Introduction

Veljan Denison V20M Mobile directional control valve is a segment type design that can be stacked together in parallel. It consists of three elements - an inlet Section, work sections with a wide choice of spool configurations and an outlet section, all bolted together as a single unit. The number of work sections in the valve unit are determined by the number of hydraulic elements to be operated. The valves are mounted on equipment at one location to meet the requirements of controlling multiple hydraulic elements from a single point by a single operator. Typically, the mobile valve is mounted near the driver who will operate the valve from his seat controlling multiple machine functions.

Features

Simple, compact and heavy duty designed sectional valve having parallel work sections with individual load ports for both open center, closed center and power beyond applications. Spring center is standard. Detent options available on request. Work port relief valves and anticavitation check valves are available. Spool end caps, lever end or protected from dust by bellows inlet and outlet ports with threading options for UNF, BSP, NPTF. Load check valves for all spools to prevent back flow from pump. Work Port Relief valve provision to limit the pressure in each spool section.

Technical Data

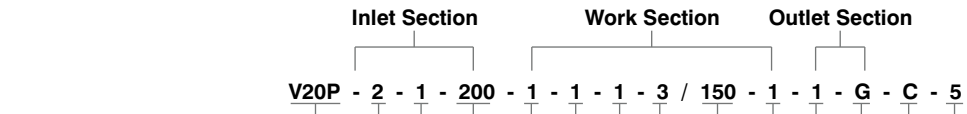
Nominal Flow Rate	:	23 GPM (90 LPM)
Max. Flow	:	36 GPM (135 LPM)
Pressure Control Range	:	Minimum depends on flow Maximum- 5000psi(350 bar)
Back Pressure(Max.)	:	25 bar (12 Sections)
Internal Leakage	:	3 cm^3/min (at 100 bar and 45 CSt)
Fluid	:	Mineral oil
Fluid Temperature Range	: :	-20°C to +100°C(For viton) -20°C to 80°C(For Buna-N)
Viscosity	:	10 to 400 CST
Operating Viscosity	:	15 CST to 75 CST
Max. Level of Contamination	:	19/16-ISO4406
Seal Compatibility	:	Buna N (Standard), Viton (Optional)
No. of Work Sections	:	1 to 12

Warning

Technical data provided for standard configuration on a test bench. For more detailed performance information or application specific data please contact the Veljan Denison Engineering team. All specifications of this catalogue refer to the standard product on the date of publication. Veljan Denison reserves the right to discontinue, modify or revise specifications without notice.

Veljan is not liable for any damage arising from incorrect use of this product.

V20P MODEL / ORDERING CODE



Parallel Circuit

No. of working sections(1,2,3,4,5,6)

Inlet Blocking Code

1 - Top inlet with Adjustable DPRV

2 - Side inlet with Adjustable DPRV

3 - Top inlet with Adjustable DPRV & Side Gauge Port

4 - Side inlet with Adjustable DPRV & Top Gauge Port

5 - Top inlet with Fixed DPRV

6 - Side inlet with Fixed DPRV

7 - Top inlet with Fixed DPRV & Side Gauge Port

8 - Side inlet with Fixed DPRV & Top Gauge Port

9 - Top inlet with PPRV

10 - Side inlet with PPRV

11 - Top inlet with PPRV & Side Gauge Port

12 - Side inlet with PPRV & Top Gauge Port

DPRV - Direct Operated Pressure Relief Valve

PPRV - Pilot Operated Pressure Relief Valve

Relief Valve Setting Pressure (bar)

No. of Identical Spool Sections

Spool Types

1 - S1 (4 Way All Ports Blocked in Neutral)

2 - S2 (4 Way A,B ports connected to T in Neutral)

3 - S3 (3 Way cylinder spool- 'B' working port)

4 - S4 (3 Way cylinder spool- 'A' working port)

Spool Positions

1 - Spring Centered

2 - 3 Position Detent

Seal Class

1- Buna N

5 - Viton

Design Letter

Ports Connections

S - SAE thread

G - BSP thread

N - NPTF thread

Outlet Blocking Code

1-Top Outlet Port

2-Side Outlet Port

3-Top Outlet With Power Beyond

4-Outlet With Closed Center

Handle Position

1 - Lever in UPWARDS

2 - Lever in DOWNWARDS

3 - Lever With JOY STICK Control

WRV Pressure Setting (bar)

(ONLY FOR WORKPORT RELIEF VALVE)

Auxiliary Valves

WRV- WORK PORT RELIEF VALVE
- 0 - NONE
- 1 - WRV ON PORT 'A'.
- 2 - WRV ON PORT 'B'.
- 3 - WRV ON PORT 'A & B'.

ACV- ANTICAVITATION VALVE
- 4 - ACV ON PORT 'A'.
- 5 - ACV ON PORT 'B'.
- 6 - ACV ON PORT 'A & B'.

NOTE:- 1. Order of Spool Section Sequence will be followed as per given Model code Sequence.
2. Straight Handle will be Supplied as Standard.

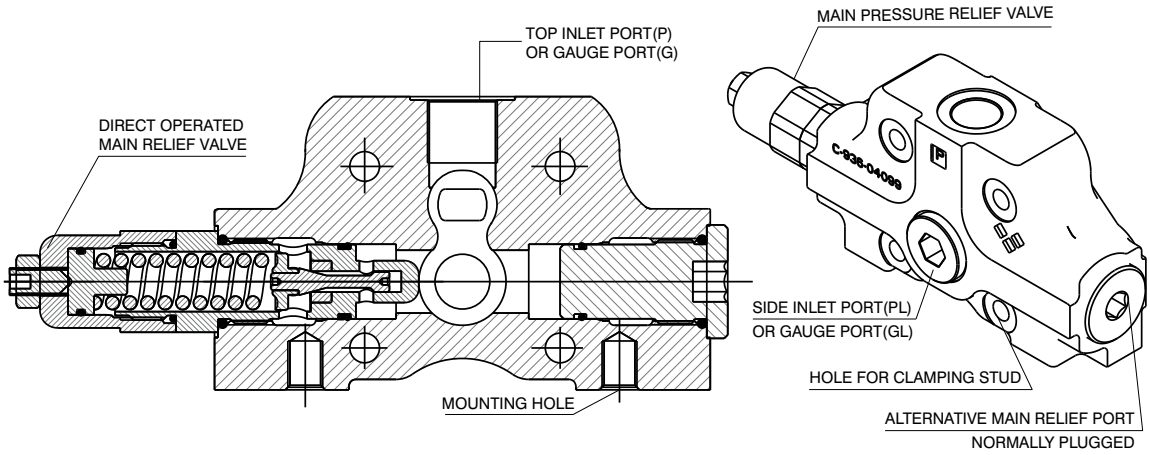
Example: V20P-1-1-240-1113/150-1-1-G-C-5 : Single S1 (All Ports Blocked in Neutral) Spool Section Valve having Work Port relief Valves in A& B Ports set to 150bar,

