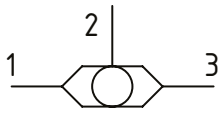
SH

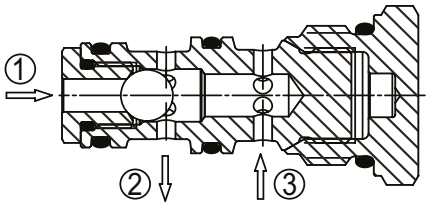
Shuttle Valves

Shuttle Valves
Application Notes

Basic Operation: Load Shuttle Valve

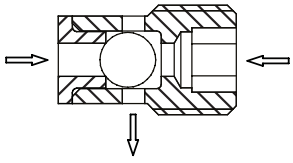
Load shuttle valves sense the higher pressure between two lines and allow a signal to the third port, while blocking the lower pressure port. The valve will sense the pressure difference between port 1 and 3 with the higher pressure referenced to port 2.



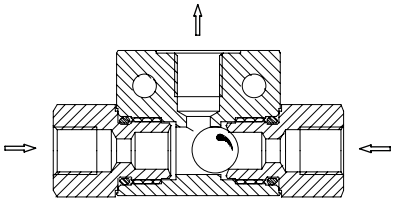


Load Shuttle Valve Types

In addition to cartridge type load shuttle valves, insert and line mounted versions are also available. The insert can be mounted deep within the manifold using the space available efficiently. A line mounted valve can be mounted in the piping when a multi function HIC is not required will sense the pressure difference between port 1 and 3 with the higher pressure referenced to port 2.



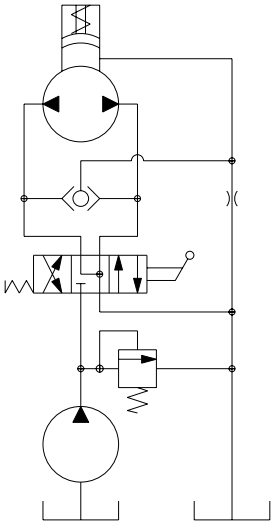
▲Inserted



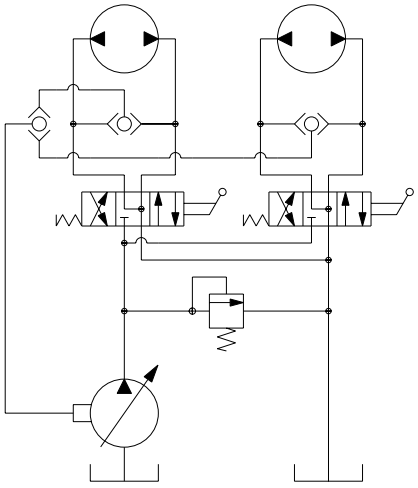
▲Line Mounted

Typical Applications

In addition to cartridge type load shuttle valves, insert and line mounted versions are also available. The insert can be mounted deep within the



▲Brake release



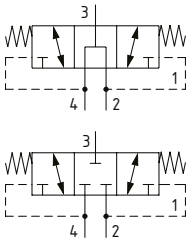
▲Load Sense

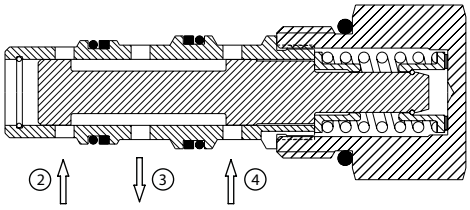
Classified as Business

Shuttle Valves
Application Notes

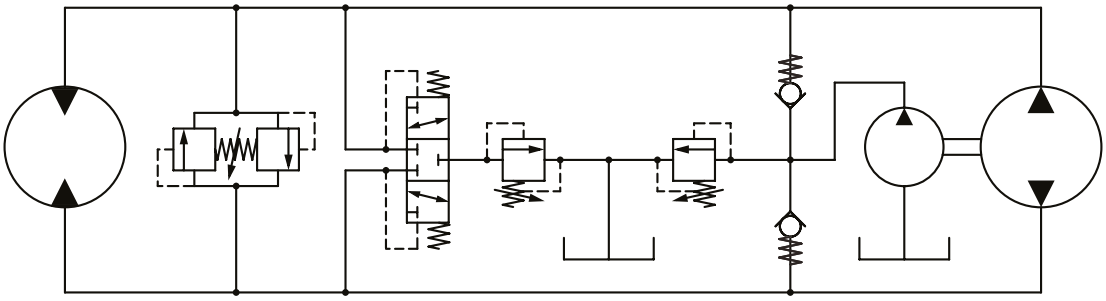
Basic Operation: Hot Oil Shuttle Valves

Hot oil shuttle valves are spool type valves that are internally piloted sensing two pressures and opening the lower pressure port to the outlet while blocking the higher-pressure port. The name is derived from its position in closed loop hydrostatic circuits where the hot oil from the motor outlet is diverted through a cooler. The exhaust flow can be regulated by balancing a purge relief valve setting, normally fitted to port 3 with the charge pump relief pressure. A closed center condition is used where it is important that flow is not lost across the two legs of the Hydrostatic circuit which could potentially delay or make unstable the initial movement of the machine. An open centre condition may be used where pressure spikes across the Hydrostatic circuit need to be avoided especially during rapid reversal.



