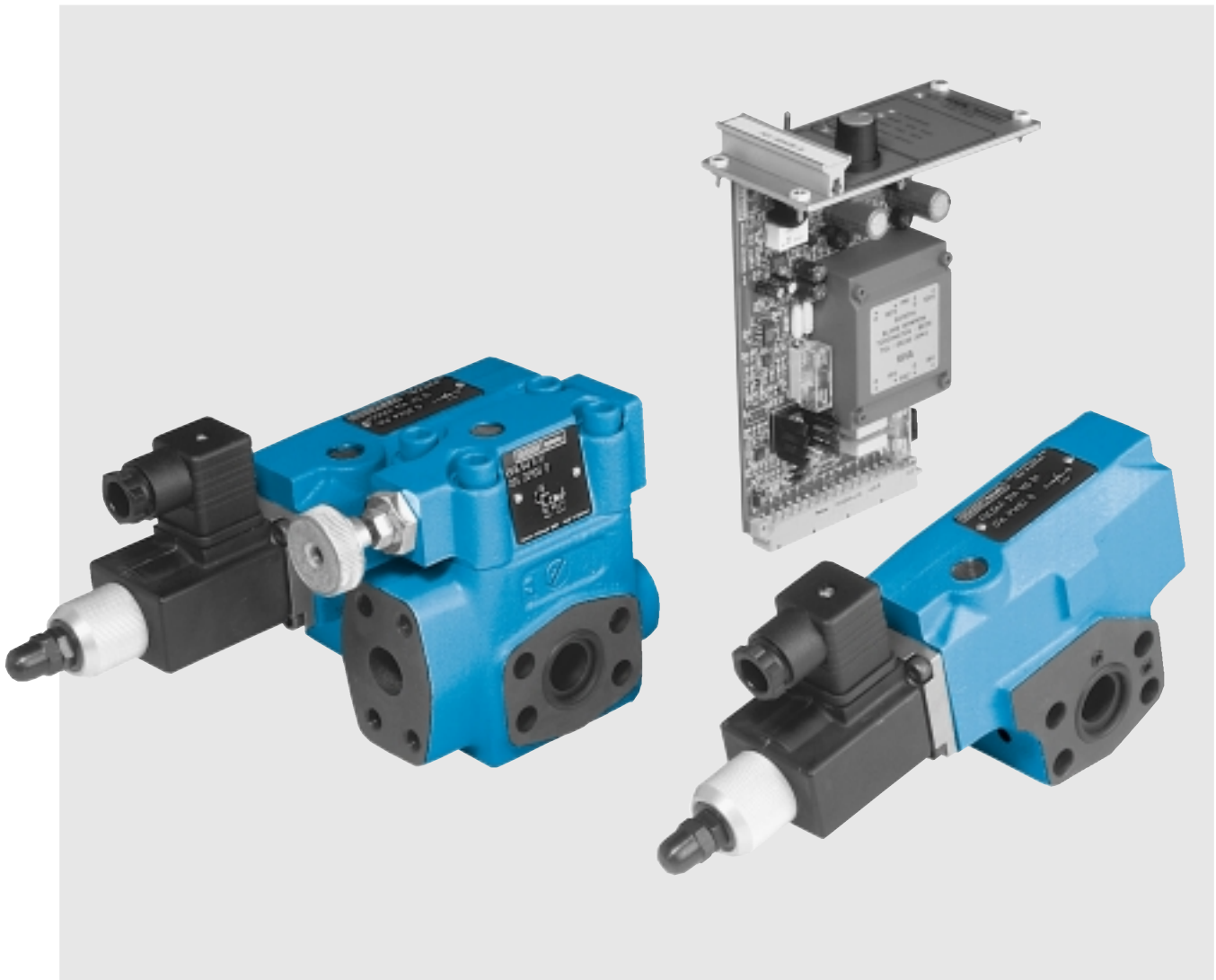


# **DENISON HYDRAULICS**

## **Proportional Throttle Valve Series F5C and Compensators Series R5A, R5P**



Publ. 5-EN 4200-C (dig.)

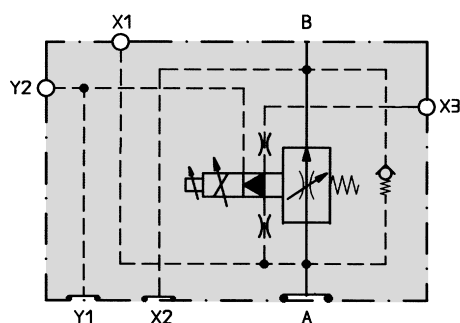
## FEATURES, DESCRIPTION, SYMBOL FOR F5C

### FEATURES

- **Increased Safety** – Flanged mounted valves F5C, R5A and R5P as illustrated in this bulletin are designed for improved operational safety and reduced mounting costs. The valves can be mounted directly on a SAE pump, motor or cylinder flange ensuring maximum precision in flow adjustment and eliminating costly piping.
- **Outstanding Stack Feature** – Together with pressure controls series R5\*, check valves C5V, C5P and seat valves series D5S, these valves enable a "stack system" as illustrated on page 23 and no additional piping is required.
- **High Performance** – Three valve sizes from  $\frac{3}{4}$ " to  $1\frac{1}{4}$ " cover a flow range from 0 to max. 380 l/min. The maximum operating pressure is 270 bar for combinations F5C / R5\*.
- **Optional Versatility** – F5C, R5A and R5P valves can be used as flanged body type units as well as for direct mounting on pumps, motors, cylinders or manifolds. The R5A and R5P compensators also are available as cartridge type for individual manifold mounting.

### PROPORTIONAL THROTTLE VALVE F5C

#### SYMBOL

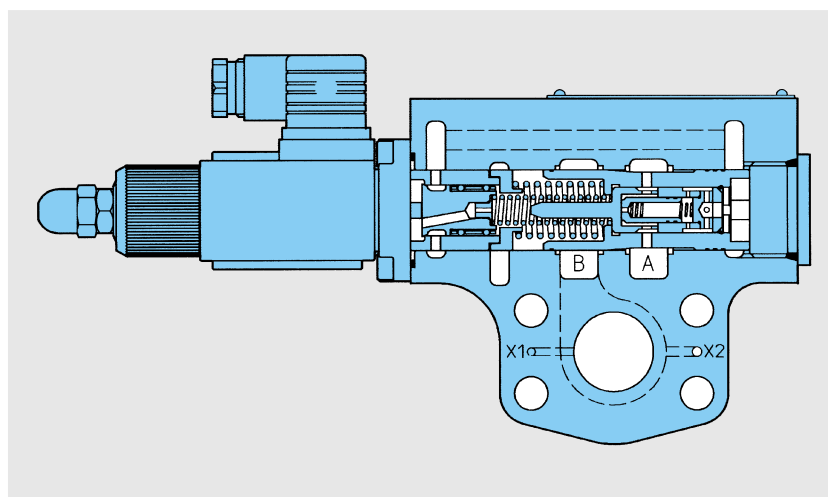


#### DESCRIPTION F5C

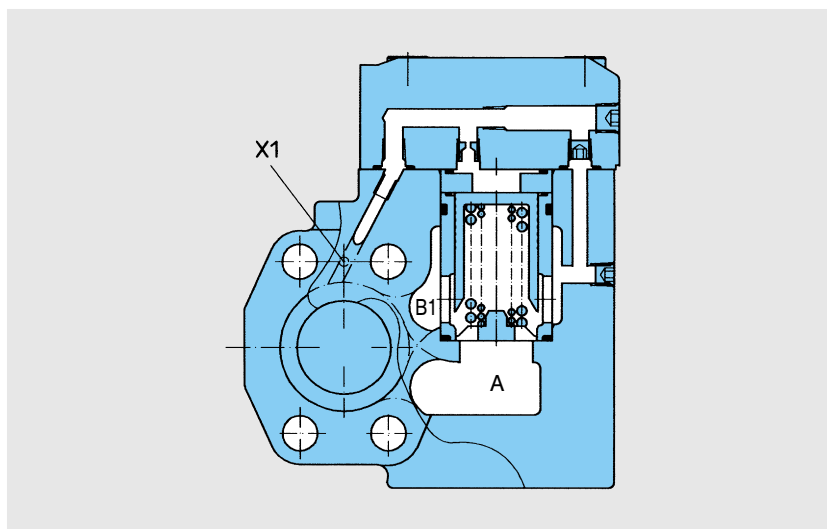
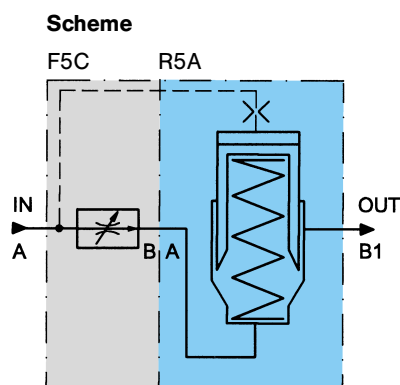
DENISON F5C proportional throttle valves are variable orifices controlled electrically. To achieve the desired flow, pilot and system pressures are balanced by spring and magnetic forces. The electric orifice is governed by a proportional solenoid and is adjusted by direct current for magnetic and pilot pressure variations, and therefore orifice size.

When used the F5C without compensator a pressure drop of 21 bar should not be exceeded.

The outstanding design features allows for high flow stability and precise repeatability.



## 2-PORT COMPENSATOR R5A

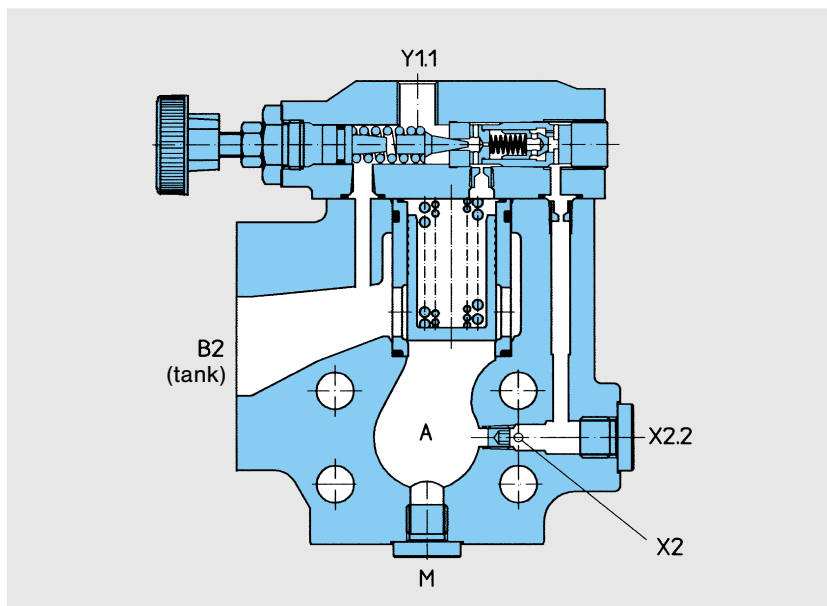
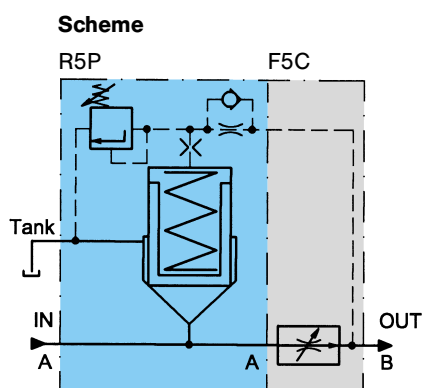


The 2-port pressure compensator R5A in combination with a variable orifice (e.g. F5C as shown in the scheme) constitutes a **2-way flow control valve**, that generates a pressure compensated variable flow. In this configuration the F5C must be externally drained.

