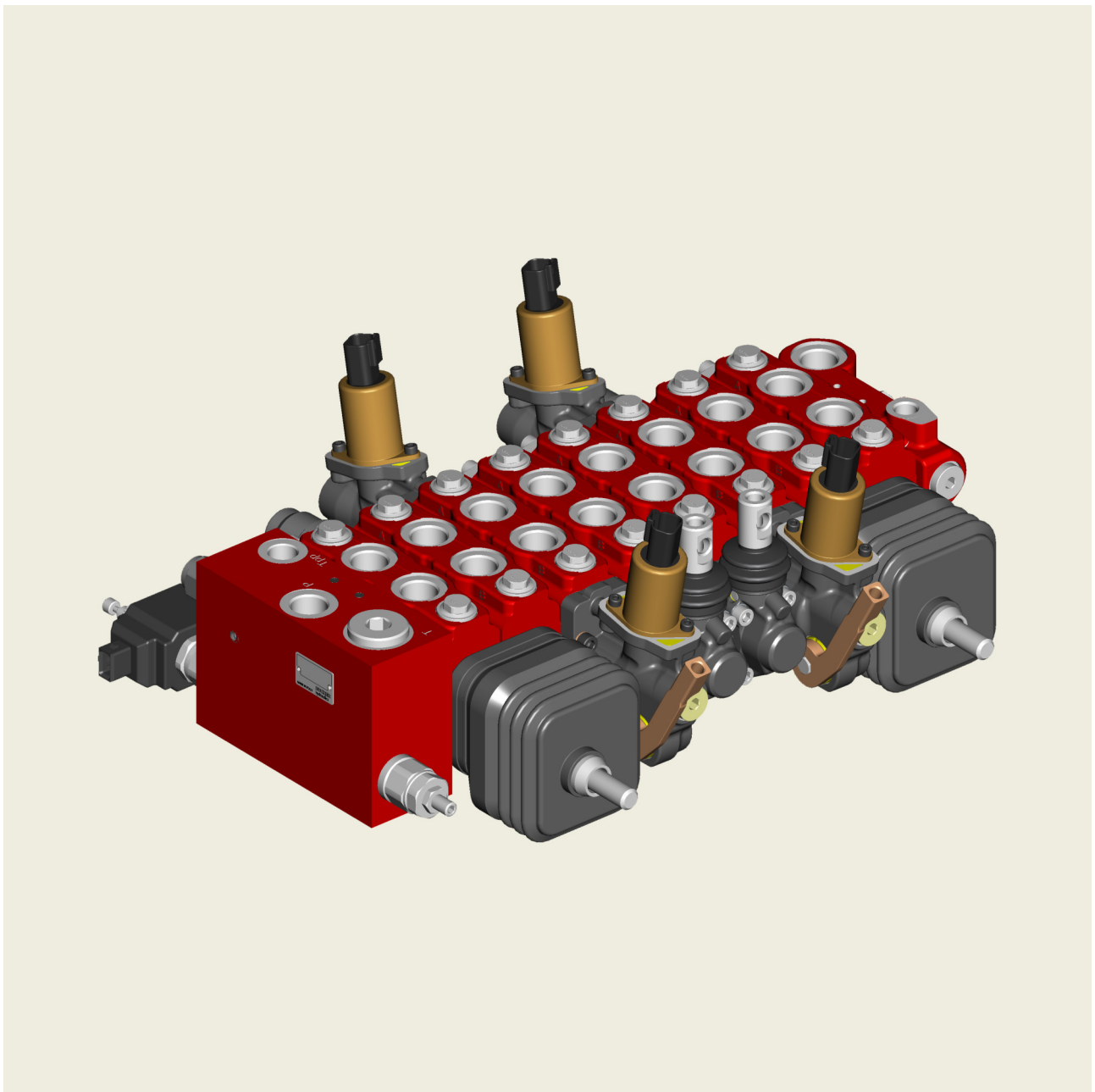


Directional Control Valve HDS16



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1 General information

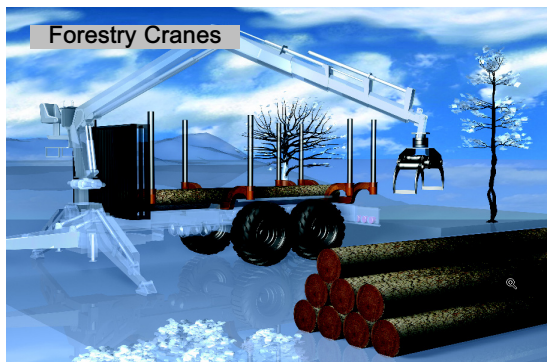
1.1 Introduction

Bucher Hydraulics HDS15 directional valve series has been market leader in a wide range of hydraulic applications for more than 20 years thanks to its extreme flexibility, outstanding control performances and application oriented unique features.

HDS16 is a step forward in this successful experience taking advantage of the gained know-how and following the market trends: lower pressure drops, increased pressure

rating, electro-hydraulic open loop controls internal piloted in combination with emergency lever and direct ON-OFF controls increased performances.

Our customer can still rely on the outstanding features and flexibility they are accustomed to but can also look to the future configuration of the machines hydraulic circuit taking advantage of the innovative options made possible by the new product.



1.2 Directional valve installation

For the installation of the directional control valve 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 cabling 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 machine controls through additional linkages, make sure that they do not affect their proper operation;
- 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) must 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.):

Cavity	Recommended tightening torque for work port fittings - Nm / lbf			
	M14X1.5	M18X1.5	M22X1.5	M27x2
Metric - ISO 261				
With O-Ring seal (ISO 6149-1)	30 / 22.1	40 / 29.5	60 / 44.3	90 / 66.4
With copper washer (ISO 9974-1)	30 / 22.1	40 / 29.5	60 / 44.3	90 / 66.4
With rubber washer or steel (ISO 9974-1)	25 / 18.4	35 / 25.8	60 / 44.3	70 / 51.7
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 sliding 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 Department, 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 instructions and recommendations.

The fineness of the filter should be selected in order to maintain the fluid contamination level according to the values listed at section 1.7.1 (Technical specification)

It is advisable to use a pressure filter with by-pass and indicator.

The size of return filters must suit the maximum return flow whereas the size of 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

- PED (97/23/EC)

The pressure relief valves assembled into the directional control valve can not to be considered and/or confused with the safety valve when the PED Directive is applied to the hydraulic system.

- Atex



Attention: The equipment and protective systems of this catalogue ARE NOT intended for use in potentially explosive atmospheres. Ref: Directive 99/92/EC and Directive 2014/34/UE

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.

- 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 Hydraulic system

1.7.1 Technical specification



IMPORTANT!: Parameter values and diagrams shown in this catalogue have been measured with mineral oil having a viscosity of 23 mm²/s at 50° C

Features		
Nominal flow range		60 l/min (15 US gpm)
Max inlet pressure (P) ¹⁾		300 bar (4300PSI)**
Max work port pressure (A/B) ¹⁾		320 bar (4640 PSI)
Max back pressure (T)	standard	30 bar (430 PSI)
	with ON-OFF control	20 bar (290 PSI)
	with electro-hydraulic positioner (EHO)	10 bar (145PSI)
Max internal leakage A/B→T (at 100 bar/1450 PSI, 23 mm ² /s) ²⁾	without port valves standard	14 cc/min (*) (0.854 Cu In/min)
	with port valves standard	19 cc/min (*) (1.139 Cu In/min)
	without port valves ON-OFF	35 cc/min (2.492 Cu In/min)
	with port valves ON-OFF	40 cc/min (2.634 Cu In ³ /min)
Fluid		mineral based oil (see 1.4)
Fluid temperature (with NBR seals)		-20°C / +80°C (-4° to 176° F)
Max contamination level		21/19/16 ISO4406:1999 (NAS 1638 class 10)
Max contamination level for electro-hydraulic and direct ON-OFF applications		20/18/15 ISO 4406:1999 (NAS 1638 class 9)
Viscosity operating range	recommended	from 15 to 75 mm ² /s
	admissible	from 12 to 400 mm ² /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 tightening torque	standard	18 ⁺² Nm

For different operating conditions, please contact our Sales Dept.

(*) Lower values can be provided on demand

1) Fatigue tested according to internal procedure at 1.16x rated pressure on 5 samples for 1 000 000 cycles.

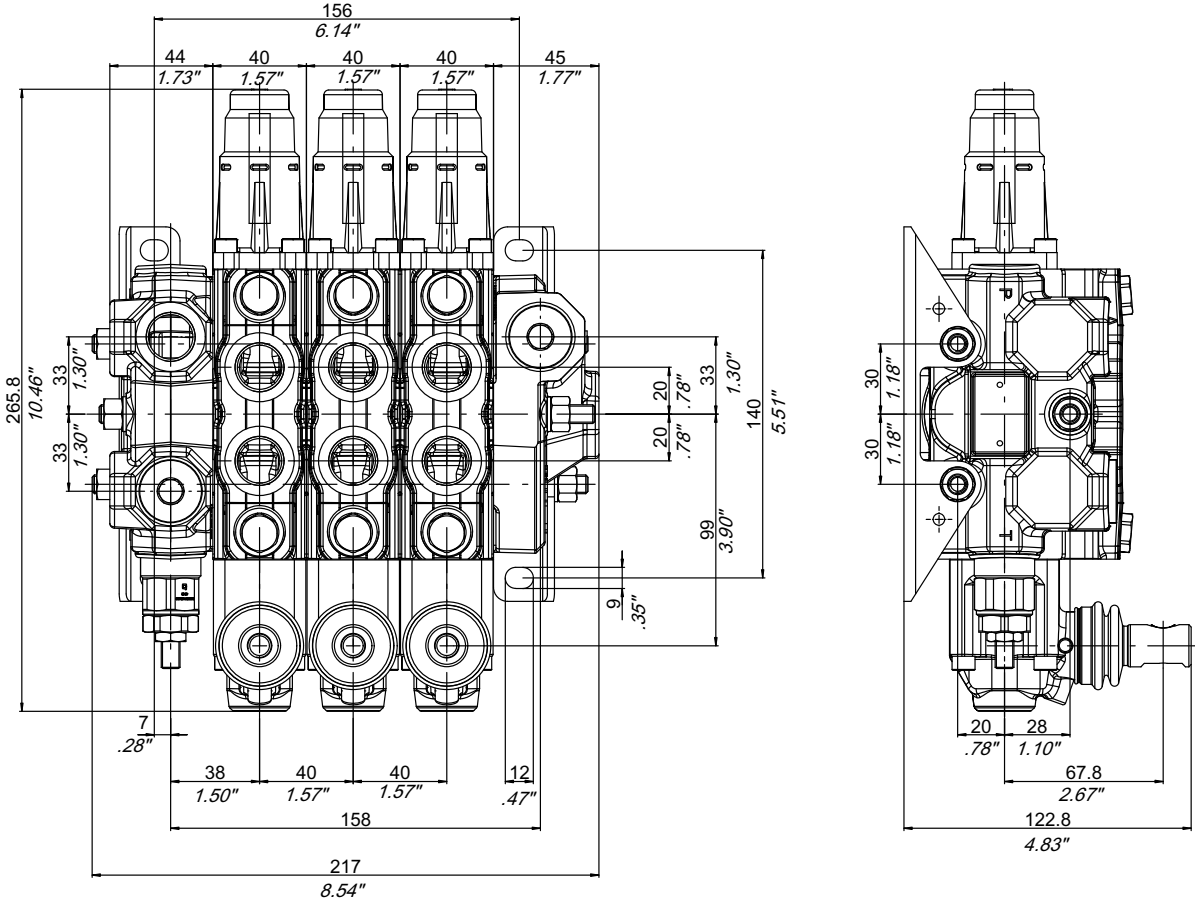
(**) For direct on-off version see operating limit diagrams at section 2.2

For work port sizes bigger than 1/2" BSP and for specific modules (TH) the rated pressure is limited to a lower value (see the correspondent paragraphs)

2) Spool leakage values are strongly influenced by fluid viscosity with a linear inversed relationship: 10 cc/min at 100 bar and 23 cSt become roughly 5 cc/min at 100 bar and 46 cSt.

