

EX54

LOAD SENSING VALVE



TECHNICAL CATALOGUE

A member of



 **walvoil**
FLUID POWER EMOTION

1st edition EX54.01

*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.**

PATENTED SYSTEM

All the control valves belonging to the EX family work according to a principle designed by Hydrocontrol's R&D department and covered by patents EP1860327 (A1) EP1860327 (B1) US2008282691 (A1) and US7581487 (B2).

The valve LS signal is managed according to innovative technique which is an absolute first in the flow sharing world, ensuring:

- elimination of any LS signal bleed off, which can be observed in most systems currently available commercially, and is often the cause of poor compensation accuracy, slow response and excessive sensitivity to operating conditions.
- LS signal picking downstream of the local compensator: this will make signal detection "neater" improving control efficiency and accuracy.

RESPONSE RATE

The EX control valve's strength resides in its quick, prompt response, achieved thanks to the functional advantages built into our patented system. Even the most critical applications such as excavator bucket shacking and the swift dynamics of forestry machinery, usually hard to achieve on flow sharing systems, can be successfully implemented by using EX family products.

ACCURACY AND STABILITY

The unique technical characteristics of the Hydrocontrol's patent allows for outstanding flow control and compensation precision, not likely to be affected even by the most diverse operating conditions. Simultaneous functions are never mutually influenced, not even in the presence of the same load factors (an aspect best highlighted in crawler machinery travelling). System stability itself is greatly benefited by the EX design; the system, also in combination with traditional overcenter valves, appears well balanced and able to effectively reduce oscillation and dynamic instability.

EFFICIENCY

In addition to the well known advantages typically offered by flow sharing systems which, associated with a variable pump, will drastically reduce the machine operating consumption, the EX family introduces a number of interesting options, including pressure relief on the LS signal to further increase energy saving and guarantee top efficiency levels.

FLEXIBILITY

The EX family control valves can be easily adjusted to a variety of applications, thanks to the wide range of available options and different types of available control systems.

COMPACT DIMENSIONS

The carefully designed features and integrated electrohydraulic control ensure a highly compact and optimised layout. Integrated end plates are available in the final working section (only EX54 and EX72), adding to the system dimensional and functional efficiency.

PRIORITY

The EX family allow to install side by side pre-compensated section with post-compensated section. This feature allow to establish a priority in the way the oil is directed and increase the number of application where the EX family can be applied solving technical difficulties that before required external components. Both Inlets and Outlets remain common for the pre and post compensated sections making the assembling of the valve particularly convenient.

APPLICATIONS

Flow Sharing valve for 300 l/min inlet flow rate. The most common application for this control valve are excavators, wheeled loaders, rough terrain cranes, drilling machines, mobile cranes, mining and off-shore equipment.





QUICK REFERENCE GUIDE

GENERAL SPECIFICATIONS	EX38	EX46	EX54	EX72
Working section number	1 - 10	1 - 10	1 - 8	1 - 8
CIRCUIT				
Spool stroke (mm)	7	7	9	11
Spool pitch (mm)	38	46	54	72
RATED FLOW				
Pump flow rate (l/min)	150	220	300	450
A/B port flow rate (l/min) (*)	100	180	250	350
RATED PRESSURE				
working pressure inlet port P (bar)	350	350	350	350
BACK PRESSURE MAX				
Max pressure outlet port T (bar)	10	10	10	10

(*) with fixed Pump inlet compensator

OPTION CHART	EX38	EX46	EX54	EX72
LS Signal pressure relief valve	•	•	•	•
Pump pressure relief valve	•	•	•	•
LS Signal dump valve (electric 12/24 Vdc)	•	•	•	•
Pump dump valve (electric 12/24 Vdc)	•	•		
SPOOLS TYPE				
Single acting	•	•	•	•
Double acting	•	•	•	•
Float spool	•	•	•	•
SPOOL ACTUATION				
Hydraulic actuation	•	•	•	•
Mechanical lever actuation	•	•	•	
Mechanical cloche actuation	(•)			
Prop. electrohydraulic actuation 12-24 Vdc (*)	•	•	•	•
ON/OFF electrohydraulic actuation 12-24 Vdc (*)	•	•	•	•
CAN BUS interface actuation	on development	on development	on development	•
SPOOL RETURN ACTION				
Return spring	•	•	•	•
Mechanical detent	•	•		
Pneumatic control	•	•		
Spools displacement sensor (HLPS)	•	•	•	•
PORT RELIEF VALVE				
Direct operated antishock valve			•	•
Anticavitation valve	•	•	•	•
Pilot operated combined valve			•	•
Direct operated combined valve (fixed setting)	•	•		
Plug	•	•	•	•

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



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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

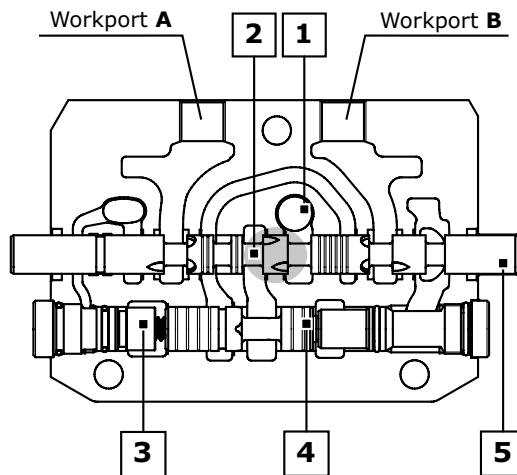
Types of fluid (according to ISO 6743/4) Oil and Solutions	Temperature (°C)		Compatible gasket
	min	max	
Mineral Oil HL, HM (or HLP acc. to DIN 51524)	-25	+80	NBR
Oil in water emulsions HFA	+5	+55	NBR
Water in oil emulsions HFB	+5	+55	NBR
Polyglycol-based aqueous solution HFC	-10	+60	NBR

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



Operating principle

The flow sharing technology applied to the standard load sensing system characterizes the new control valves EX. The valve, completely pressure compensated, guarantees great controllability to all actuations, making workport flow dependent only on metering area (spool position). When flow saturation occurs the system reacts by implementing an equal reduction of pressure margin across all spools, generating a proportional reduction of workport flow.



LEGEND:

1. Inlet line (High pressure)
2. Metering notches
3. Load sensing line
4. Local compensator
5. Metering spool

Single section

Referring to picture it's possible to remark some aspects of system functionality. Coming from the common inlet line the main flow, passing across the metering area, reaches local compensator. Metering area, according to the pressure margin, controls the total amount of flow to the workport selected by the main spool. The load sensing signal, picked up downstream the local compensator, feeds the common load-sensing line. When a single section is actuated, the local compensator fully opens to the left side, reaching its complete balanced position. The control of the LS system is made by the inlet compensator for fixed displacement pump or pump compensator for variable displacement pump.

Multi-section

When two or more sections are actuated only one, characterized by the highest pressure (dominant), is involved in the LS signal transmission, working as briefly described in the previous paragraph. The other functions (slaves) become directly dependent on it. The common LS line transfers the information coming from the dominant local compensator to all dependent compensators. Driven by the LS signal, the unbalanced slave compensators activate the pressure compensation creating an artificial pressure drop able to keep pressure margin nominally the same on all the spools. Workport flow becomes only a function of metering area making the system totally load independent.

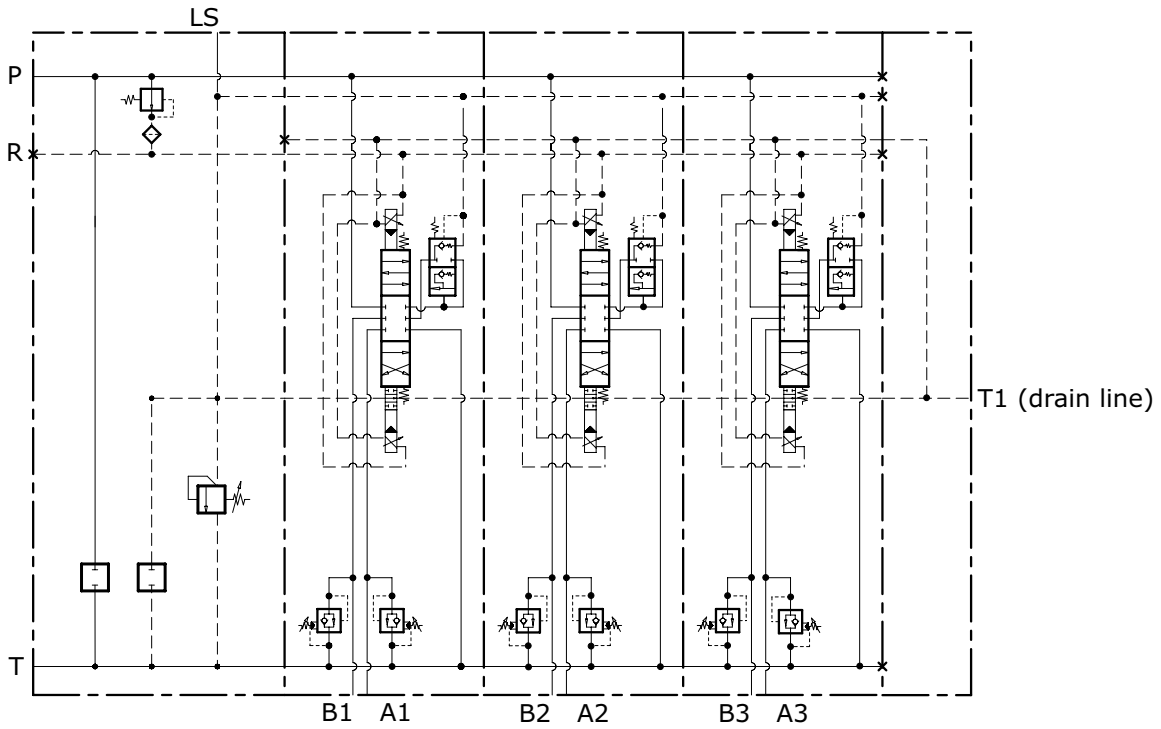
Flow Sharing function

When saturation occurs the total amount of flow required by actuations is higher than the maximum pump flow rate. The system is able to keep the nominal pressure margin no more. The actual pressure margin reduces according to real flow demand. Since all the local compensators feel the same LS signal and the same pressure drop is applied to different metering areas, then workport flows are reduced proportionally in order to keep all actuations completely under control.