Port X1.1 can be selected as measurement port optionally.

Typically 2-way flow control valves are applied in systems with several users, that are controlled simultaneously.

## 3-PORT COMPENSATOR R5P



The 3-port pressure compensator R5P in combination with a variable orifice (e.g. F5C as shown in the scheme) constitutes a **3-way flow control valve**, that generates a pressure compensated variable flow.

3-way pressure compensators have an additional tank port. The loss of energy due to the oil volume going to tank is based only on the load pressure and not on the system relief valve setting.

Directly mounted on a pump, the R5P also fulfills the function of a system pressure relief valve. Ports Y1.1 (R5P) and/or Y2 (F5C) can be selected for external drain optionally.

Typically 3-way flow control valves are applied in systems where only one user is controlled at the same time.

## TECHNICAL DATA

### GENERAL

- Type of mounting SAE 61 flanges
- Port sizes  $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ "
- Mounting position Optional
- Ambient temperature range  $-20^{\circ}\text{C} \dots +55^{\circ}\text{C}$
- Fluid temperature range  $-18^{\circ}\text{C} \dots +80^{\circ}\text{C}$
- Viscosity range 10...650 cSt; optimal 30 cSt

### HYDRAULIC CHARACTERISTICS

Size	F5C		R5A, R5P separate				F5C + R5A			F5C + R5P		
	p <sub>max</sub> (bar)	Spool type	p <sub>max</sub> (bar)	Flow max. (l/min)			p <sub>max</sub> (bar)	nominal $\Delta p$ (bar)	Flow max. to the system (l/min)	p <sub>max</sub> (bar)	nominal $\Delta p$ (bar)	Flow max. to the system (l/min)
$\frac{3}{4}$ "	270	A	350	90			270	8.4	23	270	8.4	23
$\frac{3}{4}$ ", 1"	270	B	350	90	300		270	8.4	45	270	8.4	45
$\frac{3}{4}$ ", 1"	270	1	350	90	300		270	8.4	95	270	8.4	95
1"	270	2	350		300		270	8.4	190	270	8.4	190
1 $\frac{1}{4}$ "	270	3	280			600	270	8.4	280	270	8.4	380

### F5C

Which spool types are recommended for which sizes:

Spool type	Flow at nominal $\Delta p$ <sup>1)</sup>	Flow at max. $\Delta p$ 21 bar	for Sizes		
			06	08	10
A	23 l/min	35 l/min	$\frac{3}{4}$ "	—	—
B	45 l/min	70 l/min	$\frac{3}{4}$ "	1"	—
1	95 l/min	150 l/min	$\frac{3}{4}$ "	1"	1 $\frac{1}{4}$ "
2	190 l/min	300 l/min	—	1"	1 $\frac{1}{4}$ "
3	380 l/min	600 l/min	—	—	1 $\frac{1}{4}$ "

<sup>1)</sup> pressure drop: F5C in combination with R5A, R5P

- Pressure drop  $\Delta p$  max. (for F5C only) 21 bar (F5C applied with pressure drop  $>21$  bar must be combined with pressure compensators R5A or R5P)
- Drain pressure max. 70 bar

### TYPE OF ACTUATOR (for F5C)

- Manual (Trim) By adjusting screw compression of control spring at the rear end of the electrical solenoid
- Turns of adjustment screw 4 turns
- Electrical
- Nominal voltage 12 VDC (at 20 °C)
- Type of current DC, plus dither (optional but recommended)
- Nominal current requirement 220 mA
- Relative operating period 100 %
- Resistance 60  $\Omega$  nominal at 20 °C

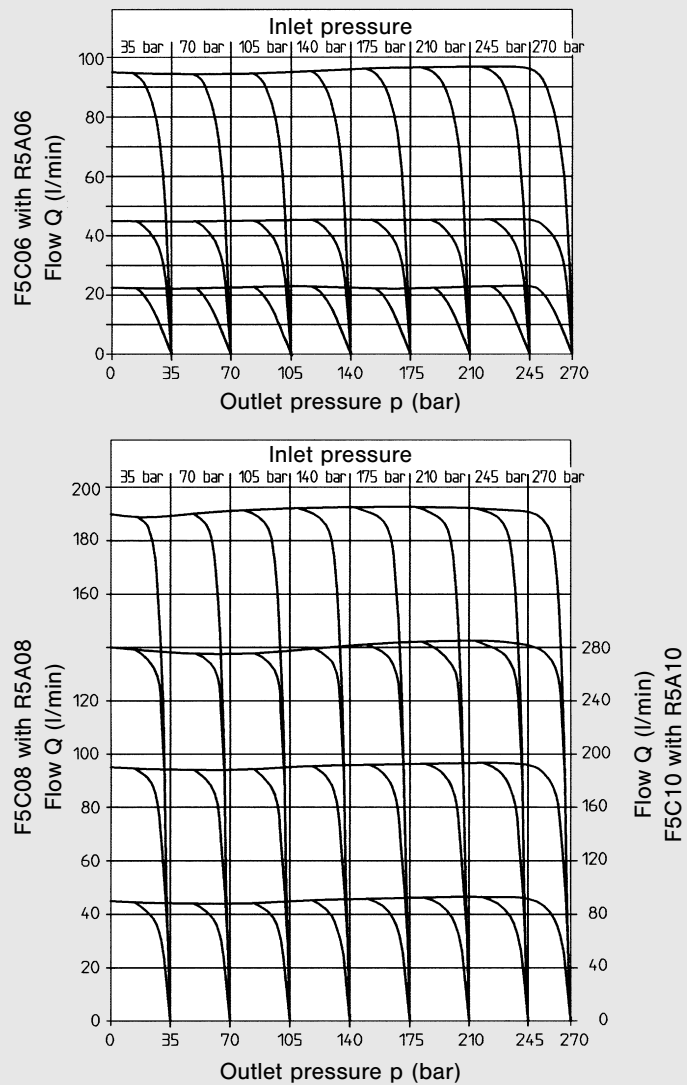
### TYPE OF CONTROL (for F5C)

- Electrical Proportional amplifier (see pages 18...21)

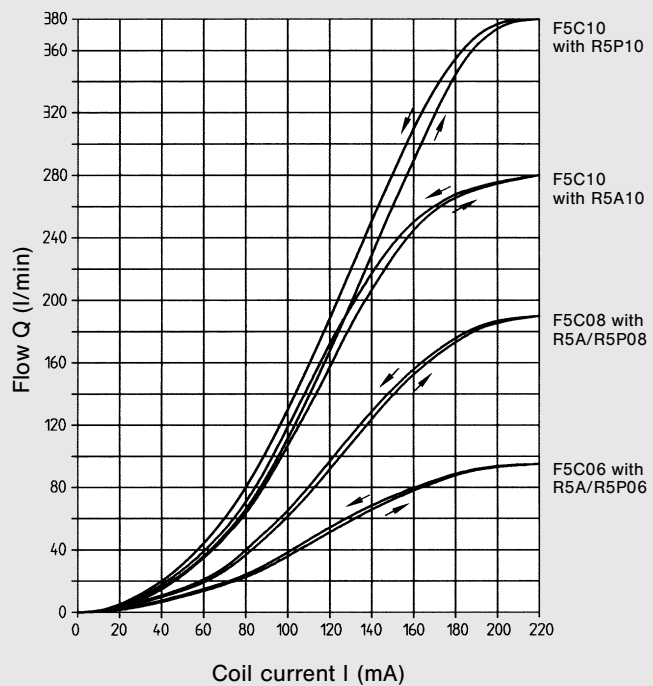
## CURVES

### FLOW – PRESSURE DROP CHARACTERISTICS

(constant inlet pressure, variable outlet pressure)



### FLOW – CURRENT CHARACTERISTICS



## ORDERING CODE FOR F5C – PROPORTIONAL THROTTLE VALVE

### Note:

**F5C = Proportional Throttle Valve** (without compensator)

**F5C + R5A Compensator = 2-Port Proportional Flow Control Valve**

**F5C + R5P Compensator = 3-Port Proportional Flow Control Valve**

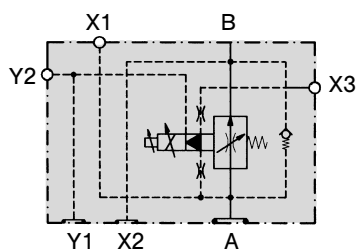
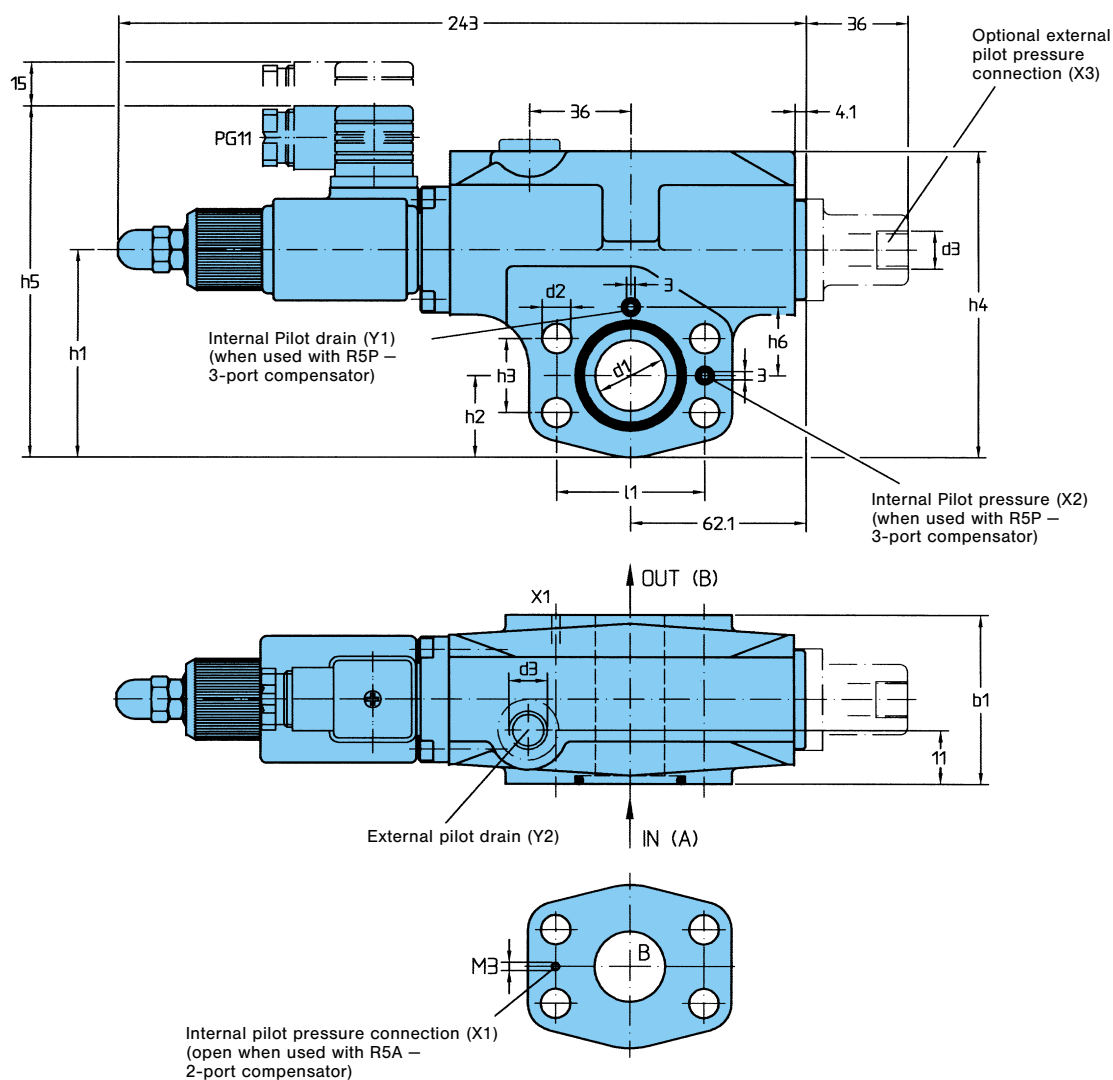
### Model Number:

	F5C	..	(.) –	.	.	.	– 1	.	.	– B	.	–	.
	1	2	3	4	5	6	7	8	9	10	11	12	
<b>1 Series</b>													
F5C = Proportional Throttle Valve													
<b>2 Size</b>													
06 = 3/4" ( 95 l/min)													
08 = 1" (190 l/min)													
10 = 1 1/4" (380 l/min)													
<b>3 Pilot Flow &amp; Response</b>													
A = } see table below													
B = }													
<b>4 Max. Pressure</b>													
3 = 210 bar (with internal check valve only)													
4 = 270 bar (without internal check valve)													
<b>5 Body</b>													
3 = X3, Y2 ports = G 1/4"													
4 = X3, Y2 ports = SAE-4 (7/16"-20 UNF)													
<b>6 Spool</b>													
A = 23 l/min (for size code 06)													
B = 45 l/min (for size codes 06, 08)													
1 = 95 l/min (for size codes 06, 08, 10)													
2 = 190 l/min (for size codes 08, 10)													
3 = 380 l/min (for size code 10)													
<b>7 Adjusting Device</b>													
1 = Proportional solenoid													
<b>8 Pilot Connection</b>													
2 = internal PD – internal PP													
3 = external PD – external PP, (without plug in X1)													
4 = external PD – external PP, (with plug in X1)													
5 = external PD – internal PP, (without plug in X1)													
6 = external PD – internal PP, (with plug in X1)													
} see page 7 for details													
<b>9 Accessories</b>													
0 = without													
C = with internal check valve (max. 210 bar)													
<b>10 Design Letter</b>													
<b>11 Seal Class</b>													
1 = N.B.R. (Buna N) Standard													
4 = E.P.R.													
5 = VITON®													
<b>12 Modification</b>													

### Pilot Flow and Response Selection

Model Code	Input Current	Pilot Flow	Max. Response (typical)	Comments
F5C...(Std.)	D.C. + A.C. Dither	1 l/min	350 ms	Standard valve for low pilot flow loss not recommended for use without A.C. Dither
F5C...A	D.C. + A.C. Dither	2 l/min	250 ms	Recommended for best overall performance
F5C...B	D.C. + A.C. Dither	2 l/min	150 ms	Maximum spool response but with maximum spool overshoot

## F5C – PROPORTIONAL THROTTLE VALVE



- open
- ⊗ closed
- closed by counterpart

### Dimensions

Pilot connections Code	F5C without com- pensators R5A, R5P	F5C for combination with R5A	F5C for combination with R5P
2 = internal PD (Y) internal PP (X)	X1, X3, Y2 ⊗ X2, Y1 ●		X1, X3, Y2 ⊗ X2, Y1 ○
3 = external PD (Y) external PP (X)		X1, X3, Y2 ○ X2, Y1 ●	
4 = external PD (Y) external PP (X)	X3, Y2 ○ X1 ⊗ X2, Y1 ●		X2, X3, Y1, Y2 ○ X1 ⊗
5 = external PD (Y) internal PP (X)		X1, Y2 ○ X3 ⊗ X2, Y1 ●	
6 = external PD (Y) internal PP (X)	X1, X3 ⊗ X2, Y1 ● Y2 ○		X1, X3 ⊗ X2, Y1, Y2 ○

	l1	b1	h1	h2	h3	h4	h5	h6	d1	d2	d3	Weight
F5C06 (3/4")	47.6	60	68.2	26.0	22.2	103.2	119.2	20.8	19	10.5	G 1/4"	3.9 kg
F5C08 (1")	52.4	60	73.6	29.0	26.2	108.6	124.6	24.3	25	10.5	or	4.1 kg
F5C10 (1 1/4")	58.7	75	83.5	36.5	30.2	118.5	134.5	29.3	32	12.5	SAE-4	5.8 kg

## ORDERING CODE FOR R5A – 2 PORT COMPENSATOR

### Note:

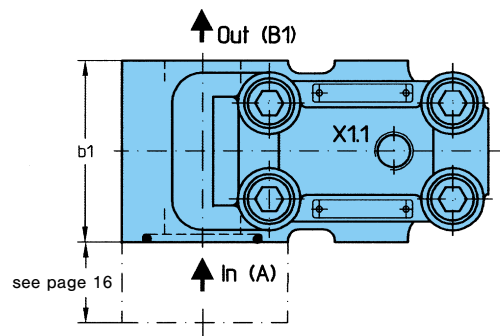
**R5A + F5C = 2-Port Proportional Flow Control Valve**

**Model Number:**

	R5A	..	-	.	.	-	..	B	.	-
	1	2	3	4	5	6	7	8	9	
<b>1 Series</b> _____ R5A = 2-Port Compensator	1	2	3	4	5	6	7	8	9	
<b>2 Size</b> _____ 06 = 3/4" 08 = 1" 10 = 1 1/4"		2	3	4	5	6	7	8	9	
<b>3 Max. Pressure</b> (w/o F5C) _____ 0 = 350 bar (for cartridge only) 4 = 280 bar, for 1 1/4" body valve only 5 = 350 bar, for 3/4" & 1" body valve only } SAE 61		2	3	4	5	6	7	8	9	
<b>4 Body</b> _____ 0 = Cartridge 4 = 2-port body		2	3	4	5	6	7	8	9	
<b>5 Top Cap</b> _____ 1 = without X1.1 port (plain cap) (for pilot connection code 01) 2 = X1.1 port = G 1/4" (for pilot connection code 03) 3 = X1.1 port = SAE-4 (7/16"-20 UNF) (for pilot connection code 03)		2	3	4	5	6	7	8	9	
<b>6 Pilot Connection</b> _____ 01 = Internal PP (port X1) <sup>1)</sup> 03 = External PP (port X1.1) <sup>1)</sup> Internal PP connection on flange face to link with inlet port of flow control valve F5C		2	3	4	5	6	7	8	9	
<b>7 Design Letter</b> _____		2	3	4	5	6	7	8	9	
<b>8 Seal Class</b> _____ 1 = N.B.R. (Buna N) Standard 4 = E.P.R. 5 = VITON®		2	3	4	5	6	7	8	9	
<b>9 Modification</b> _____		2	3	4	5	6	7	8	9	



## R5A – 2 PORT COMPENSATOR



\* optional  
(see ordering code page 8)

## Dimensions

9

## ORDERING CODE FOR R5P – 3 PORT COMPENSATOR

### Note:

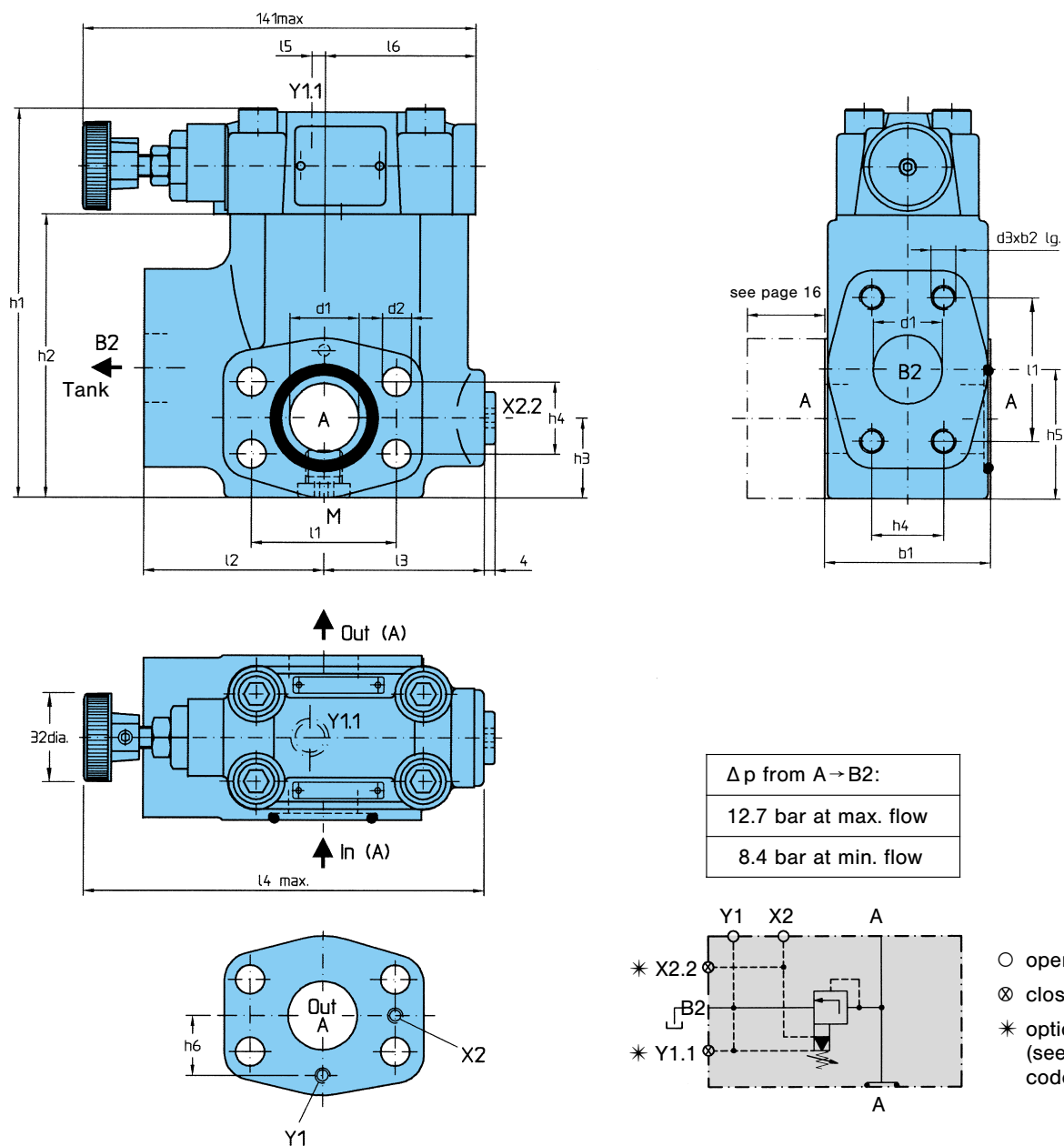
R5P + F5C = 3-Port Proportional Flow Control Valve

