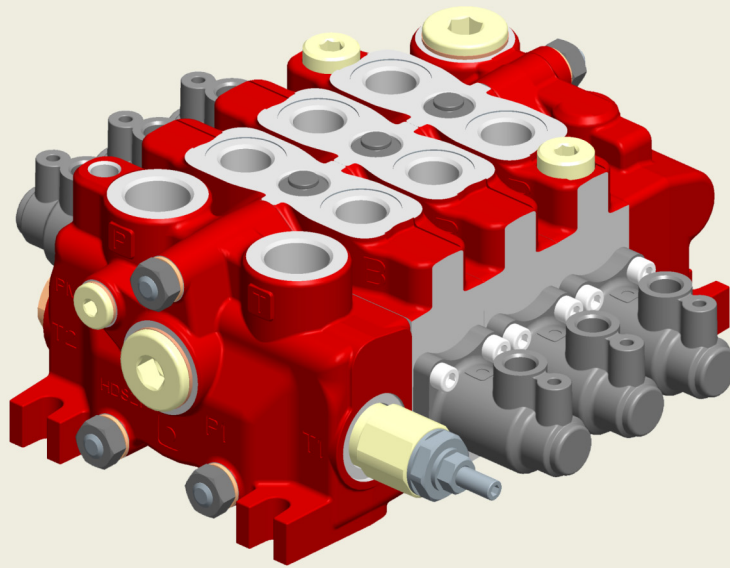


## Directional Control Valve HDS21



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## 1 General information

### 1.1 Introductions

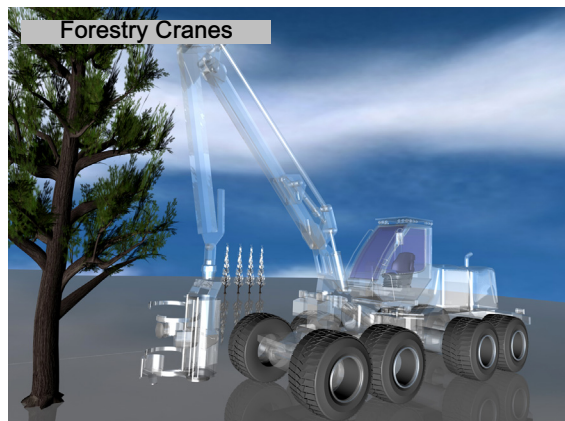
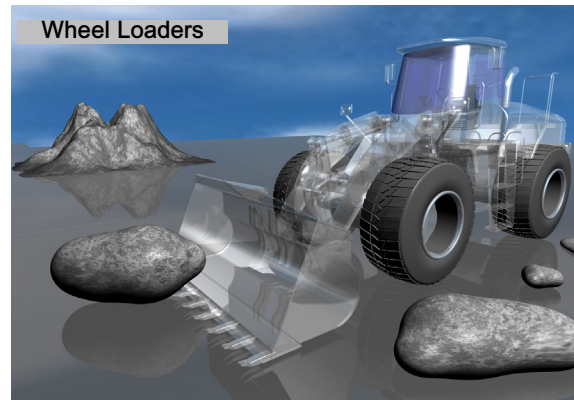
Several decades of leading presence and successful supplies in the earthmoving applications, the deep know-how gained in the material handling sector and the strong commitment to anticipate the upcoming technical and application needs of our customers, have guided Bucher Hydraulics Reggio Emilia in the development of the new stackable open center directional valve HDS21.

The stackable construction with a wide range of inlet and outlet cover configurations, up to 10 parallel and series elements, possibility to utilize several different controls, gives the machine designer a high degree of freedom in the choice of the assembling position of the valve and of the hydraulic circuit which fits in the best way the machine requirements.

Each valve section can be equipped with various type of spools, in order to satisfy the application specific requirements in terms of hydraulic circuit and precise control of the machine functions.

HDS21 can be equipped with single levers or dual axis joystick, as well as hydraulic proportional and open loop electro-hydraulic proportional controls.

The wide range of controls combined with the compact dimensions makes the HDS21 a very flexible valve able to fulfill all the requirements of modern machines.



## 1.2 Directional valve installation

For the installation of the directional control valve on the equipment frame it is important to consider the following recommendations:

- the valve can be assembled in any position but, in order to avoid deformations and spool sticking, the surface on which the product is mounted has to be flat;
- before connecting pipelines, make sure that the pipeline hollows as well as fittings and seals are thoroughly clean; check also that the work ports are protected until the connection of the pipelines

- during assembly and servicing operations, it is necessary to adopt clean procedures and work in an environment free of chips, swarf, dust and other possible source of pollution;

- if the spools are connected to the equipment controls through linkages, make sure that they do not affect their operations;

- before painting the valve, check that the work port plastic plugs are tightly in place.

## 1.3 Fittings

In the interest of safety, only fittings with STRAIGHT THREAD ENDS should be used (e.g. DIN3852).

Fittings with TAPERED THREAD ENDS (e.g. DIN 3852 form C) should never be used, as they can cause deformation and cracks in the valve body.

Our warranty conditions will not be valid in case tapered fittings are used.

The work port adaptors have to be fastened respecting the tightening torque values indicated in the following table (for different port types contact our Sales Dept.):

Recommended tightening torque for work port fittings - Nm / lbf				
Metric - ISO 261	M14X1.5	M18X1.5	M22X1.5	
With O-Ring seal (ISO 6149-1)	30 / 22.1	40 / 29.5	60 / 44.3	
With copper washer (ISO 9974-1)	30 / 22.1	40 / 29.5	60 / 44.3	
With rubber washer or steel (ISO 9974-1)	25 / 18.4	35 / 25.8	60 / 44.3	
BSP - ISO 228-1	1/4" BSP	3/8" BSP	1/2" BSP	3/4" BSP
With copper washer (ISO 1179-1)	30 / 22.1	40 / 29.5	60 / 44.3	90 / 66.4
With rubber washer or steel (ISO 1179-1)	25 / 18.4	35 / 25.8	60 / 44.3	70 / 51.7
UN-UNF - ISO 263	SAE6 - 9/16-18 UNF	SAE8 - 3/4-16 UNF	SAE10 - 7/8-14UNF	SAE12 - 1-1/16-12UNF
With O-Ring seal (ISO 11926-1)	30 / 22.1	40 / 29.5	60 / 44.3	90 / 66.4



**IMPORTANT!:** Tightening torques depends on several different factors including lubrication, coating and surfaces finish. The fitting manufacturer shall be consulted.

## 1.4 Hydraulic fluid

The main function of the fluid used in hydraulic systems is to transfer energy but it performs also other important functions: protect the components from corrosion, lubricate the directional valve moving parts, remove particles and heat from the system.

In order to ensure proper operation and long life of the system it is important to choose the correct hydraulic fluid with proper additives.

Bucher Hydraulics recommends to use a mineral based oil responding to ISO 6743/4 requirements, only.

The system should be operated only with hydraulic oil containing anti-foaming and antioxidant additives. Before using other types of fluid, please contact our Sales Dept, since they can cause serious damage to the directional valve components and jeopardize the correct function of the system.

## 1.5 Filtration

In order to ensure proper operation and long life of the directional valve components it is extremely important to provide a proper and effective filtration of the hydraulic fluid. It is advisable to follow filter manufacturers instruction and recommendations.

The fineness of the filter should be selected in order to guarantee that a contamination level of 21/19/16 ISO 4406:1999 (NAS 1638 class 10) is not exceeded.

When the high reliability of the system is an important requirement a 10 µm nominal pressure filter must be used.

In these cases it is also advisable to use a pressure filter with by-pass and indicator.

For mechanical operated directional valves a <30 µm nominal return filter is adequate.

The size of the return filters must suit the maximum return flow whereas the size of the pressure filters must suit the maximum pump flow.

It is advisable to fit filters with pressure gauge or dirt indicator in order to make it possible to verify the filter condition.

## 1.6 Directives and standards

- Atex:



Attention: The equipment and protective systems of these catalogue ARE NOT intended for use in potentially explosive atmospheres that is to say where there is an explosive atmosphere referred to in Article 2 of the Directive 99/92/EC and referred to Article 1.3 of the Directive 94/9/EC

Particular attention has to be paid to the cleaning of the machine hydraulic circuit and its components before the first run-in, since the presence of foreign materials could cause damages to the directional valve components even if a proper filtration is provided.

In order to obtain the best performance of the system we recommend to strictly follow the conditions advised here above, failing which warranty shall be void.

- Machinery safety

Hydraulic directional control valves are excluded by Directive 2006/42/CE

- ISO 9001:2008 / ISO 14001:2004

Bucher Hydraulics S.p.A. is certified for research, development and production of directional control valves, power units, gear pumps and motors, electro pumps, cartridge valves and integrated manifolds for hydraulic applications.

## 1.7 Technical specification:



**IMPORTANT!:** Parameter values and diagrams shown in this catalogue have been measured with mineral oil having a viscosity of 23 mm<sup>2</sup>/s at 50° C

Features		
Nominal flow range	80 l/min (21 US gpm)	
Max return flow admitted	125 l/min (33 US gpm)	
Max inlet pressure (*)	290 bar (4200 psi)	
Max work port pressure (*)	320 bar (4640 psi)	
Max back pressure (T)	30 bar (430 psi)	
Max back pressure (T) with electro-hydraulic positioner (EHO)	10 bar (145 psi) (**)	
Max internal leakage A/B → T (at 100 bar/1450 psi, 23 mm <sup>2</sup> /s) (***)	Without port valves	16 cc/min
	With port valves	21 cc/min
Max contamination level	21/19/16 - ISO 4406:1999 (NAS 1638 class 10)	
Max contamination level for electro-hydraulic applications	20/18/15 - ISO 4406:1999 (NAS 1638 class 9)	
Fluid	mineral based oil (see 1.4 )	
Fluid temperature (NBR seals)	-20°C / +80°C (-4° to 176° F)	
Viscosity operating range	recommended	from 15 to 75 mm <sup>2</sup> /s
	admissible	from 12 to 400 mm <sup>2</sup> /s
Max number of elements	10	
Ambient temperature in operating conditions:	With mechanical/hydraulic/ pneumatic controls	from -30 to +60 °C
	With electric/ electrohydraulic devices	from -30 to +50 °C
Tie-rods thightening torque	22.5±2.5 Nm	

For different operating conditions, please contact our Sales Dept.

(\*) Fatigue tested according to internal procedure at 1.16x rated pressure on 5 samples for 1'000'000 cycles

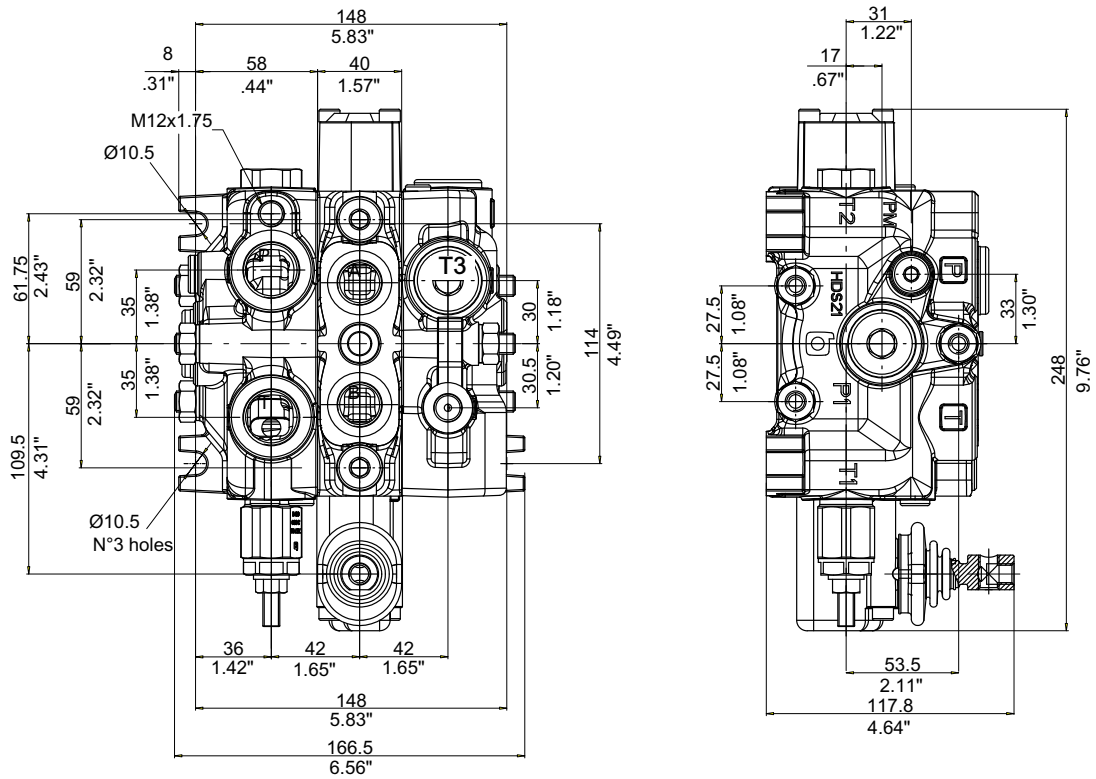
(\*\*) For higher back pressure values the pilot flow must be unloaded to tank through a separate line ( Tp)

(\*\*\*) Lower values can be provided on demand

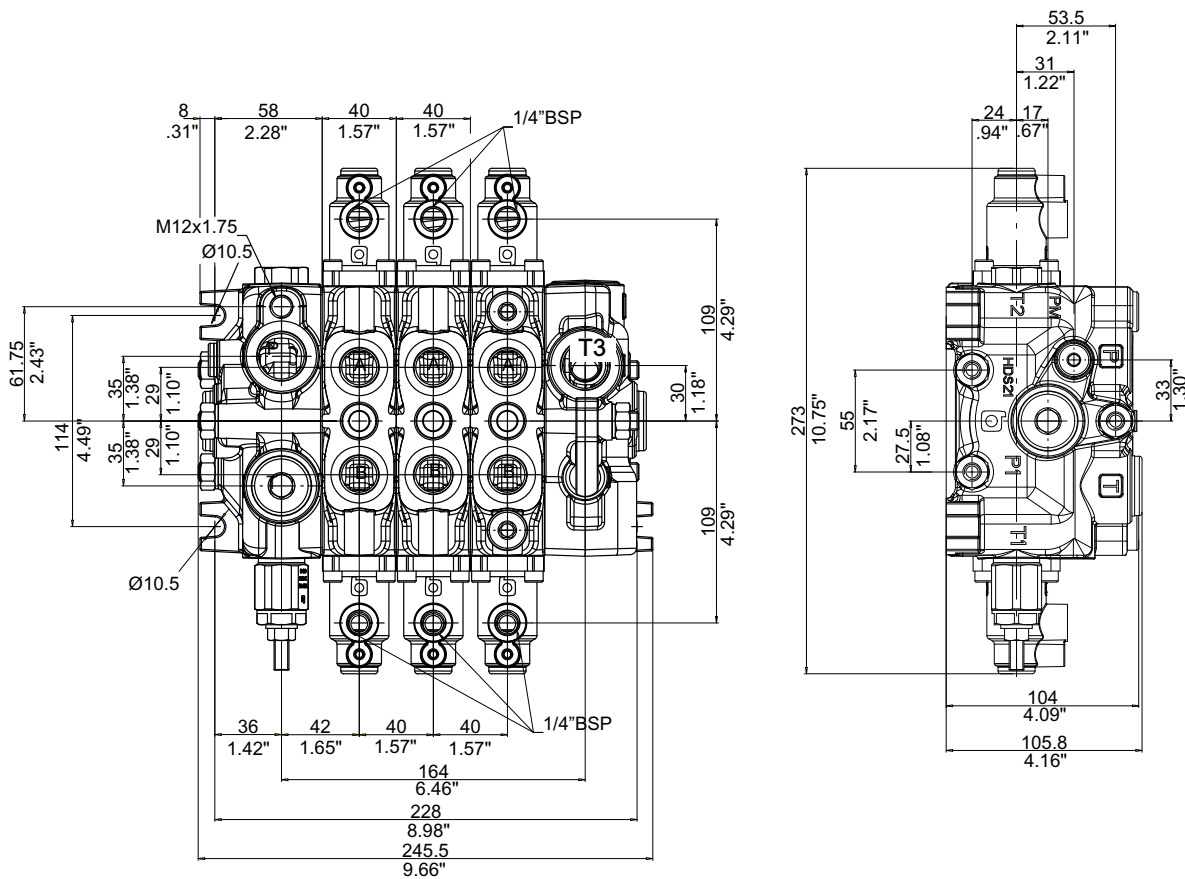


## 1.8 Examples

### 1.8.1 Manual operated

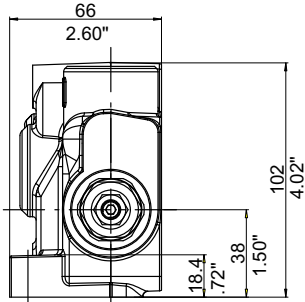


### 1.8.2 Hydraulic operated

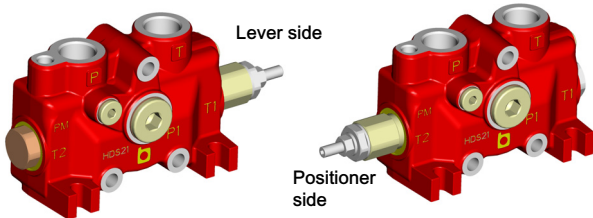
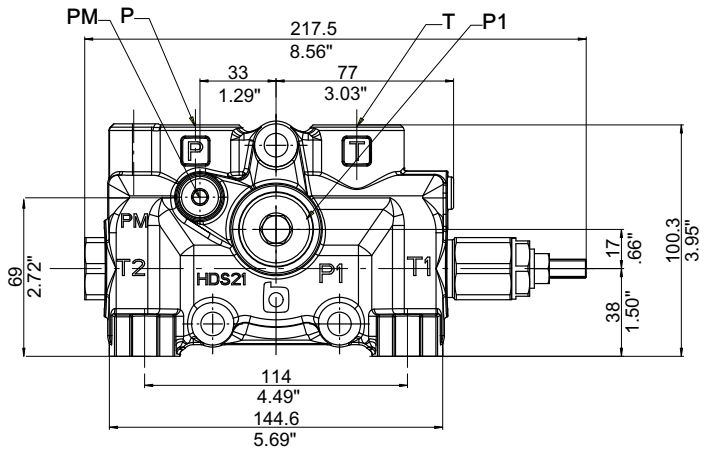


## 2 Inlet cover

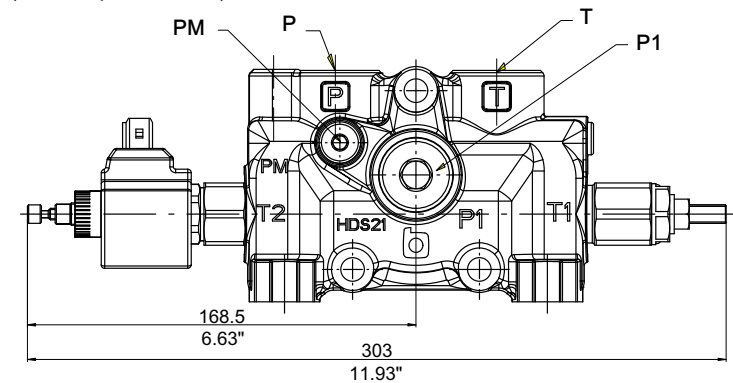
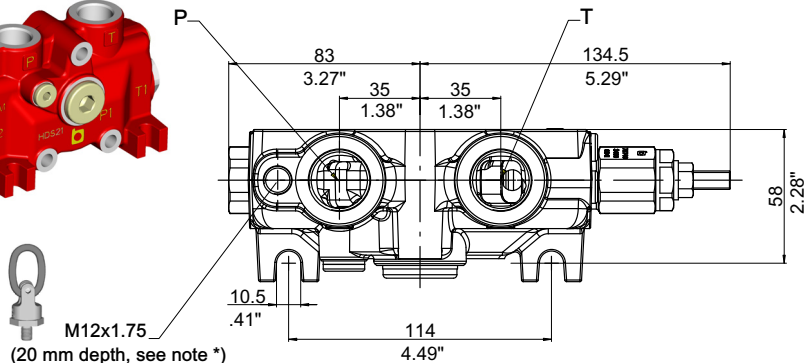
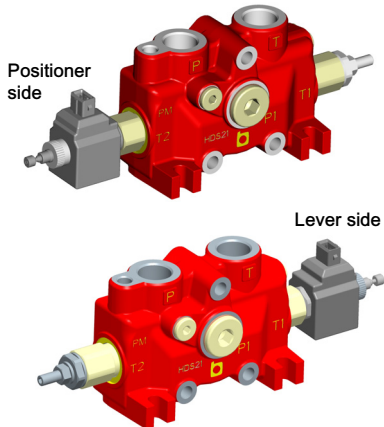
### 2.1 Standard inlet cover



With relief valve RV



With BP valve



M12x1.75  
(20 mm depth, see note \*)

RV = adjustable relief valve  
BP = by-pass valve

#### 2.1.1 Ports Size

Threads	P	P1 (optional)	T	PM (optional)
BSP	1/2"	1/2	3/4"	1/4"
Metric	M22x1.5	M22x1.5	M22x1.5	M14x1.5
UNF	SAE10	SAE10	SAE10	SAE6

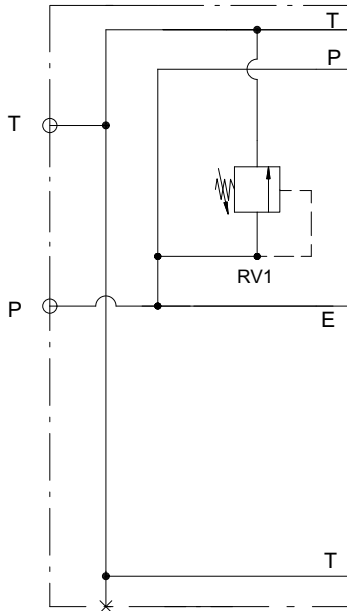


Attention: \* To handle the complete valve block use the M12x1,75 threaded hole. For the lifting operations use proper accessories like eye-bolts, cables, etc. certified and dimensioned for the weight to be lifted. Always handle with care and without giving sudden accelerations.

