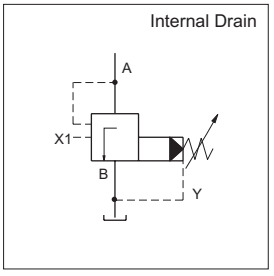
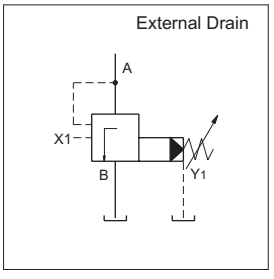
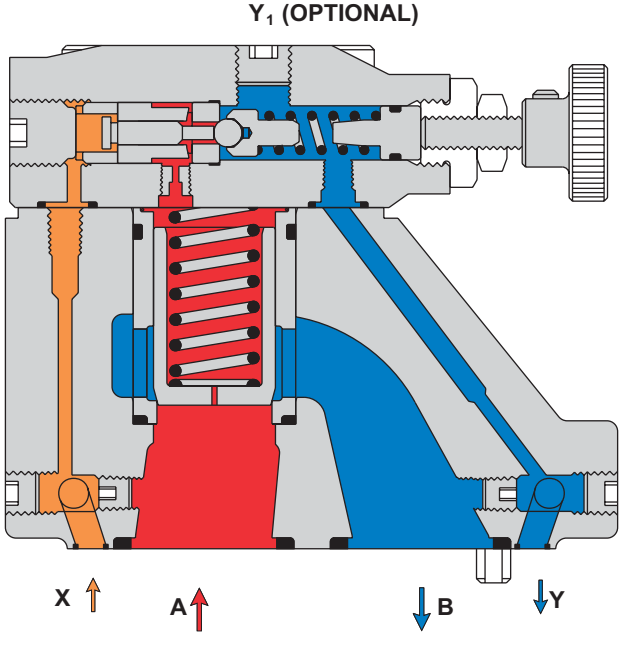
Veljan Unloading Valves series VR4U are pilot operated controls and used to unload a circuit at low pressure when pilot pressure at port X is maintained higher than that of inlet pressure at port A set by the pilot spring. A typical use of an unloader valve is to unload the low pressure side of a double pump. A Pump connected to an Accumulator circuit can also be unloaded by the VR4U valve.

VR4U consists of a high flow poppet type seat valve section controlled by the low flow, adjustable pilot section mounted on top. Pressure setting is achieved by means of knurled knob. For tamper proof setting, acorn nut with lead seal is available as option. Optional vent valve VW01 sandwiched between pilot section and main body can be used for venting the VR4U valves.

Exceptionally fast response is obtained due to the precise ratio between the main piston area and its mass. One of the unique features of VR4U is that it works as a relief valve at the set pressure even in the absence of external pilot signal.







VR4U

Normally port A is connected to pump and port B to tank. At low pressure, flow entering port A is blocked by the main poppet. Pressure from port A passes to the pilot section through orifices in the main poppet and in the pilot section. No flow takes place in this portion until the pressure overcomes the spring setting of a pilot ball. The pilot ball is lifted from its seat releasing a small pilot flow to tank and resulting in a pressure drop across the main poppet. The main poppet opens and allows only enough flow from port A to port B maintaining inlet pressure at the set value of the pilot spring as in the case of a relief valve.

In this condition, the external pilot pressure from another part of system if applied at port X causes a small override piston to act against the ball pushing it further off its seat resulting in very low pressure drop across the main poppet as long as pilot pressure is maintained, the main poppet opens further and unloads the inlet flow at very low pressure drop. As soon as the pilot pressure drops to approximately 10% below the pilot setting, the main poppet closes with a snap action diverting the main pump flow back to the hydraulic system. Excessive restriction in the tank line or the pilot pressure signal at port X should be avoided to attain a correct function.

PC

SPECIFICATIONS

General

Type	:	Pilot operated Unloading Valve
Design	:	Poppet type
Mounting	:	Threaded/Subplate/Cartridge/Flange
Mounting position	:	Optional
Port sizes (nominal)	:	3/8", 3/4", 1 1/4"
Direction of flow	:	A⟶B
Ambient temperature	:	–20°C...+60°C (–4°F...+140°F)
Special working conditions	:	Consult **VELJAN**

Hydraulics

Pressure control range	:	Minimum - depends on flow Maximum - 5000 psi (350 bar)
Maximum operating pressure	:	
Port A (inlet)		5000 psi (350 bar)
Port B (outlet)		Internal pilot drain - 50 psi (3.5 bar) External pilot drain - 430 psi (30 bar)
Port X (pilot)		5000 psi (350 bar)
Port Y, Y_1 (Pilot drain)		Without pressure to tank