Top inlet Port with Adjustable DPRV Pre set to 240 bar, Standard Straight Lever upwards with Right side Inlet, Top Outlet Port with BSP Threading & Viton Seals

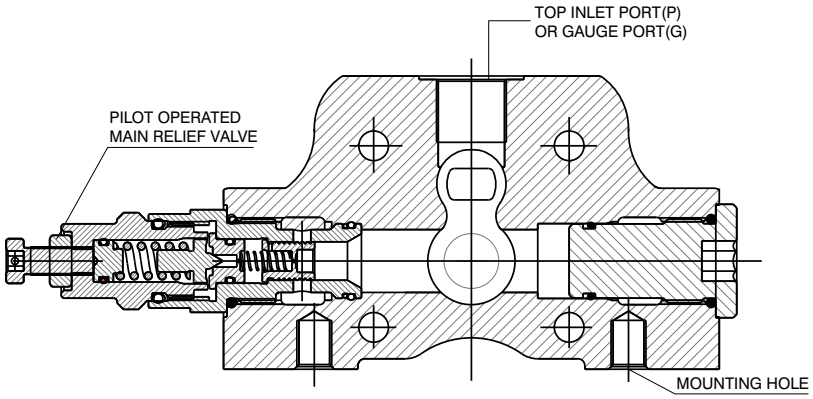
INLET SECTION

Made from a grey iron casting having high resistance to wear, seizure and excellent vibration damping capacity, inlet sections are designed to provide a variety of port sizes and locations for increasing adaptability. All unused ports must be plugged. This Inlet cover has provision for the system's main relief valve. If a gauge port is required, a port hole may be drilled and tapped for a ¼" BSP and installed in the unused inlet port for fixing the pressure gauge.

TOP SECTION



BOTTOM SECTION



Inlet section is the entry point for the pressurized fluid. From this section the fluid flows through different work sections up to the outlet section. The inlet section is provided with option of two inlet ports -one in the front and one at the top. There is an additional outlet port at the top which allows draining of oil which has returned from the outlet section to tank. There are four holes provided for the studs to clamp the spool, inlet and outlet sections of the valve. Four tapped holes are provided at the bottom of inlet and outlet sections for fixing the valve firmly to a base on the machine.

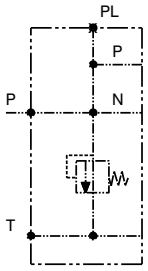
There is a port provided for main relief valve which limits the maximum pressure in work section work port A/B. At the unused inlet port you can remove the dummy plug (1/4" BSP) to connect a pressure gauge.

The position of the inlet cover with respect to the mounting on the machine depends on the customer requirement. Accordingly the mounting hole position, relief valve position, inlet and outlet positions will change. Though options have been provided to minimize plumbing by the customer, it is recommended that any customization requirements are discussed with Veljan Denison engineering teams.

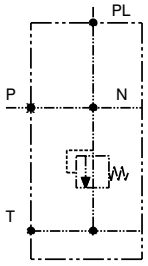
INLET SECTION

Made from a grey iron casting having high resistance to wear, seizure and excellent vibration damping capacity, inlet sections are designed to provide a variety of port sizes and locations for increasing adaptability. All unused ports must be plugged. This Inlet cover has provision for the system's main relief valve. If a gauge port is required, a port hole may be drilled and tapped for a 3/4" BSP and installed in the unused inlet port for fixing the pressure gauge.

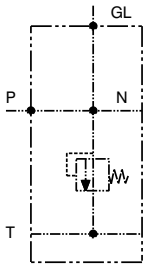
1. Top Inlet with DPRV
(Direct pressure relief valve)



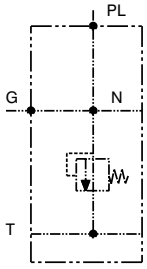
2. Side inlet with DPRV
(Direct pressure relief valve)



3. Top Inlet Port with DPRV & Side Gauge Port



4. Side Inlet Port with DPRV & Top Gauge Port



1. Pressure oil from pump is connected to Top inlet Port(P). Side inlet port (PL) is plugged. Main relief valve that limits maximum pressure at work section port A/B is fixed in the relief valve port. No relief valve cavity plug (N) is used when relief valve is not required.

2. Pressure oil from pump is connected to side inlet Port(PL). Inlet port (P) is plugged. Main relief valve that limits maximum pressure at work section port A/B is fixed in the relief valve port. No relief valve cavity plug (N) is used when relief valve is not required.

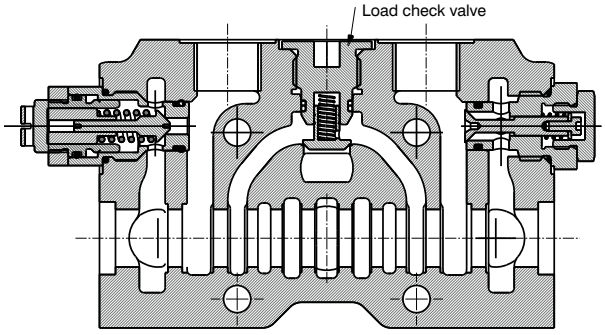
3. Pressure oil from pump is connected to Top inlet Port(P).Side inlet port (GL) provided with 1/4" NPTF adaptor for connecting a pressure gauge. Main relief valve that limits maximum pressure at work section port A/B is fixed in the relief valve port. No relief valve cavity plug (N) is used when relief valve is not required.

4. Pressure oil from pump is connected to side inlet Port(PL). Top inlet port (G) provided with 1/4" NPTF adaptor for connecting a pressure gauge. Main relief valve that limits maximum pressure at work section port A/B is fixed in the relief valve port. No relief valve cavity plug (N) is used when relief valve is not required.

