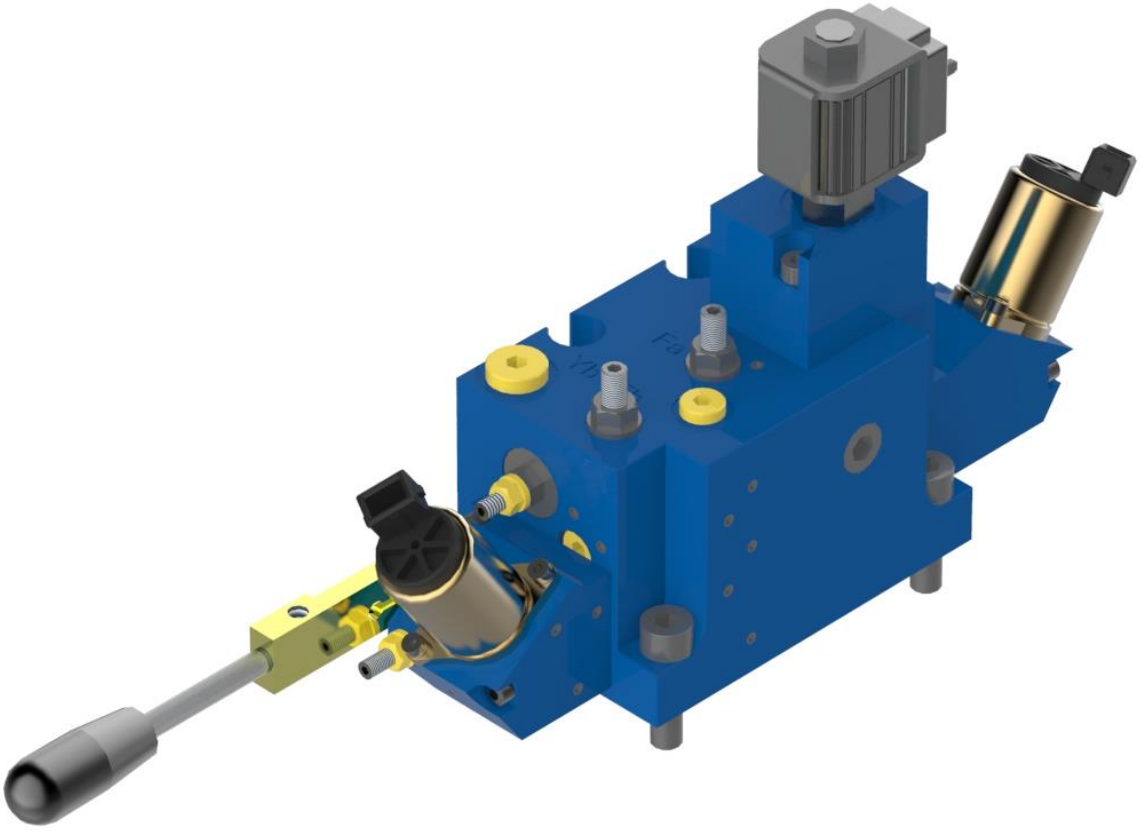
APV – 16A



* Modular assembly system, suitable for ‘Build Program’.
* Maximum operating pressure 420 Bar / 6092 PSI
* Different spool types up to 140 L/min / 38 GPM
* Pressure compensated for simultaneous multi users.
* Operating control in any combination (Electric-, Hydraulic and manual).
* Adjustable ΔP for setting the maximum flow for maximum proportional range.

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Overview 4
Control section 5
Options pump unloading functions and prop. relief 9
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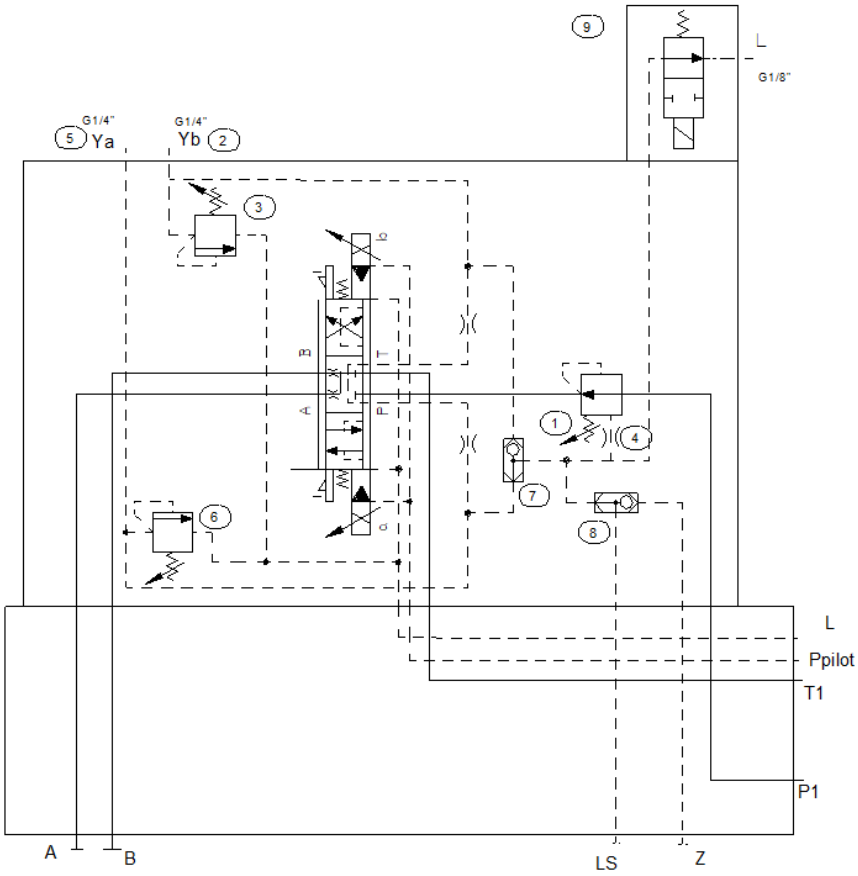
Performance curves. 14
Recommended spare parts breakdown 17
System integration 18
Troubleshooting 18