		VR4U 03 (3/8")	VR4U 06 (3/4")	VR4U 10 (1 1/4")
Nominal flow gpm (lpm)	:	15.8 (60)	52.9 (200)	119.0 (450)
Maximum flow gpm (lpm)	:	23.8 (90)	79.4 (300)	158.7 (600)

Fluid	:	Mineral oil as per DIN 51524/25 or other fluids on request
Fluid Temperature Range	:	–18°C...+80°C (0°F...+176°F)
Viscosity Range	:	10 to 650 cSt (60 to 3900 SSU)
Optimum operating viscosity	:	30 cSt (180 SSU)
Seal compatibility	:	Code 1 (Buna N) or Code 5 (Viton) (contact Veljan with specific oil details)
Cleanliness recommended	:	Better than NAS 1638 Class 8 or ISO 17/14

Adjustment

Manual	:	Handwheel
Rotation	:	3.75 rev.
Operating torque	:	0.72 Nm

Electricals (Vent Valve VVV01)	:	Solenoid
Nominal voltage	:	Refer to Ordering Code
Permissible voltage fluctuation	:	+5%...–10%
Max. coil temperature	:	+155° C (311°F)
Type of current	:	Alternating Current (AC)/Direct Current (DC)
Input power	:	31 W
Holding	:	78 VA
Inrush	:	264 VA
Relative operating period	:	100%
Type of protection	:	I P 65

ORDERING CODE

VR4U 06 - 5 6 5 - 1 0 - 09 - W07 - A 1 ***

Series

Size

03 - 3/8"
06 - 3/4"
10 - 1 1/4"

Max. Pressure of Valve Body

0 - for cartridges only
5 - 5000psi (350 bar)

Body Mounting

Cartridge

0 - Cartridge Y_1 port[2] = 1/4" NPTF
E - Cartridge Y_1 port[2] = SAE - 4 (7/16" - 20 UNF)
G[1] - Cartridge Y_1 port[2] = G 1/4"

Threaded body

1 - Threaded body - VR4U03 = 1/2" NPTF ; VR4U06 = 1" NPTF (2 A - Ports, 1B - Port)
A - Threaded body VR4U06 = 3/4" NPTF ; VR4U10 = 1 1/4" NPTF (1 A - Port, 1B - Port)
} X,Y1 ports = 1/4" NPTF

6 - Threaded body VR4U03 = 1/2" B.S.P.P ; VR4U06 = 1" B.S.P.P ; (2 A - Ports, 1B - Port)
D - Threaded body VR4U06 = 3/4" B.S.P.P ; VR4U10 = 1 1/4" B.S.P.P ; (1 A - Port, 1B - Port)
} X,Y1 ports = G 1/4"

4 - Threaded body VR4U03 - SAE - 8 VR4U06 - SAE - 16 (2 A - Port, 1B - Port)
B - Threaded body VR4U06 - SAE - 12, VR4U10 - SAE - 20 (1 A - Port, 1B - Port)
} X,Y1 ports = SAE - 4 (7/16" - 20 UNF)

Subplate mounting

3 - Subplate mounting - VR4U03/06 /10 ISO (Y_1 port - 1/4" NPTF with drain line code 2)
7 - Subplate mounting Y_1 Port[2] SAE - 4 (7/16" - 20 UNF) with drain line code 2)
9 - Subplate mounting VR4U03/06 /10 ISO (Y_1 Port[2] = 1/4" B.S.P.P ; with drain line code 2)

Flange body

2 - Flange body (X,Y_1 port - 1/4" NPTF) (2 A - Ports, 1 B - Port)

Solenoid Voltage
(Omit for non vent version)

W01 - 115V/60 Hz AC GOR - 12V DC
W02 - 230V/60 Hz AC GOQ - 24V DC
W06 - 115V/50 Hz AC GOH - 48V DC
W07 - 230V/50 Hz AC

Electrical Vent
(3way VENT VALVE VV01)
Omit for non vent version

09 - With manual override (Solenoid de-energized : open to tank. Solenoid energized : vent line blocked)
10 - Without manual override (Solenoid de-energized : open to tank. Solenoid energized : vent line blocked)
11 - With manual override (Solenoid de-energized : vent line blocked Solenoid energized : open to tank)
12 - Without manual override (Solenoid de-energized : vent line blocked Solenoid energized : open to tank)

Drain line

0 - Internal
1 - External from subplate or manifold (Y) } At subplate mounting only with body code 3,7,9
2 - External from pilot head (Y_1)

