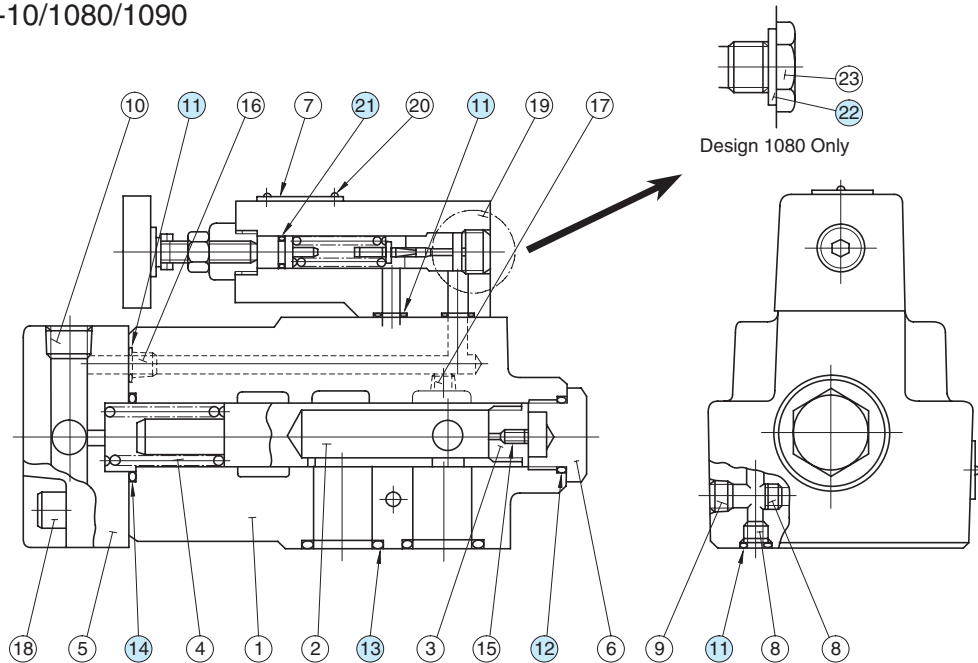
RBG-03-*-10/1080/1090



● List of Seals

Item	Name of Parts	Part Numbers	Qty.	Remarks
15	O-Ring	SO-NB-P24	1	Included in Seal Kit Kit No. : KS-RBG-03-10
16	O-Ring	SO-NB-P18	3	
17	O-Ring	SO-NB-P9	1	
18	O-Ring	SO-NA-P9	1	

RBG-06-*-10/1080/1090



● List of Seals

Item	Name of Parts	Part Numbers	Qty.	Remarks
11	O-Ring	SO-NB-P9	2	Included in Seal Kit Kit No. : KS-RBG-06-10
12	O-Ring	SO-NB-P24	1	
13	O-Ring	SO-NB-P28	3	
14	O-Ring	SO-NB-P30	1	
21	O-Ring	SO-NA-P9	1	
22	Bonded Seal	SG-FB-3/8	1	

Note: No bonded seals are included in the seal kits.

Unloading Relief Valves

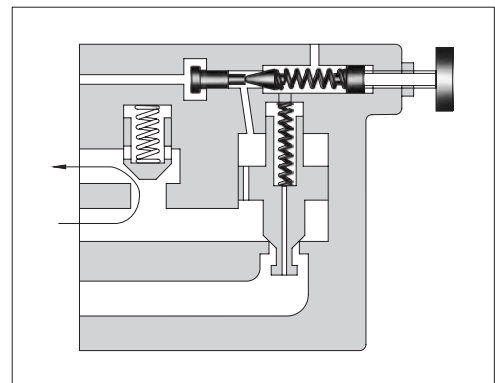
These valves are used to operate the pumps with minimum load in accumulator circuits or in high-low pump circuits.

In accumulator circuits, when the system pressure reaches to a cut out pressure (adjusted maximum), the valve acts to divert the pump delivery to the reservoir at low pressure, thus the pump is unloaded automatically.

When the accumulator pressure drops to the cut in pressure (refer to characteristic chart on [page 269](#)), the valve directs the pump delivery to the accumulator and hydraulic system.

An integral check valve prevents reverse flow through the valve from the accumulator.

In high-low pump circuits, the valve acts to unload the large volume pump with the same manner as described above during load operation of the small volume pump.



Specifications

Model Numbers	Max. Operating Pres. MPa (PSI)	Max. Flow L/min (U.S.GPM)	Approx. Mass kg (lbs.)
BUCG-06-**-30/3080/3090	21 (3050)	125 (33)	12 (26.5)
BUCG-10-**-25/2580/2590		250 (66)	21.5 (47.4)

Model Number Designation

F-	BUC	G	-06	-B	V	-30	*
Special Seals	Series Number	Type of Mounting	Valve Size	Cut-out Pres. Adj. Range MPa (PSI)	High Venting [★] Pres. Feature	Design Number	Design Standards
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	BUC: Unloading Relief Valve	G: Sub-plate Mounting	06	B: 2.5-7.0 (360-1020) C: 3.5-14 (510-2030) H: 7.0-21 (1020-3050)	V: For High Venting Pressure Feature (Omit if not required)	30	None: Japanese Std. "JIS"
			10			25	80: European Design Std. 90: N. American Design Std.