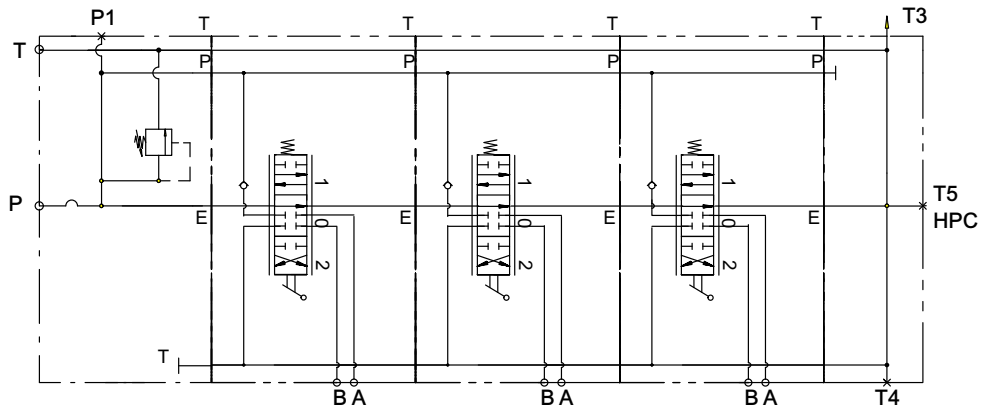
1.8 Dimensions

1.8.1 Manual operated

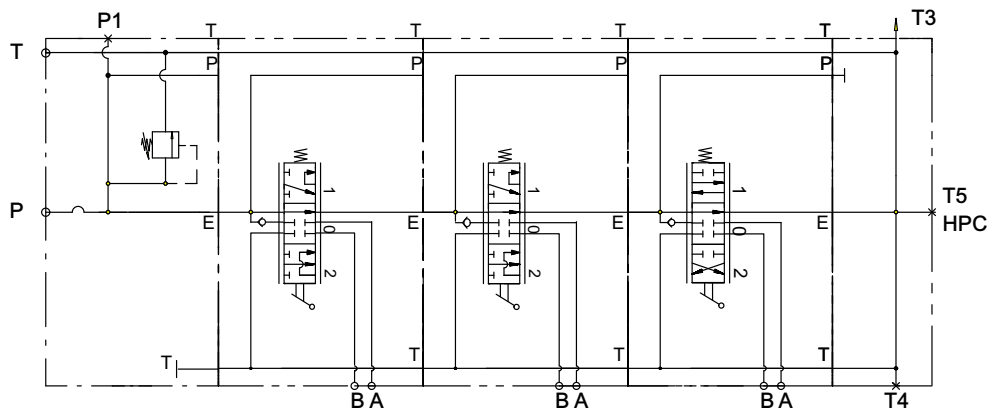


1.9 Hydraulic circuits combination examples

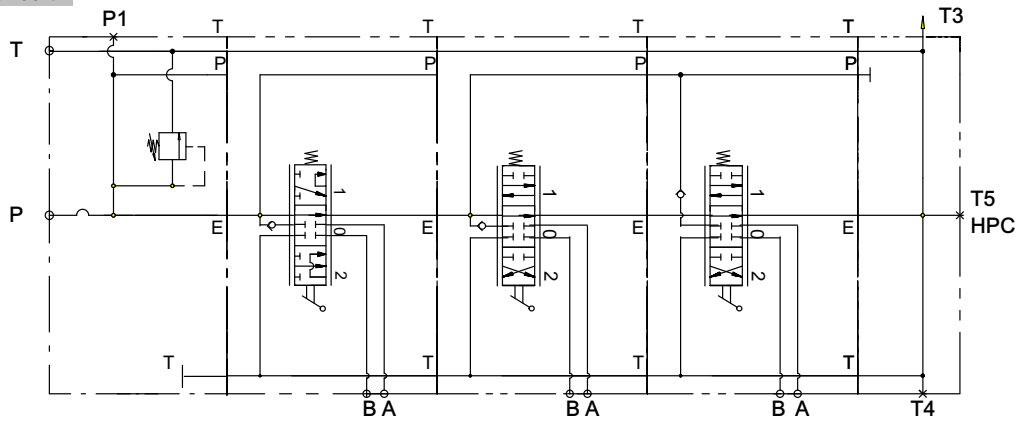
Parallel circuit



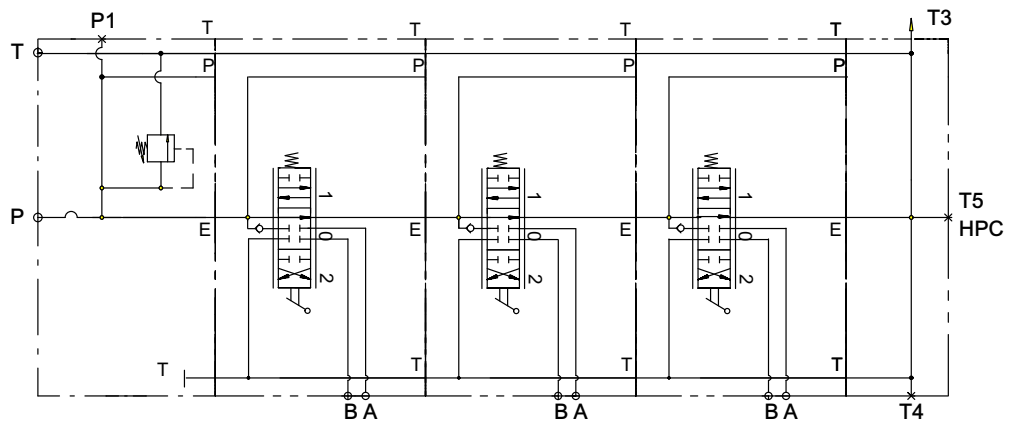
Series circuit



Series/parallel circuit



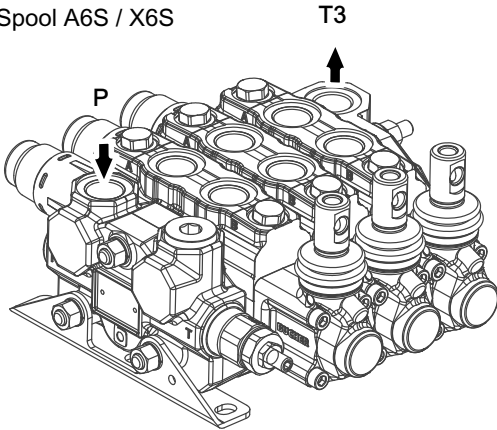
Tandem circuit



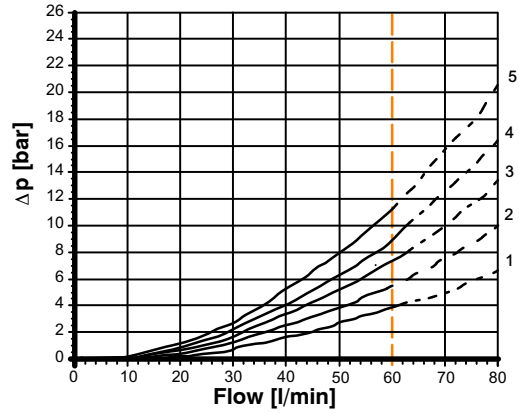
1.10 Pressure drop curves

1.10.1 Open centre P → T3

Parallel and series circuits -
Spool A6S / X6S

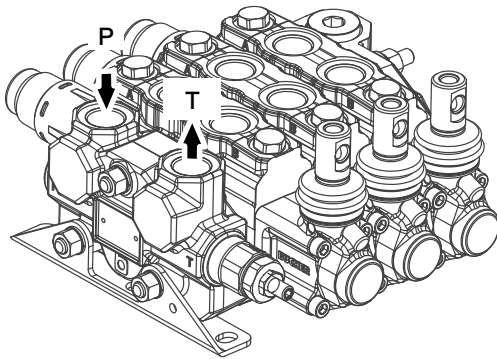


Pressure drop: P → T3

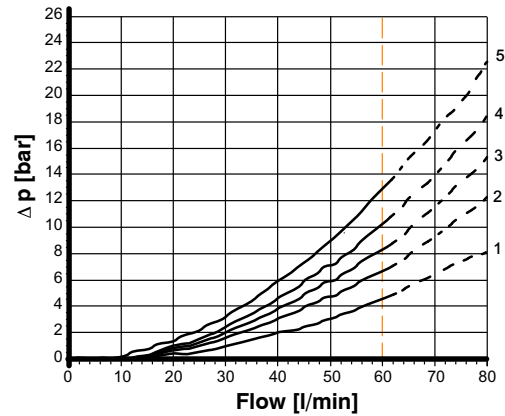


1.10.2 Open centre P → T

Parallel and series circuits -
Spool A6S / X6S

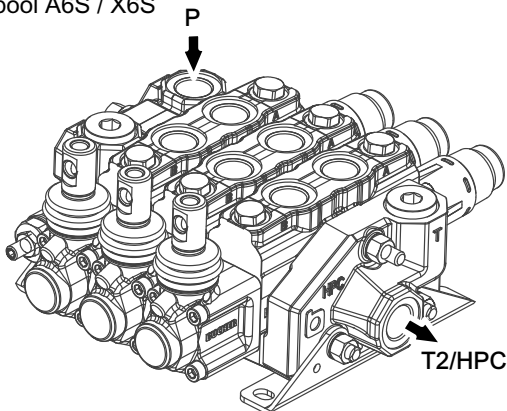


Pressure drop: P → T

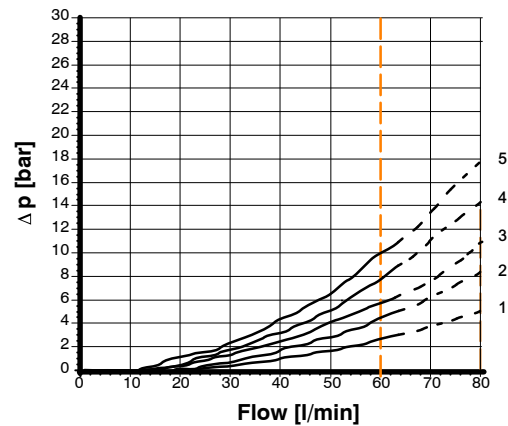


1.10.3 Carry over (HPC)

Parallel and series circuits -
Spool A6S / X6S

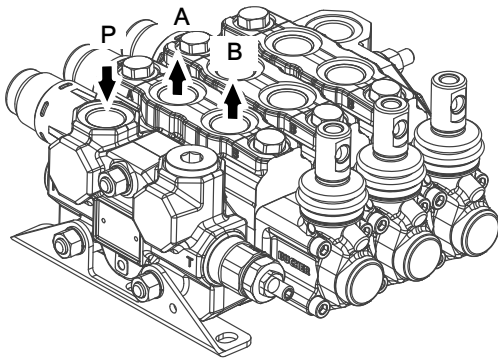


Pressure drop: P → T2/HPC

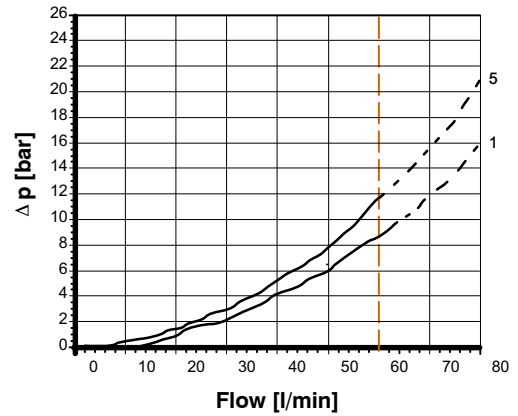


1.10.4 Inlet to work port A/B

Parallel circuit - Spool A6S

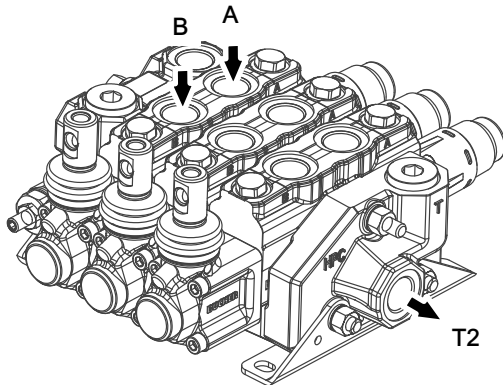


Pressure drop: P → A/B

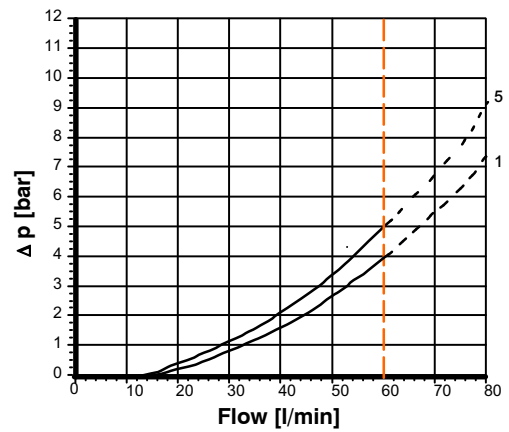


1.10.5 A/B work port to outlet "T2"

Parallel circuit - Spool A6S

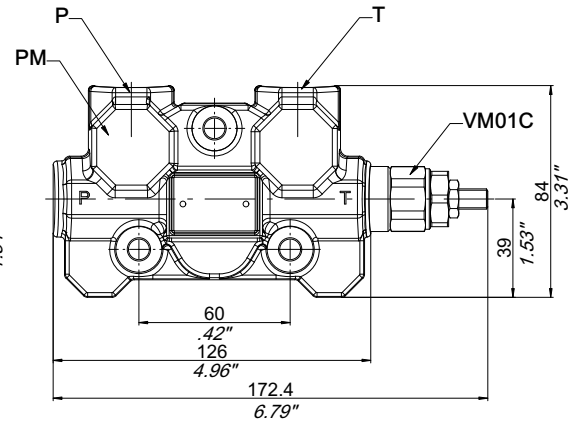
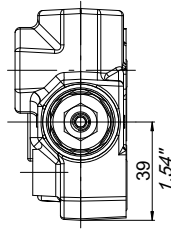
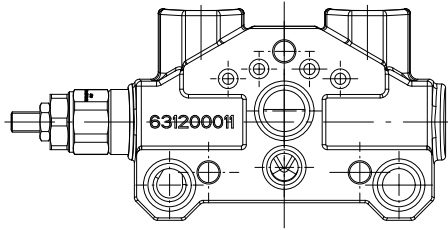


Pressure drop: A/B → T2

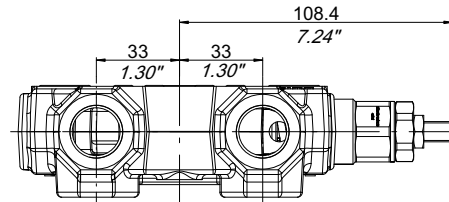
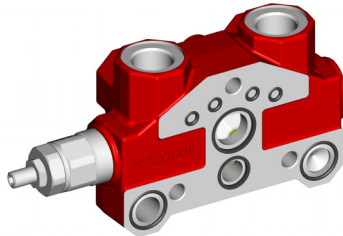
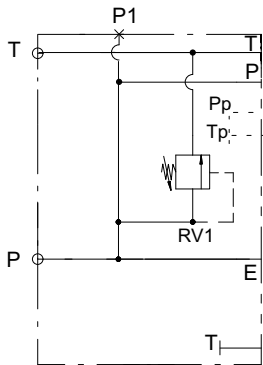


2 Inlet covers

2.1 Standard inlet cover TH



With main relief valve, P, T

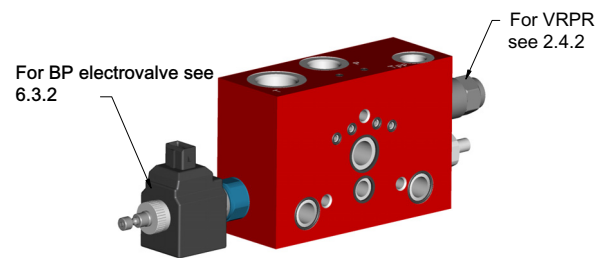
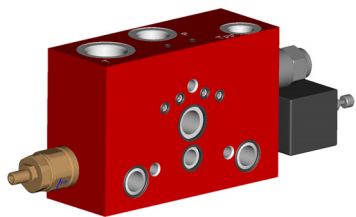
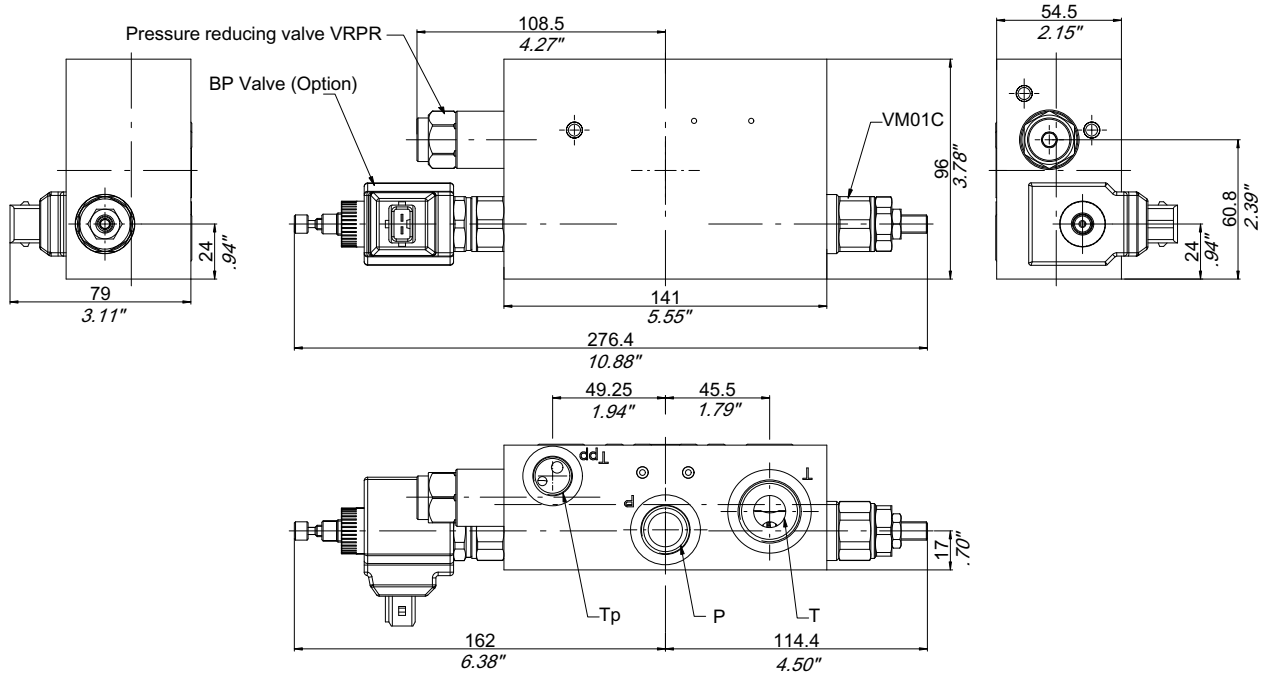


Type	P	T	PM
TH 101	1/2" BSP	1/2" BSP	-
TH 102	1/2" BSP	1/2" BSP	1/4" BSP
TH 701	3/8" BSP	3/8" BSP	-
TH 702	3/8" BSP	3/8" BSP	1/4" BSP
TH 801	M18x1.5	M18x1.5	-
TH 802	M18x1.5	M18x1.5	M14x1.5
TH 901	SAE8	SAE10	-
TH 902	SAE8	SAE10	SAE6
Max inlet pressure (P) ¹⁾		250 bar (3600 PSI)	

Type	P	T	PM
TH 101	SAE10	SAE10	-
Max inlet Pressure (P) ¹⁾		200 bar (2900 PSI)	

1) Fatigue tested according to internal procedure at 1.16x rated pressure on 5 samples for 1 000 000 cycles.

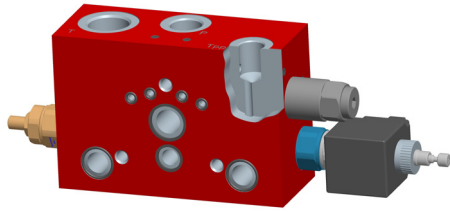
2.2 Inlet cover with pilot oil supply pressure reducing valve and unloading valve (TP)



2.2.1 Ports Size

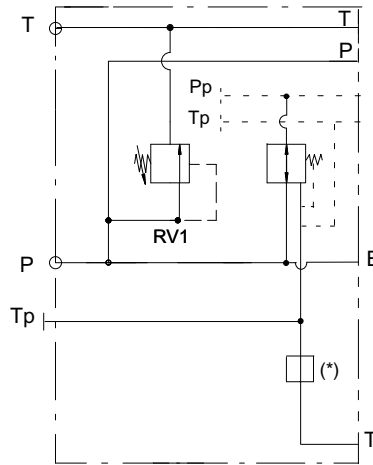
Type	P	T	Tp
TP101B	1/2" BSP	3/4" BSP	3/8" BSP
TP301B	M22x1.5	M27x2	M18x1.5
TP501B	SAE10	SAE12	SAE8

2.2.2 Hydraulic circuit examples

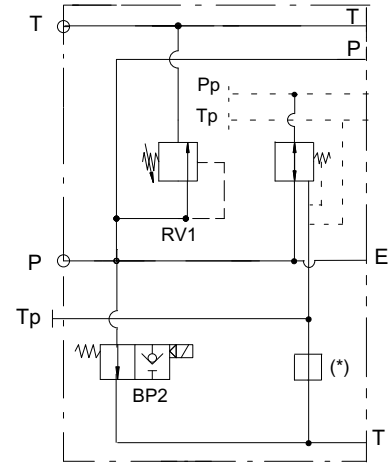


(*) without plug

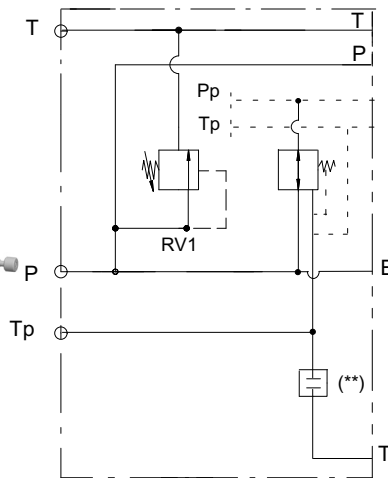
Tp with main relief valve, P, T and pressure reducing valve with internal Tp line



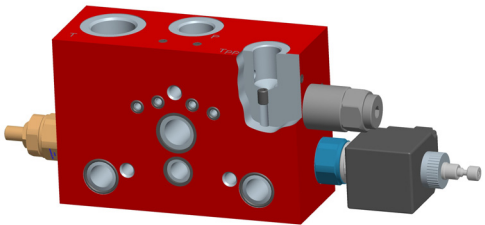
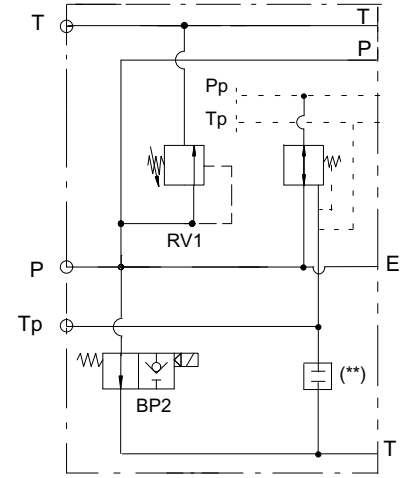
Tp with main relief valve, P, T, pressure reducing valve and by pass valve normally open with intrnal Tp line



Tp with main relief valve, P, T, pressure reducing valve with external Tp line



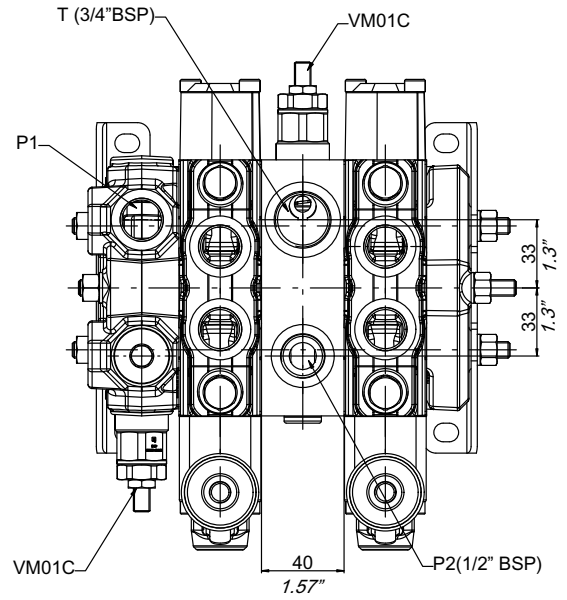
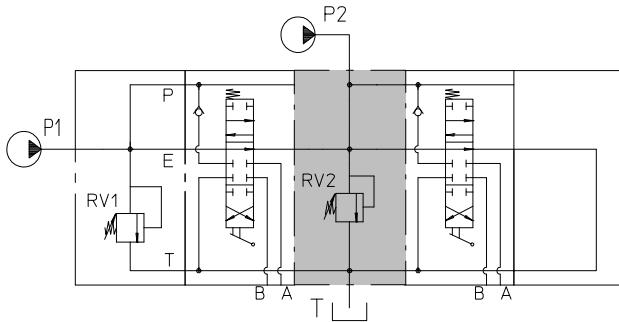
Tp with main relief valve, P, T, pressure reducing valve and by pass valve normally open and external Tp line



(**) M6x1 STEI plug

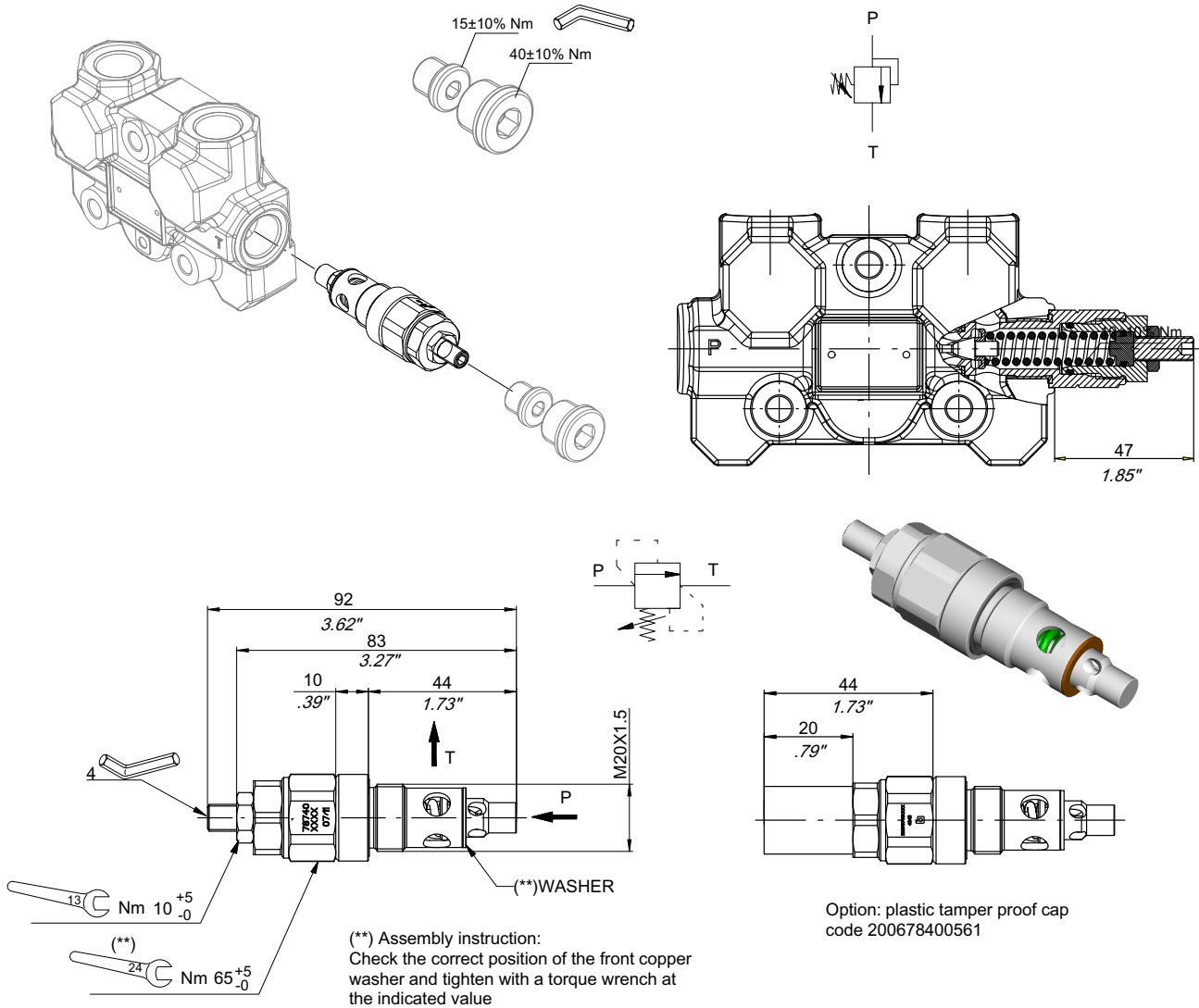
2.3 Intermediate inlet section with pressure relief valve (TI)

Type
TI**



2.4 Inlet/outlet cover valves

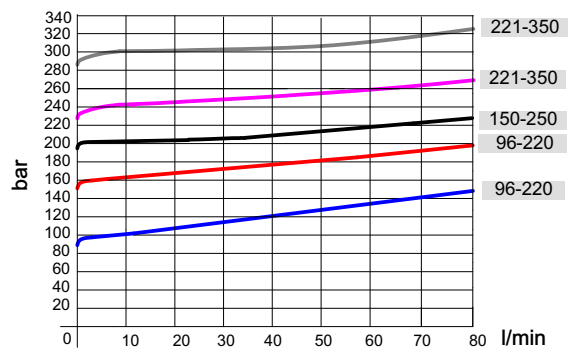
2.4.1 Direct acting relief valve VM01C



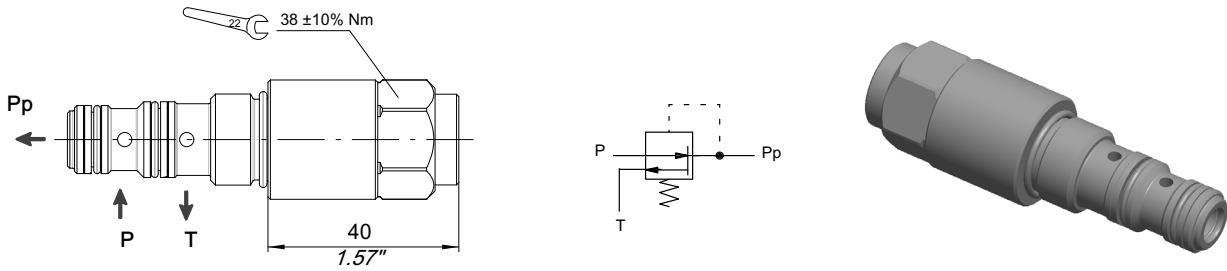
Pressure setting range bar (PSI)	Type	Relief valve only code
96 - 220 (1390 - 3190)	12VM01C	200787403420
150 - 250 (2170 - 3620)	15VM01C	200787403470
221 - 350 (3200 - 5070)	23VM01C	200787403430
VC (plug)		200978400140

Pressure setting referred to 16 l/min

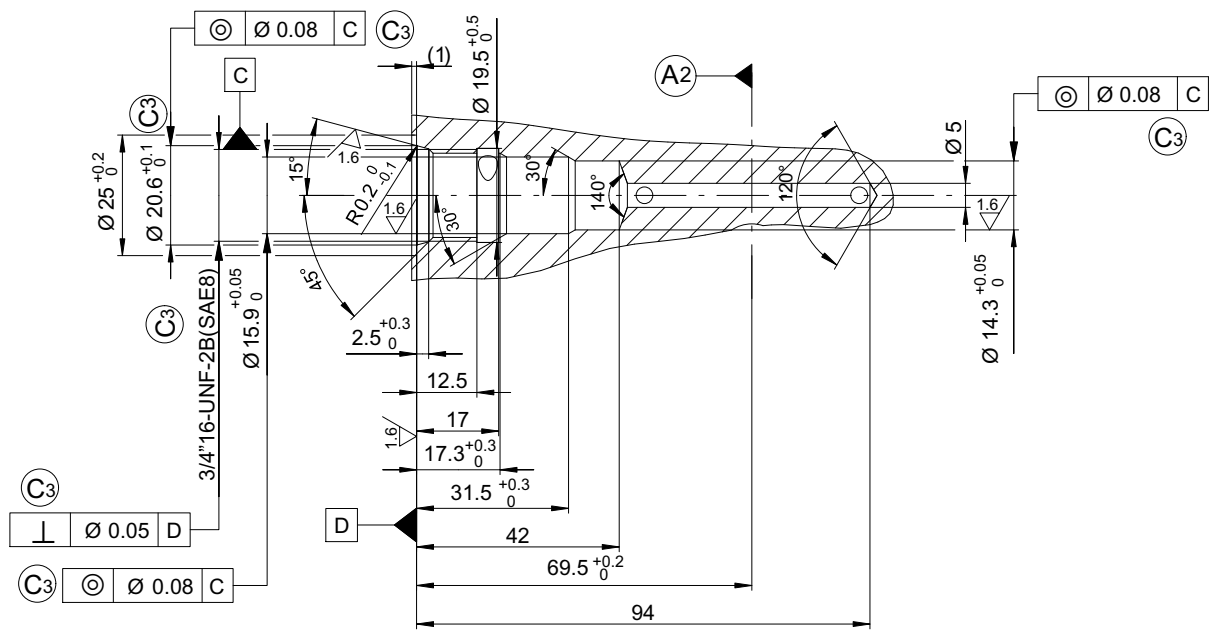
Pressure viscosity characteristic 46 cSt at 40°C