Model Number:

	R5P	..	-	.	.	-	.	-	..	-	...	- A	.	-
	1	2	3	4	5	6	7	8	9	10	11	12	13	
<b>1 Series</b> _____ R5P = 3-Port Compensator														
<b>2 Size</b> _____ 06 = 3/4" 08 = 1" 10 = 1 1/4"														
<b>3 Max. Pressure (w/o F5C)</b> _____ 0 = 350 bar (for cartridge only) 4 = 280 bar, for 1 1/4" body valve only 5 = 350 bar, for 3/4" & 1" body valve only } SAE 61														
<b>4 Body Mounting</b> _____  Cartridge with pilot head: 0 = without Y1.1 port (plain cap, only with <b>Pilot Connection</b> code 2) E = Y1.1 port = G 1/4" (only with <b>Pilot Connection</b> code 4) F = Y1.1 port = SAE-4 (only with <b>Pilot Connection</b> code 4)  Flange body with pilot head (Y1 port plugged): 3 = X2.2, Y1.1 <sup>3)</sup> and M ports = SAE-4 } <sup>3)</sup> for <b>Pilot Connection</b> 9 = X2.2, Y1.1 <sup>3)</sup> and M ports = G 1/4" } codes 4 and 6 only  Flange body with pilot head (Y1 port open): P = X2.2, Y1.1 <sup>3)</sup> and M ports = G 1/4" } <sup>3)</sup> for <b>Pilot Connection</b> S = X2.2, Y1.1 <sup>3)</sup> and M ports = SAE-4 } codes 4 and 6 only														
<b>5 Pressure Setting Range</b> _____ 1 = 7...105 bar 3 = 7...210 bar 5 = 7...350 bar														
<b>6 Adjusting Device</b> _____ 1 = Hand knob 32 mm dia. 2 = Hand knob 50 mm dia. (not for version with vent valve VV01 or P2) 3 = Acorn nut with lead seal 4 = Adjusting device with key lock, key order no. 700-70619-8														
<b>7 Pilot Connection</b> _____ 2 = Internal PD – internal PP <sup>1)</sup> plain cap, X2.2 plugged; X2 open 4 = External PD – external PP Y1.1, X2.2 open; X2 plugged 5 = Internal PD – external PP plain cap, X2 plugged; X2.2 open 6 = External PD – internal PP <sup>1)</sup> Y1.1, X2 open; X2.2 plugged <sup>1)</sup> Internal PP connection on flange face to link with outlet port of flow control valve F5C.														
<b>8 3-way Vent Valve VV01</b> _____ 09 = with manual override } Solenoid de-energized: open to tank 10 = without manual override } Solenoid energized: vent line blocked 11 = with manual override } Solenoid de-energized: vent line blocked 12 = without manual override } Solenoid energized: open to tank														
<b>9 Electric Proportional Pressure Control (12 V DC only)</b> _____ P2 = Solenoid de-energized: open to tank. Solenoid energized: valve in function. Only with <b>Pilot Connection</b> codes 4 & 6 (external drain port Y1.1.)														
<b>10 Solenoid Voltage and Current</b> _____ W01 = 115 V / 60 Hz } <sup>2)</sup> G0R = 12 V } W02 = 230 V / 60 Hz } G0Q = 24 V } DC W06 = 115 V / 50 Hz } G0H = 48 V } W07 = 230 V / 50 Hz } <sup>2)</sup> R5P...P2 = 12 VDC only														
<b>11 Design Letter</b> _____														
<b>12 Seal Class</b> _____ 1 = N.B.R. (Buna N) Standard 4 = E.P.R. 5 = VITON®														
<b>13 Modifications</b> _____														

omit  
for version  
without VV01  
& without P2

## R5P – 3 PORT COMPENSATOR



Ports	Function	Port Sizes
A	Inlet/Outlet	3/4", 1", 1 1/4"
B2	Tank	3/4", 1", 1 1/4"
X2	Internal pilot pressure	M3
X2.2	External pilot pressure	G 1/4" or SAE-4 (7/16"-20 UNF)
Y1	Internal pilot drain	M3
Y1.1	External pilot drain	G 1/4" or SAE-4 (7/16"-20 UNF)
M	Pressure gauge	G 1/4" or SAE-4 (7/16"-20 UNF)

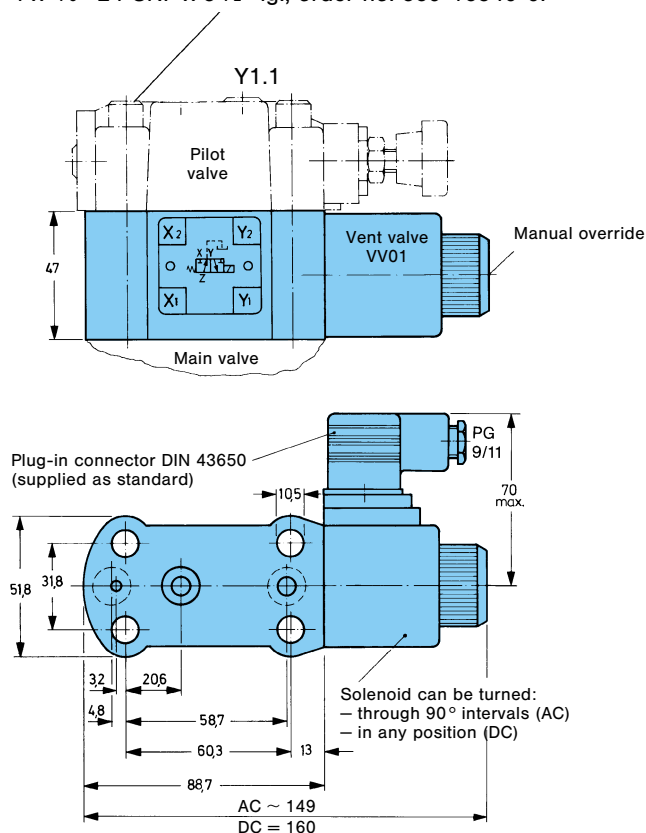
### Dimensions

	l1	l2	l3	l4	l5	l6	b1	b2	h1	h2	h3	h4	h5	h6	d1	d2	d3	Weight
R5P06 (3/4")	47.6	63	56	148.0	1.0	49.0	60	20	119	81.6	28.6	22.2	41.6	20.8	19	10.5	3/8" UNC	3.7 kg
R5P08 (1")	52.4	65	58	144.6	5.0	54.5	60	23	142	103.0	30.6	26.2	48.6	24.3	25	10.5	3/8" UNC	4.4 kg
R5P10 (1 1/4")	58.7	61	62	146.6	3.0	56.5	75	22	149	111.5	34.6	30.2	64.1	29.3	32	12.5	7/16" UNC	5.3 kg

## R5P - COMPENSATOR WITH VENT VALVE VV01

Weight (VV01): 1.7 kg

Screws for additional vent valve installation.  
4 x  $\frac{3}{8}$ "-24 UNF x  $3\frac{1}{2}$ " lg., order no. 359-15340-0.



### Note:

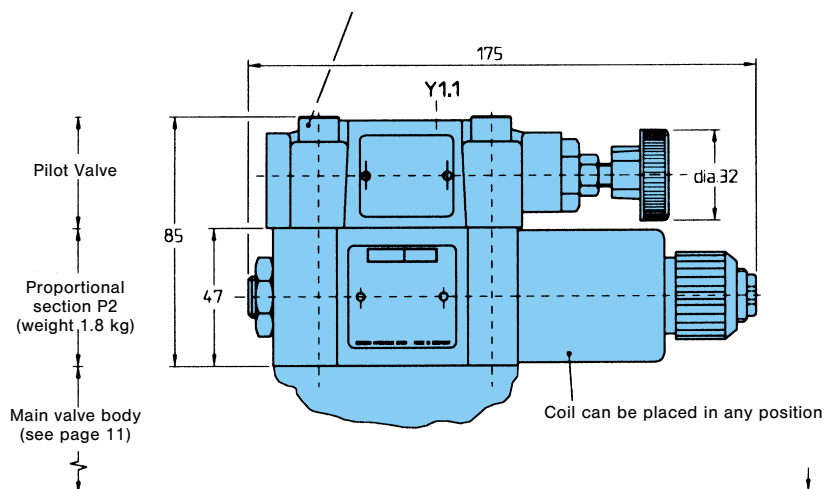
Details for vent valve VV01 see publication 3-EN 215.

### Symbols: R5P with Vent Valve VV01

Code	Internal drain	External drain
11 or 12		
09 or 10		

## PROPORTIONAL 3 PORT COMPENSATOR R5P...P2

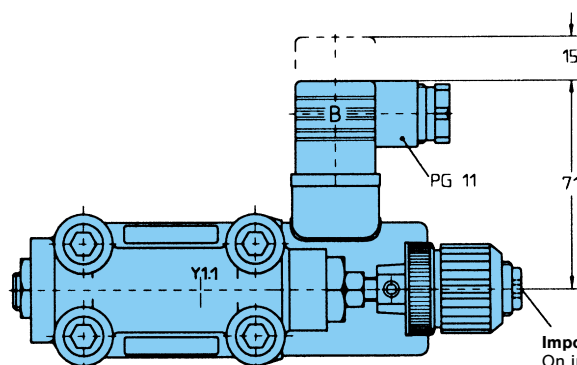
Screws for additional proportional section installation  
4 x  $\frac{3}{8}$ "-24 UNF x  $3\frac{1}{2}$ " lg., Order No. 359-15340-0.



### Drain line

Only external from the pilot head (Y1.1).

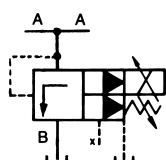
**The pilot drain port must be connected to a stable low pressure tank line. Pressure variations in the drain port should be avoided.**



Distance required to remove plug-in connector. Plug-in connector supplied as standard.

**Important:**  
On initial start up and after long shut down periods bleed air from this plug.

### Symbol



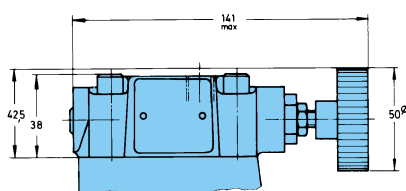
### Note:

See publication 3-EN 2200 for information on Electrical Proportional Control Valve. For additional installation please consult DENISON.