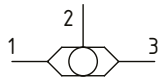
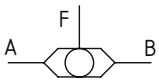
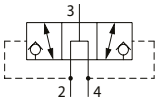
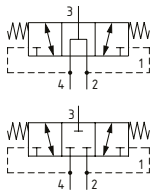
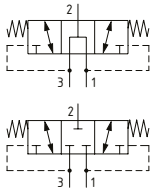


Typical Applications



Closed loop Hydrostatic transmission flushing circuit.

Shuttle Valves
Quick reference

Shuttle Valves	Model No.	Cavity	Description	Flow*	Pressure	Page
	CP124-1	CP04-3	Load Shuttle Valve	3.7 l/min [1 US gpm]	350 bar [5000 psi]	5
	SV 04	NCS04/3	Load Shuttle Valve	15 l/min [4 US gpm]	315 bar [4600 psi]	6
	CP128-1	SDC08-3	Load Shuttle Valve	22 l/min [5.8 US gpm]	315 bar [4600 psi]	7
	CP120-4	SDC10-3	Load Shuttle Valve	25 l/min [7 US gpm]	330 bar [4800 psi]	8
	SV 06	NCS06/3	Load Shuttle Valve	48 l/min [12.7 US gpm]	350 bar [5000 psi]	9
	1SH10	A16927	Load Shuttle Valve, Insert type	20 l/min [5 US gpm]	350 bar [5000 psi]	10
In-line Shuttle Valves	**Model No.**	**Cavity**	**Description**	**Flow***	**Pressure**	**Page**
	VS 06	N/A	Load Shuttle Valve, Line Mounted, 1/4 BSP	35 l/min [9 US gpm]	350 bar [5000 psi]	11
	VS 10	N/A	Load Shuttle Valve, Line Mounted, 3/8 BSP	45 l/min [12 US gpm]	350 bar [5000 psi]	12
Shuttle Valves	**Model No.**	**Cavity**	**Description**	**Flow**	**Pressue**	**Page**
	SH08-R	SDC08-4	Load Shuttle Valve, Reverse Direction	5 l/min [1.3 US gpm]	230 bar [3300 psi]	13
Hot Oil Shuttle Valves	**Model No.**	**Cavity**	**Description**	**Flow***	**Pressure**	**Page**
	CP720-3	SDC10-4	Hot Oil Shuttle Valve	25 l/min [7 US gpm]	350 bar [5000 psi]	14
Hot Oil Shuttle Valves	**Model No.**	**Cavity**	**Description**	**Flow***	**Pressure**	**Page**
	CP721-3	CP12-3M	Hot Oil Shuttle Valve	90 l/min [24 US gpm]	350 bar [5000 psi]	15
	HS12	CP12-3M	Hot Oil Shuttle Valve	80 l/min [21 US gpm]	450 bar [6500 psi]	16

*Flow ratings are for reference only. Refer to individual product page for performance information.

Shuttle Valves

CP124-1

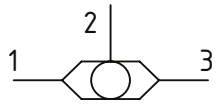
Load Shuttle Valve

350 bar [5000 psi] • 3.7 l/min [1 US gpm]

DESCRIPTION AND OPERATION

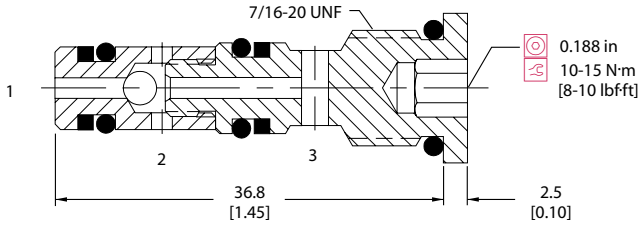
This valve senses the higher of the two input pressures at ports 1 and 3 and routes it to the output port 2.

SCHEMATIC



DIMENSIONS

mm [in]

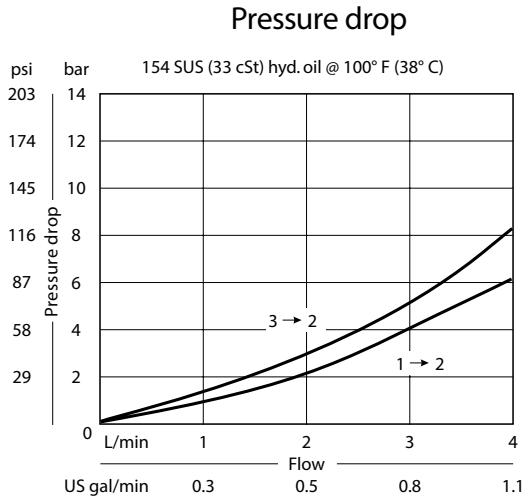


PERFORMANCE DATA

Rated pressure*	**350 bar [5000 psi]**
Rated flow at 7 bar [100psi]	**3.7 l/min [1 US gpm]**
Leakage	6 drops/min @ Rated pressure
Weight	0.02 kg [0.04 lb]
Cavity	CP04-3

*Rated pressure based on NFPA fatigue test standard [at 1 million cycles]

PERFORMANCE CURVES



MODEL CODE

CP124 - 1 - B - 4S

Seal Option

Code	Seal kit
B-Buna-N	120111
V-Viton	120282

Housing

Code	Ports & Material	Housing Model Code
0	No Housing	No Housing
2B	Al, 1/4 BSP	CP04-3-2B
4S	Al, #4 SAE	CP04-3-4S