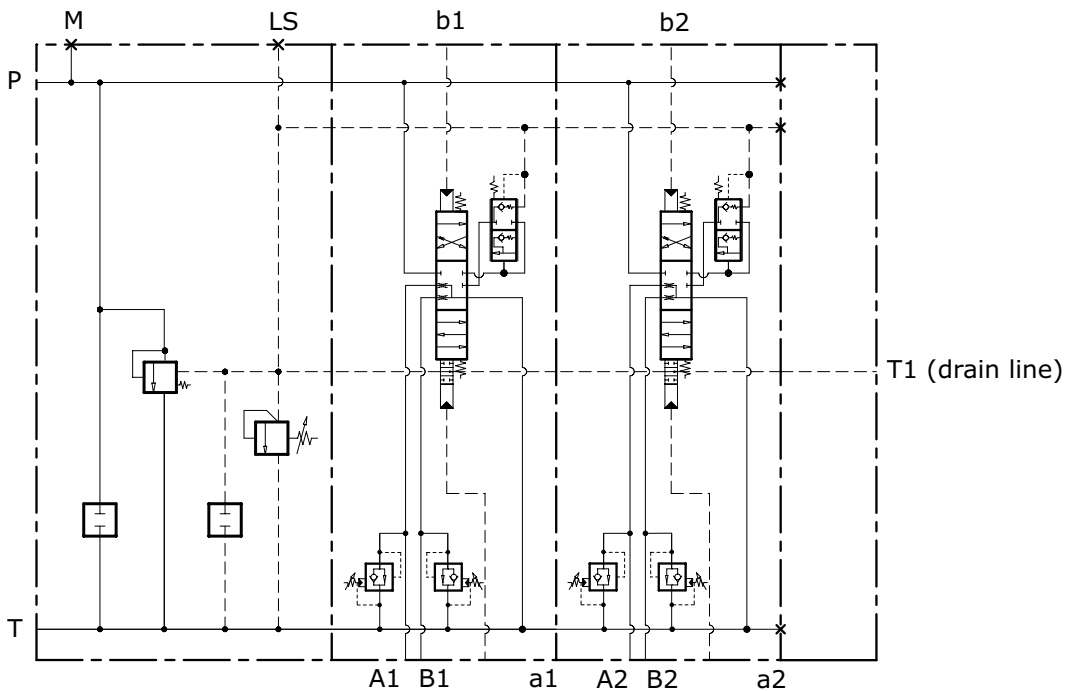


HYDRAULIC SCHEMA

Post compensated system - Electrohydraulic actuation



Post compensated system - Hydraulic actuation





ORDER EXAMPLE

EX54/2: MR V1A 200 V7B C12AJ V10C KV S35 W001C 5050 HP05A RC1 G06 04 PA 350 04 PB 350 W001C 5050 HP05A RCK1A G06 04 PA 350 04 PB 350

TYPE:

EX54: product type
/2: working section number

1) INLET ARRANGEMENT: p.13

- MR** Inlet side
- V1A** LS pressure relief valve on port A
- 200** Setting (bar)
- V7B** Full flow relief plug on port B
- C12AJ** Connector kit type
- V10C** LS plug on port C
- KV S35** Inlet body arrangement

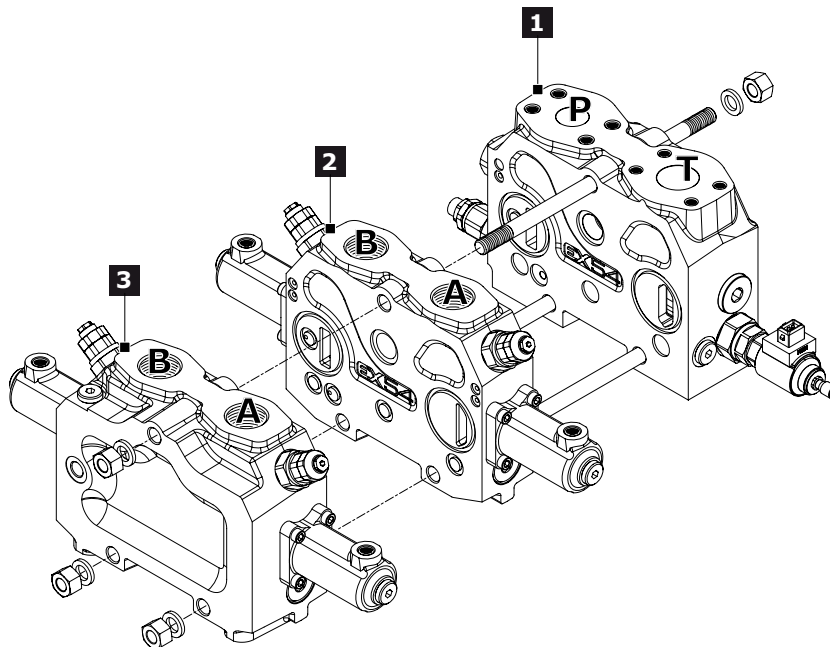
2) WORK SECTION ARRANGEMENT: p.19

- W001C 5050** Spool delivery
- HP05A** Spool actuation type
- RC1 G06** Section type and port threads
- 04 PA 350** Auxiliary valve (port A)
- 04 PB 350** Auxiliary valve (port B)

3) INTEGRATED OUTLET SECTION ARRANGEMENT: p.32

- W001C 5050** Spool delivery
- HP05A** Spool actuation type
- RCK1A G06** Integrated section type and port threads
- 04 PA 350** Auxiliary valve (port A)
- 04 PB 350** Auxiliary valve (port B)

Ordering row 2 must be repeated for every work section



Standard thread

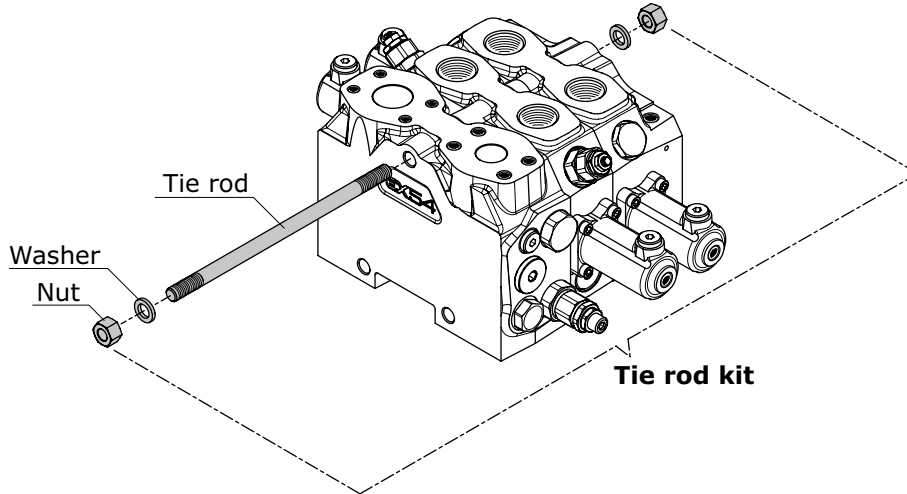
The connection ports size is indicated by an ordering code common for all Hydrocontrol products. Following table shows all available connections; for ordering code refer to table on page 44.

Ports	BSP	Code	UN-UNF	Code	SAE 3000	Code	SAE 6000	Code
(P)	G 1"1/4	G07	1"5/8 - 12 UN	U07			1" MA-UNC	S35-S36
(T)	G 1"1/4	G07	1"5/8 - 12 UN	U07	1"1/4 MA-UNC	S07-S08		
(T1)	G 1/4"	G02	9/16" - 18 UN	U02				
(A - B)	G 1	G06	1"5/16 - 12 UN	U06	3/4" MA - 3/4" UNC	S03-S04		



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. EX54 requires 3 tie-rod kits



Tie rod kit	Order Code	Length (mm)	Clamping Torque (Nm)	Quantity
EX54/1	300198002	192		
EX54/2	300198003	246		
EX54/3	300198004	300		
EX54/4	300198005	354		
EX54/5	300198006	408	60	3
EX54/6	300198007	462		
EX54/7	300198008	516		
EX54/8	300198009	570		

Painting

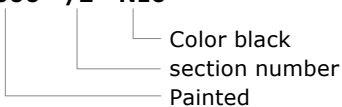
On request, all Hydrocontrol valves can be delivered painted (RAL 9005 black primer).

Order example of EX54/2 painted:

EX54/2
 MR V1A 200 V7B C12AJ V10C KV S35
 W001C 5050 H005C RC1 G06 04 PA 350 04 PB 350
 W001C 5050 H005C RCK1A G06 04 PA 350 04 PB 350
P006/2 N10

The painting is indicated with the following value:

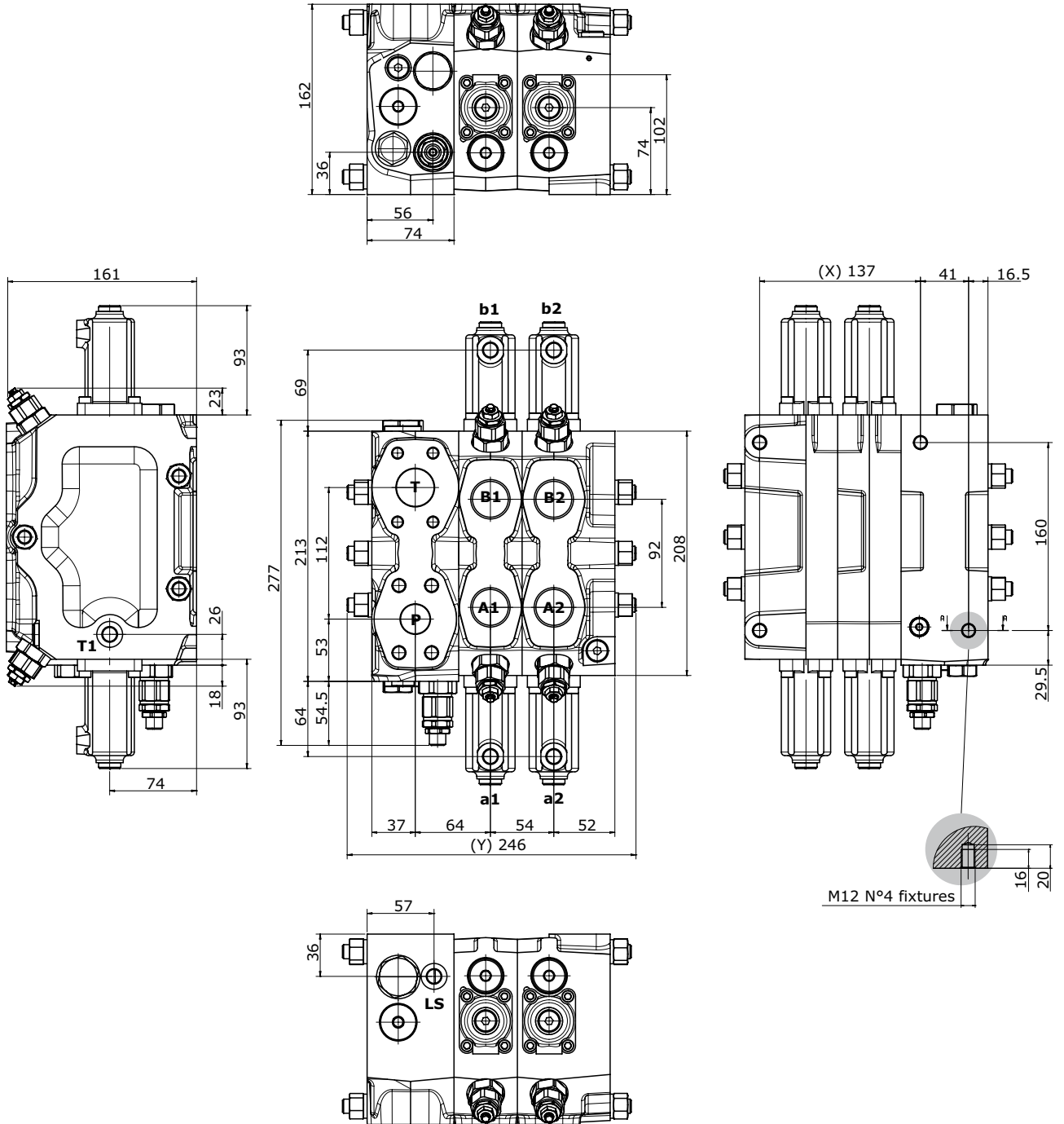
P006 - /2 - N10





DIMENSIONS

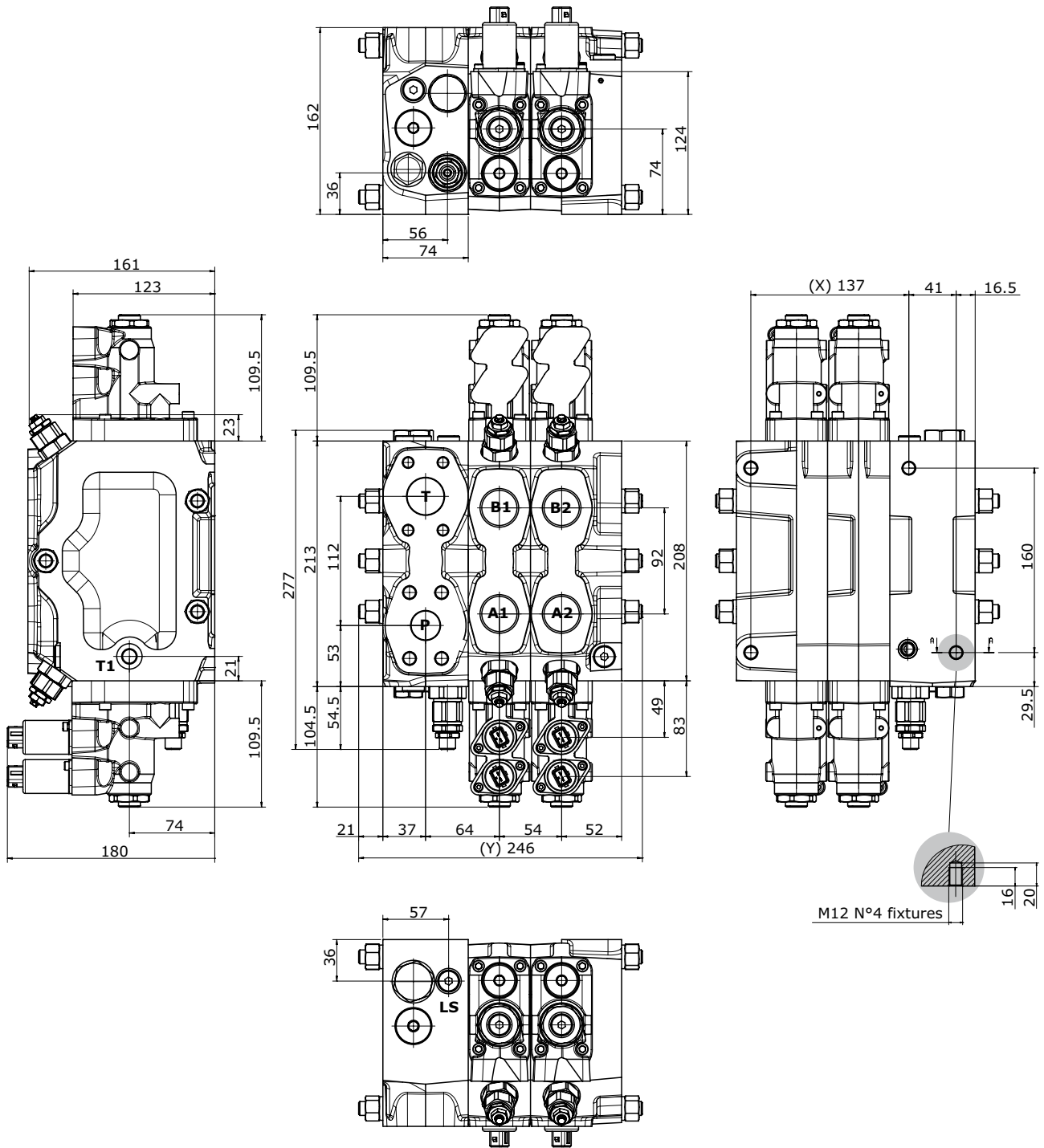
EX54 with mechanical lever actuation



Type	/1	/2	/3	/4	/5	/6	/7	/8
X (mm)	83	137	191	245	299	353	407	461
Y (mm)	192	246	300	354	408	462	516	570
Weights (kg)	32	43	54	65	76	87	98	109



EX54 with electrohydraulic actuation



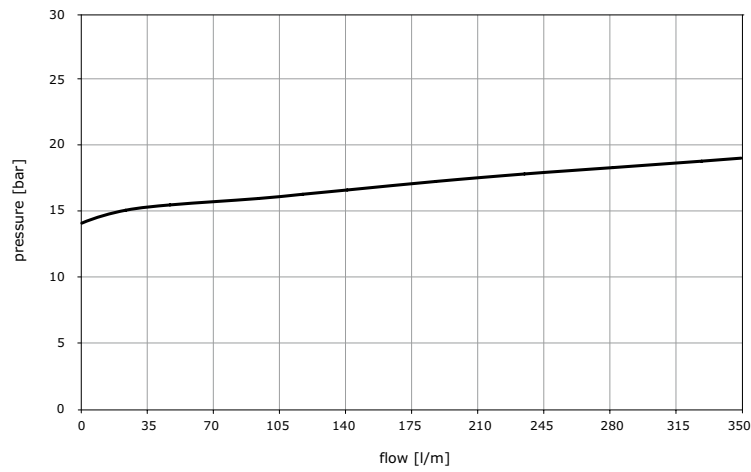
Type	/1	/2	/3	/4	/5	/6	/7	/8
X (mm)	83	137	191	245	299	353	407	461
Y (mm)	192	246	300	354	408	462	516	570
Weights (kg)	32	43	54	65	76	87	98	109



TYPICAL CUEVES

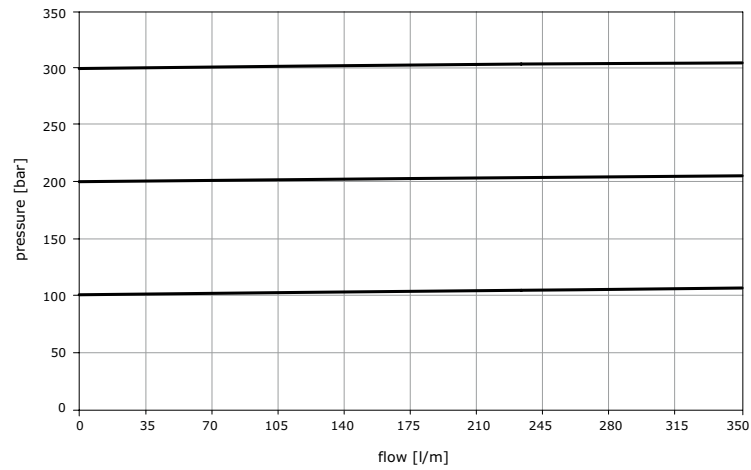
Inlet compensator Pressure drop (P-T)

Fixed displacement system (KV): pressure drop across the inlet compensator as function of pump flow



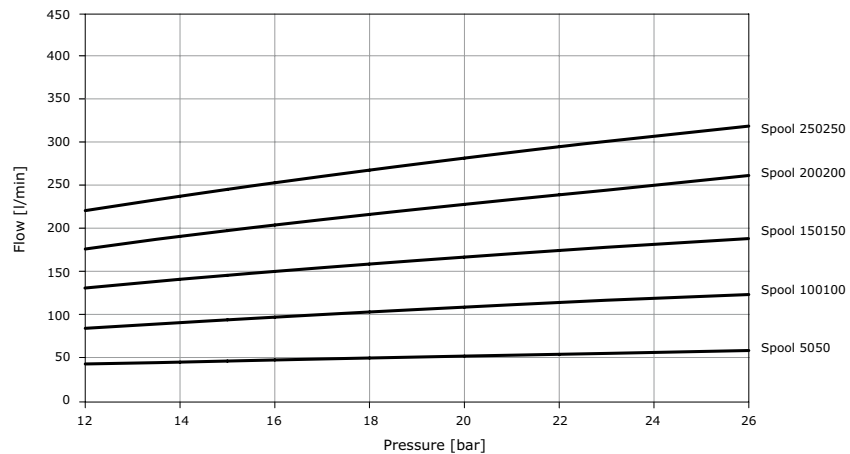
LS relief valve

Fixed displacement system (KV): LS relief valve characteristic



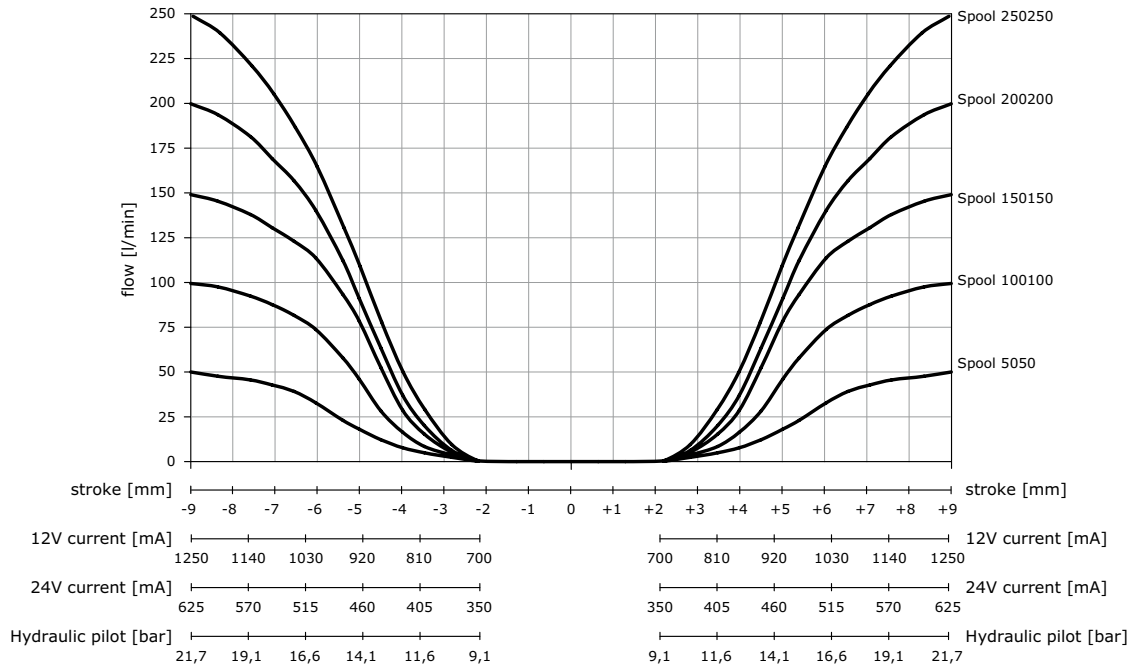
Post compensated spool flow with variable displacement pumps