## ADDITIONAL TYPES OF CONTROLS

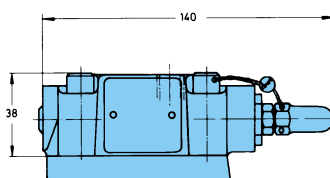
### Type of Control-Code 2

Hand knob 50 mm dia.  
(not for version with vent valve VV01 or P2)



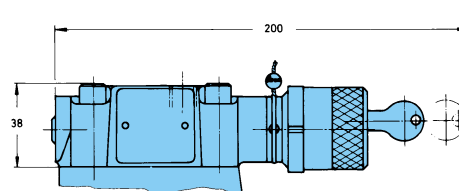
### Type of Control-code 3

Acorn nut with lead seal



### Type of Control-Code 4

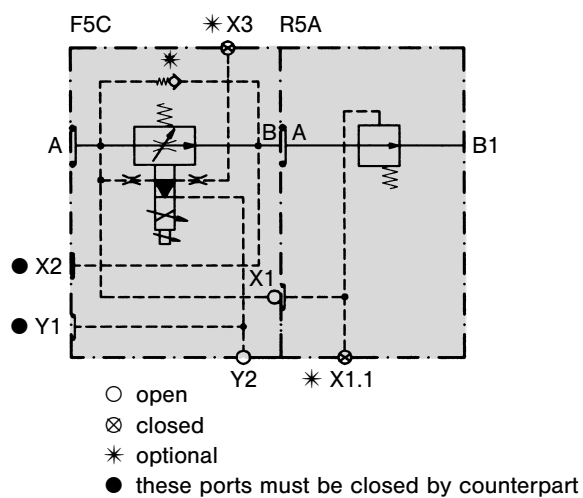
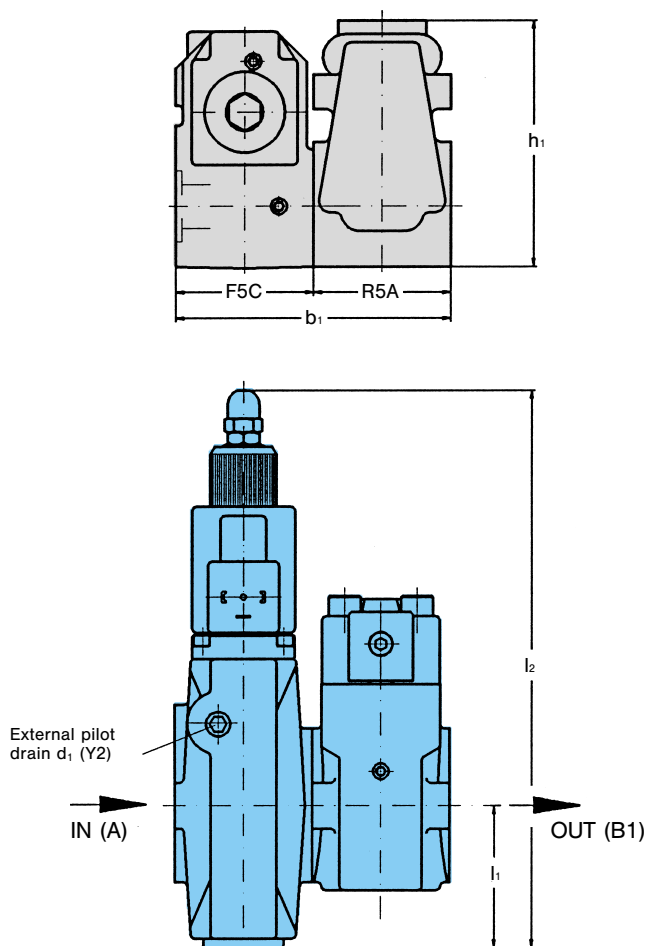
Adjusting device with key lock.  
Key must be ordered separately  
order-no. 700-70619-8



## F5C WITH COMPENSATORS

### F5C with R5A – 2-Port Compensator

For further installation details refer to pages 7 & 9

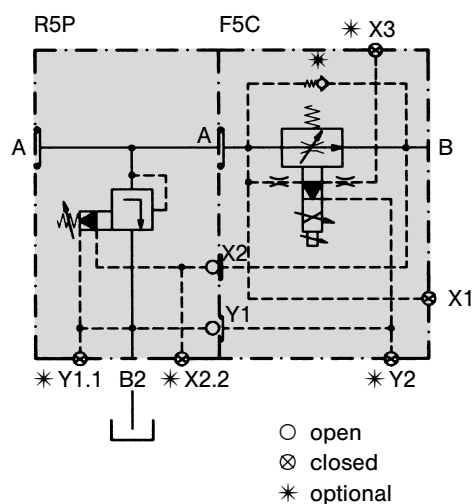
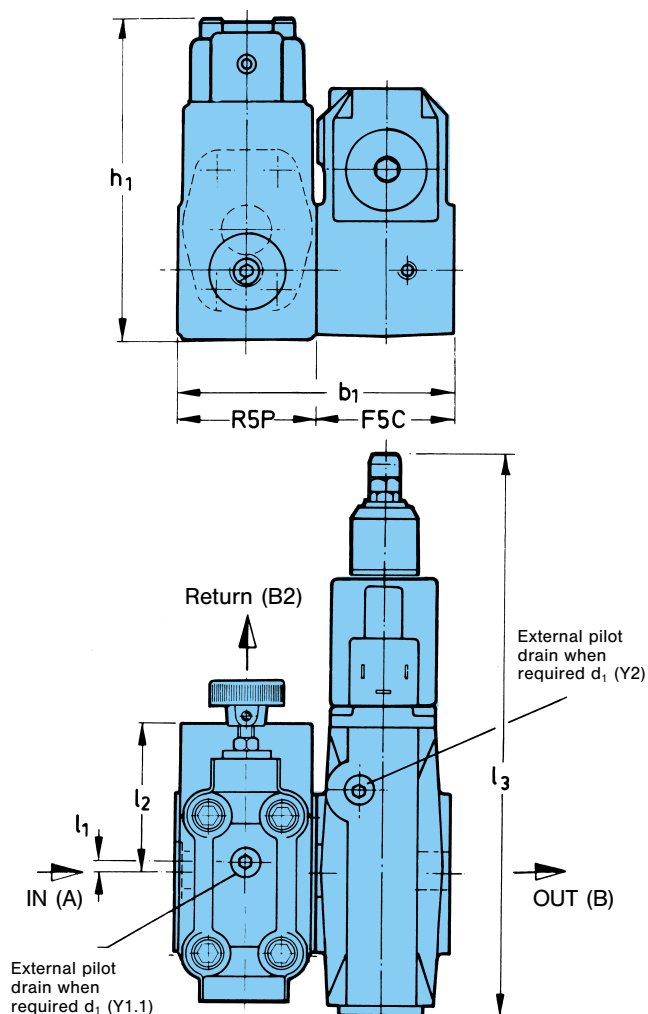


#### Dimensions

Size	$l_1$	$l_2$	$b_1$	$h_1$	$d_1$	Weight
3/4"	62	243	120	107	G 1/4"	7.5 kg
1"				127	or	8.4 kg
1 1/4"			150	135	SAE-4	11 kg