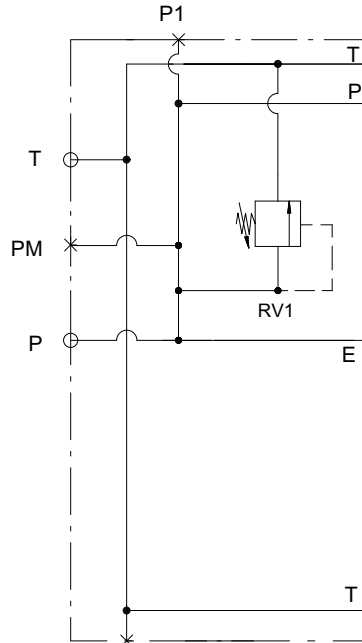


## 2.2 Inlet cover hydraulic schemes

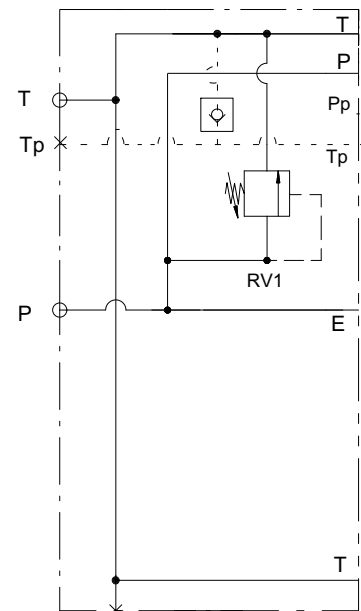
TM with main relief valve, P, T  
Basic version



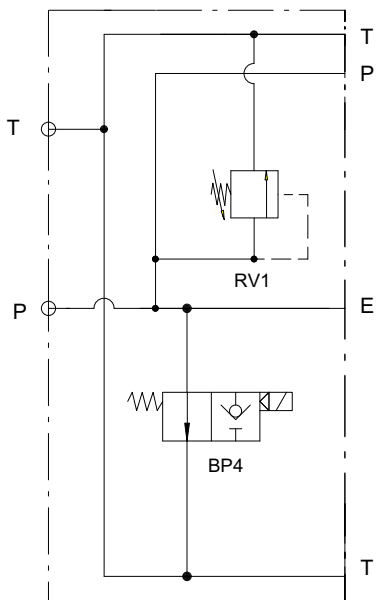
TM with main relief valve, P, P1, PM, T



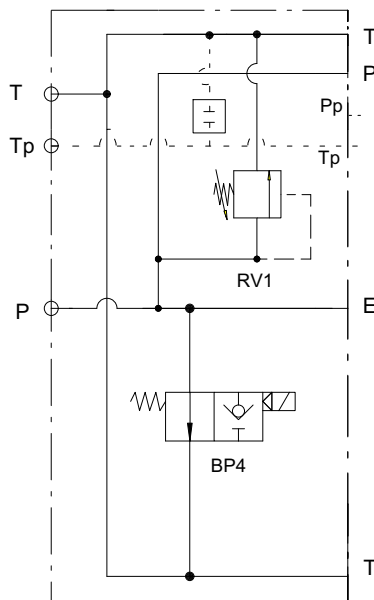
TH with main relief valve, P, T and pilot lines check valve



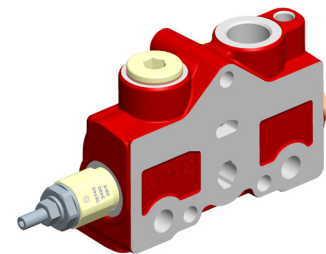
TH with main relief valve, P, T and BP solenoid valve normally open



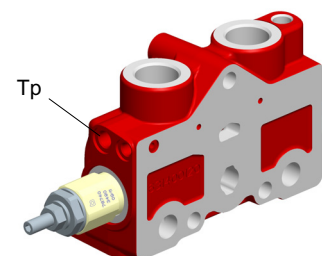
TH with main relief valve, P, T, BP solenoid valve normally open and Tp



Basic TM: for manual and hydraulic controls

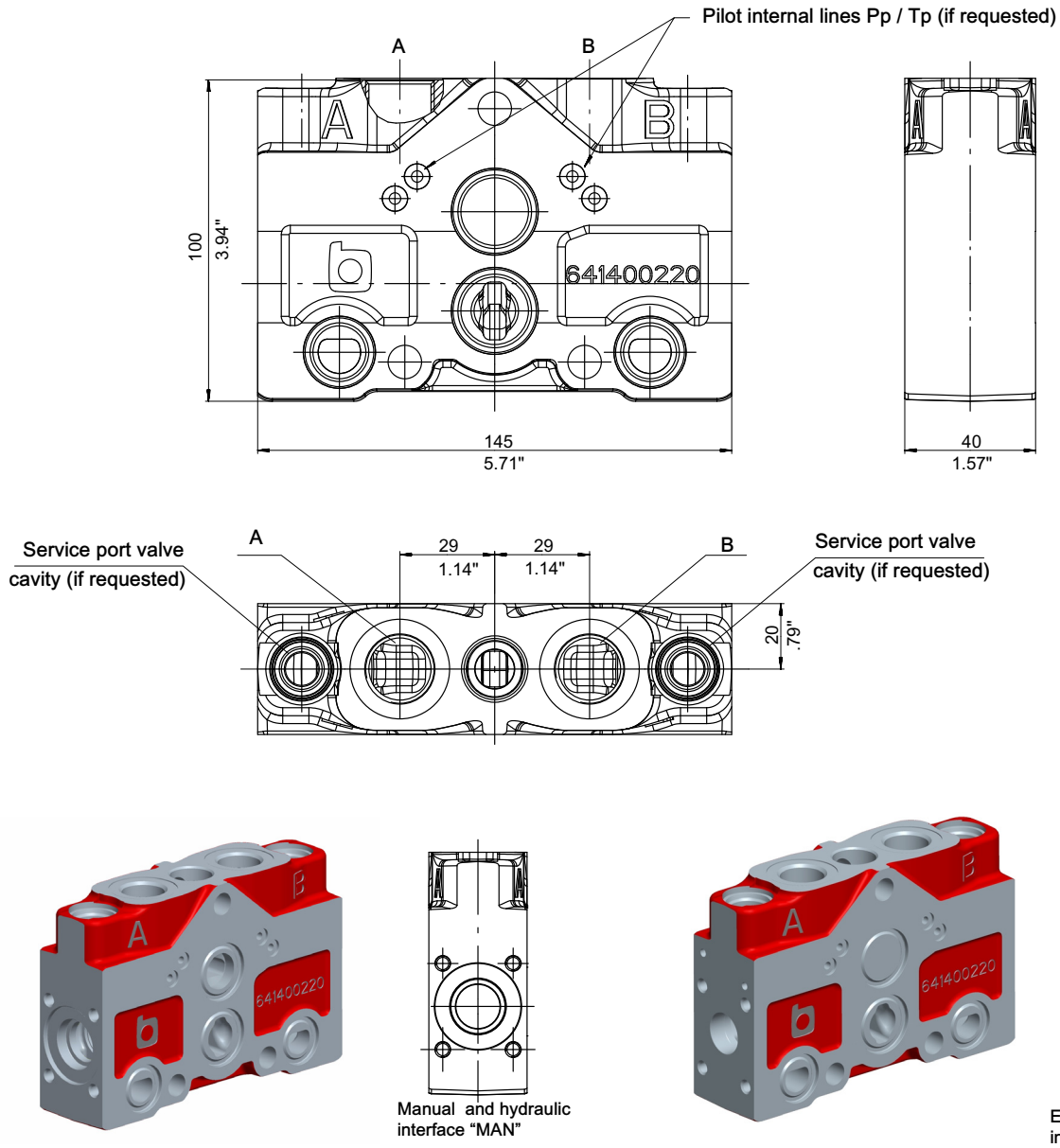


Pilot lines TH: for electro-hydraulic controls



## 3 Elements

### 3.1 Characteristics and dimensions



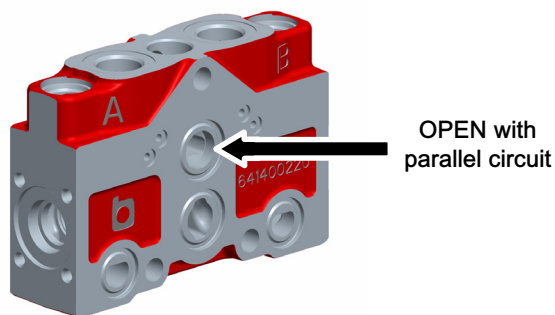
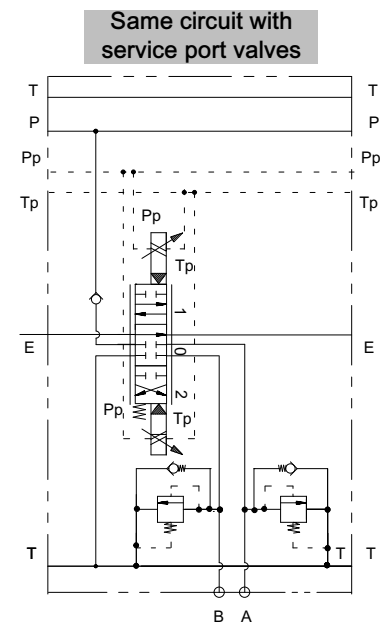
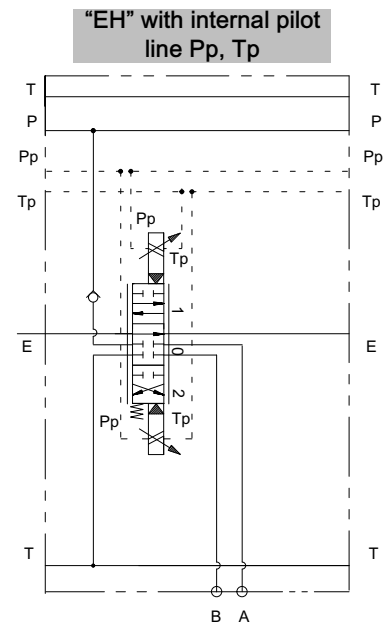
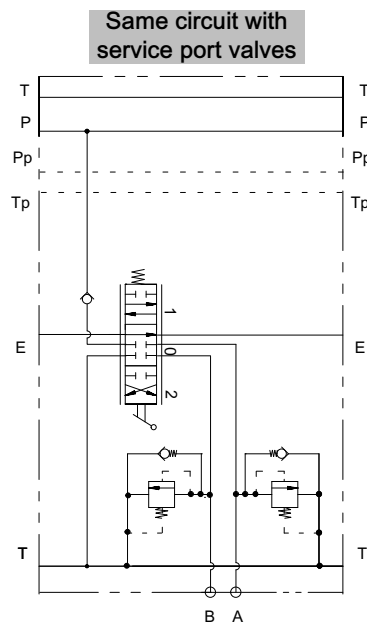
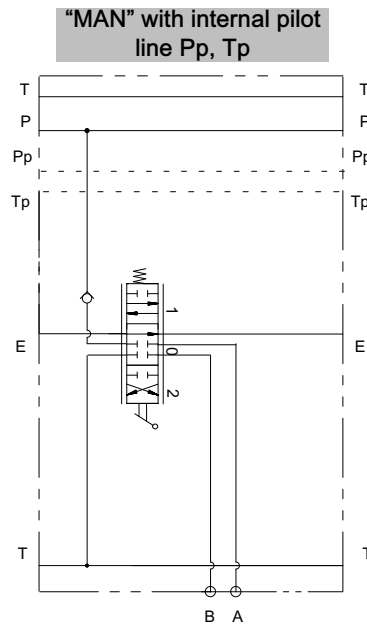
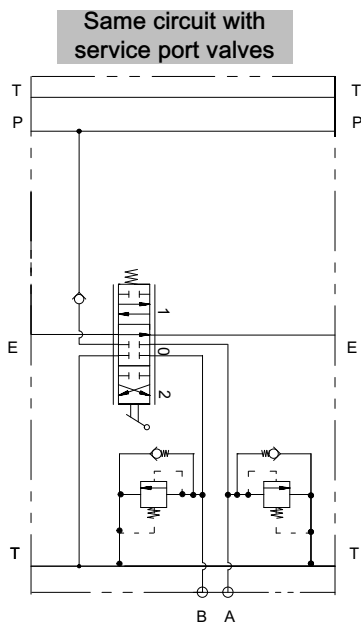
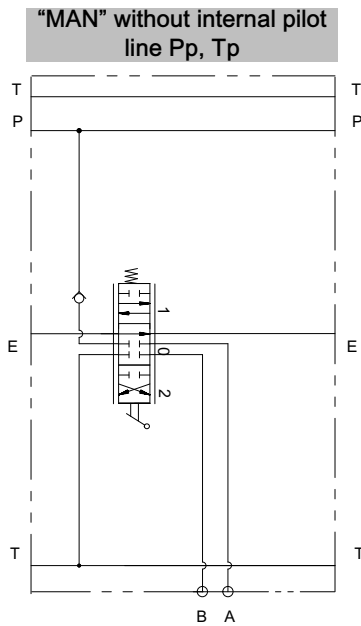
### 3.2 Ports size

Threads	Standard A/B	On demand (*)
BSP	1/2"	3/4"
Metric	M22x1,5	
UNF	SAE10	SAE12

(\*) The operating pressure indicated in the catalogue is referred to standard A/B threads. For these port sizes the maximum operated pressure must be reduced.

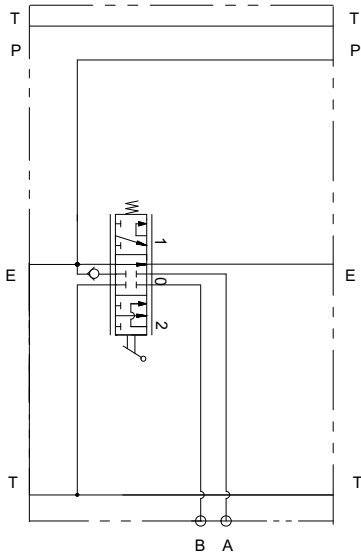
## 3.3 Element hydraulic schemes

### 3.3.1 Parallel circuits

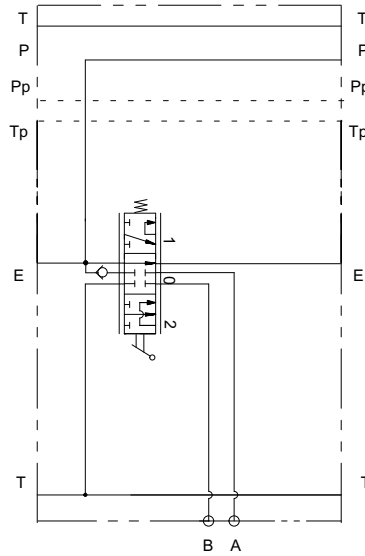


## 3.3.2 Series circuits

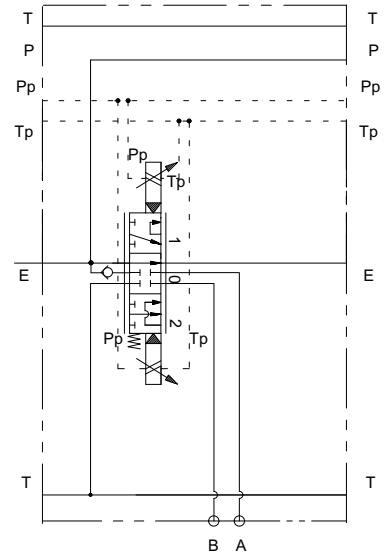
"MAN" without internal pilot line Pp, Tp



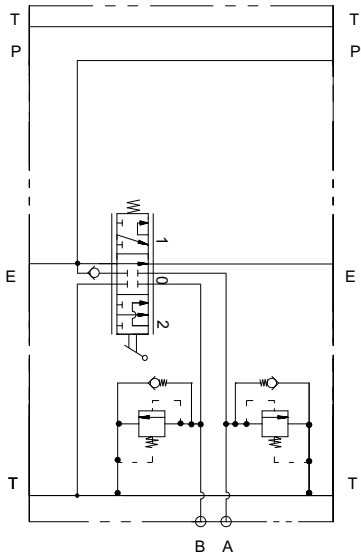
"MAN" with internal pilot line Pp, Tp



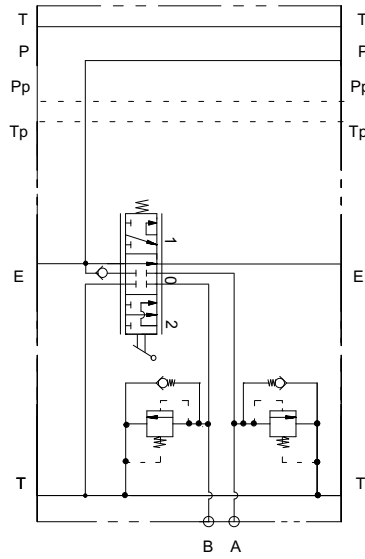
"EH" with internal pilot line Pp, Tp



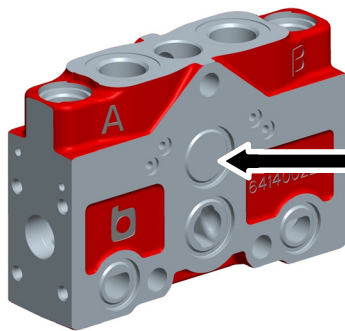
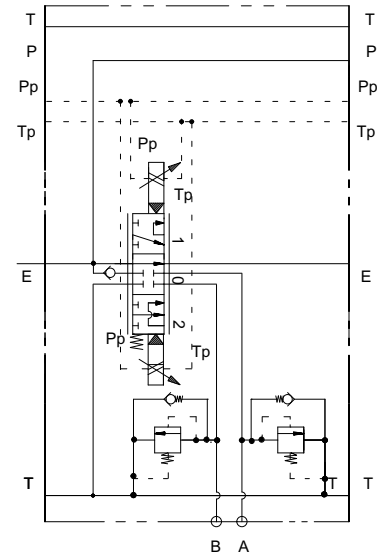
Same circuit with service port valves



Same circuit with service port valves



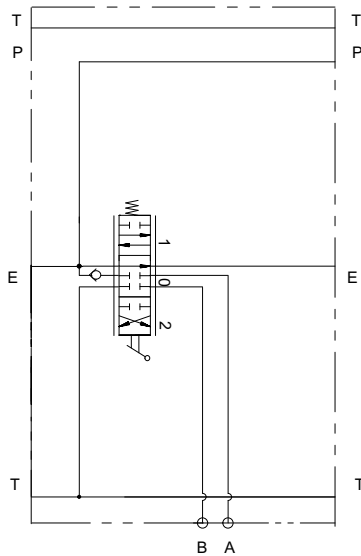
Same circuit with service port valves



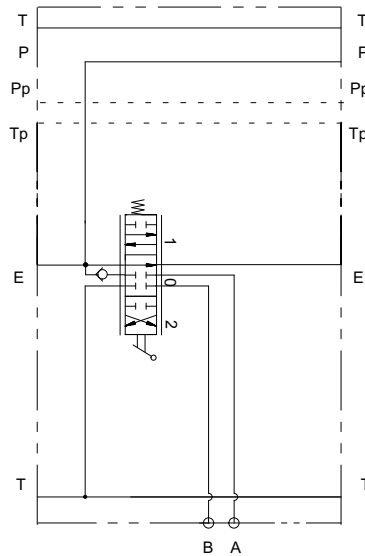
CLOSED with series circuit

## 3.3.3 Tandem circuits

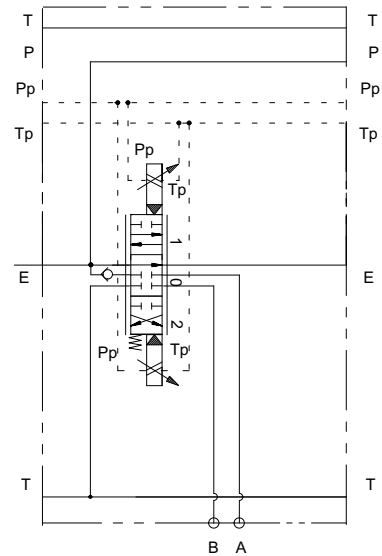
**"MAN" without internal pilot line Pp, Tp**



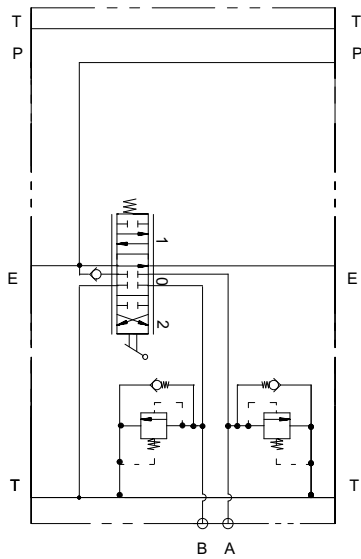
**"MAN" with internal pilot line Pp, Tp**



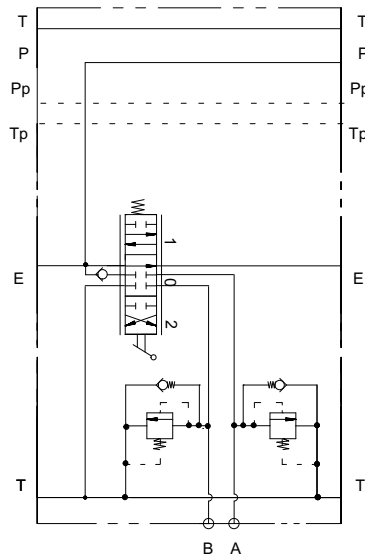
**"EH" with internal pilot line Pp, Tp**



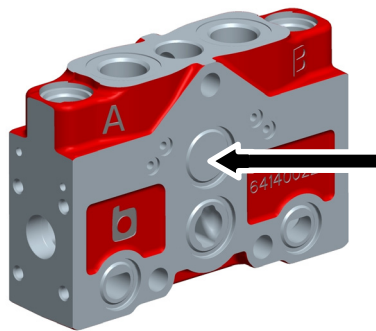
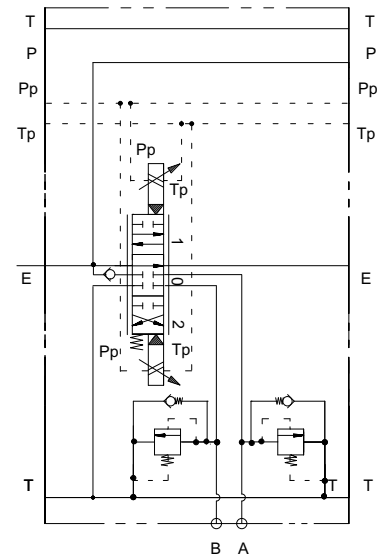
**Same circuit with service port valves**