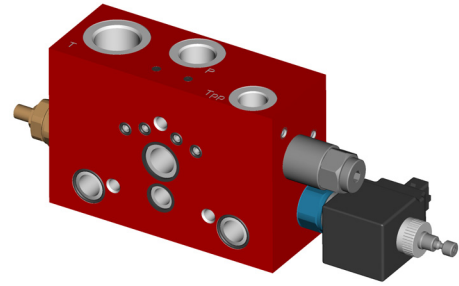
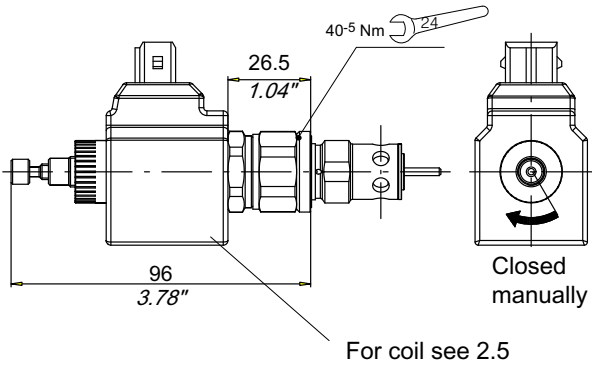
2.4.2 Pressure reducing valve VRPR



Type	Code	Nominal pressure (bar)
VALV VRPR-08A	200533930135	35



2.4.3 By-pass solenoid valve (BP)

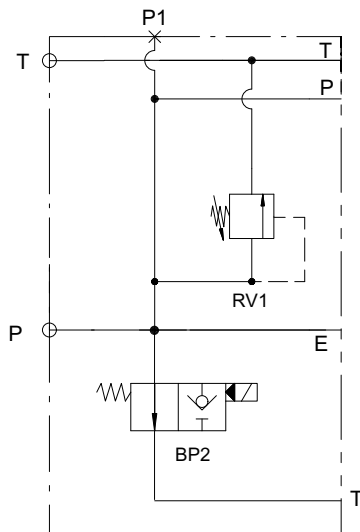


Under development

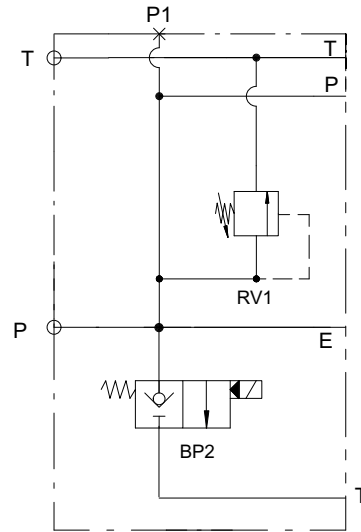
Type	Manual override	Code without coil
Normally open	With	-
	Without	-
Normally closed	With	-
	Without	-

For available coils see 2.5

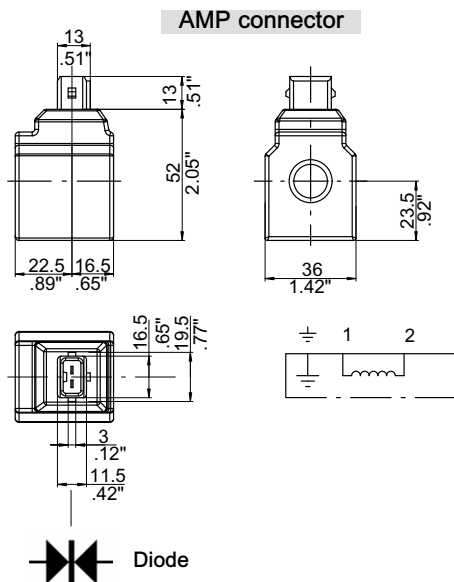
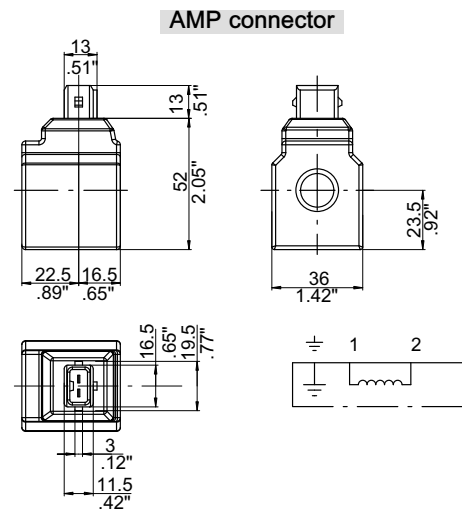
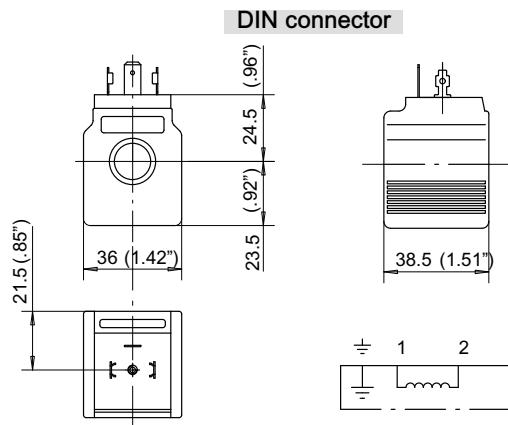
Normally open



Normally closed



2.5 Coils for solenoid valves

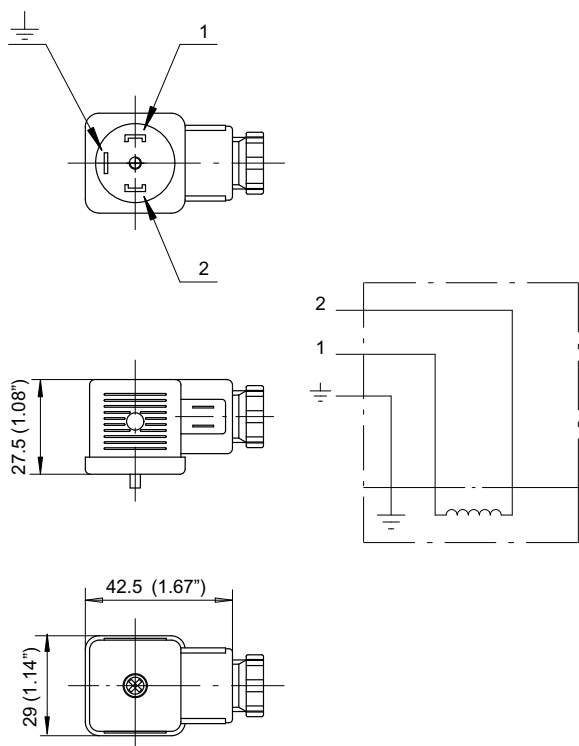


Coils features	
Wire class	H (VDE0580)
Protection	IP65 (DIN40050)
Duty rating	ED 100%
Voltage tolerance	± 10%

Connector style	Nominal Coil voltage	Power (Watt)	Resistance (Ohm)		Current (Ampere)		Coil code (without connector)
			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		200541220033
DT	12 V. DC.	27	5.3		2.2		200674910370
	24 V. DC.	27.2	21.3		1.12		200674920290

2.5.1 Connector for DIN type solenoids

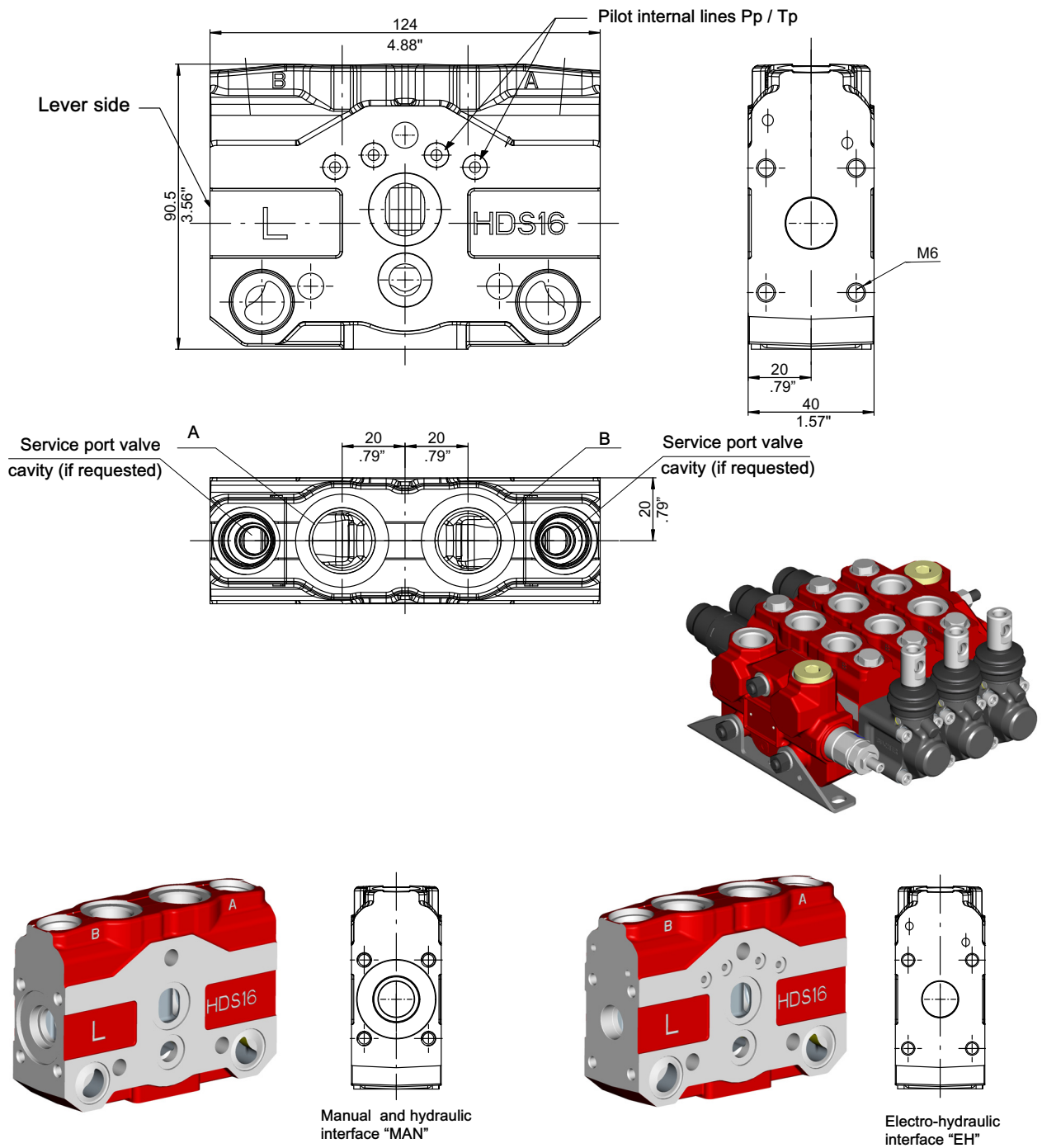
Code 200544110009



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	≥ 4 mOhm
Max section of cable	1.5 mm ²
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

3 Valve sections

3.1 Characteristics and dimensions



3.2 Section configurations

3.2.1 Parallel valve bodies

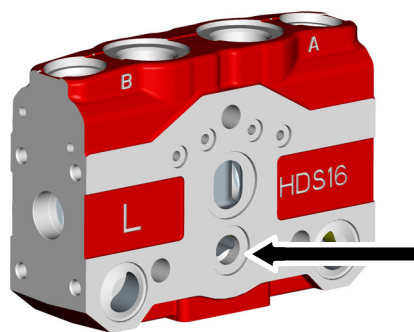
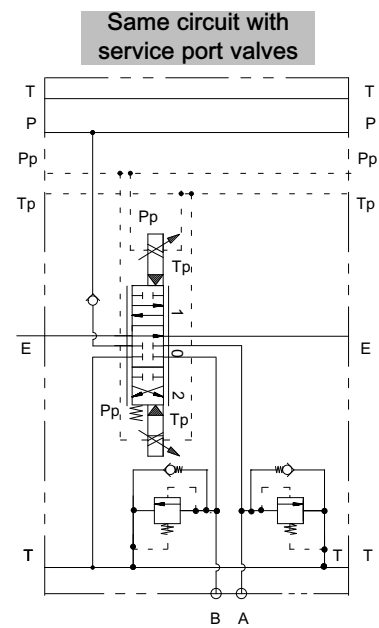
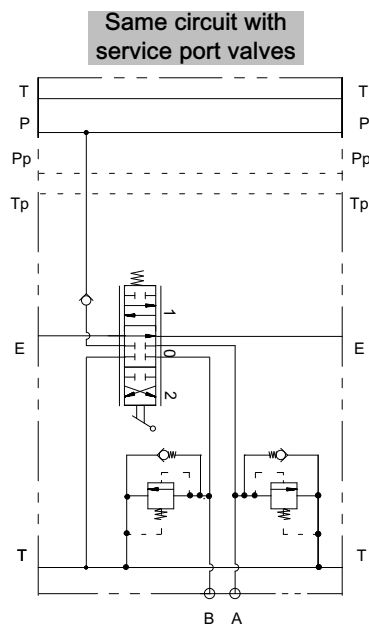
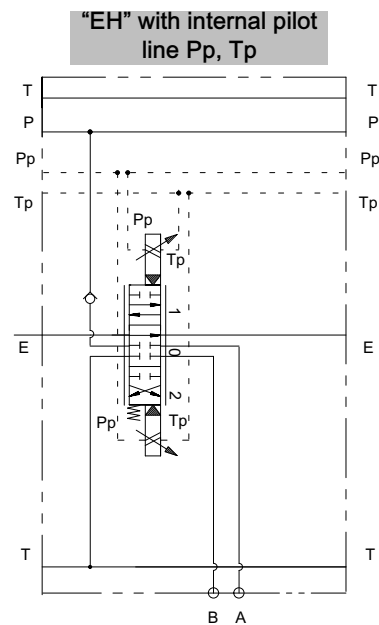
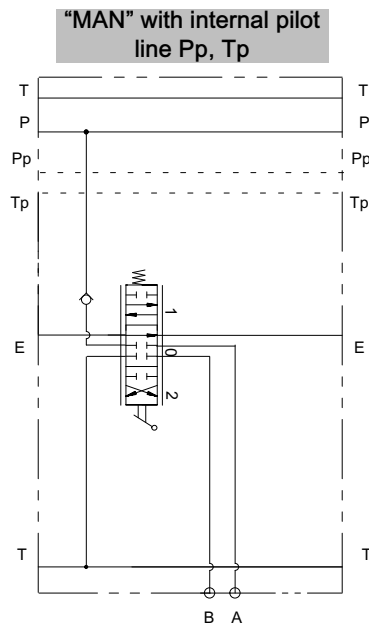
Thread	Interface	A/B service port valve cavities	
		Without	With
1/2" BSP	MAN	K102	K101
1/2" BSP	EH	K106	K105
3/8" BSP	MAN	K702	K701
3/8" BSP	EH	K706	K705
M18x1.5	MAN	K802	K801
M18x1.5	EH	K806	K805
SAE8	MAN	K902	K901
SAE8	EH	K906	K905
SAE10 (*)	MAN	K302	K301
SAE10 (*)	EH	K306	K305

For floating spools a dedicated valve body is needed. To specify that the body has to be used with a floating spool it is necessary to add a letter (Z or W) to the body identification number.

For example a manual interface body with 1/2" BSP thread and service port valves to be used with Z6S spool can be identified as K101Z.

(*) For this port sizes the maximum operated pressure must be reduced.

3.2.2 Parallel circuits



OPEN with parallel circuit

3.2.3 Series and tandem bodies

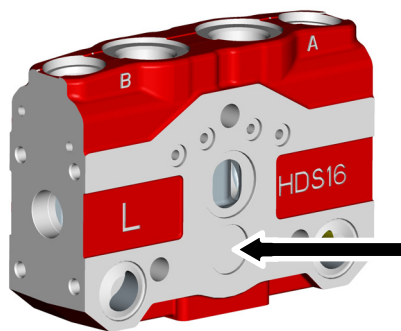
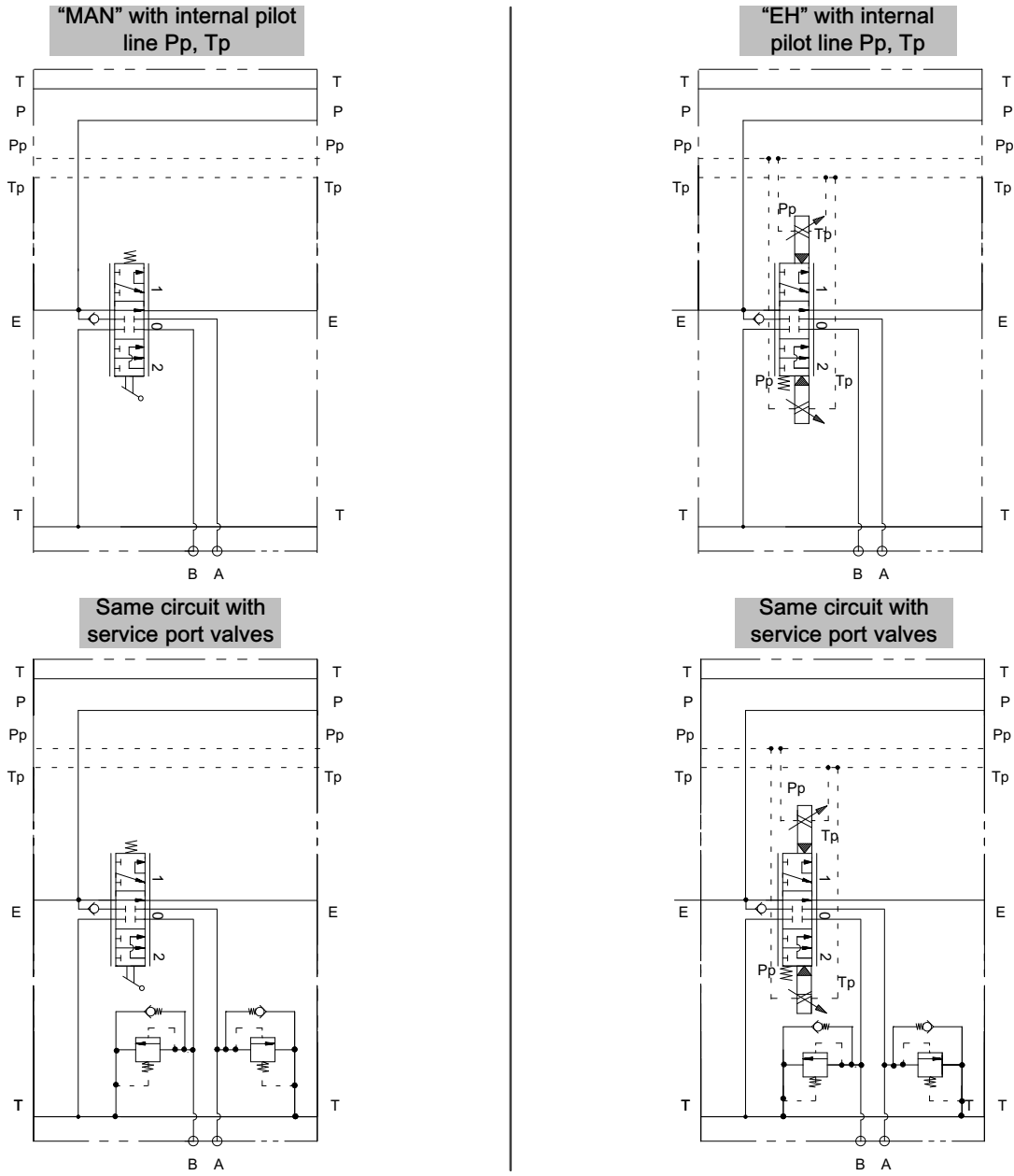
Thread	Interface	A/B service port valve cavities	
		Without	With
1/2" BSP	MAN	K152	K151
1/2" BSP	EH	K156	K155
3/8" BSP	MAN	K752	K751
3/8" BSP	EH	K756	K755
M18x1.5	MAN	K852	K851
M18x1.5	EH	K856	K855
SAE8	MAN	K952	K951
SAE8	EH	K956	K955
SAE10 (*)	MAN	K352	K351
SAE10 (*)	EH	K356	K355

For floating spools a dedicated valve body is needed. To specify that the body has to be used with a floating spool it is necessary to add a letter (Z or W) to the body identification number.

For example a manual interface body with 1/2" BSP thread and service port valves to be used with Z6S spool can be identified as K101Z.

(*) For this port sizes the maximum operated pressure must be reduced.