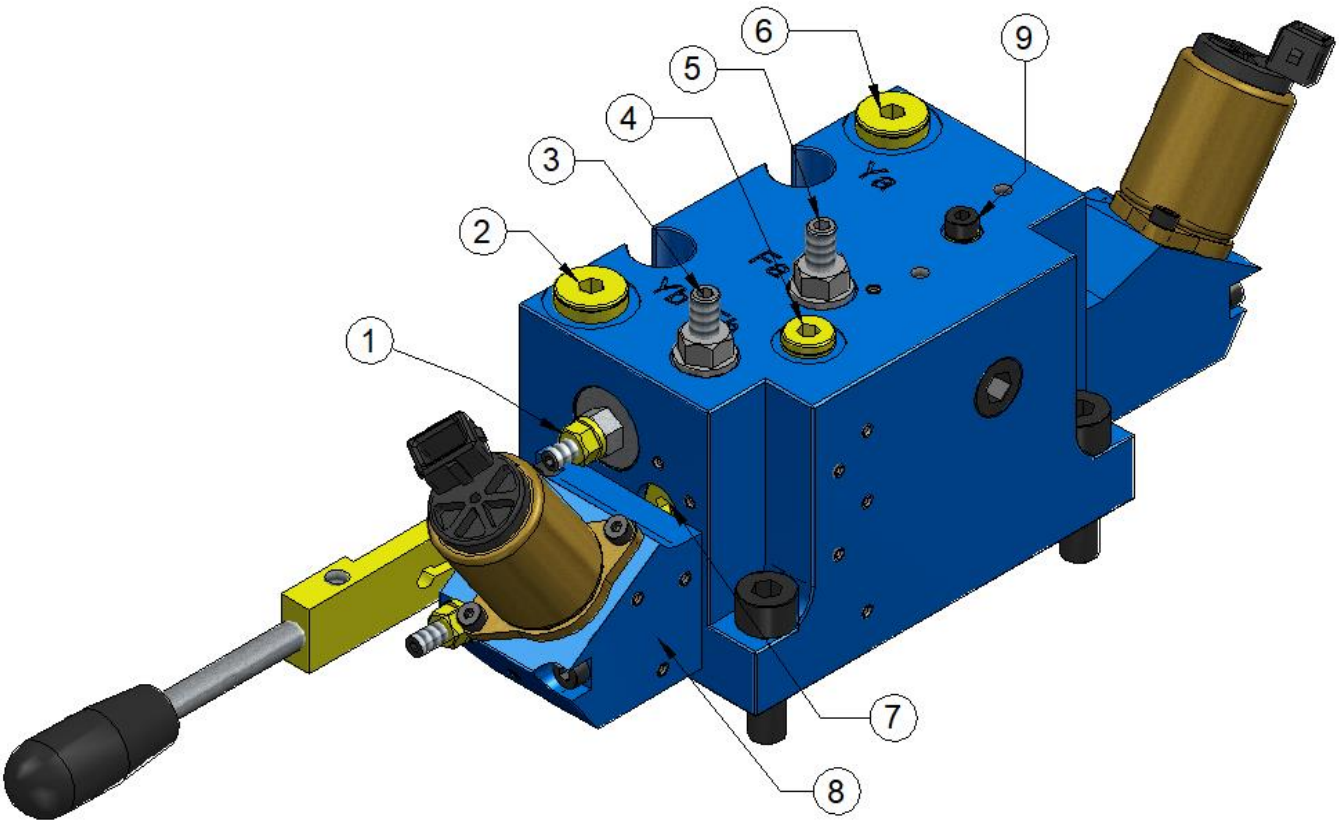
Main technical data

Max. flow:	Port P	140 L/min.	38 GPM
	Port A / B	120 L/min.	31 GPM
Max. pressure:	Port P / A / B	420 Bar	6092 PSI
	Port T	35 Bar	508 PSI
Pressure setting range		14-350 Bar	203-6092 PSI
Pressure drop over 2-way compensator (A,B)		7 Bar	102 PSI
Internal pilot pressure supply		28 Bar	406 PSI
Pilot pressure for electric and hydraulic control		6-20 Bar	87-290 PSI
Spool stroke		5,25 mm	0,207 Inches
Spool overlap (dead band)		1,25 mm	0.04 Inches (21% of spool stroke)
Fluid		Mineral oil according to DIN 51524/51525	
Fluid temperature range		-30°C…+80°C	
Viscosity range		10…500cSt, optimal 30cSt	
Contamination level max.		According to NAS 1638 Class 8 or ISO 4406:18/16/13	
Port connections			
Port P, T		Through subplate	
Port A,B		Through subplate	
Port Ls		Through subplate	
Port L		Through subplate	
Port YA,YB		G 1/4” BSP	
Electric connection		AMP Junior Power Timer / Deutsch	
Nominal voltage		12 VDC or 24 VDC	
Nominal current		12 VDC (1500 mA)	
		24 VDC (750 mA)	
Coil resistance		12 VDC (4,72 ± 5% Ω)	
		24 VDC (20,8 ± 5% Ω)	
Recommended dither frequency		100 Hz	
Type of protection		IP 65	
Duty cycle		100%	
Hysteresis		3%	

Overview

1 Dp adjustment
2 Yb
3 LSb adjustment
4 LS orifice
5 Ya
6 LSa adjustment
7 Shuttle valve 1 (A/B)
8 Shuttle valve 2 (ls/Z)
9 Option block

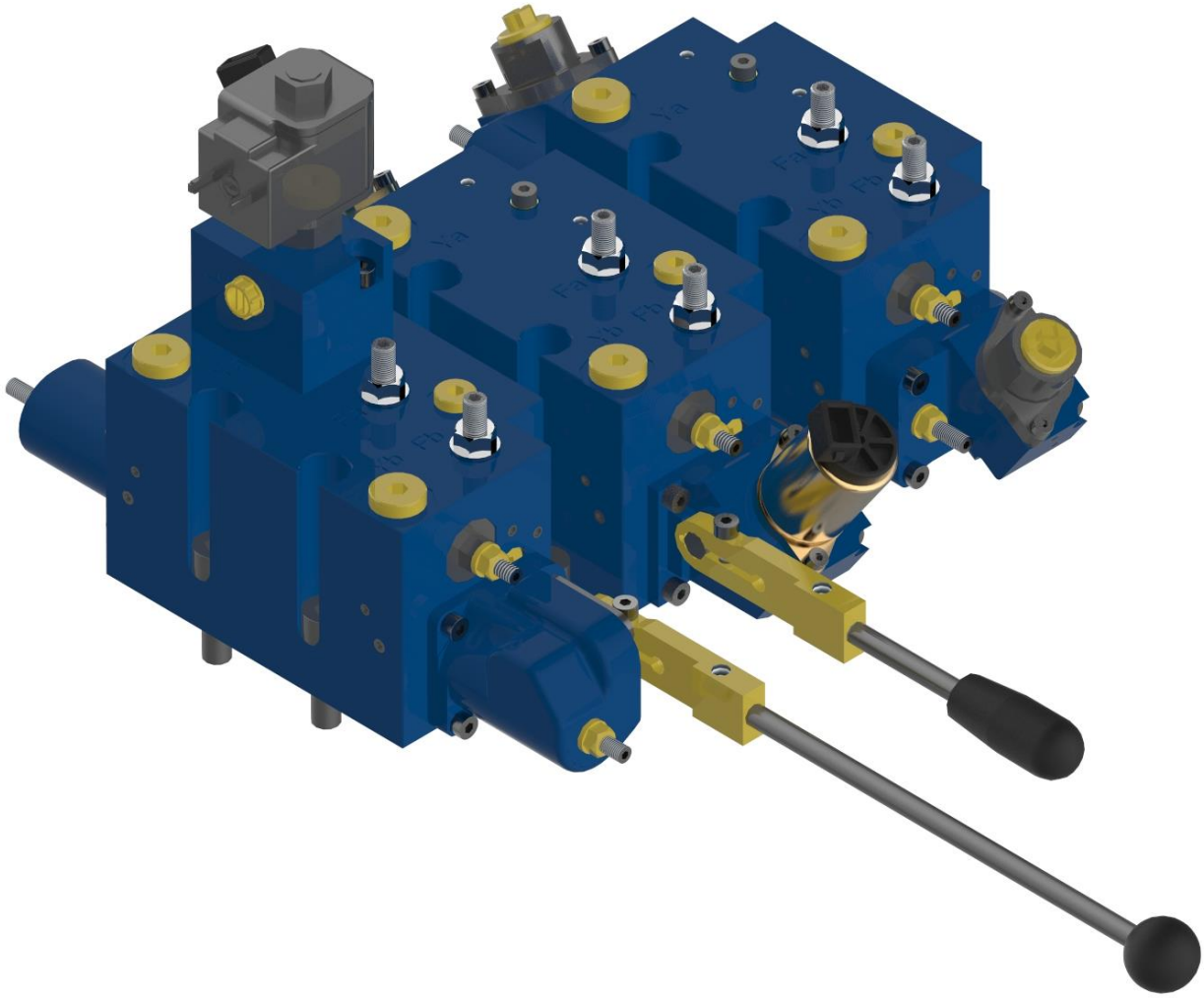




Control section

Control section

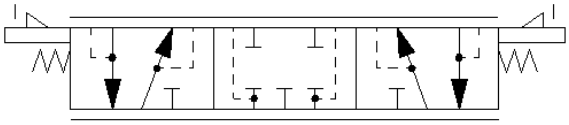
The spool section is the base of the APV-16 control section, it contains the 2-way compensator with delta p adjustment, so the flow can be adjusted without using the stroke limitation.
Each control section has measuring ports (Ya, Yb) on LSa and LSb, and LS adjustment per user port. To change between the several control types, different endcaps are used.