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].
* Additional housings available

Shuttle Valves

SV 04

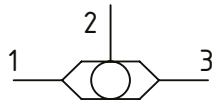
Load Shuttle Valve

315 bar [4600 psi] • 15 l/min [4 US gpm]

DESCRIPTION AND OPERATION

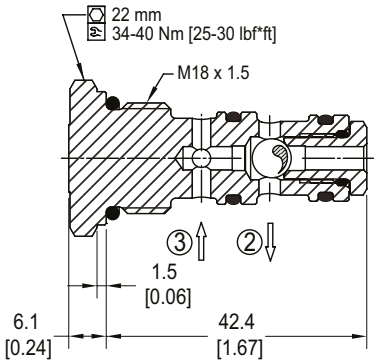
This valve senses the higher of the two input pressures at ports 1 and 3 and routes it to the output port 2.

SCHEMATIC



DIMENSIONS

mm [in]

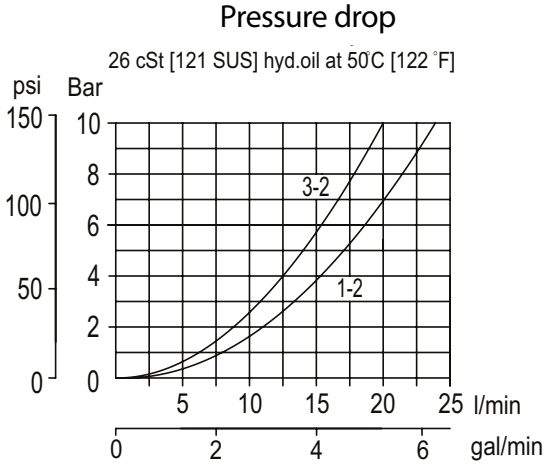


PERFORMANCE DATA

Rated pressure*	**315 bar [4600 psi]**
Rated flow at 7 bar [100psi]	**15 l/min [4 US gpm]**
Leakage	6 drops/min @ Rated pressure
Weight	0.07 kg [0.15 lb]
Cavity	NCS04/3

*Rated pressure based on NFPA fatigue test standard [at 1 million cycles]

PERFORMANCE CURVES



MODEL CODE

SV04 - 00 - V

Housing

Code	Ports & Material	Housing Model Code
00	No Housing	No Housing
SE1/4	AL, 1/4 BSP	NCS04/3-SE-1/4
SE4S	AL, #4 SAE	NCS04/3-SE-4S
SE6S	AL, #6 SAE	NCS04/3-SE-6S

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].
* Additional housings available

Seal Option

Code	Seal kit
B-Omit	230000160
V-Viton	230000450

Shuttle Valves
CP128-1

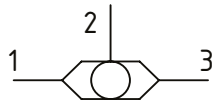
Load Shuttle Valve

315 bar [4600 psi] • 22 l/min [5.8 US gpm]

DESCRIPTION AND OPERATION

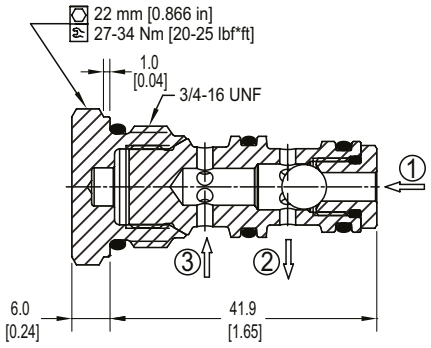
This valve senses the higher of the two input pressures at ports 1 and 3 and routes it to the output port 2.

SCHEMATIC



DIMENSIONS

mm [in]

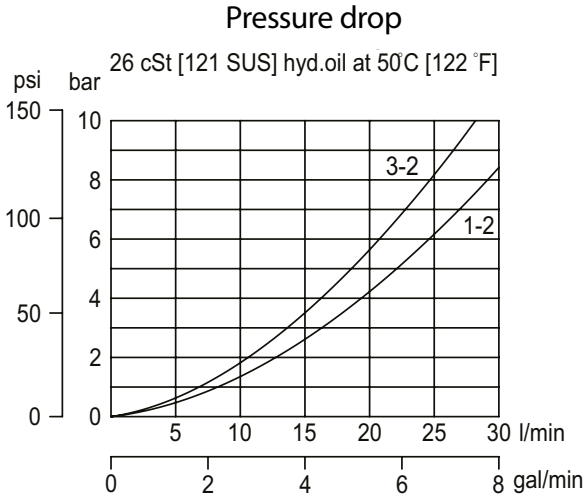


PERFORMANCE DATA

Rated pressure*	**315 bar [4600 psi]**
Rated flow at 7 bar [100psi]	**22 l/min [5.8 US gpm]**
Leakage	6 drops/min @ Rated pressure
Weight	0.06 kg [0.14 lb]
Cavity	SDC08-3

*Rated pressure based on NFPA fatigue test standard [at 1 million cycles]