Variable displacement systems (JV): spools maximum delivered flow as function of pump ΔP setting

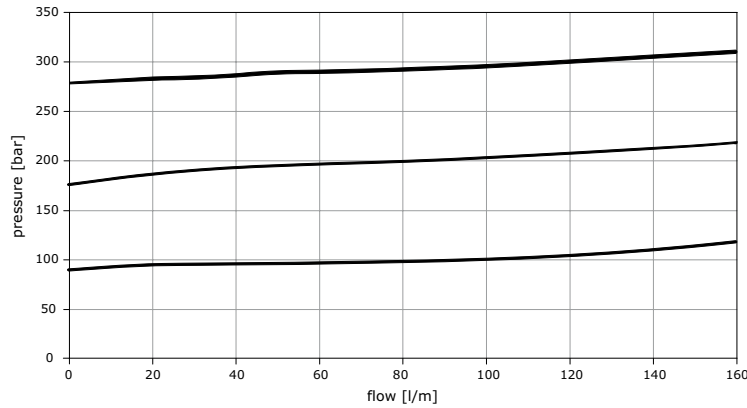




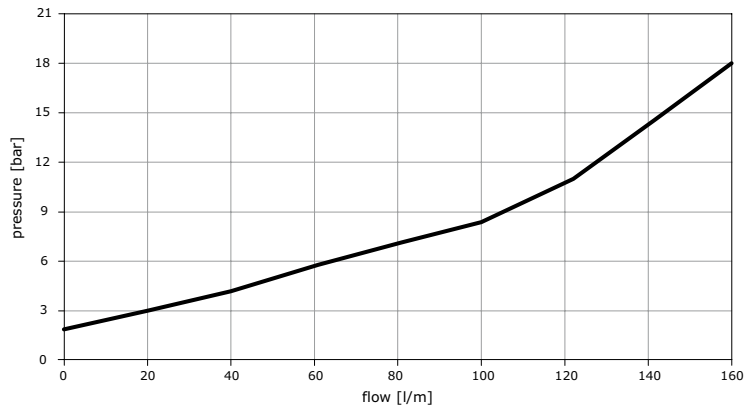
Post compensated spool flow characteristic
Fixed displacement systems (KV): flow on ports A and B as function of spool stroke, pilot pressure, control current
Inlet flow: 300 l/min - Pump inlet compensator at 16 bar Δp



Combined valves (antishock function)
Pressure characteristic as function of flow



Combined valves (anticavitation function)
Opening and pressure characteristic as function of flow

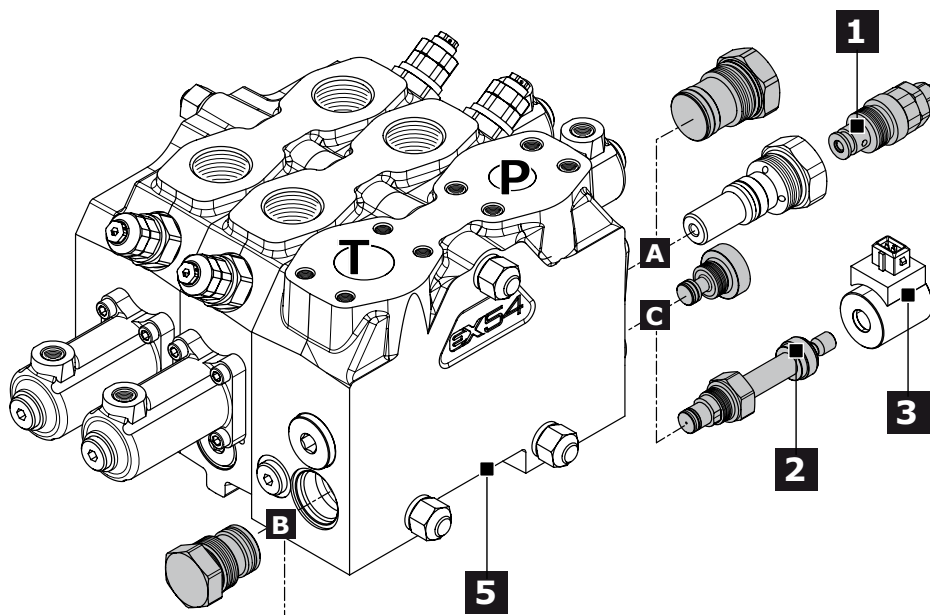




INLET SECTION

Order example

	MR	V1A	200	V7B	C12AJ	V10C	KV S35
1.	MR	Inlet side					
	V1A	LS pressure relief valve on position A					
	200	setting (bar)					
2.	V7B	Full flow electric dump valve on position B					
3.	C12AJ	Connector kit type					
4.	V10C	LS plug on position C					
5.	KV S35	Inlet body classification					



Rif.	Code	Description	Page
-	MR	Flow sharing valve with right inlet section	14
1	V1A V2A	LS pressure relief valve - on position A LS relief plug - on position A	14
2	V3B V4B V7B	Full flow direct operated pressure relief valve - on position B Full flow relief plug - on position B Full flow electric dump valve - on position B	14
3	C12AJ	AMP Junior connector - 12 Vdc	16
4	V10C V11C	LS plug - on position C LS electric dump valve - on position C	14
5	KV S35 JV S35 KVR S35 JVR S35	Open centre inlet section for fixed displacement pumps (SAE 6000 1"MA) Closed centre inlet section for variable displacement pumps (SAE 6000 1"MA) Open centre inlet section with RDP for fixed displacement pumps (SAE 6000 1"MA) Closed centre inlet section with RDP for variable displacement pumps (SAE 6000 1"MA)	17

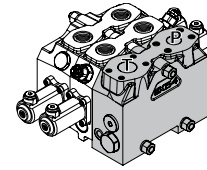
NOTE: when ordering a relief valve it is necessary to specify factory setting (example 200).



Inlet side classification

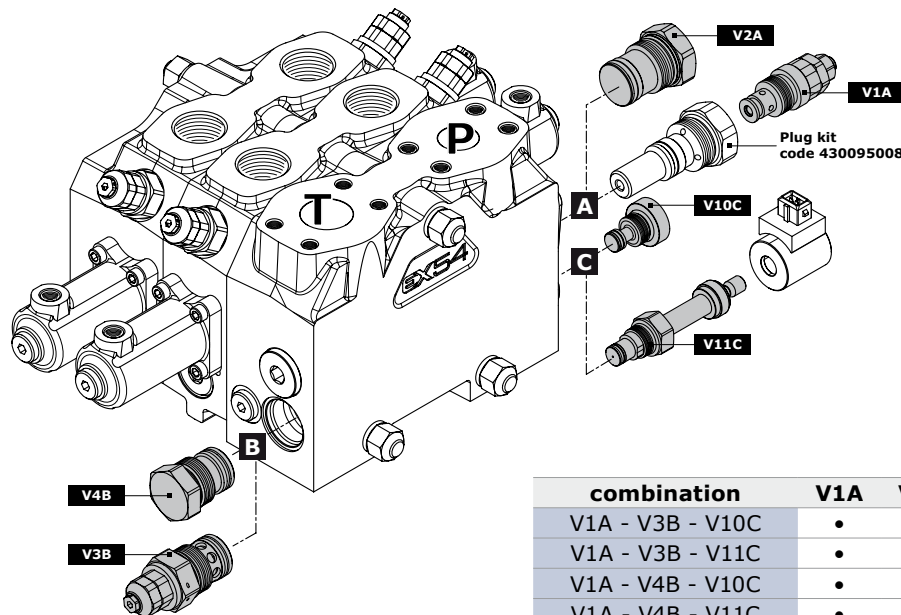
MR

Flow sharing valve with **RIGHT INLET** section



Order code	Schema		Description	Setting Range (bar)
V1A			LS pressure relief valve	120 - 250
				251 - 350
V2A			LS relief plug	
V3B			Full flow direct operated pressure relief valve	50 - 350
V4B			Full flow relief plug	
V10C			LS plug	
V11C			LS electric dump valve	

Combinations valve available



In the presence of LS pressure relief valve (V1A) is compulsory to order separately plug adapter kit that allows the correct assembly of the valve on the inlet section.

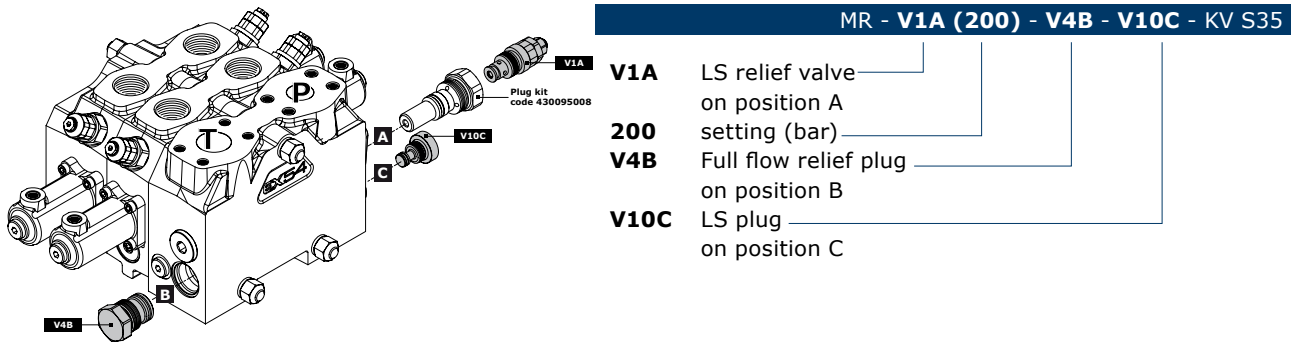
ORDER CODE: **430095008**

combination	V1A	V2A	V3B	V4B	V10C	V11C
V1A - V3B - V10C	•		•		•	
V1A - V3B - V11C	•		•			•
V1A - V4B - V10C	•			•	•	
V1A - V4B - V11C	•			•		•
V2A - V4B - V10C		•		•	•	
V2A - V4B - V11C		•		•		•