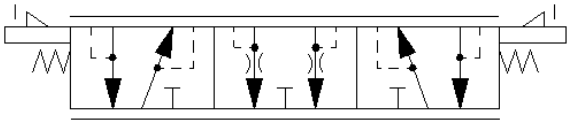
Control spool

There are 2 basic control spools available, the A spool with all ports closed in neutral position and the C spool with P closed and A en B to T in neutral position, with 20% of nominal opening to T.
These 2 basic spools have 4 flow ranges in combination with different compensator springs, shown below.

A spool 5-10* l/min: AP-1620S902 + AP-1620-001-042
A spool 10-17 l/min: AP-1620S402 + AP-1620-001-042
A spool 17-30 l/min: AP-1620S402 + AP-1620-001-039
A spool 32-50 l/min: AP-1620S302 + AP-1620-001-039
A spool 48-75 l/min: AP-1620S202 + AP-1620-001-039
A spool 68-100 l/min: AP-1620S102 + AP-1620-001-039
A spool 92-120 l/min: AP-1620S102 + AP-1620-001-040



C spool 5-10* l/min: AP-1620S952 + AP-1620-001-042
C spool 10-17 l/min: AP-1620S452 + AP-1620-001-042
C spool 17-30 l/min: AP-1620S452 + AP-1620-001-039
C spool 32-50 l/min: AP-1620S352 + AP-1620-001-039
C spool 48-75 l/min: AP-1620S252 + AP-1620-001-039
C spool 68-100 l/min: AP-1620S152 + AP-1620-001-039
C spool 92-120 l/min: AP-1620S152 + AP-1620-001-040



A Spool 35-80 l/min

C Spool 35-80 l/min

*Only possible with manual control

Configuration codes control section (1)

CONTROL VALVE

PART: SPOOL SECTION

16	A	F-	S	H	E	B	A	M

Size

16	16

Build type

A	Subplate

Compensator

F	With compensator
N	No compensator

1	Check valve function
-	none

Body type

S	Standard body type

Compensator spring

S	standard flow compensator spring
L	Low flow compensator spring
H	High flow compensator spring

Control body

E	Suitable for electric or hydraulic control 4/3 version
F	Suitable for electric or hydraulic control 4/2 version
J	for electric and hydraulic control combined 1/4" BSP
I	for electric and hydraulic control combined SAE ORB 6
H	Manual control

Actuating type body		**with control**
B	24VDC	E,F,J,I,C,D
F	24VDC with pin	E,F,J,I,C,D
A	12VDC	E,F,J,I,C,D
E	12VDC with pin	E,F,J,I,C,D
H	24VDC with II 2G Ex mb II T4, flying leed	E,F,J,I,C,D
O	Hydraulic control 1/4" BSP	E,F,C,D
P	Hydraulic control SAE ORB 6	E,F,C,D
only in combination with manual control (H)		
F	spring returm	
B	friction brake	
R	3 position detent	

Connector type

A	Amp junior connector
D	Deutsch connector
-	

M	Additional manual control with E/O

Configuration codes control section (2)

CONTROL VALVE

PART: SPOOL SECTION

C 2- / 2-

Main spool type

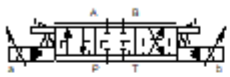
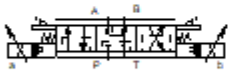
A	all ports blocked in neutral
C	A&B to tank in neutral (20% of nominal flow)
F	In neutral position all ports blocked
G	In neutral position port A + B throttled flow to T (20%)
B	B port blocked in neutral, A port throttled to tank (20%)
D	A port blocked in neutral, B port throttled to tank (20%)

Max. flow (l/min) (APV-16) A port / B port

1	150
2	120
3	100
4	75
5	50
6	30
7	17
8	10

Pre-tension (optional)

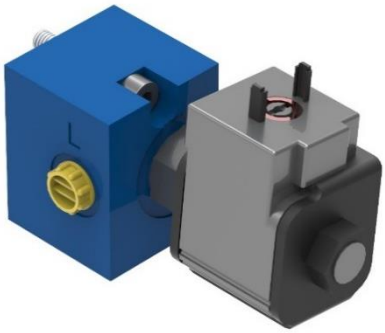
-	none
x	20 bar

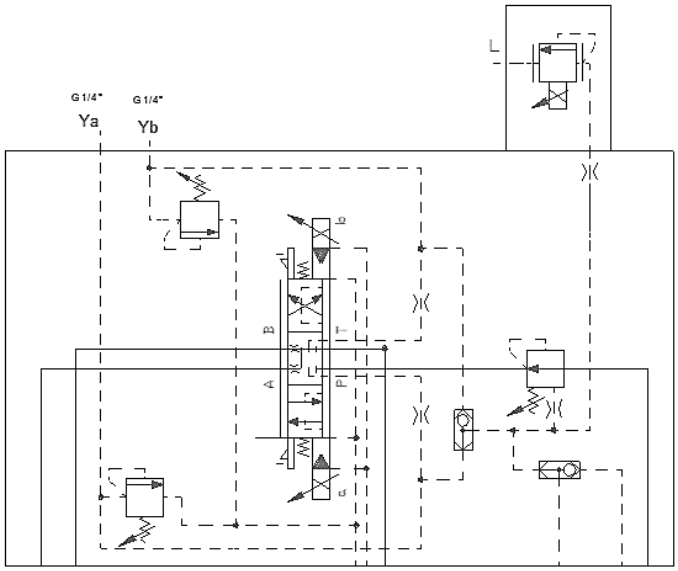
Code:	Symbol:	Remark	Code:	Symbol:	Remark
A		In neutral position all ports blocked	G		In neutral position port A+B throttled flow to T (approx.20% of nominal flow)
C		In neutral position port A+B throttled flow to T (approx.20% of nominal flow)	B		In neutral position port A throttled flow to T (approx.20% of nominal flow)
F		In neutral position all ports blocked	D		In neutral position port B throttled flow to T (approx.20% of nominal flow)

Options pump unloading functions and prop. relief

Electrical proportional pressure relief

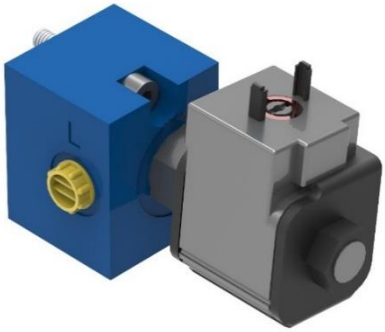
For remote control of the maximum pressure of the valve, the electrical proportional pressure relief is available in 12 VDC and 24VDC with prop cartridge in increasing current, decrease pressure and increase current, increase pressure configuration.