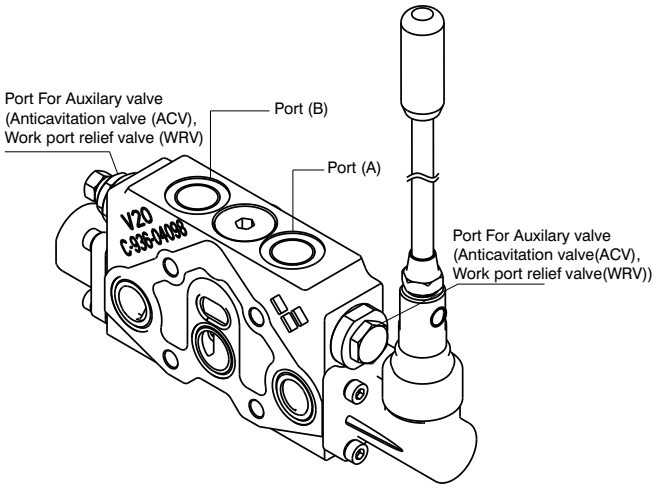
X - INDICATES PORT IS PLUGGED

SPOOL SECTION

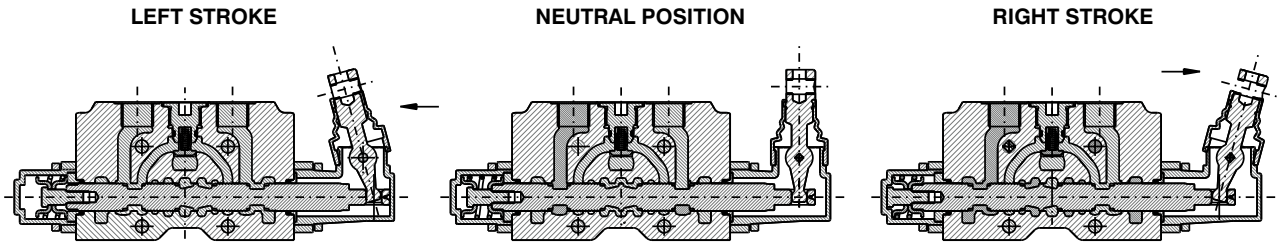
Model V20M work sections are precisely machined and have a high resistance to wear and seizure, excellent vibration and damping capacity. This model offers manual operation in a parallel circuit as the standard configuration. Spools are hardened and treated for long life and corrosion resistance. Looking from the inlet body, the two ports on the work section are designated as 'A' for left hand side port and 'B' for the right hand side port. Additional port spools are provided to fix anti cavitation or conversion valve or work port relief valve to either or both of the work ports A and B.



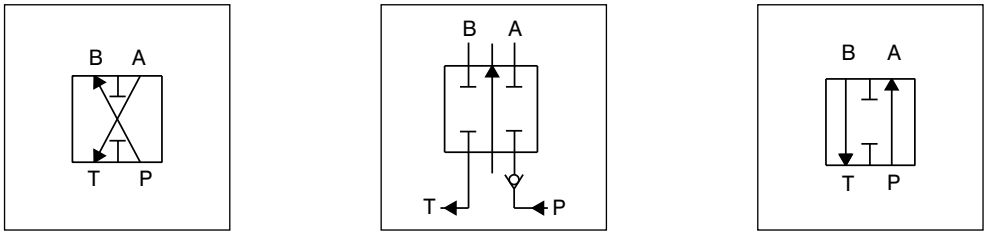
SECTIONAL DRAWING



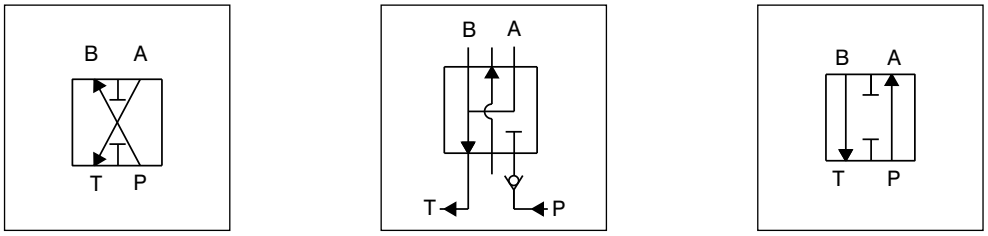
SPOOL TYPES



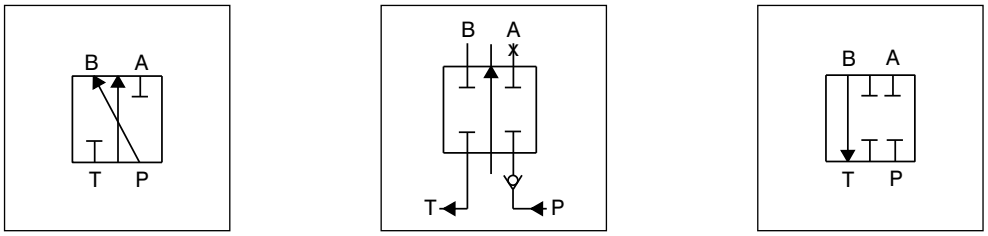
1. Spool (S1)



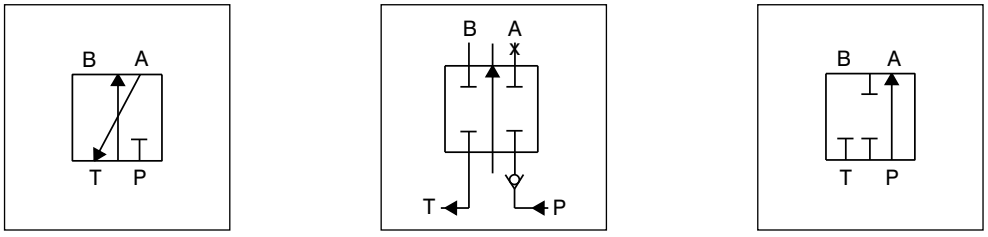
2. Spool (S2)