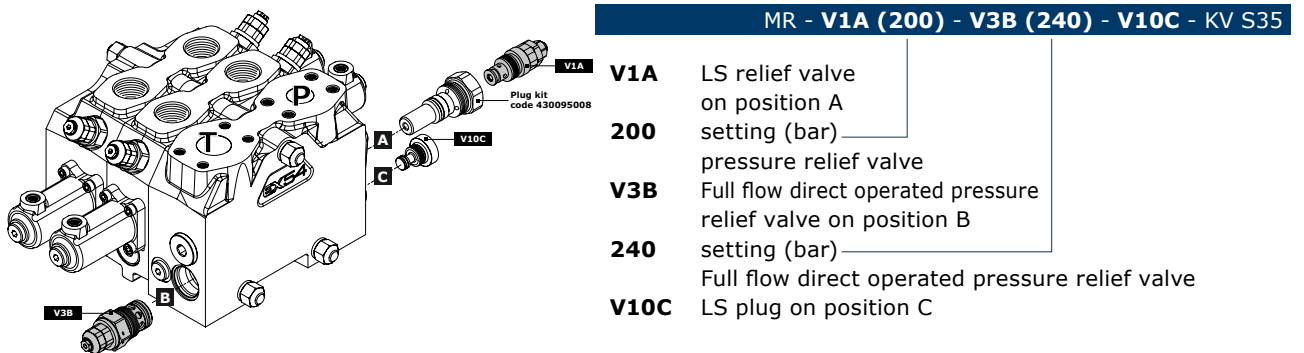


Inlet valve arrangement examples

NOTE: when ordering a valve type V1A or V3B, it is necessary to specify pressure setting.



NOTE: requires minimum 40 bar difference in setting of valve V1A (LS relief valve) and valve V3B (Full flow relief valve)



NOTE: when ordering a valve type V11C, it is necessary to specify connector type (see table "A" page 18)

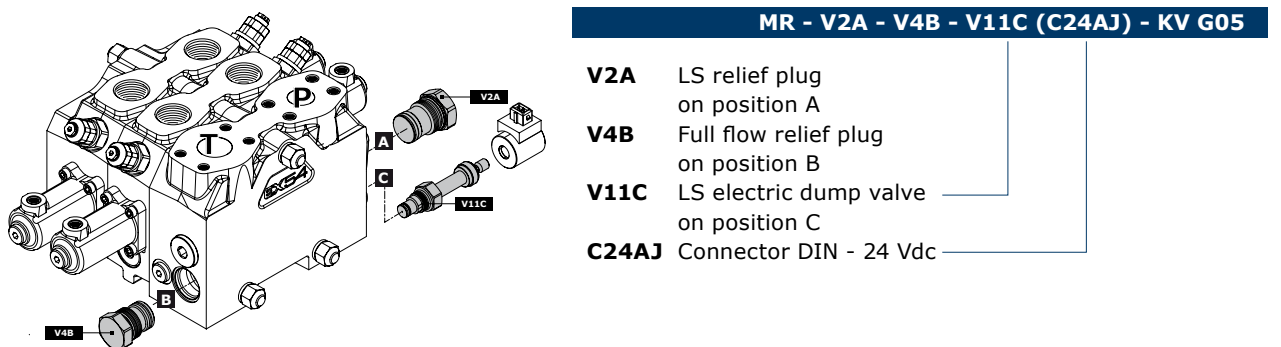
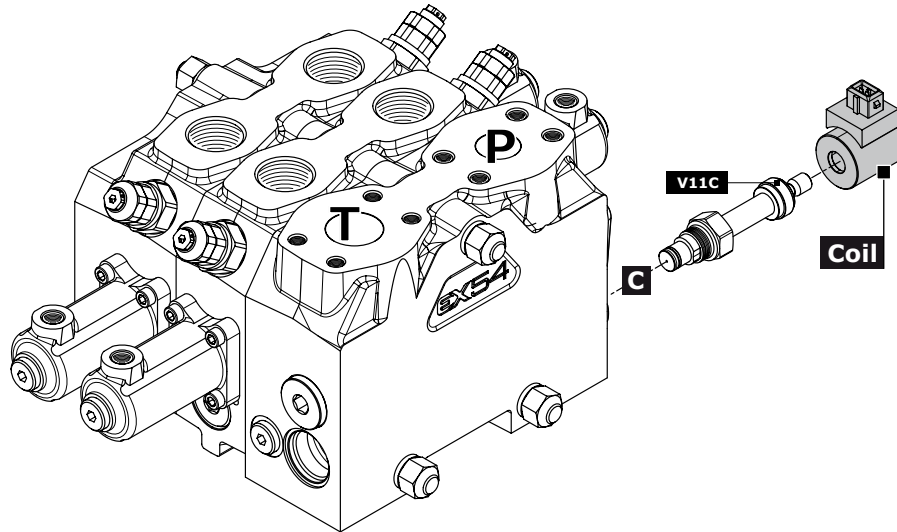




Table "A"
Coil and Connectors specifications for inlet section

Electric dump valve coil must be ordered separately



Coil Type	Order Code	supply voltage (Vdc)	weather protection	Coil resistance R20 (Ω)	connector Material	coil body	duty cycle	Coil Insulation	power	
DIN 43650 ISO 4400	C12DI	413171235	12	7	Nylon	Zinc plated steel	ED 100%	Class H coil as from IEC 85 standard	20.5 W	
		C24DI	413172432							24
DEUTSCH DT 4	C12DE	413171238	12	7						IP67
		C24DE	413172440	24						
AMP JUNIOR	C12AJ	413171237	12 Vdc	7						IP65
		C24AJ	413172433	24 Vdc						

NOTE: mating connector for DIN 43650 can be ordered separately with code 413000313.



Inlet body classification

The inlet section with KV configuration enables control valve usage with fixed displacement pumps. With this configuration the presence of LS relief valve (valve type 1) is suitable to adjust the system maximum pressure. The inlet section with JV configuration enables control valve usage with variable displacement pumps. With this configuration the presence of LS relief valve (valve type 1) is suitable to adjust the system maximum pressure. LS electric dump valve (valve type 11) can also be added as safety device. An additional full flow relief valve (valve type 3) can be added to protect the system from pump regulator failures. Additional solution for variable displacement pumps is available on request to allow a constant reduced free flow in stand by condition through the system: this is sometime required to guarantee a stand by flow for oil cooling.

INLET BODY ARRANGEMENT AND THREAD AVAILABLE		
code	schema	description
KV G07		<p>Open centre inlet section for fixed displacement pumps</p>
KV U07		
KV S35		
KV S36		
JV G07		<p>Closed centre inlet section for variable displacement pumps</p>
JV U07		
JV S35		
JV S36		
KVR G07		<p>Open centre inlet section with RDP for fixed displacement pumps</p>
KVR U07		
KVR S35		
KVR S36		
JVR G07		<p>Closed centre inlet section with RDP for variable displacement pumps</p>
JVR U07		
JVR S35		
JVR S36		

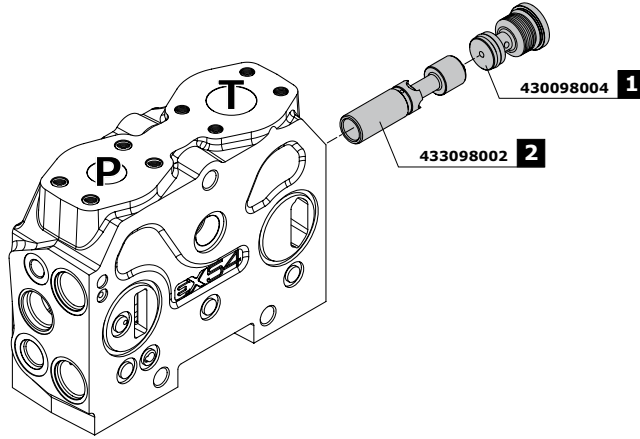
NOTE:

Electrohydraulic actuation requires inlet section with RDP. Transformation of the inlet section from closed center to open center and vice versa is possible by ordering the appropriate kit 320098006 or 320098007 (see page 18)



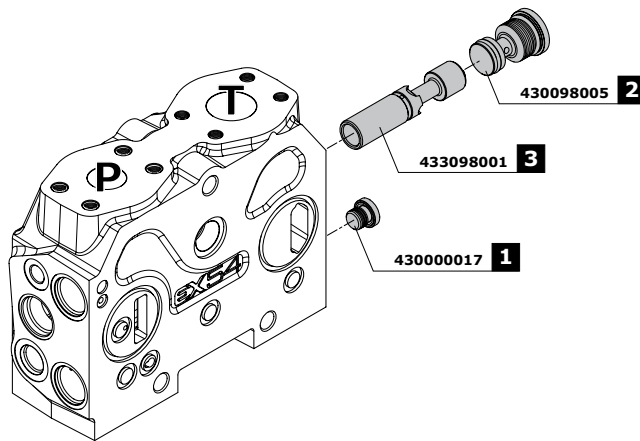
Trasformation kits

Transformation on the inlet section from open center to closed center is possible by ordering the complete kit code: **320098006 (transformation kit from KV to JV)**



OPEN CENTER CONFIGURATION (JV) - VARIABLE PUMP			
Ref.	Order Code	Description	Q.ty
1	430098004	Inlet compensator kit	1
3	433098002	Spool assembly	1
Complete transformation kit: order code - 320098006			

Transformation on the inlet section from closed center to open center is possible by ordering the complete kit code: **320098007 (transformation kit from JV to KV)**



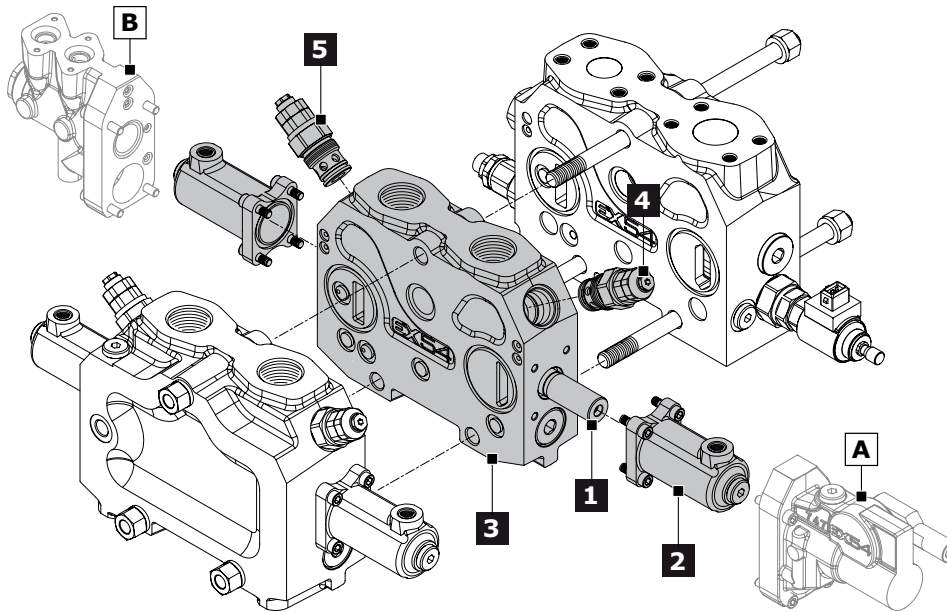
OPEN CENTER CONFIGURATION (KV) - FIXED PUMP			
Ref.	Order Code	Description	Q.ty
1	430000017	Plug G1/4"	1
2	430098005	Inlet compensator plug kit	1
4	433098001	Spool assembly	1
Complete transformation kit: order code - 320098007			