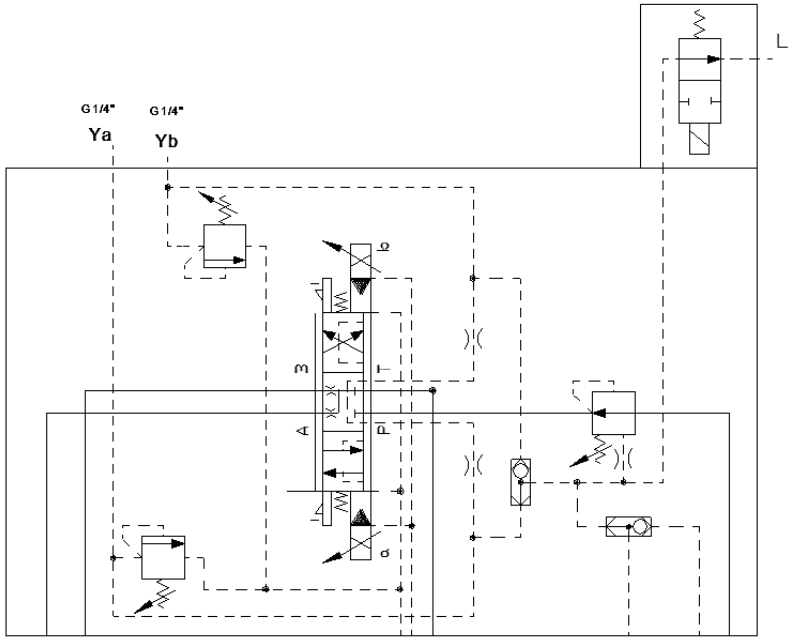




Pump unloading function

For emergency stop function the load pressure signal from the control sections can be unloaded to tank. The electrical control is available in 12 VDC and 24 VDC with 2/2 – way cartridge in normal-open and normal-closed configuration.





Option configuration codes

CONTROL VALVE

PART: OPTIONBLOCK

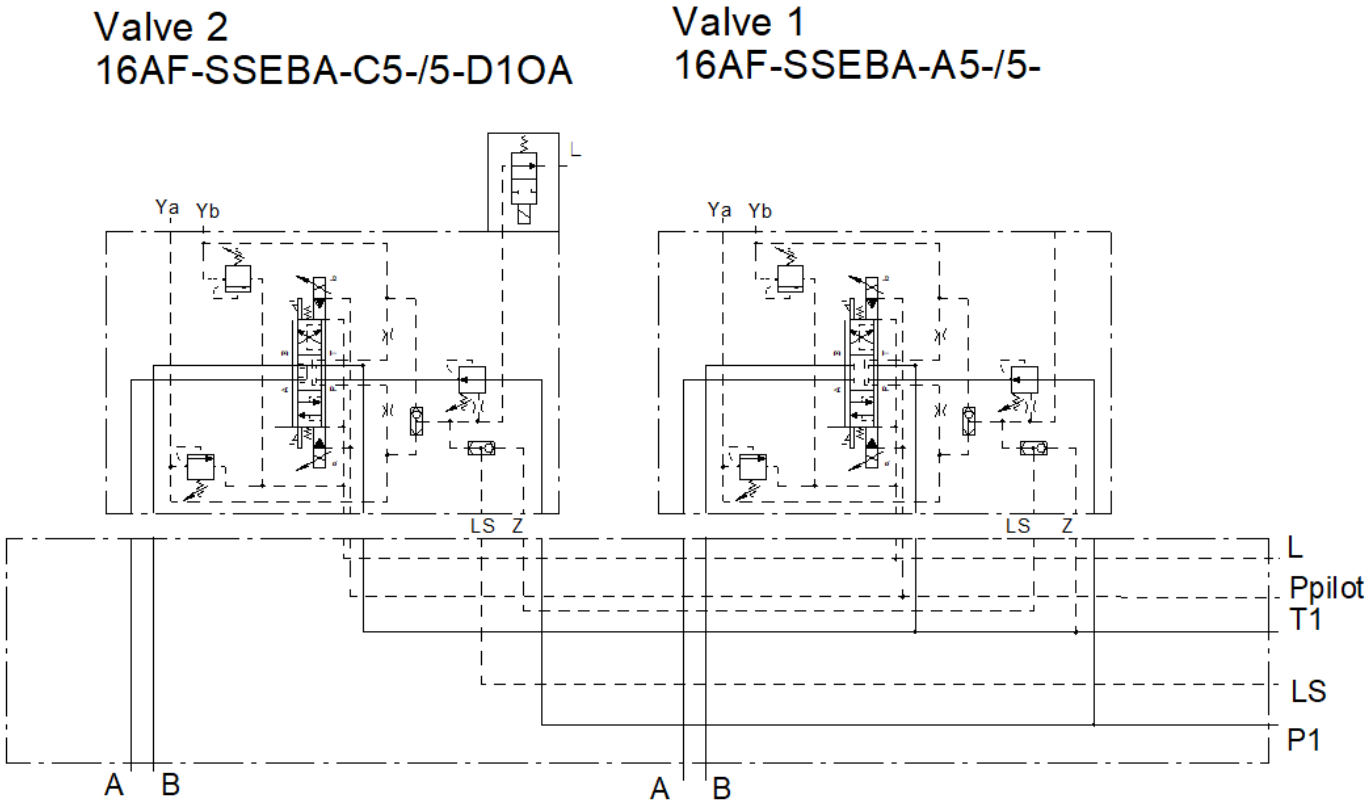
D1	O	B

	Connection block body
O	Pump unloading function, normally open
C	Pump unloading function: normally closed
E	prop pressure relief increase current, increase pressure
F	prop pressure relief increase current, decrease pressure
-	none

	Actuation
A	12 VDC
B	24 VDC
H	Manual

Example circuit

The APV-16-A is meant for customers who design and produce the manifold or subplate themselves. In the example diagram the circuit of a manifold with two control valves is shown.
The pilot line needs 28- to 35 Bar pressure or 406- to 508 PSI pressure, The L-connection is ideally separately connected to tank.
LS connection of valve 1 connects to the LS cascade entering valve 2 through the Z connection.
The LS connection of valve 2 connects to the LS port of the pump, or to the Z connection of another valve in the manifold system. Z connection of valve 1 needs to be connected to the T-line
If only 1 control valve is used, than the Z connection also has to be connected to the T-line.

