

# MV99

LOAD SENSING VALVE



TECHNICAL CATALOGUE

A member of



**walvoil**  
FLUID POWER EMOTION

**1<sup>st</sup> edition MV99.07**

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*This catalogue shows the product in the most standard configurations.  
Please contact our Sales Dpt. for more detailed information or special requests.*

**WARNING!**

*All specifications of this catalogue refer to the standard product at this date.  
Walvoil, oriented to a continuous improvement, reserves the right to  
discontinue, modify or revise the specifications, without notice.*

**WALVOIL IS NOT RESPONSIBLE FOR ANY DAMAGE CAUSED BY AN  
INCORRECT USE OF THE PRODUCT.**

The proportional valve **MV99** has specifically been studied to equip lifting machinery; the Load Sensing system and the proportional electrohydraulic actuation allows for sensitive and accurate movement control.

Besides the inlet compensated version, now the fully compensated system is available: this resolves the difficulty of simultaneous movements, even with different loads on the ports.

Several different configurations give a solution to every application needs.

## APPLICATIONS

The valve is available with manual, hydraulic remote, pneumatic, electrohydraulic and electropneumatic controls.

Numerous configurations and solutions are possible.

Working sections have auxiliary valves and a broad range of interchangeable spools.

Larger sections are available to manage higher flows on tank line (Garbage compactors).

Suitable for applications including compactors, hook and skip loaders, wheel loaders and Refuse trucks.





## QUICK REFERENCE GUIDE

GENERAL SPECIFICATIONS	MV99
Working section number	1 - 10
<b>CIRCUIT</b>	
Spool stroke (mm)	7
Spool pitch (mm)	43
Dead band (mm)	1,5 + 1,5
<b>RATED FLOW</b>	
P/T Pump flow rate (l/min)	130
A/B port flow rate (l/min) (*)	100
<b>RATED PRESSURE</b>	
working pressure port P/A/B (bar)	420
<b>BACK PRESSURE MAX</b>	
Max pressure outlet port T (bar)	20

(\*) with fixed Pump inlet compensator

OPTION CHART	MV99
LS Signal pressure relief valve	•
Full Flow pressure relief valve	•
Pump dump valve (electric 12/24 Vdc)	•
<b>SPOOLS TYPE</b>	
Single acting	•
Double acting	•
Regenerative spool	(•)
<b>SPOOL ACTUATION</b>	
Hydraulic actuation	•
Mechanical lever actuation	•
Prop. electrohydraulic actuation 12-24 Vdc (*)	•
<b>SPOOL RETURN ACTION</b>	
Return spring	•
Hydraulic load limit	•
Electrical load limit	•
<b>PORT RELIEF VALVE</b>	
Direct operated antishock valve	•
Anticavitation valve	•
Pilot operated antishock and anticavitation valve	•
Plug	•

- = available
- (•) = available on request
- (\*) = we recommend to keep the T line for the electrohydraulic cartridges separate from the T line of the valve.



## GENERAL INDEX

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The specifications detailed in this catalogue show standard products. Special applications are available to order subject to contacting our Engineering Department for an estimate. The data and specifications indicated are to be considered a guide only and Hydrocontrol S.p.A. reserves the right to introduce improvements and modifications without prior notice. Hydrocontrol is not responsible for any damage caused by an incorrect use of the product.

**GENERAL SPECIFICATIONS****Standard working conditions**

Description	Value
Ambient operating temperature range	-40°C / +60°C
Kinematic viscosity range	10 ÷ 300 cSt
Max contamination level	9 (NAS 1638) - 20/18/15 (ISO 4406:1999)
Recommended filtration level	b10 > 75 (ISO 16889:2008)
Internal filter (on electroproportional valves pilot line)	30 µm

All information and diagrams in this catalogue refer to a mineral base oil VG46 at 50°C temperature (32 cSt kinematic viscosity)

**Fluid options**

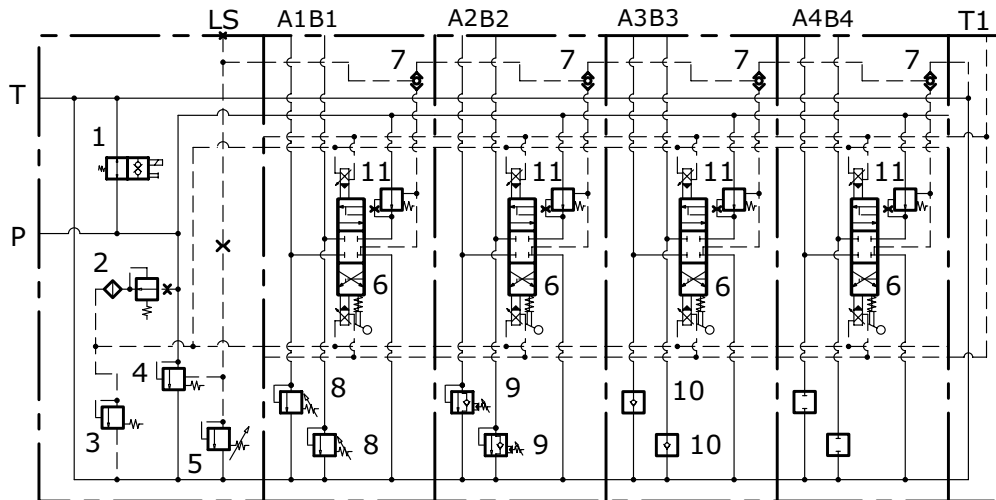
Types of fluid (according to ISO 6743/4) Oil and Solutions	Temperature (°C)		Compatible gasket
	min	max	
Mineral Oil HL, HM (or HLP acc. to DIN 51524)	-25	+80	NBR
Oil in water emulsions HFA	+5	+55	NBR
Water in oil emulsions HFB	+5	+55	NBR
Polyglycol-based aqueous solution HFC	-10	+60	NBR

For special applications and different fluids, please call our Technical Department.



HYDRAULIC SCHEMA

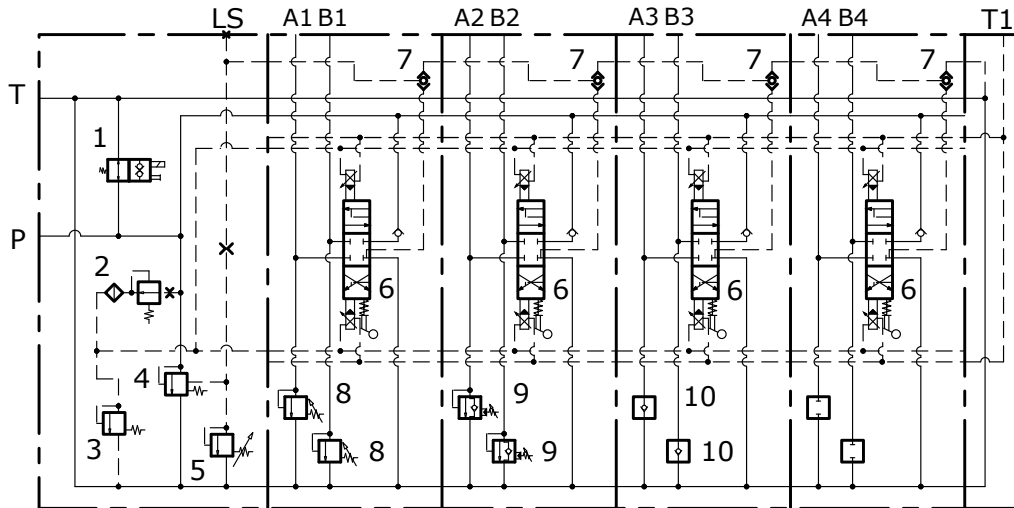
Compensated on work section valve



1. Electric operated dump valve
2. Pressure reducing valve with internal filter for electrohydraulic actuation
3. Relief valve for electrohydraulic actuation
4. Inlet pressure compensator
5. Main relief valve
6. Manual and electrohydraulic operated spool
7. L.S. selection valve
8. Antichock auxiliary valve
9. Pilot combined auxiliary valve
10. Anticavitation auxiliary valve
11. Work section pressure compensator



Compensated on inlet section valve



1. Electric operated dump valve
2. Pressure reducing valve with internal filter for electrohydraulic actuation
3. Relief valve for electrohydraulic actuation
4. Inlet pressure compensator
5. Main relief valve
6. Manual and electrohydraulic operated spool
7. L.S. selection valve
8. Antichock auxiliary valve
9. Pilot combined auxiliary valve
10. Anticavitation auxiliary valve





**ORDER EXAMPLE**

**MV99/1:** **ML 005 150 KV G05** **W001C AACC H404 F001 RD1 G04 05 PA 05 PB** **KZ3**

**TYPE:**

**MV99:** product type  
**/1:** working section number

**1) INLET ARRANGEMENT: p. 14**

**ML** Inlet side  
**005** Valve type  
**150** Setting (bar)  
**KV G05** Inlet body arrangement

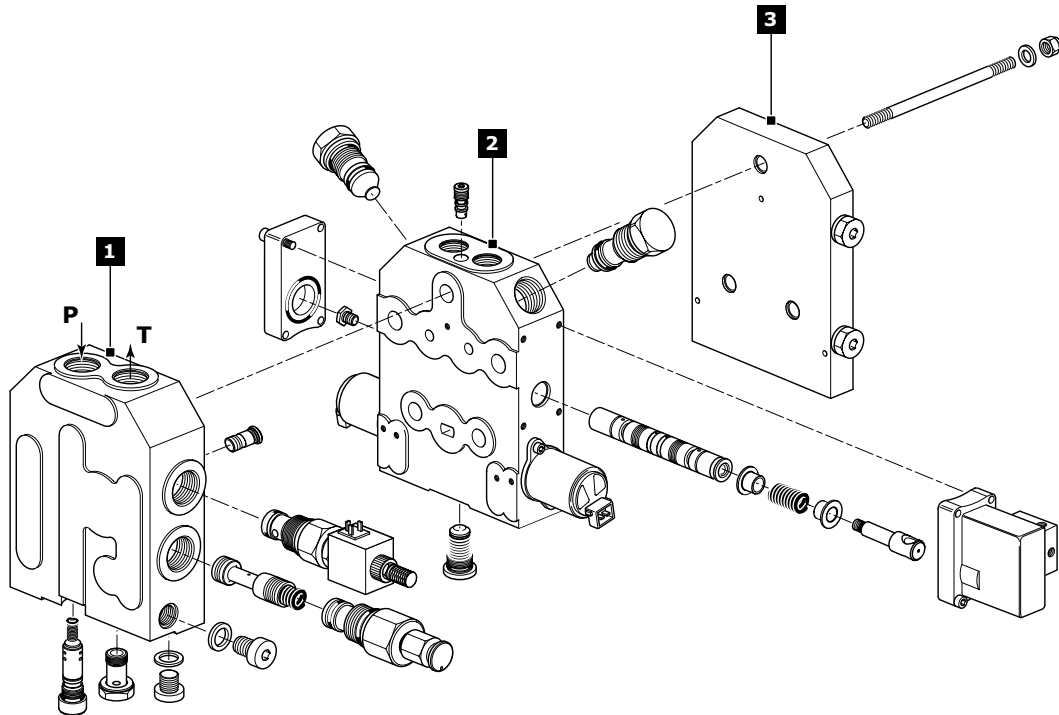
**2) WORK SECTION ARRANGEMENT: p. 21**

**W001C AACC** Spool delivery  
**H404** Spool actuation type  
**F001** Spool return action type  
**RD1 G04** Work section arrangement  
**05 PA** Auxiliary valve (port A)  
**05 PB** Auxiliary valve (port B)

**3) OUTLET ARRANGEMENT (END PLATE): p. 29**

**KZ3** Plate type

Ordering row 2 must be repeated for every work section



**Standard thread**

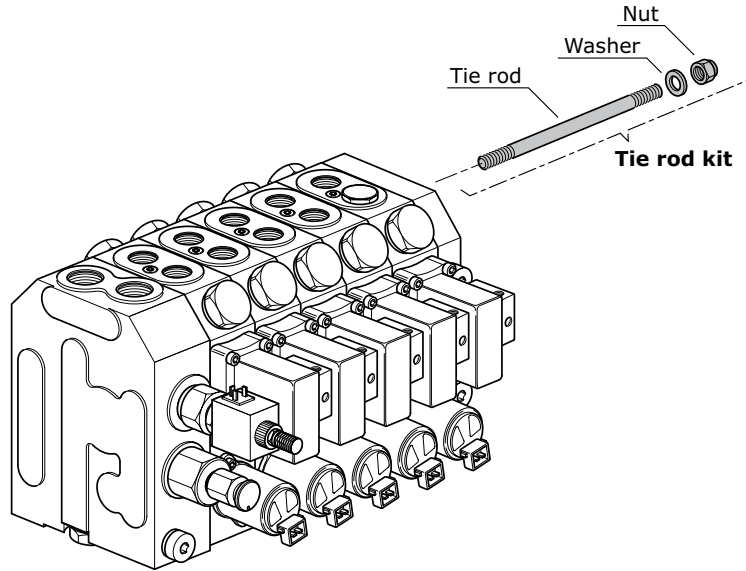
The connection ports size is indicated by an ordering code common for all Hydrocontrol products. Following table shows all available connections; for ordering code refer to table on page 40.

Ports	BSP (ISO - 228)	Code	UN-UNF (ISO - 725)	Code
<b>(P - T - HPCO)</b>	G 3/4	<b>G05</b>	1"1/16 - 12 UNF	<b>U05</b>
<b>(A - B)</b>	G 1/2	<b>G04</b>	7/8" - 14 UNF	<b>U04</b>



**Tie-rod kit classification**

Tie rod kit allows the correct assembly of sectional valves. Tie rod's length depends on the number of sections; each valve is assembled with tie rod kits including a tie rod, nut and washer. MV99 requires 3 tie-rod kits.



Tie rod kit	Order Code	Lenght (mm)	Clamping Torque (Nm)	Quantity
MV99/1	300155001	86	40	3
MV99/2	300155002	129		
MV99/3	300155003	172		
MV99/4	300155004	215		
MV99/5	300155005	258		
MV99/6	300155006	301		
MV99/7	300155007	344		
MV99/8	300155008	387		
MV99/9	300155009	430		
MV99/10	300155010	473		

**Painting**

On request, all Hydrocontrol valves can be delivered painted (RAL 9005 black primer).