WORKING SECTION

Order example:

	W001C 5050	HP05A	RC1 G06	04 PA 350	04 PB 350
1. W001C 5050	spool type _____				
2. HP05A	spool actuation type _____				
3. RC1 G06	section type _____				
4. 04 PA 350	auxiliary valve type (port A) _____				
5. 04 PB 350	auxiliary valve type (port B) _____				



Rif.	Code	Description	Page
1	W001C 5050	3 positions double-acting (5050 = l/min Spool flow)	20
	W002C 5050	3 positions double-acting A-B to tank (5050 = l/min Spool flow)	
2	HP05A	hydraulic actuation (pilot ports on the top)	22
	HP05C	hydraulic actuation (pilot ports on the side)	
3	RC1 G06	Post-Compensated section with auxiliary valve (G 1)	29
	RC2 G06	Post-Compensated section without auxiliary valve (G 1)	
	RC1 U06	Post-Compensated section with auxiliary valve (1"5/16-12 UN)	
	RC2 U06	Post-Compensated section without auxiliary valve (1"5/16-12 UN)	
4	04 PA 350	Pilot combined valve (port A)	31
	05 PA	Prearrangement for auxiliary valve (port A)	
5	04 PB 350	Pilot combined valve (port B)	31
	05 PB	Prearrangement for auxiliary valve (port B)	

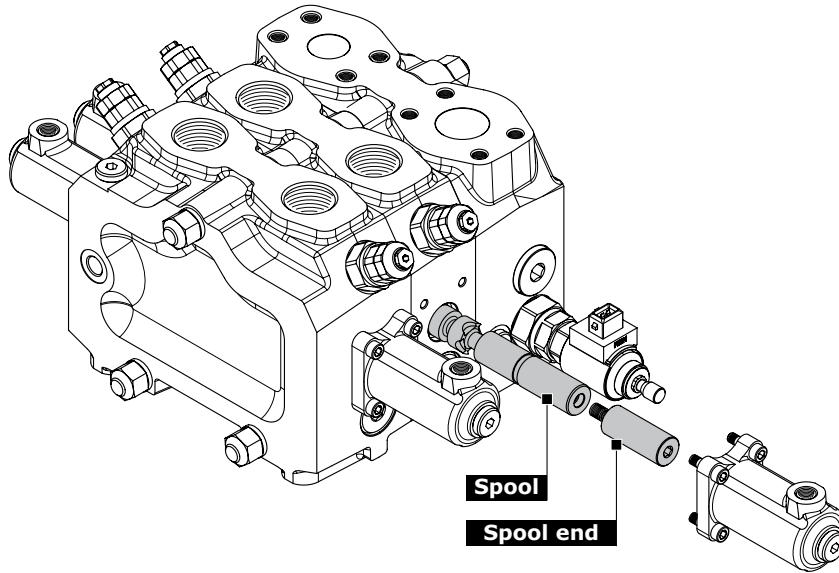
EX54 work sections are available in one configuration: POST COMPENSATED

- RIF. A = spool actuation side A / RIF. B = Spool return action side B
- Sections designed with electrohydraulic actuation require double choice on side A and side B
- Leave out the spool return action code when choosing hydraulic actuation HP05A, HP05C and HP05L
- 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)
- When ordering a section with electrohydraulic actuation, it is necessary to specify connector type. (see table on page 27).



Spool identification

Each work section contains a spool; each spool is compatible with all actuations. For the correct operation of all actuations, each work section requires a spool end which changes according to the type of actuations. (see tables "C" on page 21)



POST - COMPENSATED SECTION		
Code	Description	Schema
W001C	3 positions double-acting	
W002C	3 positions double-acting A and B to tank	

Spool flow

Flow rates delivered to the A and B ports are identified in following table. Rated flows refer to simmetrical spools.

POST - COMPENSATED SECTION (FLOW RATES l/min)					
Spool type	5050	100100	150150	200200	250250
W001C	•	•	•	•	•
W002C	•	•	•	•	•



Spool end identification (Tables "C")

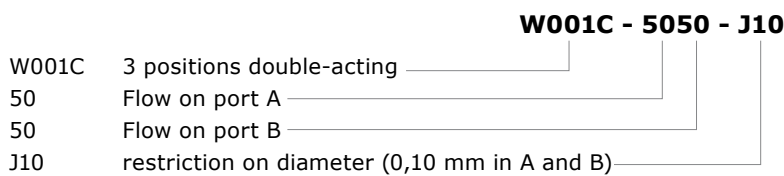
All work section contain end spool, that changes as a function of spool actuation control.

POST - COMPENSATED SECTION		
Code	Description	Layout
422501240	Pin hole end (Available with hydraulic actuation)	
422501275	Pin hole end (Available with electrohydraulic actuation)	

Spool with restricted service ports

Code	Circuit	Restriction on diameter (mm)	Section (mm ²)	Schema
J10	A-B IN T	0,10	2,19	
K10	A IN T	0,10	2,19	
Y10	B IN T	0,10	2,19	

Classification spool example



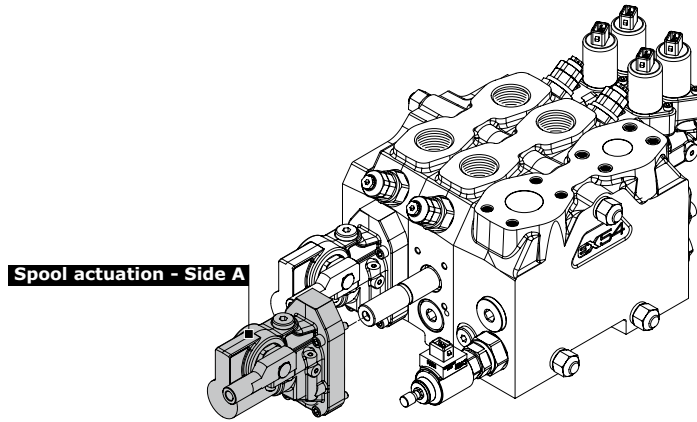
NOTE:

- not simmetric spools (such as 50100, 150200...) are available on request; for availability we suggest to contact our Sales department.
- rated flows are defined for 16 bar ΔP (as per KV inlet arrangement); for different ΔP values on variable pump systems, refer to diagram on page 12 (Post compensated spool flow with variable displacement pumps).

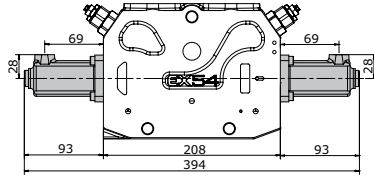
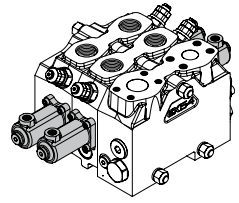
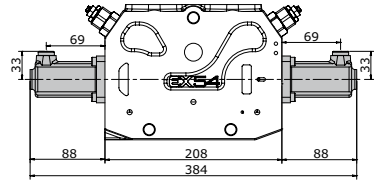
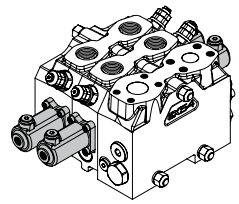
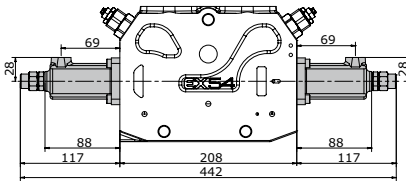
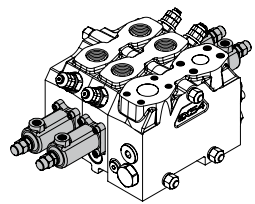


Spool actuation classification - SIDE A

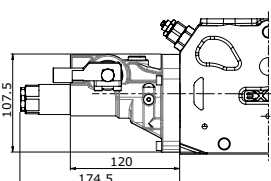
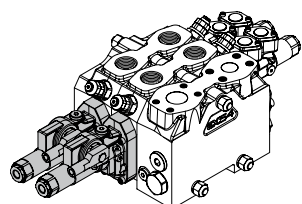
Spool actuations are divided in two types: **Hydraulic actuation - Electrohydraulic actuation**



COMPLETE HYDRAULIC ACTUATION

Code	Description	Dimensions	Configuration
HP05A	Hydraulic actuation (pilot ports on the top) (only with manual and hydraulic section body)		
HP05C	Hydraulic actuation (pilot ports on the sides) (only with manual and hydraulic section body)		
HP05L	Hydraulic actuation with stroke limiter (only with manual and hydraulic section body)		

HYDRAULIC ACTUATION - SIDE A

Code	Description	Dimensions	Configuration
HP01	Lever actuation + hydraulic actuation		



HYDRAULIC ACTUATION SPECIFICATIONS

Regulating pressure (bar)	6,2 - 20,1
Max Pressure on pilot line (bar)	40
Max Pressure on pilot Tank line (bar)	5

NOTE:

- Leave out the spool return action code when choosing hydraulic actuation HP05A, HP05C and HP05L
- HP05A, HP05C, HP05L requires a hydraulic version body.
- All hydraulics actuation are available in BSP or UNF version: (Port Pilot: 1/4" BSP or 9/16" UNF)
- Recommended control curve for HC Remote Control: A01 for standard spool

ELECTROHYDRAULIC ACTUATION - SIDE A

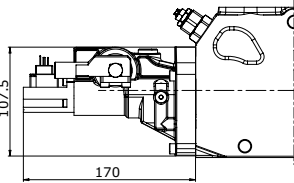
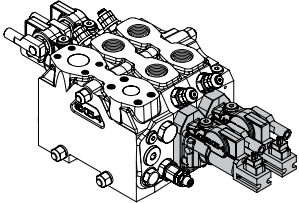
Code	Description	Dimensions	Configuration
HP04	Lever actuation + electrohydraulic actuation		
HP04L	Lever actuation + electrohydraulic actuation with stroke limiter		
HP07	Without lever + electrohydraulic actuation		
HP07L	Without lever + electrohydraulic actuation with stroke limiter		
HP09	Without lever + hydraulic actuation electrohydraulic actuation		

NOTE: Require electrohydraulic version body.