PERFORMANCE CURVES



MODEL CODE

CP128 - 1 - B - 0

Seal Option

Code	Seal kit
B-Buna-N	120238
V-Viton	120239

Housing

Code	Ports & Material	Housing Model Code
0	No Housing	No Housing
SE2B	AL, 1/4 BSP	SDC08-3-SE-2B
SE3B	AL, 3/8 BSP	SDC08-3-SE-3B
4S	AL, #4 SAE	CP08-3-4S
6S	AL, #6 SAE	CP08-3-6S

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].
* Additional housings available

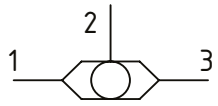
Shuttle Valves
CP120-4

Load Shuttle Valve
330 bar [4800 psi] • 25 l/min [7 US gpm]

DESCRIPTION AND OPERATION

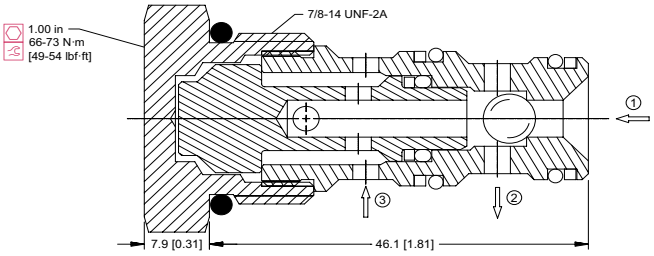
This valve senses the higher of two input pressures at 1 and 3, and routes it to the output 2.

SCHEMATICS



DIMENSIONS

mm [in]

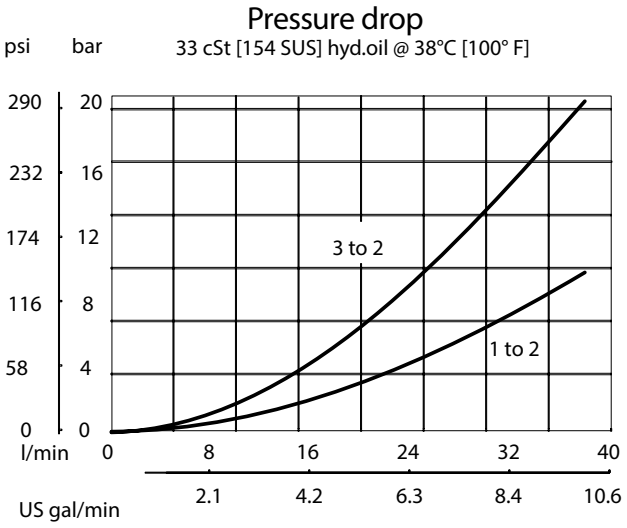


PERFORMANCE DATA

Rated pressure*	**330 bar [4800 psi]**
Rated flow at 7 bar [100psi]	**25 l/min [7 US gpm]**
Leakage	6 drops/min @ Rated pressure
Weight	0.10 kg [0.22 lb]
Cavity	SDC10-3

*Rated pressure based on NFPA fatigue test standard [at 1 million cycles]

PERFORMANCE CURVES



MODEL CODE

CP120 - 4 - B - 8S

Seal Option

Code	Seal kit
B-Buna-N	120027
V-Viton	120028

Housing

Code	Ports & Material	Housing Model Code
0	No Housing	No Housing
SE3B	Al, 3/8 BSP	SDC10-3-SE-3B
SE4B	Al, 1/2 BSP	SDC10-3-SE-4B
6S	Al, #6 SAE	CP10-3-6S
8S	Al, #8 SAE	CP10-3-8S
S6S	Ductile, #6 SAE	CP10-3-S6S
S8S	Ductile, #8 SAE	CP10-3-S8S

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].
* Additional housings available

Shuttle Valves

SV 06

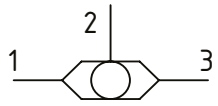
Load Shuttle Valve

350 bar [5000 psi] • 48 l/min [12.7 US gpm]

DESCRIPTION AND OPERATION

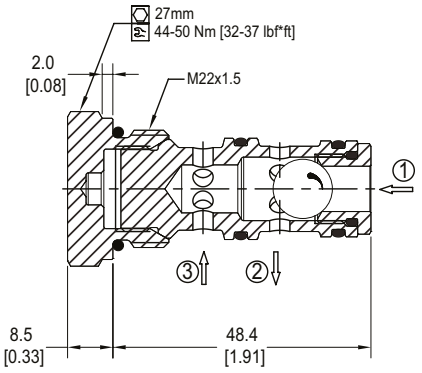
This valve senses the higher of two input pressures at 1 and 3, and routes it to the output 2.

SCHEMATIC



DIMENSIONS

mm [in]

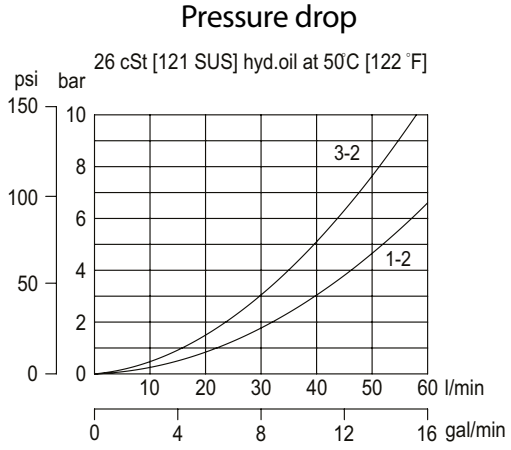


PERFORMANCE DATA

Rated pressure*	**350 bar [5000 psi]**
Rated flow at 7 bar [100psi]	**48 l/min [12.7 US gpm]**
Leakage	6 drops/min @ Rated pressure
Weight	0.11 kg [0.24 lb]
Cavity	NCS06/3