Type of Control

1 - Hand knob (32mm dia)
2 - Hand knob (50mm dia) (not for version with vent valve VV01)
3 - Acorn nut with lead seal

Pressure setting range

1 - 100 - 1500 psi (7 - 105 bar) } Nominal pressure differential 20%
3 - 100 - 3000 psi (7 - 210 bar) }
5 - 100 - 5000 psi (7 - 350 bar) Nominal pressure differential 15%

Seal Class

1 - Buna N (Standard)
5 - Viton

Design letter

Modification

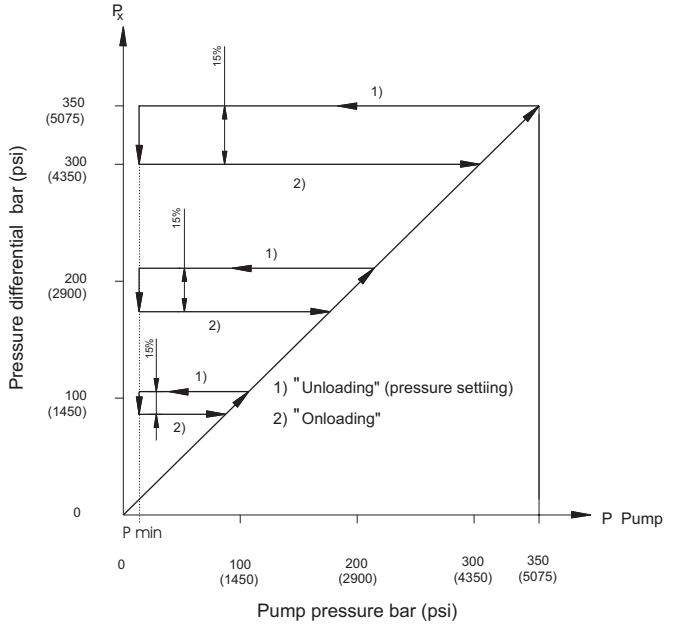
PC

1) Only with Drain line code 2
2) Port Y1 is only available at Drain line (code2) external from pilot head.

PC

PERFORMANCE CURVES

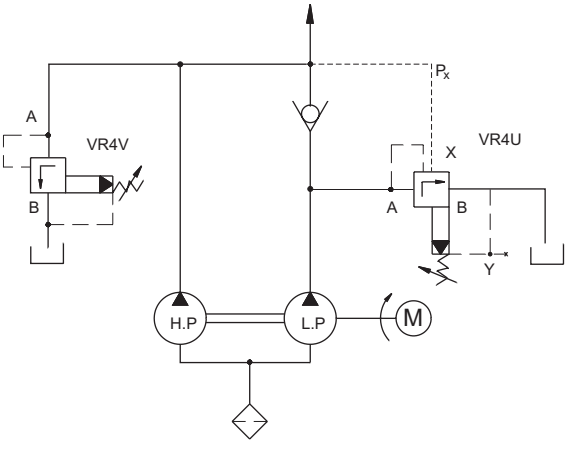
Pressure Differential Charecteristics



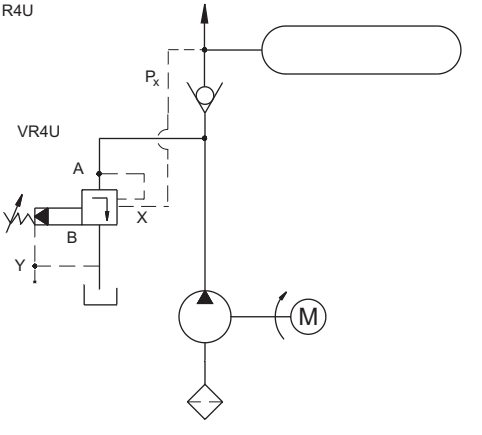
The differential between Unloading and Onloading is typical 15%. When system pressure (for instance accumulator) drops 15% below the pilot setting, the valve closes and pump feeds the system again.

Typical application sytsems

Double pump system, to unload the low pressure side (L.P)



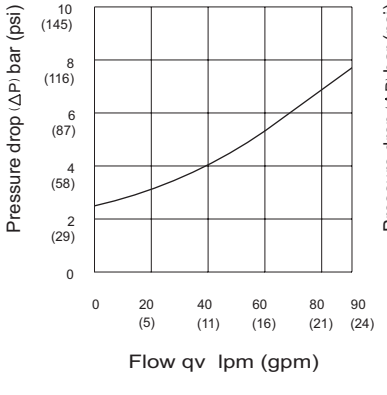
Accumulator system with unloading valve R4U