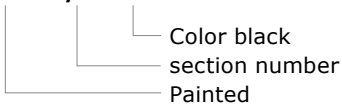
**Order example of MV99/1 painted:**

MV99/1  
 ML 005 150 KV G05  
 W001C AACC H404 F001 RD1 G04 05 PA 05 PB  
 KZ3

**P006/1 N10**

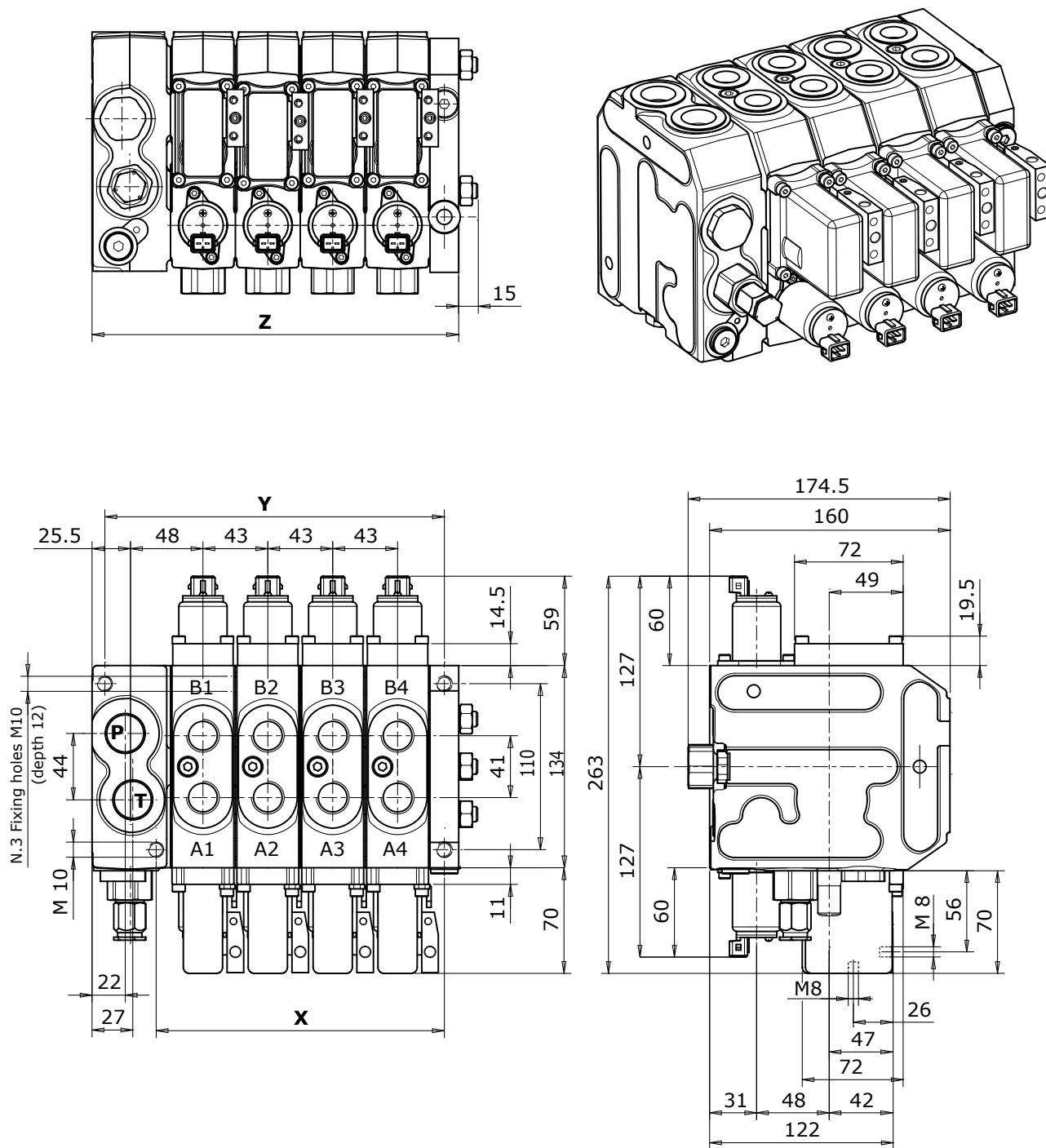
The painting is indicated with the following value:

**P006 - /1 - N10**





**DIMENSIONS**



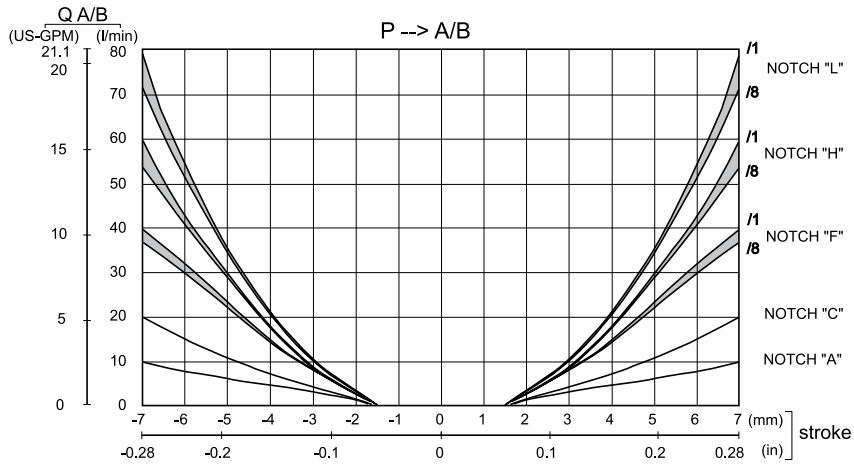
Type	/1	/2	/3	/4	/5	/6	/7	/8	/9	/10
X (mm)	62	105	148	191	234	277	320	363	406	449
Y (mm)	96	139	182	225	268	311	354	397	440	483
Weights (kg)	16,5	23	29,5	36	42,5	49	55,5	62	68,5	75



TYPICAL CURVES

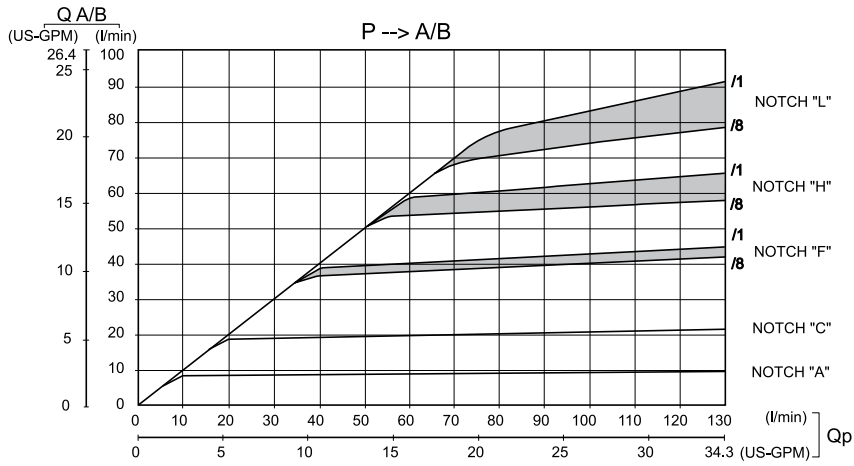
Compensated on inlet section valve

Flow on ports A and B (Q A/B) as function of spool stroke - Inlet flow  $Q_p = 100$  l/min



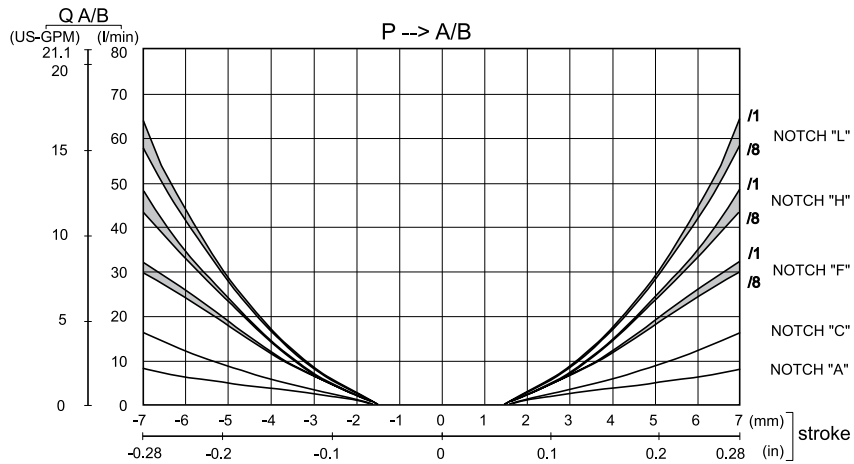
Compensated on inlet section valve

Flow on ports A and B (Q A/B) as function of inlet flow ( $Q_p$ )



Compensated on work section valve

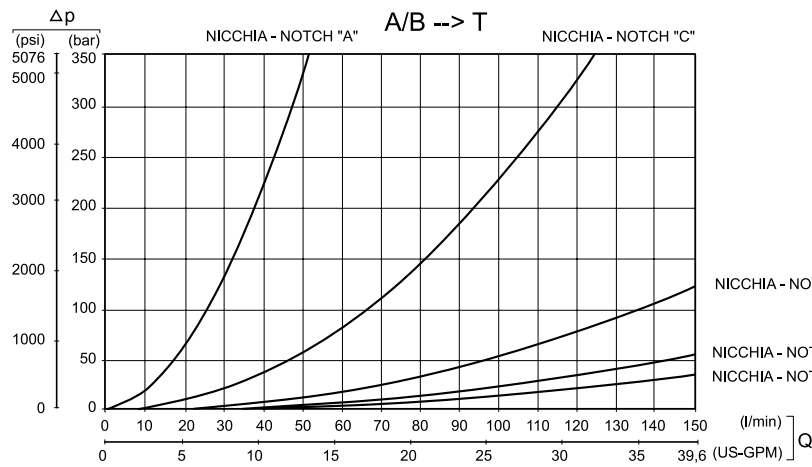
Flow on ports A and B (Q A/B) as function of spool stroke - Inlet flow  $Q_p = 100$  l/min





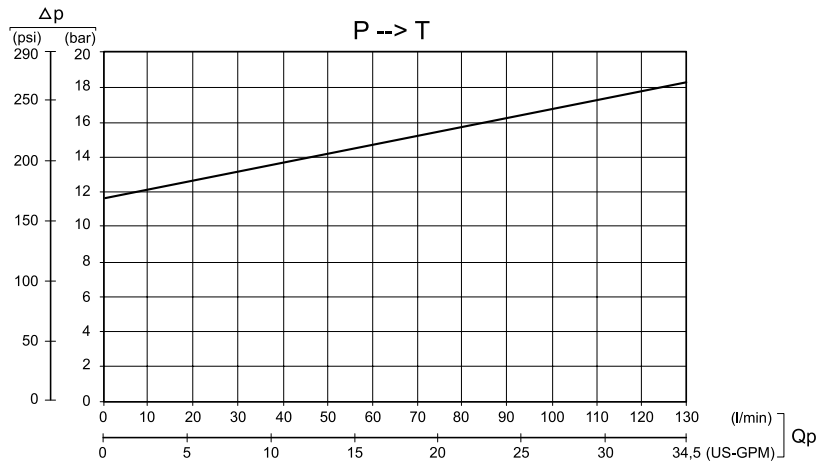
**Pressure drop**

Pressure drop (A/B in T) as function of spool. Spool at end of stroke



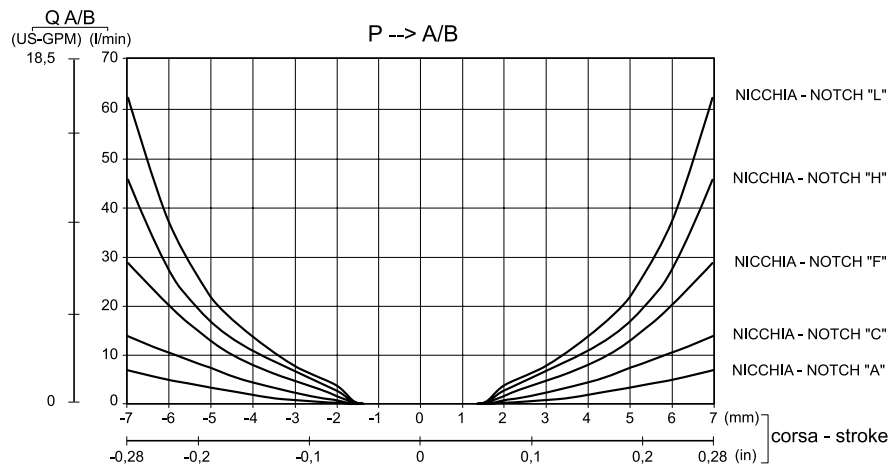
**Inlet section pressure compensator**

Pressure drop as function of inlet flow for open centre circuit



**Compensated on inlet section valve**

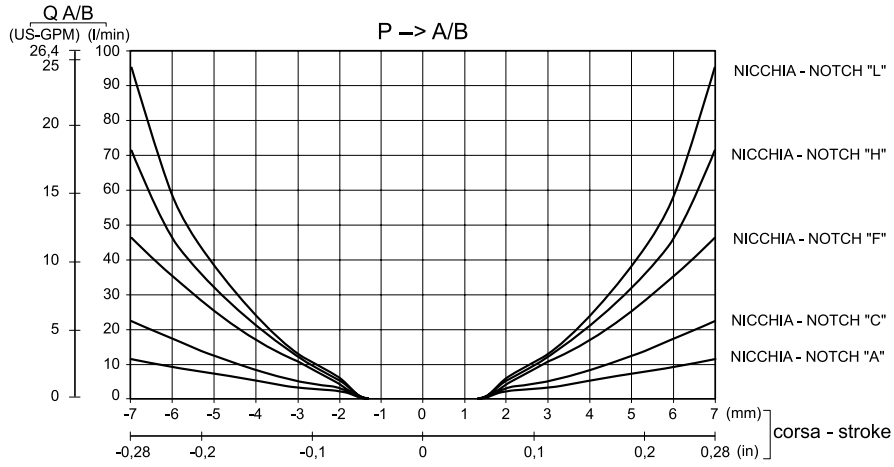
Flow on ports A and B ( $Q_{A/B}$ ) as function of spool stroke. Closed centre circuit with 10 bar set on variable pump.