**Same circuit with service port valves**



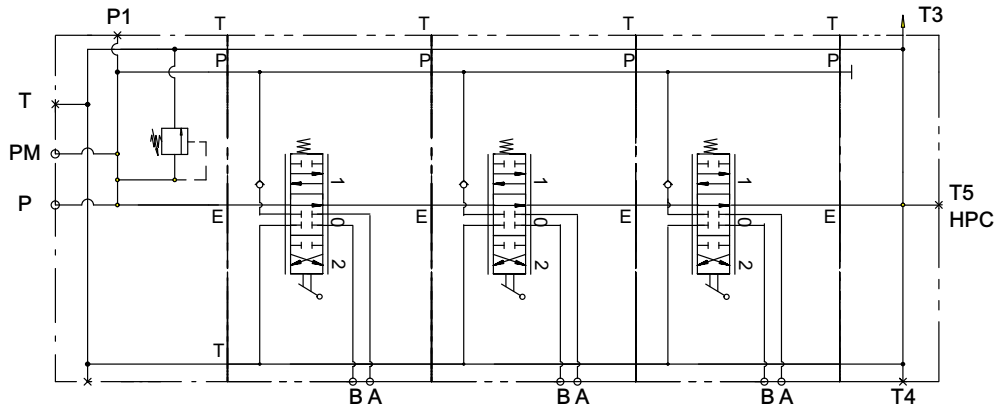
**Same circuit with service port valves**



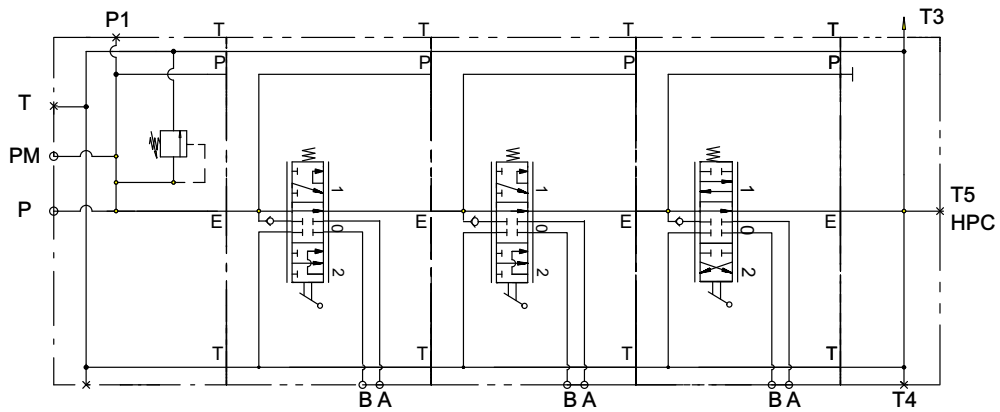
CLOSED with tandem circuit

## 3.3.4 Hydraulic circuits combination examples

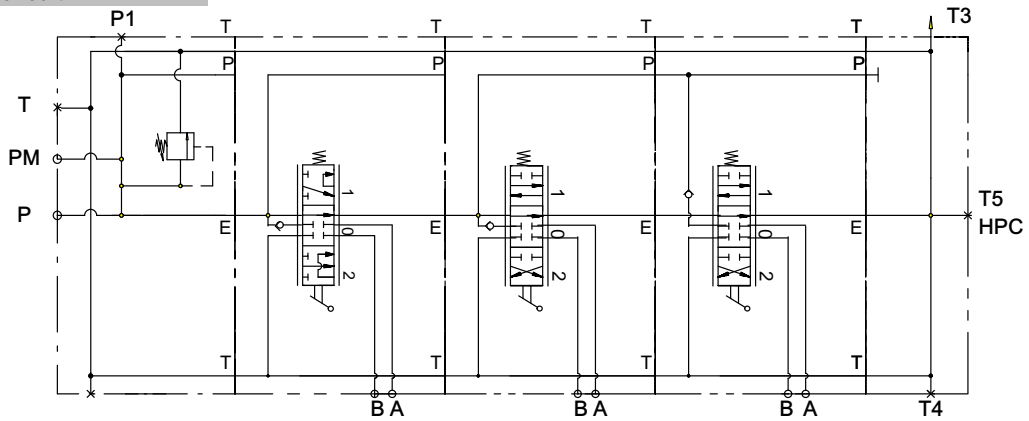
Parallel circuit



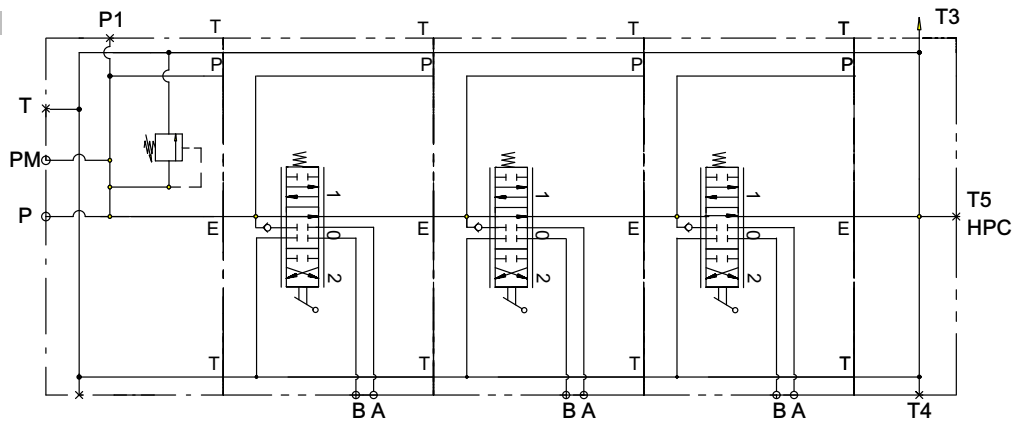
Series circuit



Series/parallel circuit



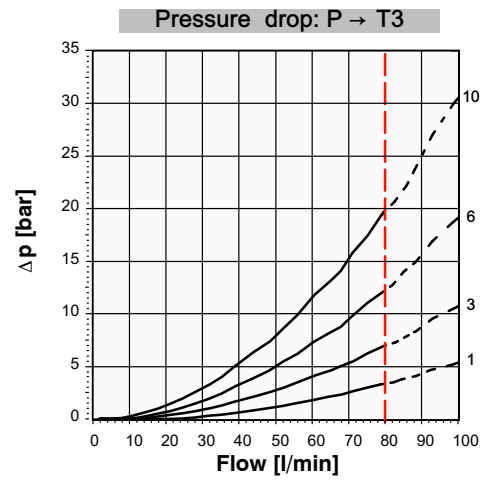
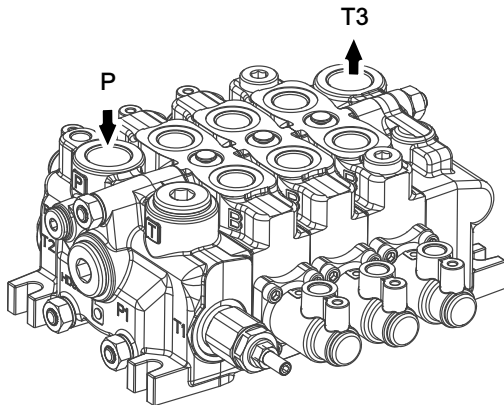
Tandem circuit



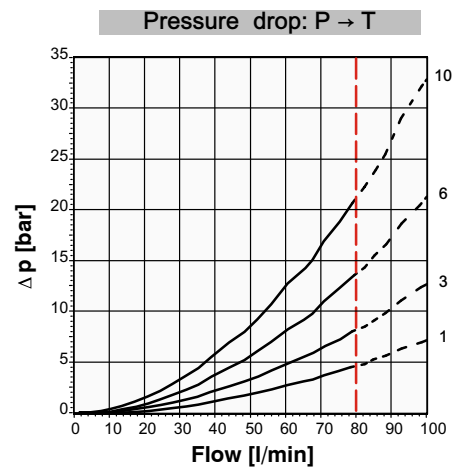
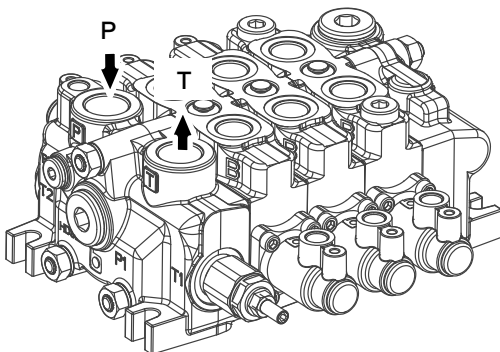


## 4 Performance data

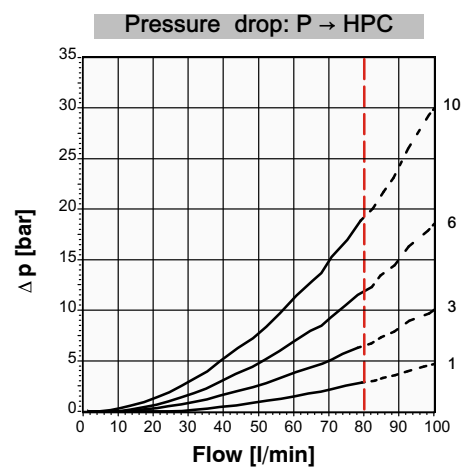
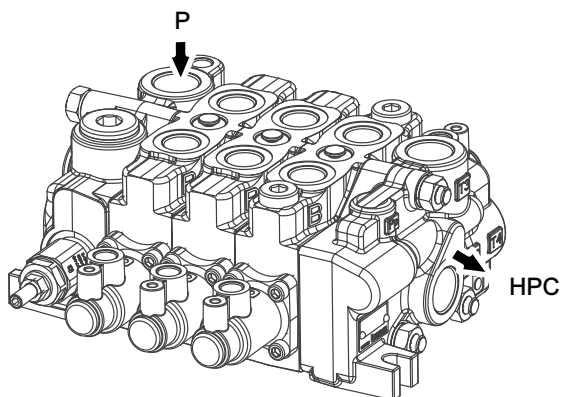
### 4.1 Open centre P → T3



### 4.2 Open centre P → T

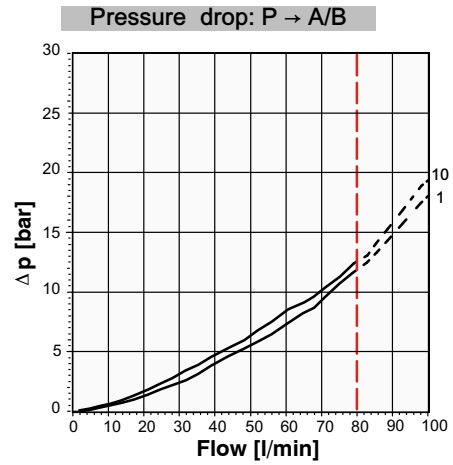
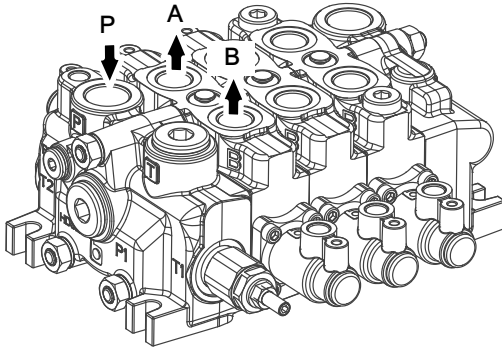


### 4.3 Carry over (HPC)



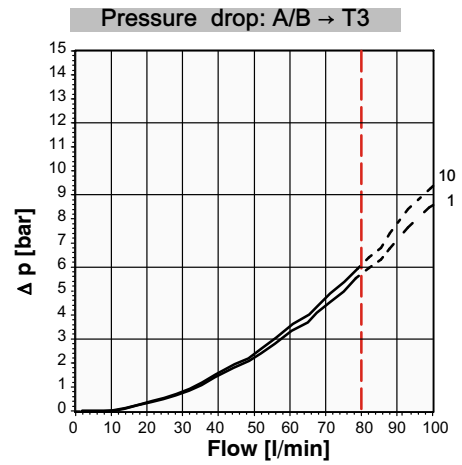
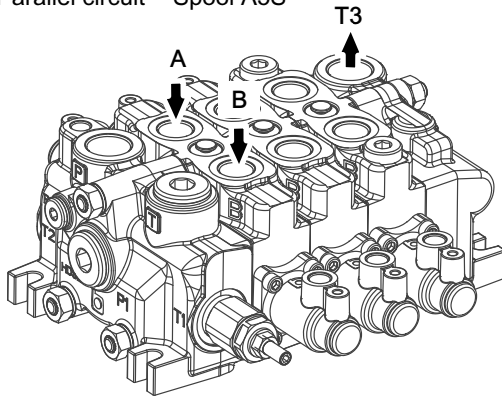
## 4.4 Inlet to work port A/B

Parallel circuit - Spool A5S



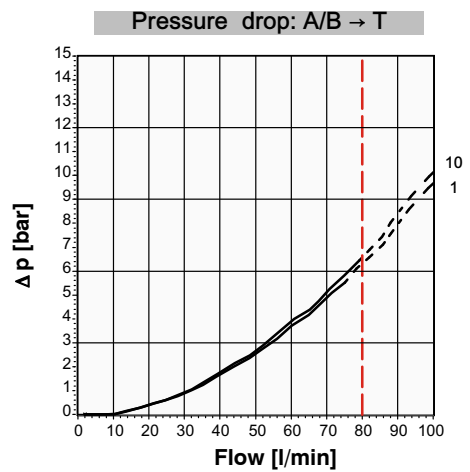
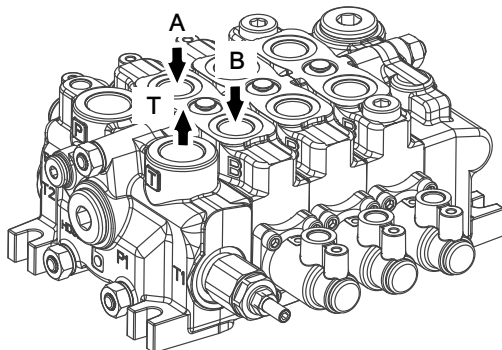
## 4.5 A/B work port to outlet "T3"

Parallel circuit - Spool A5S

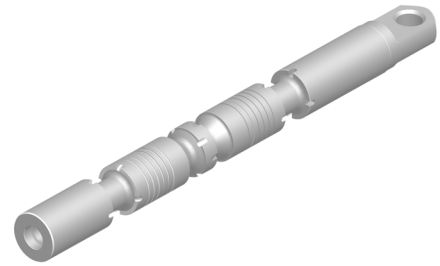
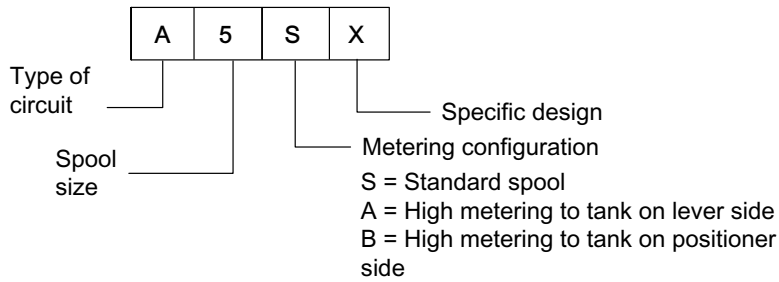


## 4.6 A/B work port to outlet "T"

Parallel circuit - Spool A5S

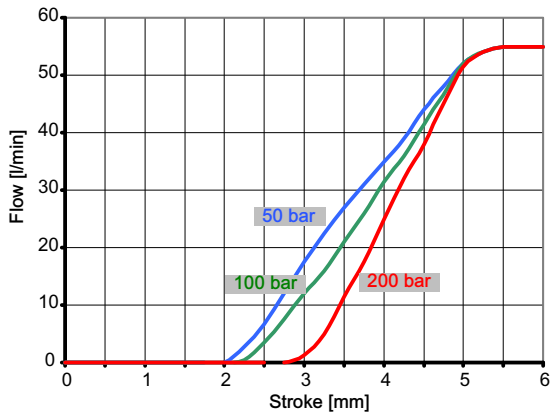


## 5 Spools

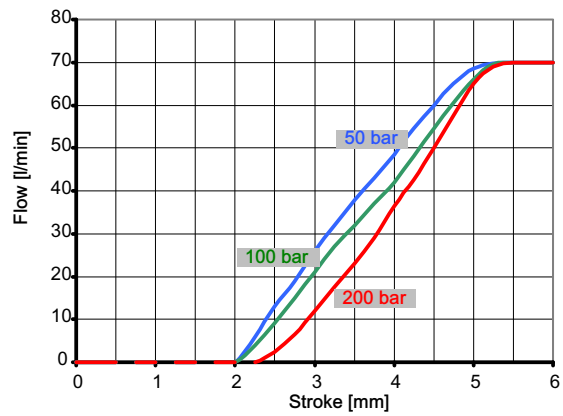


Spool Type	Hydraulic schematic	Features	Application examples
A5S A5B A5A		4 way - 3 position A/B closed	A5B - A5A LOADERS BOOM and BUCKET FUNCTION
C5S		4 way - 3 position A/B to tank in neutral	
G5S		3 way - 3 position B closed	Fork lift LIFTING FUNCTION
S5S		3 way - 3 position A closed	Fork lift LIFTING FUNCTION
Z5S		4 way - 4 position 4th floating position	4th floating position by pulling the spool (Manual controls only)
X5S		4 way - 3 position series connection	
W5S		4 way - 4 position 4th floating position	4th floating position by pushing the spool
R5RB		Regenerative circuit at full stroke pushing the spool for high dumping speed	LOADERS BUCKET FUNCTION
A5BP		4 way - 3 position A/B closed	LOADERS BOOM and BUCKET FUNCTION For HP controls only
W5P		4 way - 4 position 4th floating position	4th floating position by pushing the spool LOADERS BOOM FUNCTION For HP controls only

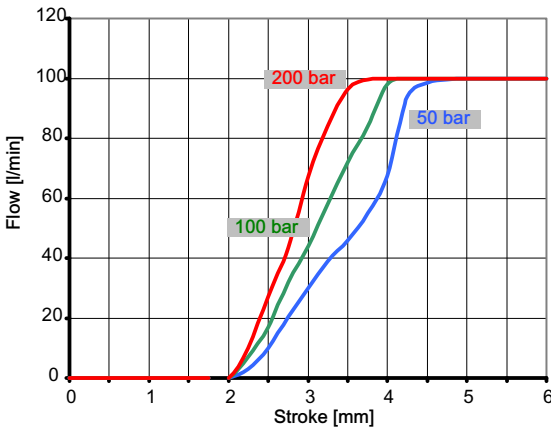
Spool size 5 metering: P → A/B (inlet flow 55 l/min)



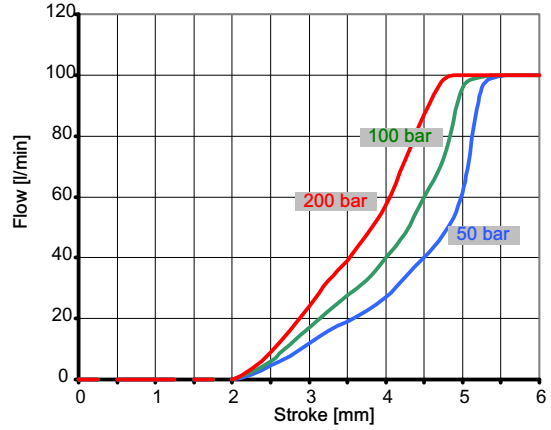
Spool size 5 metering: P → A/B (inlet flow 70 l/min)



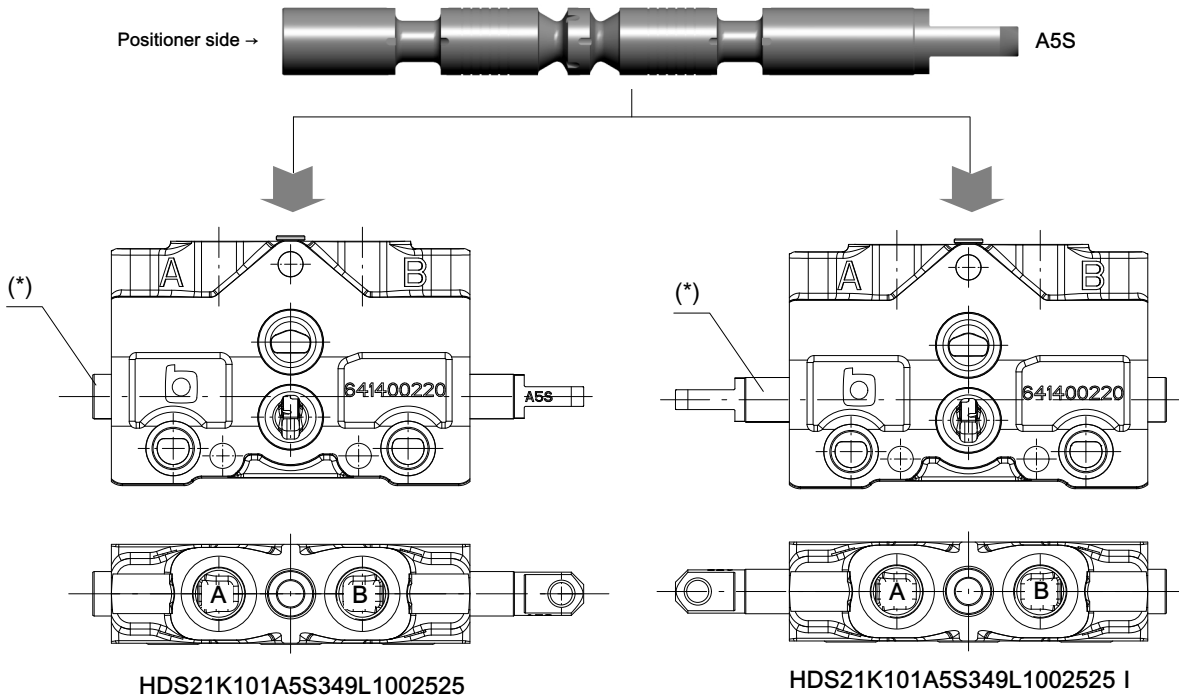
Spool size 5 metering: A/B → T (port flow 100 l/min) metering configuration S