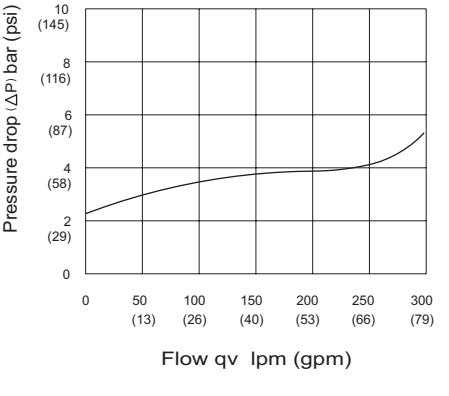
△p - qv - Characteristics

(Fluid 60 cSt at 40° C
Test temp. 50° C± 10%)

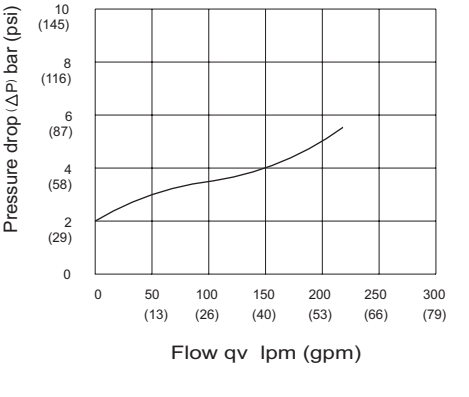
VR4U03



VR4U06



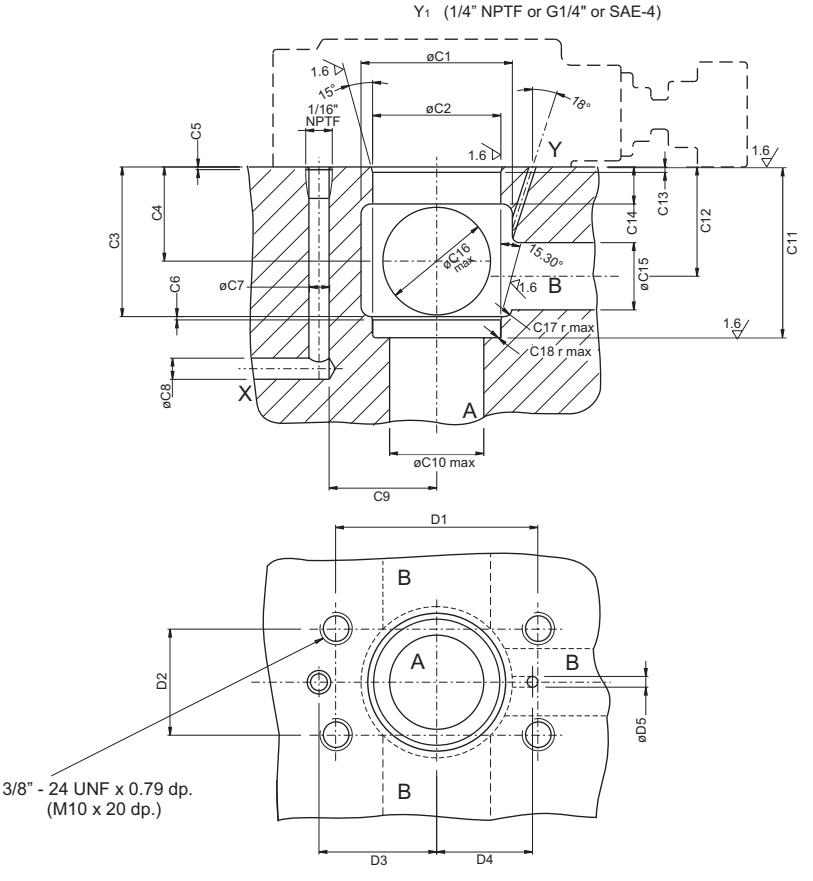
VR4U10



PC

CARTRIDGES WITH PILOT VALVES VR4U06/VR4U10 (#0, #E & #G)

Weight : 2.63 lbs (1.2 kg)



	Dimensions	
	in	mm
C1	ø1.772 ø1.732	ø45.0 ø44.0
C2	ø1.501 ø1.500	ø38.139 ø38.100
C3	1.752	44.5
C4	1.102/1.083	28.0/27.5
C5	0.031	0.8
C6	0.04	1.0
C7	ø0.236	ø6.0
C8	ø0.248	ø6.3
C9	1.26	32.0
C10	ø1.1	ø28.0
C11	2.000/1.997	50.80/50.73
C12	1.28	32.5
C13	0.063	1.6
C14	0.433	11.0
C15	ø0.79	ø20.0
C16	ø1.26	ø32.0
C17	0.08 r	2.0 r
C18	0.018 r	0.4 r