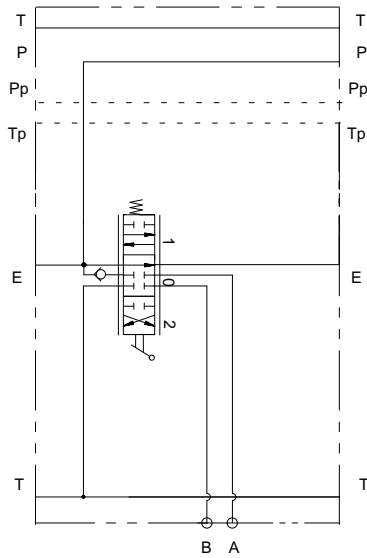
3.2.4 Series circuits



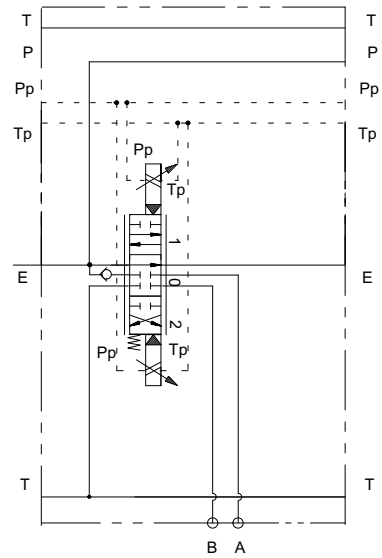
CLOSED with series circuit

3.2.5 Tandem circuits

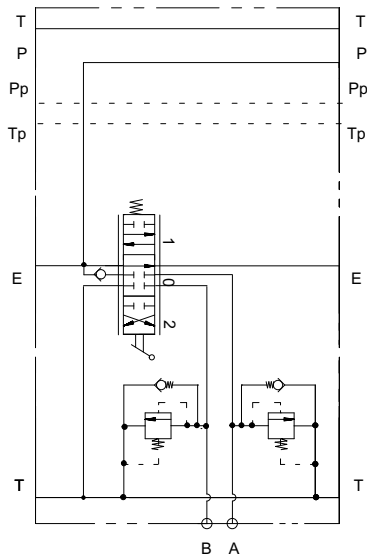
"MAN" with internal pilot line Pp, Tp



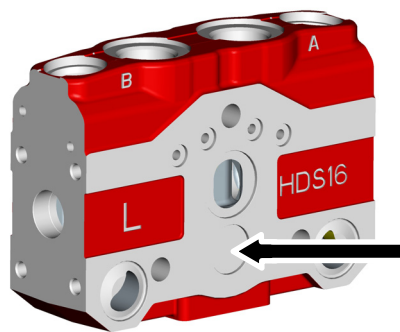
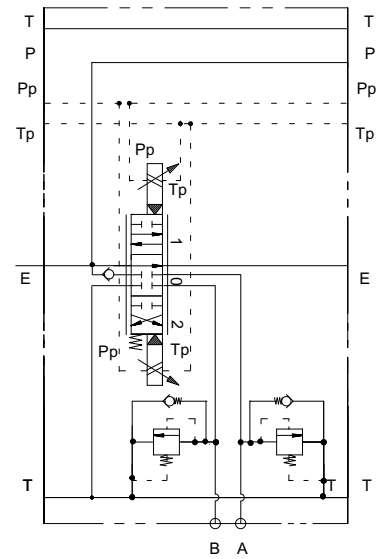
"EH" with internal pilot line Pp, Tp



Same circuit with service port valves

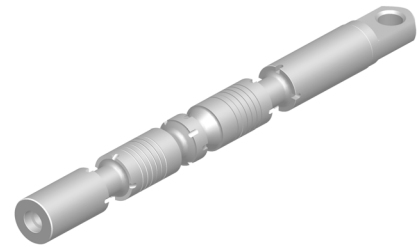
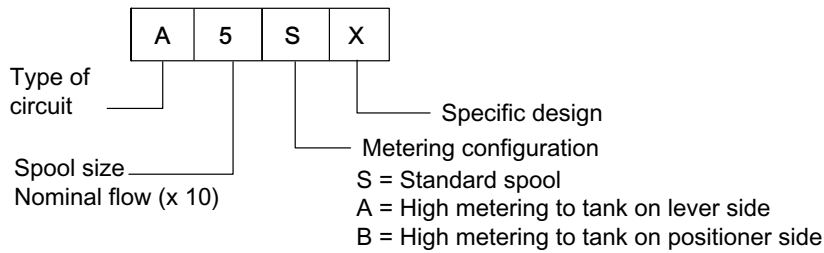


Same circuit with service port valves



CLOSED with tandem circuit

4 Spools

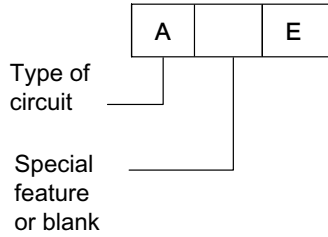


4.1 Standard spools

4.2 For manual, hydraulic and electro-hydraulic controls

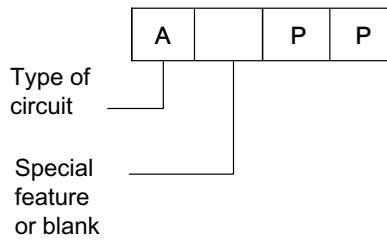
Spool Type	HDS15 equivalent	Hydraulic schematic	Features	Application examples
A6S	A		4 way - 3 position A/B blocked	
A3S	AXS		4 way - 3 position A/B blocked High metering low flow spool	
A5B A5A	AXB AXA		4 way - 3 position A/B blocked - E open by-pass High metering to tank on A or B side	LOADERS BOOM and BUCKET FUNCTION
B6S	B		4 way - 3 position A/B blocked - E closed	
C6S	C		4 way - 3 position A/B to tank	
D6S	D		4 way - 3 position A blocked - B to tank	
G6S	G		3 way - 3 position B blocked	Fork lift LIFTING FUNCTION
L6S	L		4 way - 3 position B blocked - A to tank in neutral	
S6S	S		3 way - 3 position A blocked - E open by pass	Fork lift LIFTING FUNCTION
Z5S	ZSS		4 way - 4 position 4th floating position	4th floating position by pulling the spool (Manual controls only)
Z6S	ZS		4 way - 4 position 4th floating position	4th floating position by pulling the spool (Manual controls only)
W5S	WSS		4 way - 4 position 4th floating position	4th floating position by pushing the spool
X6S	X		4 way - 3 position A/B: blocked - Series connection	

4.3 For EMC push-push ON/OFF controls



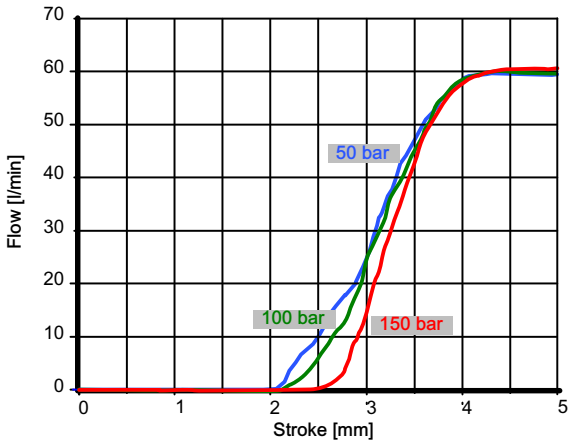
Spool Type	Hydraulic schematic	Features	Application examples
AE		4 way - 3 position A/B: blocked E: open by pass	
BE		4 way - 3 position A/B: blocked E: closed	
CE		4 way - 3 position A/B to tank in neutral E: open by pass	
DE		4 way - 3 position A: blocked B: to tank in neutral	
GE		3 way - 3 position B: blocked E: open by pass	
LE		4 way - 3 position B: blocked A: to tank in neutral	
SE		3 way - 3 position A: blocked E: open by pass	
XE		4 way - 3 position A/B: blocked series connection	Series circuit
XCE		4 way - 3 position A/B: to tank in neutral series connection	Series circuit

4.4 For EMC push-pull ON/OFF controls

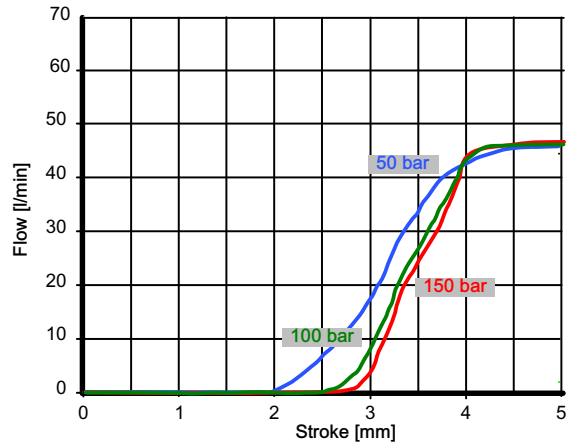


Spool Type	HDS15 equivalent	Hydraulic schematic	Features	Application examples
APP	APD		4 way - 3 position A/B blocked - E open by-pass Electromagnetic ON-OFF control	
CPP	CPD		4 way - 3 position A/B to tank in neutral E open by-pass Electromagnetic ON-OFF control	
GPP	GPD		3 way - 3 position B blocked	Fork lift LIFTING FUNCTION

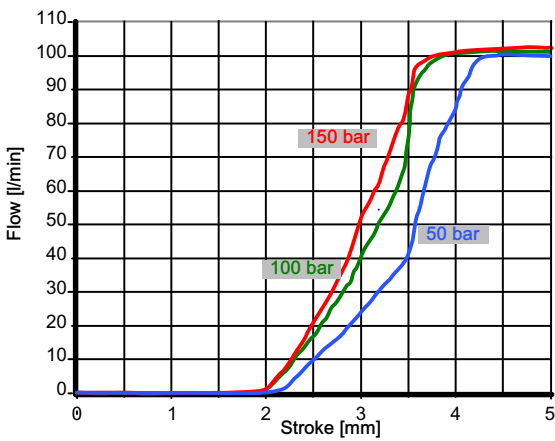
Spool size 6 metering: P → A/B (inlet flow 60 l/min)



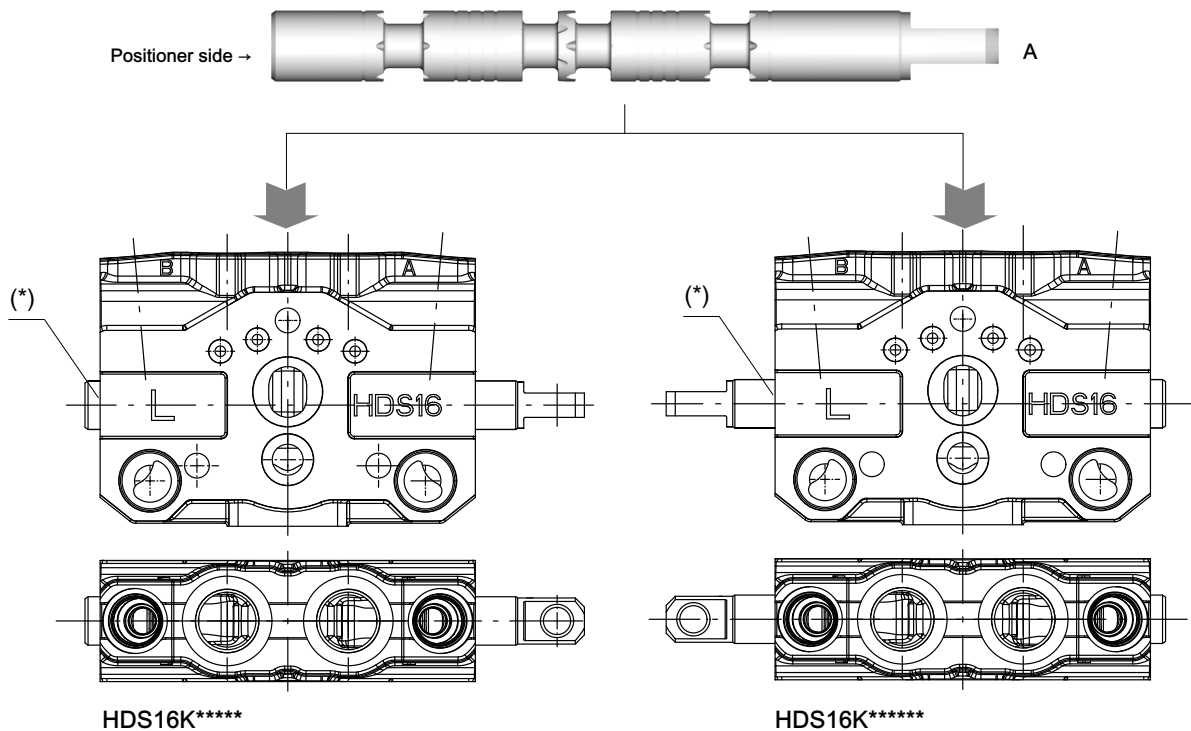
Spool size 6 metering: P → A/B (inlet flow 45 l/min)



Spool size 6 metering: A/B → T (port flow 100 l/min) metering configuration S



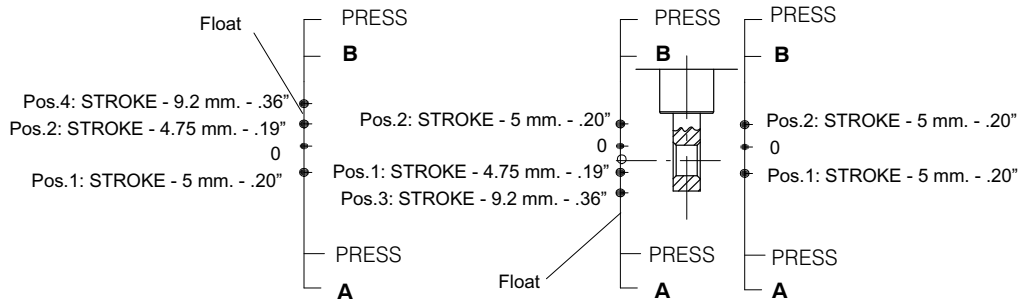
Spool assembly direction



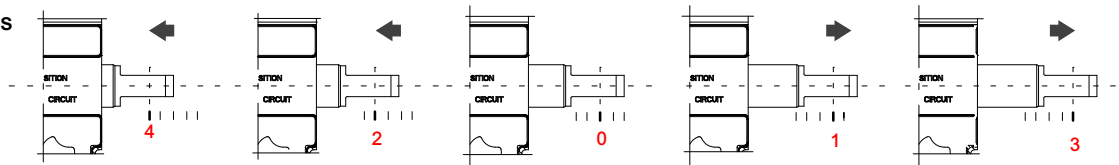
B port is always on the standard lever side printed on the body (*)

5 Levers

5.1 Spool stroke

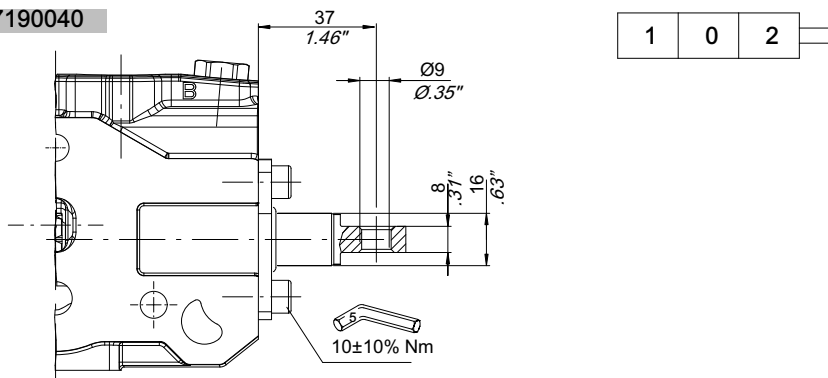


Spool positions



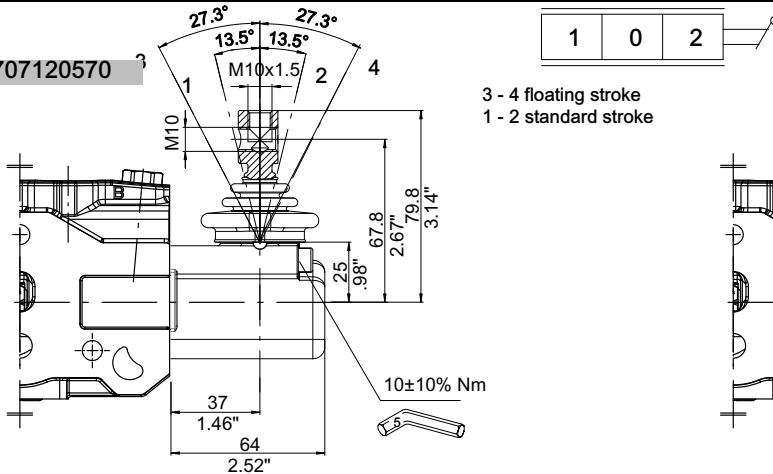
5.2 Standard lever groups

L55 Code: 200707190040

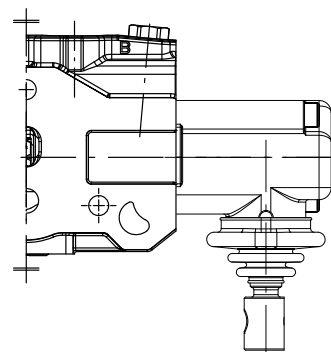


L100

Code: 200707120570



L300

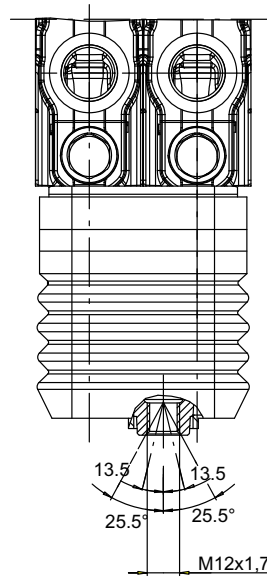
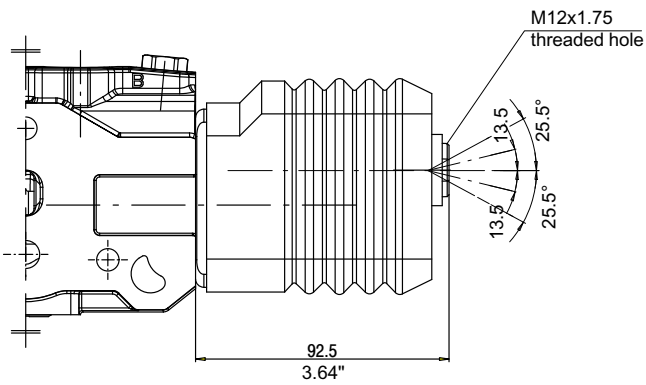
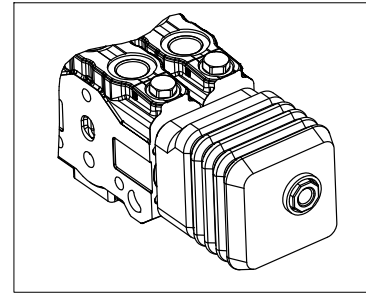
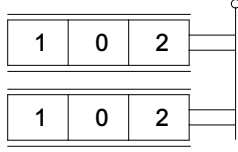
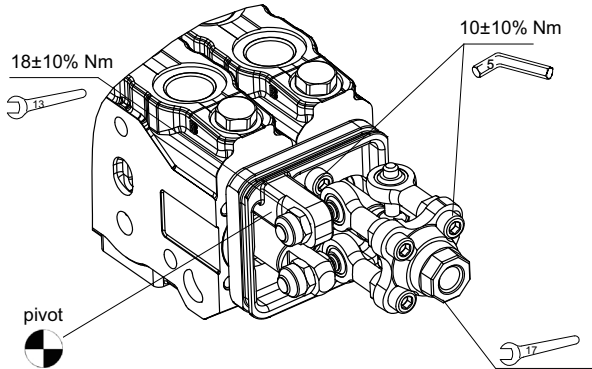




	Lo		Type	Code
	mm	inches		
	190	7.48	AL001	200702220010
	255	10.04	AL002	200702220030
	300	11.81	AL003	200702220040
	350	13.78	AL004	200702220050

Body Interface	Spool type
Manual	Manual

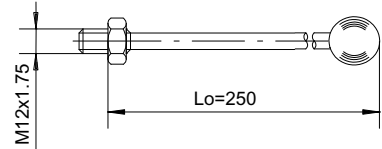
5.3 Manual joystick control L133 - 134

Code: 200775930470

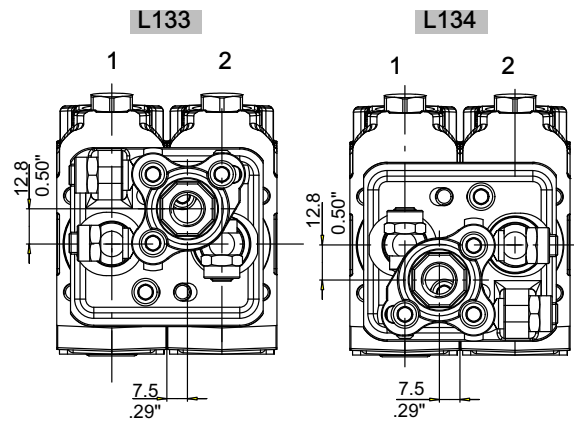
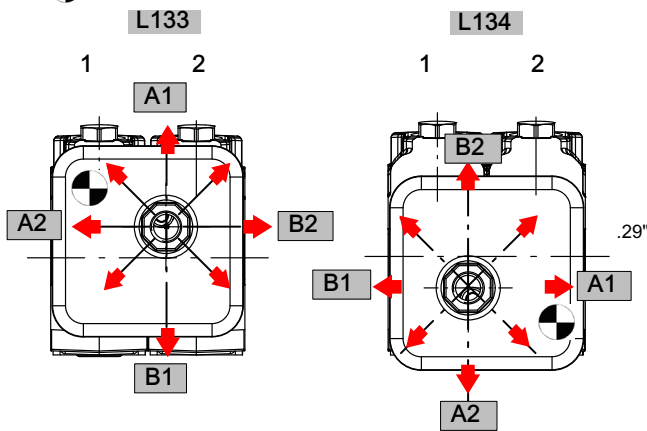


Body Interface	Spool type
	
Manual	Manual

AL010
Code: 200702230040

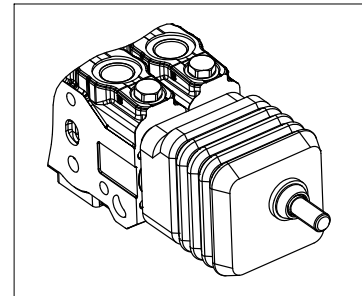
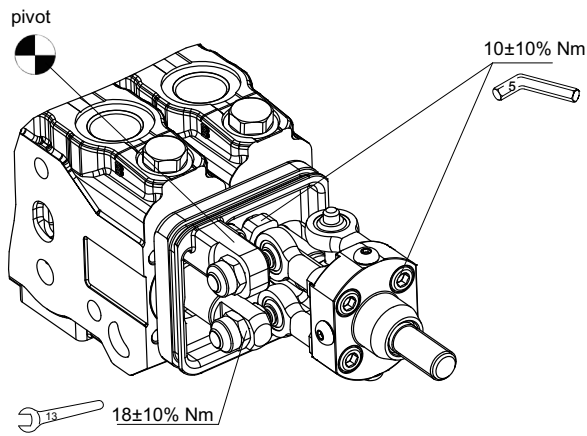