### F5C with R5P – 3-Port Compensator

For further installation details refer to pages 7 & 11

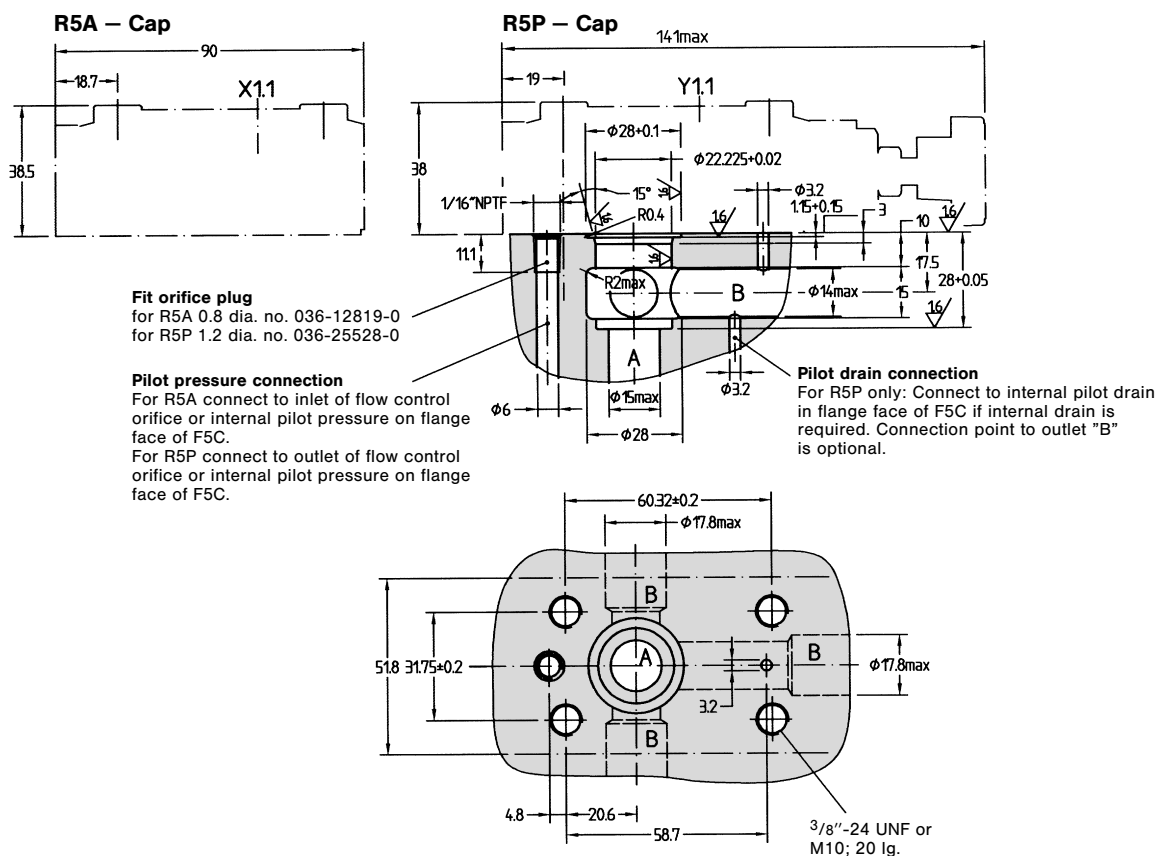


#### Dimensions

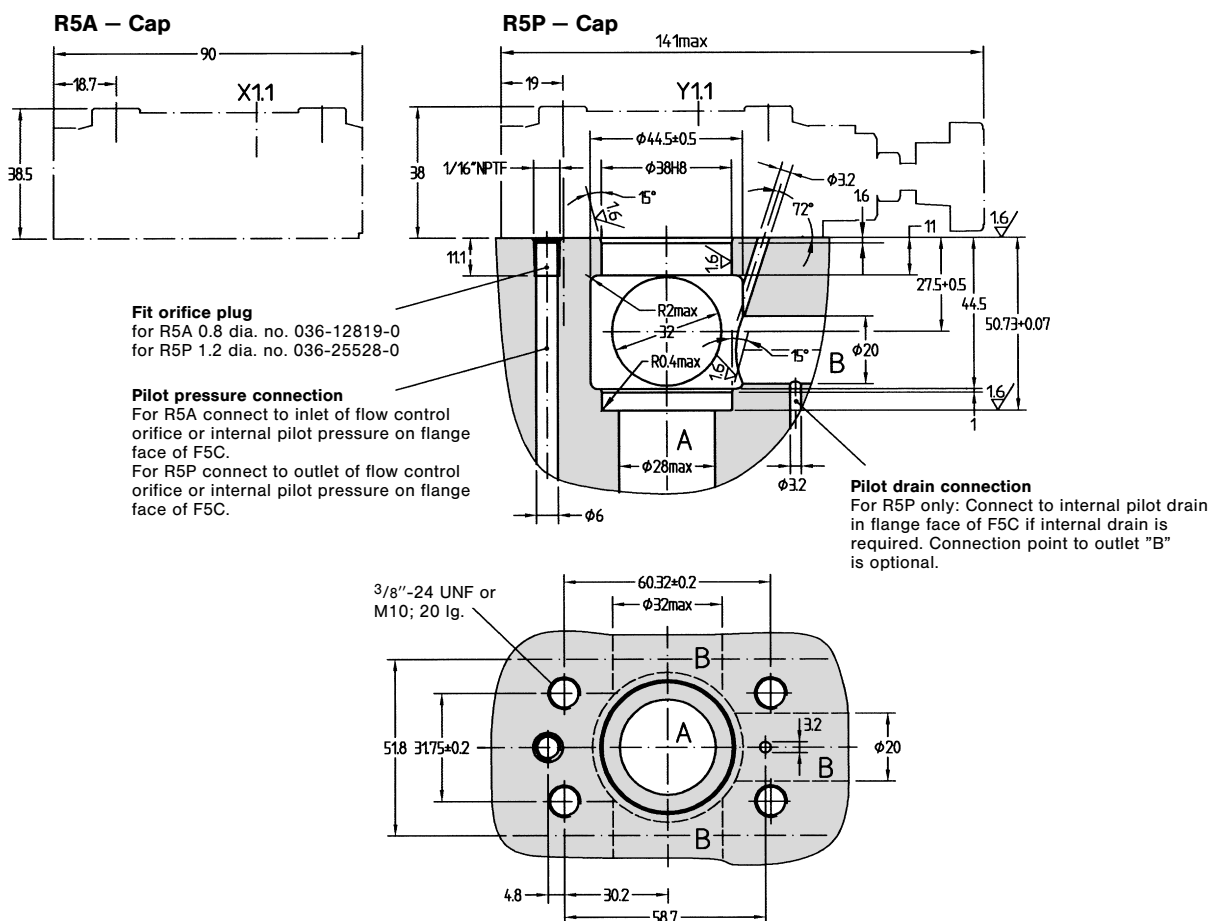
Size	$l_1$	$l_2$	$l_3$	$b_1$	$h_1$	$d_1$	Weight
3/4"	1.0	63	243	120	120	G 1/4"	7.6 kg
1"	5.0	65			143	or	8.5 kg
1 1/4"	3.0	61		150	152	SAE-4	11.1 kg

## R5A / R5P – CARTRIDGES

### R5A / R5P06



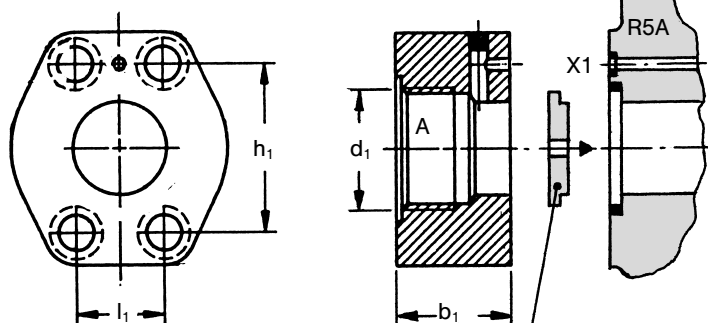
### R5A / R5P08/10



## SAE-FLANGES WITH A-X CONNECTION & ORIFICE PLATES

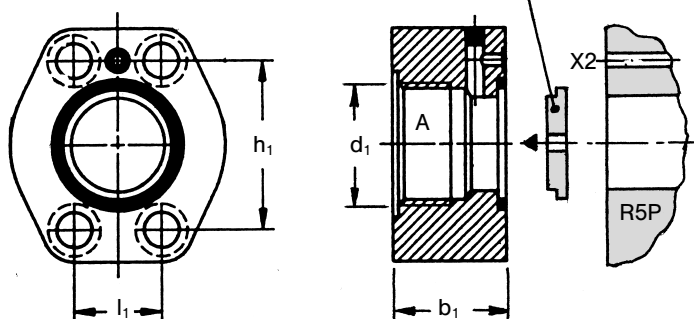
for R5A / R5P as constant flow valve (without F5C flow control valve)

### R5A-Flanges



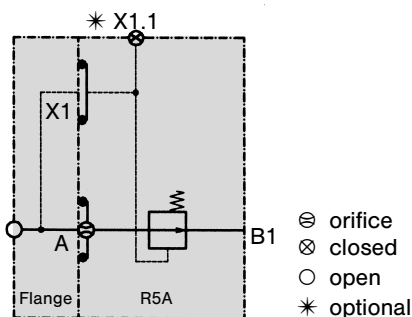
Orifice plate (see diagram and table below) A

### R5P-Flanges



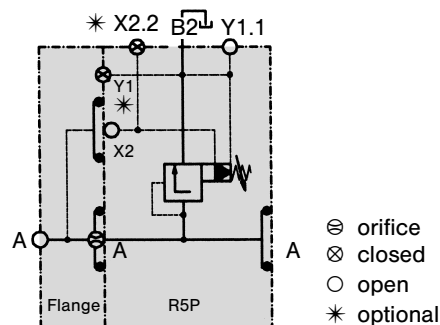
### Flanges

For	Size d <sub>1</sub>	Order no.	b <sub>1</sub>	l <sub>1</sub>	h <sub>1</sub>
R5A06	G 3/4"	S16-98873-0	34	22.2	47.6
R5A08	G 1"	S16-98874-0	34	26.2	52.4
R5A10	G 1 1/4"	S16-98875-0	39	30.2	58.7

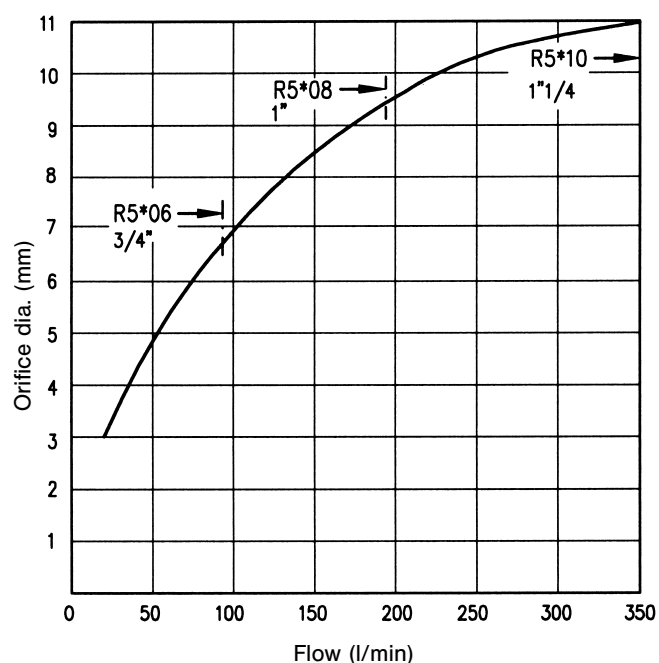


### Flanges

For	Size d <sub>1</sub>	Order no.	b <sub>1</sub>	l <sub>1</sub>	h <sub>1</sub>
R5P06	G 3/4"	S16-39922-0	34	22.2	47.6
R5P08	G 1"	S16-39923-0	34	26.2	52.4
R5P10	G 1 1/4"	S16-39924-0	39	30.2	58.7



The curve below is only to be used to approximate the desired orifice diameter (orifice plate). Select the next smallest orifice diameter (full mm). The diameter adaptation to the desired flow has to be made by the user.



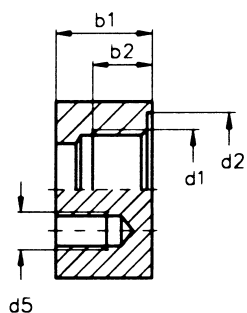
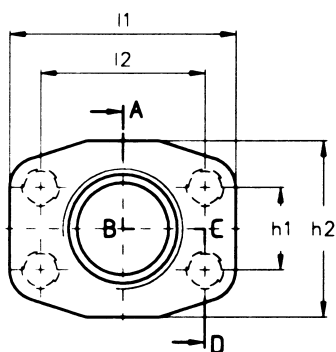
### Orifice plates

Orifice dia. (mm)	3/4"	Order No. 1"	1 1/4"
11.0	—	—	036-84982-0
10.0	—	036-84990-0	036-84981-0
9.0	—	036-84989-0	036-84980-0
8.0	036-84996-0	036-84988-0	036-84979-0
7.0	036-84995-0	036-84987-0	036-84978-0
6.0	036-84994-0	036-84986-0	036-84977-0
5.0	036-84993-0	036-84985-0	036-84976-0
4.0	036-84992-0	036-84984-0	036-84975-0
3.0	036-84991-0	036-84983-0	036-84974-0

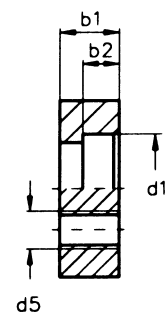


# SAE-FLANGES 3000 PSI (210 BAR)

**Inlet flange**  
(only for  
pipe mounting  
and only with  
UNC thread)

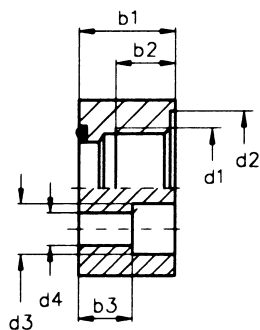
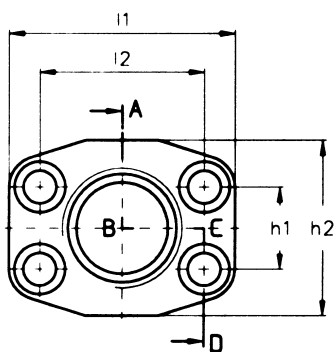


**with G-thread**

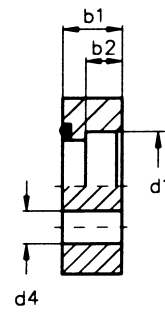


**socket weld**

**Outlet flange**



**with G-thread**



**socket weld**

Port sizes d <sub>1</sub>	Inlet flange (without screws*) only for pipe mounting	Outlet flange (without screws*)												
	Order No.	Order No.	l <sub>1</sub>	l <sub>2</sub>	b <sub>1</sub>	b <sub>2</sub>	b <sub>3</sub>	h <sub>1</sub>	h <sub>2</sub>	d <sub>2</sub> ∅	d <sub>3</sub> ∅	d <sub>4</sub> ∅	d <sub>5</sub>	
G 3/4" 3/4" socket weld	S16-86520-0 S16-86519-0	S16-86529-0 S16-86528-0	67	47.6	34	15.9	22	22.2	52	40	16.5	10.5	3/8" UNC	
					19	12	—				—			—
G 1" 1" socket weld	S16-86523-0 S16-86522-0	S16-86532-0 S16-86531-0	72	52.4	34	20	22	26.2	58	46	16.5			
					24	14	—				—			—
G 1 1/4" 1 1/4" socket weld	S16-86526-0 S16-86525-0	S16-86535-0 S16-86534-0	80	58.7	39	22	24	30.2	73	54	17.5	12.5	7/16" UNC	
					24	14	—				—			—

\* see page 23 for screws

## 350 mA PROPORTIONAL AMPLIFIER

Order No. 701-00526-8



The DENISON 350 mA Proportional Amplifier has been designed to be mounted in rack or enclosure systems as well as the single card holder (see page 22) which use the proven DIN 41612 connector.