3. Spool (S3)

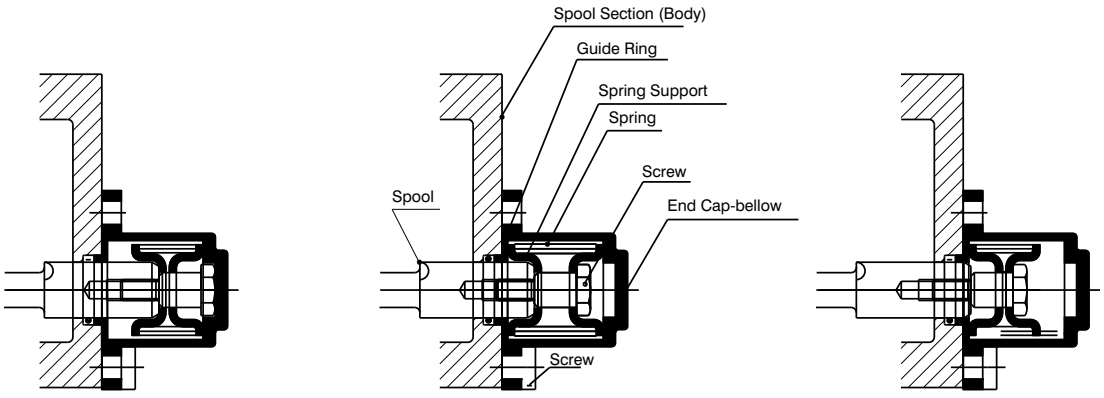


4. Spool (S4)



SPOOL POSITIONS

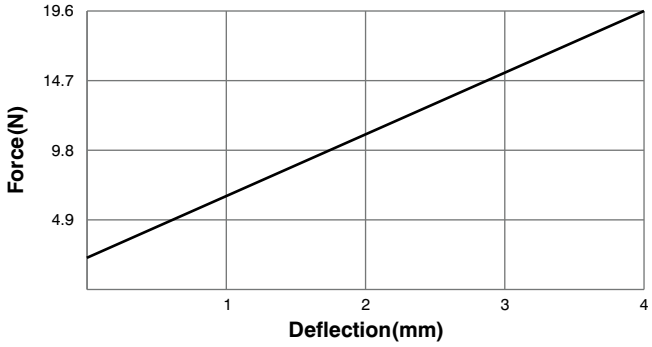
1. SPRING CENTERED



Forward position **Center position** **Backward position**

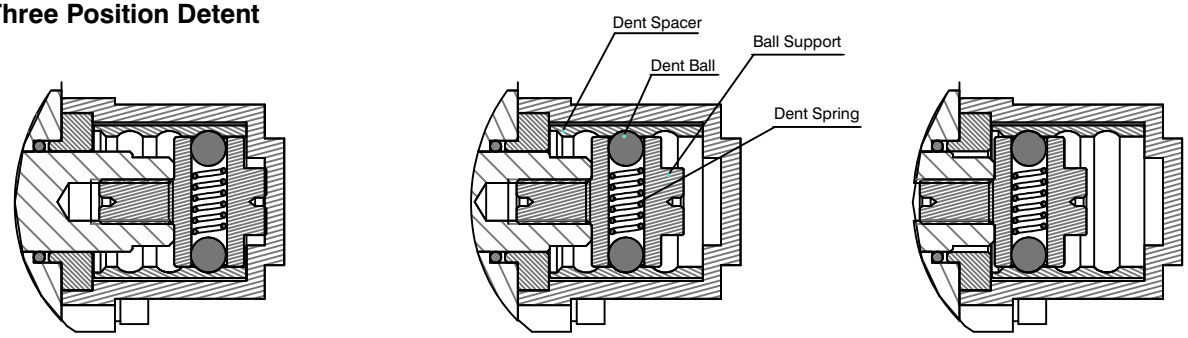
Spring rate

Spool is assembled on one side with lever assembly and on the other side with spring and spring supports housed in an end cap. At the neutral condition lever position is 90° and it moves 15° either side from center for forward and backward positions. Linearly the spool will move 7.1 mm on either side from the center position. The spring force bring the lever to the neutral position when released from either forward or backward position. Operators conversant with mobile valves can control the oil flow rate by intermediate positioning of the lever to achieve speed control of hydraulic cylinders /motor. The operator can also get trained to move more than one lever at a time assisted by the design and placement of the work sections.

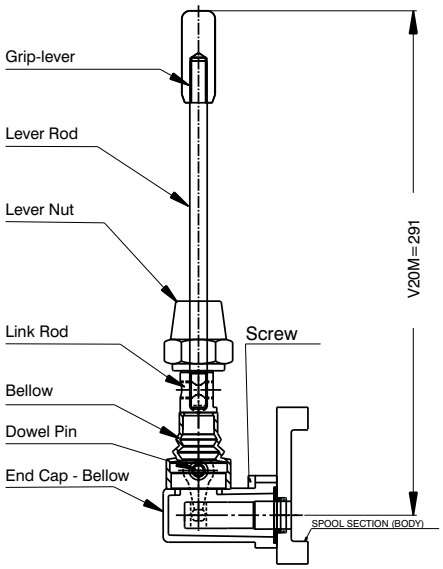


$$\text{SPRING RATE} = \frac{\text{Load}}{\text{Deflection}}$$

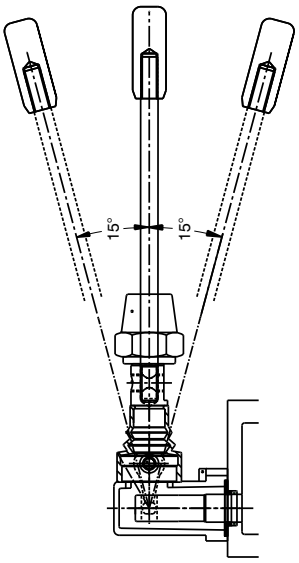
2. Three Position Detent



Forward Position **Center Position** **Backward Position**



Lever center position

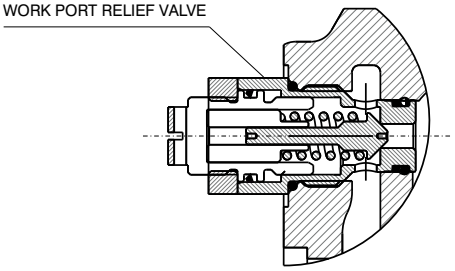


Lever 3 positions

Auxilary Valves

WORK PORT RELIEF VALVE (WRV)

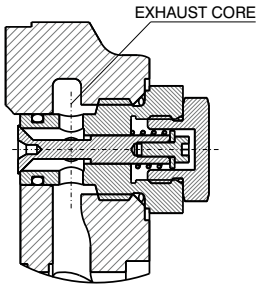
These are used for setting maximum pressure limit in ports A and / or B in individual work sections in addition to the common main relief valve installed in the inlet section.



HOW TO SET PRESSURE ON WORK PORT RELIEF

A good pressure gage must be installed in the line which is in communication with the work port relief. A load must be applied in a manner to reach the set pressure of the port relief unit. Then, follow these steps:

* Remove End cap and loosen lock nut
* Set adjusting Plug to desired pressure setting
* Tighten lock nut and reassemble End cap
* Reset in similar manner as above

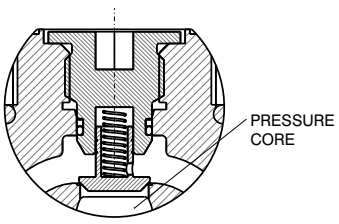


ANTI-CAVITATION CHECK VALVE (ACV)

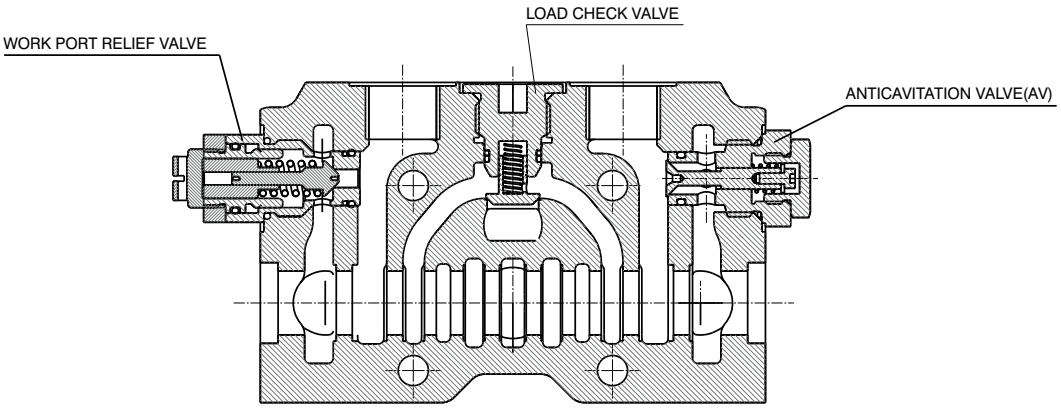
Anti-cavitation check valves are available for use in the work port option cavity to prevent cylinder or motor cavitation. It allows the cavitating work port to refill from the exhaust core. Anti-cavitation check valve is non adjustable but is designed to operate whenever work port pressure is lower than the exhaust core pressure.