	Dimensions	
	in	mm
D1	2.383/2.367	60.52/60.12
D2	1.24/1.26	31.55/31.95
D3	1.38	35.0
D4	1.122	28.5
D5	ø0.126	ø3.2

Ports	Function
A	Pressure (Inlet)
B	Tank (Outlet)
X	External control connection
Y, Y_1 1)	Drain

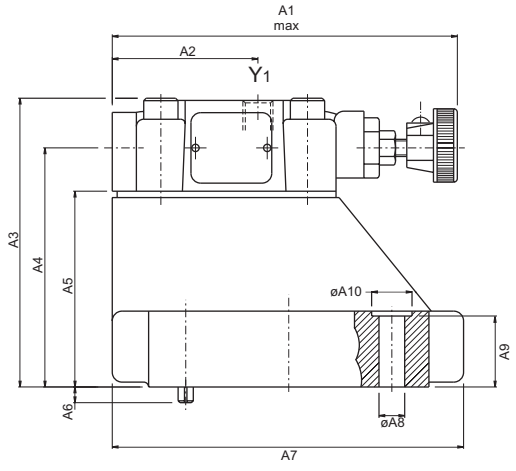
1) Port Y_1 is only available at drain line (code 2) external from the pilot head.

4 Mounting screws*	
Dimensions	Order number
3/8"- 24 UNF x $1\frac{3}{4}$" lg. or M10 x 45mm, DIN 912 - 12.9	V359 -15220 or V700 - 71602

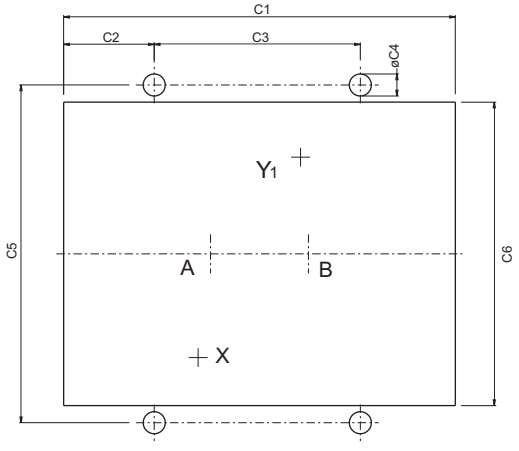
* Mounting screws must be ordered separately

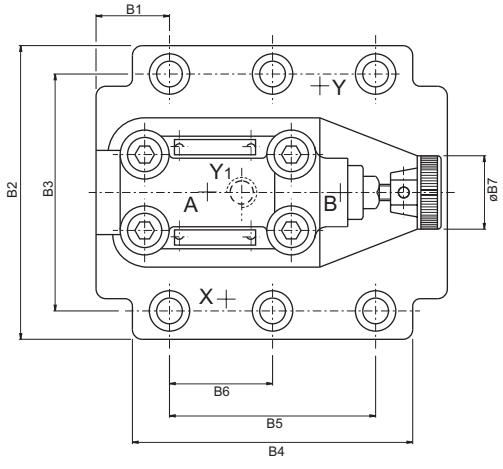
VR4U10 (1 1/4") SUBPLATE MOUNTING BODY (#3, #7 & #9)

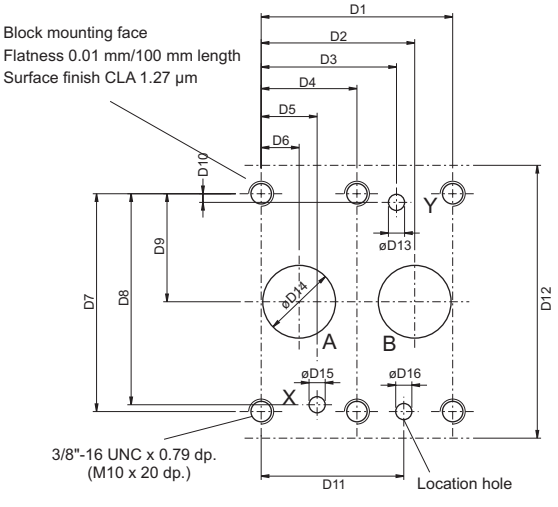
Weight : 13.2 lbs (6.0 kg)



Panel opening







	Dimensions	
	in	mm
A1	5.55	141.0
A2	2.34	59.5
A3	4.645	118.0
A4	3.846	97.7
A5	3.15	80.0
A6	0.25	6.4
A7	5.645	143.5
A8	ø0.41	ø10.5
A9	1.14	29.0
A10	ø0.65	ø16.5