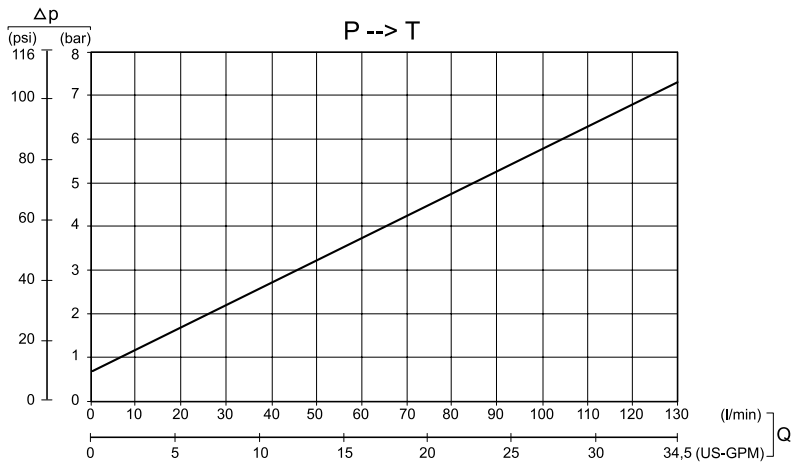
**Compensated on inlet section valve**

Flow on ports A and B (Q A/B) as function of spool stroke. Closed centre circuit with 20 bar set on variable pump.



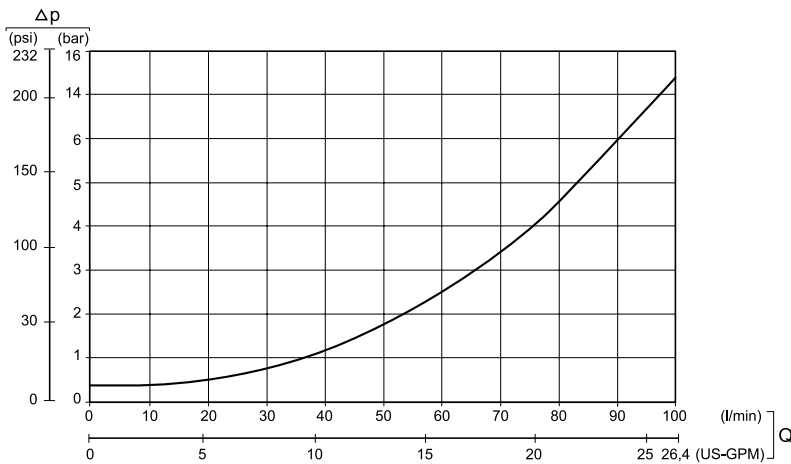
**Electric dump valve**

Pressure drop through open electric dump valve.



**Anticavitation valve**

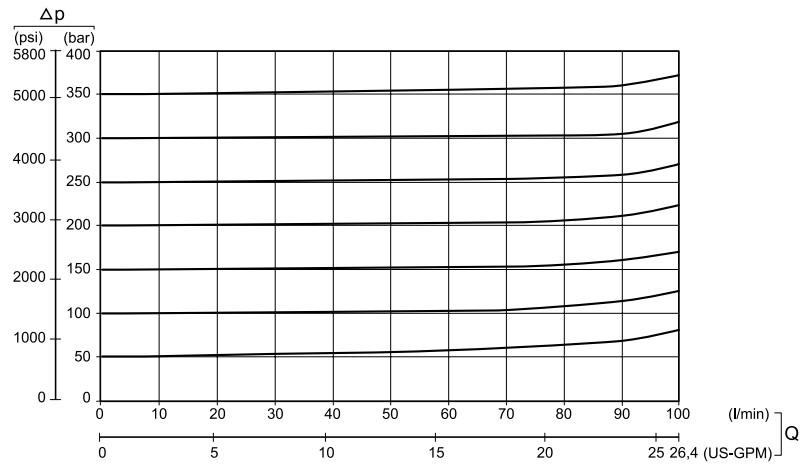
Opening and pressure drop characteristic.





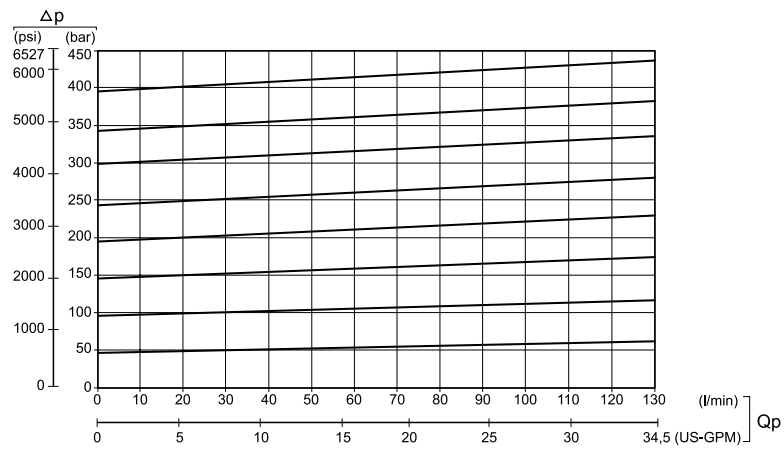
**Antishock valve**

Antishock auxiliary valve characteristic: setting at 15 l/min



**Main relief valve on LS signal**

Main relief valve on LS signal characteristic: setting at 15 l/min





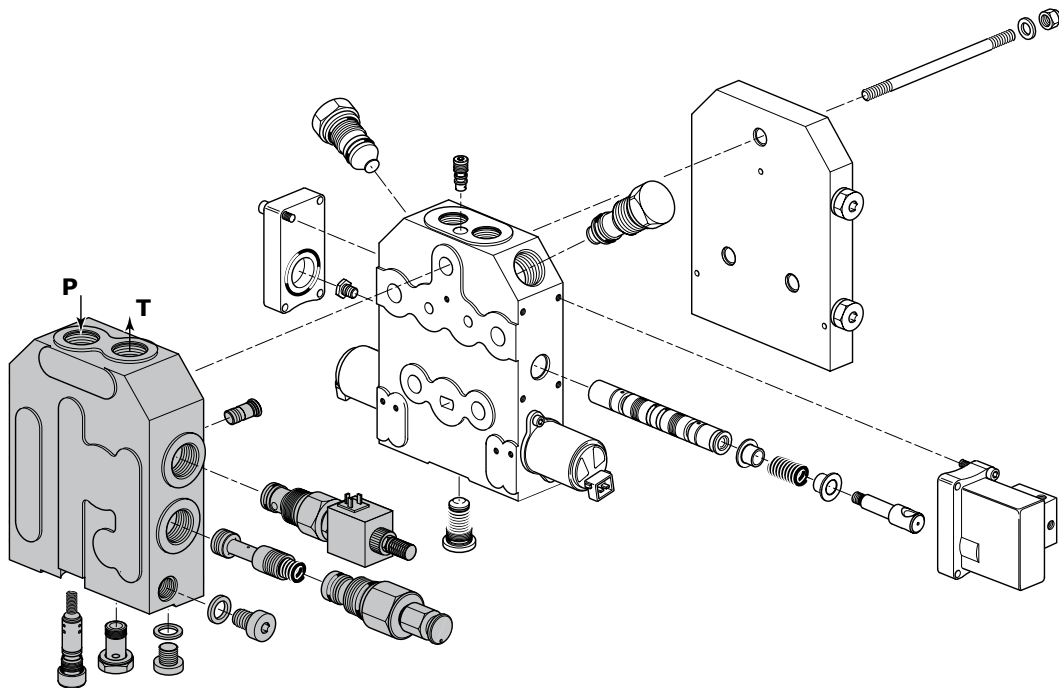
**INLET SECTION**

The inlet module includes the valve feed port P and tank port T in addition to an outlet for LS signal. It can be variously equipped with a 12 or 24 VDC electric operated dump valve, a main pressure relief valve, a pressure reducing valve to feed the proportional electro-hydraulic control (equipped with a 30 µm filter) and a pressure relief valve. The open center version for combination with fixed displacement pumps or the closed center version for variable displacement pumps are both available. In the first circumstance, the spool functions as a general pressure compensator for the Load Sensing system, whereas in the closed center version, it acts as a main stage for the main pressure relief valve.

**Order example**

<b>ML</b>	<b>005</b>	<b>150</b>	<b>KV G05</b>
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- 1. **ML** Inlet side
- 1. **005** valve arrangement
- 1. **150** setting (bar)
- 2. **KV G05** Inlet body classification



Rif.	Code	Description	Page
-	<b>MR</b>	Proportional valve with right inlet section	<b>15</b>
-	<b>ML</b>	Proportional valve with left inlet section	
<b>1</b>	<b>001</b>	Direct acting pressure relief valve on LS signal	<b>16</b>
	<b>004</b>	Direct acting pressure relief valve on LS signal and electric dump valve 12 vdc	
	<b>005</b>	Direct acting pressure relief valve on LS signal and electric dump valve 24 vdc	
	<b>019</b>	Without valves	
<b>2</b>	<b>KV G05</b>	Open centre inlet section for fixed displacement pumps (G 3/4)	<b>17</b>
	<b>JV G05</b>	Closed centre inlet section for variable displacement pumps (G 3/4)	
	<b>KV U05</b>	Open centre inlet section for fixed displacement pumps (1"1/16 - 12 UN)	
	<b>JV U05</b>	Closed centre inlet section for variable displacement pumps (1"1/16 - 12 UN)	

**NOTE:** when ordering a relief valve it is necessary to specify factory setting (example 150).

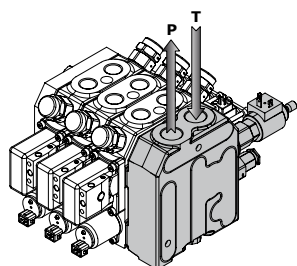




## Inlet side classification

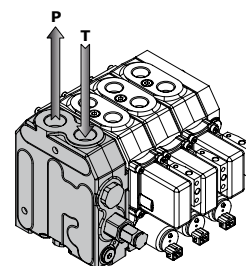
### MR

Proportional valve with **RIGHT INLET** section

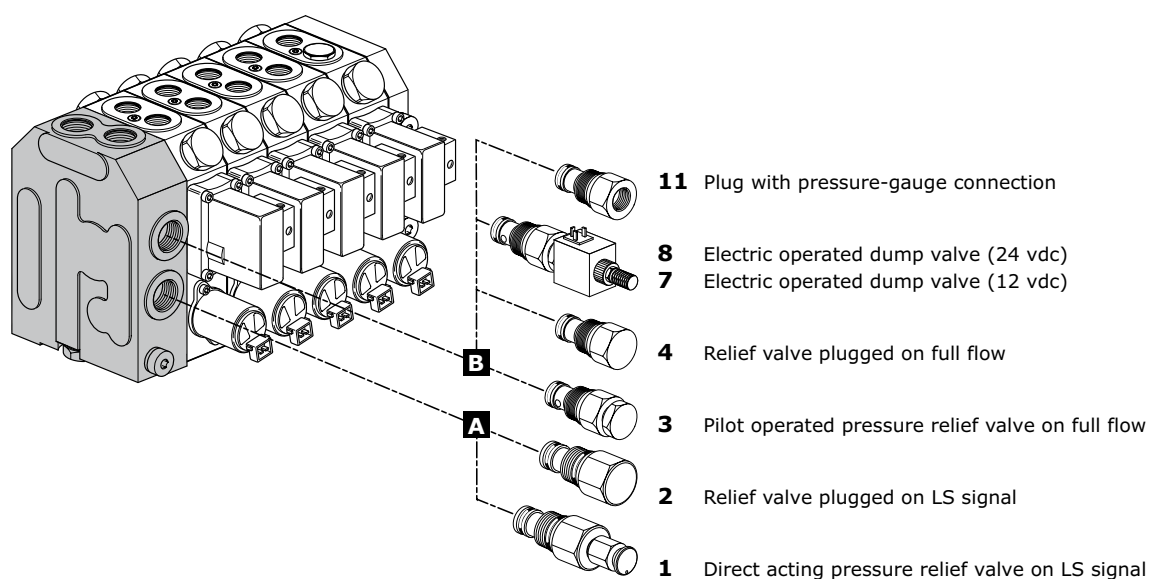


### ML

Proportional valve with **LEFT INLET** section



## Valve identification



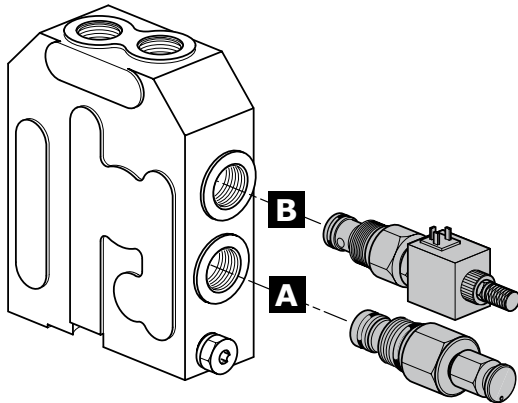
Type	Schema	Drawing	Description	Setting Range (bar)
<b>1</b>			Direct acting pressure relief valve on LS signal	50 - 200 201 - 420
<b>2</b>			Relief valve plugged on LS signal	
<b>3</b>			Pilot operated pressure relief valve on full flow	40 - 200 201 - 420
<b>4</b>			Relief valve plugged on full flow	
<b>7</b>			Electric operated dump valve (12 Vdc)	
<b>8</b>			Electric operated dump valve (24 Vdc)	
<b>11</b>			Plug with pressure-gauge connection	



Valve arrangement

Combination valve example: 005 = 1A - 8B

- 005 Combination valve
- 1A Relief valve in port A
- 8B Solenoid dump valve in port B



The code identifies:

with a number, the type of valve; with a letter its position on the inlet section.

NOTE: when ordering a main relief valve it is necessary to specify setting.