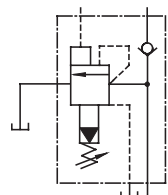
★ Use the high-venting-pressure type to reduce the shift time from unloading to onloading.

Pilot-drain system

A pilot-drain system is typically configured with an external pilot and an external drain, as indicated by the right graphic symbol. However, customized pilot-drain systems with an internal pilot are also available.

For the internal pilot type, the design standard number at the end of the model number is uniquely assigned. Refer to the table below for the internal pilot type. Please contact us for details.

Graphic Symbol



Pilot & Drain Conn.	Graphic Symbols	European Design Standard	N. American Design Standard	Japanese Std. "JIS"
Int. Pilot- Int. Drain		BUCG-06-**-30801 BUCG-10-**-25801	BUCG-06-**-30901 BUCG-10-**-25901	BUCG-06-**-3001 BUCG-10-**-2501
Int. Pilot- Ext. Drain		BUCG-06-**-30802	BUCG-06-**-30902	BUCG-06-**-2502

■ Instructions

- To adjust the pressure, loosen the lock nut and turn the pressure adjustment handle slowly clockwise for higher pressures or anti-clockwise for lower pressures. After adjustments, do not forget to tighten the lock nut.
- Take care not to neglect connecting the drain pipe to the reservoir; otherwise not only will the valve fail to operate properly but also the line pressure will rise infinitely. Extend the end of the drain pipe into fluid.
- Limit the pressure drop between the valve and the accumulator in an accumulator circuit below 10% of the cut-out pressure.
- Limit the drain port back pressure below 2% of the cut-out pressure.

■ Attachment

● Mounting Bolts

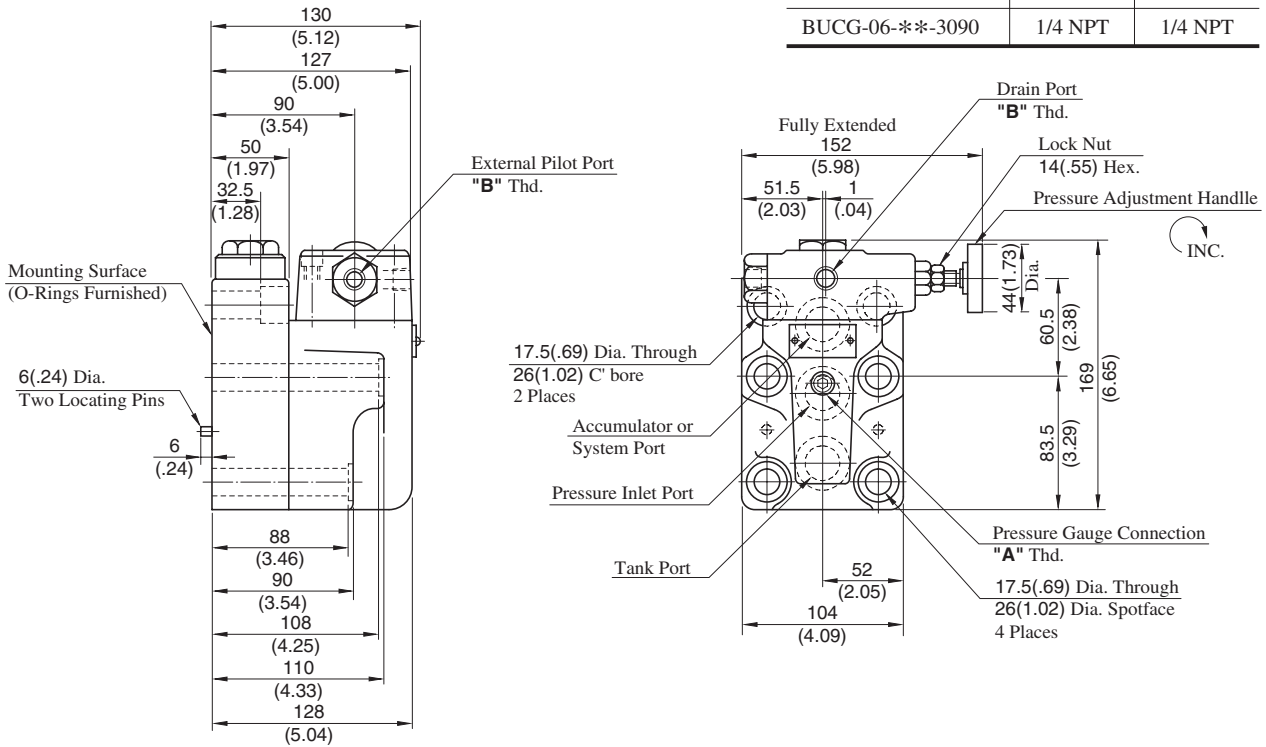
Valve Model Numbers	Socket Head Cap Screw	
	Japanese Std. "JIS" and European Design Std.	N. American Design Std.
BUCG-06	M16 × 55Lg. (2 pcs.)	5/8-11 UNC × 2-1/4 Lg. (2 pcs.)
	M16 × 110Lg. (2 pcs.)	5/8-11 UNC × 4-1/2 Lg. (2 pcs.)
	M16 × 130Lg. (2 pcs.)	5/8-11 UNC × 5 Lg. (2 pcs.)
BUCG-10	M20 × 70Lg. (2 pcs.)	3/4-10 UNC × 2-3/4 Lg. (2 pcs.)
	M20 × 160Lg. (4 pcs.)	3/4-10 UNC × 6-1/2 Lg. (4 pcs.)