Hall effect Linear Position Sensor HLPS - side A

HLPS is a Hall effect sensor based device used in conjunction with spool position transducer kits available for EX54. 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 close loop feedback control applications and whenever determining spool position reliably is, as in safety functions, a major concern.

ELECTROHYDRAULIC ACTUATION - SIDE A			
Code	Description	Dimensions	Configuration
HP04S	Spool position indicator for electrohydraulic actuation Only available with HP04 - HP07		

Technical specifications

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

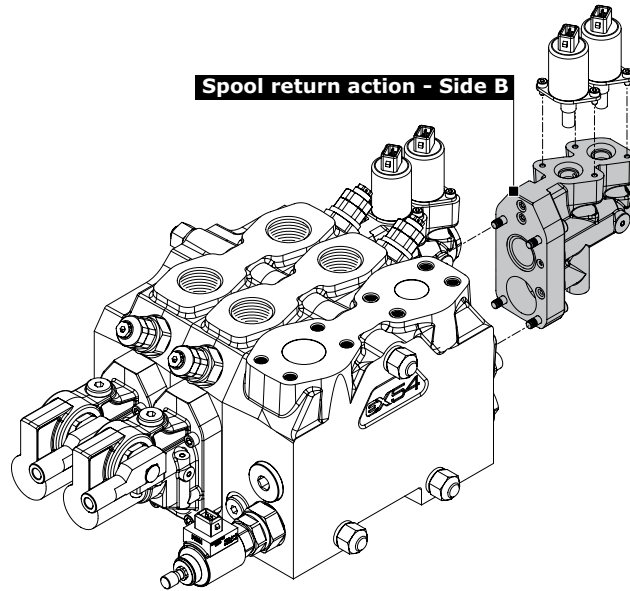
NOTE: mating connector for DIN 43650-C can be ordered separately with code 487200314



Spools return action classification - SIDE B

Spool return action are mandatory for all electrohydraulics actuation and hydraulic actuation HP01. Also Spool return action are divided in two types:

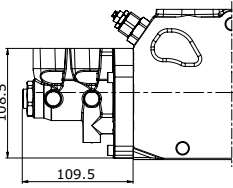
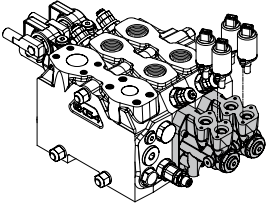
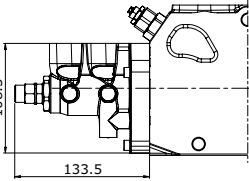
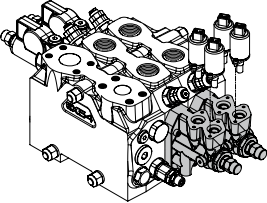
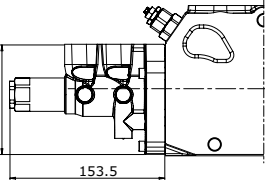
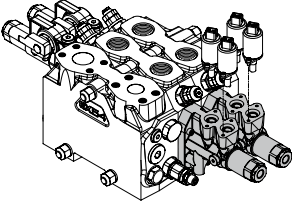
- **Hydraulic spool return action**
- **Electrohydraulic spool return action**



HYDRAULIC ACTUATION - SIDE B			
Code	Description	Dimensions	Configuration
FP01	Hydraulic actuation Only available with HP01		

NOTE: FP01 is available in BSP or UNF version: (Port Pilot: 1/4" BSP or 9/16" UNF)



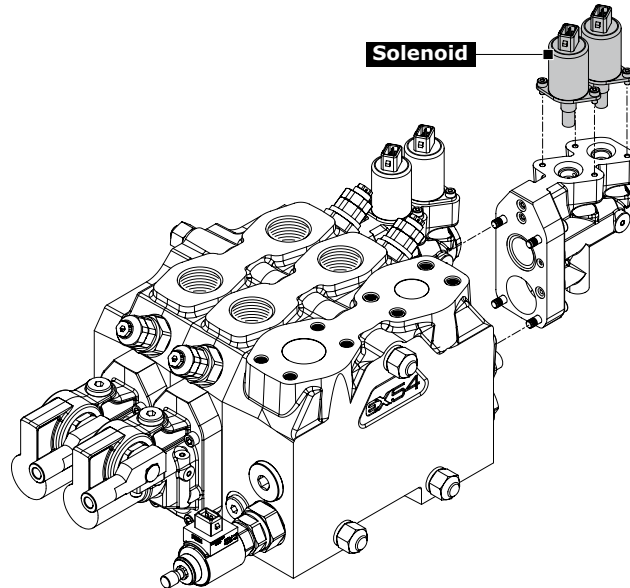
ELECTROHYDRAULIC ACTUATION - SIDE B			
Code	Description	Dimensions	Configuration
FP04	Electrohydraulic actuation available with HP04 - HP04L - HP07		
FP04L	Electrohydraulic actuation with stroke limiter Only available with HP07L		
FP08	Electrohydraulic actuation and hydraulic actuation available with HP01 - HP09		

NOTE: FP08 is available in BSP or UNF version: (Port Pilot: 1/4" BSP or 9/16" UNF)



Solenoid specifications for Electrohydraulic actuation

Solenoid kit must be ordered separately. Each work section require two solenoid kit.



COIL AND CONNECTOR SPECIFICATIONS				
Type	DEUTSCH DT 4		AMP JUNIOR POWER TIMER	
Order Code	B12DE	B24DE	B12AJ	B24AJ
	430093102	430093103	430093100	430093101
Supply voltage (Vdc)	12	24	12	24
Coil resistance R20 (Ω)	4,7	20,8	4,7	20,8
ON-OFF control current (mA)	2500	1150	2500	1150
Proportional control current (mA)	500 - 1300	250 - 650	500 - 1300	250 - 650
PWM frequency suggested (Hz)	70 - 90		70 - 90	
Connector	DEUTSCH DT 4		AMP Junior Power Timer	
Feeding reducing pressure (bar)	40		40	
Max Pressure on pilot Tank line (bar)	5		5	

NOTE:

Mating connector for AMP Junior Power Timer can be ordered separately with code 413000223 (including 2 m wire). Mating connector for Deutsch DT 4 can be ordered separately with code 487200802.



Compatibility table

COMBINATION		SPOOL ACTION AND RETURN SPRING TYPE - SIDE B				
		FP01	FP04	FP04L	FP04S	FP08
SPOOL ACTION AND RETURN SPRING TYPE - SIDE A	HP05A					
	HP05C					
	HP05L					
	HP01	•				•
	HP04		•		•	
	HP04L		•			
	HP07		•			
	HP07L			•		
	HP09					•
	HP04S		•			

NOTE: Leave out the spool return action code when choosing hydraulic actuation HP05A, HP05C and HP05L



Work section arrangement

Following pages are showing ordering code for post compensated section in their standard version and in combination with some specific applicable devices.

POST-COMPENSATED Section with local LS relief valve

Another feature not commonly found in flow sharing systems is the possibility to have a Load Sensing relief valve on individual sections. The purpose to use a local LS relief instead of a standard port shock relief is to improve the efficiency of the system. When a standard port shock relief is used, the full flow across the relief will be directed to tank, if the pressure system exceeds the setting. By using a local LS relief, only a very minimal part of oil will be directed to tank in the same condition, with great advantage for the system efficiency.

Furthermore, by saving oil from going to tank, more oil will be available for simultaneous operations and this will improve the performance of the machine.

The pressure limitation generated by the local LS relief applies to both section ports, A and B.

The local pressure limitation works properly if the section is actuated alone or if the section is the most charged.

The local LS relief can be easily installed as a retrofit too.

Functions	Code	Setting range	Type	POST compensated
Standard section	RC1		with auxiliary valve	•
Section with local LS relief valve	RCD1	50 - 170 171 - 420	with auxiliary valve	•
Standard integrated outlet section	RCK1A RCK1C		with auxiliary valve	•
Integrated outlet section with local LS relief valve	RCDK1A RCDK1C	50 - 170 171 - 420	with auxiliary valve	•

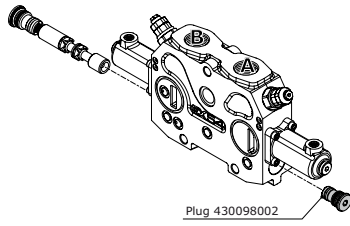
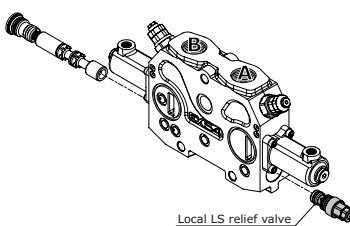
NOTE:

- Local LS relief valve work on both ports; setting for A and B ports is the same.
- LS relief valve setting must be specified as follow: RCD1 G06 (120) - RCDK1A G06 (120)



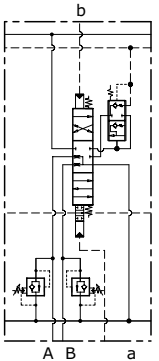
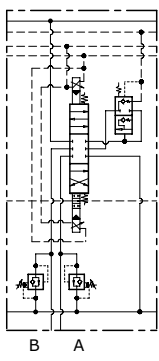
Work section trasformation kits

Transformation on the work section from RC type to RCD type and viceversa, is possible by ordering the following plug kit codes:

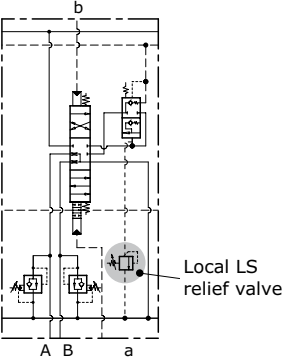
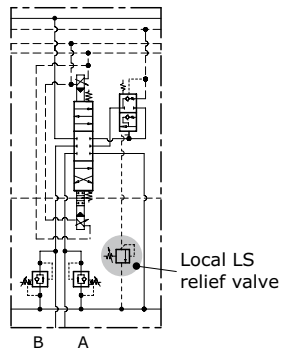
Type	Order Code	Setting Range	Description	Configuration	Section Type
RC	430098002		Standard section		Post compensated section
RCD	915009801	50 - 170	Section with local LS relief valve		
	915009802	171 - 420			

POST compensated arrangement

POST-COMPENSATED SECTION STANDARD

code	schema for hydraulic lever actuation	schema for electrohydraulic actuation	description
RC1 G06			POST compensated section Arranged for auxiliary valves
RC1 U06			

POST-COMPENSATED SECTION WITH LOCAL LS RELIEF VALVE

code	schema for hydraulic lever actuation	schema for electrohydraulic actuation	description
RCD1 G06			POST compensated section with local Load Sensing relief valve Arranged for auxiliary valves
RCD1 U06			

NOTE: RCD1 type in combination with HP04, HP07, HP08, HP09, HP01 requires left inlet assembly (ML).