LOAD CHECK VALVE

Load check valve is built in every working module and it is available as standard. No specific ordering is needed because it is part of the module. In some applications like a free flow motor spool, load check valves will not be required. The check blocks back flow from work port to the inlet port until the inlet pressure is greater than the load pressure. At this point the spool is moved to control the flow.



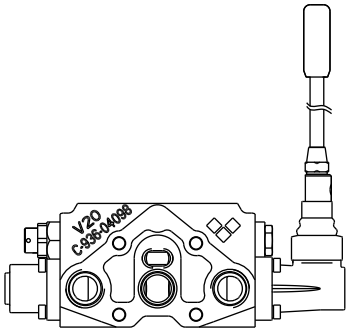
SPOOL SECTION WITH ACV AND WRV



Handle Position

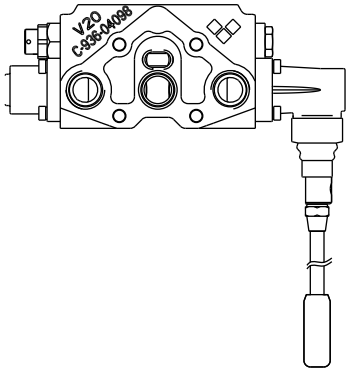
1. Upwards

Lever Will Be Fitted Vertically
Upwards With Spool Section Ports.

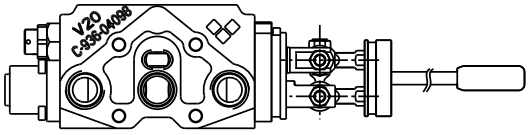


2. Downwards

Lever Will Be Fitted Vertically Downwards
With Spool Section Ports.

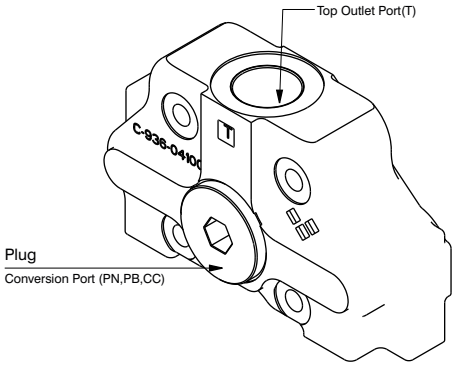


3 - Lever With JOY STICK Control



Outlet Section

Designed for high resistance to wear, seizure and excellent vibration damping capacity, outlet sections provide a variety of port sizes and locations for increasing adaptability. They have outlet ports on top (T) and end(TL). An additional conversion port on side offers option for power beyond, closed center and turn around.



When all the spools are in neutral position, pressurized oil from the inlet will flow through to the outlet conversion port. In the outlet body two additional ports, end outlet port and top outlet port are provided. The end outlet port turns around the return oil from cylinders/motors through the spool sections up to the inlet body's out port. This is a optional tank port provided for the ease of machine hose piping. Similarly the top port in the outlet body is an optional tank connection for user convenience.

The tank connection from the work port A comes through the work sections and up to the outlet body and in the outlet section it gets connected to the conversion port. The tank connections from the B-port of the spool sections get connected to the end outlet port. The end outlet port is connected to the conversion port, top port of the outlet body and to the outlet port of the inlet body. These inter connections make it possible for the pressure oil from the inlet section port to reach the outlet section conversion port and further allows it to come back to the inlet section. When the oil pressure in the inlet port tends to rise above the relief valve set pressure then it is by passed to tank through the inlet section outlet port.

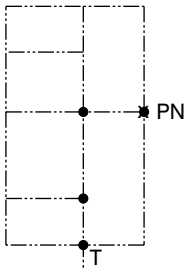
1. **Direct Connection To The Tank**
   The hydraulic oil from the inlet port of inlet section passes through the open centers of spools in the neutral position and reaches the conversion port from where it is channeled to the tank.

2. **Power Beyond Sleeve(PB)**
   The hydraulic oil from the inlet port of inlet section is made available as input for another mobile valve unit down stream. In a power beyond circuit the upstream valve will always have priority. Hydraulic oil will only be available to the downstream valve when all valve spools in the up stream valve are in neutral. When the pressure requirements of up stream and down stream valves are the same, pressure relief is provided in up stream valve. When the pressure requirements are different, two independent relief valves are provided-one each in the upstream and down stream inlet sections. When conversion port is used for Power beyond option, alternate tank outlet port is used for channeling return oil.

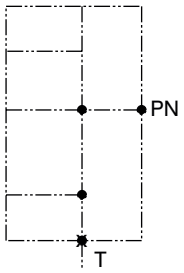
3. **Closed center plug (closed center system)-(PC)**
   Install the closed center plug into the conversion port when using a variable displacement pump. Assuming all other optional outlet ports are closed, the closed center plug will block pump flow when all the valve spools are in neutral. High pressure is maintained at the control valve inlet. The maximum system pressure is set with the compensator adjustment on the pump. The maximum pressure in the mobile valve is limited by the relief valve setting.