■ Sub-plate

Valve Model Numbers	Japanese Standard "JIS"		European Design Standard		N. American Design Standard		Approx. Mass kg (lbs.)
	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	Sub-plate Model Numbers	Thread Size	
BUCG-06	BUCGM-06-20	Rc 3/4	BUCGM-06-2080	3/4 BSP.F	BUCGM-06-2090	3/4 NPT	4.4 (9.7)
BUCG-10	BUCGM-10-20	Rc 1-1/4	BUCGM-10-2080	1-1/4 BSP.F	BUCGM-10-2090	1-1/4 NPT	7.2 (15.9)

- Sub-plates are available. Specify the sub-plate model number from the table above. When sub-plates are not used, the mounting surface should have a good machined finish.

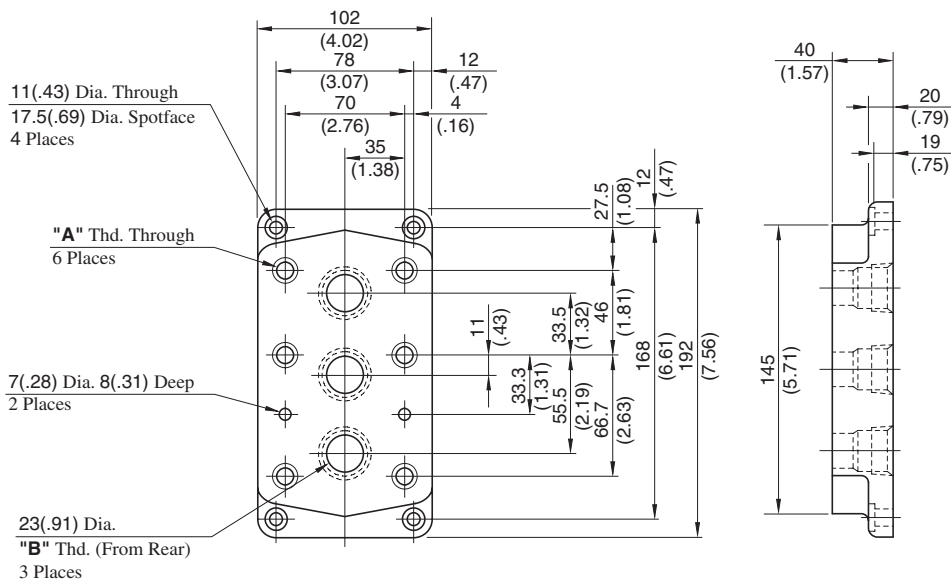
BUCG-06-**-30/3080/3090



DIMENSIONS IN
MILLIMETRES (INCHES)