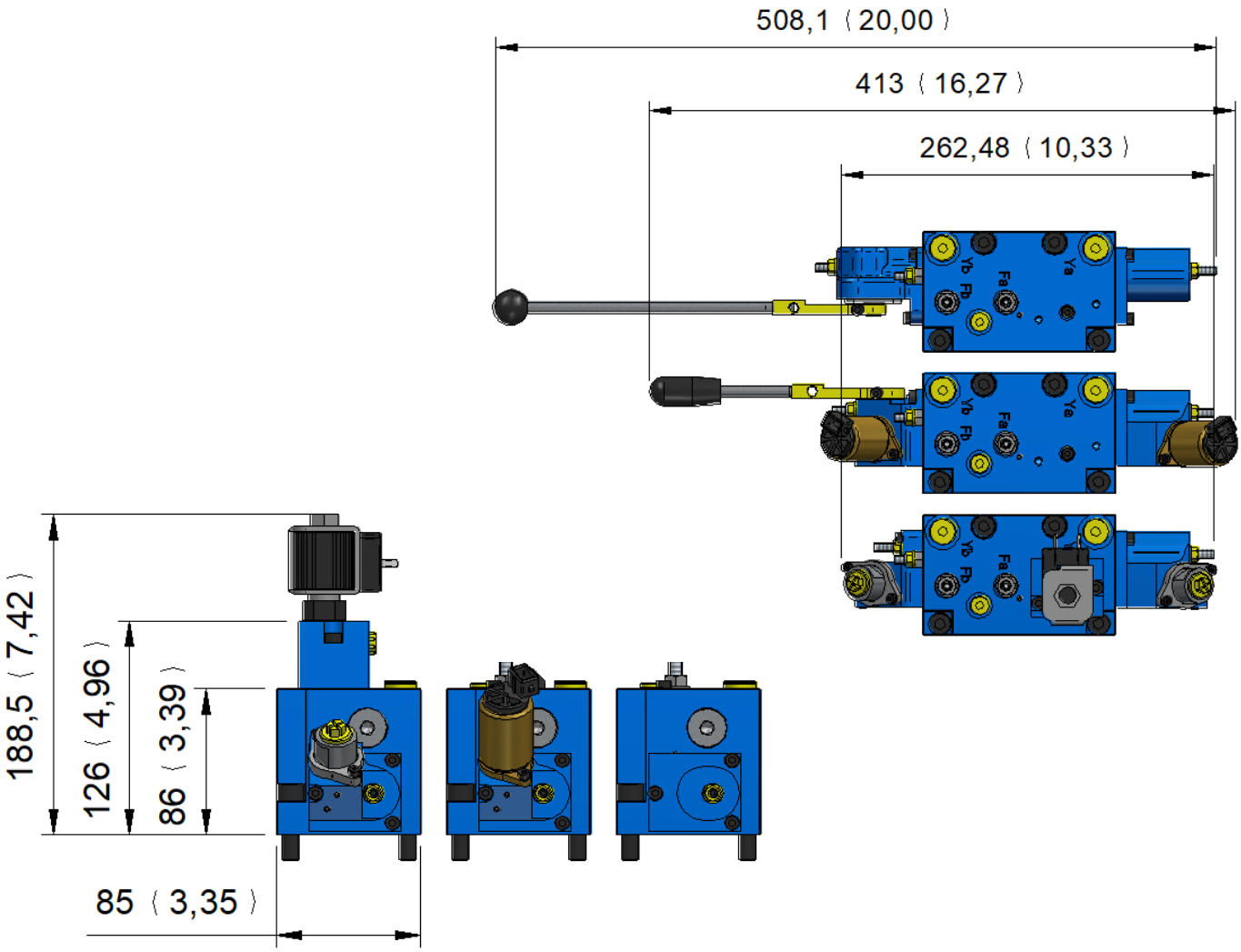


Manifold/Subplate

Connection	Function
L	Connect to separate drain to tank
Ppilot	28 to 35 bar Pilot pressure / 406 to 507 PSI Pilot pressure
T	Tank
Z	Connect to next valve in LS cascade or to tank
LS	Load sense line
P	Pump line

General dimensions.

Dimensions in mm (inch).

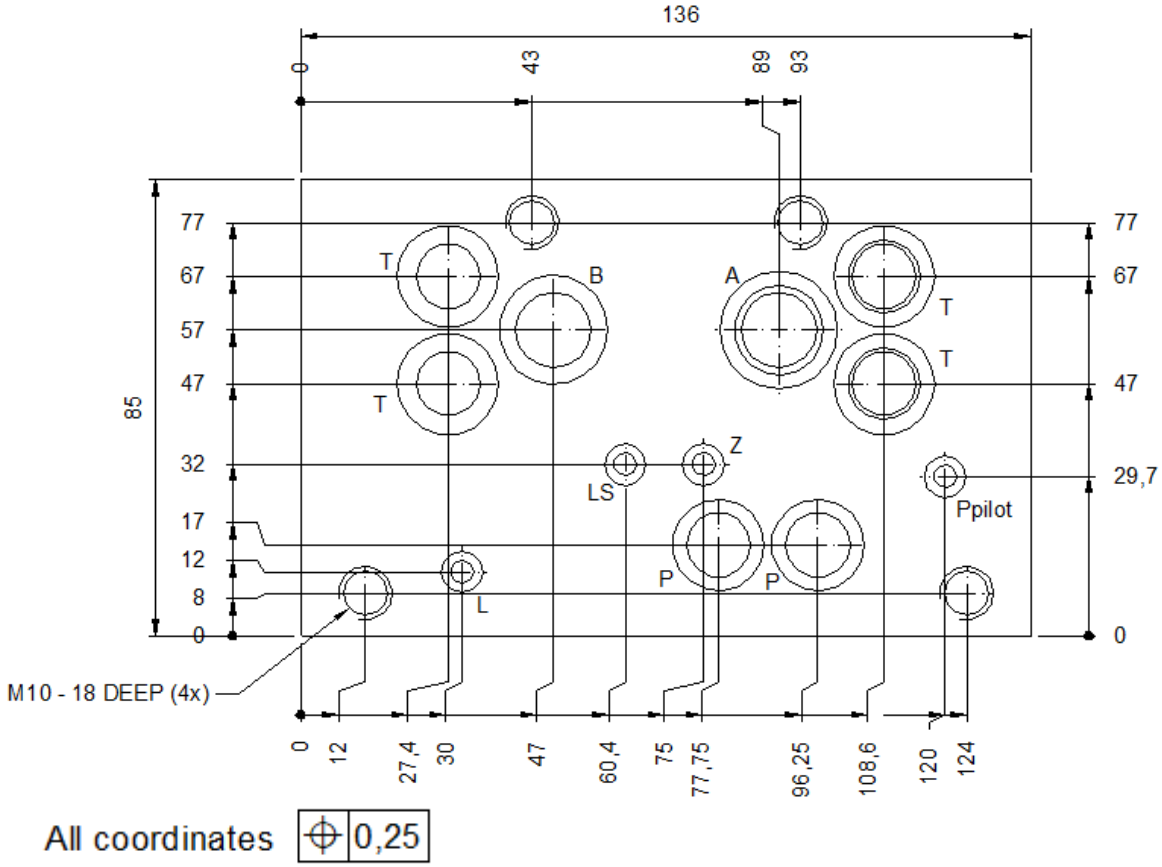


Weight:

Manual control section	6,9 kg (15.2 lb)
Hydraulic control section	7,3 kg (16.1 lb)
Electric control section	7,4 kg (16,3 lb)

Subplate lay-out (to produce by customers)

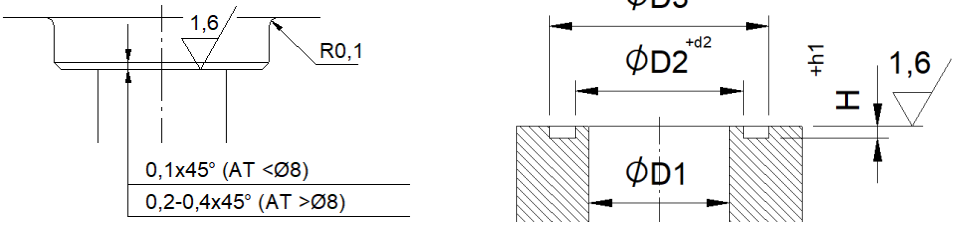
Dimensions in mm



Open O-ring chamber						
Ports	**Ø D1 (mm)**	**Ø D3 (mm)**	**Ø d2 (mm)**	**H (mm)**	**h1 (mm)**	**O-ring NBR (90-shore)**
P	12	17,20		1,2	0,1	14x1.78
T	12	18,90		1,9	0,1	19,94x2.62
A,B	14	20,35		1,9	0,1	15,54x2,62
LS, Z, L, Ppilot	4	7,8		1,2	0,1	4.47x1.78