	Dimensions	
	in	mm
B1	1.181	30.0
B2	4.72	120.0
B3	3.8	96.8
B4	4.51	114.5
B5	3.315	84.2
B6	1.657	42.1
B7	ø1.26	ø32.0

	Dimensions	
	in	mm
C1	6.3	160.0
C2	1.456	37.0
C3	3.315	84.2
C4	ø0.35	ø9.0
C5	5.433	138.0
C6	4.88	124.0

	Dimensions	
	in	mm
D1	3.315	84.2
D2	2.657	67.5
D3	2.342	59.5
D4	1.657	42.1
D5	0.97	24.6
D6	0.657	16.7
D7	3.8	96.8
D8	3.653	92.8
D9	1.87	48.4
D10	0.15	3.8
D11	2.468	62.7
D12	4.724	120.0
D13	ø0.28	ø7.1
D14	ø1.26	ø32.0
D15	ø0.28	ø7.1
D16	ø0.28 x 0.433 dp.	ø7.1 x 11.0 dp.

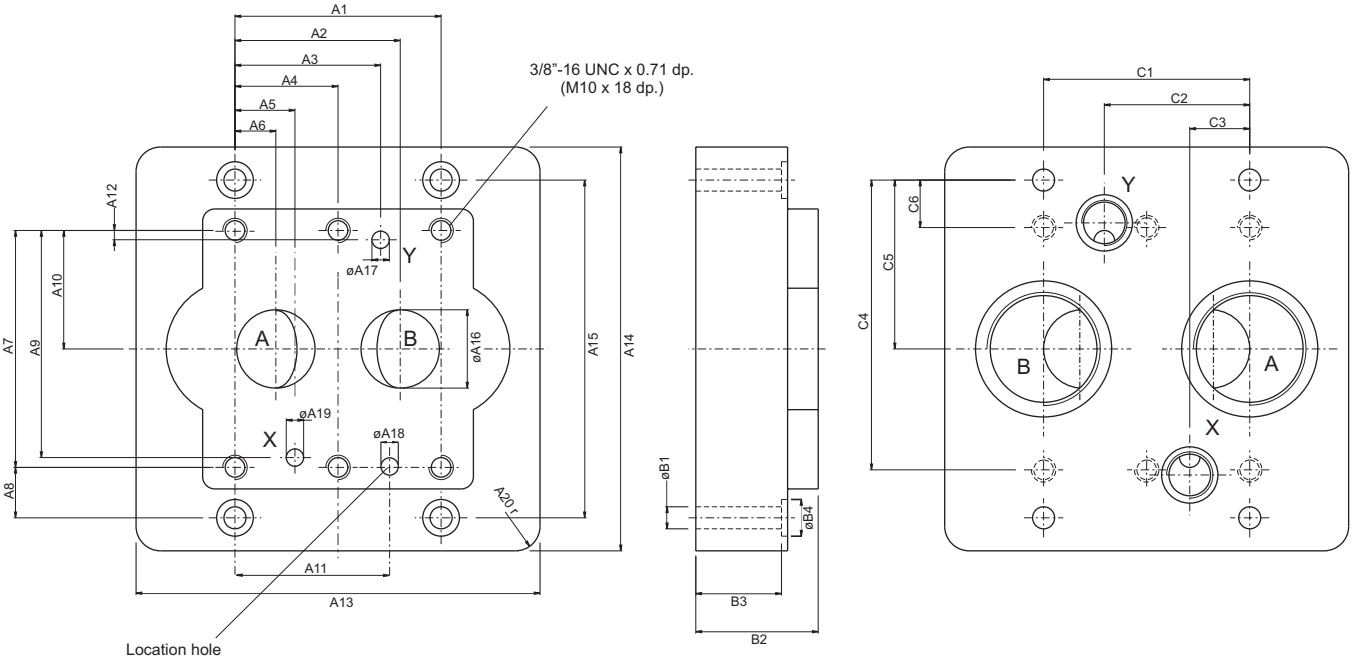
Ports	Function
A	Pressure (inlet)
B	Tank (outlet)
X	Remote control or vent connection
Y(Y1)	External drain[1)]

1) Optional from pilot head or subplate.
Port Y1 is only available at drain line (code 2) external from the pilot head.