SETTING RANGE DIRECT ACTING RELIEF VALVE:

- A - 50/200 bar
- B - 201/420 bar

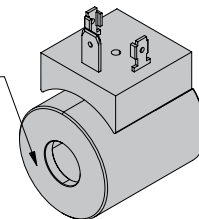
Available combinations on inlet section		Valve type on port B				
		3	4	7	8	11
Valve type on port A	1		001	004	005	008
	2	018	019	023	024	027

Dump valve coil specifications

GENERAL AND TECHNICAL SPECIFICATIONS		
Ordering code	413171235	413172432
Supply voltage (Vdc)	12	24
Coil resistance R <sub>20</sub> (Ω)	7	28
Connector	DIN 43650 / ISO 4400	
Connector material	Nylon	
Coil Body	Zinc plated steel	
ED 100%		
Class H coil as from IEC 85 standard		
Class H wire (200°C)		

NOTE: different connector available on request

- Coil - 12 Vdc = 413171235
- Coil - 24 Vdc = 413172432





**Inlet body classification**

Inlet combination and thread available	
<b>KV G05</b>	
<b>KV U05</b>	
<b>KV03 G05</b>	

**Open centre  
inlet section**  
for fixed  
displacement pumps

The inlet section with KV configuration enables control valve usage with fixed displacement pumps. When fully equipped, a 12 or 24 VDC electric operated dump valve (1) is used to act on full inlet flow rate and serves as a safety device. Load Sensing flow rate control is achieved by the pressure compensator (4), which keeps a pressure drop constant through the spool control notches by comparing the LS signal and feed pressure. In its standard version, the main relief valve (5) acts on the LS signal. The pressure reducing valve (2), equipped with a 30 µm filter and a relief valve (3), feeds the proportional electro-hydraulic section controls.

<b>JV G05</b>	
<b>JV U05</b>	
<b>JV03 G05</b>	

**Closed centre  
inlet section**  
for variable  
displacement pumps

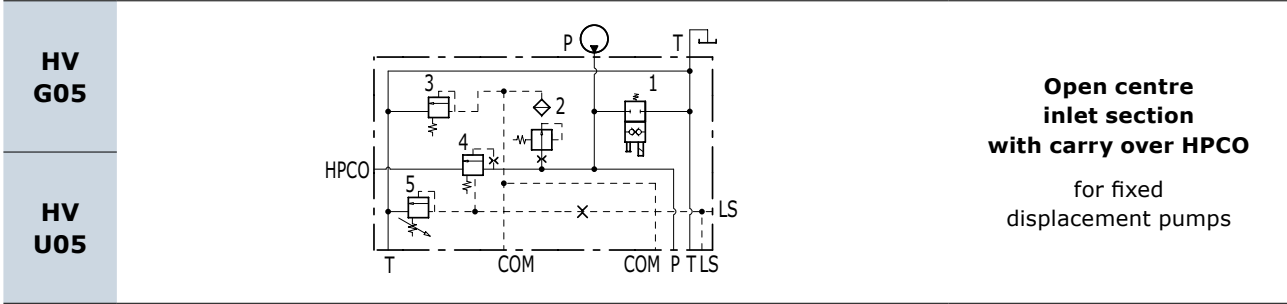
The inlet section with JV configuration enables control valve usage with variable displacement pumps. The piloting signal of the pump displacement controller can be drawn from the LS outlet. The 12 or 24 VDC electric operated dump valve (1) acts on full flow rate and serves as a safety device. In this case, the main relief valve (5) acts on a piloting line and serves as a pilot stage for the main stage (4), disposing of the entire flow rate. The pressure reducing valve (2) ensures that the relative 30 µm filter and the relief valve feed the sections proportional electro-hydraulic controls.

**NOTE:**

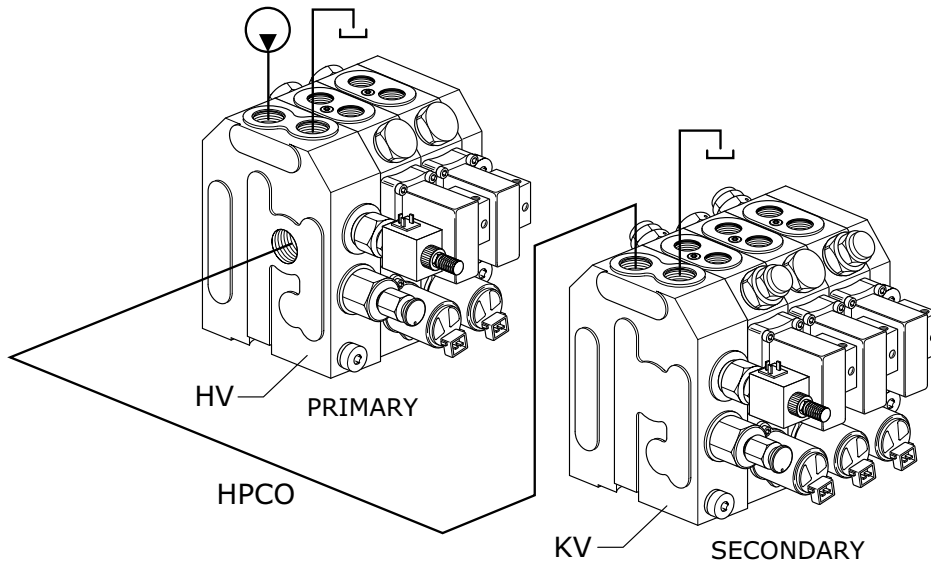
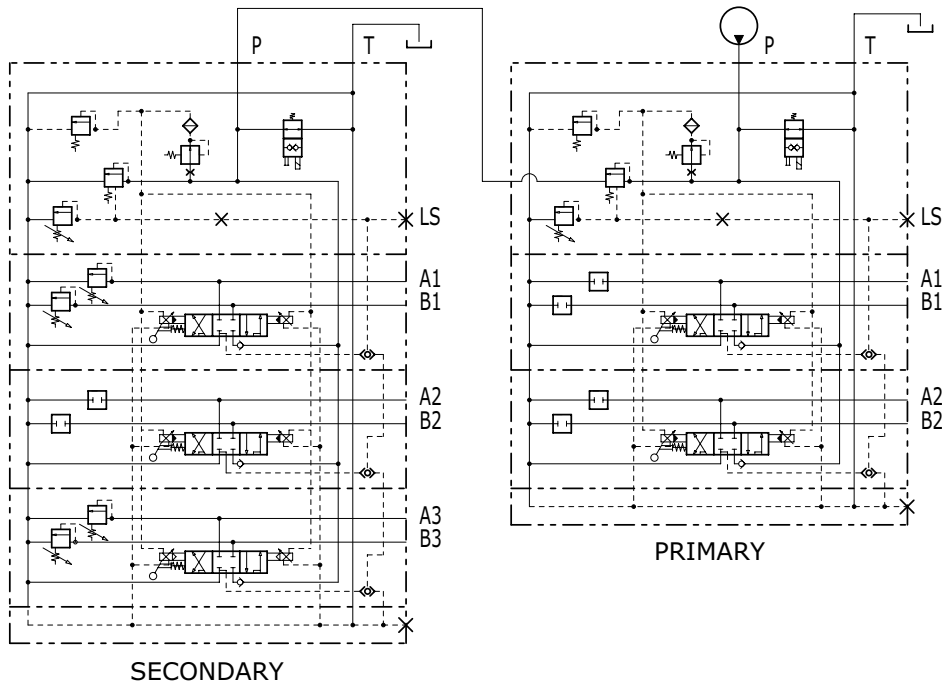
transformation of the inlet section from closed center to open center and vice versa is possible by ordering the appropriate kit 320055005 or 320055021 (see page 20)



Sample of carry-over special circuit (HV type)



The special HV inlet module section achieving a special carry-over connection between two MV99 control valves which is extremely useful as only two connection tubes are used between the two control valves. This application is only suitable for systems with fixed displacement pumps. Flow rate goes through the first control valve, with HV inlet configurations, then proceeds from HPCO outlet to the second control valve with KV inlet configuration; the second control valve is fed by the unused flow rate of the first one. Available also for this version are: the 12 or 24 VDC electric operated dump valve (1), the main relief valve (5) and the pressure reducing valve (2) with 30 µm filter and relief valve (3).





Complete configuration samples for inlet section

ordering code: **MR 004 (180) JV G05**

hydraulic diagram	description
	<p>Right inlet section</p> <p>Arranged with electric operated dump valve (12 VDC) and direct acting relief valve on LS signal (setting 180 BAR)</p> <p>“JV” type for variable pump</p> <p>3/4” BSP thread</p>

ordering code: **ML 001 (130) KV G05**

hydraulic diagram	description
	<p>Left inlet section</p> <p>Arranged with plug and direct acting relief valve LSsignal(setting 130 bar)</p> <p>“KV” type for fixed pump</p> <p>3/4 ” BSP thread</p>

ordering code: **MR 018 (210) JV U05**

hydraulic diagram	description
	<p>Right inlet section</p> <p>Arranged with plug and pilot operated relief valve on full flow (setting 210 BAR)</p> <p>“JV” type for variable pump</p> <p>1”1/16-12 UN thread</p>

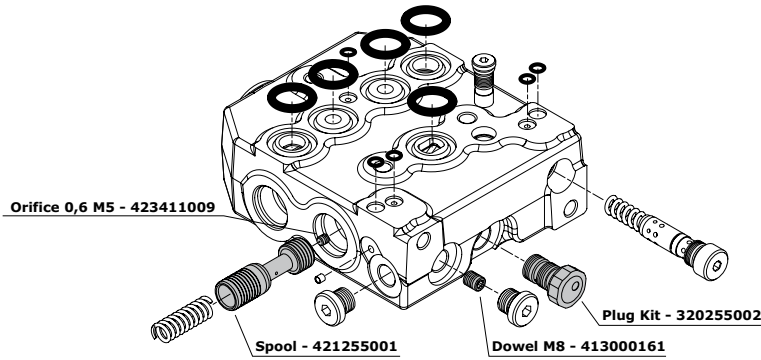
ordering code: **ML 023 HV G05**

hydraulic diagram	description
	<p>Left inlet section</p> <p>Arranged with plug and electric operated dump valve 12 VDC</p> <p>“HV” type for fixed pump and special carry-over</p> <p>3/4” BSP thread</p>



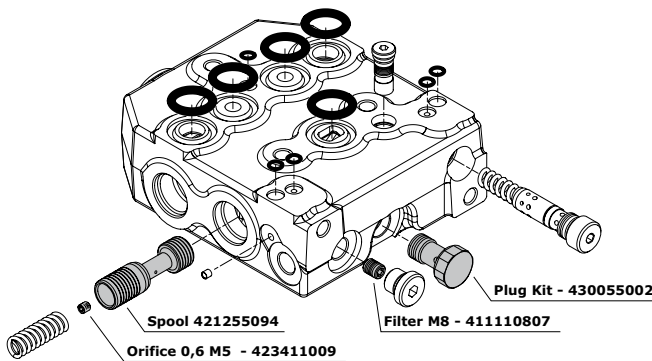
Trasformation kits

Transformation on the inlet section from open center to closed center is possible by ordering the complete kit code: **320055005 (transformation kit from KV/HV to JV)**



OPEN CENTER CONFIGURATION (KV-HV) FIXED PUMP		
order code	Description	Q.ty
421255001	Spool	1
423411009	Orifice 0,6 M5	1
413000161	Dowel M8	1
320255002	Plug kit	1
<b>Complete transformation kit: order code - 320055005</b>		

Transformation on the inlet section from closed center to open center is possible by ordering the complete kit code: **320055021 (transformation kit from JV to KV/HV)**



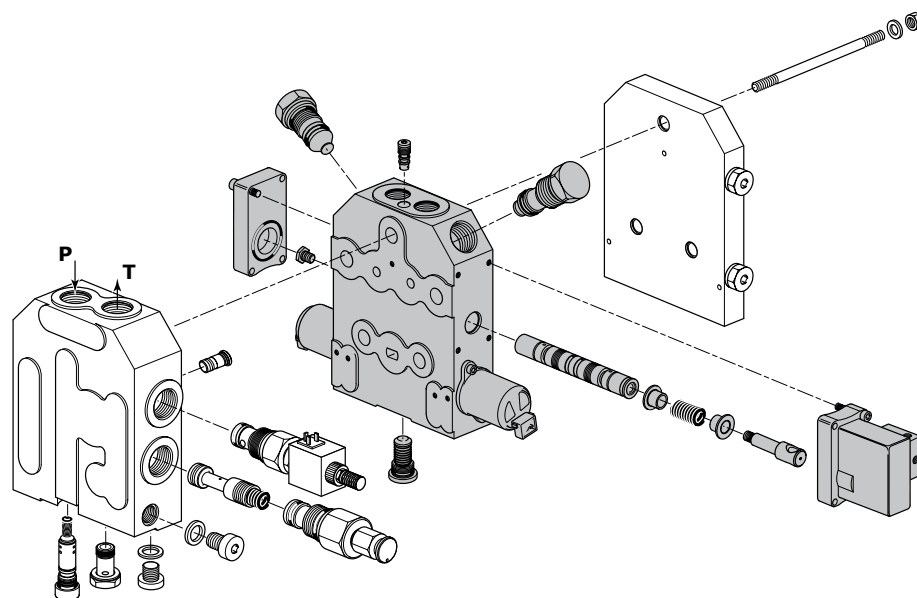
OPEN CENTER CONFIGURATION (JV) VARIABLE PUMP		
order code	Description	Q.ty
421255094	Spool	1
423411009	Orifice 0,6 M5	1
411110807	M8 Filter	1
430055002	Plug kit	1
<b>Complete transformation kit: order code - 320055021</b>		



**WORKING SECTION**

**Order example:**

		<b>W001C AACC</b>	<b>H404</b>	<b>F001</b>	<b>RD1 G04</b>	<b>05 PA</b>	<b>05 PB</b>
1.	<b>W001C</b>	spool type					
2.	<b>AACC</b>	spool flow					
3.	<b>H404</b>	spool actuation type					
4.	<b>F001</b>	spool return action type					
5.	<b>RD1 G04</b>	section type					
6.	<b>05 PA</b>	auxiliary valve type (port A)					
7.	<b>05 PB</b>	auxiliary valve type (port B)					



Rif.	Code	Description	Page
1	<b>W001C</b>	3 positions double-acting	22
	<b>W002C</b>	3 positions double-acting A-B to tank	
2	<b>AACC</b>	Spool flow (see tables page 21)	23
3	<b>H401</b>	Lever actuation	24
	<b>H403</b>	Lever + hydraulic actuation	
	<b>H404</b>	Lever + electrohydraulic actuation 12 vdc	
	<b>H405</b>	Lever + electrohydraulic actuation 24 vdc	
4	<b>F001</b>	3 positions spring-centred spool	25
	<b>F024</b>	Load limit in A and B	
	<b>F0360</b>	Directional load limit kit	
5	<b>RD1 G04</b>	Not Compensated section with auxiliary valve (G 1/2)	27
	<b>RD2 G04</b>	Not Compensated section without auxiliary valve (G 1/2)	
	<b>RC1 G04</b>	Compensated section with auxiliary valve (G 1/2)	
	<b>RC2 G04</b>	Compensated section without auxiliary valve (G 1/2)	
6	<b>01 PA</b>	Antishock valve (port A)	28
	<b>05 PA</b>	Prearrangement for auxiliary valve (port A)	
7	<b>01 PB</b>	Antishock valve (port B)	28
	<b>05 PB</b>	Prearrangement for auxiliary valve (port B)	

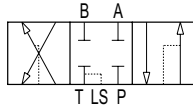
- Sections designed to house auxiliary valve option require double choice on work ports A and port B.  
 - Always indicate setting value when using antishock and pilot combined valve: 01 PA (120) - 04 PA (120)



Spool identification

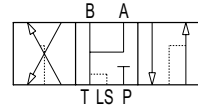
W001C

3 positions double-acting



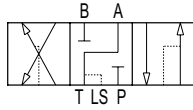
W002C

3 positions double-acting  
A and B to tank



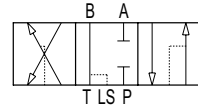
W003C

3 positions double-acting  
A to tank B blocked



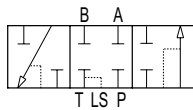
W004C

3 positions double-acting  
A blocked B to tank



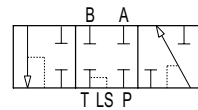
W005C

3 positions  
single-acting on A



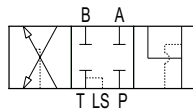
W006C

3 positions  
single-acting on B



W013C

3 positions double-acting  
regenerative



NOTE:

W013 spools need a special machining on the valve body.