Spool size 5 metering: A/B → T (port flow 100 l/min) High metering to tank spools Metering configuration A and B and floating



### Spool assembly direction

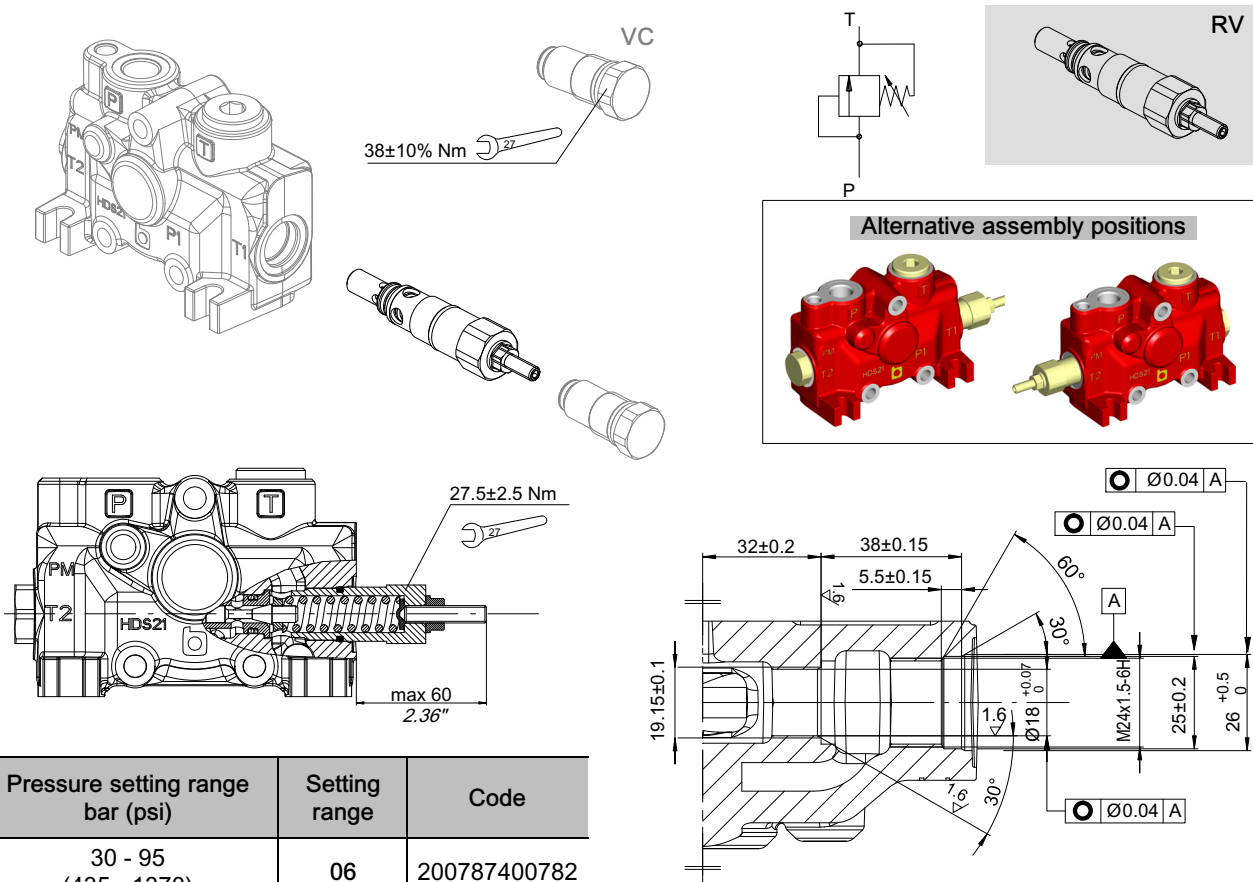


B port is always on the standard lever side printed on the body (\*)

Note: Contact Bucher Hydraulics for any desired combination

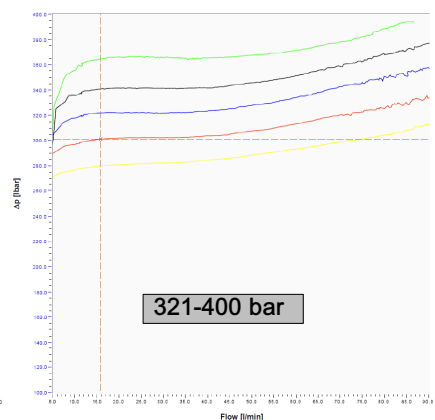
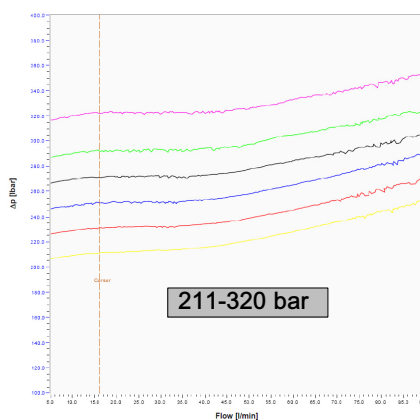
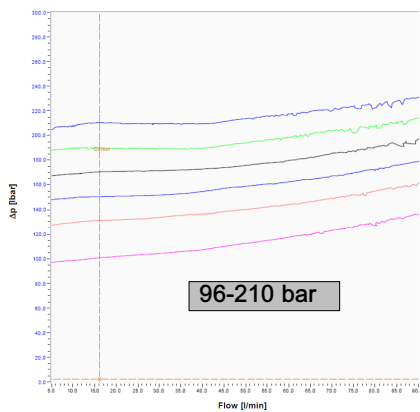
## 6 Valves

### 6.1 Standard relief valve RV



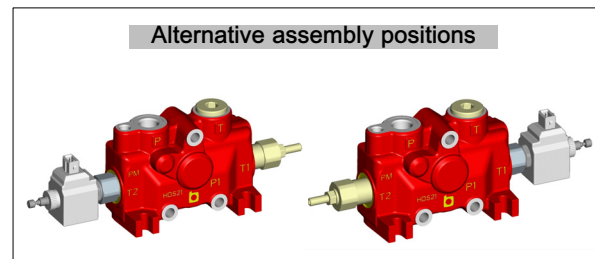
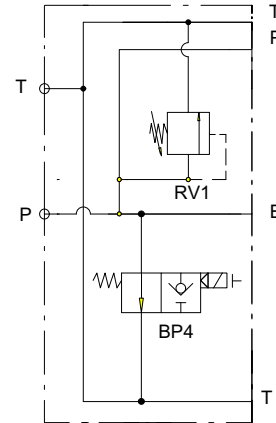
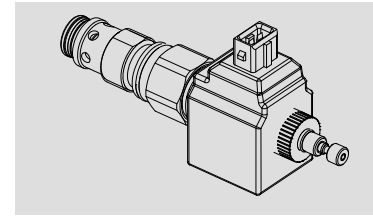
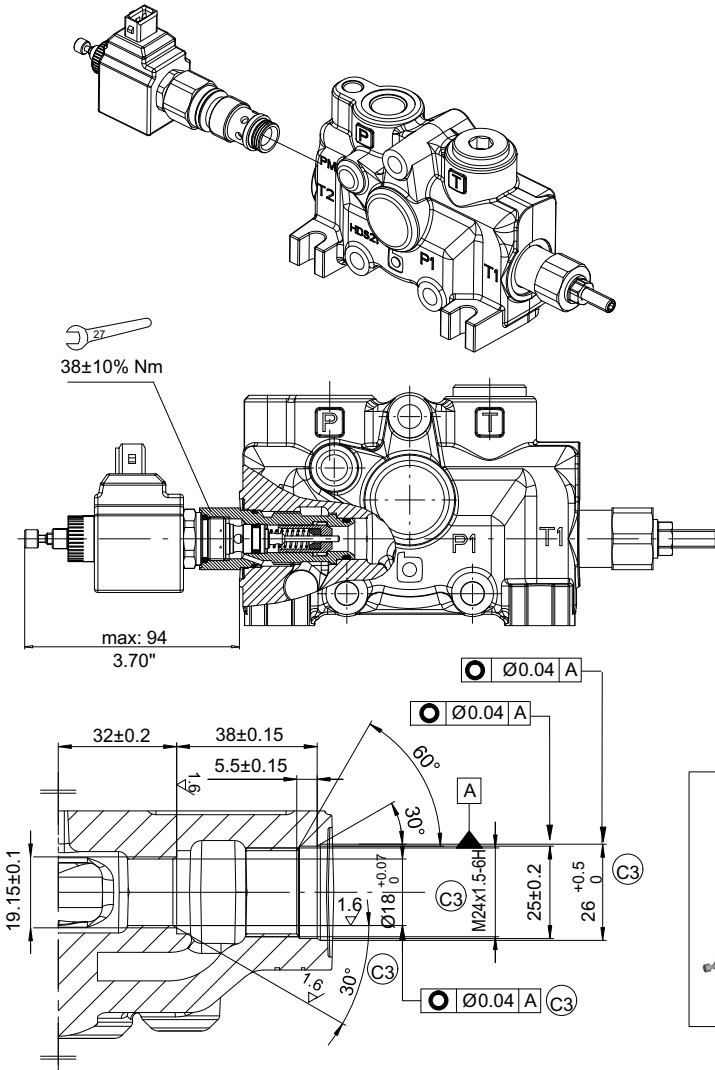
Pressure setting range bar (psi)	Setting range	Code
30 - 95 (435 - 1370)	06	200787400782
96 - 210 (1390 - 3045)	15	200787400802
211 - 320 (3060 - 4640)	26	200787400762
321 - 400 (4650 - 5800)	32	200787402302
VC (plug)		200778400160

A tamper proof shrinkable-sheath can be supplied on demand



## 6.2 Unloading solenoid valve BP4/AE, normally open

Max operating pressure 290 bar



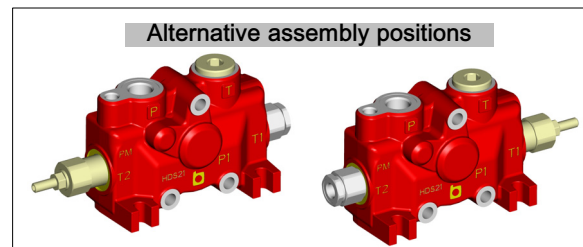
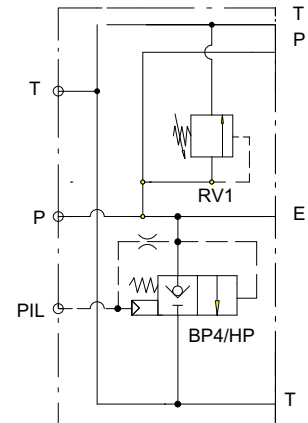
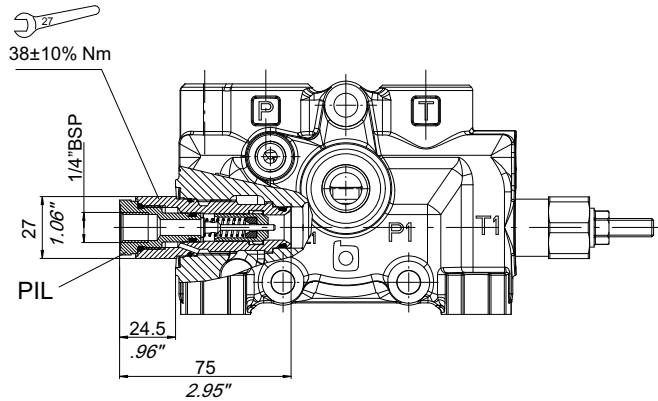
Manual override	Type	Code without coil
With	BP4/CE P.M.	200757200520
With	BP4/AE1 P.M.	200757200530
Without	BP4/C P.M.	200757200500
Without	BP4/A P.M.	200757200510

For available coil versions see 6.5



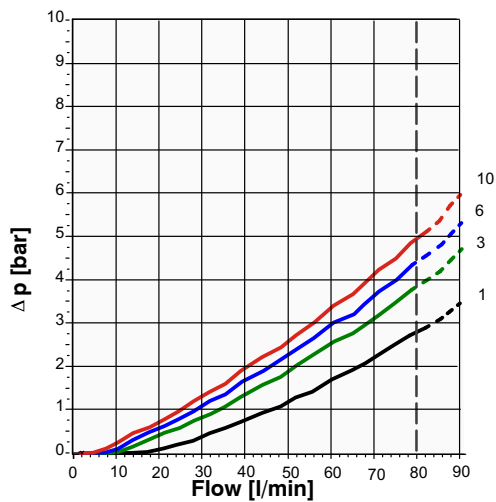
### 6.3 Hydraulic operated unloading valve

Type	Code
BP4/HP	200787202390

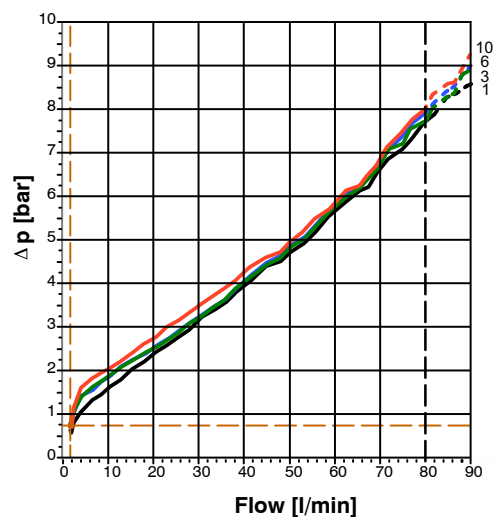


### 6.4 Pressure drop curves

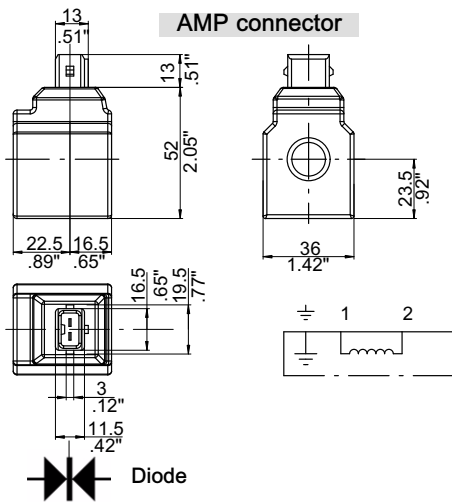
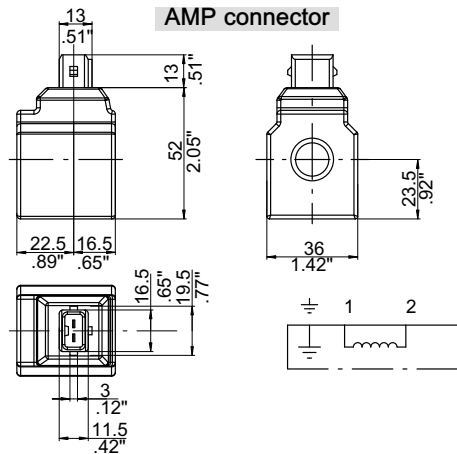
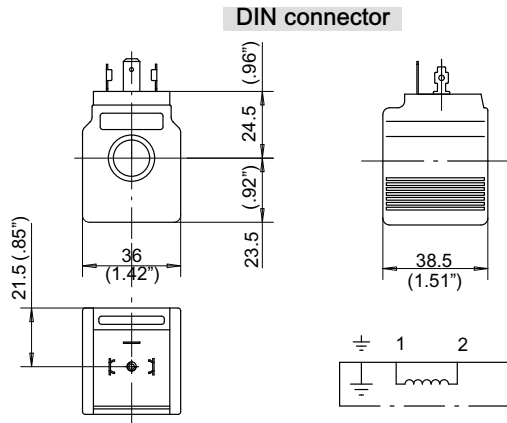
Pressure drop: P → T3  
With by-pass valve open and spools  
in neutral position



Pressure drop: P → T3  
With by-pass valve open and neutral gallery  
close (one spool switched to full stroke  
and A/B plugged)



## 6.5 Coils for solenoid valves

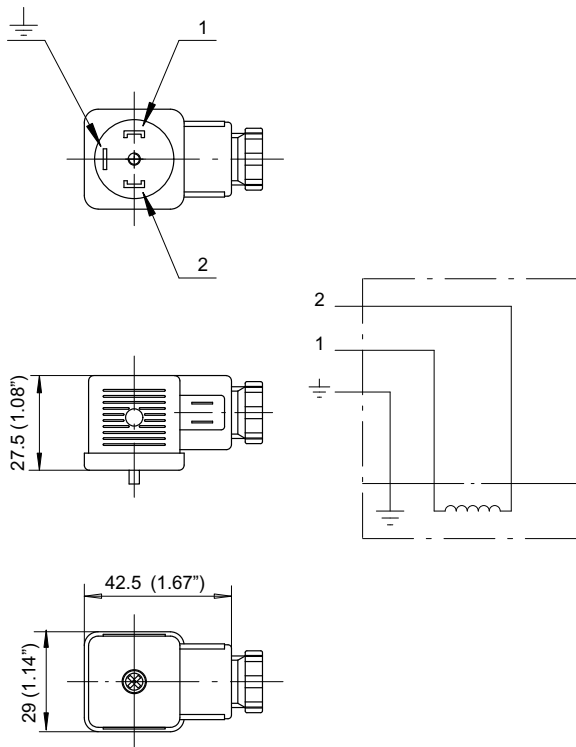


For solenoid valve series	
Wire class	H (VDE0580)
Protection	IP65 (DIN40050)
Coil insulation	F
Duty rating	ED 100%
Voltage tolerance	± 10%

Connector style	Nominal Coil voltage	Power (Watt)	Resistance (Ohm)		Coil code
			Ambient temp.	Ambient temp.	
DIN	12 V. DC.	27.2	5.3	2.2	200674910100
	24 V. DC.	27	21.3	1.12	200674920080
AMP	12 V. DC.	27.2	5.3	2.2	200674910250
	24 V. DC.	27	21.3	1.12	200674920200
AMP + DIODE	12 V. DC.	21	6.85	1.75	200541210032
	24 V. DC.	21	27	0.78	200541210033

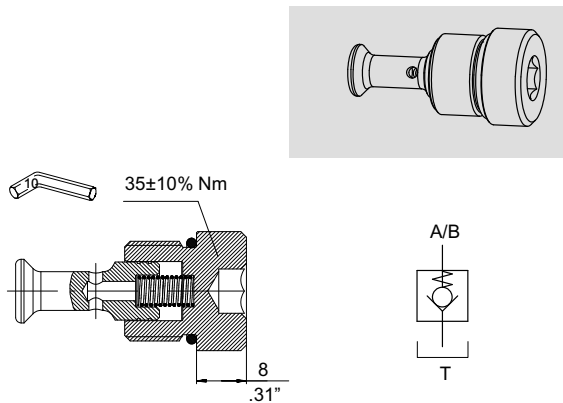
## 6.5.1 Connector for DIN type solenoids

Code 200544110009

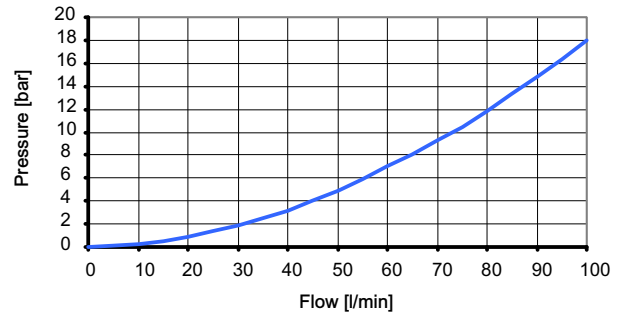


For power input	D.C.
Connector type	DIN 43650
Number of poles	2 + $\perp$
Supply voltage	max. 220 V.
Nom. capacity at contacts	10 A.
Max capacity at contacts	16 A.
Resistance at contacts	$\geq 4$ mOhm
Max section of cable	1.5 mm <sup>2</sup>
Outer material	Glass fibre reinforced Nylon
Contact mount material	
Color	Black
Armour clamp	Pg 9
Ø cable	6-8 mm.
Protection factor	IP65 (DIN40050)
Insulation class	C (VDE0110)
Temperature range	-40 / +90 °C

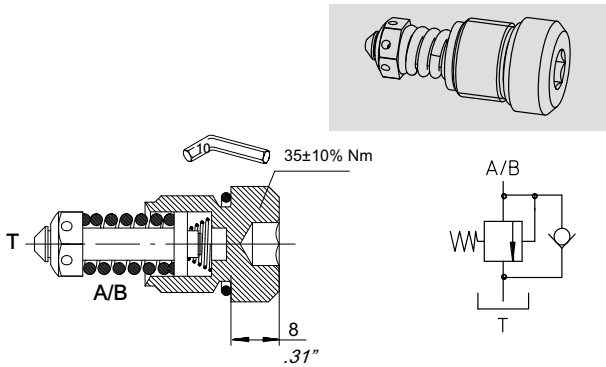
## 6.6 Anti-cavitation valves C



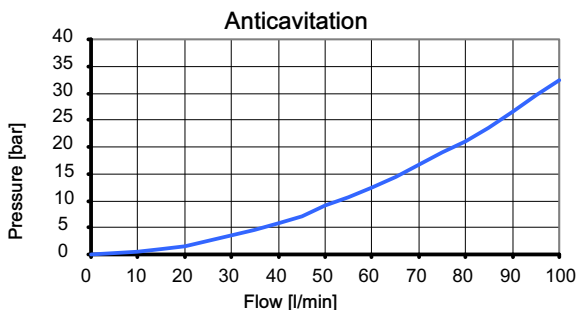
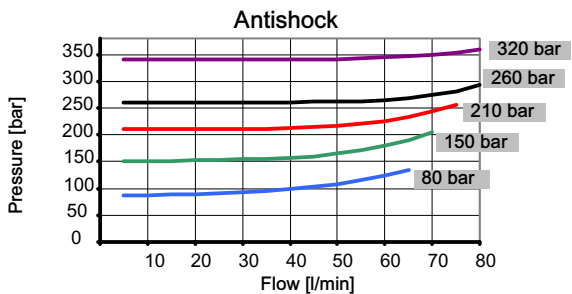
Type	Code
C	200787602560
VC (plug)	200778400310