Note : For details of Subplate & mtg. screws please refer page 40

Subplate for VR4U10

Weight : 18.68 lbs (8.5 kg)



	Dimensions	
	in	mm
A1	3.315	84.2
A2	2.657	67.5
A3	2.342	59.5
A4	1.657	42.1
A5	0.968	24.6
A6	0.657	16.7
A7	3.811	96.8
A8	0.811	20.6
A9	3.653	92.8
A10	1.905	48.4
A11	2.468	62.7
A12	0.15	3.8
A13	6.535	166.0
A14	6.5	165.0
A15	5.43	138.0
A16	ø1.26	ø32.0
A17	ø0.28	ø7.1
A18	ø0.28 x 0.315 dp.	ø7.1 x 8.0 dp.
A19	ø0.28	ø7.1
A20	0.4 r	10.0 r

	Dimensions	
	in	mm
B1	ø0.351	ø9.0
B2	1.97	50.0
B3	1.38	35.0
B4	ø0.59	ø15.0

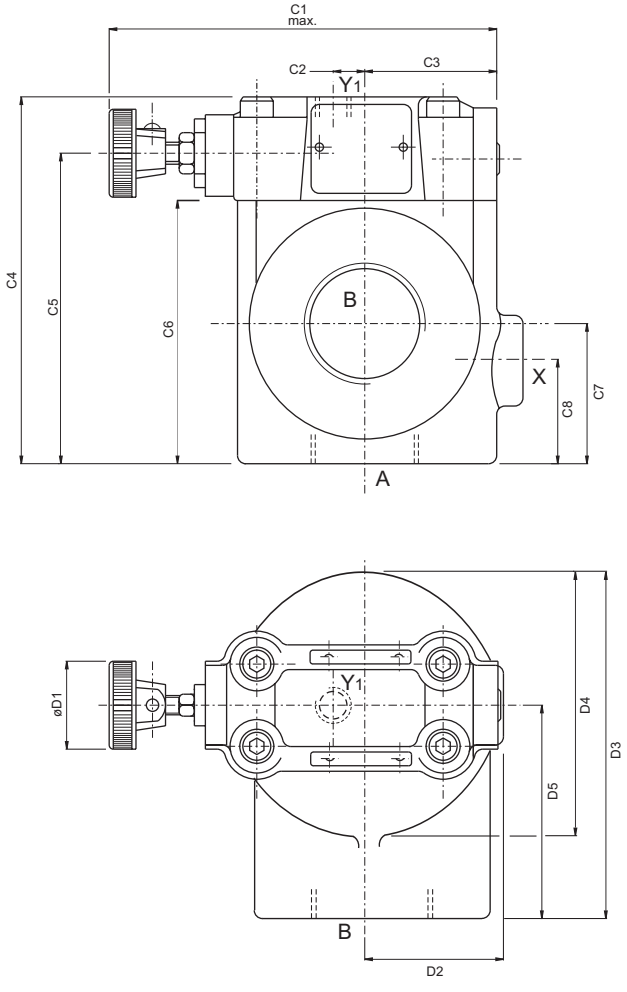
	Dimensions	
	in	mm
C1	3.315	84.2
C2	2.342	59.5
C3	0.97	24.6
C4	4.66	118.4
C5	2.716	69.0
C6	0.764	19.4

Order No.	Port sizes		6 Mounting screws*		
	A+B	X+Y	Dimension	Order No.	min.tensile strength
VSS - P - 24 - G 116	1 1/2" NPTF	1/4" NPTF	3/8"- 16UNC 1 3/4" lg.	V358 -16220	at p< 210 bar = 100 daN/mm^2 (Torque 68 Nm)
VSS - B - 24 - G 117	1 1/2" B.S.P.P	1/4" B.S.P.P.	M 10 x 45 DIN 912-12.9	V700 - 71602	at p>210 bar = 120 daN/mm^2 (Torque 82 Nm)

* Mounting screws are included in subplate order.
For valves ordered without subplate, mounting screws must be ordered seperately.

VR4U10 (1 1/4") - THREADED BODY (#A, #B & #D)

Weight : 12.3 lbs (5.6 kg)



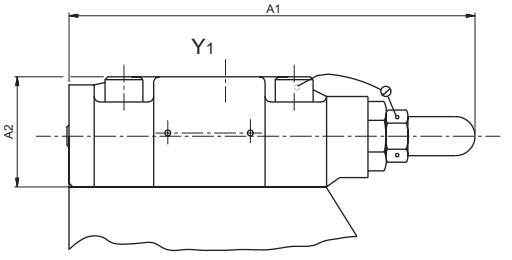
	Dimensions	
	in	mm
C1	5.55	141.0
C2	0.453	11.5
C3	1.89	48.0
C4	5.236	133.5
C5	4.45	113.0
C6	3.76	95.5
C7	2.01	51.0
C8	1.496	38.0

	Dimensions	
	in	mm
D1	ø1.26	ø32.0
D2	2.01	51.0
D3	4.75	120.6
D4	3.374	85.7
D5	3.063	77.8