Float spools are also available under specific application conditions: please ask for further informations.

Float spools need special detent kit (F008) and special machining on the valve body.

spools with restricted service ports

code	circuit	restriction on diameter (mm)	section (mm <sup>2</sup> )	hydraulic schema
J10	A-B IN T	0,10	2,82	
K10	A IN T	0,10	2,82	
Y10	B IN T	0,10	2,82	

Order example

W001C J10

W001C 3 positions double-acting \_\_\_\_\_

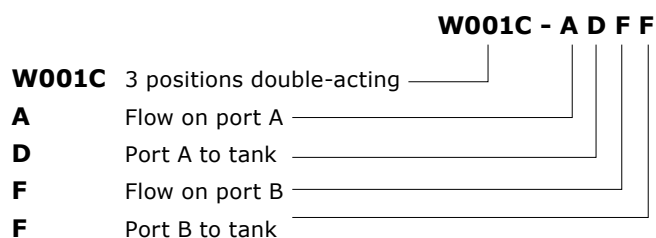
J10 restriction on diameter (0,10 mm in A and B) \_\_\_\_\_





### Spool flow

Flow rates delivered to the A, B ports and the return control characteristics of the spools are identified by a four letter abbreviation as explained below:



Spools are defined as standard when delivery and return flow rates are the same for each single port (ex. AADD, AAFF, AAI).

The correct definition of delivered flow rates can be established via the following table where different notch types are indicated. Following table shows possible flows for ports A and B: flows are different depending on the type of section (compensated or not compensated): data are valid considering 100 l/min inlet flow and fixed pump configuration.

NOTCH TYPE (l/min)	Z	A	D	F	I	N
<b>not-compensated section (RD)</b>	6	10	25	40	70	95
<b>compensated section (RC)</b>	4	8	16	26	50	70

For complete simmetric spools (ex. AAAA, BBBB, CCCC), following flow rates are also available:

NOTCH TYPE (l/min)	B	C	E	G	H	L	M
<b>not-compensated section (RD)</b>	15	20	30	50	60	80	90
<b>compensated section (RC)</b>	11	14	20	34	45	60	68

### Special spool flow

Special spools for high flow rate are also available:

Special spool code	Hydraulic schema	Description	RD (l/min)	RC (l/min)
<b>WSP006</b>		High flow 3 positions double-acting	110	90
<b>WSP013</b>		High flow 3 positions double-acting A and B to tank		

On compensated sections flow rates can be additionally increased about 15% by means of special compensator kit **RC4-RC5** (see page 27).



Spool actuation classification

code	description	dimensions	configuration
<b>H401</b>	Lever actuation		
<b>H402</b>	Lever actuation arranged for electrohydraulic proportional actuation		
<b>H403</b>	Lever actuation + hydraulic actuation		
<b>H404</b>	Lever actuation + electrohydraulic actuation (12 vdc)		
<b>H405</b>	Lever actuation + electrohydraulic actuation (24 vdc)		
<b>H406</b>	Without lever + hydraulic actuation		
<b>H407</b>	Without lever + electrohydraulic actuation (12 vdc)		
<b>H408</b>	Without lever + electrohydraulic actuation (24 vdc)		
<b>H424</b>	lever + hydraulic actuation electrohydraulic actuation (12 vdc)		
<b>H425</b>	lever + hydraulic actuation electrohydraulic actuation (24 vdc)		



**Spool return action classification**

code	description	dimensions	configuration
<b>F001</b>	3 position spring centered spool		
<b>F0710</b>	3 position spring centered spool (only for H424=H425)		
<b>F024</b>	Load limit in A and B X in A1: it inhibits flow on port A X in B1: it inhibits flow on port B P max = 350 bar 		
<b>F026</b>	Load limit in A X in A1: it inhibits flow on port A P max = 350 bar 		
<b>F028</b>	Load limit in B X in B1: it inhibits flow on port B P max = 350 bar 		

**NOTE:**

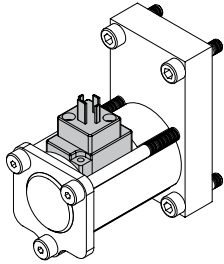
Detent kit (F008) for Float spools are also available under specific application conditions: please ask for further informations.



**Special spools return action with hall effect Linear Position Sensor HLPS2**

HLPS is a Hall effect sensor based device used in conjunction with spool position transducer kits available for MV99. HLPS is based on a state of the art programmable Hall effect sensor device; after the final assembly of the valve a computer assisted calibration procedure is performed that compensates for mechanical inaccuracies and uncertainties allowing to attain high accuracy and linearity in spool position detection. Spool position is output as an analog voltage signal in the 0.5 - 4.5V range. The unit works in 12V and 24V environments and is protected against load-dump and other major electrical faults. Fault signalling is carried out through the output signal. HLPS with the companion mechanical kit is therefore applicable in spool loopback control applications and whenever determining spool position reliably is, as in safety functions, a major concern.



code	description	configuration
<b>F0470</b>	Spool position indicator	

**Technical specifications**

<p><b>Electrical</b></p> <p>Operating voltage</p> <p>Max current consumption</p> <p><b>Output</b></p> <p>Output voltage spanning</p> <p>Quiescent voltage</p> <p>Output current</p> <p>Minimum output load resistance</p> <p>Overall accuracy</p> <p>Resolution</p> <p>Fault signalling levels</p> <p>Protections</p> <p>EM Immunity</p> <p><b>Mechanical, Environmental</b></p> <p>Operating temperature</p> <p>Ingress Protection Rating</p> <p>Dimensions</p> <p><b>Connections</b></p> <p>I/O</p> <p>PIN 1</p> <p>PIN 2</p> <p>PIN 3</p> <p>PIN 4</p> <p><b>Applied Standards</b></p> <p>Immunity for industrial environments</p> <p>Emission standard for residential commercial and light-industrial environments</p> <p>EMC - Agricultural and forestry machines</p> <p>EMC - Earth-moving machinery</p>	<p>6 - 30 Vdc</p> <p>20.5 mA</p> <p>0.5 - 4.5 Vdc</p> <p>2.5 Vdc</p> <p>-1 - +1 mA</p> <p>4.5 kOhm</p> <p>± 2.5%</p> <p>12 bit</p> <p>4.8V &lt; Vout &lt; 0.2 Vdc</p> <p>short circuit protection, reverse, battery protection, thermal shutdown, overvoltage, undervoltage, load-dump &gt; 60 Vdc/m</p> <p>-40 / +85 °C</p> <p>IP 65</p> <p>28 x 18 x 23 mm (L x W x H)</p> <p>DIN 43650-C male</p> <p>Vout</p> <p>Vcc</p> <p>OV</p> <p>Chassis (connected to valve body)</p> <p>EN 61000-6-2</p> <p>EN 61000-6-3</p> <p>EN 14982</p> <p>ISO 13766</p>
-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------



**Work section identification**

not compensated section		
RD1 G04		<p><b>Not compensated section</b> arranged for auxiliary valves</p>
RD1 U04		
RD2 G04		<p><b>Not compensated section</b> without auxiliary valves</p>
RD2 U04		


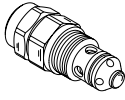

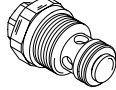

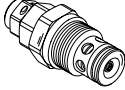

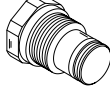
A spool with ample flow ranges, differentiated on ports A and B if required, is used for each work section. Spool actuation can be manual, hydraulic or proportional electro-hydraulic. The selector valve, which appears on all sections, selects the highest LS signal and transmits it to the inlet module in the event of simultaneous section operation. The A and B ports can also both be equipped with an auxiliary valve which can be of antishock, anticavitation or combined type, according to requirements. When using not compensated sections, the Load Sensing principle (flow rate control is entirely free from load variations) is guaranteed for each work section only when operated individually. If two or more sections are operated simultaneously, only the one with the highest load will keep its flow rate constant against load changes.


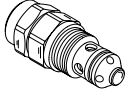

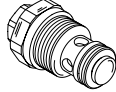

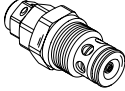

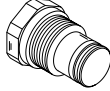
compensated section		
RC1 G04		<p><b>Compensated section</b> arranged for auxiliary valves</p>
RC1 U04		
RC5 G04		<p><b>Compensated section for high flow rate</b> arranged for auxiliary valves  (include special compensator kit code: 320255008 to increase 15% spool flow)</p>
RC5 U04		
RC2 G04		<p><b>Compensated section</b> without auxiliary valves</p>
RC2 U04		
RC4 G04		<p><b>Compensated section for high flow rate</b> without auxiliary valves  (include special compensator kit code: 320255008 to increase 15% spool flow)</p>
RC4 U04		

The technical specifications of each non compensated section can be directly transferred to compensated ones. A local pressure compensator spool is also provided. In addition to guaranteeing constant flow rate against load changes as in the previous case, compensated sections also ensure this function during contemporary operation of two or more spools. This solution exploits this highly developed Load Sensing system and frees each function from external disturbances.



## Auxiliary valve identification

code	description	schema	configuration	setting range (bar)	
01 PA	Antishock valve (port A)			A	50 / 200
				B	201 / 420
02 PA	Anticavitation valve (port A)				
04 PA	Pilot operated combined valve (port A)			A	50 / 420
05 PA	Prearrangement for auxiliary valve (port A)				

code	description	schema	configuration	setting range (bar)	
01 PB	Antishock valve (port B)			A	50 / 200
				B	201 / 420
02 PB	Anticavitation valve (port B)				
04 PB	Pilot operated combined valve (port B)			A	50 / 420
05 PB	Prearrangement for auxiliary valve (port B)				

## Auxiliary valve - Setting range

Sections designed to house auxiliary valve option require double choice on work ports A and B.

Always indicate setting value when using antishock valve:

**01PA (120) = setting at full flow**

**01PA (120-A) = setting at min. flow**



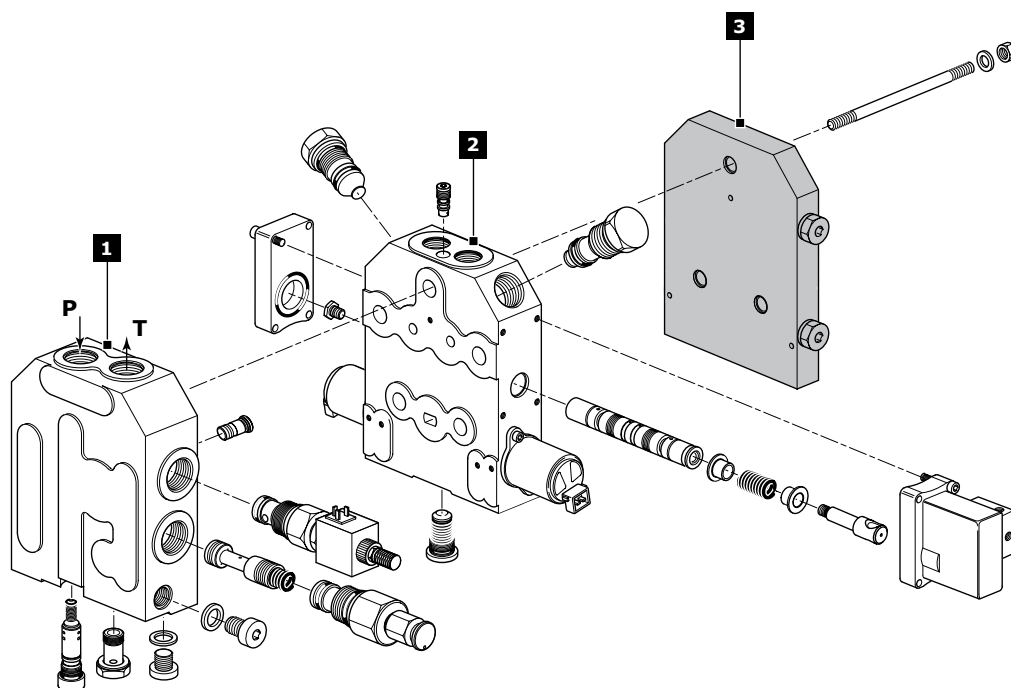
**OUTLET SECTION (END PLATE)**

The standard end plate version includes the drainage for LS signal. If proportional electrovalves are used, their drainages taken from port T1. Special plates are also available for HPCO connection between two MV99 control valves.