## 6.7 Anti-shock and anti-cavitation valves UC



Pressure setting at 10 l/min (*) bar (psi)	Code
40 (580)	200533930068
60 (870)	200533930077
70 (1010)	200533930050
80 (1160)	200533930050
90 (1300)	200533930084
100 (1450)	200533930100
110 (1590)	200533930110
120 (1740)	200533930085
130 (1880)	200533930057
140 (2030)	200533930059
150 (2170)	200533930051
160 (2320)	200533930067
170 (2460)	200533930071
180 (2610)	200533930056
190 (2750)	200533930113
200 (2900)	200533930060
210 (3040)	200533930080
220 (3190)	200533930064
230 (3330)	200533930058
240 (3480)	200533930081
250 (3620)	200533930052
260 (3770)	200533930065
270 (3910)	200533930066
280 (4060)	200533930053
290 (4200)	200533930069
300 (4350)	200533930079
320 (4640)	200533930054
VC (plug)	200778400310

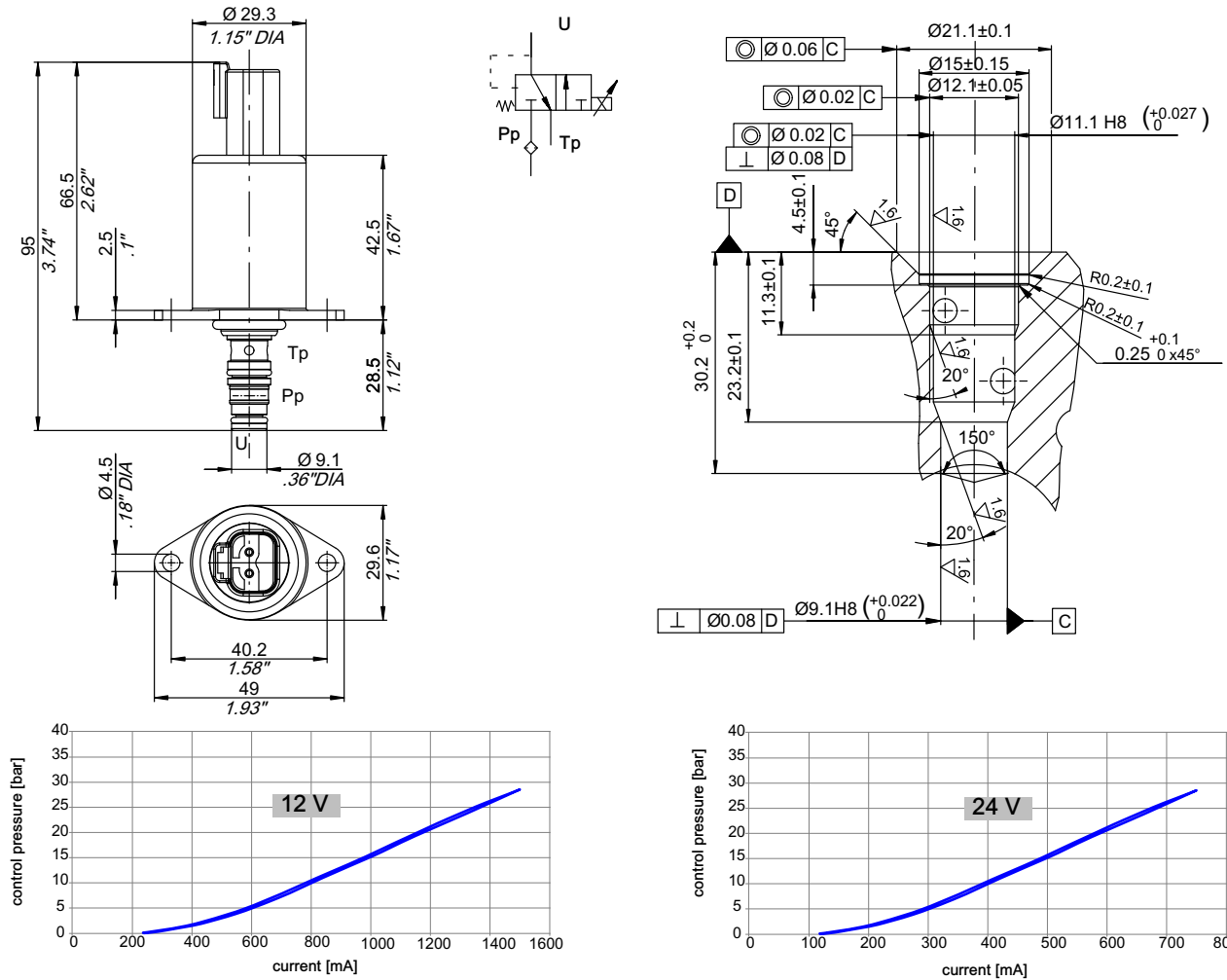


**IMPORTANT!:** The UC anti-shock valve is designed to absorb shock effects. Therefore, it should not be used as pressure relief valve

The dedicated cavity is machined on request only

(\*) For different pressure settings please contact our Sales Department

### 6.8 Proportional pressure reducing valve / ON-OFF directional valve

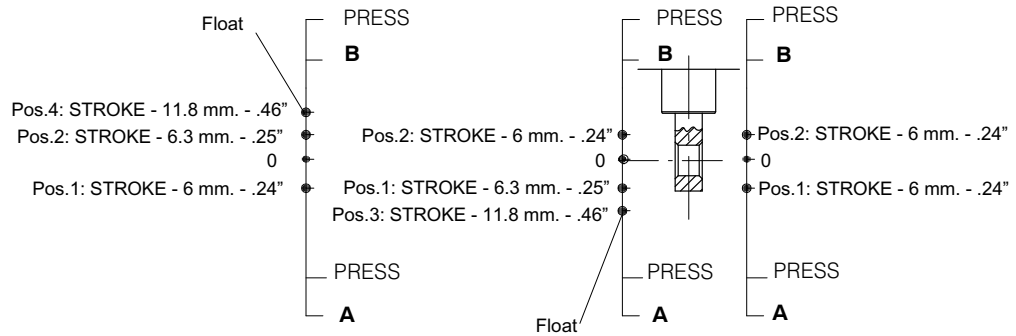


Electro-hydraulic specifications	12 V	24 V
Nominal flow rate	4 l/min (1 GPM)	
Max inlet pressure	50 bar (725 psi)	
Rated supply voltage	12 VDC	24 VDC
Current supply characteristic	PWM (Pulse width modul.)	
Maximal current	1500±10 mA	750±10 mA
Superimposed dither frequency	100	
Degree of protection	AMP IP65	Deutsch IP69K
Pp filter screen	125 µm	
Coil resistance	4.7 Ohm ±5%	20.8 Ohm ±5%
Response time	< 50 ms	
Leakage from Pp to Tp	< 30 cc/min. at 35 bar and 50°C (< 0.9 cu.in./min. at 500 psi and 176 °F)	
Duty cycle	ED 100%	
Connector Type	AMP Junior timer (AMP84-9419) / DEUTSCH DT04-2P	
Connector colour	MOSSY-GREY	BLACK
Code (*)	200533960015 (DEUTSCH) 200533960016 (AMP)	200533960013 (DEUTSCH) 200533960014 (AMP)

(\*) nr. 2 screws M4x12 are not included

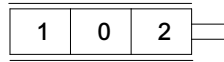
## 7 Levers

### 7.1 Spool stroke

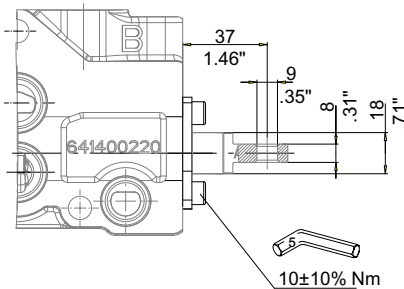


### 7.2 Standard lever groups

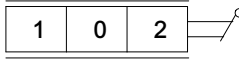
Code: 200707190050



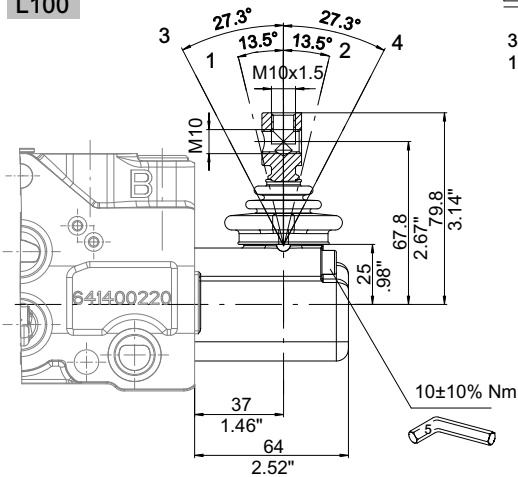
**L55**



Code: 200707120570

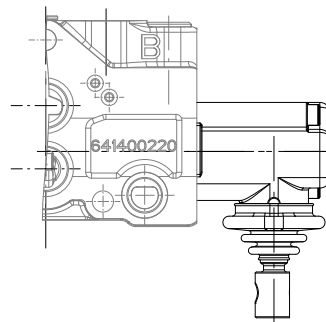


**L100**



**L300**

3 - 4 floating stroke  
1 - 2 standard stroke



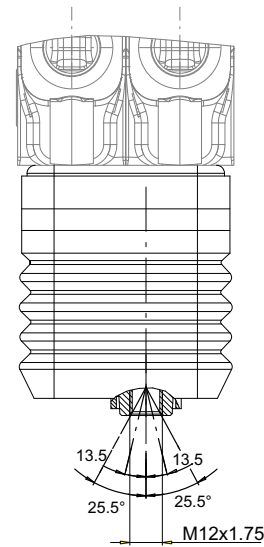
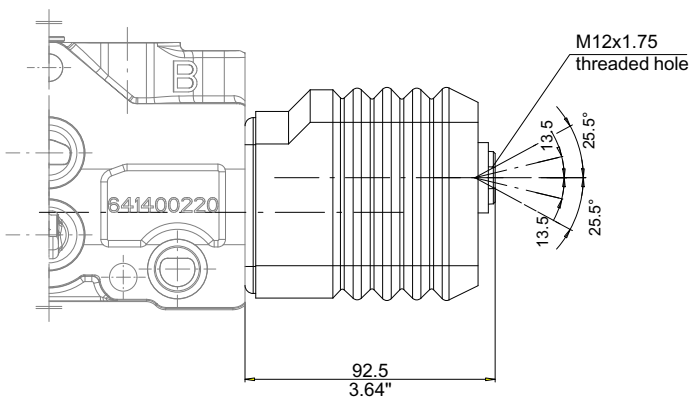
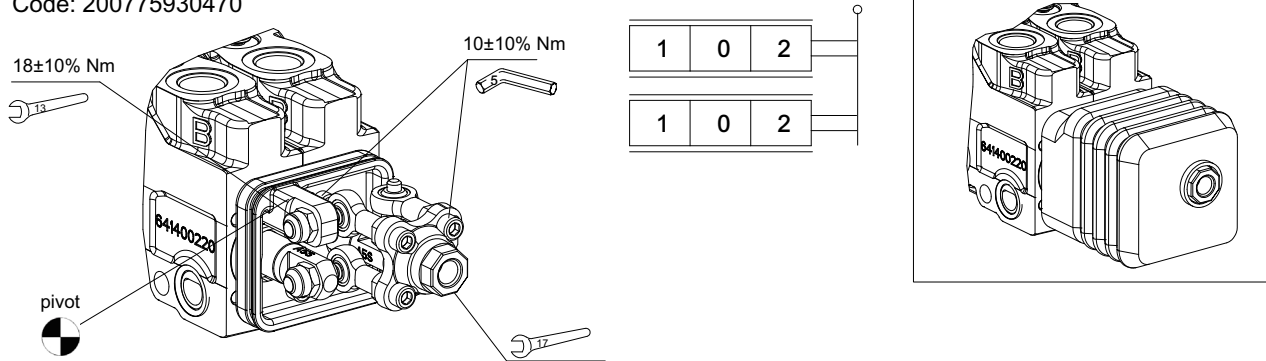
Body Interface	Spool type
Manual	Manual

Lo	Lo		Type	Code
	mm	inches		
185	7.28	AL001	200702220010	
250	9.84	AL002	200702220030	
300	11.81	AL003	200702220040	
350	13.78	AL004	200702220050	



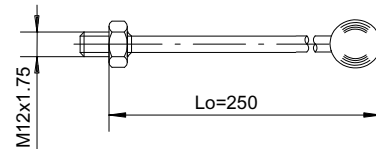
## 7.3 Manual joystick control

Code: 200775930470

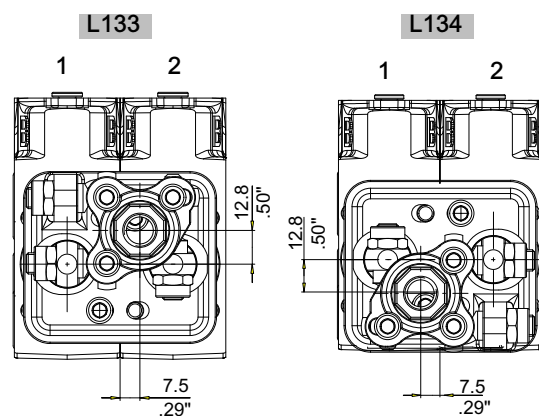
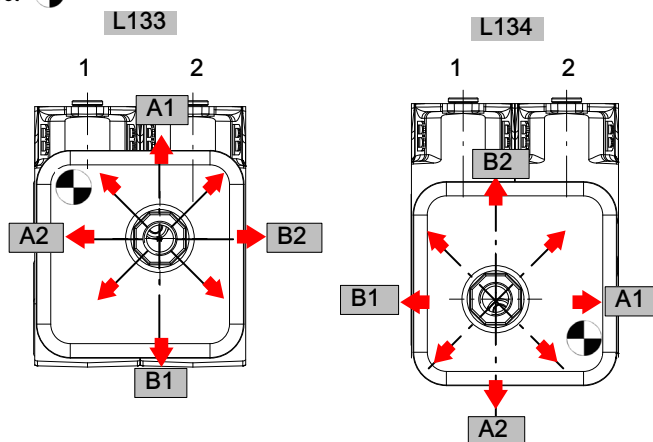


Body Interface	Spool type
Manual	Manual

AL010  
Code: 200702230040

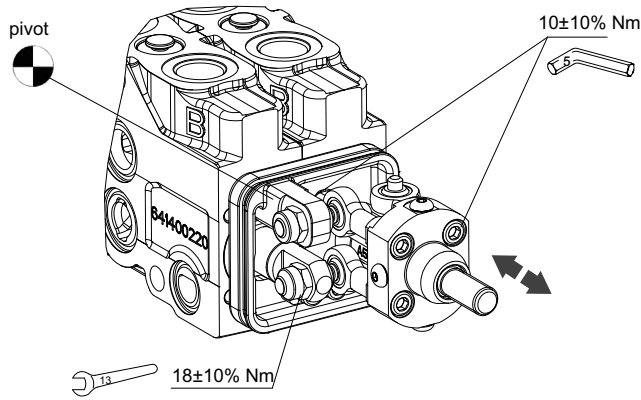


Pivot

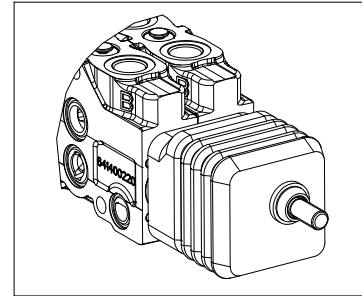


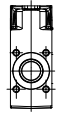

## 7.4 Joystick control L260-460 with integrated locking system

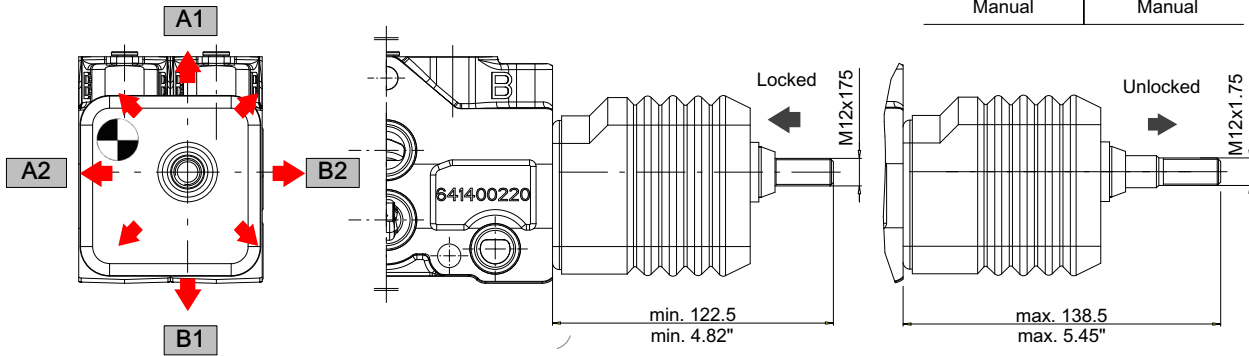
Code: 200775930480



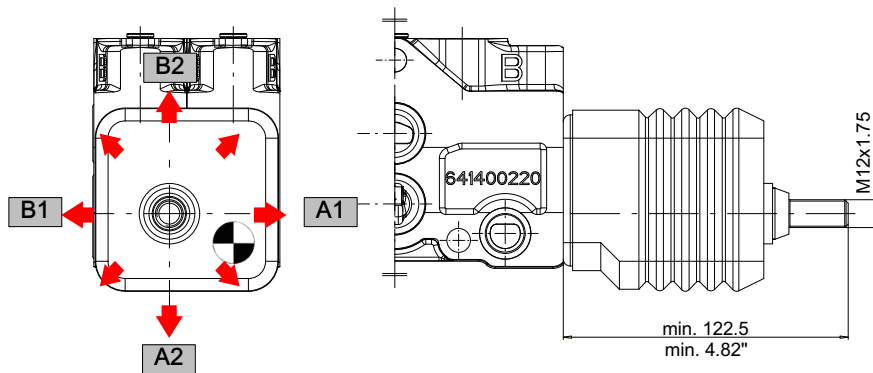
**L260**



Body Interface	Spool type
	
Manual	Manual

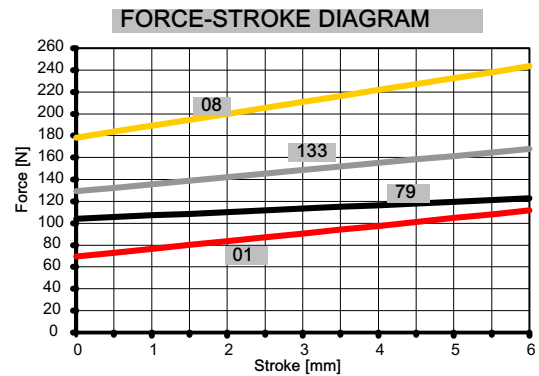
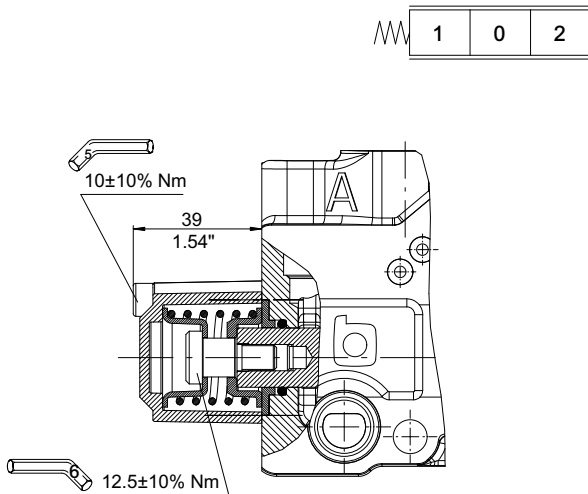


**L460**



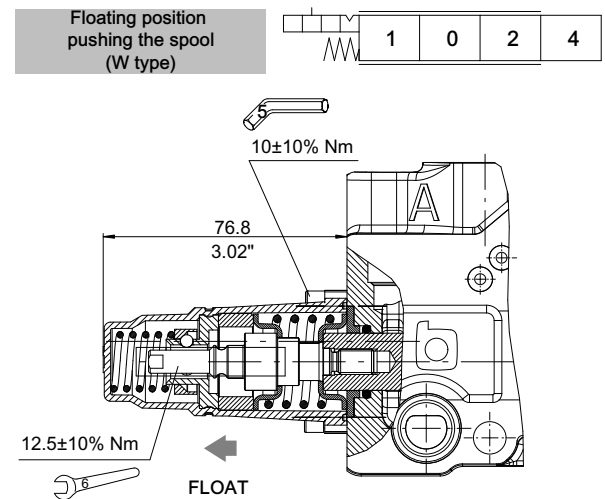
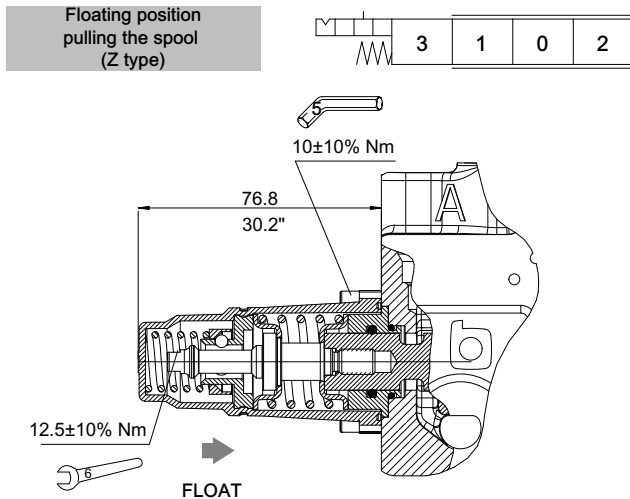
## 8 Positioners