Pivot 



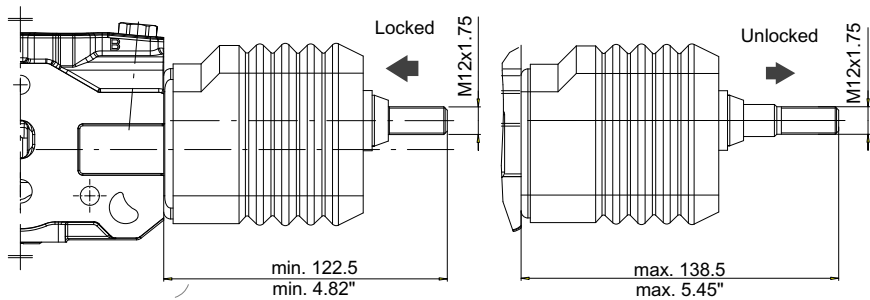
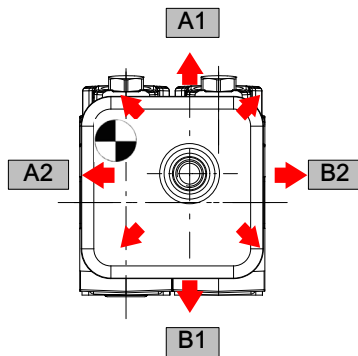
5.4 Manual joystick control L260-460 with integrated locking system

Code: 200775930480

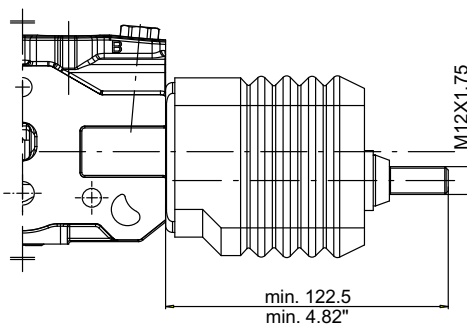
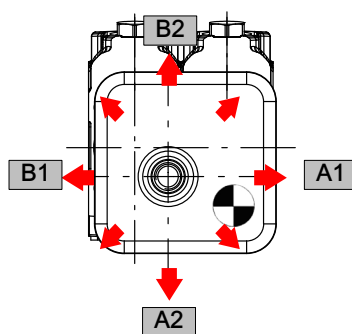


Body Interface	Spool type
	
Manual	Manual

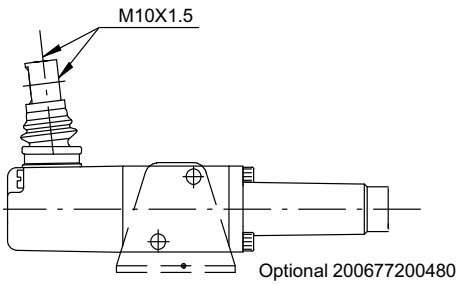
L260



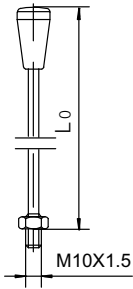
L460



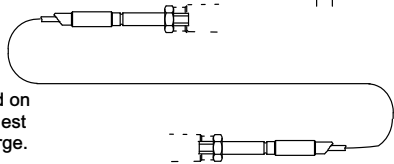
Lever support code: 200760900130



AL00*

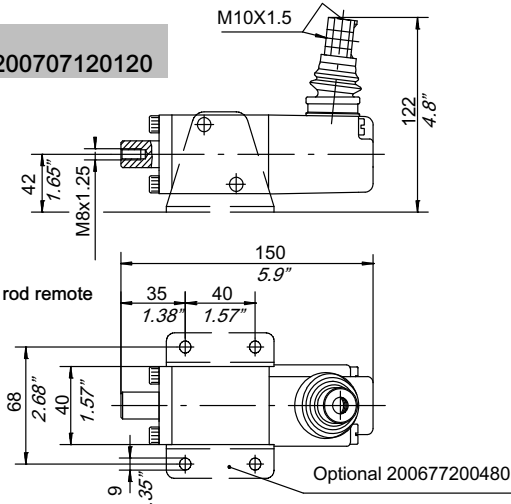


Cable



Cables are assembled on the valve only on request and with an extra charge.

L142
code 200707120120

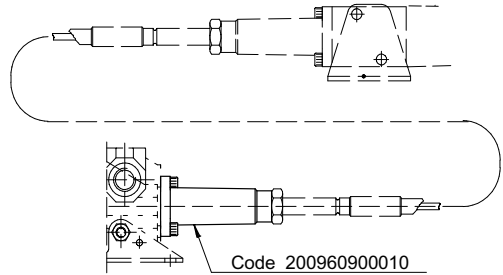


Only for rod remote control

Lo		Type	Code
mm	inches		
190	7.48	AL001	200702220010
255	10.04	AL002	200702220030
300	11.81	AL003	200702220040
350	13.78	AL004	200702220050

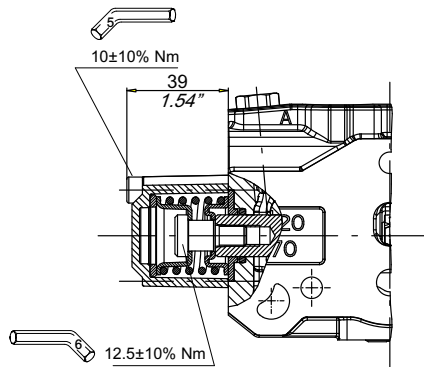
Cable length	Code	Cable length	Code
1000 mm	200544104002	2500 mm	200544104007
1500 mm	200544104005	3000 mm	200544104008
2000 mm	200544104006	4000 mm	200544104009

Spool kit

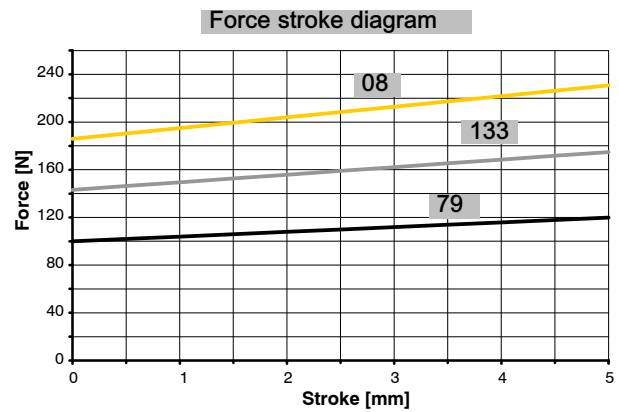


6 Positioners

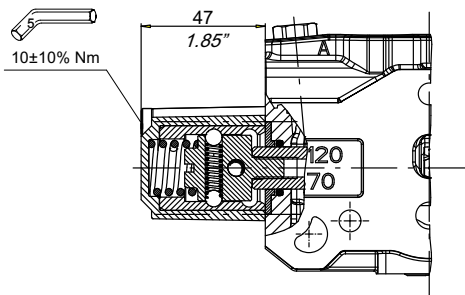
6.1 Spring return to neutral position



Type	Code	Spring	Scheme
08	200768610081	YELLOW	
79	200768610911	BLACK	
133	200768610311	WHITE	

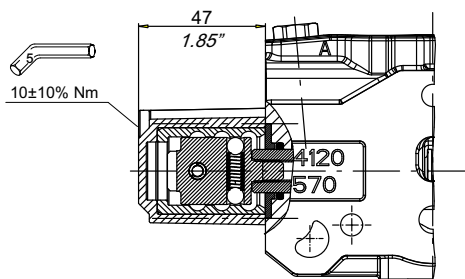


6.2 Spring return to neutral position and detent position in 1 and 2



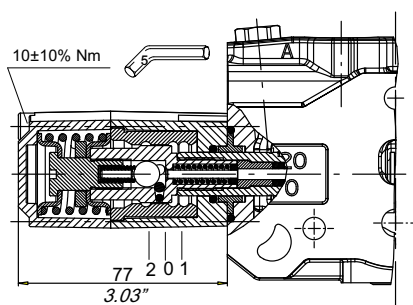
Type	Code	Spring code	Scheme
10	200768630040	200662401240	
20	200768630090	200662400860	

6.3 Detent in all positions



Type	Code	Spring code	Scheme
17	200768620140	-	
25	200768620150	-	

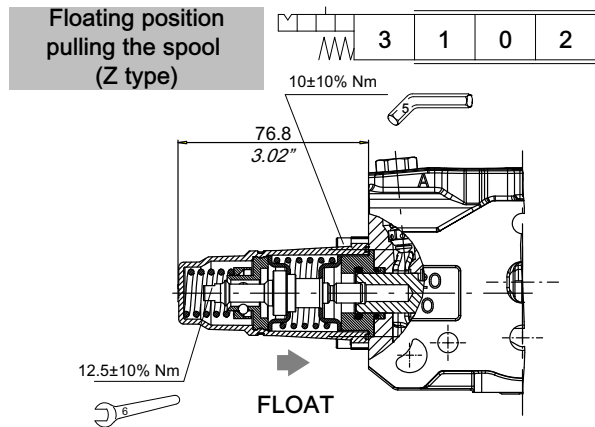
6.4 Kick-out in position 1 and 2



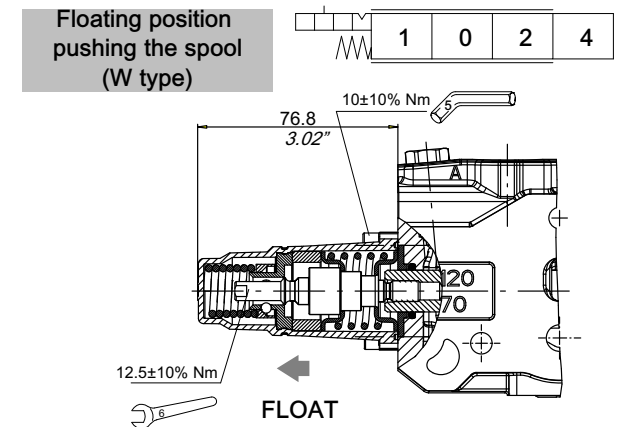
Type	Code	Main spring code	Scheme
358	200768630471	200662401521	

Standard kick-out setting: 150 bar
A special spool is requested

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

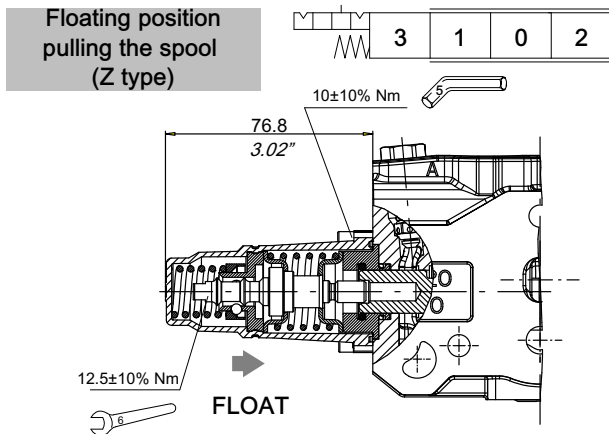


Type	Code	Main spring	Detent spring
04	-	BLACK	BLACK



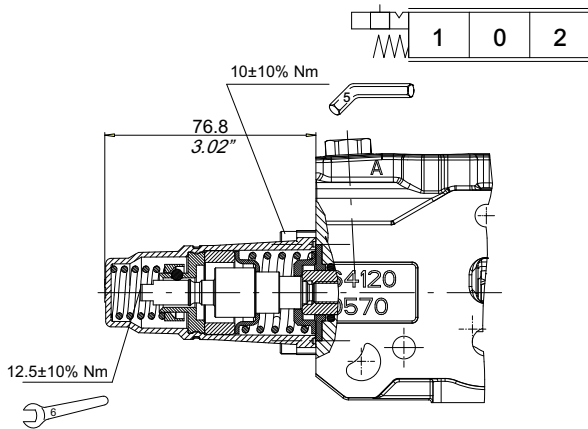
Type	Code	Main spring	Detent spring
06	-	BLACK	BLACK

6.6 Detent in position 2 and 3 and spring return to neutral in both directions



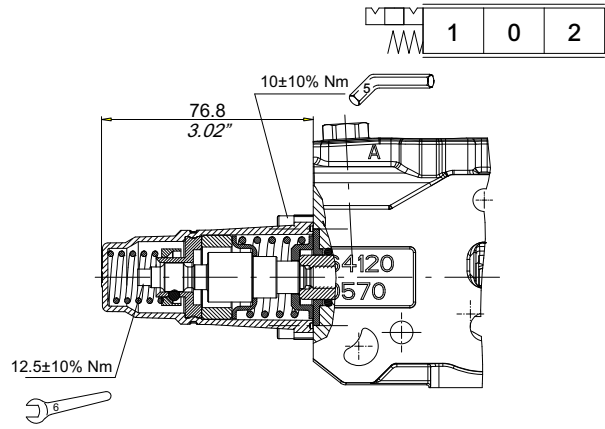
Type	Code	Main spring	Detent spring
-	-	WHITE	BLACK

6.7 Detent in position 2 and spring centred



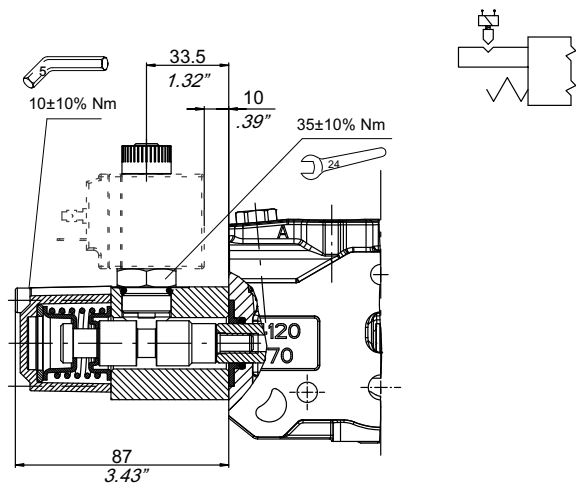
Type	Code	Main spring	Detent spring
-	-	WHITE	WHITE

6.8 Detent in position 1 and 2 and spring centred

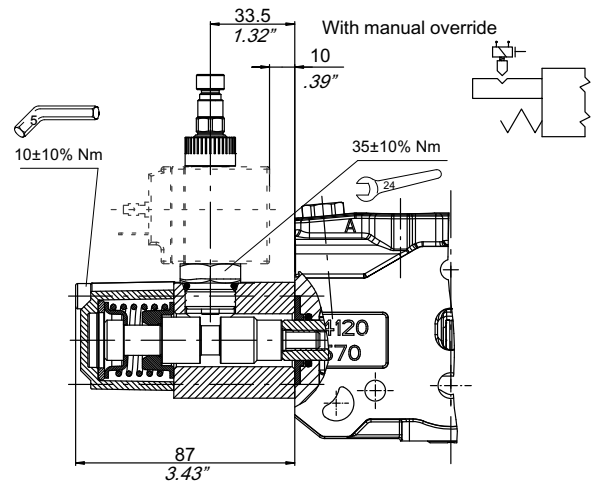


Type	Code	Main spring	Detent spring
-	-	WHITE	BLACK

6.9 Electro-mechanical locking system (normally locked)



Type	Code
379	-

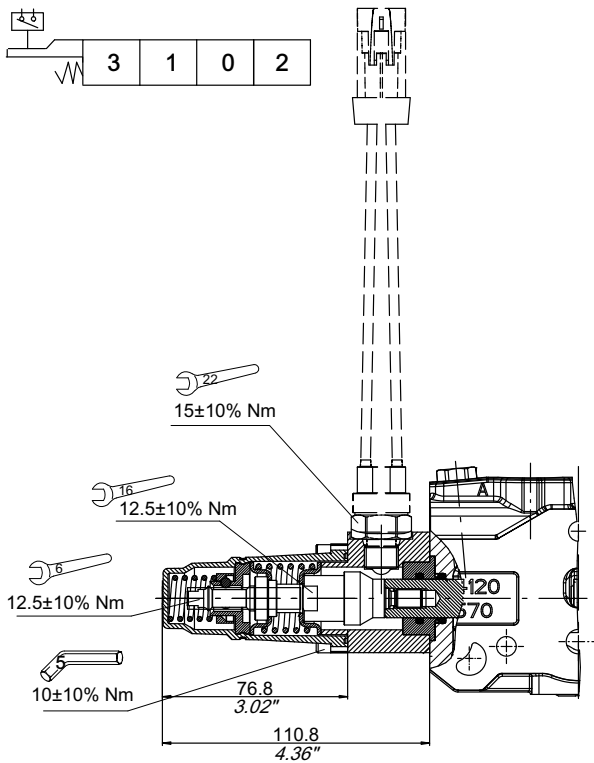


Type	Code
380	-

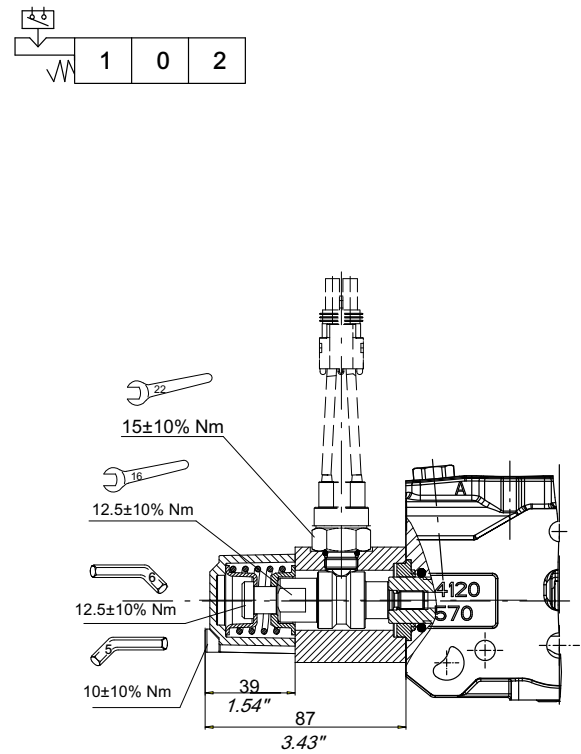
For coils see section 2.5

6.10 Microswitch positioners

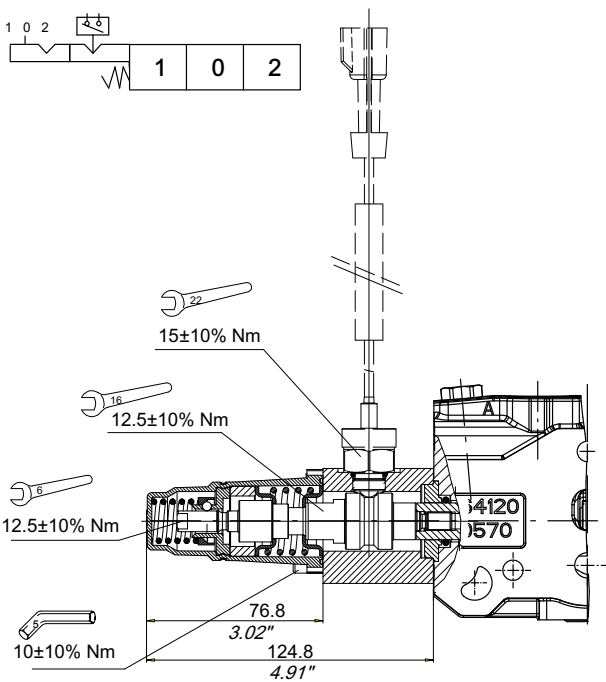
6.10.1 Floating position detection



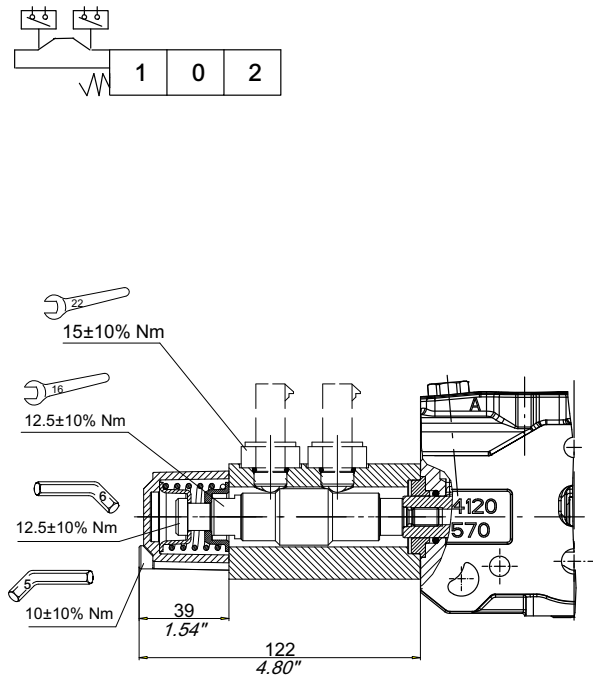
6.10.2 Spool movement detection



6.10.3 Spool movement detection with detent in position 2



6.10.4 Spool direction detection





DE: microswitch operated in both directions



SE1: microswitch operated in POS.1



SE2: microswitch operated in POS.2

Microswitch control

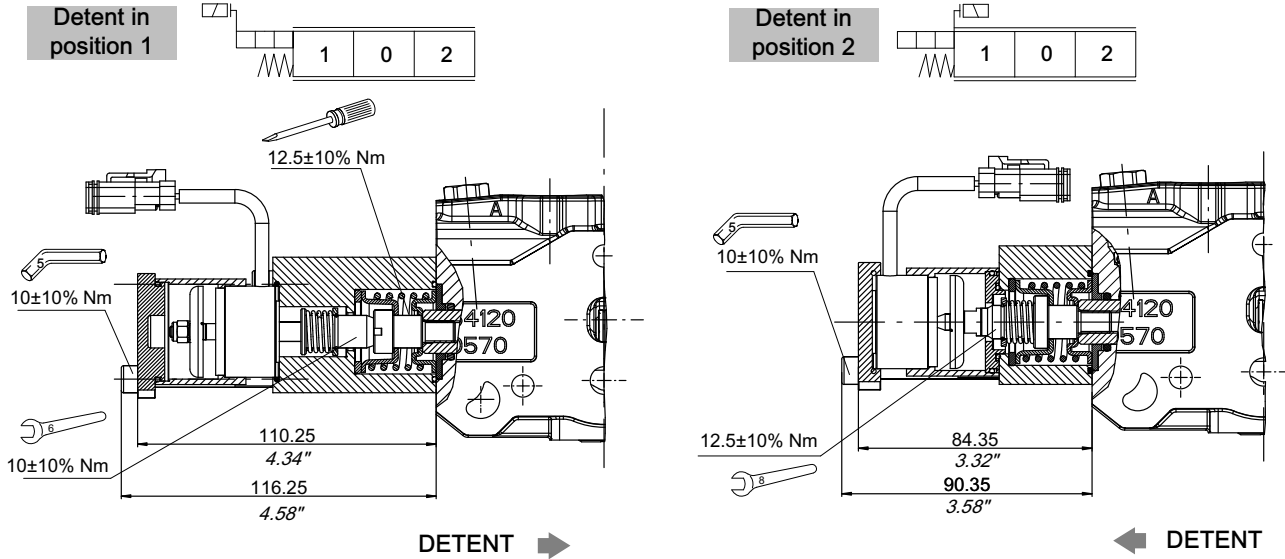
Current rating	.01 - 5.0 DC Amp
Voltage rating	5.0 - 24.0 VD C
Mechanical life	500.000 cycles
Temperature range	-30 to 120° C