**Order example**

**KZ20EH**

1. **KZ20EH** Outlet section type \_\_\_\_\_



Rif.	Code	Description	Page
1	<b>KZ3</b>	End plate with T1 port plugged	30
	<b>KZ4</b>	End plate with separated proportional electrovalves tank line (port T1)	
	<b>KZ5</b>	End plate with T1 port plugged (HPCO version)	
	<b>KZ6</b>	End plate with separated proportional electrovalves tank line (port T1) (HPCO version)	



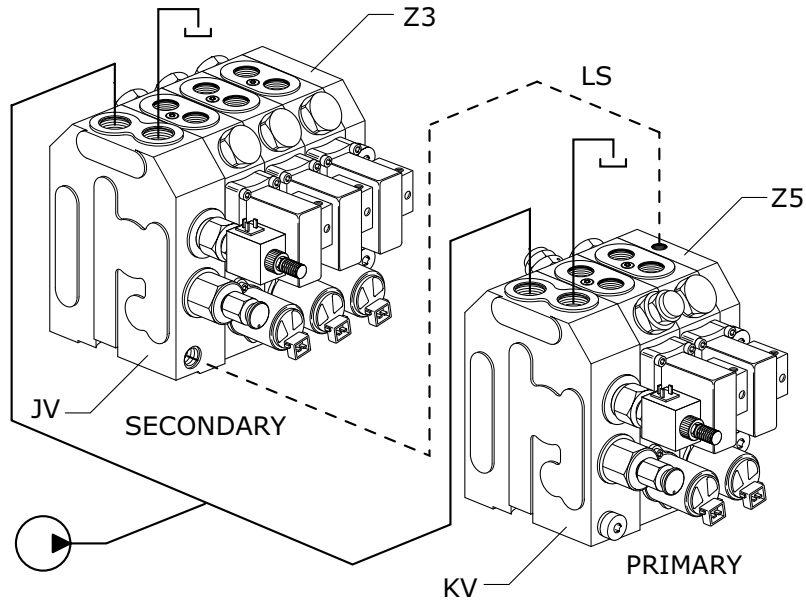
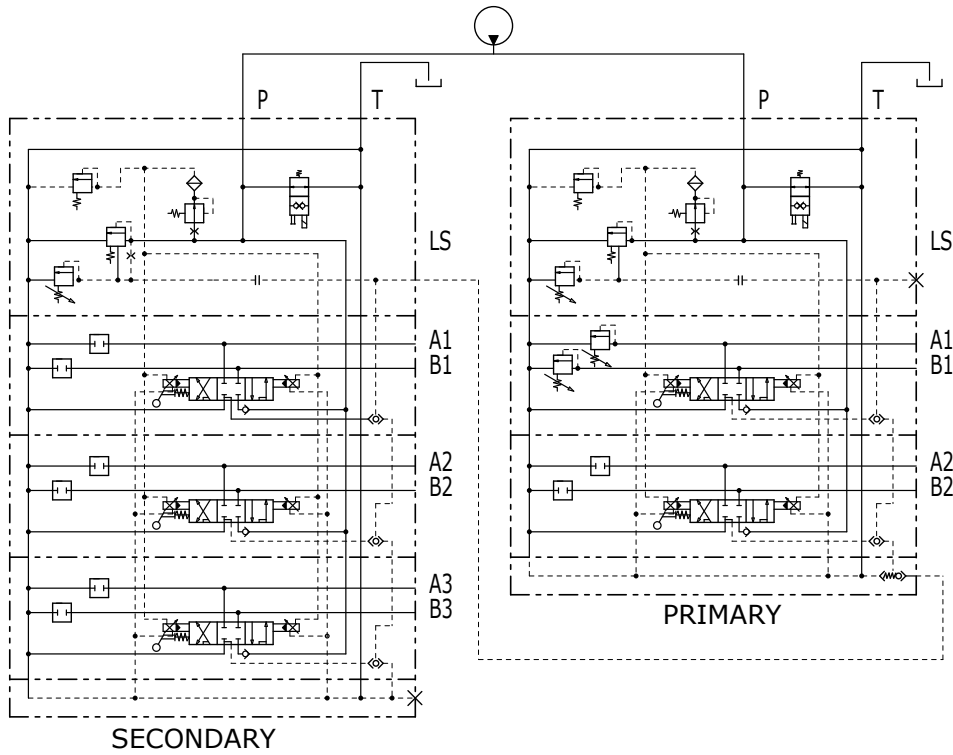
STANDARD VERSION		
code	configuration	description
KZ3		<p><b>End plate with T1 port plugged</b></p> <p>to be used with: H401-H403-H406</p>
KZ4		<p><b>End plate with separated proportional electrovalves tank line (port T1)</b></p> <p>to be used with: H402 H404 H405 H407 H408 H424 H425</p>

SPECIAL VERSION (HPCO)		
code	configuration	description
KZ5		<p><b>End plate with T1 port plugged (HPCO version)</b></p> <p>to be used with: H401 H403 H406</p>
KZ6		<p><b>End plate with separated proportional electrovalves tank line (port T1) HPCO version</b></p> <p>to be used with: H402 H404 H405 H407 H408 H424 H425</p>



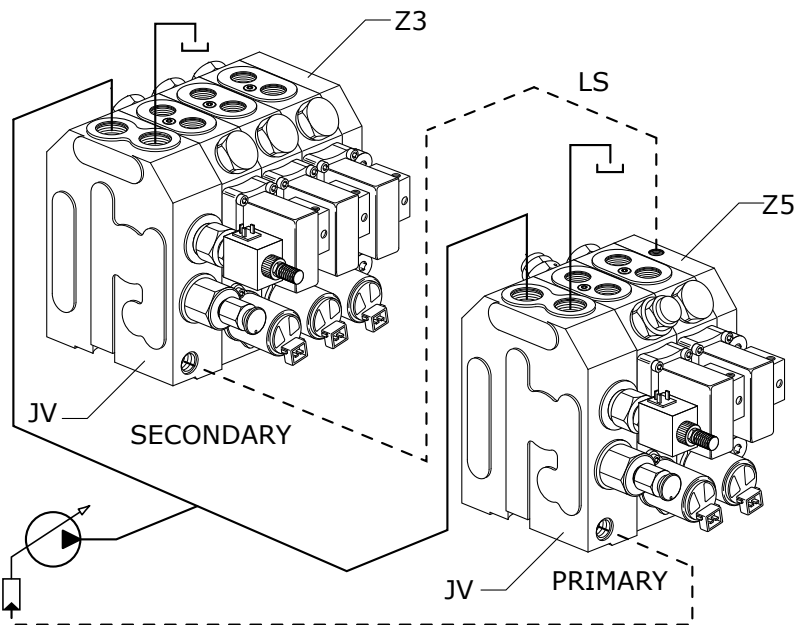
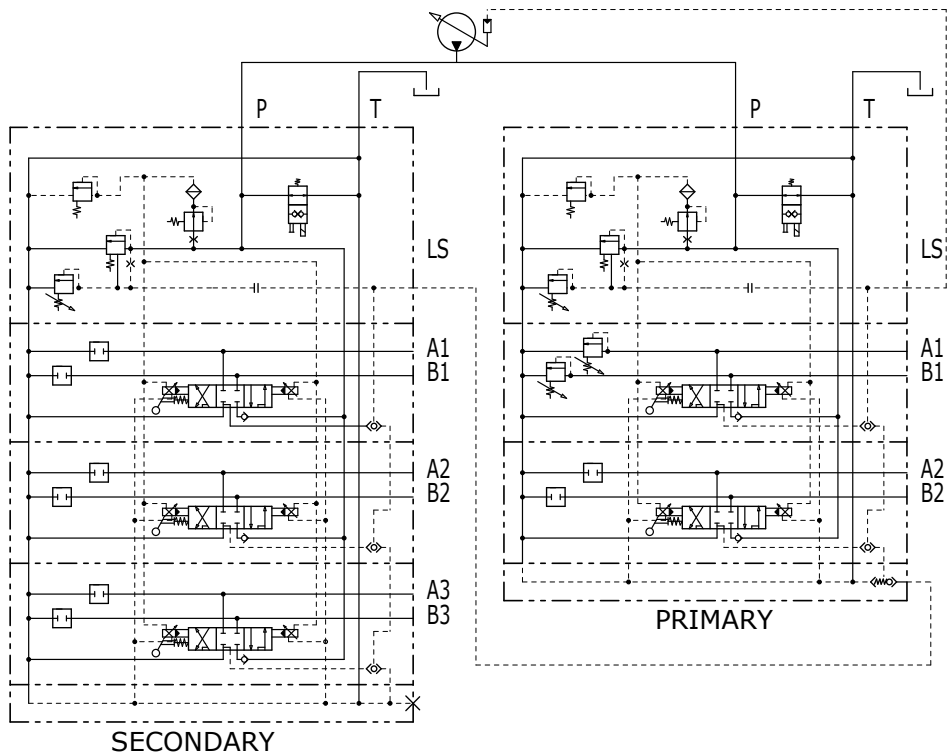


**Sample of end plate (with fixed displacement pump)**





Sample of end plate (with fixed displacement pump)



**NOTES:**

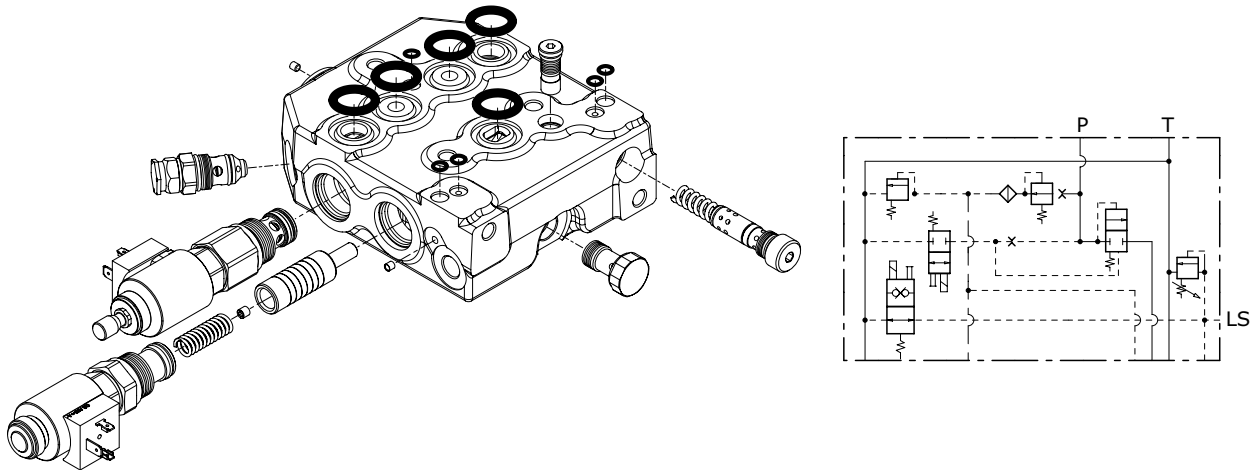
the secondary control valve necessarily adopts a JV type inlet module; the LS signal of the secondary one is drawn from the inlet module and driven to the end plate Z5 (o Z6) of the primary control valve. The primary control valve is equipped with a KV or JV type inlet module depending on whether the system is fed by a variable or fixed displacement pump.



**SPECIAL FUNCTIONS**

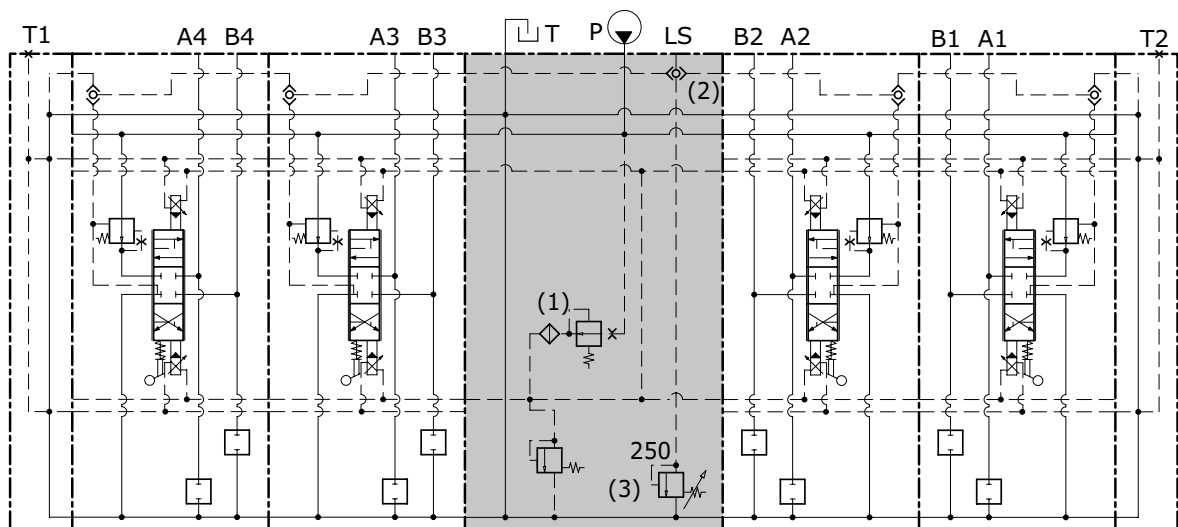
**Inlet section with P-Closed**

P closed inlet section is a special execution for variable pump systems that completely inhibits the oil flow to the valve. Active operations are inhibited even in presence of pump stand by pressure. The valve can be activated by means of an electric operated cartridge. LS signal dump valve is also available on request.



**Intermediate inlet section**

The intermediate inlet section for the MV99 control valve allows inlet flow rate up to 200 l/min from a Load Sensing variable displacement pump. This intermediate section has been designed to assemble two independent flow control units, fed from a single, high flow rate pump. The symmetrical pressure drop control allows the regulated flow-rates to be accurately distributed. Among the possible applications are travel systems for drills, excavators and medium- to large-sized agricultural machinery.