*Rated pressure based on NFPA fatigue test standard [at 1 million cycles]

PERFORMANCE CURVES



MODEL CODE

SV06 - 00 - V

Housing

Code	Ports & Material	Housing Model Code
00	No Housing	No Housing
SE3/8	AL, 3/8 BSP	NCS06/3-SE3/8
SE1/2	AL, 1/2 BSP	NCS06/3-SE1/2
SE6S	AL, #6 SAE	NCS06/3-SE-6S
SE8S	AL, #8 SAE	NCS06/3-SE-8S

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].

* Additional housings available

Seal Option

Code	Seal kit
B-Omit	230000070
V-Viton	230000110

Shuttle Valves

1SH10

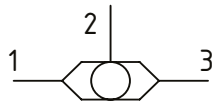
Load Shuttle Valve, Insert type

350 bar [5000 psi] • 20 l/min [5 US gpm]

DESCRIPTION AND OPERATION

This valve senses the higher of two input pressures at 1 and 3, and routs it to output 2.

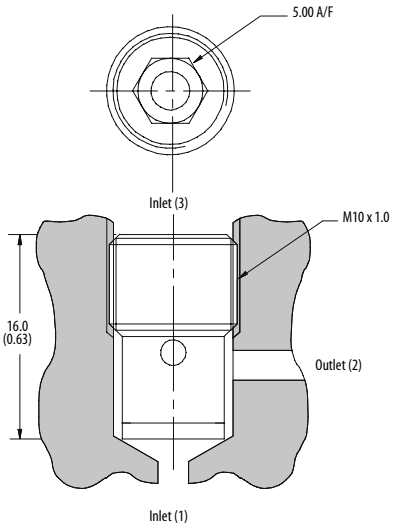
SCHEMATIC



DIMENSIONS

mm [in]

Using LOC-TITE 542, torque cartridge to 8-10 Nm against the bottom of the cavity.

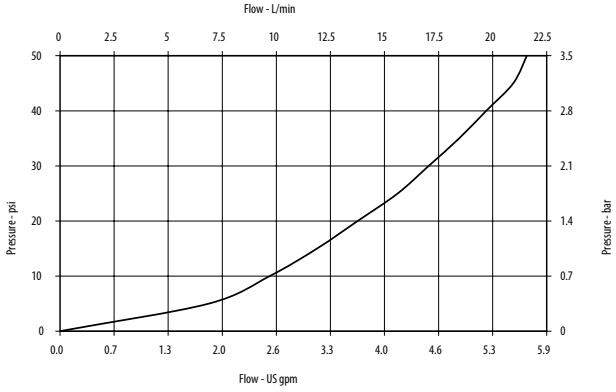


PERFORMANCE DATA

Rated pressure	**350 bar [5000 psi]**
Rated flow	**20 l/min [5 US gpm]**
Leakage	0.6 ml/min max
Weight	0.05 kg [0.11 lbs]
Cavity	A16927

PERFORMANCE CURVES

Pressure drop



MODEL CODE

1SH10

Basic code

1SH10-Cartridge Only

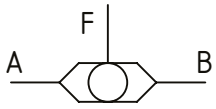
Shuttle Valves
VS 06

Load Shuttle Valve, Line Mounted, 1/4 BSP
350 bar [5000 psi] • 35 l/min [9 US gpm]

DESCRIPTION AND OPERATION

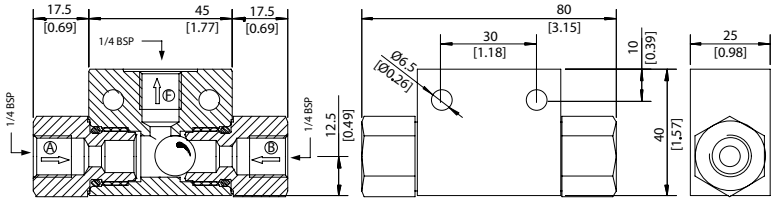
This valve senses the higher of the two input pressures and routes it to the output port.

SCHEMATIC



DIMENSIONS

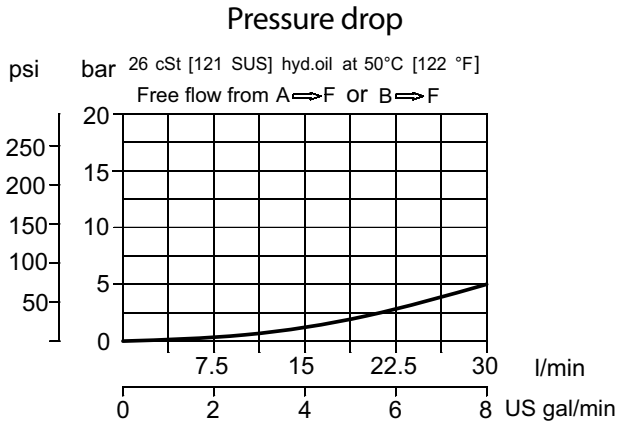
mm [in]