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	

6.11 Electro-magnetic detent positioners (EMD)

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



6.11.1 Operating features

COIL

Nominal voltage: 12 VDC \pm 10%

Power rating: 7 W

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

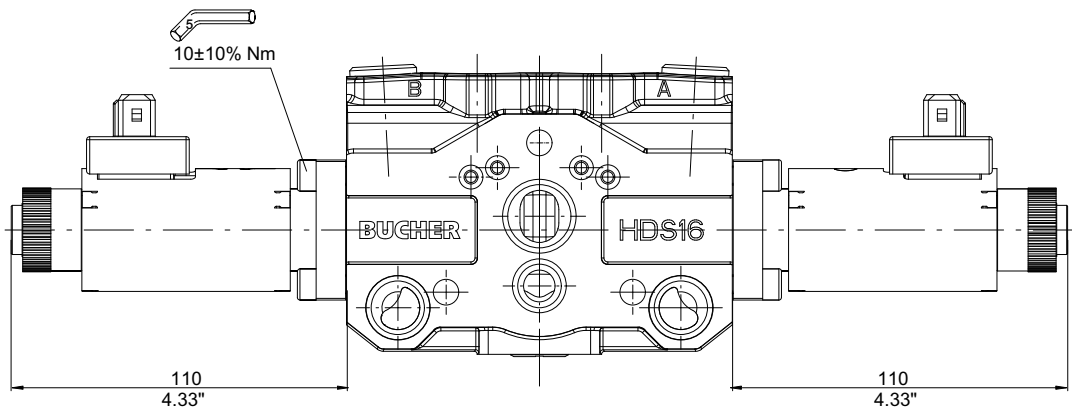
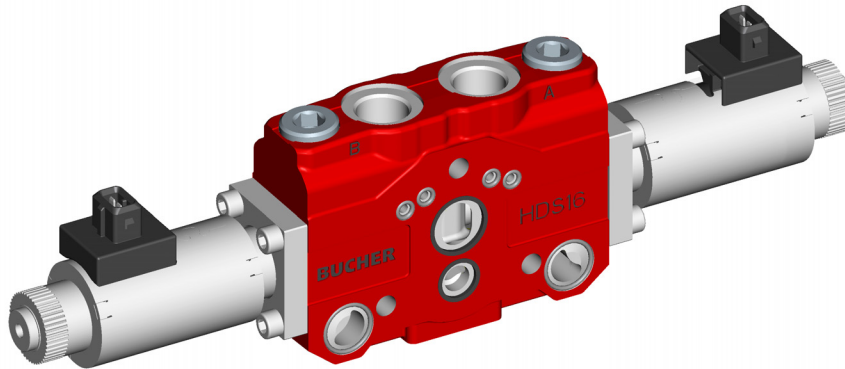
Min. solenoid axial hold force: 260 N

Duty cycle: 100%

Standard cable length: 500 mm

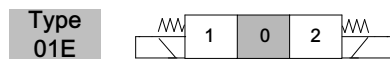
Type	Code	Spring	Voltage	Min. holding force	Connector	Detent position
336	200768670160	BLACK	12 VDC	137 N	DEUTSCH DT06-2S	2
363	200768670150	BLACK	12 VDC	137 N	DEUTSCH DT06-2S	1

6.12 Electromagnetic ON-OFF control - Push-Push type (ON-OFF)

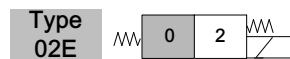


For coils see section 6.13.

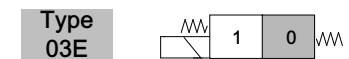
Double acting



Single acting port "B"

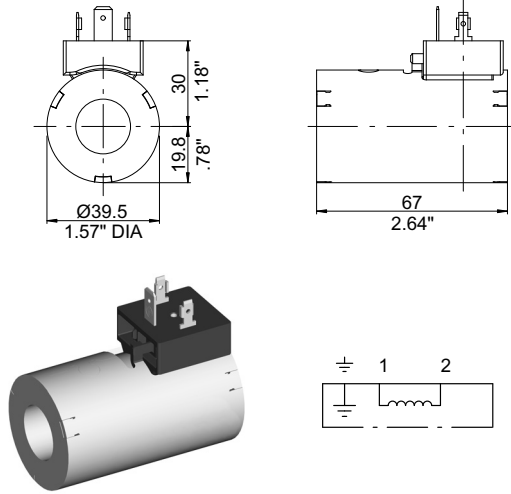


Single acting port "A"

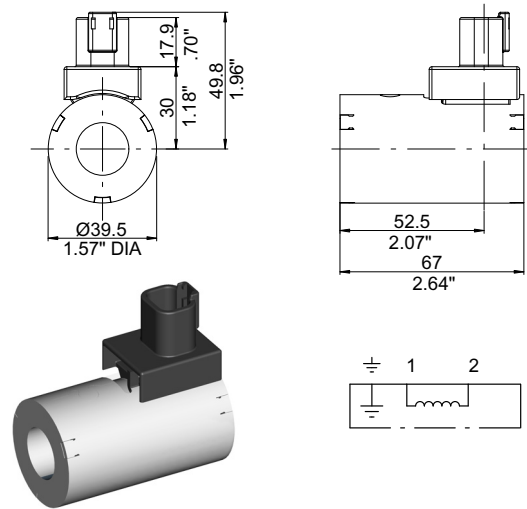


6.13 Coils for solenoid valves

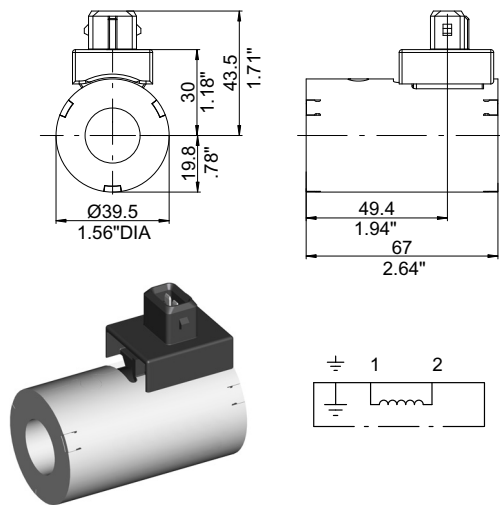
DIN connector



DT 04 connector



AMP JPT connector



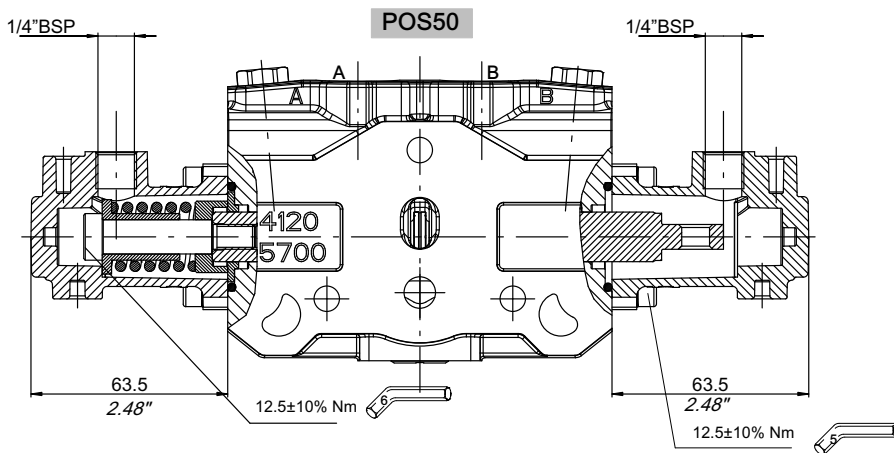
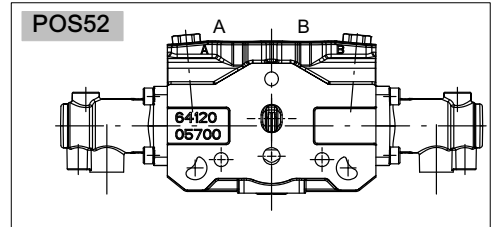
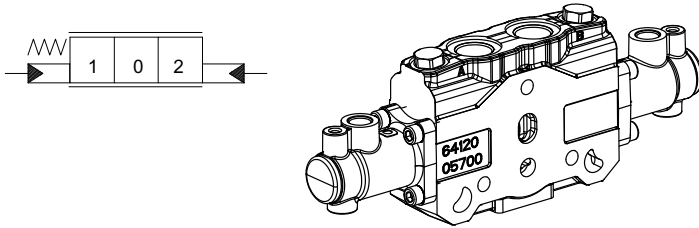
For solenoid valve series

Wire class	H (VDE0580)
Duty rating	ED 100%
Voltage tolerance	± 10%
Magnetic frame protection	Fe/ZnNi5/Cn/T0 (DIN 50979)

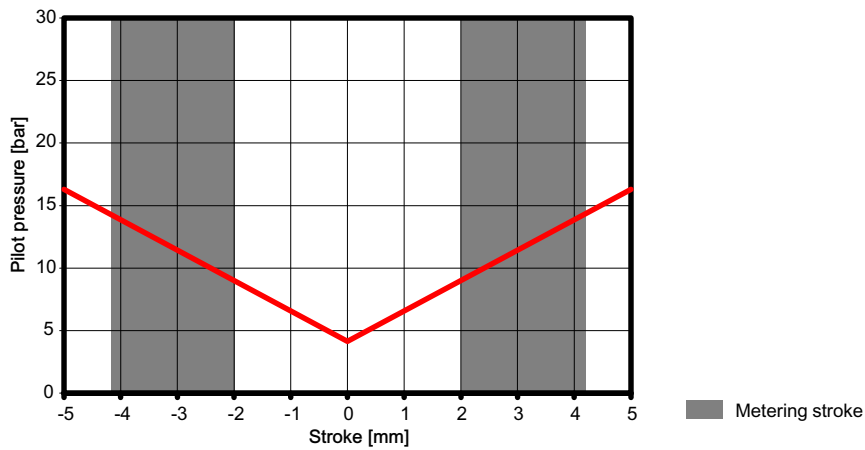
Connector style	IP	Nominal Coil voltage (VDC)	Power (Watt)	Resistance at 20° C (Ohm)
DIN	65	12	29	5
		24	25	21.9
AMP	65	12	29	5
		24	25	21.9
DT	67	12	29	5
		24	25	21.9

6.14 Hydraulic control (HP)

Type	Code
50-52	200768650632

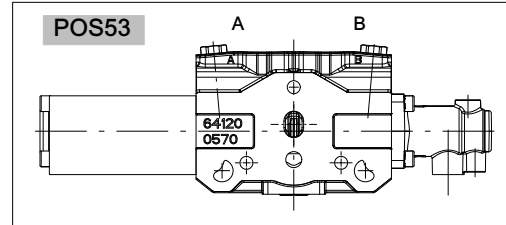
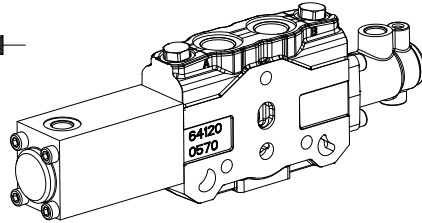
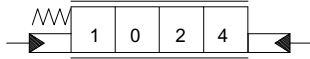


Spring characteristic curves

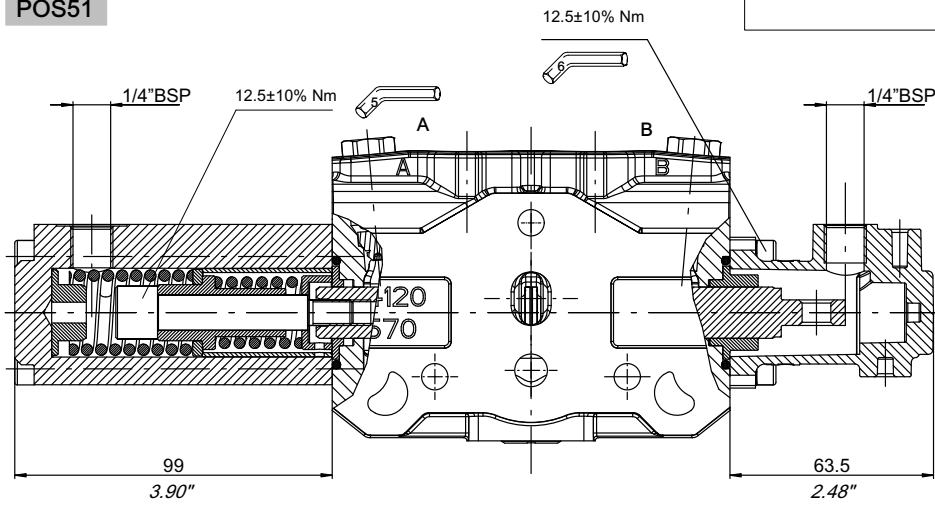


6.15 Hydraulic control (HP) + floating position

Type	Code
51-53	200768650641



POS51

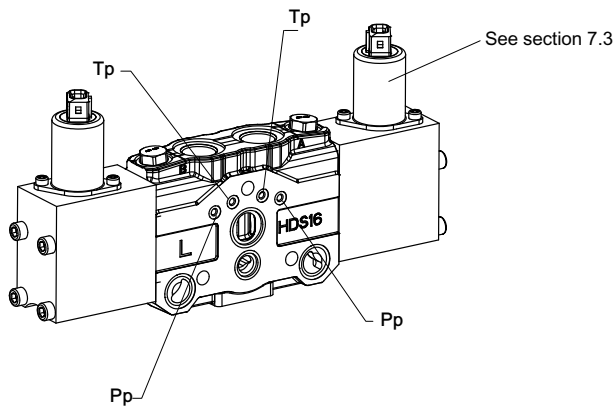


Spring characteristic curves

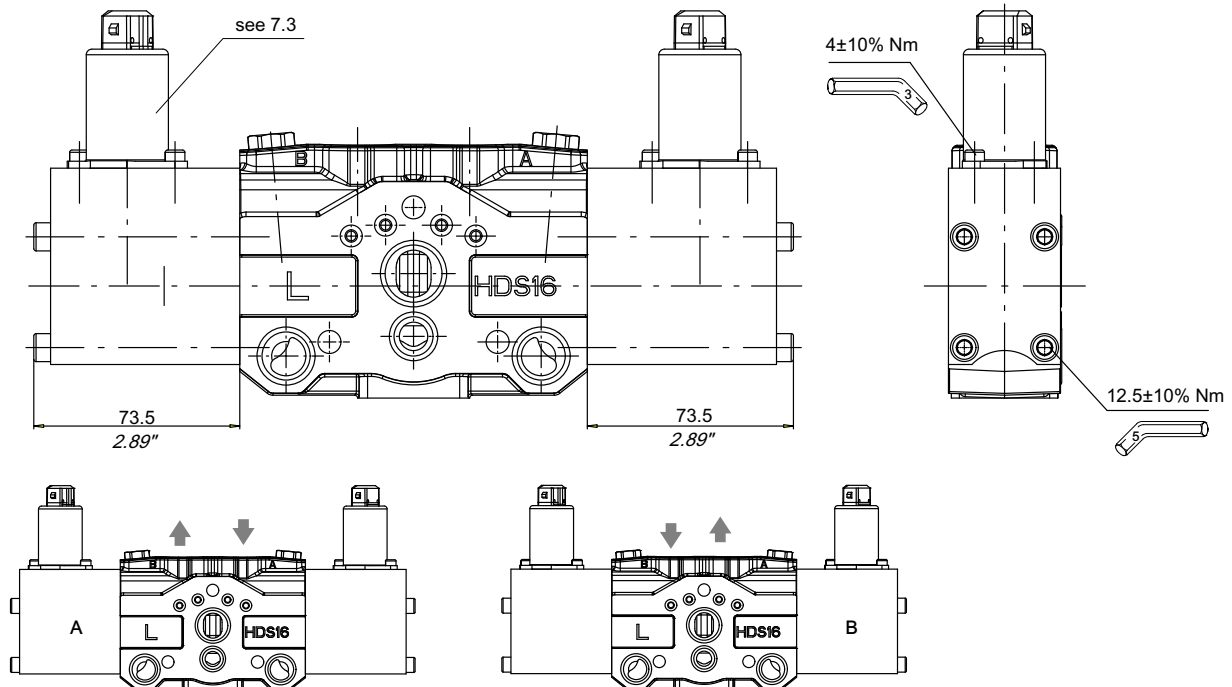
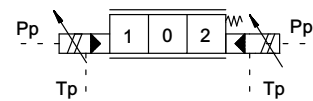


Special body with four lever/positioner fixing holes is requested.

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

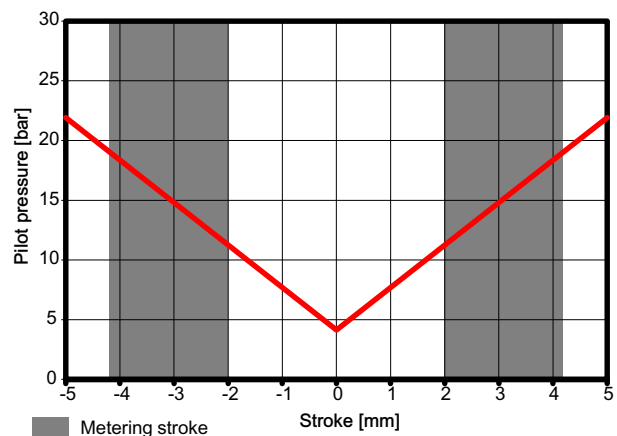


Simplified scheme



EHO positioner spring curve

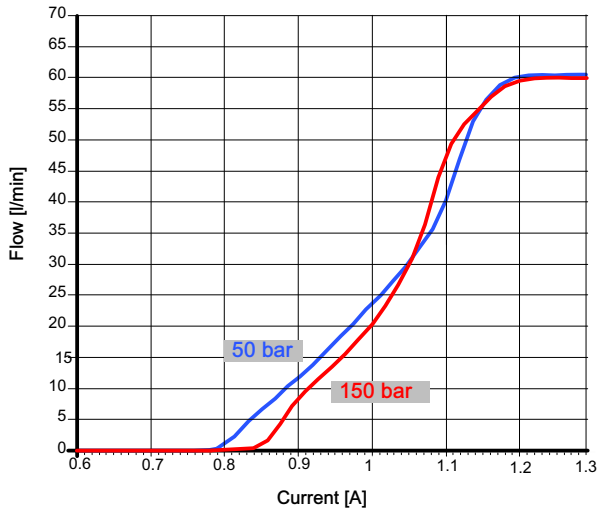
Type	Code	Voltage	Connector
310B	-	12 VDC	AMP
311B	-	24 VDC	AMP
312B	-	12 VDC	Deutsch
313B	-	24 VDC	Deutsch



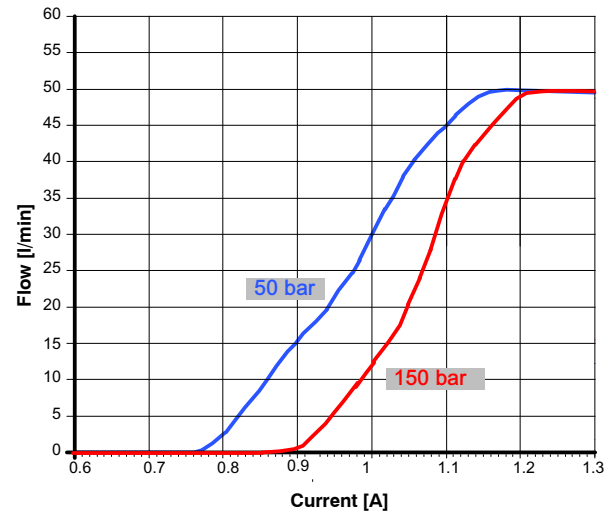
The pressure differential between pilot lines Pp and Tp should be > 25 bar in order to be sure to switch the spool to full stroke in all operating conditions

6.16.1 Spool metering curves 12 V

Spool size 6 metering : P→A→B→T (inlet flow 60 l/min)

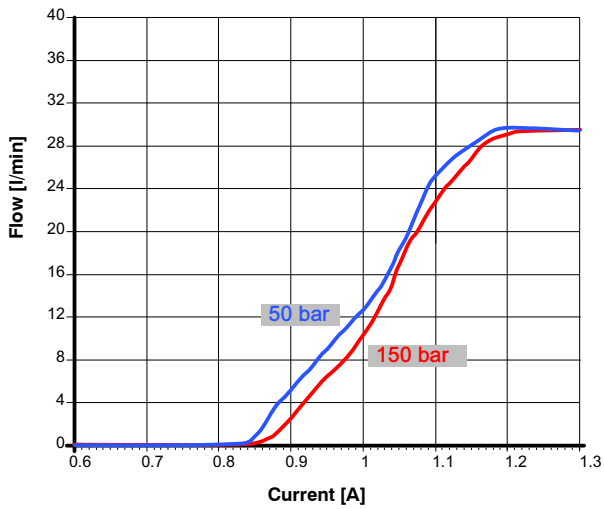


Spool size 5 metering: P→A→B→T (inlet flow 50 l/min)



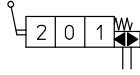
6.16.2 Spool metering curves 24 V

Spool size 3 metering: P→A→B→T (inlet flow 30 l/min)



6.17 Pneumatic/hydraulic control with lever option (HP)

Type	Code
HP 24	200768650111



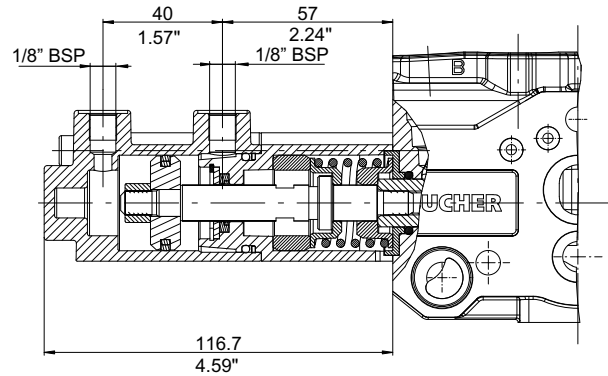
Operating conditions:

Hydraulic controls

Pressure range: (bar): Min. 6 - Max. 15
(PSI): Min. 85 - Max. 215

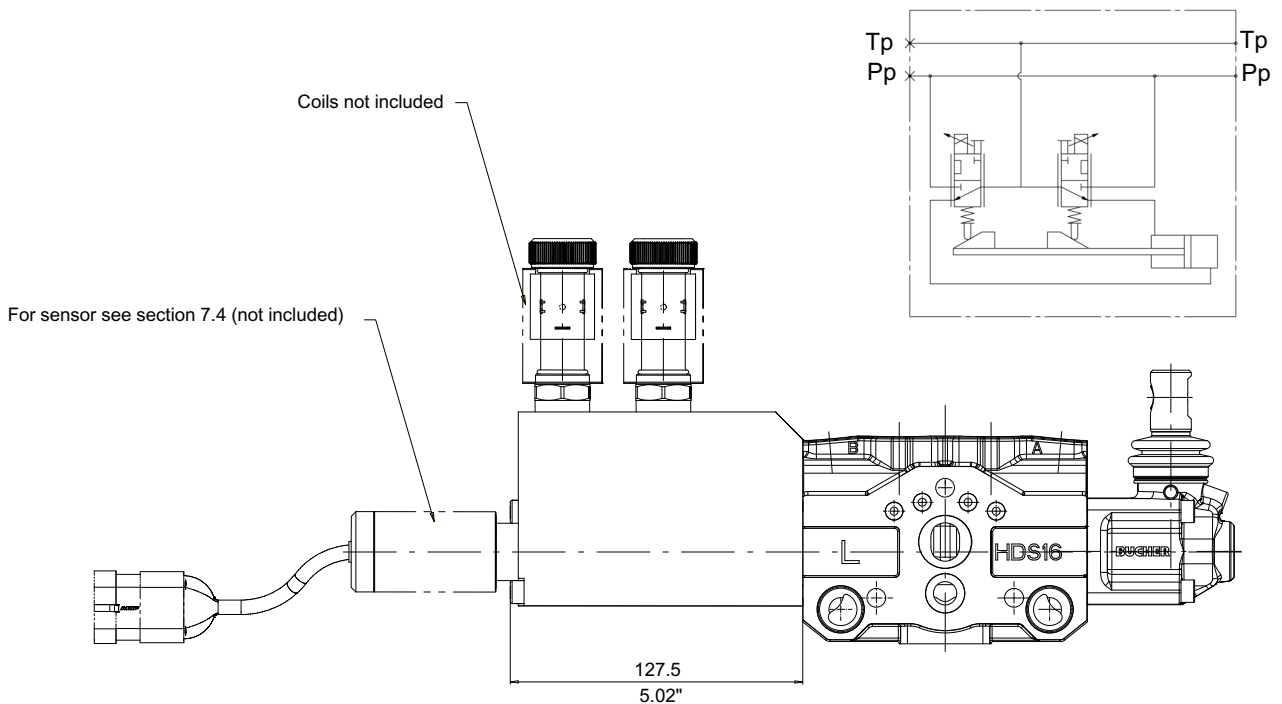
Pneumatic controls:

Pressure range: (bar): Min. 6 - Max. 10
(PSI): Min. 85 - Max. 145



6.18 Electro-hydraulic proportional control with lever option (EHM)

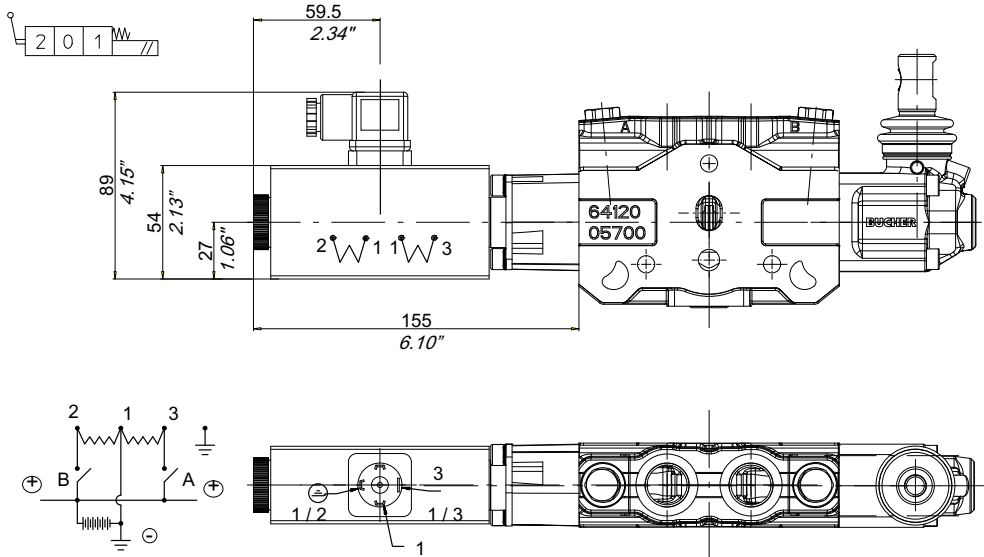
Voltage	Type	Code
12/24 V.DC	EHM 330B	-



A special body is requested.

6.19 Electromagnetic ON-OFF control - Push/Pull type (PP)

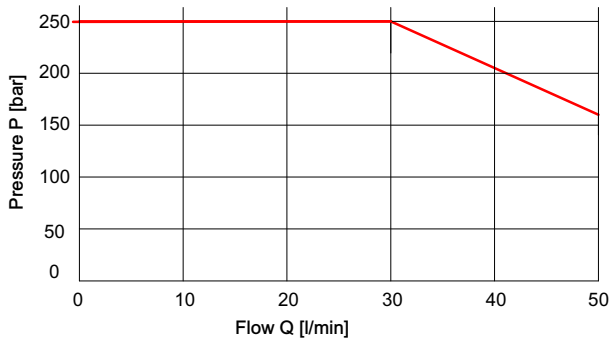
Voltage	Type	Code
12 V.DC	EPP 344*	200768611790
24 V.DC	EPP 343*	200768611800



* To be used with special spools only: the spool definition is different from the standard one because of the extension "PP". For example A spool become APP.

Ex.: (A spool + 24 VDC positioner)= APP343

Mechanical and hydraulic features	
Max flow vs pressure	see diagram
Max back pressure	5 bar (70 PSI)
Operating oil temperature	80° C (180° F)

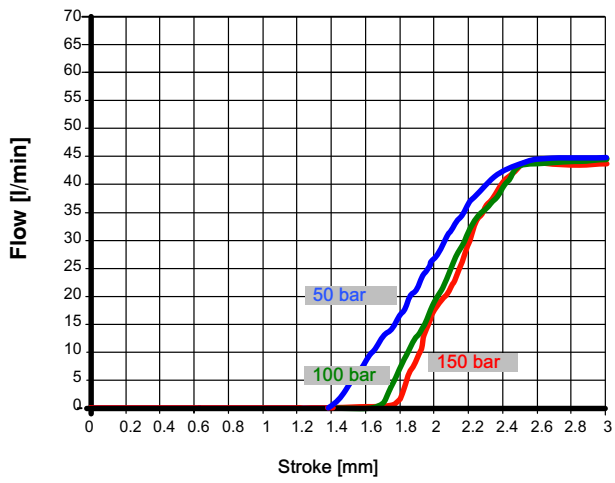


Electromagnetic specification	
Input tension	12 V DC [24 V DC] + 10%
Power consumption	60 W
ED	100%
Ohms resistance (cold T°)	2.4 Ω [9.6 Ω]
Ohms resistance (stabilized T°)	3.1 Ω [12.5 Ω]
Intensity of current (cold T°)	5 A (2.5 A)
Intensity of current (stabilized T°)	3.8 A (1.9 A)
Ambient operating temperature range	-25° C/+50° C

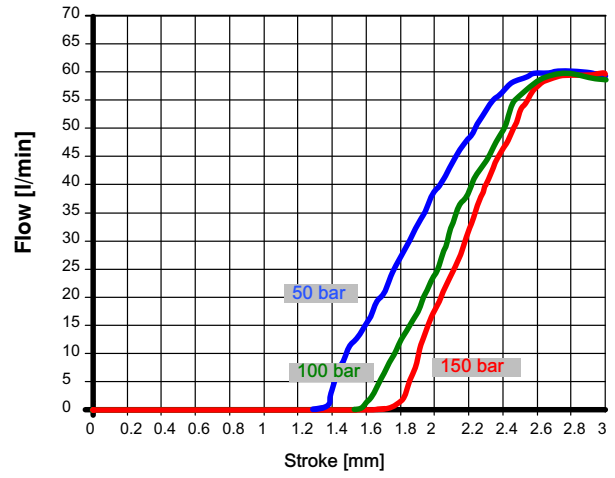
Insulation class:
According to VDE 0580 standard: H
Electrical connection: DIN 43650: IP 65

6.19.1 Spool metering curves

Spool metering: P→A→B→T (inlet flow 45 l/min)



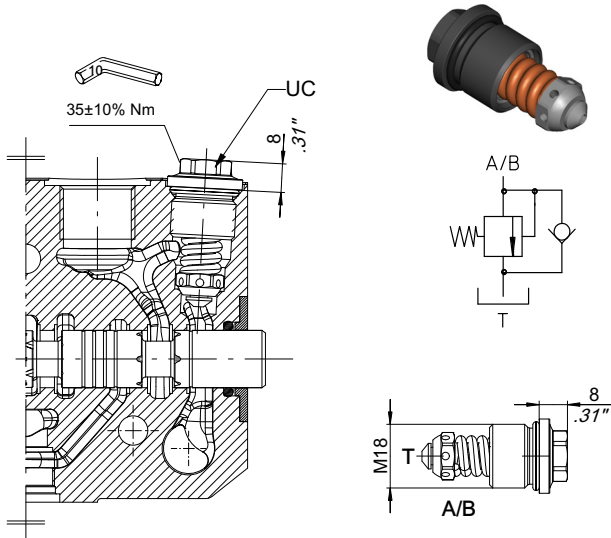
Spool metering: P→A→B→T (inlet flow 60 l/min)



7 Valves

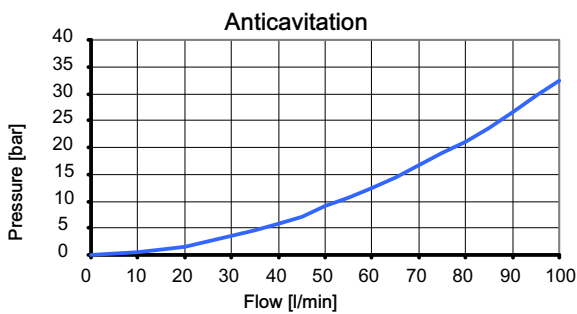
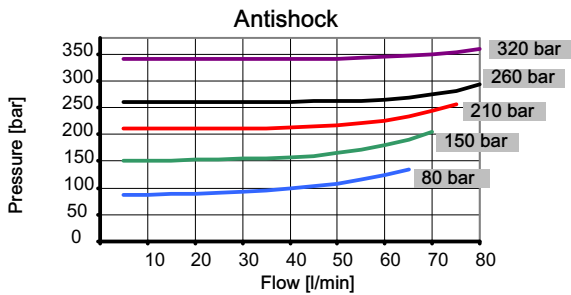
7.1 Anti-shock and anti-cavitation valves UC

7.1.1 Fixed setting



The dedicated cavity is machined on request only

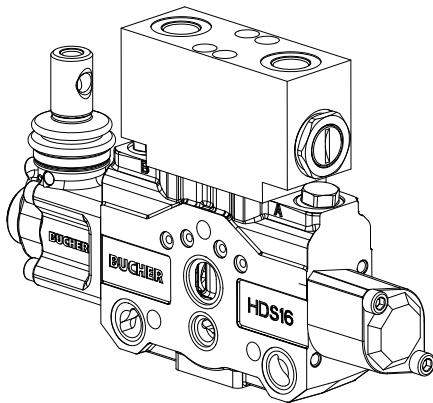
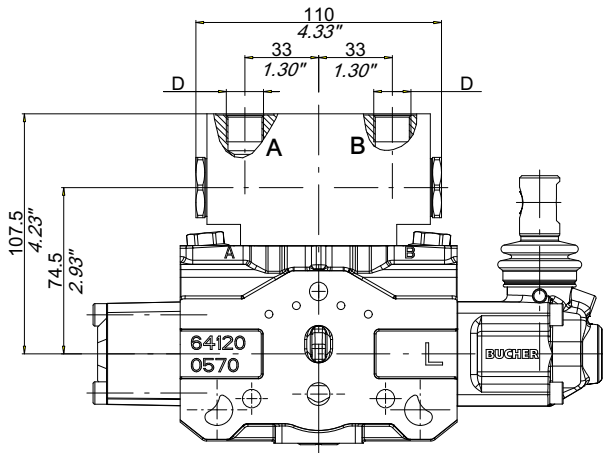
Pressure setting at 10 l/min (*) bar (psi)	Code
50 (720)	200533930240
80 (1160)	200533930370
100 (1450)	200533930250
120 (1740)	200533930260
150 (2170)	200533930270
160 (2320)	200533930380
170 (2460)	200533930280
180 (2610)	200533930460
190 (2750)	200533930290
200 (2900)	200533930300
210 (3040)	200533930310
230 (3330)	200533930320
240 (3480)	200533930390
250 (3620)	200533930330
260 (3770)	200533930400
270 (3910)	200533930410
280 (4060)	200533930340
320 (4640)	200533930350
350 (5070)	200533930360
VC (plug)	200533630002



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

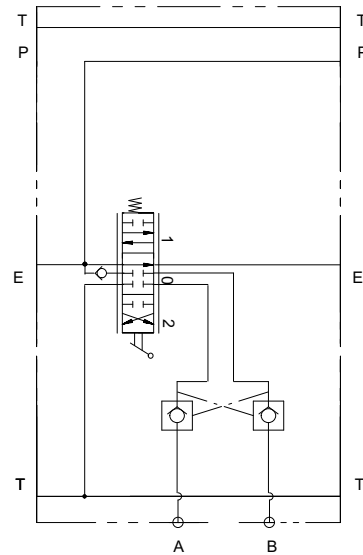
(*) For different pressure settings please contact our Sales Department

7.2 Hydraulic piloted check valve (RP)



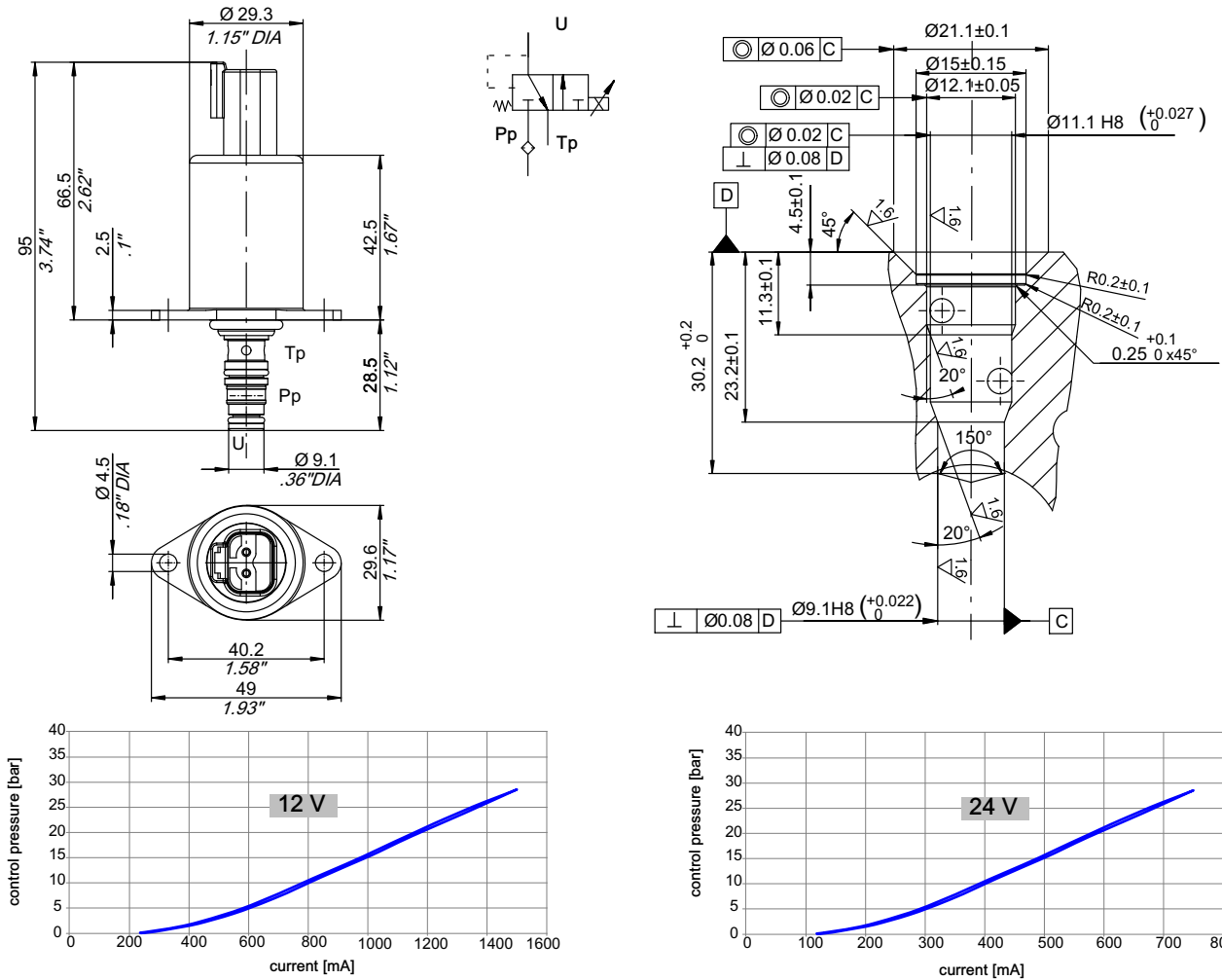
A special body is requested.

Type	Pilot check valveo
RP/A-B	Double on A/B
RP/A	Single on A
RP/B	Single on B



Threads	Standard A/B	On demand
BSP	1/2"	3/8"
Metric	M18x1,5	M22x1,5*
UNF	SAE8	SAE10*

7.3 Proportional pressure reducing 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

7.4 Spool position transducer

7.4.1 Features

Code : 200544124029

Position transducer.

± 7,5 mm linear stroke.

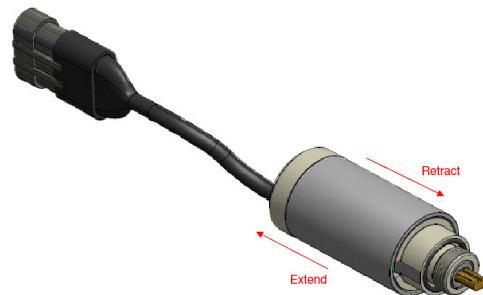
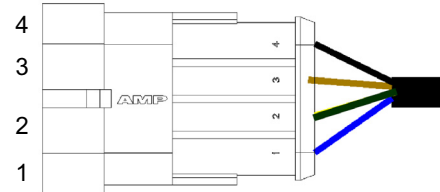
Hall effect sensor

Mechanical specifications	
Maximum mechanical stroke	≥±8,5mm
External diameter	35 mm
Body length	91 ± 8,5mm
Cable length (including connector)	350mm
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

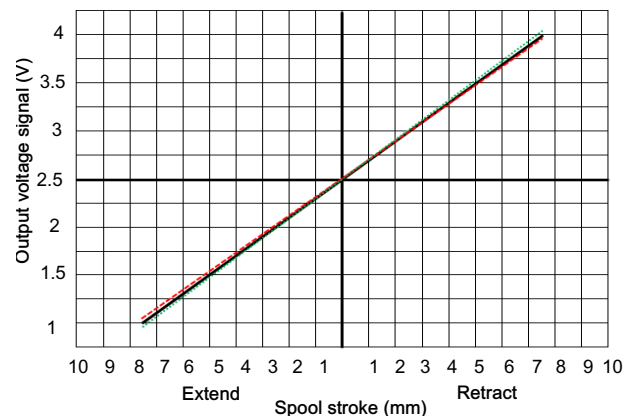
Electrical specifications - Linear, Hall-effect sensor	
Power Supply Voltage	7 ÷ 32 Vdc
Current Consumption	< 20 mA
Output signal in Neutral	2,5V
Output signal range	1 V ÷ 4 V
Tolerance on output signal	± 0,1 V
Maximum linearity error (-25 ÷ 105°C)	± 2%
Max. Electrical stroke linearity range	± 7,5mm (adjustable)
Electrical life	10 Million cycles

Electrical Connections (proportional version)

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

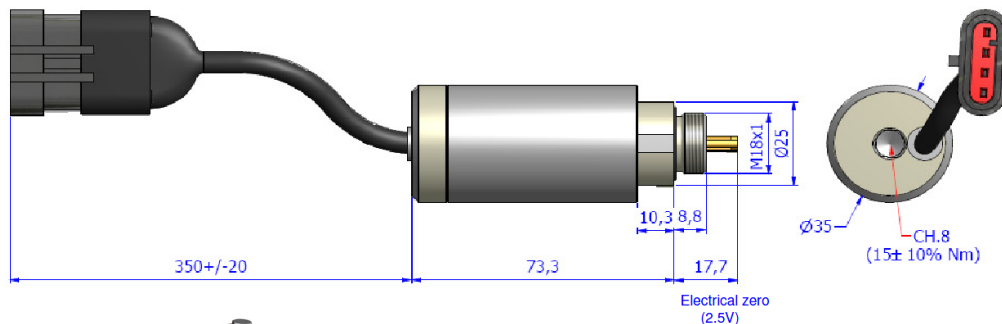


Output signal control characteristic (proportional version)

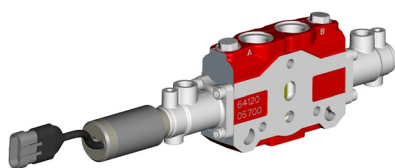


Red lines: -25 / +85 °C

Green lines: 85 / 105 °C

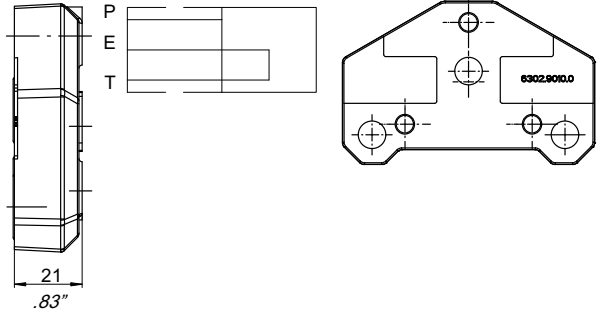
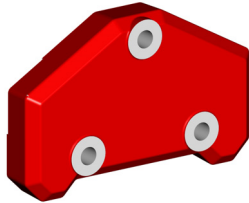
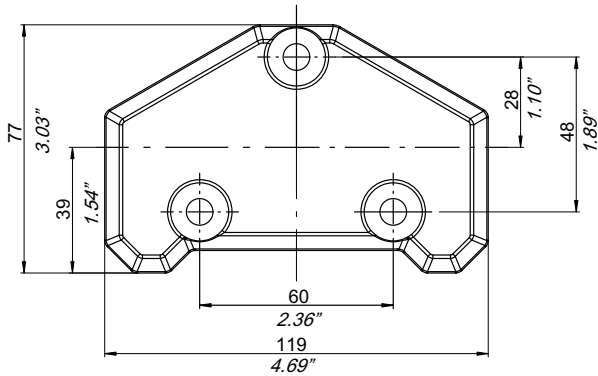