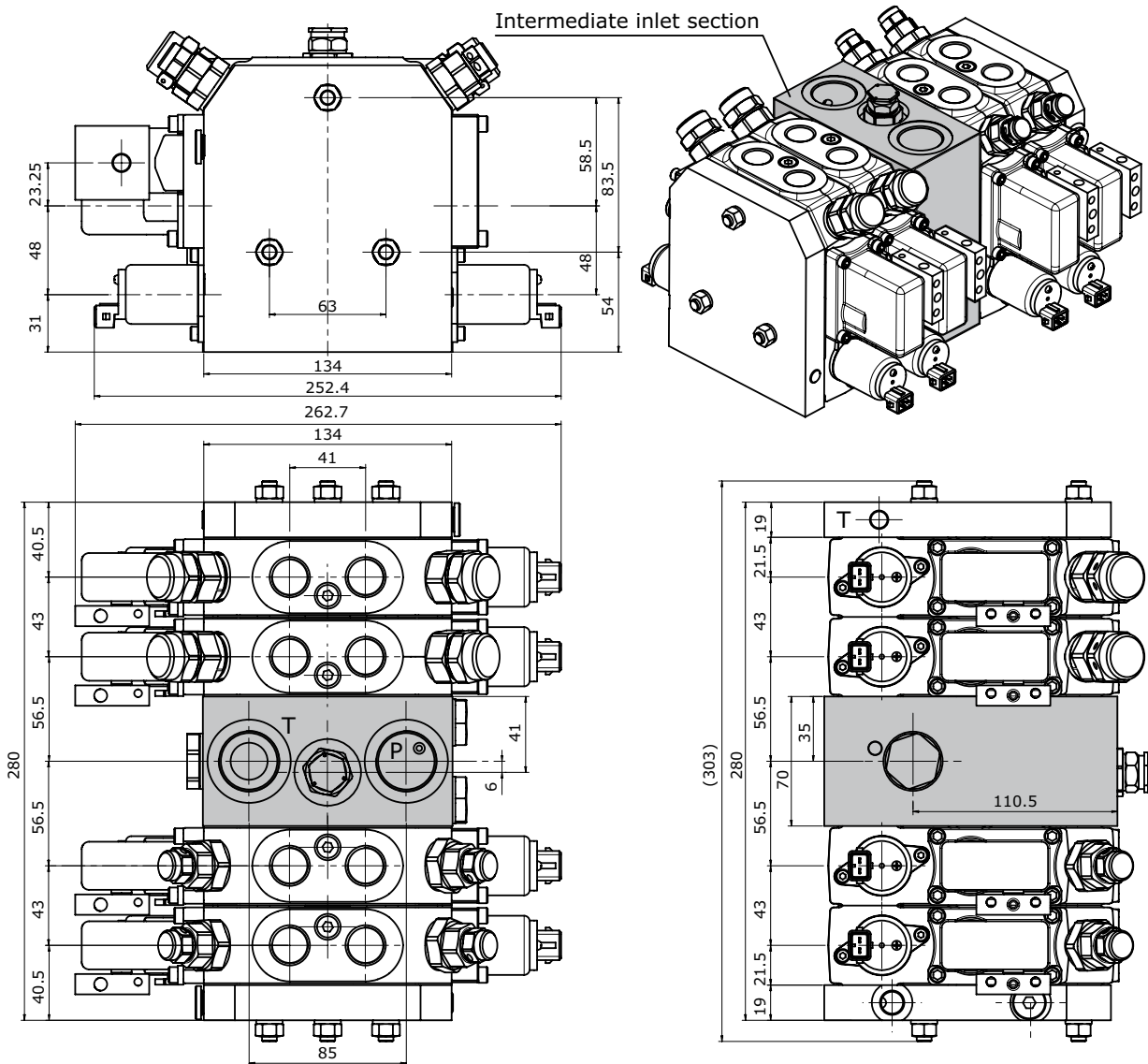
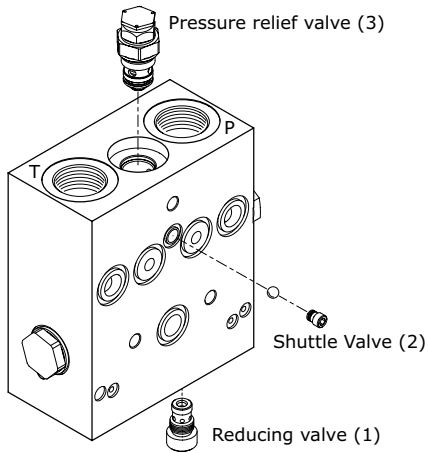
Assembly kit

The MV99 intermediate inlet section is equipped with a pressure reducer valve (1) feeding the proportional electro-hydraulic controls, equipped with a filter and pressure limiting device. It also has an integral "Shuttle Valve" (2) to select LS signals coming from the two flow control units, controlled in turn by the pressure relief valve (3).

Ordering code

The intermediate section assembly ordering code is **61071**. The proportional control valve assembly (equipped with an intermediate inlet section) should be used with two closure plates on both ends and without an inlet module.

Dimensional drawing





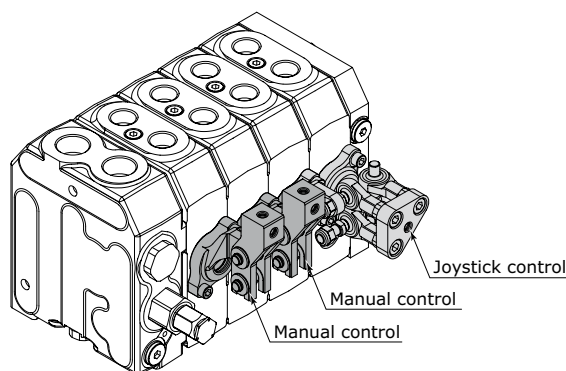
### Manual and Joystick control

A special version of MV99 has been specifically developed for manual control.

This version requires dedicated section bodies, special spool return action and allows the use of simple and robust manual control kit such as lever and cloche control.

This solution is particularly indicated for heavy duty application.

Following some ordering codes for special manual version:



### Manual spool actuation

code	description	configuration
<b>H101</b>	Unprotected lever	
<b>H102</b>	Unprotected lever rotated 180°	

### Joystick control spool actuation

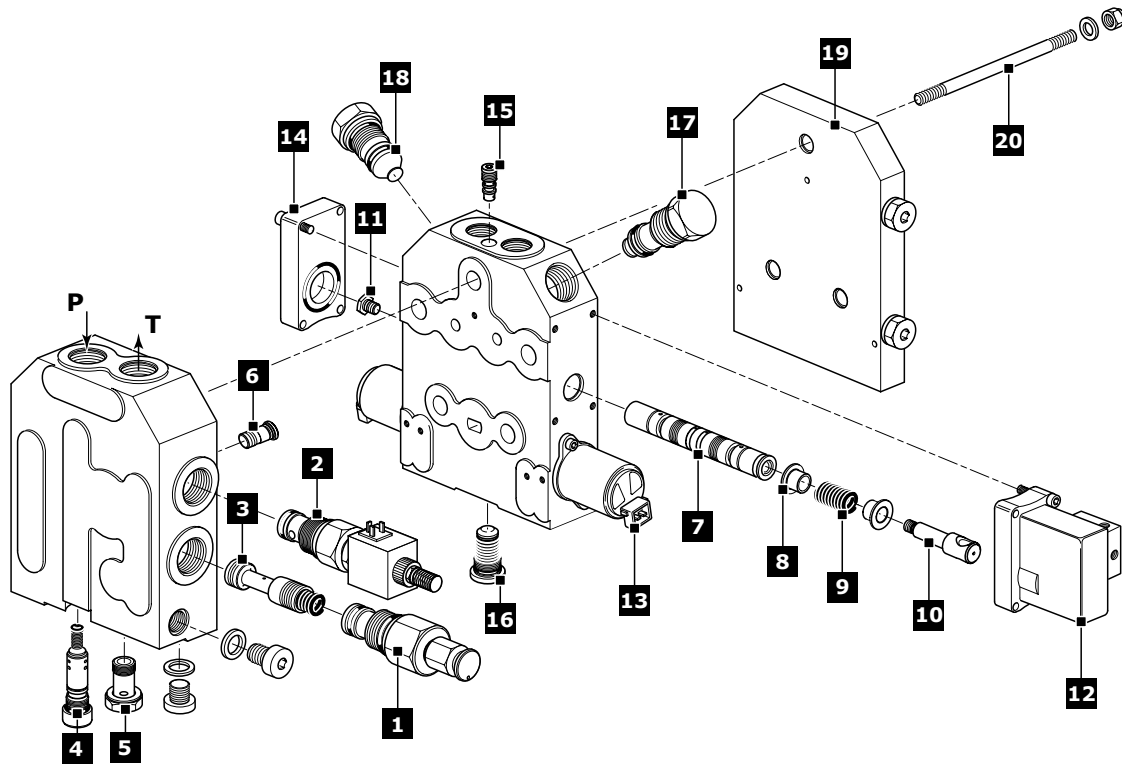
code	description	configuration	code	description	configuration
<b>H009</b>	Right side inlet fulcrum on 1 <sup>st</sup> section (compulsory code for second section: H120)		<b>H011</b>	Left side inlet fulcrum on 1 <sup>st</sup> section (compulsory code for second section: H120)	
<b>H010</b>	Right side inlet fulcrum on 2 <sup>nd</sup> section (compulsory code for first section: H120)		<b>H012</b>	Left side inlet fulcrum on 2 <sup>nd</sup> section (compulsory code for first section: H120)	

### Manual spool return action

code	description	configuration
<b>F001A</b>	3 positions spring-centred spool (Spring type A)	
<b>F001B</b>	3 positions spring-centred spool (Spring type B)	



MV99 SPARE PARTS LIST



Rif.	Description	Order code	Type	Note
1	Direct acting pressure relief valve on LS signal (*)	33208		Setting: 100 bar
		49967		Setting: 200 bar
		26002		Setting: 300 bar
	Relief valve plugged on LS signal	430155001		
	Relief valve plugged	430455001		
2	Pilot operated pressure relief valve on full flow (*)	35824		Setting: 100 bar
		26698		Setting: 250 bar
		80208		Setting: 400 bar
		915045501		
	Complete electric operated dump valve (12 vdc) (**)	915045502		
	Plug with pressure-gauge connection	430455002		
3	Compensator Spool	421255001		only for KV and HV
		421255094		only for JV
4	Pressure reducing valve kit (RDP)	320255001		
5	Control signal valve	320255002		only for KV and HV
		430055002		only for JV
6	Flow limiter valve	320055001		
		421255003	W001C-AAAA	
		421255029	W001C-DDDD	
		421255012	W001C-FFFF	
		421255018	W001C-IIII	
		421255057	W001C-NNNN	
		421255028	W001C-ZZZZ	
		421255008	W002C-AAAA	
		421255035	W002C-DDDD	
		421255035	W002C-FFFF	
7	3 positions double-acting spool	421255025	W002C-IIII	
		421255112	W002C-NNNN	
		421255181	W002C-ZZZZ	
7	3 positions double-acting A and B to tank spool	421255035	W002C-AAAA	
		421255035	W002C-DDDD	
		421255035	W002C-FFFF	
		421255025	W002C-IIII	
		421255112	W002C-NNNN	
		421255181	W002C-ZZZZ	
8	Spacer	421901117		
9	Spring	421801128		for lever kit
		421801127		for proportional kit
10	Anterior spool end kit	430055016		

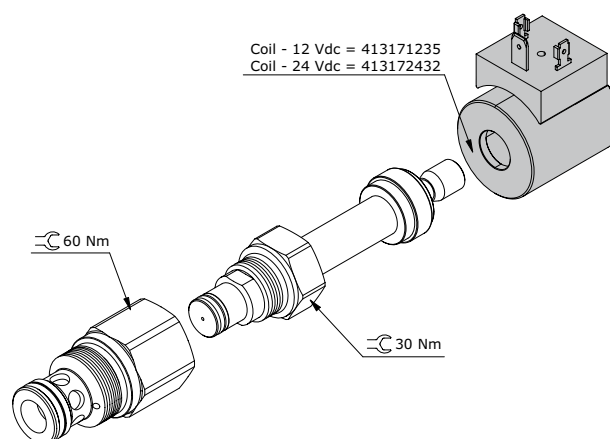


Rif.	Description	Order code	Type	Note	
11	Posterior spool end kit	430055019			
12	Lever actuation kit	320355001			
	Without lever actuation kit	320355002			
	Lever + Hydraulic + electrohydraulic actuation kit	320355005			
	Hydraulic atuation	430855001			
13	Electrohydraulic actuation 12 Vdc	430055004			
	Electrohydraulic actuation 24 Vdc	430055003			
	Prearrangement for Electrohydraulic actuation	430055001			
14	3 positions spring centered spool	320755001	F001		
	3 positions spring centered spool	320755002	F0710	only for H424-H425	
	Load limit in A and B	320055007	F024		
	Load limit in A	320055009	F026		
	Load limit in B	320055008	F028		
	Proportional directional load limit	320055024	F0470		
15	Signal selection valve	320255004			
16	Check valve	320255005		not compensated section	
	Compensated valve on section	320255003		compensated section	
17	Antishock valve on port A (*)	20705	01 PA	Setting: 100 bar	
		35838	01 PA	Setting: 200 bar	
		20783	01 PA	Setting: 300 bar	
	Anticavitation valve on port A	915085501	02 PA		
	Pilot operated combined valve on port A (*)	35824	04 PA	Setting: 100 bar	
		26698	04 PA	Setting: 250 bar	
		80208	04 PA	Setting: 400 bar	
	Prearrangement for auxiliary valve on port A	430455001	05 PA		
	18	Antishock valve on port B (*)	20705	01 PB	Setting: 100 bar
			35838	01 PB	Setting: 200 bar
		20783	01 PB	Setting: 300 bar	
Anticavitation valve on port B		915085501	02 PB		
Pilot operated combined valve on port B (*)		35824	04 PB	Setting: 100 bar	
		26698	04 PB	Setting: 250 bar	
		80208	04 PB	Setting: 400 bar	
Prearrangement for auxiliary valve on port B		430455001	05 PB		
19		End plate with T1 port plugged	20615	KZ3	
			20565	KZ4	
	End plate with HPCO version	20955	KZ5		
		20669	KZ6		
20	Tie rod kit MV99/1	300155001			
	Tie rod kit MV99/2	300155002			
	Tie rod kit MV99/3	300155003			
	Tie rod kit MV99/4	300155004			
	Tie rod kit MV99/5	300155005			
	Tie rod kit MV99/6	300155006			
	Tie rod kit MV99/7	300155007			
	Tie rod kit MV99/8	300155008			
	Tie rod kit MV99/9	300155009			
	Tie rod kit MV99/10	300155010			

**NOTE:**

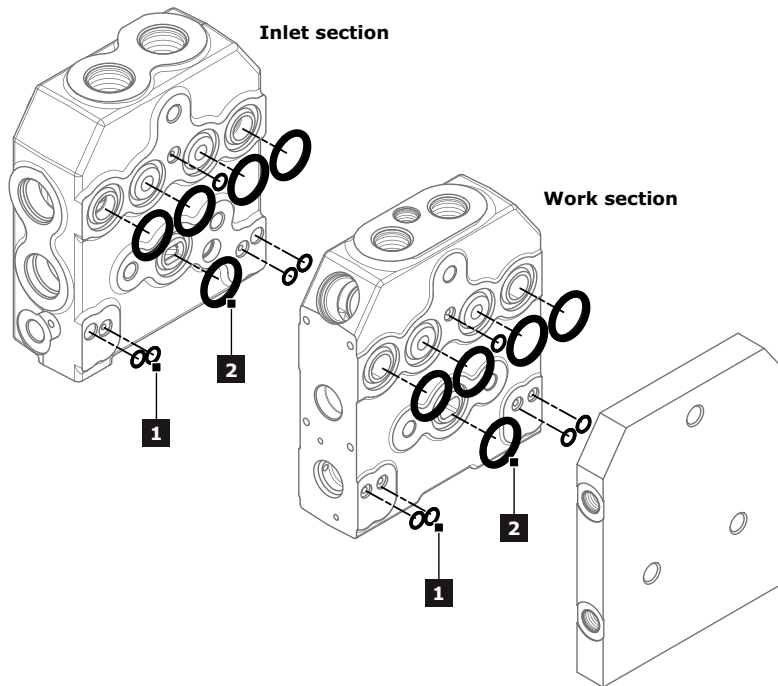
(\*) = for different settings please contact our Sales Dpt.