PERFORMANCE DATA

Rated pressure	**350 bar [5000 psi]**
Rated flow at 7 bar [100psi]	**35 l/min [9 US gpm]**
Leakage	6 drops/min @ Rated pressure
Weight	0.22 kg [0.49 lb]

PERFORMANCE CURVES



MODEL CODE

VS06 - G - V

Seal Option
Omit-Buna-N
V-Viton

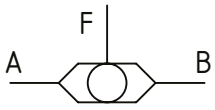
Shuttle Valves
VS 10

Load Shuttle Valve, Line Mounted, 3/8 BSP
350 bar [5000 psi] • 45 l/min [12 US gpm]

DESCRIPTION AND OPERATION

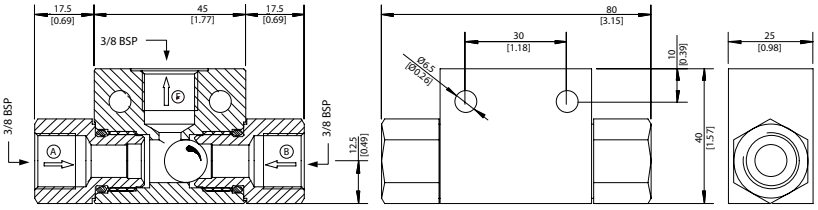
This valve senses the higher of two input pressures and routes it to the output port.

SCHEMATIC



DIMENSIONS

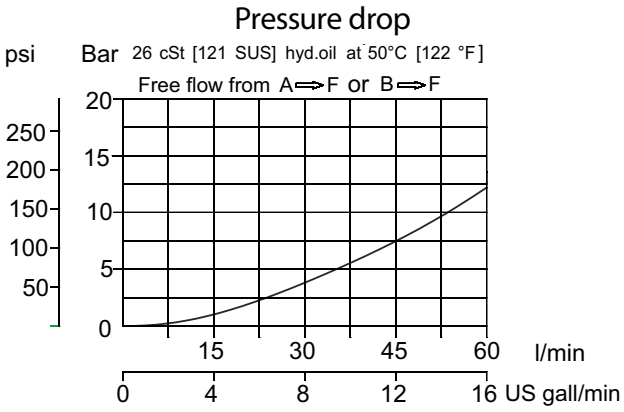
mm [in]



PERFORMANCE DATA

Rated pressure	**350 bar [5000 psi]**
Rated flow at 7 bar [100psi]	**45 l/min [12 US gpm]**
Leakage	6 drops/min @ Rated pressure
Weight	0.19 kg [0.42 lb]

PERFORMANCE CURVES



MODEL CODE

VS 10 - G - V

Seal Option
Omit-Buna-N
V-Viton

Shuttle Valves

SH08-R

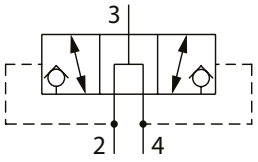
Load Shuttle Valve, Reverse Direction

230 bar [3300 psi] • 5 l/min [1.3 US gpm]

DESCRIPTION AND OPERATION

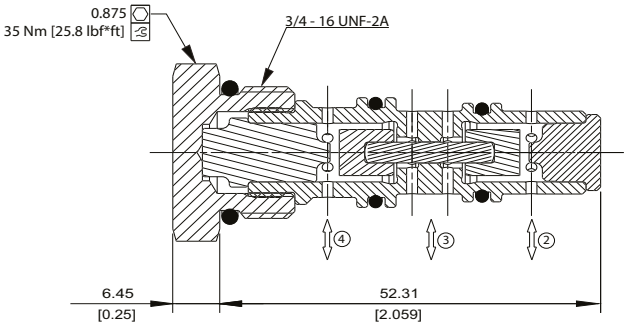
This valve that senses the lower of two input pressures at 1 and 3 and routes it to the output 2.

SCHEMATIC



DIMENSIONS

mm [in]

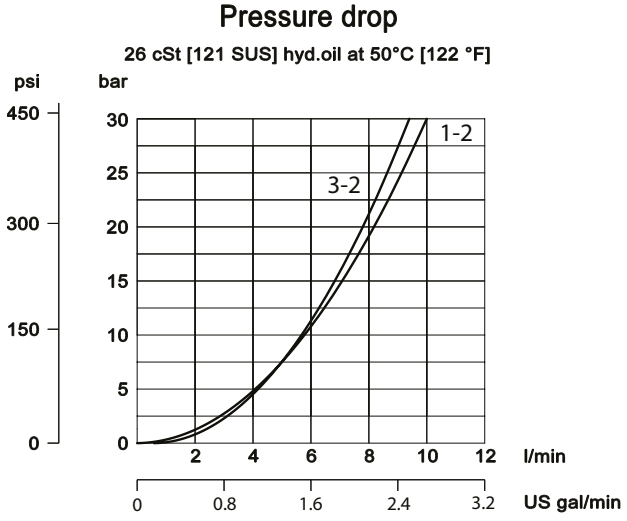


PERFORMANCE DATA

Rated pressure	**230 bar [3300 psi]**
Rated flow at 7 bar [100psi]	**5 l/min [1.3 US gpm]**
Leakage	6 drops/min @ Rated pressure
Weight	0.2 kg [0.44 lb]
Cavity	SDC08-4

*Rated pressure based on NFPA fatigue test standard [at 1 million cycles]