■ Sub-plate

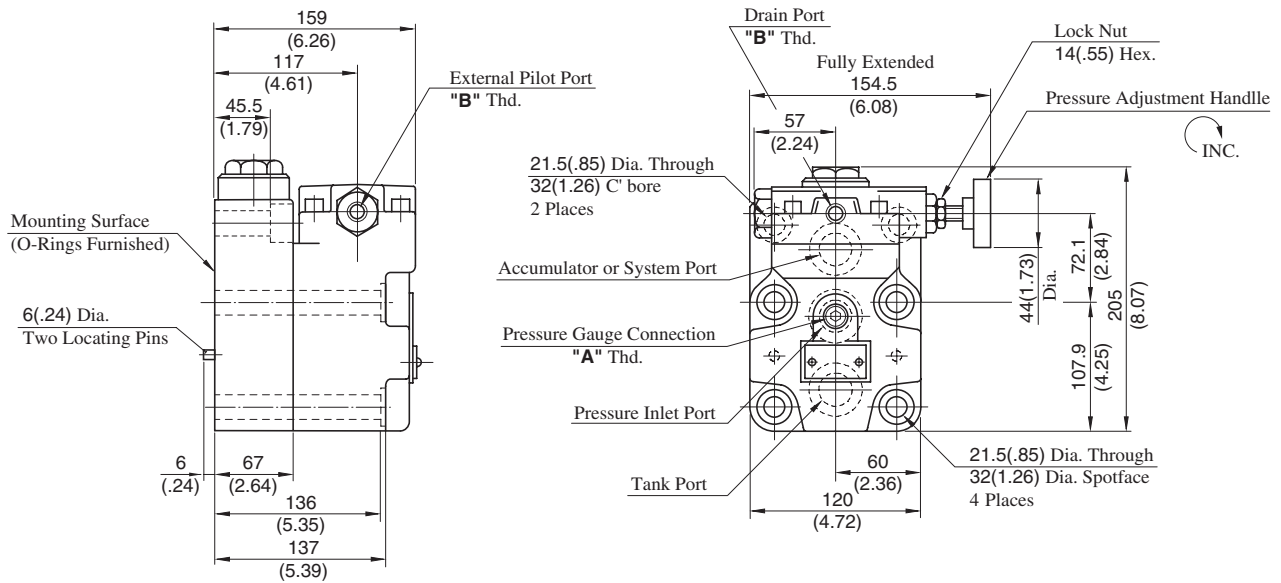
BUCGM-06-20/2080/2090



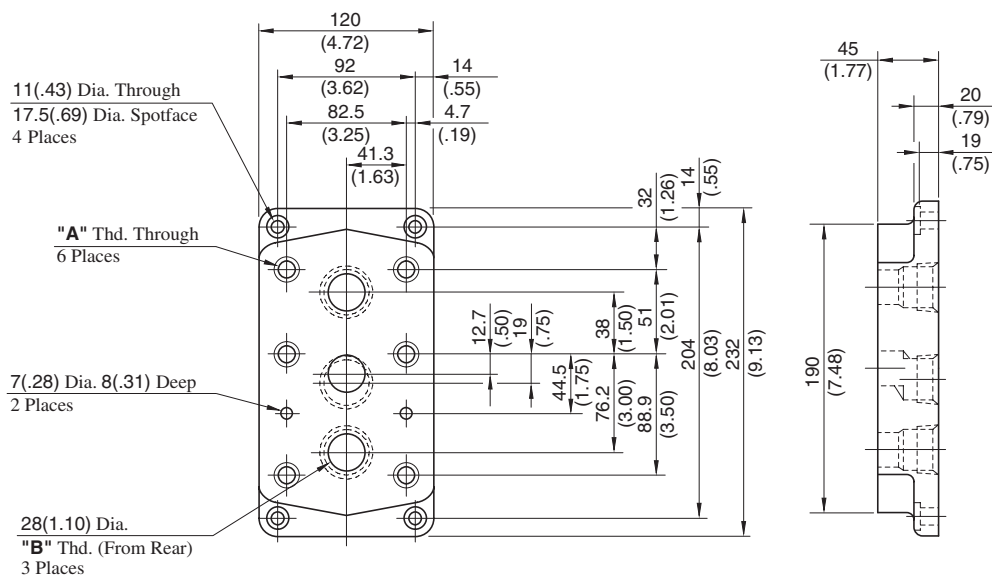
Sub-plate Model No.	"A" Thd.	"B" Thd.
BUCGM-06-20	M16	Rc 3/4
BUCGM-06-2080	M16	3/4 BSP.F
BUCGM-06-2090	5/8-11 UNC	3/4 NPT

BUCG-10--25/2580/2590**

Model Numbers	"A" Thd.	"B" Thd.
BUCG-10-**-25	Rc 1/4	Rc 1/4
BUCG-10-**-2580	1/4 BSP.Tr	1/4 BSP.F
BUCG-10-**-2590	1/4 NPT	1/4 NPT



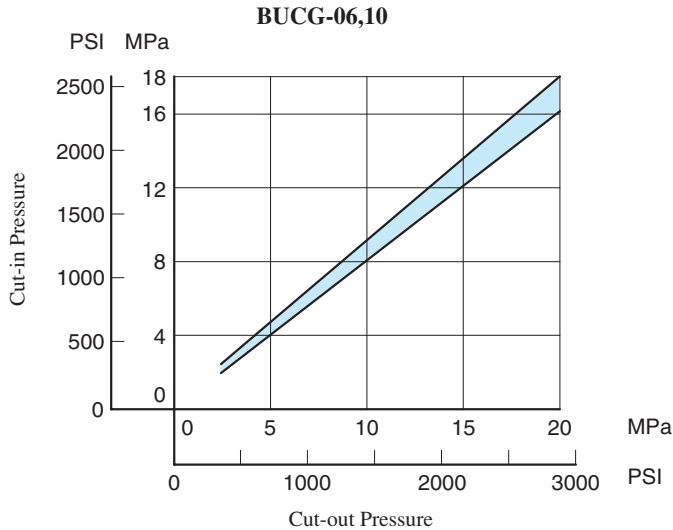
**DIMENSIONS IN
MILLIMETRES (INCHES)**

■ Sub-plate
BUCGM-10-20/2080/2090


Sub-plate Model No.	"A" Thd.	"B" Thd.
BUCGM-10-20	M20	Rc 1-1/4
BUCGM-10-2080	M20	1-1/4 BSP.F
BUCGM-10-2090	3/4-10 UNC	1-1/4 NPT