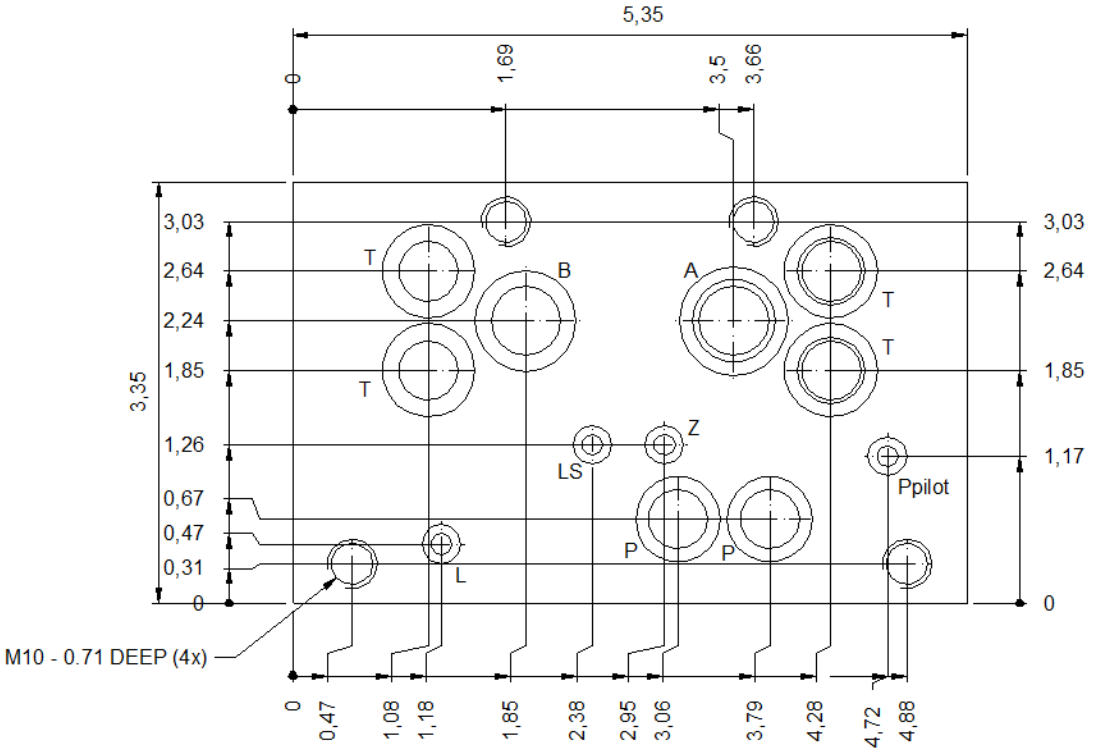
Closed O-ring chamber								
Ports	**ØD1 (mm)**	**Ø D2 (mm)**	**Ø d2 (mm)**	**Ø D3 (mm)**	**Ø d3 (mm)**	**H (mm)**	**h1 (mm)**	**O-ring NBR (90-shore)**
P	-	-	-					
T	12	17	21,9	21,90	0,20	1,2	0,1	13.94x2.62
A,B	14	21,9	16,75	18,90	0,25	1,2	0,1	18.77x1.78
LS, Z, L, Ppilot	-	-	-					

DETAIL O-RINGCHAMBERS (*)



Subplate lay-out (to produce by customers)

Dimensions in inches

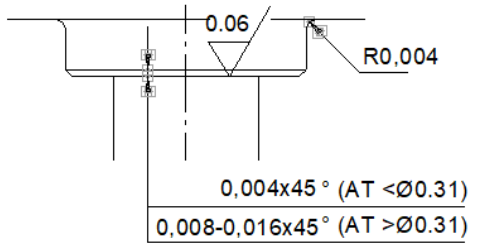


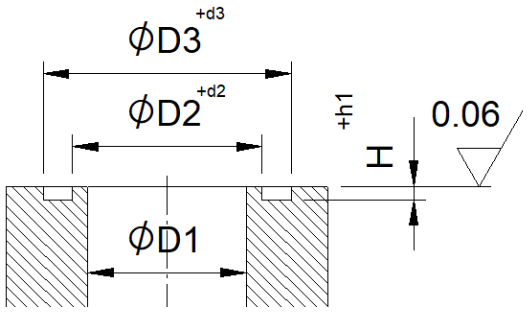
All coordinates ⌖ 0,01

Open O-ring chamber						
Ports	**Ø D1 (inch)**	**Ø D3 (inch)**	**Ø d2 (inch)**	**H (inch)**	**h1 (inch)**	**O-ring NBR (90-shore)**
P	0.74	0.68		0.05	0.004	0.55x0,07
T	0.74	0.74		0.07	0.004	0.79x0.10
A,B	0.55	0.80		0.07	0.004	0.61x0.10
LS, Z, L, Ppilot	0.16	0.31		0.05	0.004	0.18x0.07

Closed O-ring chamber								
Ports	**ØD1 (inch)**	**Ø D2 (inch)**	**Ø d2 (inch)**	**Ø D3 (inch)**	**Ø d3 (inch)**	**H (inch)**	**h1 (inch)**	**O-ring NBR (90-shore)**
P	-	-	-					
T	0,47	0,67	0,86	0,86	0,01	0,05	0,004	0.55x0.10
A,B	0,55	0,86	0,66	0,74	0,01	0,05	0,004	0,74x0,07
LS, Z, L, Ppilot	-	-	-					

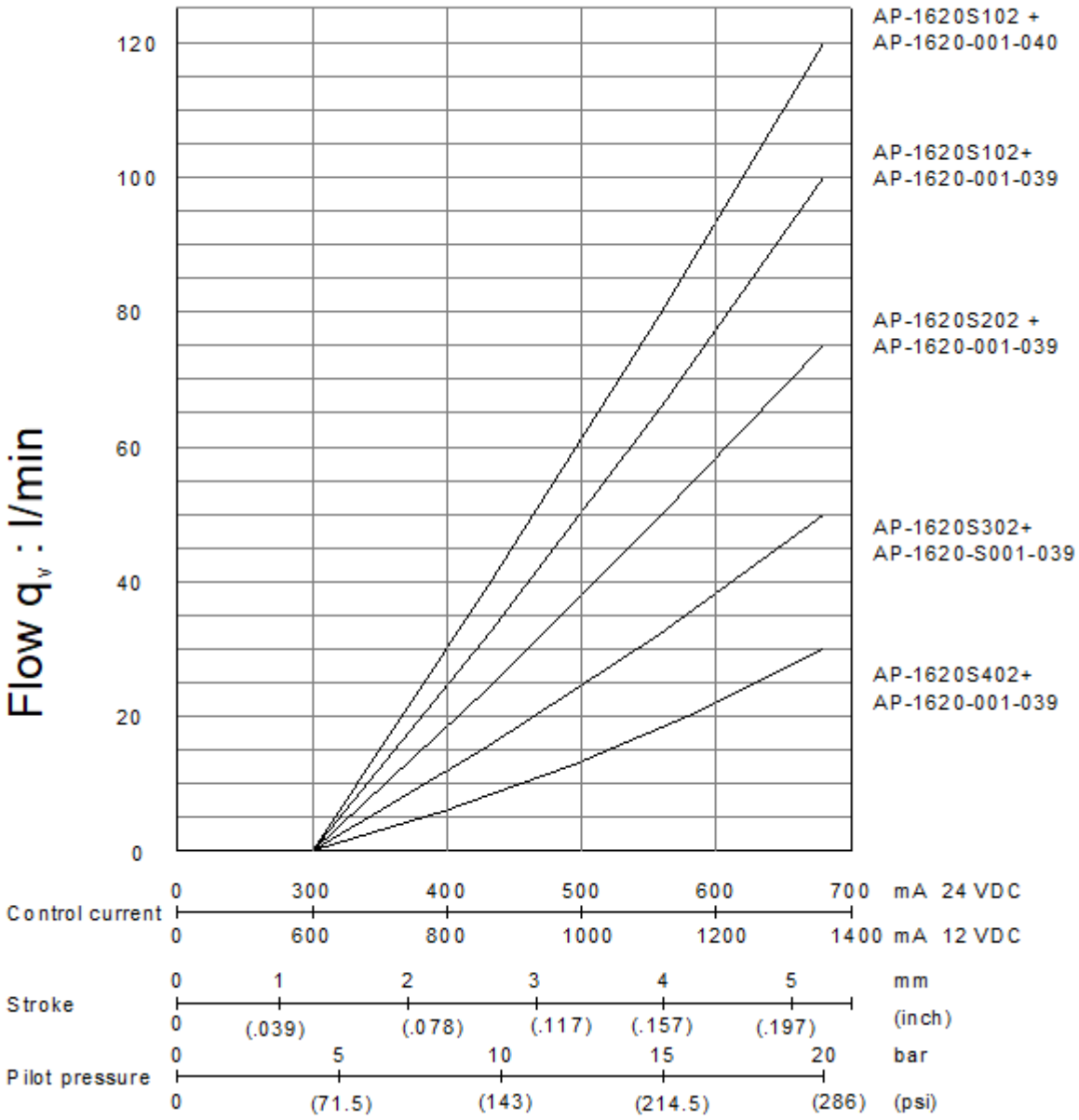
DETAIL O-RINGCHAMBERS (*)