PERFORMANCE CURVES



MODEL CODE

SH08 - R - B - 4S

Seal Option

Code	Seal kit
Omit-Buna-N	11362953
V-Viton	11362954

Housing

Code	Ports & Material	Housing Model Code
00	No Housing	
4S	#4 SAE, AL	CP08-4-4S
L2B	1/4 BSP, AL	SDC08-4-L2B

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].
* Additional housings available

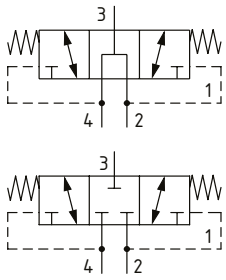
Shuttle Valves
CP720-3

Hot Oil Shuttle Valve
350 bar [5000 psi] • 25 l/min [7 US gpm]

DESCRIPTION AND OPERATION

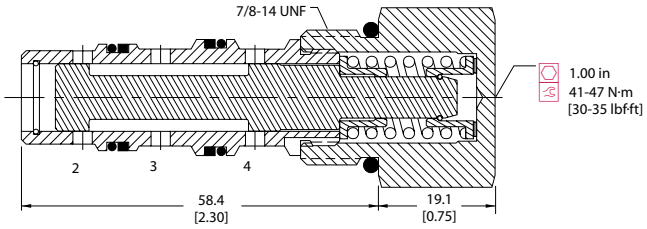
This valve has an internally piloted spool that directs flow from the lower pressure inlet, 2 or 4, to the output at 3.

SCHEMATIC



DIMENSIONS

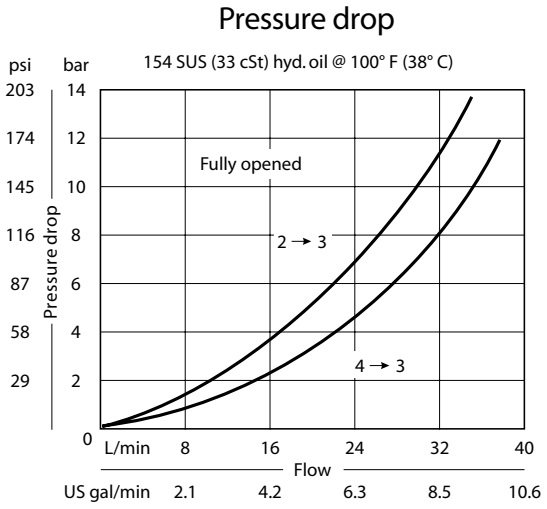
mm [in]



PERFORMANCE DATA

Rated pressure	**350 bar [5000 psi]**
Rated flow at 7 bar [100psi]	**25 l/min [7 US gpm]**
Leakage	82 cm^3/min [5 in^3/min] @ 207 bar [3000 psi]
Weight	0.15 kg [0.34 lb]
Cavity	SDC10-4

PERFORMANCE CURVES



MODEL CODE

CP720 - 3 - B - 8S - 080 - C

Seal Option

Code	Seal kit
B-Buna-N	11032943
V-Viton	11032944

Housing

Code	Ports & Material	Housing Model Code
0	No Housing	No Housing
L3B	Al, 3/8 BSP	SDC10-4-L-3B
L4B	Al, 1/2 BSP	SDC10-4-L-4B
6S	Al, #6 SAE	CP10-4-6S-X1
8S	Al, #8 SAE	CP10-4-8S-X1
S6S	Ductile, #6 SAE	CP10-4-S6S
S8S	Ductile, #8 SAE	CP10-4-S8S

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].
* Additional housings available

Spool Configuration

O-Open
C-Closed

Shift Pressure

Code	Bar	Psi
050	3.4	[50]
080	5.5	[80]

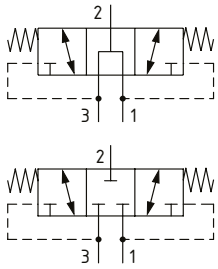
Shuttle Valves
CP721-3

Hot Oil Shuttle Valve
350 bar [5000 psi] • 90 l/min [24 US gpm]

DESCRIPTION AND OPERATION

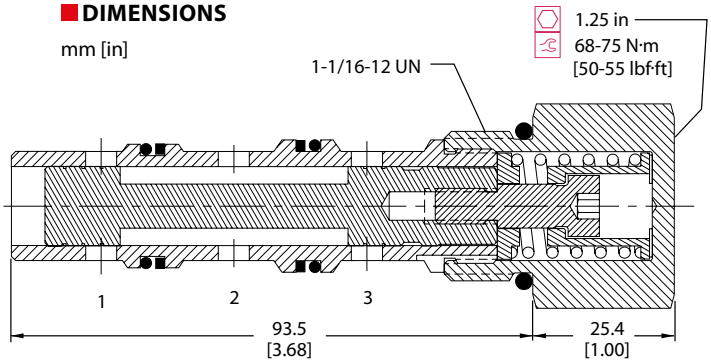
This valve has an internally piloted spool that directs flow from the lower pressure inlet, 1 or 3, to the output at 2.