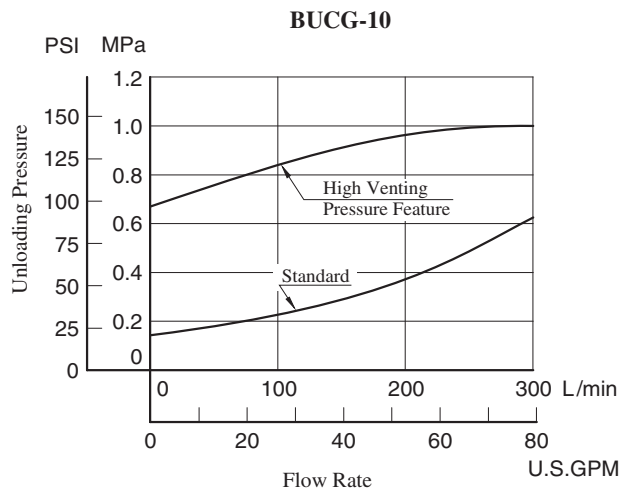
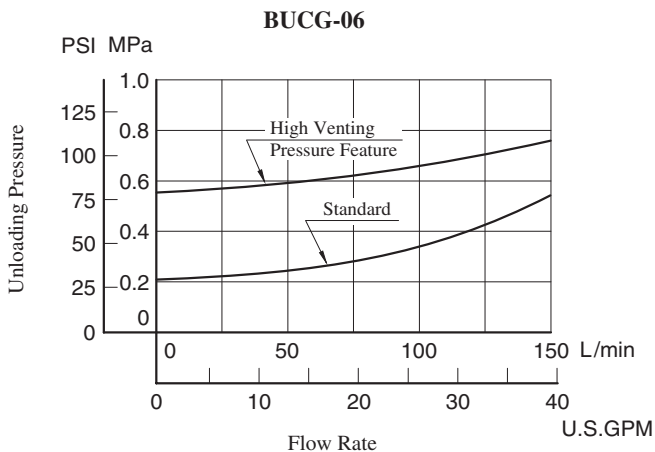
Cut-in Pressure vs. Cut-out Pressure

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



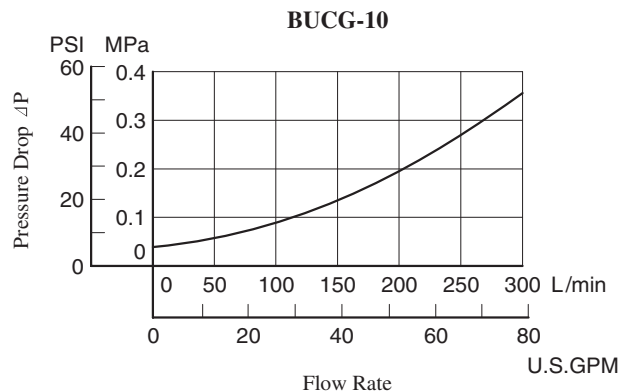
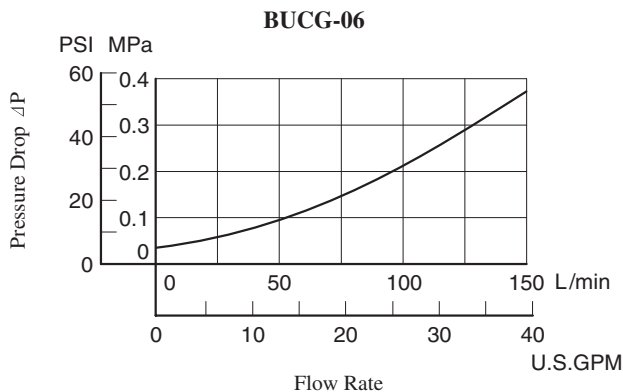
Unloading Pressure vs. Flow

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850



Pressure Drop for Check Valve

Hydraulic Fluid: Viscosity 35 mm²/s (164 SSU), Specific Gravity 0.850

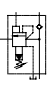


● For any other viscosity, multiply the factors in the table below.

Viscosity	mm ² /s	15	20	30	40	50	60	70	80	90	100
	SSU	77	98	141	186	232	278	324	371	417	464
Factor		0.81	0.87	0.96	1.03	1.09	1.14	1.19	1.23	1.27	1.30

● For any other specific gravity (G'), the pressure drop (ΔP') may be obtained from the formula below.

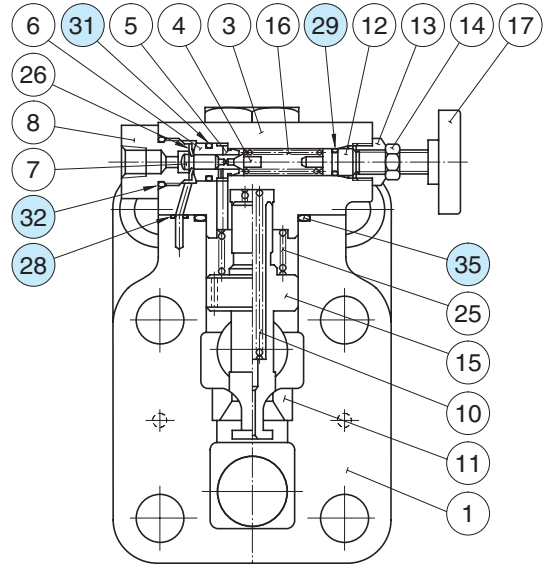
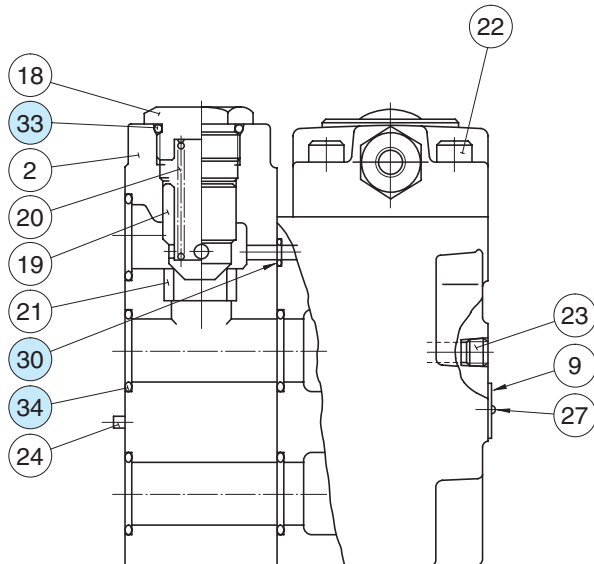
$$\Delta P' = \Delta P (G'/0.850)$$