Outlet Block Coding

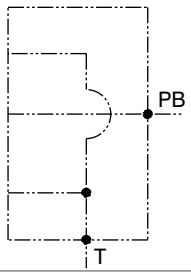
1. Top Outlet Port



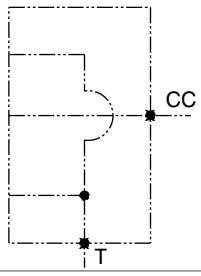
2. Side Outlet Port



3. Top Outlet with Power beyond



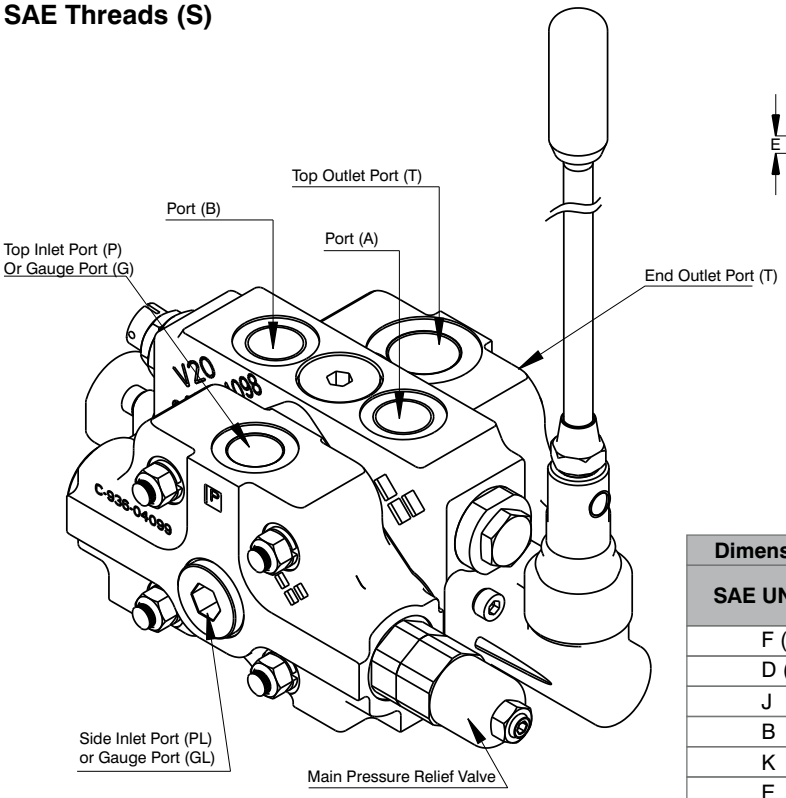
3. Outlet with Closed center

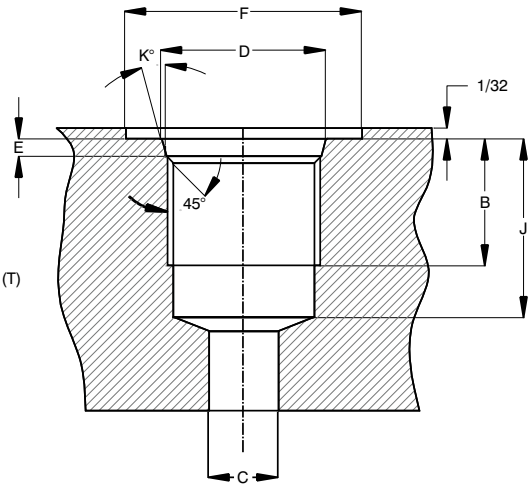


1. Side port (PN) are plugged and Top outlet port is open.
2. Top outlet (T)is plugged and Side port(PN) is open.
3. Power beyond sleeve is installed in the conversion port (PB) & Top outlet port(T) is open.
4. Closed center plug is installed in the side port (PN) and top outlet ports(T) is plugged.

STANDARD PORTS THREADING

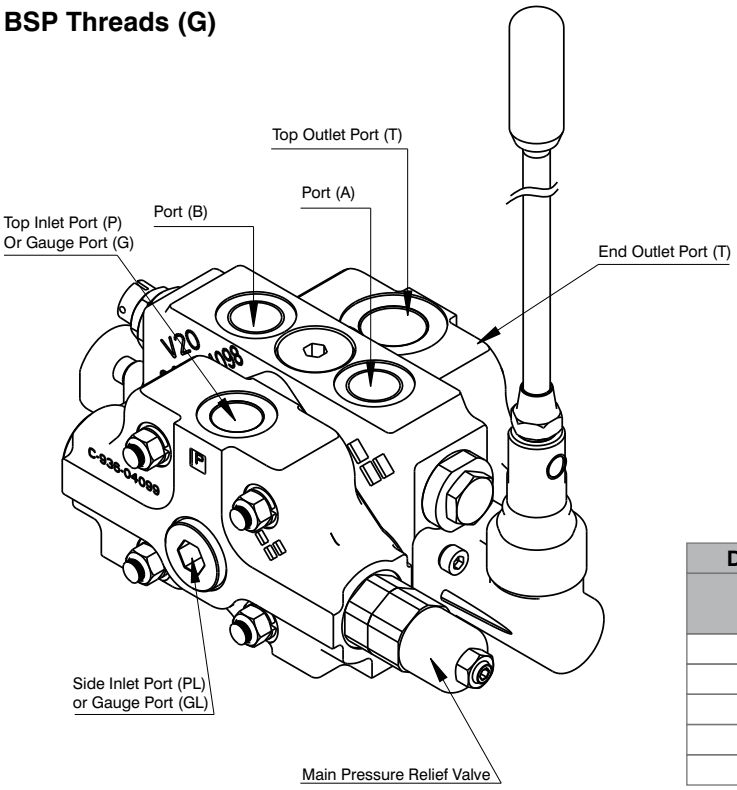
SAE Threads (S)

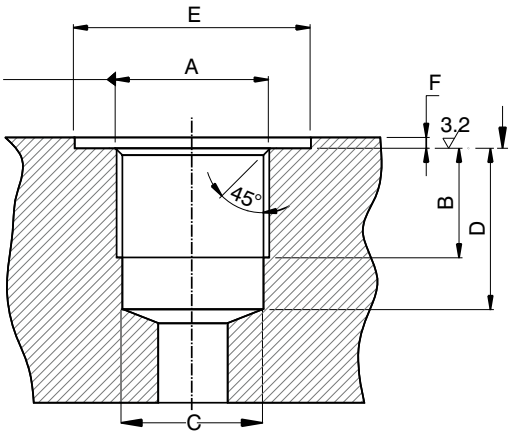




Dimensions	A, B & P		T	
SAE UN-UNF	7/8-14 UNF		1 1/16-12 UNF	
	mm	in	mm	in
F (Ø)	34.14	1.344	41.3	1.625
D (Ø)	23.93	0.942	29.16	1.148
J	26.2	1.031	31.75	1.25
B	16.66	0.656	19.05	0.75
K	15°	15°	15°	15°
E	2.54	0.1	3.3	0.13
C (Ø)	12.3	0.484	15.5	0.609

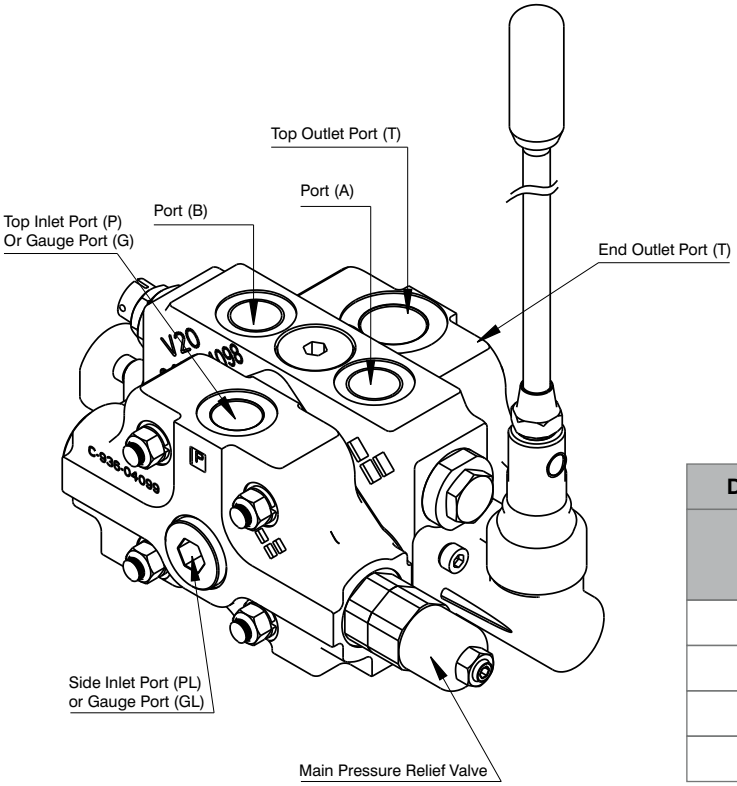
BSP Threads (G)