### 8.1 Spring return to neutral position



Type	Code	Colour
01	200768611722	RED
79	200768612070	BLACK
133	200768612050	WHITE
08	200768612060	YELLOW

### 8.2 Detent in floating position and spring return to neutral from position 1 and 2

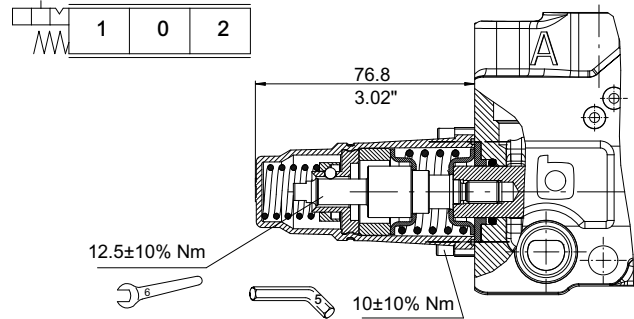
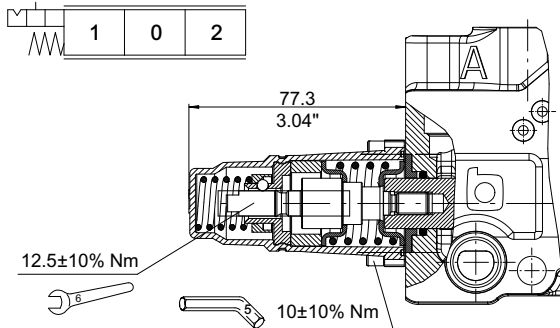


Type	Code	Main spring	Detent spring
04	200768640800	RED	BLACK
333	200768640830	BLACK	BLACK

Type	Code	Main spring	Detent spring

## 8.3 Detent in position 1 or 2 and spring return to neutral in both directions

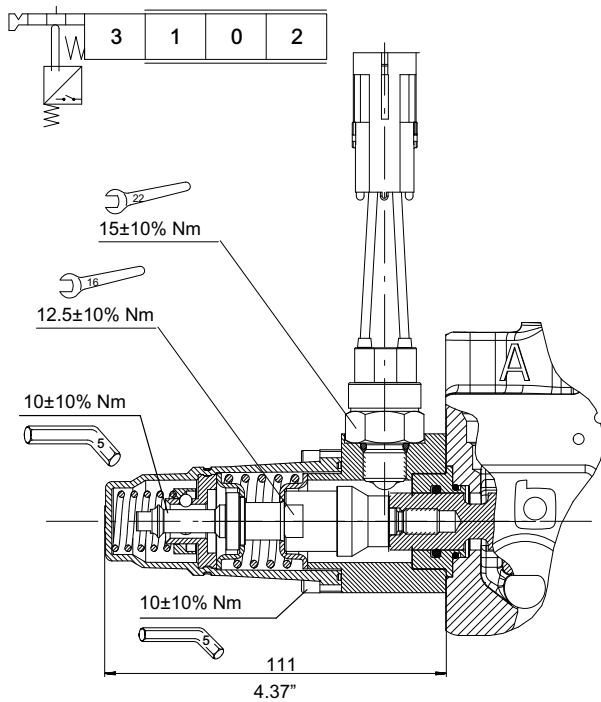
A pre-feeling (force increase) signals the operator that the detent position is going to be engaged



Type	Code	Main spring	Detent spring
359	200768630481	RED	BLACK

Type	Code	Main spring	Detent spring
340	200768640471	RED	BLACK

## 8.4 With microswitch in floating position

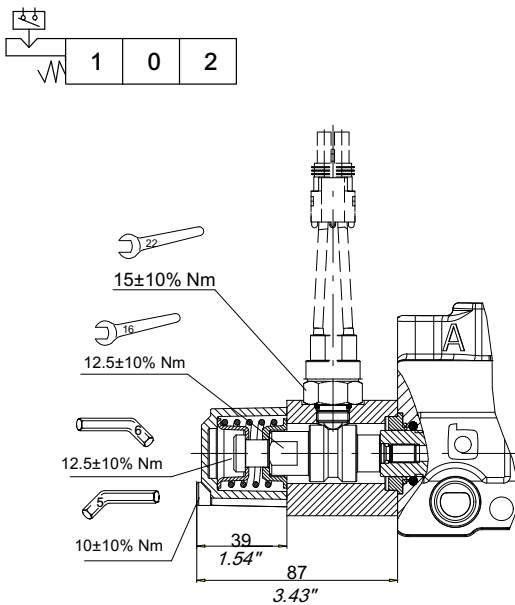


Microswitch specification	
Current rating	.01 - 5.0 DC Amp
Voltage rating	5.0 - 24.0 VDC
Connector	Packard Metri-pack
Electrical life max.	100.000 cycles - 7A/13.5 VDC
	50.000 cycles - 10A/12 VDC
Mechanical life max.	50.000 cycles - 3A/28 VDC
	500.000 cycles
Type	Normally Open, Encapsulated with Wire Leads

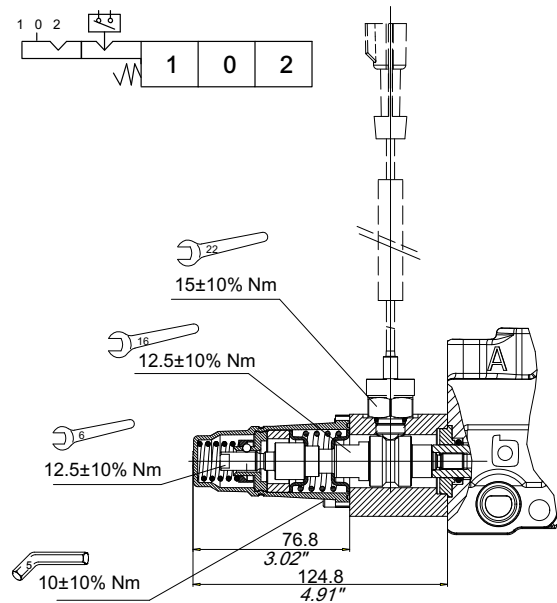
Type	Code	Main spring	Detent spring	Contact type

## 8.5 Microswitch positioners

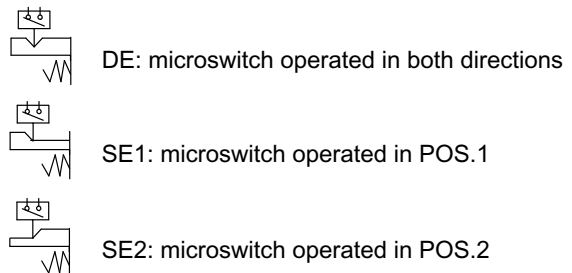
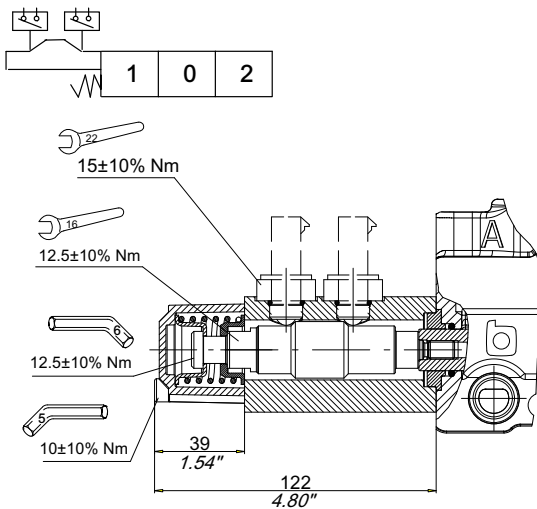
### 8.5.1 Spool movement detection



### 8.5.2 Spool movement detection with detent posit.



### 8.5.3 Spool direction detection



#### Microswitch control

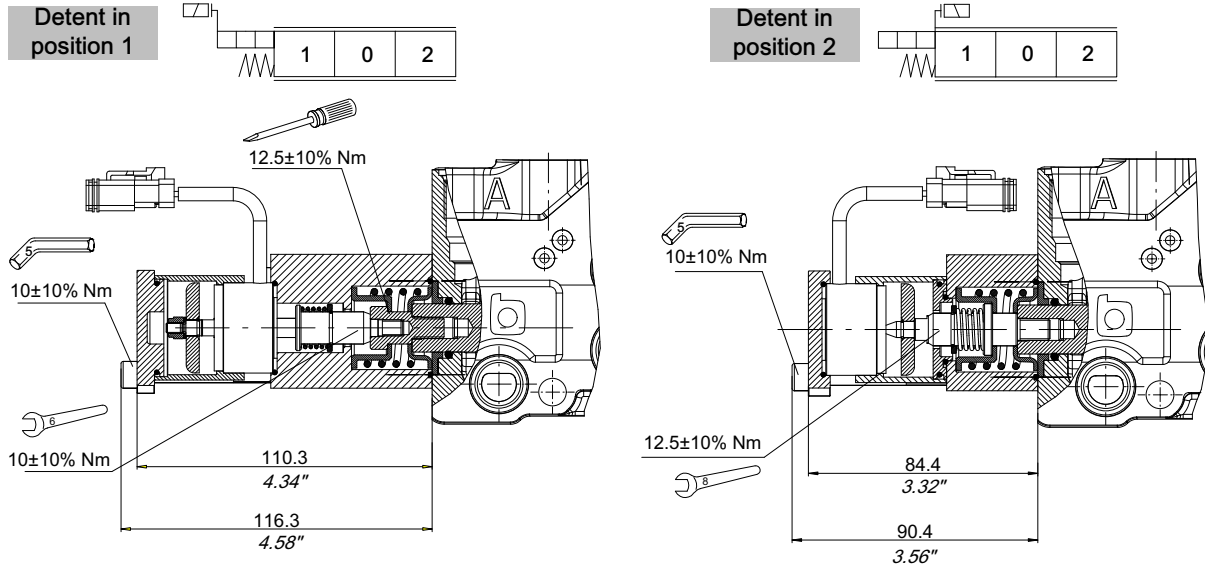
Current rating	.01 - 5.0 DC Amp
Voltage rating	5.0 - 24.0 VD C
Mechanical life	500.000 cycles
Temperature range	-30 to 120° C

The normally closed version is available too.

Type	Code	Hydraulic scheme	Description	Connector type
SAE6 C21-478	200544124021		Normally Closed, Encapsulated with Wire Leads	Packard Weather Pack
SAE6 O21-477	200544124022		Normally Open, Encapsulated with Wire Leads	Packard Weather Pack
SAE6 O21-467	200544124023		Normally Open, Encapsulated with Wire Leads, Convoluted nylon wire shield	Packard Metri-pack
SAE6 C21-462	200544124027		Normally Closed, Sealed Terminals	Packard Weather Pack

## 8.6 Electro-magnetic detent positioners (EMD)

A pre-feeling (force increase) signals the operator that the detent position is going to be engaged



### 8.6.1 Operating features

#### COIL

Nominal voltage: 12 VDC  $\pm$  10%

Power rating: 7 W

Electrical resistance when holding (20°C): 21  $\pm$  1.5 Ohm:

Min. solenoid axial hold force: 260 N

Duty cycle: 100%

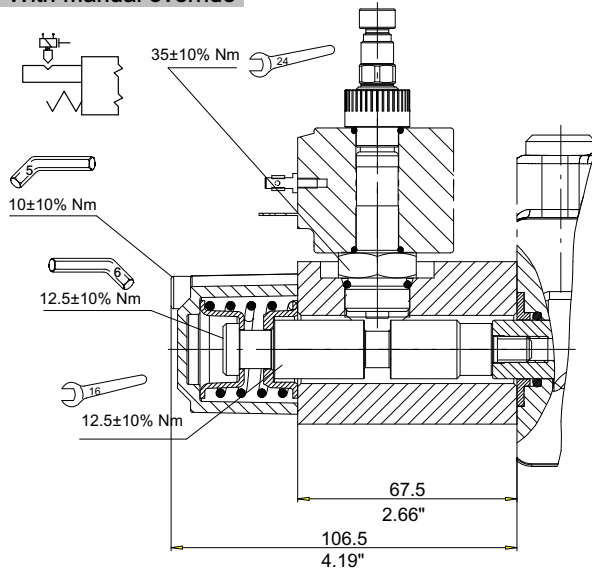
Standard cable length: 500 mm

Type	Code	Spring	Voltage	Min. holding force	Connector	Detent position
336	200768670100	RED	12 VDC	137 N	DEUTSCH DT06-2S	2
363	200768670110	RED	12 VDC	137 N	DEUTSCH DT06-2S	1

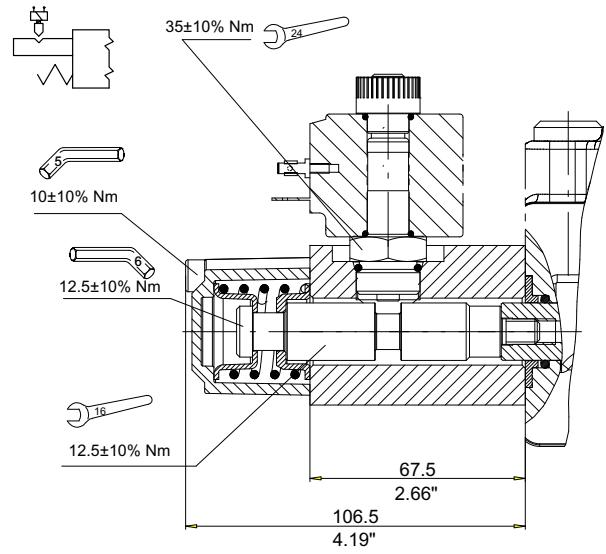


## 8.7 Electro-mechanic locking system

**With manual override**



**Without manual override**

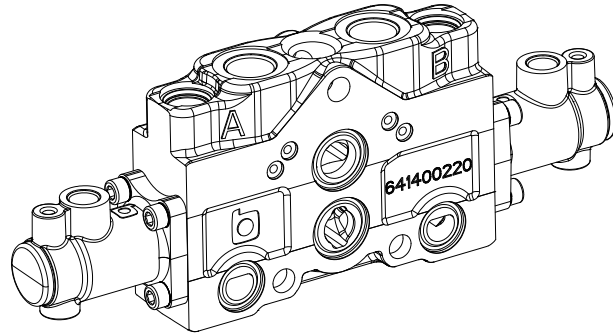


Type	Code	Colour	Manual override
178	200768690260	YELLOW	Y
179	200768690270	YELLOW	N

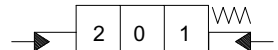
For types of coils see 6.5 and contact our Sales Department

For other types of springs see section 8.1

## 8.8 Hydraulic controls (HP)

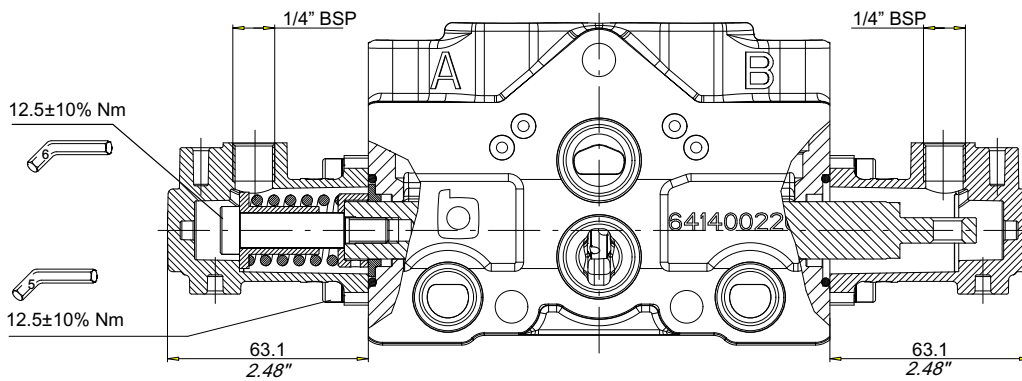
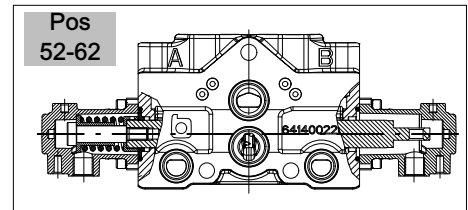


### 8.8.1 Positioner 50-52, 60-62



#### Pos 50-60

$P_{max} = 40 \text{ bar (580 psi)}$

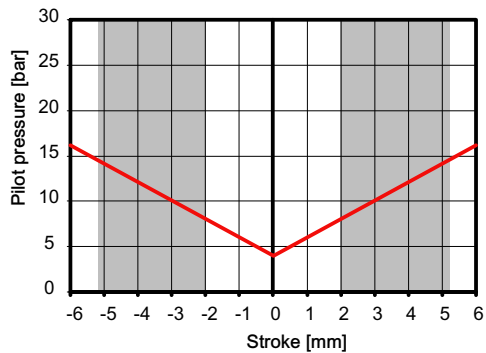


Type	Code
50-52	200768650691

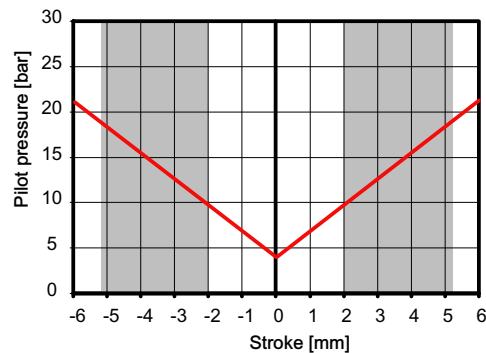
Type	Code
60-62	200768650701

#### Spring characteristic curves

Pos 50-52

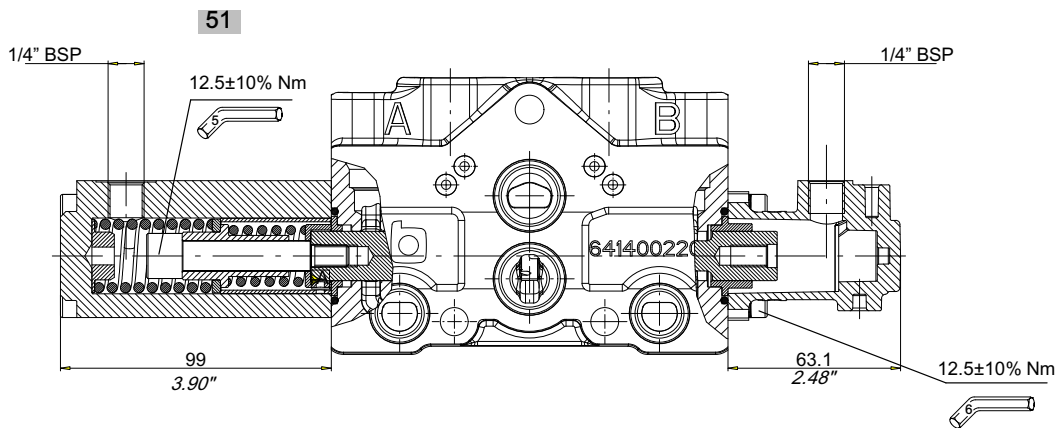
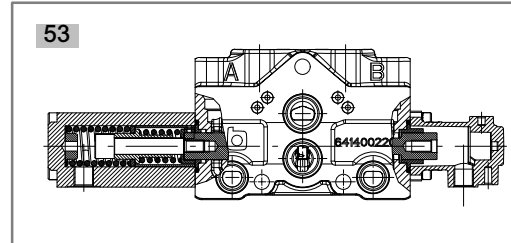
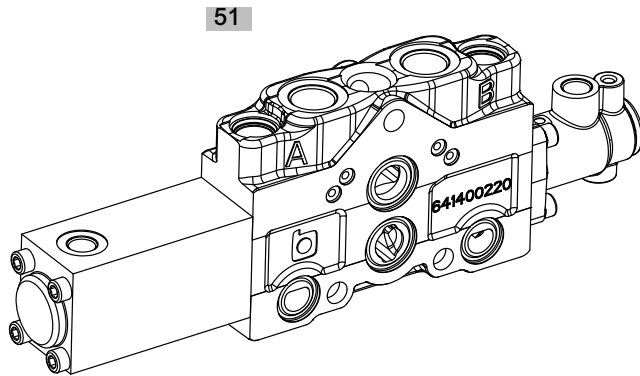
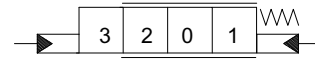


Pos 60-62



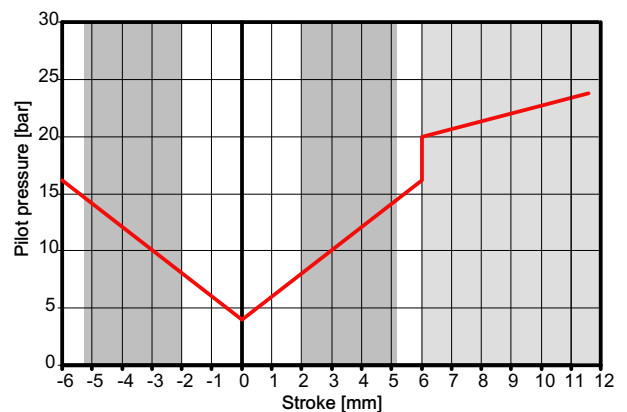
## 8.8.2 Positioner 51-53

P<sub>max</sub> = 40 bar (580 psi)