(\*\*) = electric dump valve coil can be ordered separately as spare part: (see drawing)  
 Ordering code Coil 12 vdc: 413171235  
 Ordering code Coil 24 vdc: 413172432





**Gasket kits**



Ref.	Order Code	Description	Q.ty
<b>1</b>	<b>412010122</b>	O.R. 70SH 6.07 x 1,78 (2-10)	5
<b>2</b>	<b>412020610</b>	O.R. 90SH 21.89 x 2.62 (2-118)	5
<b>Complete Gasket kit: order code - 350955001</b>			





**INSTALLATION**

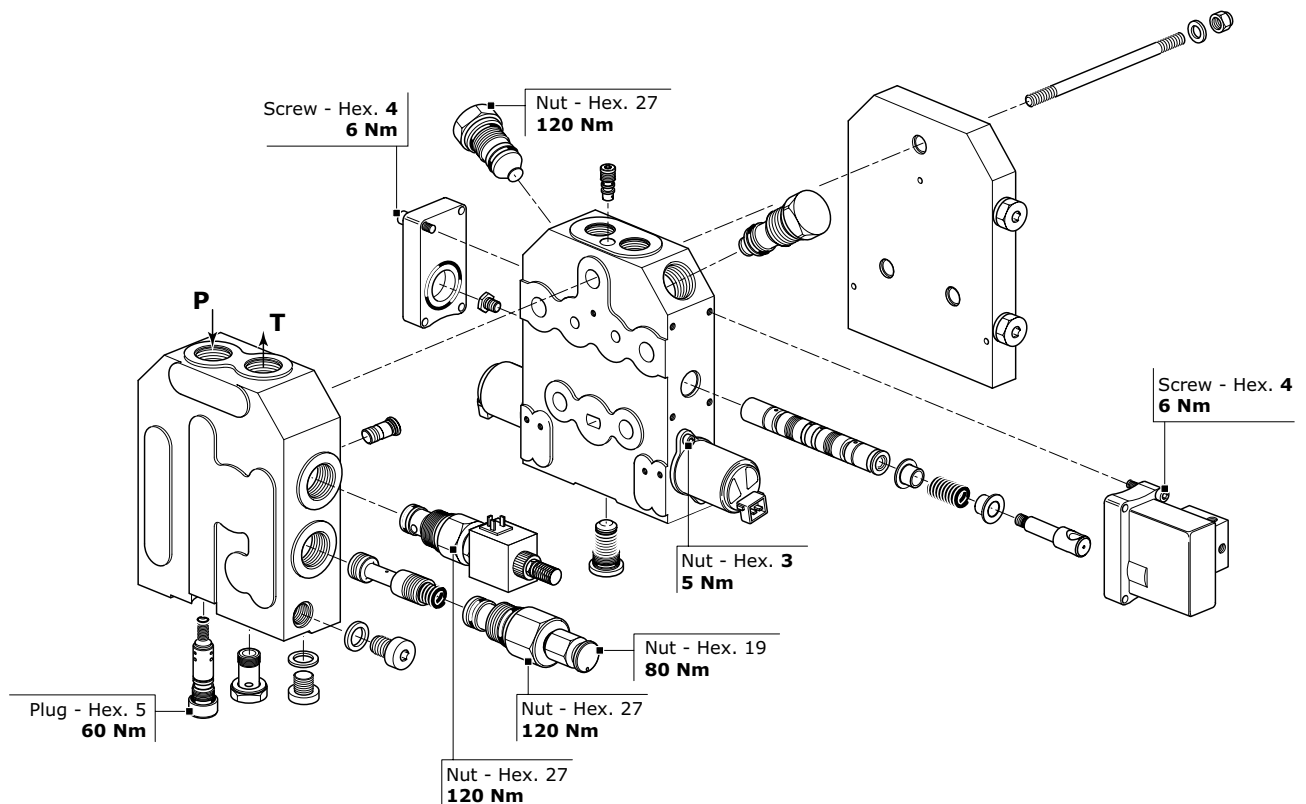
**Guidelines**

- Mount the control valve securely to a flat surface (recommended 3 point fixing); at the time do not use a hammer to positioning by hitting.
- When handling the control valve, be careful not hold the pilot cover or return spring cap of the spool or accessory valves such as main relief valves and anti-shock relief valves.
- Clean piping materials sufficiently before use.
- Make sure to prevent the port openings from being entered with dust or foreign matters.
- Tighten the port connectors surely with the recommended fastening torques.
- Do not direct the jet of a pressure washing unit directly to the valve.

**Fittings tightening torque (Nm)**

thread type	port P	Port A - B	Port T
<b>BSP (ISO - 228)</b>	<b>G 3/4</b>	<b>G 1/2</b>	<b>G 3/4</b>
with rubber sealing (DIN 3869)	120	120	120
with copper or steel and rubber washer	120	120	120
<b>UN-UNF (ISO - 725)</b>	<b>1"1/16 - 12 UN</b>	<b>7/8" - 14 UN</b>	<b>1"1/16 - 12 UN</b>
with O.R.	120	120	120

**General clamping torque**



**Dimensions - Thread codes**

The connection ports size is indicated by an ordering code common for all Hydrocontrol products. Following table shows all available connections.

**METRIC THREAD (ISO 9974-1)**

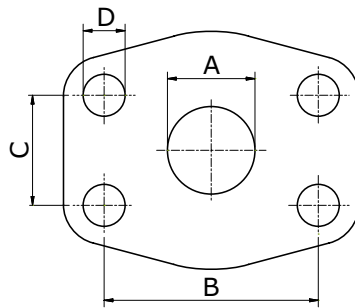
Type	M18x1,5	M22x1,5	M27x2
Code	<b>M01</b>	<b>M02</b>	<b>M03</b>

**BSP THREAD (ISO 1179-1)**

Type	1/4"	3/8"	1/2"	3/4"	1"	1"1/4	1"1/2	2"
Code	<b>G02</b>	<b>G03</b>	<b>G04</b>	<b>G05</b>	<b>G06</b>	<b>G07</b>	<b>G08</b>	<b>G09</b>

**UN / UNF THREAD (ISO 11926-1)**

Type	9/16" 18 UNF SAE6	3/4" 16 UNF SAE8	7/8" 14 UNF SAE10	1"1/16 12 UNF SAE12	1"5/16 12 UNF SAE16	1"5/8 12 UNF SAE20
Code	<b>U02</b>	<b>U03</b>	<b>U04</b>	<b>U05</b>	<b>U06</b>	<b>U07</b>

**Dimensions - SAE Flange codes****SAE / 3000 FLANGE (ISO 6162-1)**

Type	3/4" (MA)	3/4" (UNC)	1" (MA)	1" (UNC)	1"1/4 (MA)	1"1/4 (UNC)	1"1/2 (MA)	1"1/2 (UNC)	2" (MA)	2" (UNC)	3" (MA)	3" (UNC)
Code	<b>S03</b>	<b>S04</b>	<b>S05</b>	<b>S06</b>	<b>S07</b>	<b>S08</b>	<b>S09</b>	<b>S10</b>	<b>S11</b>	<b>S12</b>	<b>S15</b>	<b>S16</b>
A	19	19	25	25	32	32	38	38	51	51	76	76
B	47,6	47,6	52,4	52,4	58,7	58,7	69,9	69,9	77,8	77,8	106,4	106,4
C	22,3	22,3	26,2	26,2	30,2	30,2	35,7	35,7	42,9	42,9	61,9	61,9
D	M10	3/8-16	M10	3/8-16	M10	7/16-14	M12	1/2-13	M12	1/2-13	M16	5/8-11

**SAE / 6000 FLANGE (ISO 6162-2)**

Type	3/4" (MA)	3/4" (UNC)	1" (MA)	1" (UNC)	1"1/4 (MA)	1"1/4 (UNC)	1"1/2 (MA)	1"1/2 (UNC)
Code	<b>S33</b>	<b>S34</b>	<b>S35</b>	<b>S36</b>	<b>S37</b>	<b>S38</b>	<b>S39</b>	<b>S40</b>
A	19	19	25	25	32	32	38	38
B	50,8	50,8	57,2	57,2	66,6	66,6	79,3	79,3
C	23,8	23,8	27,8	27,8	31,8	31,8	36,5	36,5
D	M10	3/8-16	M12	7/16-14	M14	1/2-13	M16	5/8-11



## GENERAL CONDITIONS AND PATENTS

### Product identification

All Hydrocontrol products have an identifying plate placed in specific position.



Serial number

**Serial number:**  
It univocally identifies the physical valve: this provides an easy way to find all sales and production details.

Product code

**Product code:**  
It is a number univocally identifying the configuration and pressure settings of a valve.

### Introduction

These general conditions apply to all general supplies from Hydrocontrol s.p.a., after receiving orders from the Customer. Should commercial terms such as EXW, DDP, etc be mentioned, of course the Incoterms of the International Chamber of Commerce must be referred to, according to the test existing when the general supply conditions are agreed on.

### Management of orders

No Customer's order is binding to Hydrocontrol s.p.a. if Hydrocontrol s.p.a. has not confirmed the order in writing. Hydrocontrol s.p.a. commits to supplying the orders in compliance with the order confirmation that has been issued. Any disagreement with the content of the order confirmation must be communicated in writing to Hydrocontrol s.p.a. within and no later than 5 days from the delivery of the order confirmation. The Customer commits to paying for the goods supplied by Hydrocontrol s.p.a., according to the prices indicated on the order confirmation.

### Payment conditions

The Parties agree on the payment terms at the beginning of the supply. The terms will be indicated on the order confirmation. Should the Customer be late with the payments, Hydrocontrol S.p.a. will be entitled to require the payment of interests on arrears based on the exiting Prime Rate increased by 2%. Should there be any payment delay, Hydrocontrol s.p.a. will be entitled not to process the Customer's purchase order, even if it has already been confirmed.

### Delivery and shipment

The goods are always supplied Ex Works, even when Hydrocontrol s.p.a. agrees with the Customer that the shipment, or a part of it, will be arranged by Hydrocontrol s.p.a. It is agreed that the Customer will bear the risk of goods deterioration or damaging from the moment the goods are handed by Hydrocontrol s.p.a. to the first carrier.

### Product characteristics

Hydrocontrol s.p.a. commits to supplying good quality products, compliant with the technical specifications declared on the technical tables and on the catalogue. Hydrocontrol s.p.a, even without notice, at its own discretion, reserves the right to modify the products as necessary, without these changes altering the main characteristics of the products.

### Claims

Any claims about defects on delivered products (just as an example: claims about the packaging, the number, the quantity or the external product characteristics) will have to be notified to Hydrocontrol s.p.a. in writing, within and no later than 7 days from reception of the goods, otherwise the claims will be considered as null and void. Occult defects (the defects of the goods that cannot be spotted with a careful control of the goods received by the Customer), will have to be notified in writing to Hydrocontrol s.p.a. within 7 days from the discovery of the defect, and anyhow no later than 12 months from the delivery of the goods, otherwise the claim will be considered as null and void. Even in case of claim or objection, the Customer will never be entitled to suspend or delay the payments to Hydrocontrol s.p.a. for the products subject to claim or objection nor for any other supply.



## GENERAL CONDITIONS AND PATENTS

### Warranty

Should the products supplied by Hydrocontrol not be compliant or have the required quality and should this defect be due to Hydrocontrol, Hydrocontrol s.p.a. commits, at its choice, to replace or repair the faulty products, as long as the defect or lack of compliance is notified to Hydrocontrol s.p.a. in writing, as specified at point 6, within and no later than 12 months from product delivery. On the products that have been fixed or replaced in accordance with what specified above, the above-mentioned warranty applies. The 12 month duration starts from the date of repair or replacement. In case of defects, lack of quality or in case of lack of compliance for the supplied products, with the exception of fraud or serious offence, Hydrocontrol s.p.a. only commits to repairing or replacing the faulty products, according to what specified above. This warranty replaces any other Supplier's warranty or liability established by the law. This warranty excludes any other liability contractual or extra-contractual by Hydrocontrol s.p.a. on the products supplied by Hydrocontrol (as a mere example: damage refund, loss of profit, product recall campaign, etc). Hydrocontrol s.p.a. has signed a product civil liability police, with a suitable maximum coverage.

### Ownership retention

The products supplied by Hydrocontrol s.p.a. will be owned by the latter until Hydrocontrol receives the complete payment for the supplied goods.

### Obligation confidentiality

Hydrocontrol s.p.a. commits to not disclosing the technical and commercial information it receives from the Customer, unless this information has already been publicly disclosed.

### Patents

The Customer is not allowed to use the provided Products, or a part of them, their descriptions or drawings protected or not protected by Patent or registered trademark in order to design or make similar products, unless Hydrocontrol s.p.a. previously issues its written authorization. Should Hydrocontrol s.p.a. give its written authorization, all patents, trademarks, registered designs, copyrights and intellectual property rights related or connected to the Products provided by Hydrocontrol s.p.a. will stay Hydrocontrol's property. The Customer commits to respecting the highest confidentiality.

### Applicable law and court of jurisdiction

Hydrocontrol s.p.a.'s supplies are regulated by these General Supply Conditions and, for anything not defined here, by the Italian law. Any controversy related, generated or connected to the supply of Products by Hydrocontrol s.p.a., where Hydrocontrol s.p.a. is involved, will be exclusively dealt with by the Court of Bologna.

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