Spare Parts List

BUCG-06-**-30/3080/3090

BUCG-10-**-25/2580/2590



List of Seals

Item	Name of Parts	Part Numbers		Quantity
		BUCG-06	BUCG-10	
28	O-Ring	SO-NB-P6	SO-NB-P6	3
29	O-Ring	SO-NA-P9	SO-NA-P9	1
30	O-Ring	SO-NB-P11	SO-NB-P9	1
31	O-Ring	SO-NB-P12	SO-NB-P12	1
32	O-Ring	SO-NB-P18	SO-NB-P18	1
33	O-Ring	SO-NB-P24	SO-NB-P32	1
34	O-Ring	SO-NB-P28	SO-NB-P32	5
35	O-Ring	SO-NB-P32	SO-NB-P45	1

Note: When ordering the seals, please specify the seal kit number from the table below.

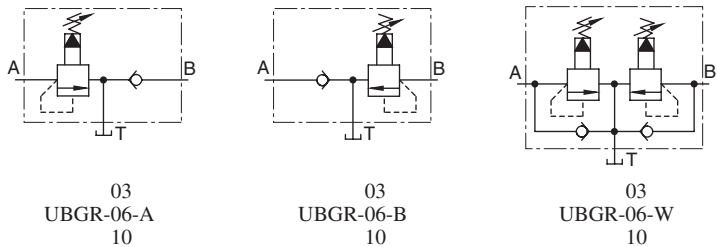
List of Seal Kits

Valve Model Numbers	Seal Kit Numbers
BUCG-06	KS-BUCG-06-30
BUCG-10	KS-BUCG-10-25

Brake Valves

Brake valves are used on hydraulic cylinders and in brake circuits of hydraulic motors. They can brake with any pressure, permitting smooth stopping.

Graphic Symbols



Specifications

Model Numbers	Max. Operating Pressure MPa (PSI)	Pres. Adj. Range MPa (PSI)	Max. Flow L/min (U.S.GPM)
UBGR - 03 - * - B - 20 *	25 (3630)	0.7 - 7.0 (100 - 1020)	50 (13.2)
UBGR - 03 - * - H - 20 *		3.5 - 25 (510 - 3630)	
UBGR - 06 - * - 20 *		0.7 - 25 (100 - 3630)	125 (33.0)
UBGR - 10 - * - 20 *		0.7 - 25 (100 - 3630)	200 (52.8)

Model Number Designation

F-	UBGR	-03	-A	-B	-20	*
Special Seals	Series Number	Valve Size	Type	Pres. Adj. Range MPa (PSI)	Design Number	Design Standards
F: Special Seals for Phosphate Ester Type Fluids (Omit if not required)	UBGR: Brake Valves, Sub-plate Mounting	03	A: For A-Line B: For B-Line W: For A•B-Lines	B: 0.7-7.0 (100-1020) H: 3.5-25 (510-3630)	20	Refer to ★
		06		None: 0.7-25 (100-3630)	20	
		10			20	

★ Design Standards: None Japanese Standard "JIS" and European Design Standard
90 N. American Design Standard

• Consult Yuken when detailed material such as dimensions figures is required.

Semiconductor Type Pressure Switches

These pressure switches have built-in electronic circuit on a semiconductor pressure sensor and an open collector insulated by a photocoupler has been used as output. As the use of semiconductor has put movable parts away from the sensor section, high reliability and durability can be obtained.

These pressure switches are suitable for the applications not only compact, light weight and vibration-proof are required but also better substitute to conventional pressure switches.