Type	Code
51-53	200768650681

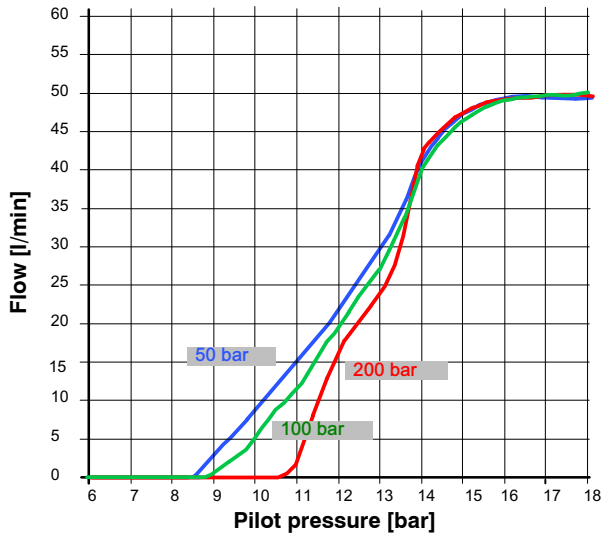
Spring characteristic curve



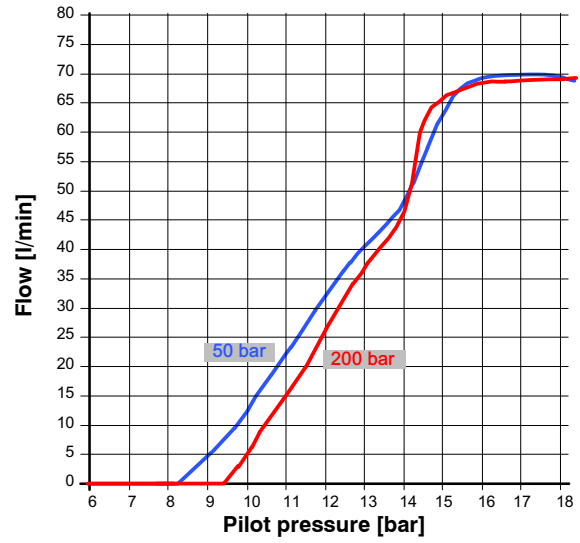
■ Metering stroke    ■ Floating

## 8.8.3 Spool metering curves pos 50

Spool metering: P→A→B→T (inlet flow 50 l/min)

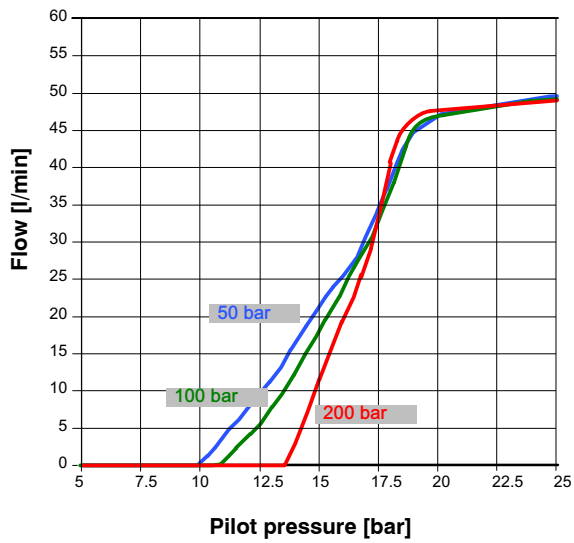


Spool metering: P→A→B→T (inlet flow 70 l/min)

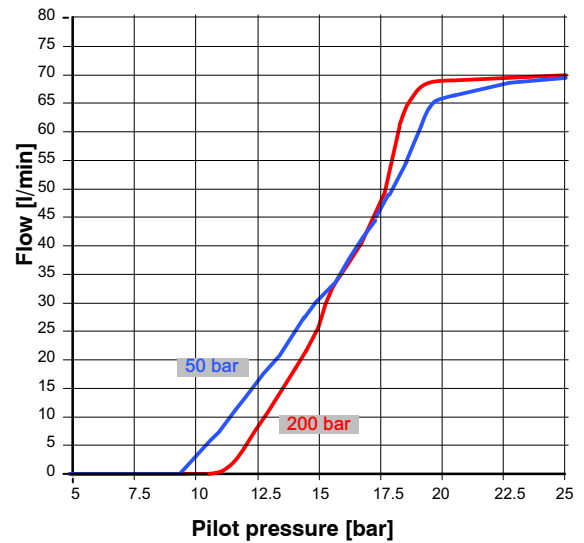


## 8.8.4 Spool metering curves pos 60

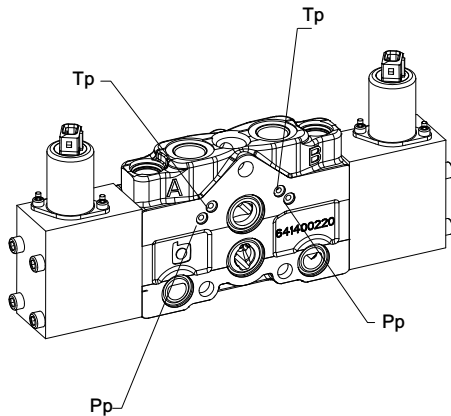
Spool metering: P→A→B→T (inlet flow 50 l/min)



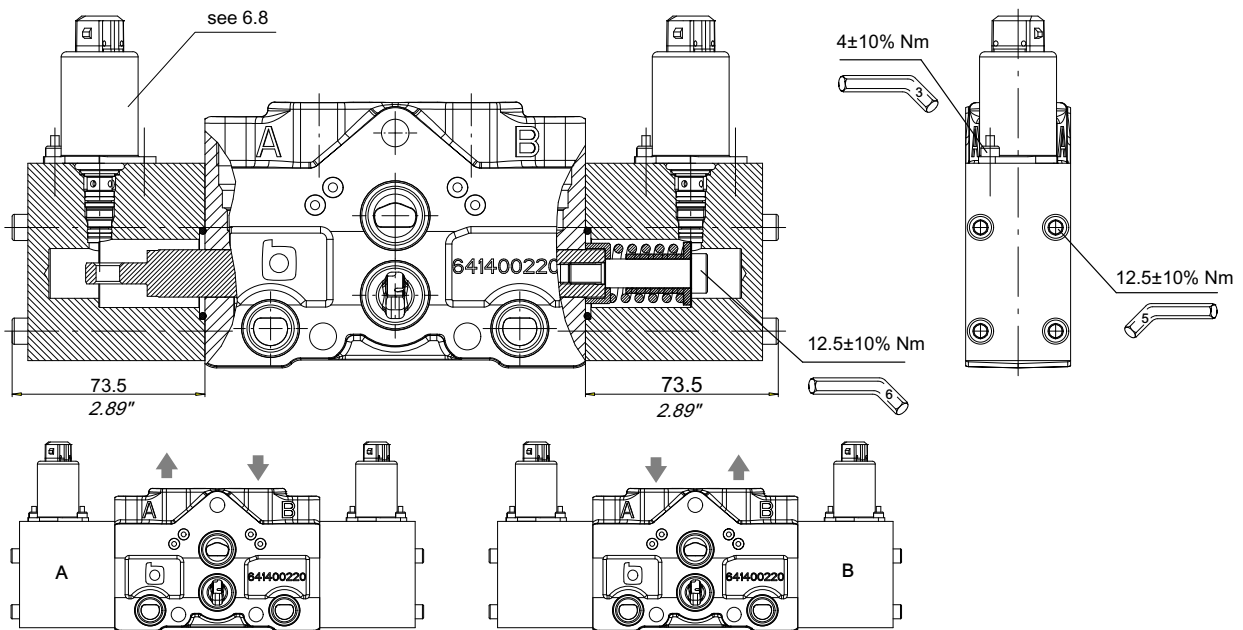
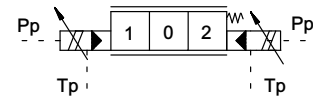
Spool metering: P→A→B→T (inlet flow 70 l/min)



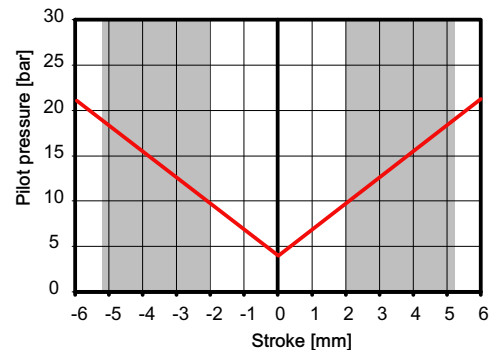
8.9 Electro-hydraulic open loop proportional / ON-OFF control (EHO)



Simplified scheme



EHO positioner spring curve

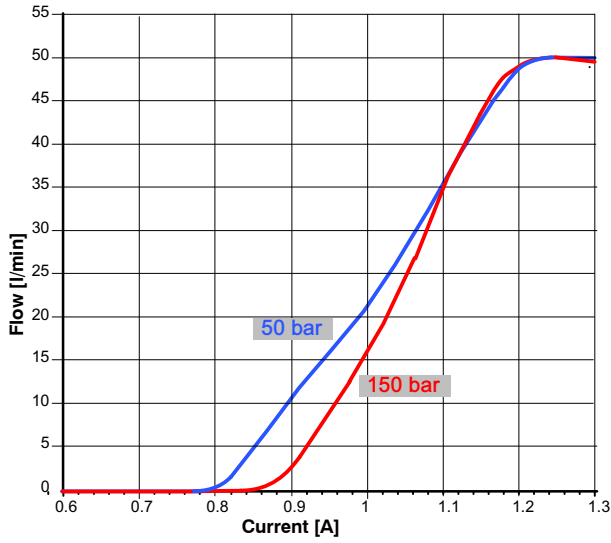


Type	Code	Voltage	Connector
310B	200768661030	12 VDC	AMP
311B		24 VDC	AMP
312B		12 VDC	Deutsch
313B	200768660920	24 VDC	Deutsch

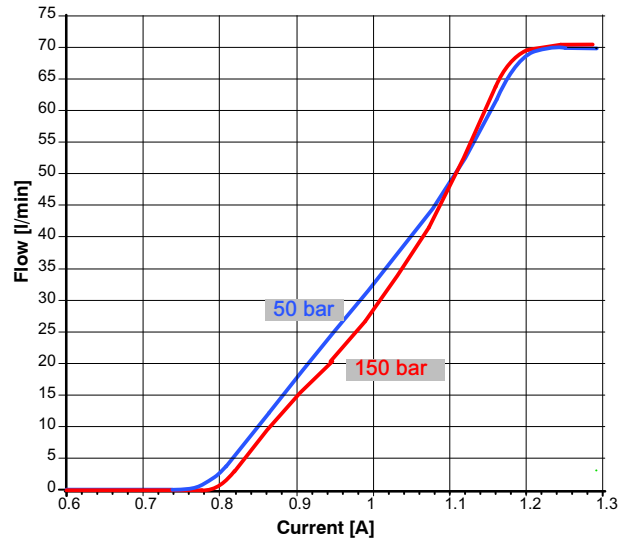
The pressure differential between pilot lines Pp and Tp should be > 25 bar in order to be sure to switch the spool to full stroke in all operating conditions

## 8.9.1 Spool metering curves 12 V

Spool metering : P→A→B→T (inlet flow 50 l/min)

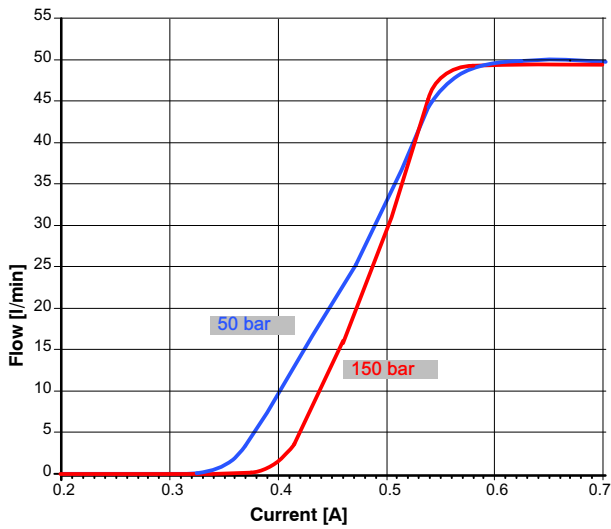


Spool metering: P→A→B→T (inlet flow 70 l/min)

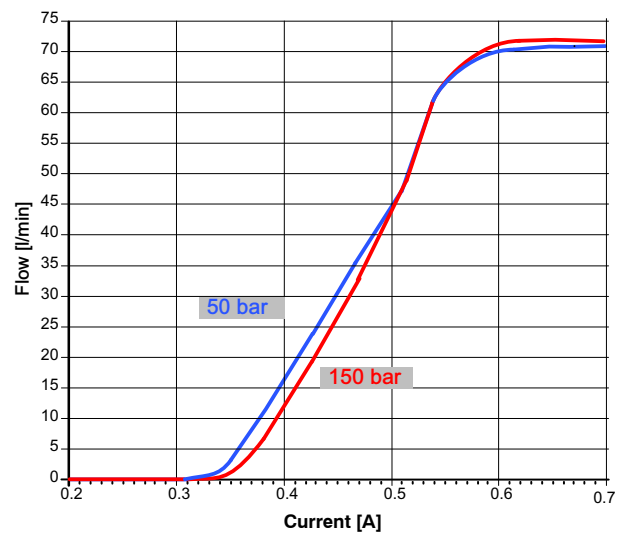


## 8.9.2 Spool metering curves 24 V

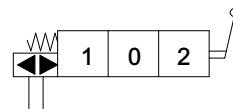
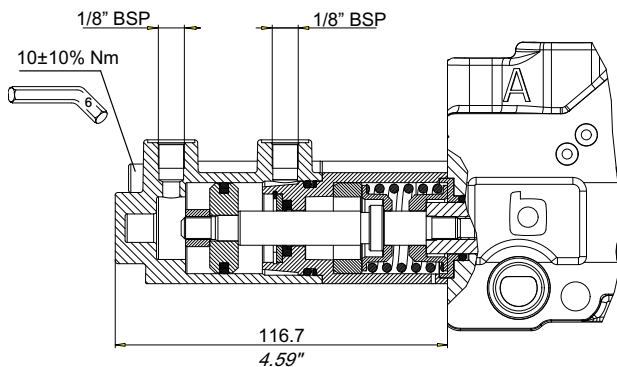
Spool metering: P→A→B→T (inlet flow 50 l/min)



Spool metering: P→A→B→T (inlet flow 70 l/min)



## 8.10 Pneumatic control



Type	Code
24	200768650760

### Operating conditions

#### Hydraulic control:

Pressure range: min. 6 bar (87 psi) - max. 15 bar (217 psi)

#### Pneumatic control:

Pressure range: min. 6 bar (87 psi) - max. 10 bar (145 psi)

## 9 Spool position transducer

### 9.1 Features

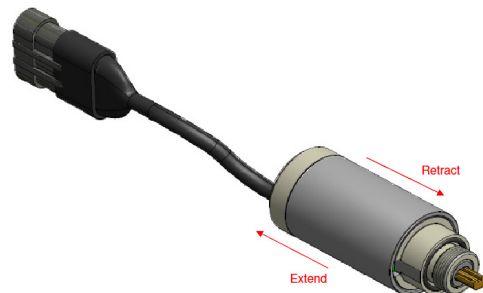
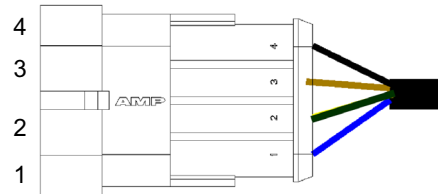
Code: 200544124026  
Position transducer.  
± 7,5mm linear stroke.  
Hall effect sensor

Mechanical specifications	
Maximum mechanical stroke	≥±8,5mm
External diameter	35 mm
Body length	91 ± 8,5 mm
Cable length (including connector)	350 mm
Maximum operating pressure	5 MPa (50bar)
Operating temperature range	-25°C / +105°C
Protection class	IP 67
Connector	Amp seal, 4 male pins
Mechanical life	5 Million cycles

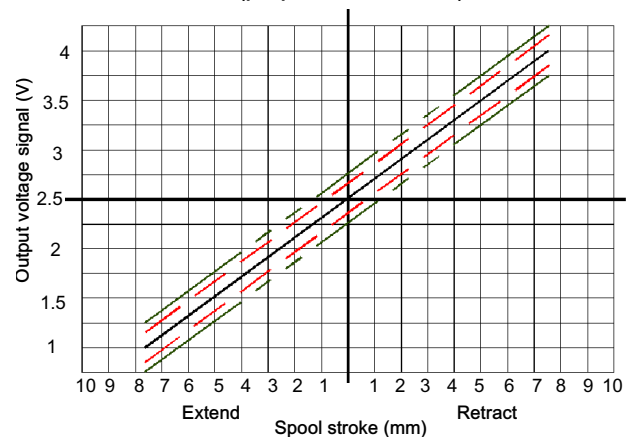
Electrical specifications - Linear, Hall-effect sensor	
Power Supply Voltage	6 ± 32 Vdc
Current Consumption	< 15 mA
Output signal in Neutral	2,5V
Output signal range	1 V ÷ 4 V
Tolerance on output signal	± 0,1 V
Maximum linearity error (-25 ÷ 85°C)	3%
Maximum linearity error (85 ÷ 105°C)	5%
Electrical stroke linearity range	± 7,5mm
Electrical life	10 Million cycles

### Electrical Connections (proportional version)

1. Vcc - **Blue**
2. Gnd - **Green/Yellow**
3. Proportional Output - **Brown**
4. n.u. - **Black**

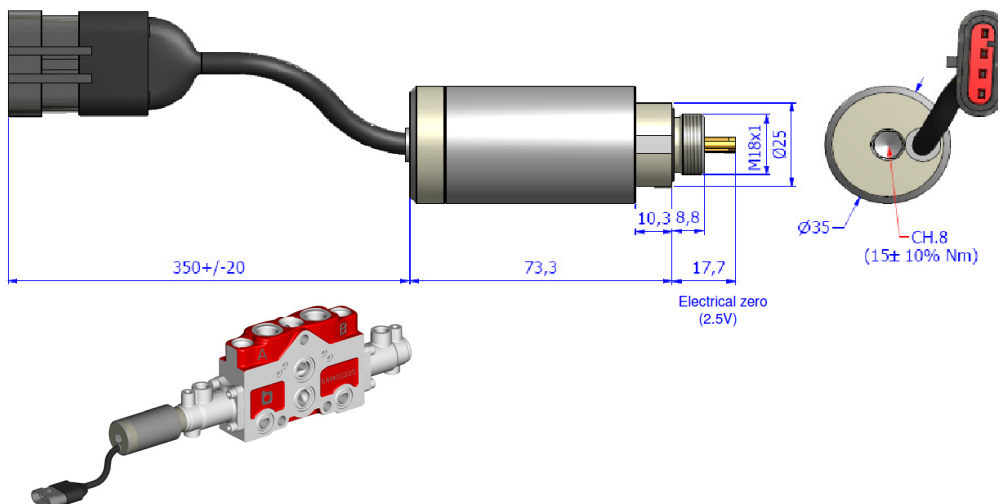


### Output signal control characteristic (proportional version)



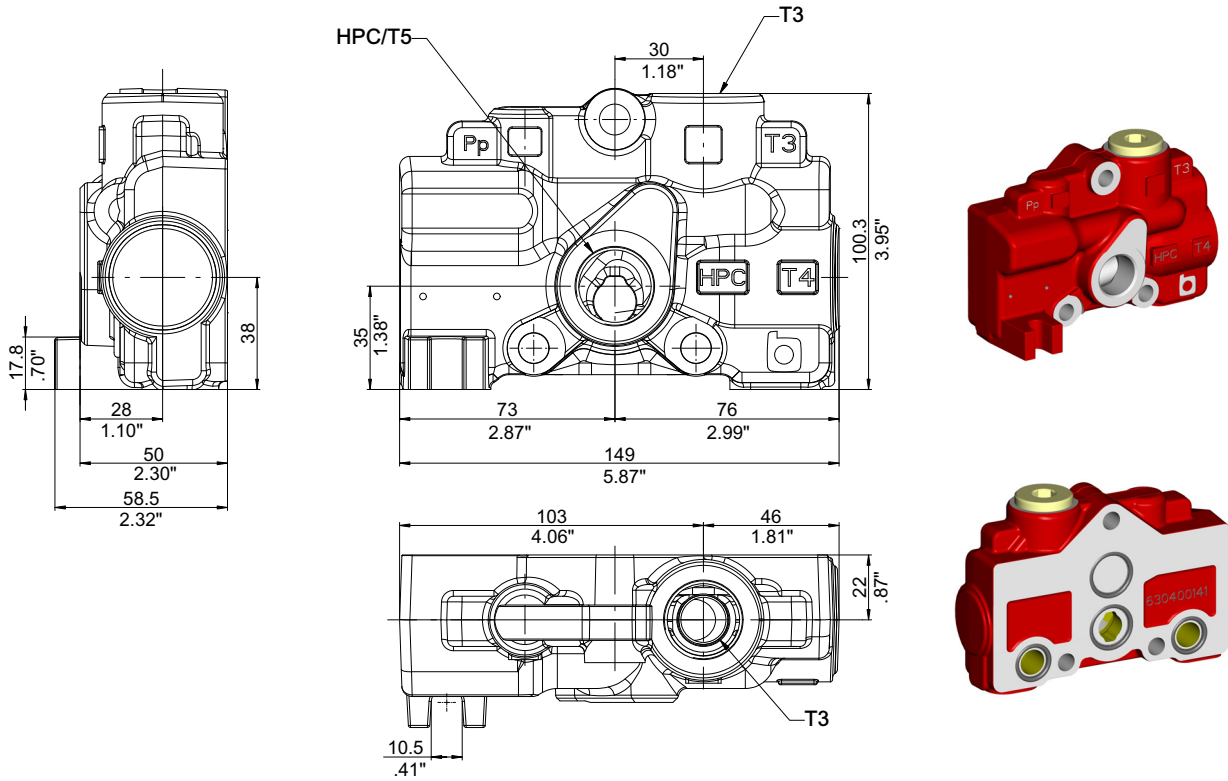
Red lines: -25 / +85 °C

Green lines: 85 / 105 °C



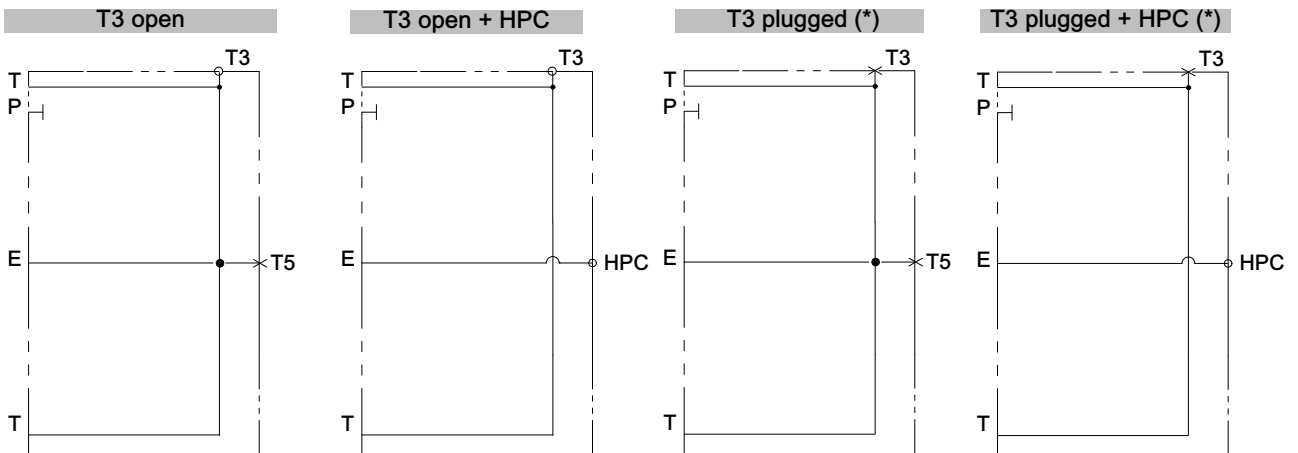
## 10 End covers

### 10.1 Standard end cover (PM)



Threads	HPC/T5	T3	T4 (Optional)
BSP	3/4"	3/4"	3/4"
Metric	M22x1.5	M22x1.5	M22x1.5
UNF	SAE10	SAE10	SAE10