SCHEMATIC



DIMENSIONS

mm [in]

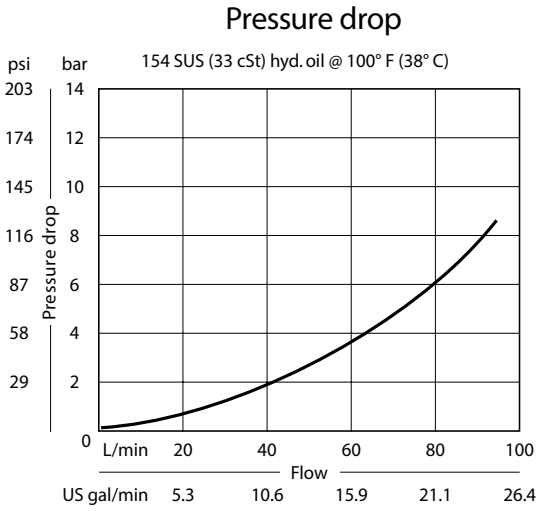


PERFORMANCE DATA

Rated pressure*	**350 bar [5000 psi]**
Rated flow at 7 bar [100psi]	**90 l/min [24 US gpm]**
Leakage	82 cm^3/min [5 in^3/min] @ 207 bar [3000 psi]
Weight	0.34 kg [0.75 lb]
Cavity	CP12-3M

*Rated pressure based on NFPA fatigue test standard [at 1 million cycles]

PERFORMANCE CURVES



MODEL CODE

CP721 - 3 - B - 12S - 100 - C

Seal Option

Code	Seal kit
B-Buna-N	120098
V-Viton	120099

Housing

Code	Ports & Material	Housing Model Code
0	No Housing	No Housing
6B	AL, 3/4 BSP	CP12-3M-6B
10S	AL, #10 SAE	CP12-3M-10S
12S	AL, #12 SAE	CP12-3M-12S
S12S	Ductile, #12 SAE	CP12-3M-S12S

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].
* Additional housings available

Spool Configuration

O-Open
C-Closed

Shift Pressure

Code	Bar	Psi
025	1.6	[25]
050	3.4	[50]
100	6.9	[100]

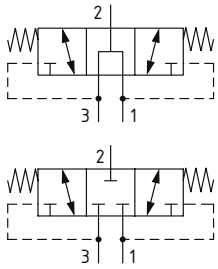
Shuttle Valves
HS12

Hot Oil Shuttle Valve
450 bar [6500 psi] • 80 l/min [21 US gpm]

DESCRIPTION AND OPERATION

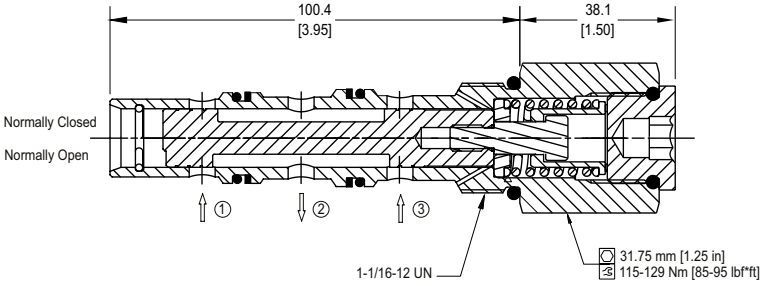
This valve has an internally piloted spool that directs flow from the lower pressure inlet, 1 or 3, to the output at 2.

SCHEMATIC



DIMENSIONS

mm [in]

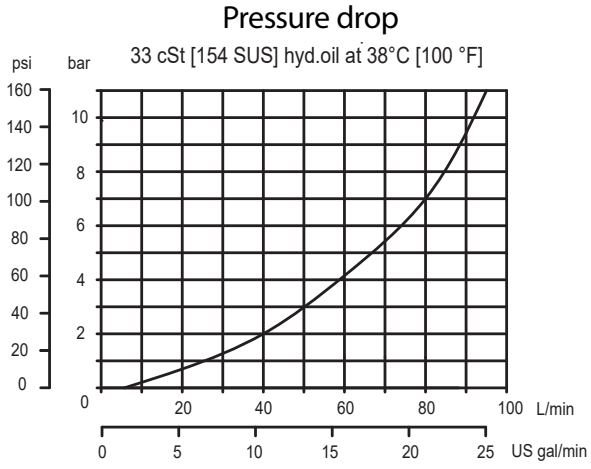


PERFORMANCE DATA

Rated pressure*	**450 bar [6500 psi]**
Rated flow at 7 bar [100psi]	**80 l/min [21 US gpm]**
Leakage	82 cm^3/min [5 in^3/min] @ 207 bar [3000 psi]
Weight	0.41 kg [0.90 lb]
Cavity	CP12-3M

* Rated Pressure based on NFPA fatigue test standards [at 1 Million Cycles, 90% assurance, 90% verification]

PERFORMANCE CURVES



MODEL CODE

HS12 - NC - 100 - U - 00

Spool Configuration

NO-Normally Open
N-Normally Closed

Shift Pressure

Code	Bar	Psi
025	1.6	[25]
050	3.4	[50]
100	6.9	[100]

Seal Option

Code	Seal kit
U-Urethane	11251458
V-Viton	120099

Housing

Code	Ports & Material	Housing Model Code
00	No Housing	No Housing
S12S	STEEL, #12 SAE	CP12-3M-S12S

* Aluminum bodies are to be used for pressures less than 210 bar [3000 psi].
* Additional housings available