Model Number Designation

J	T	-02	-100	-11
Series Number	Type of Mounting	Valve Size	Max. Setting Pressure MPa (PSI)	Design Number
J: Semiconductor Type Pressure Switch	T: Threaded Connection	02	35 : 3.5 (510) 100 : 10 (1450) 200 : 20 (2900) 350 : 35 (5080)	11

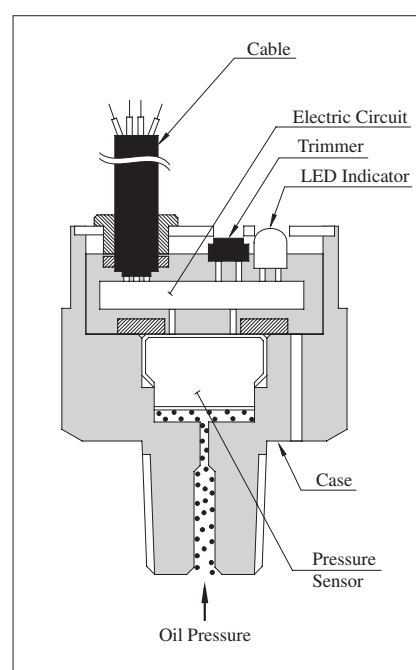
Specifications

Model Numbers		JT-02 -35-11	JT-02 -100-11	JT-02 -200-11	JT-02 -350-11
Description					
Max. Operating Pressure	MPa (PSI)	10 (1450)	10 (1450)	20 (2900)	35 (5080)
Proof Pressure	MPa (PSI)	20 (2900)	20 (2900)	40 (5800)	50 (7250)
Pressure Setting Range	MPa (PSI)	0.1 – 3.5 (15 – 510)	1 – 10 (145 – 1450)	2 – 20 (290 – 2900)	3.5 – 35 (510 – 5080)
Pressure Setting (ON pressure Setting)		Single adjustment: ON trimmer setting (variable resistor) [*]			
Differential Pressure Setting (OFF Pressure Setting)		Single adjustment: DIFF trimmer setting (-1 to -10% of the ON pressure setting)			
Sign on act		When the ON pressure, the LED indicator lights.			
Output System		Open collector (photocoupler insulated) Maximum operating voltage : 35 VDC; maximum current: 100 mA			
Power Source		10 to 28 VDC (ripple included). A constant-voltage power supply must be used. Curent consumption: 10 mA.			
Insulation Resistance		100 MΩ or more			
Response Time		1.5 ms	20 ms (damper contained)		
Repeatability		Approx. 0.5 %			
Operating Temperature Range		-20 to +70 °C (-4 to 158 °F)			
Setting Fluctuation with Temperature Drift		1% or less of the maximum operating pressure relative to 10 °C change.			
Storage Temperature Range		-40 to +105 °C (-40 to 221 °F)			
Dust-proofness /Water-Proofness		IEC Pub. 529 IP54			
Vibration-resistance		98 m/s ² (322 ft./s. ²) (10 – 55 Hz)			
Shock-resistance		98 m/s ² (322 ft./s. ²)			
Mass		17g (.39 lbs.)			

★ Trimmer Rotation Angle: 0 to 260°

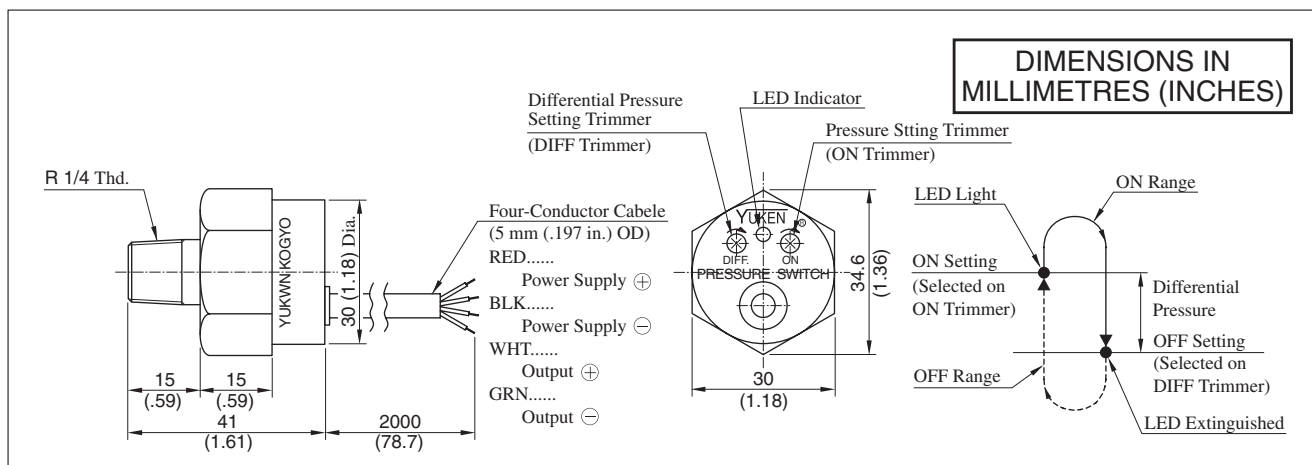
Instructions

Voltage-proof test should not be carried out as semiconductor has been used.



Graphic Symbol



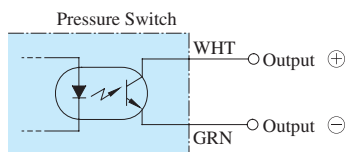


Adjustment

- Before starting, turn the ON and DIFF trimmers fully clockwise. (Trimmer Rotation Angle: 0 – 260°)
- Turn on the power.
- < ON pressure setting >
 Apply required pressure to the switch. Turn ON trimmer slowly anti-clockwise and stop it when LED indicator lights, ON setting obtained.
- < Differential pressure setting >
 Gradually reduce pressure to obtain the required OFF pressure. Then, turn DIFF trimmer anti-clockwise slowly and stop it when LED indicator goes off. The OFF setting is now obtained.
- Make sure if "ON" or "OFF" setting is correct by working of LED indicator when applying or reducing pressure repeatedly several times.