HP



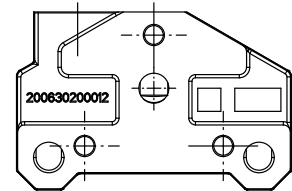
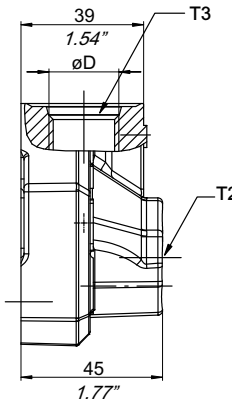
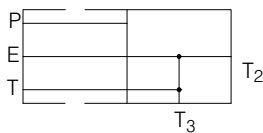
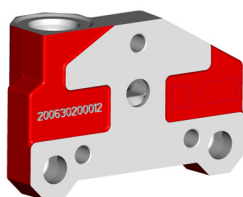
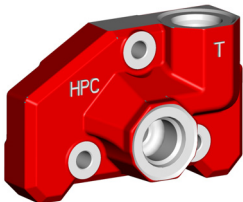
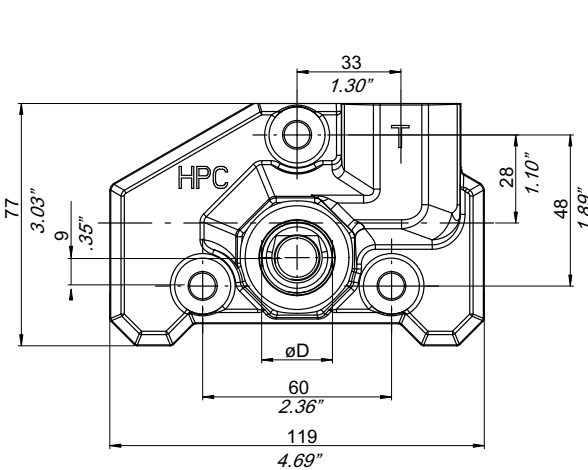
8 End covers

8.1 Standard end cover (P)



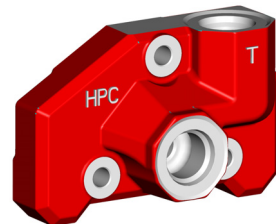
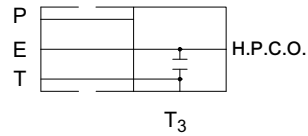
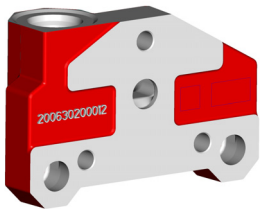
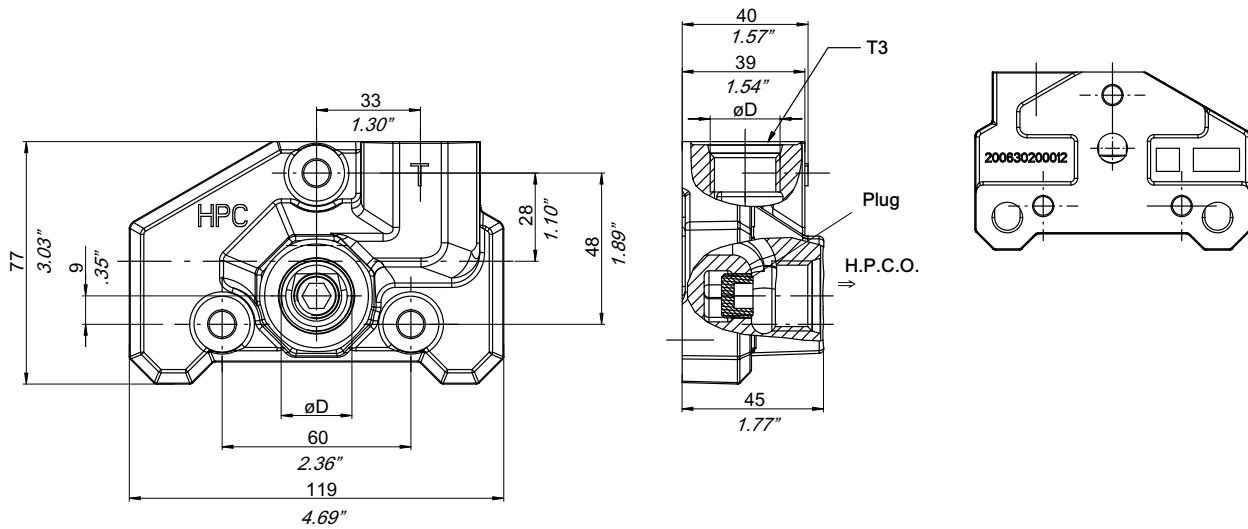
Type/code	
Standard circuit parallel	Optional circuit series and tandem
P31	P32

8.2 End cover with outlet ports T₂ and T₃ (P)



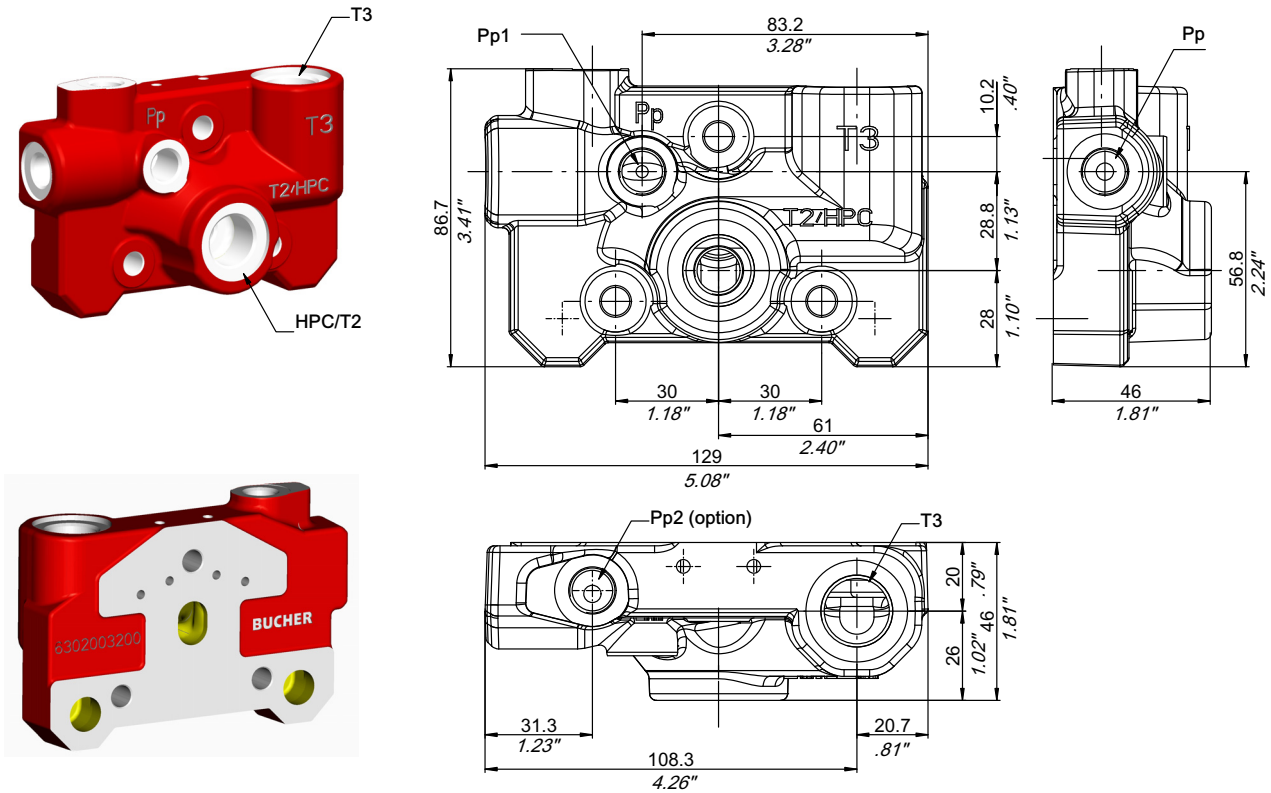
ØD	Type/code	
	Standard circuit parallel	Optional circuit series and tandem
M18X1.5	P01	P41
3/8" BSP	P02	P42
1/2" BSP	P03	P43
SAE10	P05	P45
3/4" BSP	P09	P49

8.3 End cover with outlet port T₃ and H.P.C.O. (P)



ØD	Type/code	
	Standard circuit parallel	Optional circuit series and tandem
M18X1.5	P11	P51
3/8" BSP	P12	P52
1/2" BSP	P13	P53
SAE10	P15	P55
3/4" BSP	P19	P59

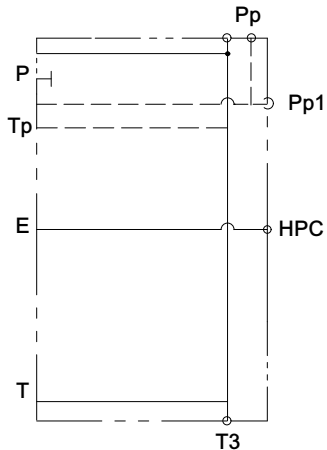
8.4 End cover with pilot pressure port Pp for EH version (PH)



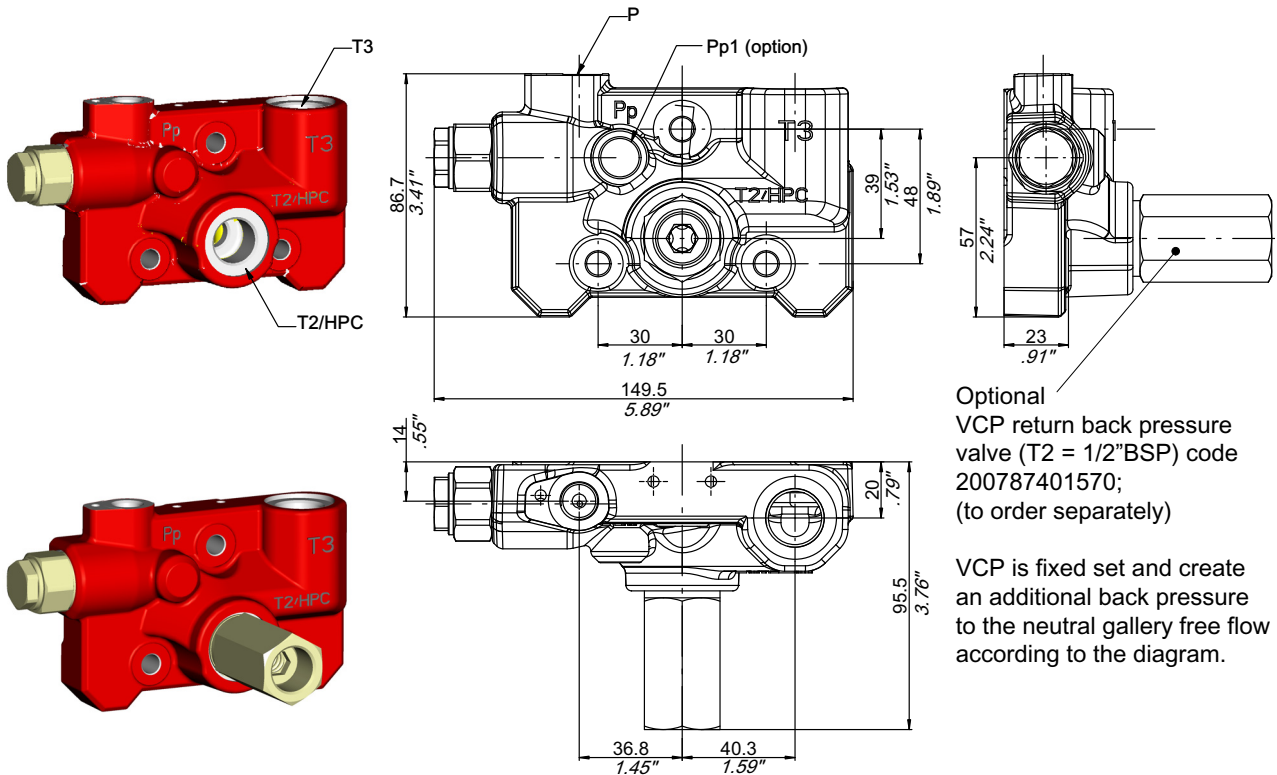
Pp ports max supply pressure: 40 bar

Type	T2/HPC	T3	Pp	Pp1	Pp2
PH 101	1/2" BSP	1/2" BSP	1/4" BSP	1/4" BSP	-
PH 102	1/2" BSP	1/2" BSP	1/4" BSP	1/4" BSP	1/4" BSP
PH 201	3/8" BSP	3/8" BSP	1/4" BSP	1/4" BSP	-
PH 202	3/8" BSP	3/8" BSP	1/4" BSP	1/4" BSP	1/4" BSP
PH 301	SAE10	SAE10	SAE6	SAE6	-
PH 302	SAE10	SAE10	SAE6	SAE6	SAE6
PH 501	M22x1.5	M22x1.5	M14x1.5	M14x1.5	-
PH 502	M22x1.5	M22x1.5	M14x1.5	M14x1.5	M14x1.5

With pilot line for EH positioners



8.5 End cover with pilot lines and pressure reducing valve for EHO positioners (PH)

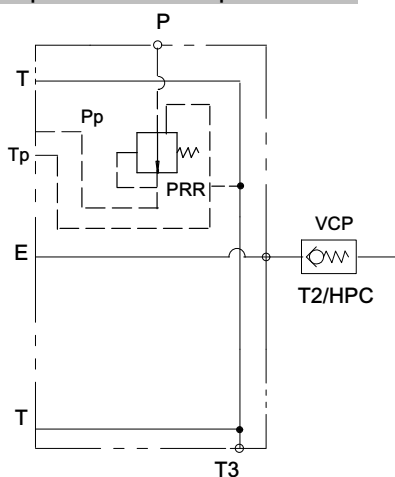


Optional VCP return back pressure valve (T2 = 1/2" BSP) code 200787401570; (to order separately)

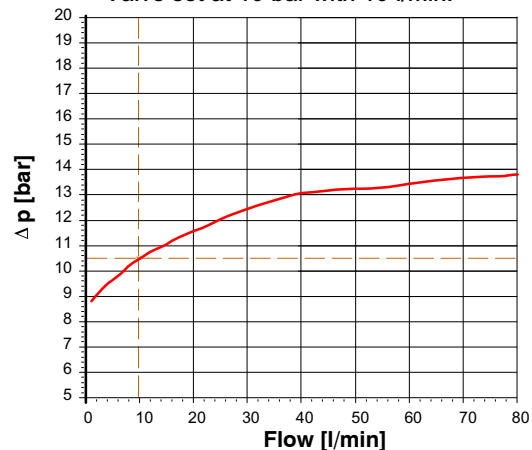
VCP is fixed set and create an additional back pressure to the neutral gallery free flow according to the diagram.

Type	T2/HPC	T3	P	Pp1
PH 103	1/2" BSP	1/2" BSP	1/4" BSP	-
PH 104	1/2" BSP	1/2" BSP	1/4" BSP	1/4" BSP
PH 203	3/8" BSP	3/8" BSP	1/4" BSP	-
PH 204	3/8" BSP	3/8" BSP	1/4" BSP	1/4" BSP
PH 303	SAE10	SAE10	SAE6	-
PH 304	SAE10	SAE10	SAE6	SAE6
PH 503	M22x1.5	M22x1.5	M14x1.5	-
PH 504	M22x1.5	M22x1.5	M14x1.5	M14x1.5

With pilot line for EHO positioners

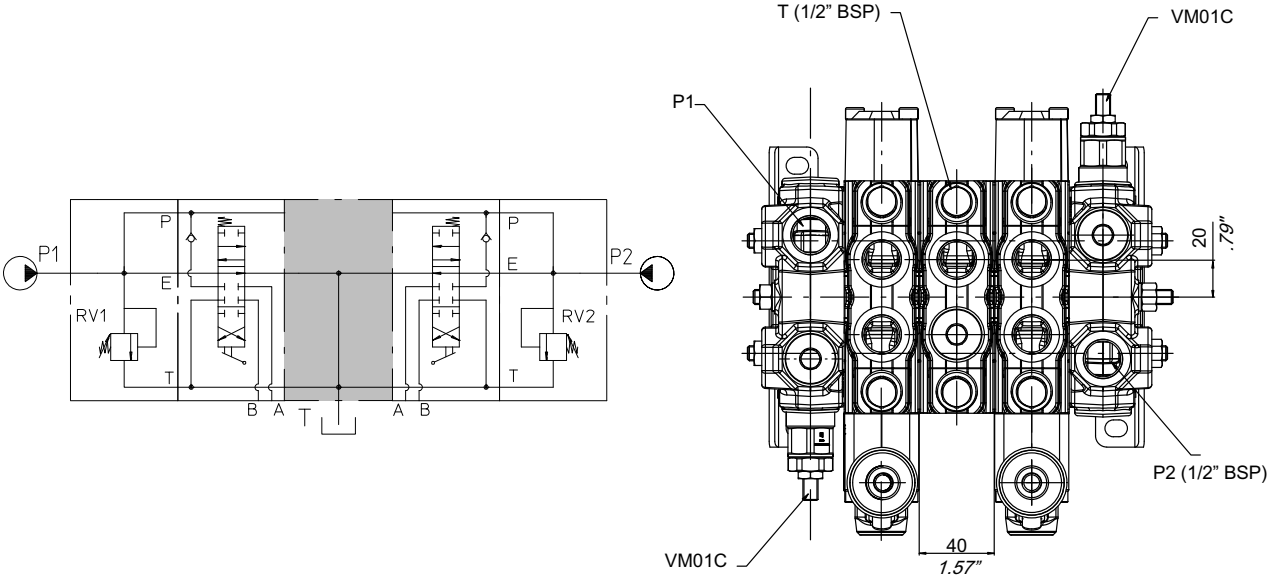


VCP characteristic curve (cartridge valve only)
Valve set at 10 bar with 10 l/min.



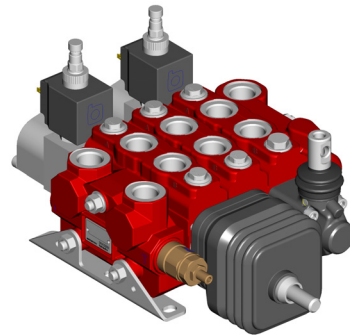
8.6 Intermediate outlet section (PI)

Type
PI**

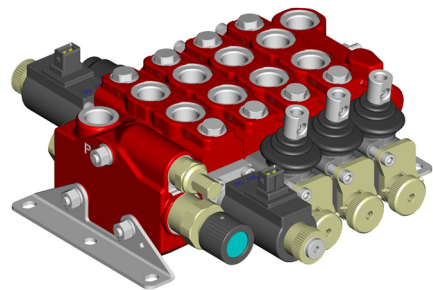


9 Suitable applications (Examples)

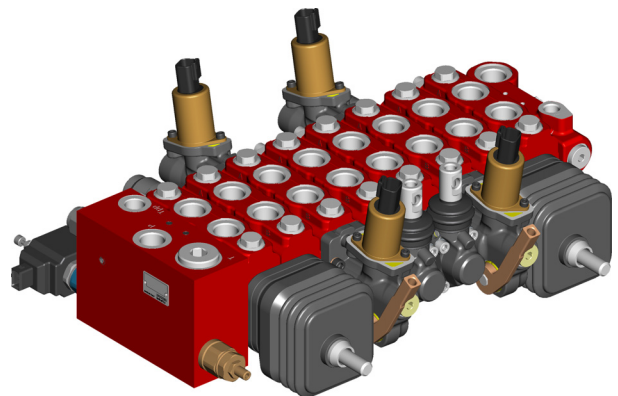
9.1 Wheel loader



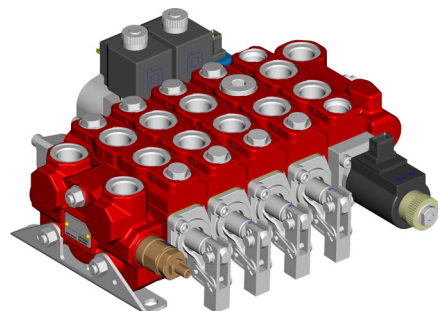
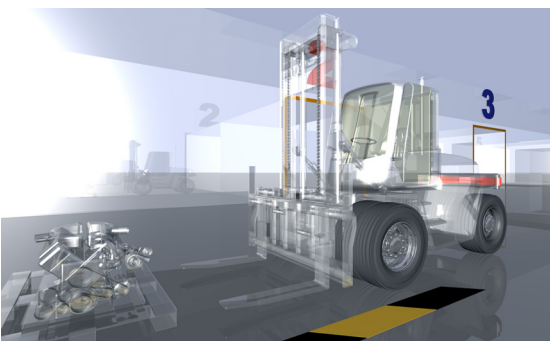
9.2 Tractors



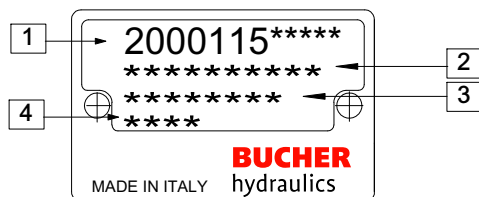
9.3 Forestry



9.4 Fork lift



10 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					
	2016	2017	2018	2019	2020	2021
January	6A	7A	8M	9M	0M	1M
February	6B	7B	8N	9N	0N	1N
March	6C	7C	8P	9P	0P	1P
April	6D	7D	8Q	9Q	0Q	1Q
May	6E	7E	8R	9R	0R	1R
June	6F	7F	8S	9S	0S	1S
July	6G	7G	8T	9T	0T	1T
August	6H	7H	8U	9U	0U	1U
September	6I	7I	8V	9V	0V	1V
October	6J	7J	8Z	9Z	0Z	1Z
November	6K	7K	8X	9X	0X	1X
December	6L	7L	8Y	9Y	0Y	1Y

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Classification: 430.300.000