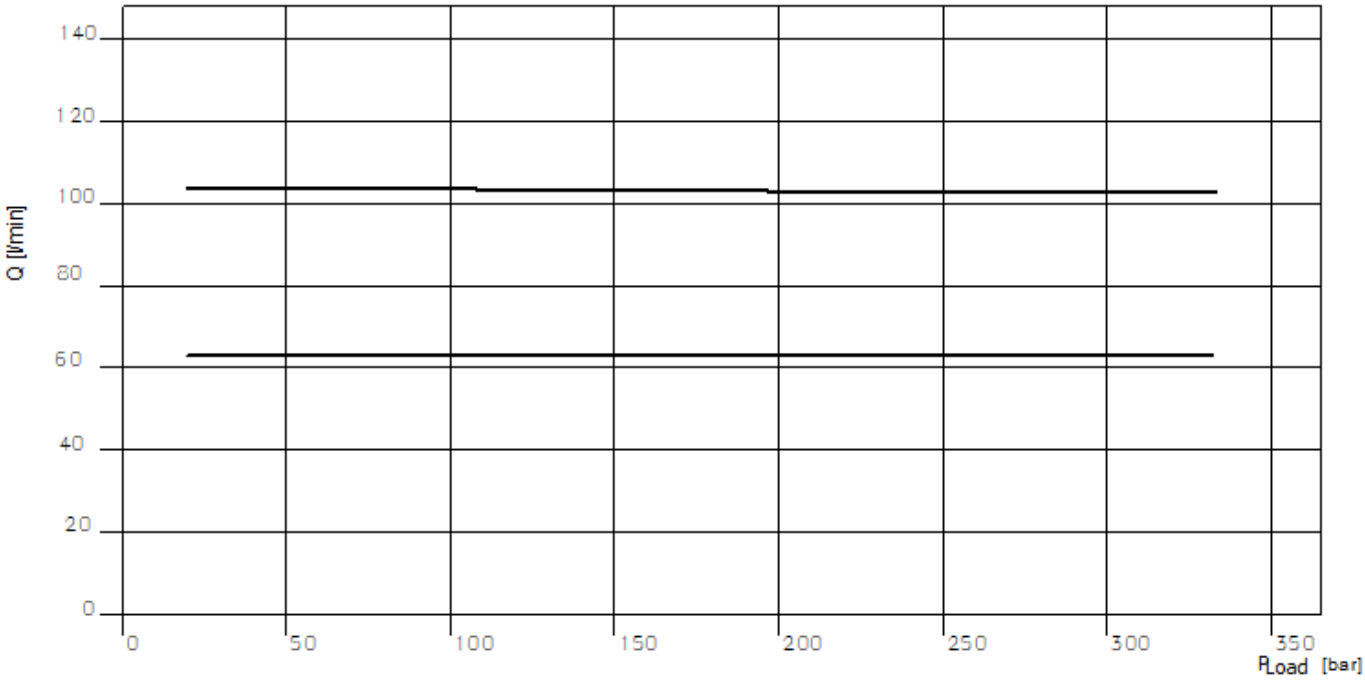


Performance curves.

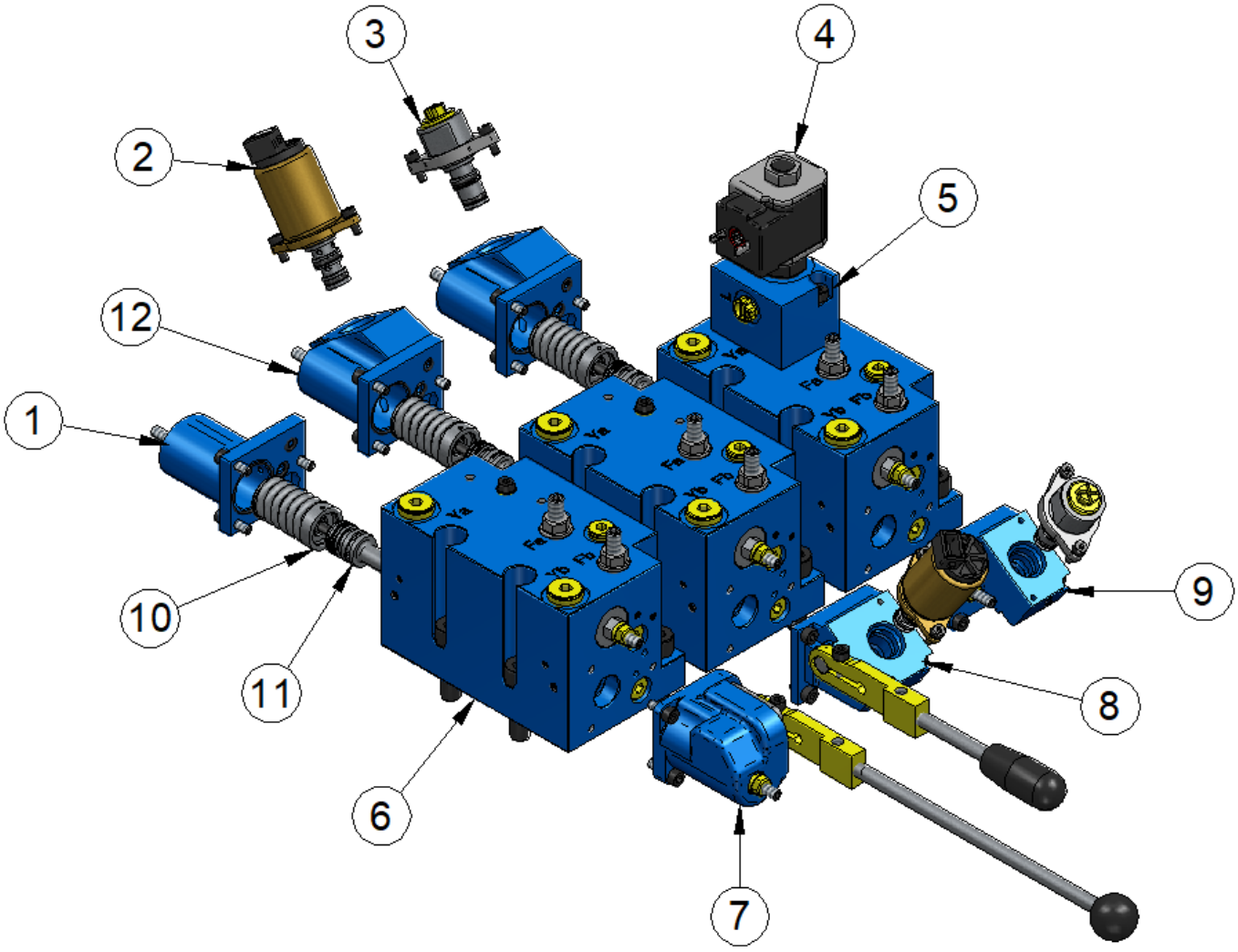
Flow P → A/B



Q/P_{load} curve



Recommended spare parts breakdown



1:	AP-1670-347	Springcap 100%H
2:	AP-1620-356	Solenoid
3:	AP-1620-321	Cardridge hydraulically control
4:	AP-1640-364D	Pump unloading function
5:	AP-1010-330	D/E Block
6:	AP-1670-315F	Spoolsection
7:	AP-1620-348	Handlemechanism 100 %H
8:	AP-1620-317	Handle mechanism
9:	AP-1620-312	End cap hydraulically control / electrically control
10:	AP-1620S000E	Spring assembly
11:	AP-1620S102…952	Spool A/C
12:	AP-1620-313	Spring cap hydraulically control / electrically control