The card has all the necessary building blocks built in including the power supplies and signal conditioning which allow fast and accurate control in unidirection in open loop mode.

This version of the card is capable of an output up to a maximum of 350 mA which is adjusted by means of a "Multi Turn Potentiometer" marked as  $I_{max}$ .

This card is supplied as a loose item and comes complete with an attached front panel.

**This card is fitted with an option which allows the internal and external command to be selected by a front panel switch.**

### Characteristics – Proportional Amplifier

• Input supply voltage AC	110 / 240 VAC, 50 / 60 Hz. Selection by onboard switch.
• Input supply voltage DC	24 + 4 / - 3 Volts DC
• Input supply current	Valve current + approx. 100 mA max.
• Reference voltage	+ 12 Volts +/- 5 % at 10 mA max.
• Valve supply voltage	approx. 12 Volts current controlled
• Nominal valve current (12 V solenoid)	220 mA
• Command input values	+ 12 VDC
• Available adjustments (front panel)	$I_{max}$ , ramp up & down, dither frequency & amplitude
• Outputs	$a6 = V+ / a8 = V-$
• External stop	Carry out as normal closed circuit (N.C.) Pin c12: +24 V must be normally applied to operate. Zero volt or open will drive card output to zero.
• Ramp type	linear and continuously variable
• Ramp time up	20 ms...10 s +/- 20 %
• Ramp time down	20 ms...10 s +/- 20 %
• Dither amplitude	DC...9 V R.M.S.
• Dither frequency	10...100 Hz +/- 10 %

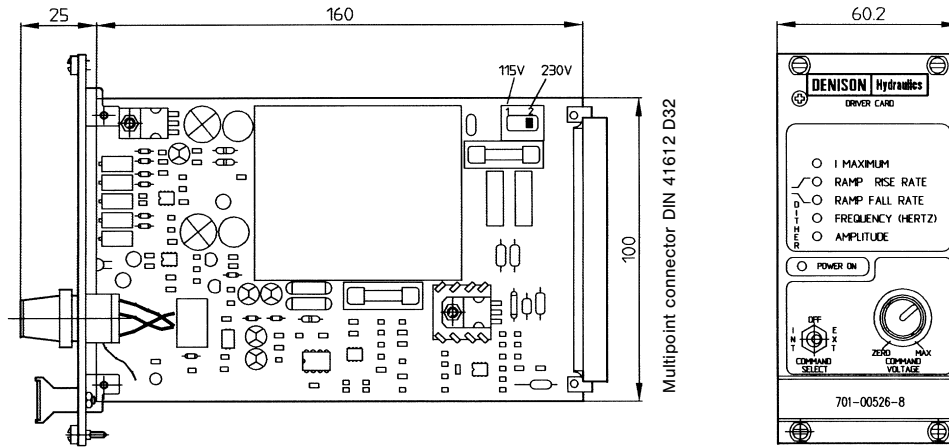
**Note:** Potentiometer, card holder see page 22.

**For replacement of proportional amplifiers with the following order no. please contact DENISON:**

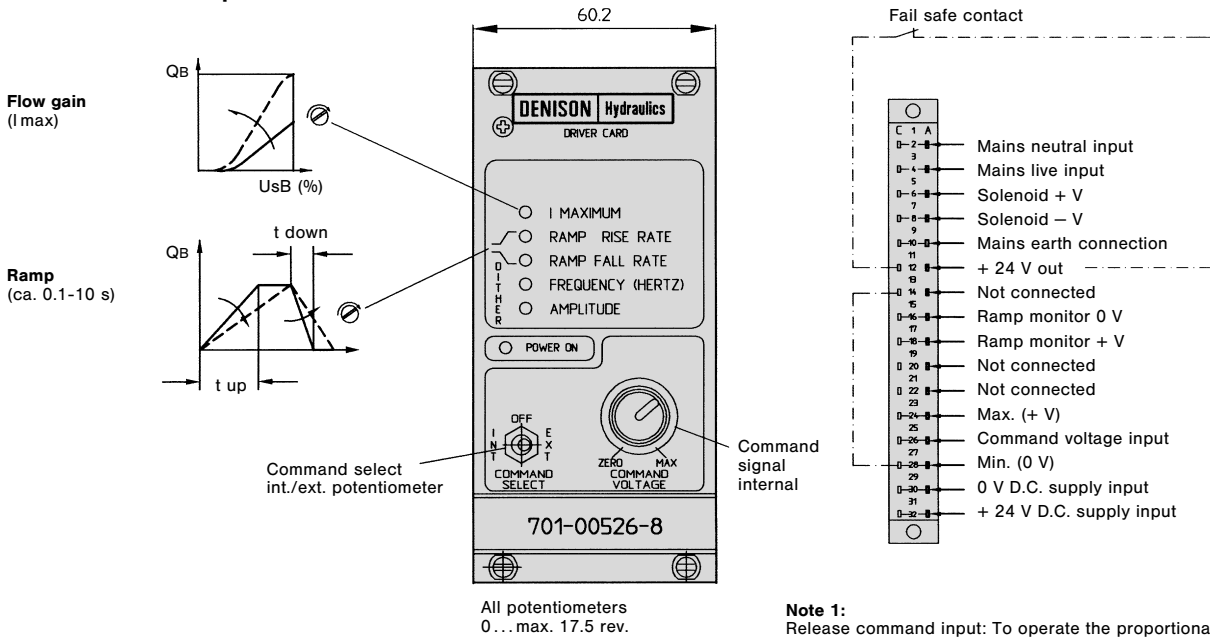
027-27680-0	S17-87097-0	027-30227-0
027-27681-0	017-87099-0	027-30371-0
027-27682-0	S27-22691-0	027-27661-0
027-27646-0	017-95937-0	
027-27084-0	027-27622-0	

## 350 mA PROPORTIONAL AMPLIFIER

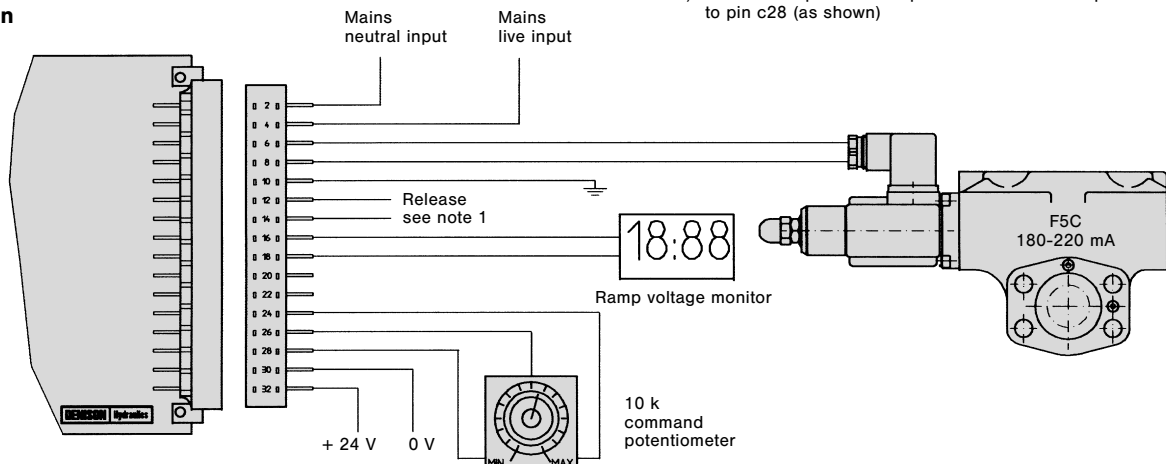
### Dimensions Plug-in module 3U/12HP according to IEC297



### Details on the front panel



### Installation



## F5C DRIVER PLUG

Order No. 701-00506-8



The DENISON F5C Driver Plug has been designed for applications where single output polarity control is required and where a 24 VDC supply is available. The Driver Plug operates the F5C in different systems and applications. For those system adaptations fully variable ramp up / down times and dither frequency and amplitude adjustments have been provided.

This version is housed in a rugged thermo plastic shell which has a "o" ring sealing to give an IP 54 rating when assembled correctly.

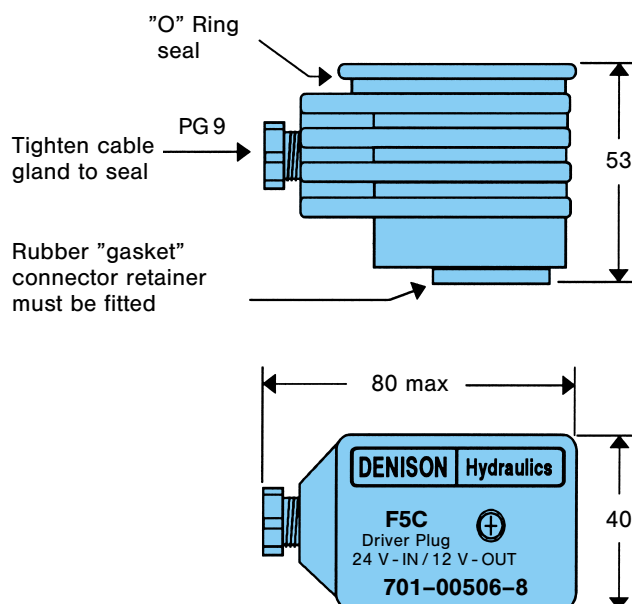
Due to the use of surface mount components, all of the functions and characteristics associated with the normal euro-card controller can be found in this small size valve mounting unit.