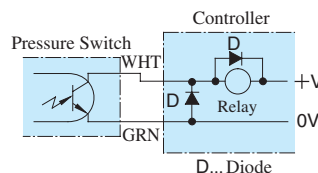
Application Examples of Electrical Circuit

Output Circuit of Semiconductor Type Pressure Switch (Internal Circuit)



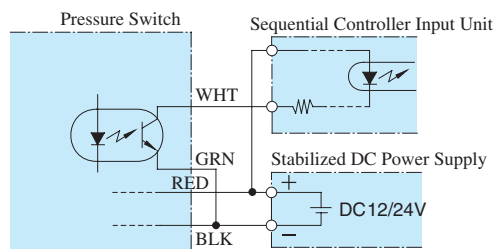
Direct Relay Drive

- Use relay operable at 100 mA or lower.
- Connect surge voltage absorption diode (D) in parallel with the relay coil.
- Connect protective diode (D) between the white and green wires.

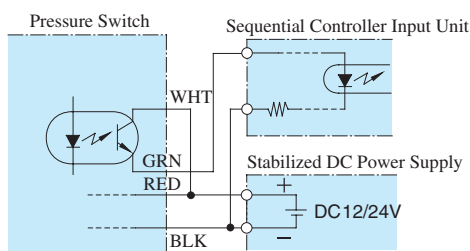


Connection to Sequential Controller

1. Sink System



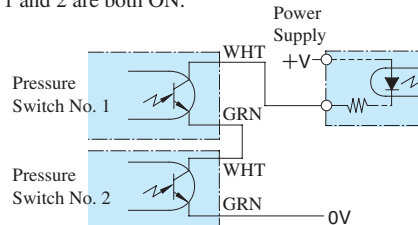
2. Source System



The usage below is possible because output circuit is insulated by a photocoupler.

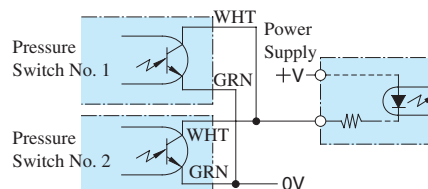
1. When AND circuit Two Pressures

The sequential controller is signaled only when pressure switches No. 1 and 2 are both ON.



2. When OR circuit two pressures

The sequential controller is signaled when either of pressure switches No. 1 and 2 is ON.



Pressure Monitoring System

The pressure monitoring system is for watching hydraulic system pressure and is composed of highly reliable pressure sensor (SJT*-02-10) and easy-to-use digital pressure monitor (DP*-*-10). There is no specific model number code for the pressure monitoring system itself, therefore, when ordering, specify the digital pressure monitor and pressure sensor with respective model number code.

Remote pressure indication

Even if the monitor is located away from the unit, remote pressure indication can be obtained by combination with special sensors.

Remote-setting pressure sensors

The pressure sensor can be used as a pressure switch with two contacts: top and bottom. Pressure can be set and checked without using any other pressure gauge, moreover, such pressure setting and pressure check can be made when no pressure is applied in the hydraulic system.



Digital Pressure Monitors

The digital pressure monitor indicates the system pressure and also despatches signals when the system pressure reaches to the preset pressure. The monitor can be separated from the sensor and installed away from the sensor. The monitor and the sensor so separately installed can be connected by wire, therefore, a long hydraulic piping is not required. The digital pressure monitor provides high accuracy when it is used with a special pressure sensor (SJT*-02-10).



Specifications

Model Numbers	Input Voltage	Output System	Pressure setting
DP20*-*-10	0 – 4.5V / 0 – 19.6 MPa (0 – 4.5V / 0 – 2842 PSI)	Open-collection output × 2, 40 V - 100 mA (max.)	Total 4 points: high (HI) and low (LO) limits for 2 channels (each set independently)
DP35*-*-10	0 – 4.5V / 0 – 34.3 MPa (0 – 4.5V / 0 – 4974 PSI)		

Pressure Sensor

The pressure sensor uses semiconductors and has no moving parts for high reliability and durability. It provides high accuracy when combined with the special monitor (DP*-*-10).

Specifications

Model Numbers	Rated Pres. Range	Output Range *	Power Supply
SJT20-02-10	0 – 20 MPa (0 – 2900 PSI)	0.5 – 4.5 V	DC 5.0 ± 0.5 V
SJT35-02-10	0 – 35 MPa (0 – 5080 PSI)		

★ Proportional to supply voltage if this voltage is 5.00 V



Graphic Symbol



• Consult Yuken when detailed material such as dimensions figures is required.



油研工業株式会社

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4ManPro

Elements For Manufacturing Processes



4ManPro

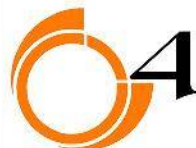
Mexico Branch Office

Elements For Manufacturing Processes

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Manufacturing Processes*