Ports	Function	Port Sizes
A	Pressure (inlet)	$1^{1}/_{4}$" NPTF or G $1^{1}/_{4}$" or SAE - 20 ($1^{5}/_{8}$" - 12 UNF)
B	Tank (outlet)	$1^{1}/_{4}$" NPTF or G $1^{1}/_{4}$" or SAE - 20 ($1^{5}/_{8}$" - 12 UNF)
X	Remote control or vent connection	1/4" NPTF or G 1/4" or SAE - 4 (7/16" - 20 UNF)
Y_1	External drain	1/4" NPTF or G 1/4" or SAE - 4 (7/16" - 20 UNF)

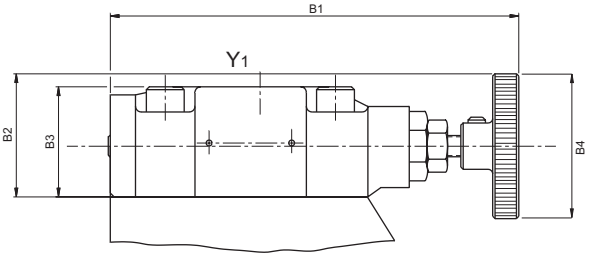
OPTIONAL CONTROL

Type of control - Code 3
Acron nut with lead seal



	Dimensions	
	in	mm
A1	5.51	140.0
A2	1.49	38.0

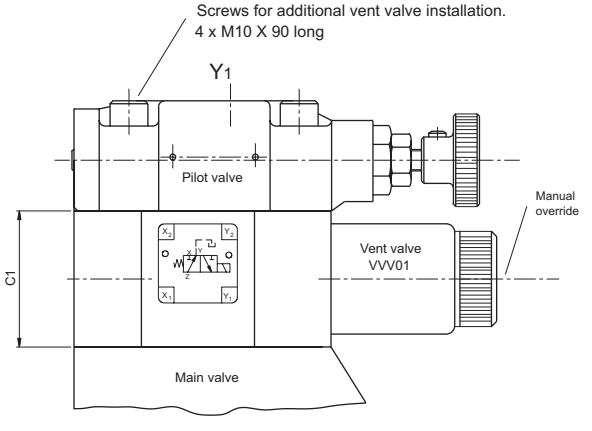
Type of control - Code 2
Hand knob 50mm dia
(not for version with vent valve VVV01)



	Dimensions	
	in	mm
B1	5.55	141.0
B2	1.67	42.5
B3	1.49	38.0
B4	ø1.96	ø50.0

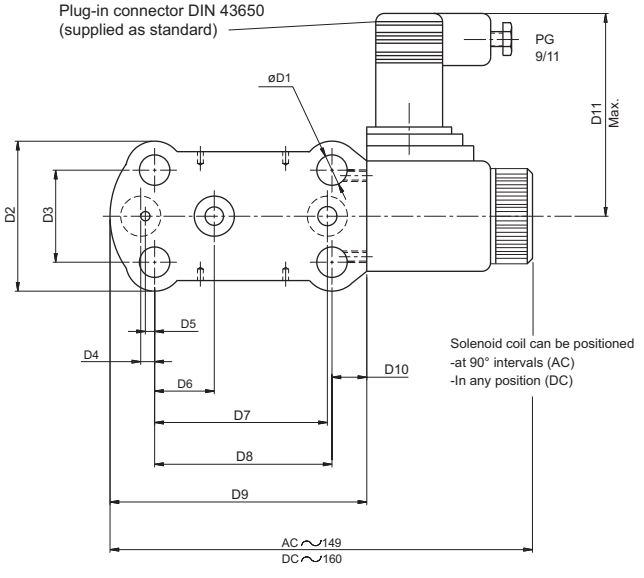
Version with Vent Valve VVV01

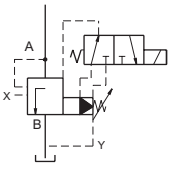
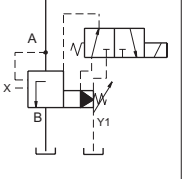
Weight (VVV01) : 3.73 lbs (1.7 kg)



	Dimensions	
	in	mm
C1	1.85	47.0

	Dimensions	
	in	mm
D1	ø0.41	ø10.5
D2	2.03	51.8
D3	1.25	31.8
D4	0.18	4.8
D5	0.12	3.2
D6	0.81	20.6
D7	2.31	58.7
D8	2.37	60.3
D9	3.49	88.7
D10	0.51	13.0
D11	2.75	70.0



Code	Internal Drain	External Drain
11 or 12		
09 or 10