### Characteristics – Driver Plug for 12 V Solenoids

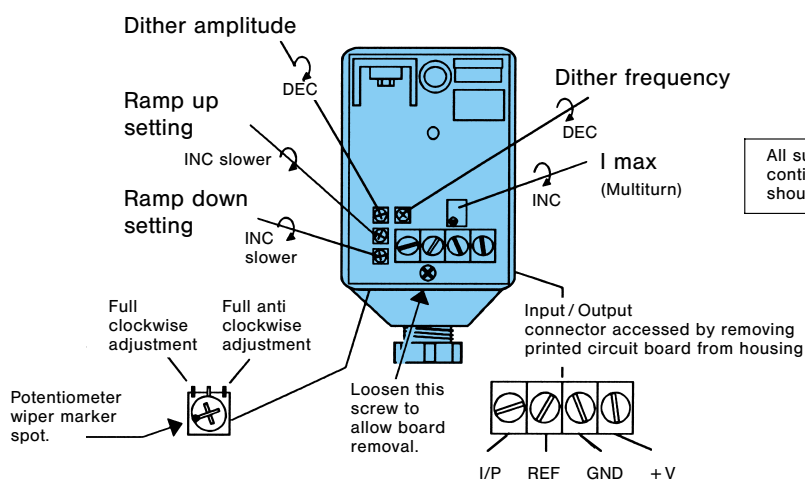
• Board style	DENISON
• Connector type	Standard Hirschmann female outline
• Input supply voltage	24 + 4 / – 3 Volts DC
• Input supply current	Valve current + approx. 50 mA max.
• Reference voltage	+ 12 Volts +/- 5 % at 10 mA max.
• Valve supply voltage	approx. 12 Volts current controlled
• Valve current (12 V solenoid)	220 mA max.
• Command input values	+ 8 V
• Available adjustments (inside)	I <sub>max</sub> , ramp up & down, dither frequency & amplitude
• Ramp type	linear and continuously variable
• Ramp time up	20 ms...10 s +/- 20 %
• Ramp time down	20 ms...10 s +/- 20 %
• Dither amplitude	DC...9 V R.M.S.
• Dither frequency	10...100 Hz +/- 10 %

## F5C DRIVER PLUG

### Dimensions

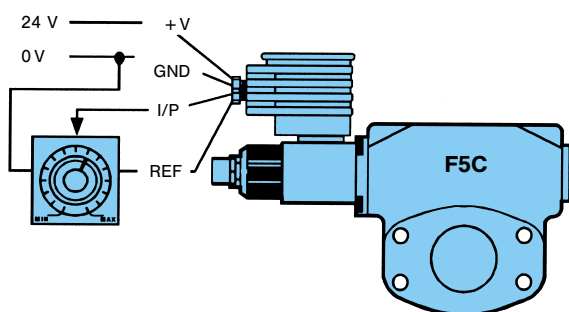


### Details

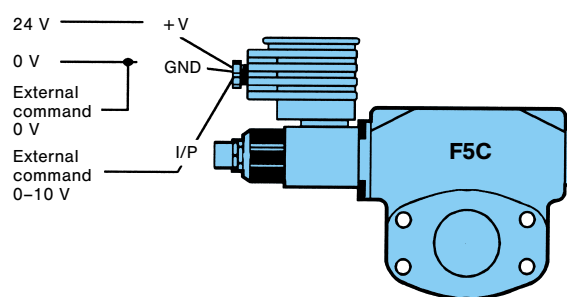


All surface mount potentiometers are continuous rotation variety and care should be taken during setup.

### Installation



Application showing potentiometer connected to internal reference command voltage.

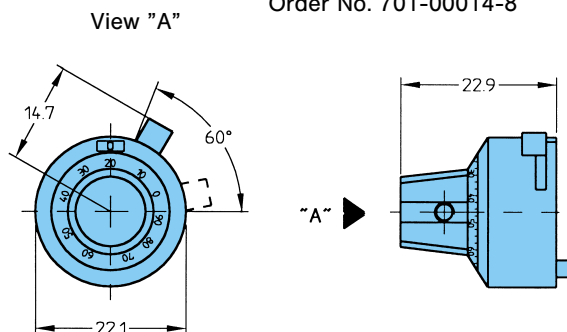


Application showing external command signal connection.

## ACCESSORIES

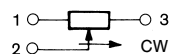
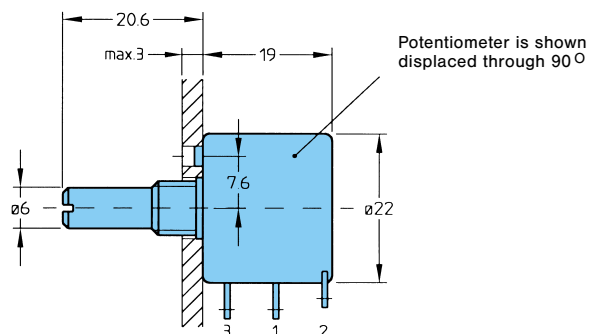
### Potentiometer-Adjusting knob

Order No. 701-00014-8

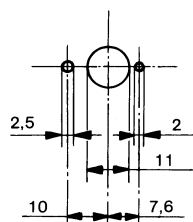


Adjusting knob with scale 0...100  
and with revolution counter.  
Adjustment is lockable.

### Potentiometer 10/4.7 k $\Omega$



### Panel opening

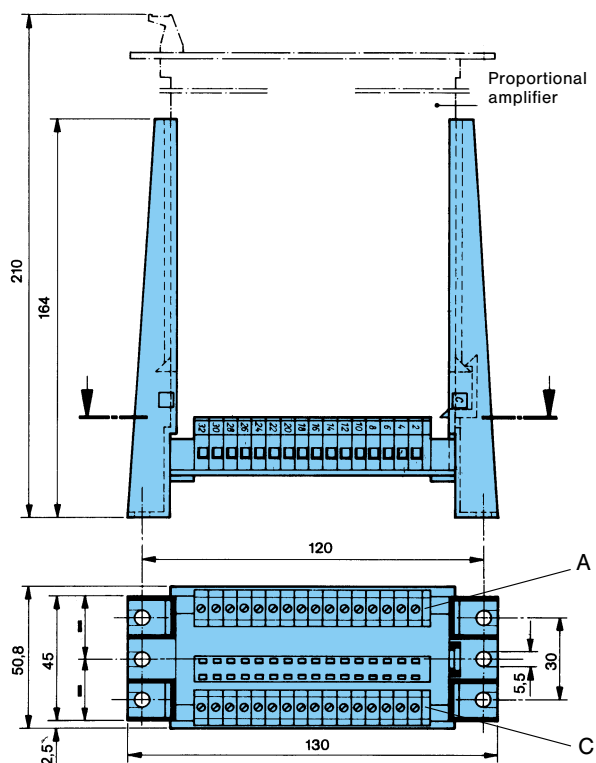


Potentiometer-Characteristics	Potentiometer Order No.	
	761-01001-2	701-00013-8
Angle of rotation	275°	3600°
Linearity	± 0.5 %	± 0.25 %
Resolution-Drift	0.11 % of 275°	0.02 % of 3600°
Value	10 k $\Omega$	4.7 k $\Omega$

### Euro-Card Holder

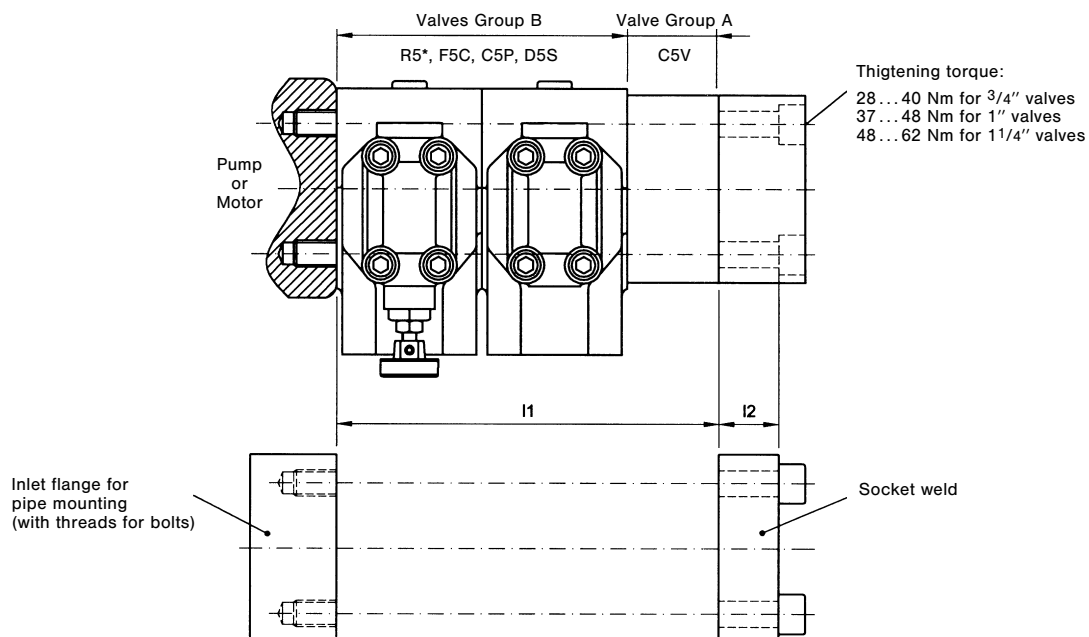
Order No. 701-00007-8

Holder for individual mounting according to DIN 41612



## MOUNTING INSTRUCTION

### Example



	Qty. of valves and group for each stack	I1	I2	UNC-Screws (12.9)		Metric Screws (12.9)	
				Dimension	Order No.	Dimension	Order No.
3/4" SAE 61	1 x A	45	16...22	3/8"-16 x 3 1/4"	358-16330-0	M10 x 80	361-11324-8
	1 x B	60		3/8"-16 x 3 3/4"	358-16350-0	M10 x 95	361-11354-8
	(1 x A) + (1 x B)	105		3/8"-16 x 5 1/2"	358-16420-0	M10 x 140	361-11424-8
	2 x B	120		3/8"-16 x 6"	358-16440-0	M10 x 160	700-70836-8
	(1 x A) + (2 x B)	165		3/8"-16 x 8"	358-16520-0	M10 x 200	700-70821-8
	3 x B	180		3/8"-16 x 8 1/2"	358-16540-0	M10 x 220	361-11494-8
1" SAE 61	1 x A	45	18...24	3/8"-16 x 3 1/4"	358-16330-0	M10 x 80	361-11324-8
	1 x B	60		3/8"-16 x 3 3/4"	358-16350-0	M10 x 95	361-11354-8
	(1 x A) + (1 x B)	105		3/8"-16 x 5 3/4"	358-16430-0	M10 x 140	361-11424-8
	2 x B	120		3/8"-16 x 6 1/4"	358-16450-0	M10 x 160	700-70836-8
	(1 x A) + (2 x B)	165		3/8"-16 x 8"	358-16520-0	M10 x 200	700-70821-8
	3 x B	180		3/8"-16 x 8 1/2"	358-16540-0	M10 x 220	361-11494-8
1 1/4" SAE 61	1 x A	50	21...25	7/16"-14 x 3 1/2"	358-18340-0	M12 x 90	361-12344-8
	1 x B	75		7/16"-14 x 4 1/2"	358-18380-0	M12 x 120	361-12404-8
	(1 x A) + (1 x B)	125		7/16"-14 x 6 1/2"	358-18460-0	M12 x 170	361-12454-8
	2 x B	150		7/16"-14 x 7 1/2"	358-18500-0	M12 x 190	361-12474-8
	(1 x A) + (2 x B)	200		7/16"-14 x 9 1/2"	358-18580-0	M12 x 240	361-12504-8
	3 x B	225		7/16"-14 x 10 1/2"	358-18590-0	M12 x 270	361-12664-8

The product described is subject to continual development and the manufacturer reserves the right to change the specifications without notice.