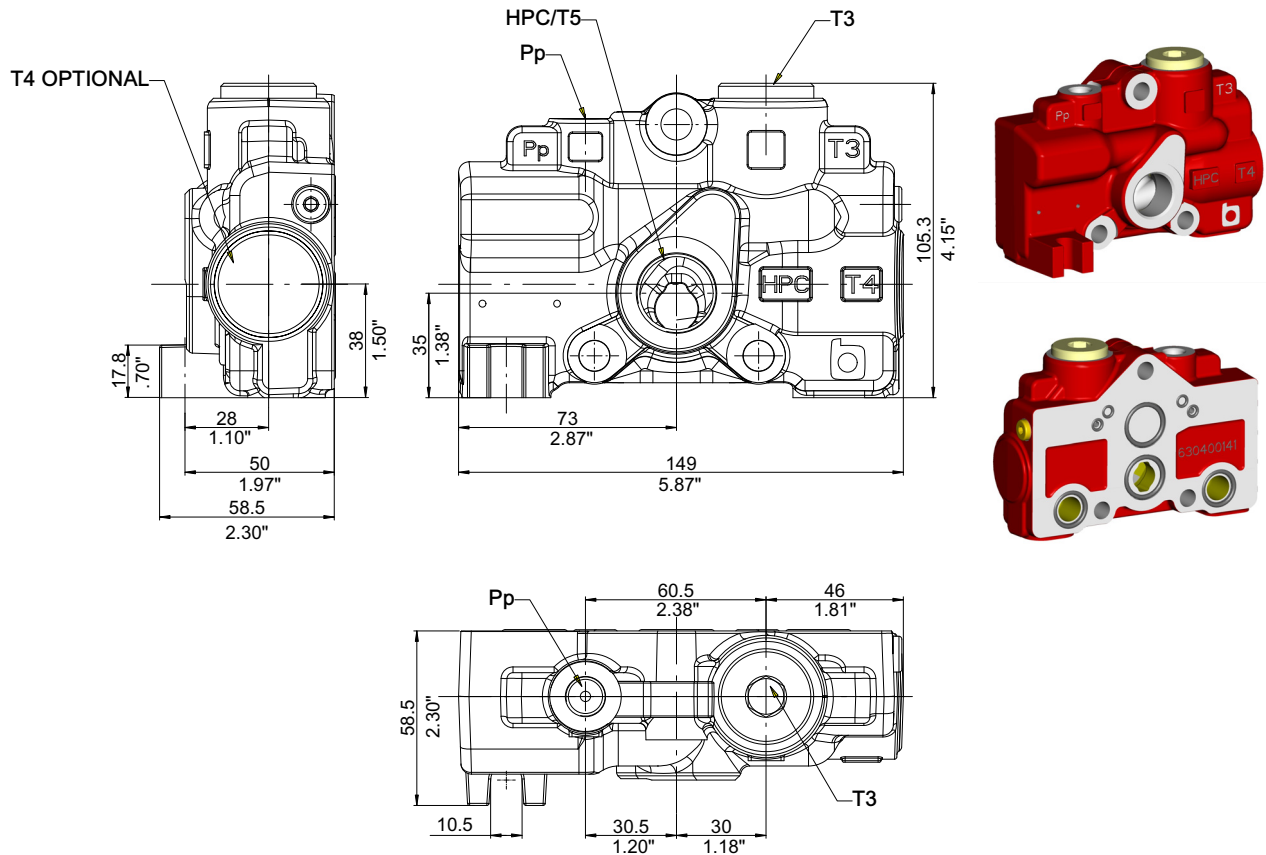
#### Basic version



(\*) the tank port in the inlet cover has to be used .

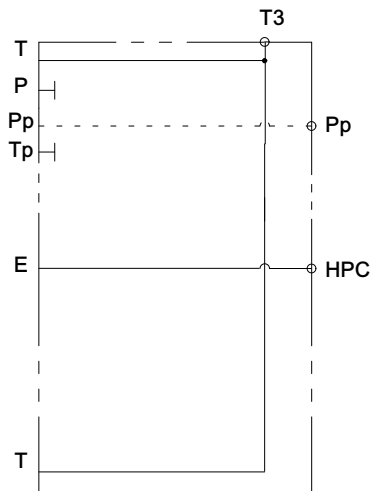


10.2 End cover with pilot oil supply line (PH)



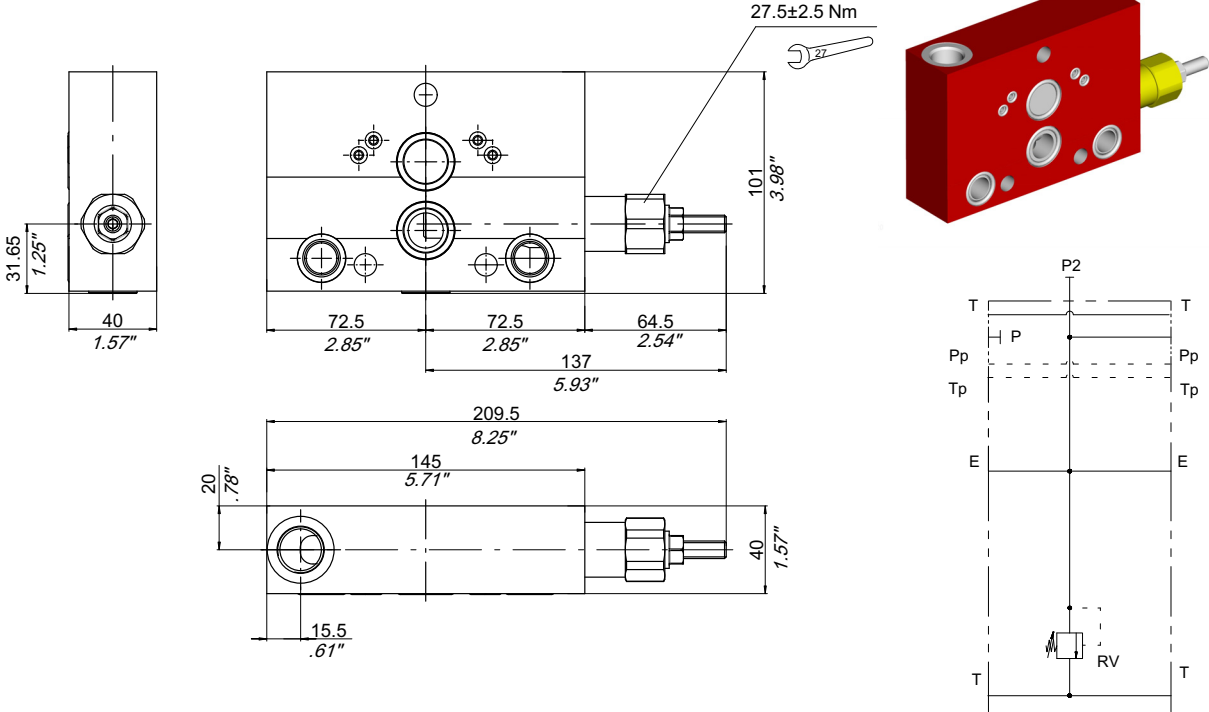
Threads	HPC/T5	Pp	T3	T4 (Optional)
BSP	3/4"	1 / 4"	3/4"	3/4"
Metric	M22x1.5	M14x1.5	M22x1.5	M22x1.5
UNF	SAE10	SAE6	SAE10	SAE10

**T3 open with external pilot line Pp and HPC**



11 Intermediate sections

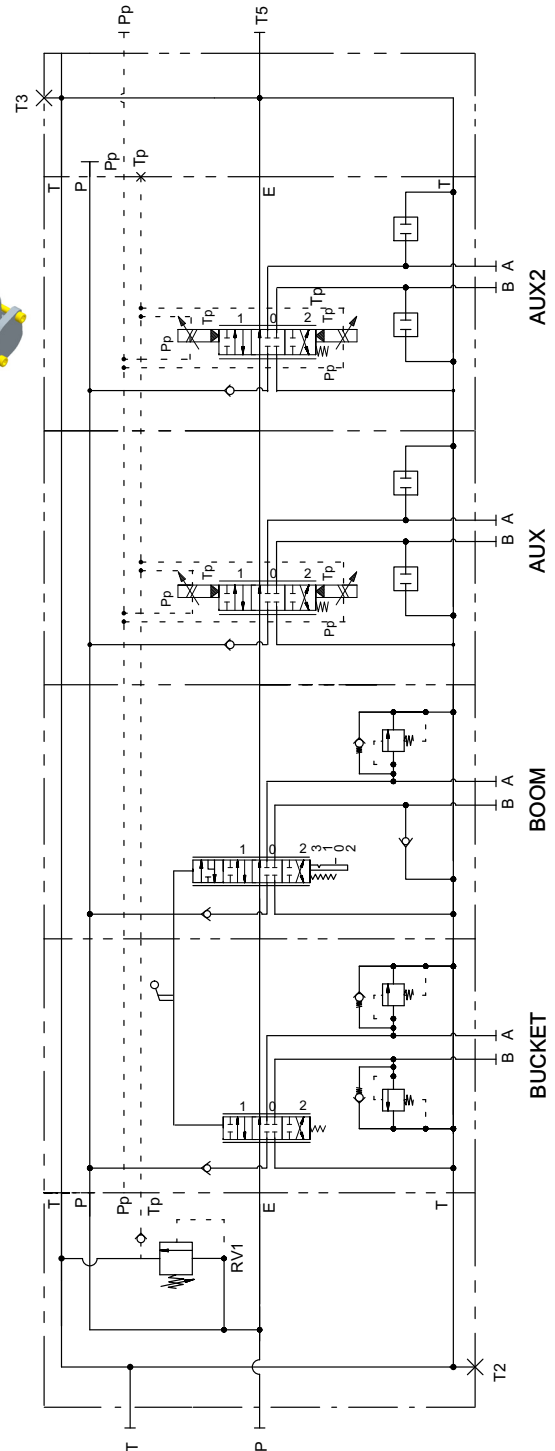
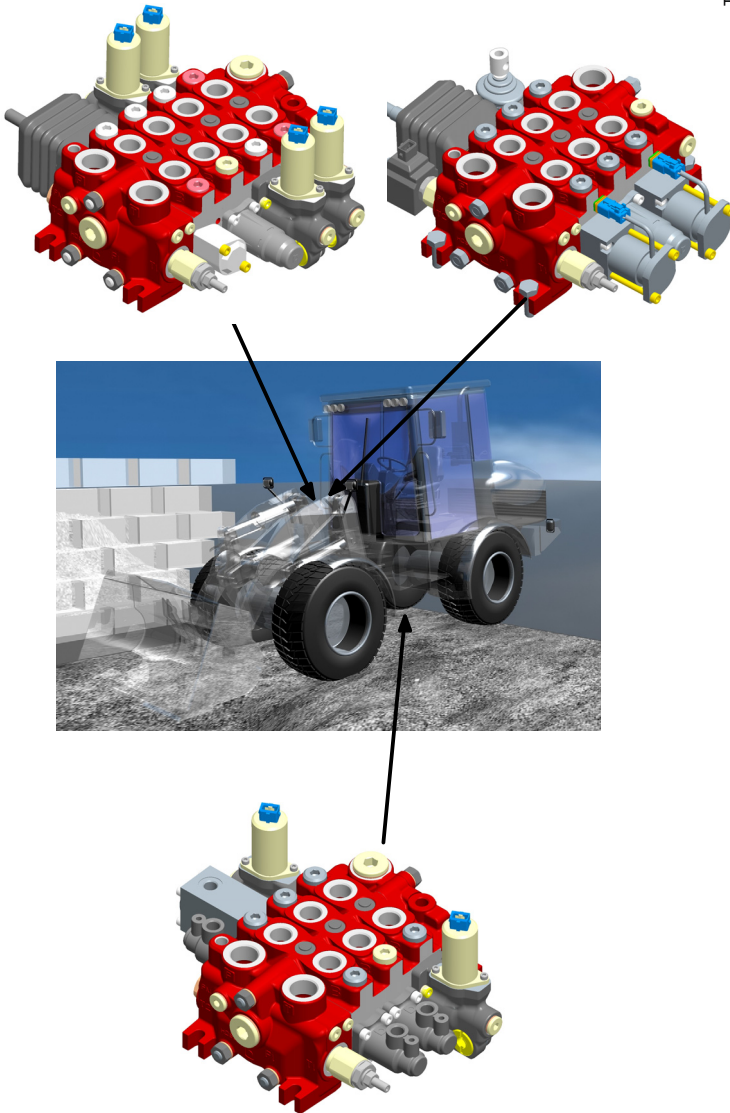
11.1 Intermediate inlet with relief valve



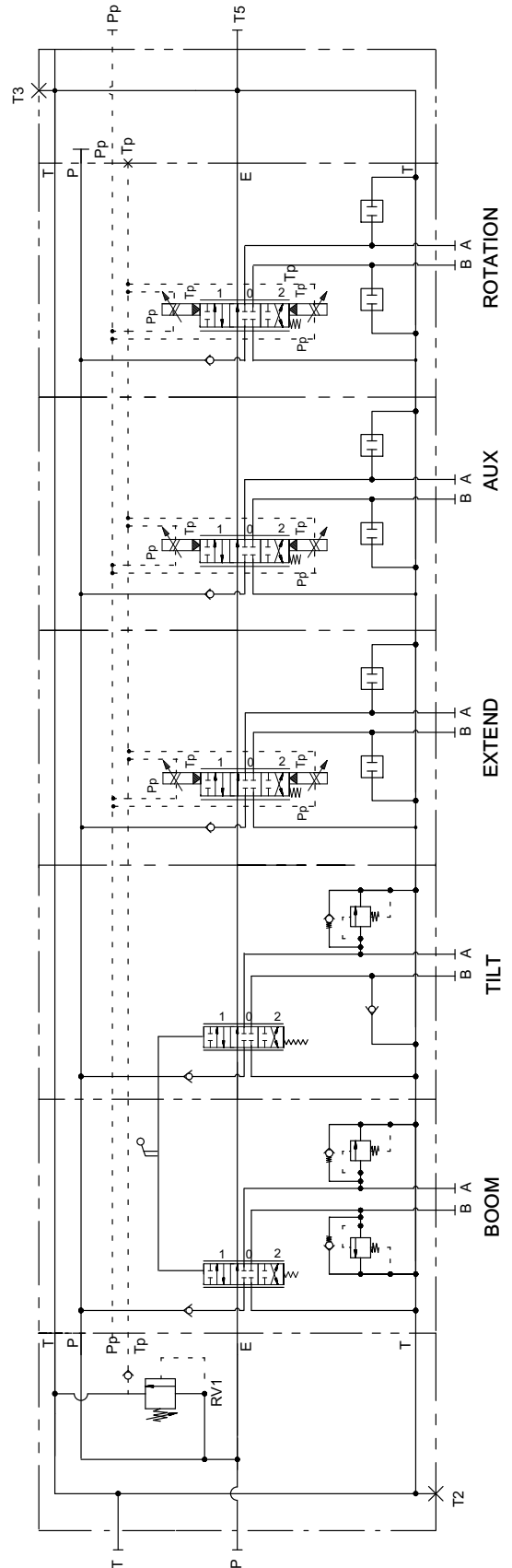
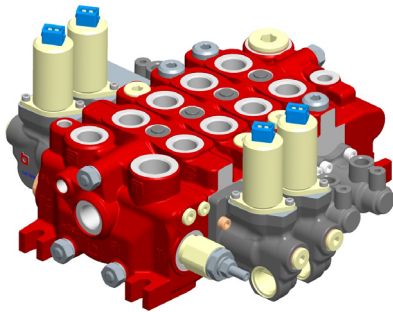
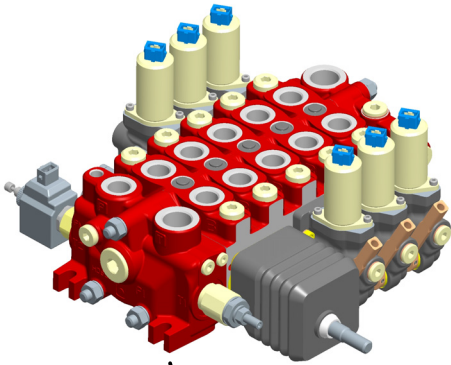
## 12 Suitable applications (Examples)

### 12.1 Wheel loader

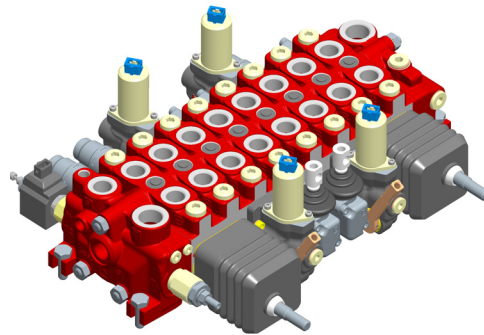
Assembling positions / controls flexibility



## 12.2 Telehandlers Assembling positions / controls flexibility



12.3 Forestry & Backhoes  
Assembling positions / controls flexibility



### 13 Composition of ordering code

#### 13.1 Inlet cover

T	E	S	T		2	1		T	M	2	0	1	B	L	T	P	H	C	P	1	P	M	C										
---	---	---	---	--	---	---	--	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--

Type of inlet cover

M = manual and hydraulic proportional control  
H = for electro-hydraulic controls

Port P: thread

1 = 1/2" BSP  
2 = 3/4" BSP  
3 = SAE10  
5 = M22x1.5  
7 = 3/8" BSP  
8 = M18x1.5  
9 = others

Progressive (defined by Bucher)

Lever side: RV or other valve types

06 = RV vsetting range (6.1)  
TP = Plug  
12 = BP 12 Volt  
24 = BP 24 Volt  
HP= BPH

Positioner side: RV or other valve types

06 = RV vsetting range (6.1)  
TP = Plug  
12 = BP 12 Volt  
24 = BP 24 Volt  
HP= BPH

Electrovalve Connector type

AJ = AMP Junior  
HC = DIN  
00 = not present

P1 port (optional)

00 = not present  
P1 = present (same thread type as "P")

Diagnostic port (optional)

00 = not present  
PM = present (same thread type as "P")

Pilot tank line check valve

0 = without pilot lines TM  
T = Plugged/External  
C = with valve

#### Examples

T	E	S	T		2	1		T	M	2	0	1	B	L	1	2	H	C	0	0	0	0										
T	E	S	T		2	1		T	M	2	0	2	B	L	T	P	0	0	P	1	P	M	C									



## 13.3 End cover

C	O	P		2	1		P	M	2	0	1		H	P	C	0	0	P	P	3	0												
---	---	---	--	---	---	--	---	---	---	---	---	--	---	---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--	--	--	--	--

Type of end cover

M = manual and hydraulic proportional control  
H = for open loop control

Port T3: thread

- 1 = 1/2" BSP
- 2 = 3/4" BSP
- 3 = SAE10
- 5 = M22x1.5
- 7 = 3 / 8" BSP
- 8 = M18x1.5
- 9 = others

Progressive (defined by Bucher)

Circuit

T5 = plugged outlet port  
HPC = carry over circuit

Optional tank port

- 00 = not present
- T4 = machined with same thread as T3

Pp port

- 00 = not present
- PP = present (same thread type as T3)

Pilot supply pressure reducing valve

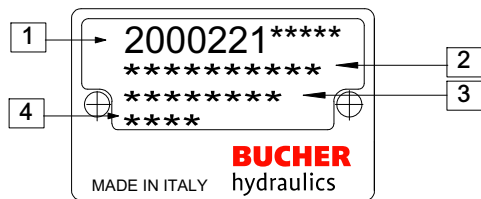
- 00 = not present
- 30 = pressure reducing valve adjustment

### Examples

C	O	P		2	1		P	M	2	0	1		T	5	0	0																	
C	O	P		2	1		P	M	2	0	1		H	P	C	T	4	P	P	0	0												



### 13.4 Product identification plate



- 1 : BHRE Product Order Code
- 2 : Customer Code (on demand, only - if not requested manufacturing year and month are printed)
- 3 : WO : Production Work Order
- 4 : WO progressive number

Manufacturing month	Manufacturing year				
	2013	2014	2015	2016	2017
January	3A	4A	5A	6A	7A
February	3B	4B	5B	6B	7B
March	3C	4C	5C	6C	7C
April	3D	4D	5D	6D	7D
May	3E	4E	5E	6E	7E
June	3F	4F	5F	6F	7F
July	3G	4G	5G	6G	7G
August	3H	4H	5H	6H	7H
September	3I	4I	5I	6I	7I
October	3J	4J	5J	6J	7J
November	3K	4K	5K	6K	7K
December	3L	4L	5L	6L	7L

[info.it@bucherhydraulics.com](mailto:info.it@bucherhydraulics.com)

[www.bucherhydraulics.com](http://www.bucherhydraulics.com)

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Classification: 430.300.000