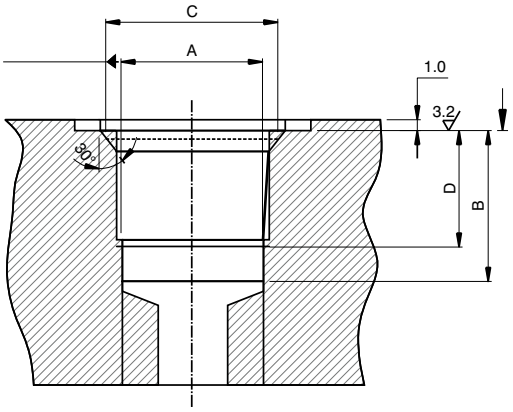




Dimensions	A, B & P		T	
BSP.F	G 1/2		G 3/4	
	mm	in	mm	in
E (Ø)	30.0	1.181	40.0	1.575
F	1.0	0.04	1.0	0.04
B	15.9	0.625	19.05	0.75
D	24.0	0.95	27.0	1.070
C (Ø)	19.0	0.75	24.5	0.964

NPTF Threads (N)



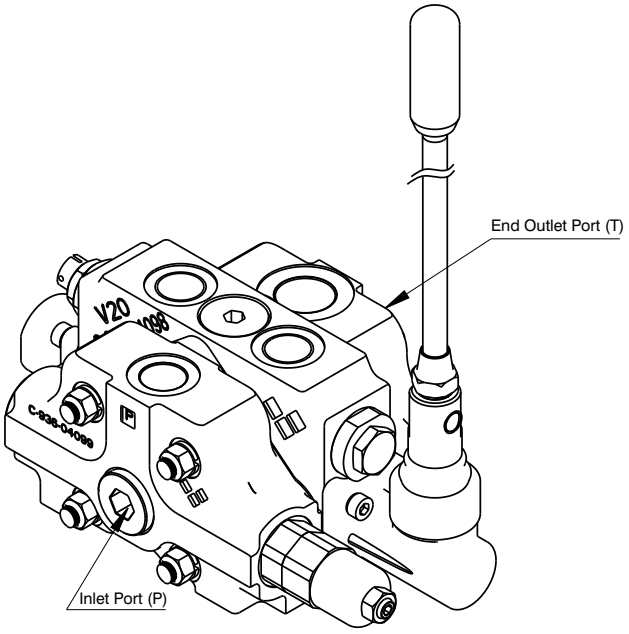


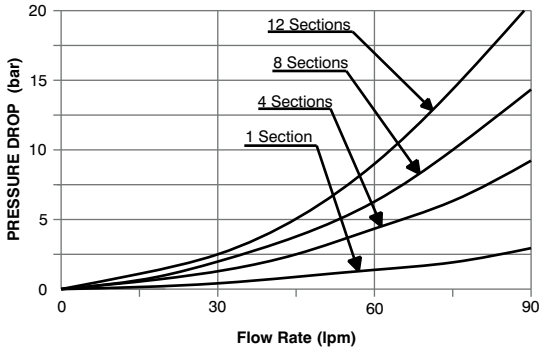
Dimensions	A, B & P		T	
NPTF	1/2"-NPTF		3/4"-NPTF	
	mm	in	mm	in
A (Ø)	17.46	0.687	22.63	0.89
B	30.2	1.19	30.2	1.19
C (Ø)	22.2	0.87	27.78	1.09
D	16.0	0.63	18.0	0.71

PERFORMANCE DATA (PRESSURE DROP VS FLOW):

Open Center Pressure Drop

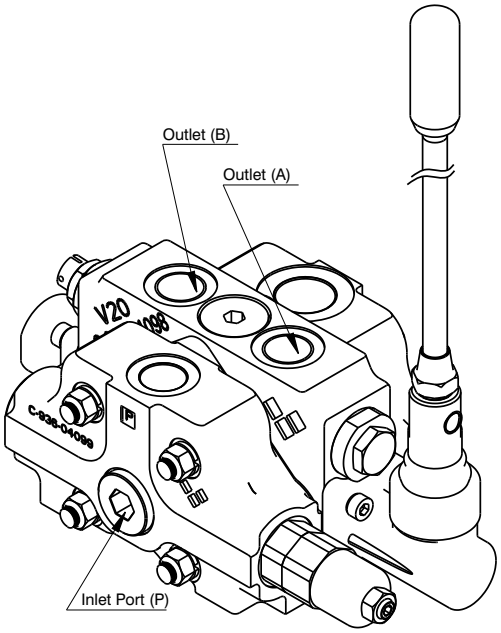
Typical pressure drop 1to 12 section valve assemblies using inlet to outlet (Pressure drop "P" to "T")

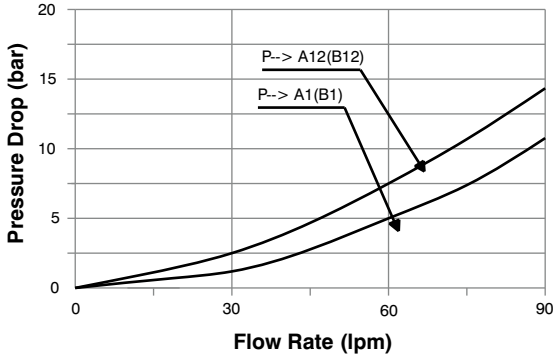




INLET TO WORK PORT PRESSURE DROP

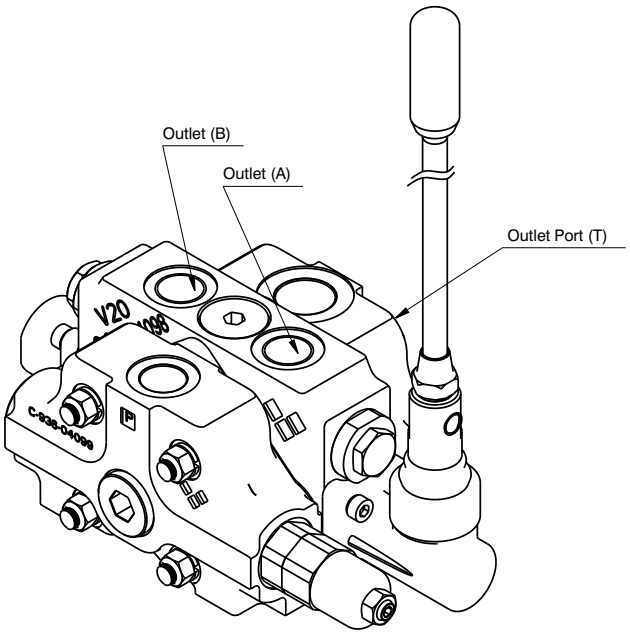
Typical Pressure Drop 1 To 12 Section Valve Assemblies Using Inlet To Work Port A & B (pressure Drop "p" To "a/b").