System integration

Mounting procedure

- AMCA-valves shall not be mounted by overtightening of mounting bolts, causing mechanical distortion and thus spool lock. (50 Nm)
- Mounting on flat surface, flatness □ 0,01/100 mm (0.0004/3.9 inch)
- Don't use conical thread for port fittings.
- For sealing purposes use O-rings.
- Check the voltage and current of the solenoid before operation.
- Avoid ingression of contamination during mounting.
- Check if the hydraulic pipes, tank and the oil are clean and demands to the needed requirements (NAS 1638 class 8)

Fluid maintenance

Due to the construction, the APV-valve is not highly susceptible to particulate (silt type) lock, nor to contaminant wear. Therefor the contaminant sensitivity is low.

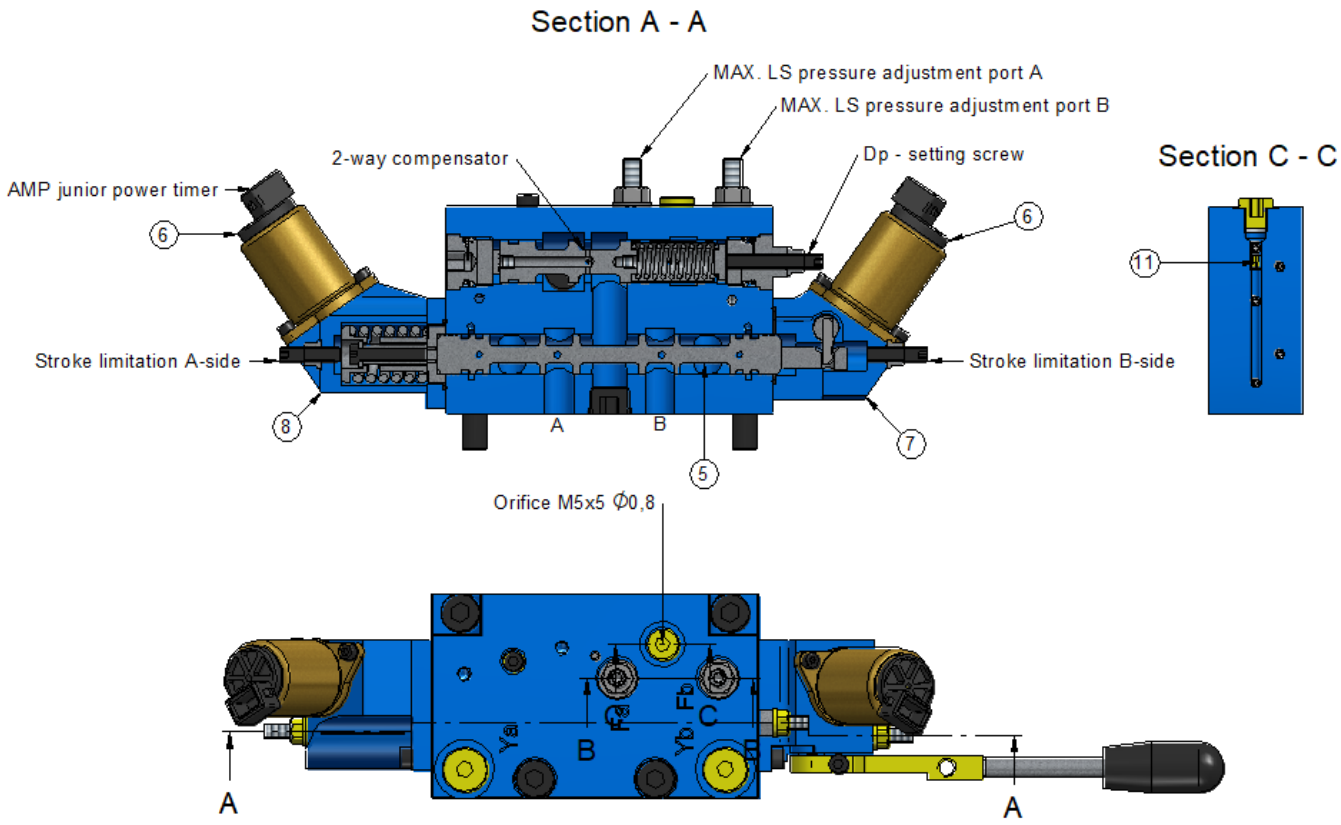
- Use mineral oil. Other fluids on request.
- Keep the contamination level better or equal to NAS 1638 class 8 or ISO 4406: 18/16/13.

Startup procedure

- Check if all ports are connected according to the diagram before starting the pump or setting the valve under pressure.
- To further bleeding, it is recommended to switch the valve under a low pressure. This will satisfy in most cases.
- In most cases, the manufacturer has set, according to order the flow and pressure of the valve. When these settings have to be changed please see page 18 to check the possibilities.

Troubleshooting

1) System pressure and pressure setting too low
    a. 1 main load pressure relief (1) contaminated.
    Cause: dirt particles between cone and seat.
    Solution: turn adjustment counter clockwise, activate the directional valve several times. If necessary dismantle the main load pressure relief (1). Check for damages, if so replace cone and seat.
    Examine the system filter.
    b. Damping orifice (2) or (11) blocked (dirt or fouled) if necessary remove and clean
    c. 3-Way compensator spool jammed open. When removing plug(4) the spring should pudh out the 3-way compensator (3).
    Examine the 3-way compensator and bore for dirt or damages. If necessary, deburr with care. Flush the spool to remove dirt.
    d. Fault in other components in the system.
    Check for a damaged pump, motor, seals etc.
2) User moves erratically
    a. Air in system
    Bleed the end-and springcaps (7/8) or the hendle mechanism with the stroke limiting screws.

b. Solenoid faulty
   Remove the solenoid (6) and check the pilot spool on dirt. If possible, swap solenoid to another section to detect faulty unit.
c. Excessive friction of the main spool
   Remove both end- and scpringcaps end remove the main spool. Examine the main spool and bore for dirt or damages. If necessary, deburr with care. Examine system filter.
d. Excessive damping
   See 2.b.
e. Excessive friction in other components in the system.

3) User doesn't work or works too slow
   a. Damping orifice (11) blocked (dirt or fouled).
   b. Main load pressure to low.
   c. Main spool doesn't switch
      See 2.C. or pressure reducing valve (10) is dirty, clean and remount.
   d. There is insufficient user load.
4) Pump does not unload.
   a. 3-Way compensator spool jammed. See 1.C.
   b. Main spool doesn't center. See 2.C. Electrical fault, check the electrical circuit.