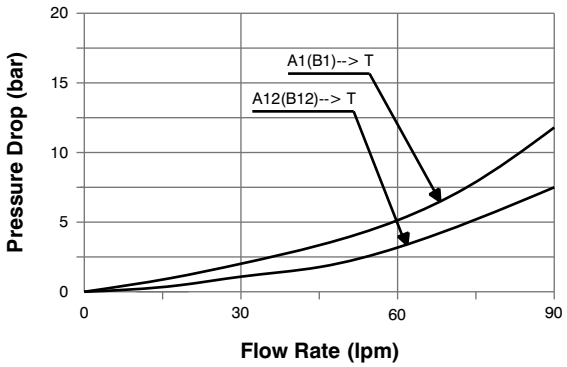




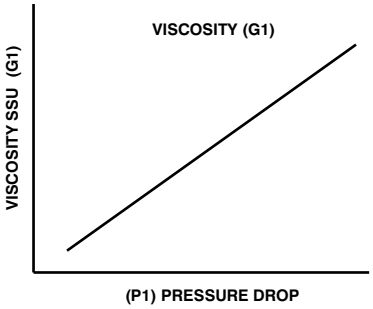
WORK PORT TO OUTLET PRESSURE DROP

Typical pressure drop 1to 12 section valve assemblies using work port to outlet (Pressure drop "A/B" to "T").





Viscosity of oil can effect the performance curves. Pressure drop is effected by viscosity as shown below

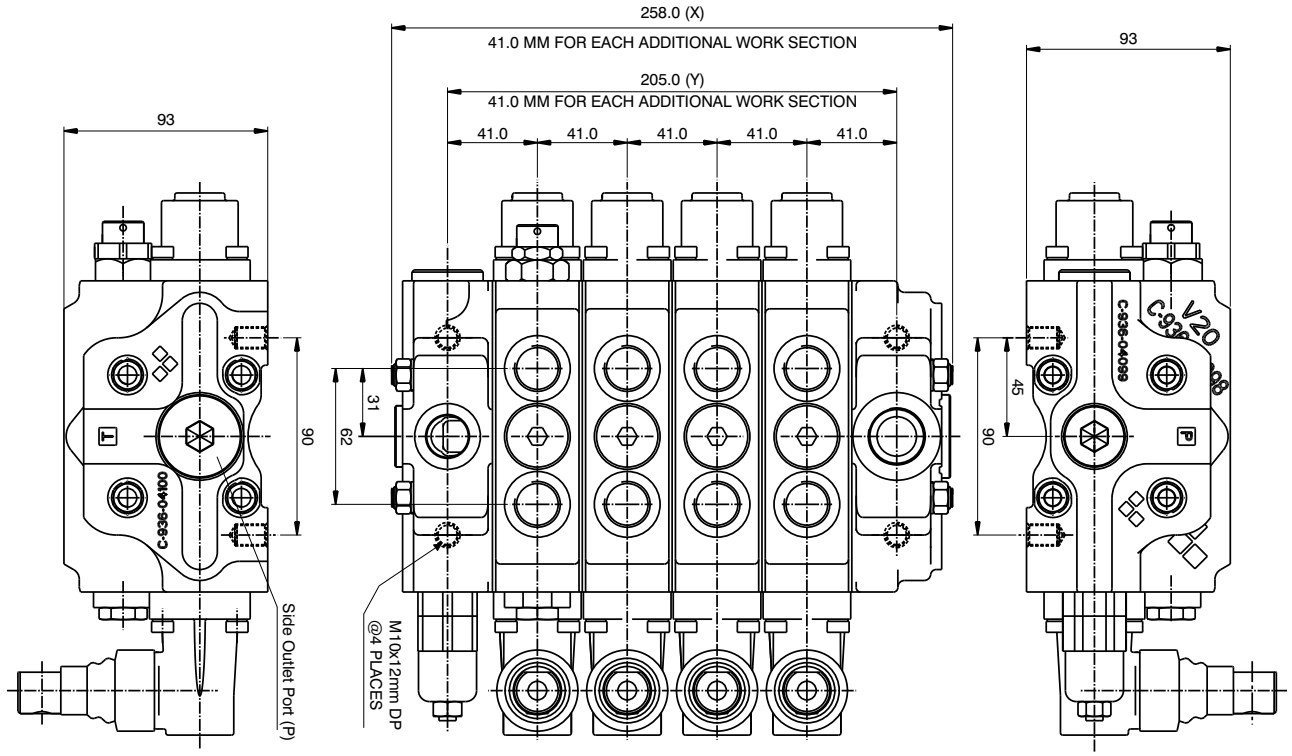


We can find pressure drop P_2 for any oil with viscosity G2

Pressure drop $P_2 = P1x \frac{G2}{G1}$

Viscosity (SSU)	75	150	200	250	300	350	400
% of Δ P(Approx)	93	111	119	126	132	137	141

ASSEMBLY DIMENSIONAL DATA



No. of spool sections(n)	1	2	3	4	5	6	7	8	9	10	11	12
kg	8.1	11.8	15.5	19.2	22.9	26.6	30.3	34.0	37.7	41.4	45.1	52.5
lb	17.8	26.0	34.2	42.3	50.5	58.6	66.8	74.9	83.1	91.3	99.4	115.7

No. of spool sections(n)	1	2	3	4	5	6	7	8	9	10	11	12
X (mm)	135	176	217	258	299	340	381	422	463	504	545	596
X (in)	5.31	6.92	8.54	10.15	11.77	13.38	15.0	16.61	18.23	19.84	21.46	23.46
Y (mm)	82	123	164	205	246	287	328	369	410	451	492	533
Y (in)	3.22	4.84	6.45	8.07	9.68	11.30	12.91	14.52	16.14	17.75	19.37	20.98

* All dimensions are in `mm' and for reference only.
* Handle information not shown, variations in handles, may be supplied on customer requirement