Auxiliary valve identification

Valve setting is defined at 10 l/min flow. Look at Auxiliay valves diagram on page 14 to evaluate setting at actual flow.

code	description	schema	configuration	setting range (bar)			
				type	at full flow	type	at min. flow
01 PA	Antishock valve (port A)			A	70 / 150	A	70-A / 120-A
				B	151 / 230	B	121-A / 200-A
				C	231 / 280	C	201-A / 250-A
				D	281 / 350	D	251-A / 350-A
02 PA	Anticavitation valve (port A)						
04 PA	Pilot combined valve (port A)			A	50 / 420	A	50-A / 420-A
05 PA	Prearrangement for auxiliary valve (port A)						

code	description	schema	configuration	setting range (bar)			
				type	at full flow	type	at min. flow
01 PB	Antishock valve (port B)			A	70 / 150	A	70-A / 120-A
				B	151 / 230	B	121-A / 200-A
				C	231 / 280	C	201-A / 250-A
				D	281 / 350	D	251-A / 350-A
02 PB	Anticavitation valve (port B)						
04 PB	Pilot combined valve (port B)			A	50 / 420	A	50-A / 420-A
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 or pilot combined valve:

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

04 PA (120) = setting at full flow / 04 PA (120-A) = setting at min. flow

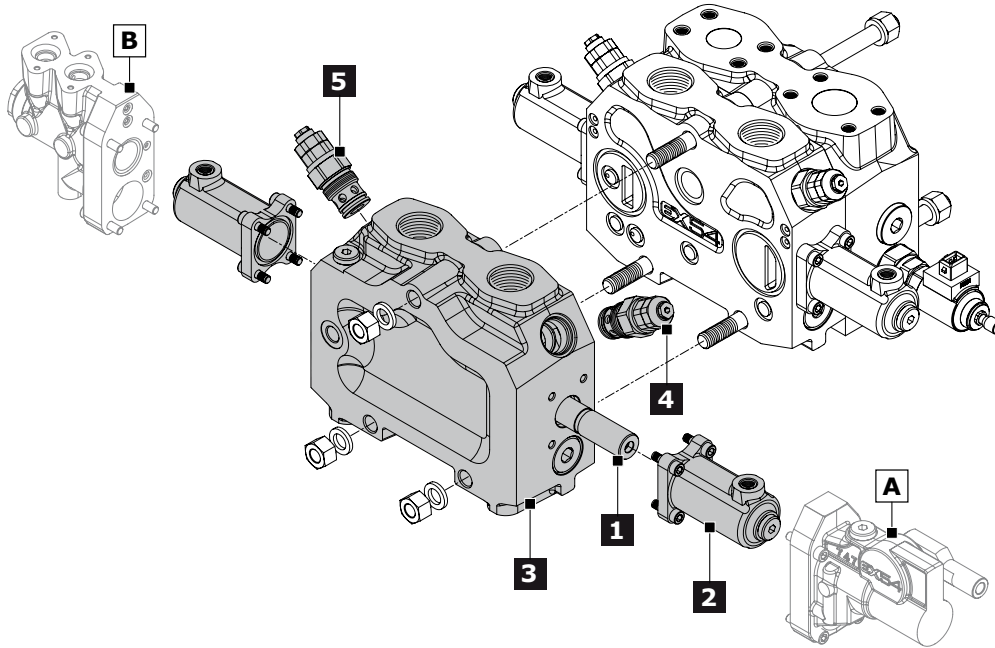


INTEGRATED OUTLET SECTION

Order example:

W001C 5050	HP05A	RCK1A G06	04 PA 350	04 PB 350
-------------------	--------------	------------------	------------------	------------------

1. **W001C 5050** spool type
2. **HP05A** spool actuation type
3. **RCK1A G06** integrated outlet section type
4. **04 PA 350** auxiliary valve type (port A)
5. **04 PB 350** auxiliary valve type (port B)



Ref.	Code	Description	Page
1	W001C 5050	3 positions double-acting (5050 = l/min Spool flow)	20
	W002C 5050	3 positions double-acting A-B to tank (5050 = l/min Spool flow)	
2	HP05A	hydraulic actuation (pilot ports on the top)	22
	HP05C	hydraulic actuation (pilot ports on the side)	
3	RCK1A G06	Integrated outlet section with LS drain upper (G 1)	33
	RCK1A U06	Integrated outlet section with LS drain upper (1"5/16-12 UN)	
	RCK1C G06	Integrated outlet section with LS drain side (G 1)	
	RCK1C U06	Integrated outlet section with LS drain side (1"5/16-12 UN)	
4	04 PA 350	Pilot combined valve (port A)	31
	05 PA	Prerangement for auxiliary valve (port A)	
5	04 PB 350	Pilot combined valve (port B)	31
	05 PB	Prerangement for auxiliary valve (port B)	

EX54 integrated outlet sections are available in one configuration: POST COMPENSATED

Integrated outlet sections are equipped with the same parts of work section, change only the body arrangement.

- RIF. A = spool actuation side A / RIF. B = Spool return action side B

Integrated outlet section designed with electrohydraulic actuation require double choice on side A and side B

- Leave out the spool return action code when choosing hydraulic actuation HP05A, HP05C and HP05L

- 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)

- When ordering a integrated outlet section with electrohydraulic actuation, it is necessary to specify connector type. (see table on page 27).



Integrated Outlet Section Arrangement

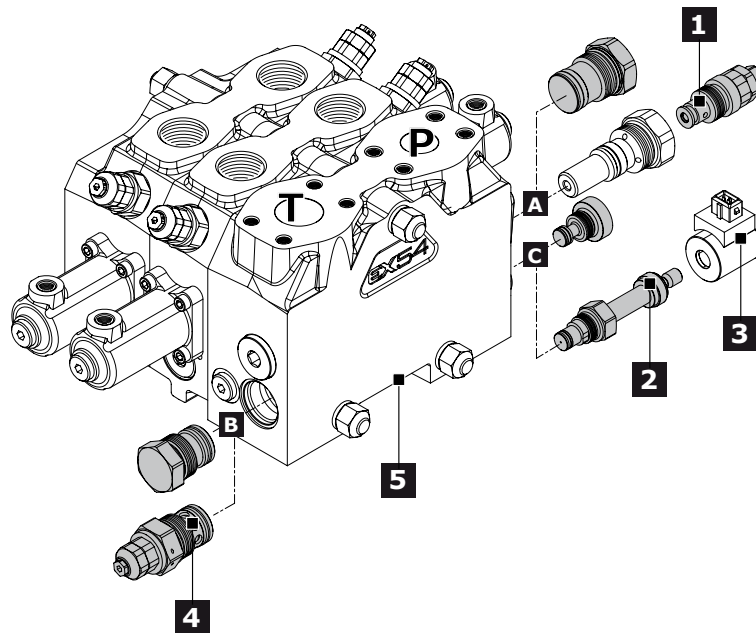
POST-COMPENSATED INTEGRATED OUTLET SECTION STD			
code	schema	configuration	description
RCK1A G06			<p>POST compensated integrated outlet section with LS drain - UPPER</p> <p>Arranged for auxiliary valves</p>
RCK1A U06			<p>POST compensated integrated outlet section with LS drain - SIDE</p> <p>Arranged for auxiliary valves</p>
RCK1A S03			
RCK1A S04			
RCK1C G06			
RCK1C U06			
RCK1C S03			
RCK1C S04			

POST-COMPENSATED INTEGRATED OUTLET SECTION WITH LOCAL LS RELIEF VALVE			
code	schema	configuration	description
RCDK1A G06			<p>POST compensated integrated outlet section with LS drain - UPPER</p> <p>Arranged for auxiliary valves</p>
RCDK1A U06			<p>POST compensated integrated outlet section with LS drain - SIDE</p> <p>Arranged for auxiliary valves</p>
RCDK1A S03			
RCDK1A S04			
RCDK1C G06			
RCDK1C U06			
RCDK1C S03			
RCDK1C S04			



EX54 SPARE PARTS LIST

Inlet Section

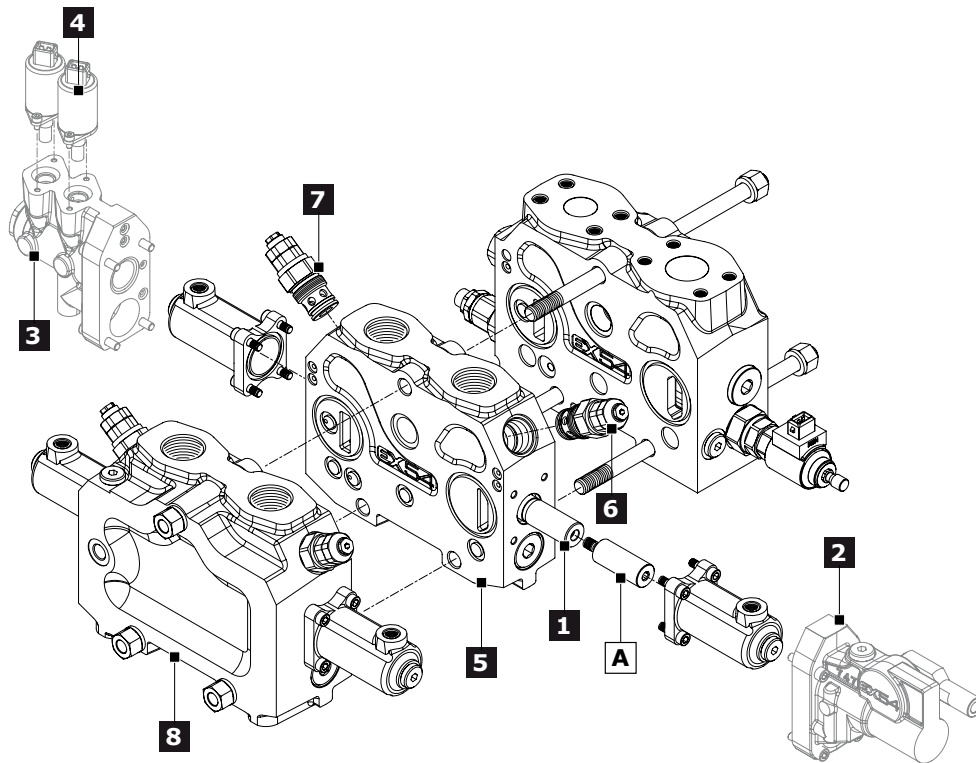


Rif.	Description	Order code	Q.ty	Code	Note
1	LS pressure relief valve	915029501	1	V1A	Setting range: 120-150 bar
		915029502	1	V1A	Setting range: 251-350 bar
	LS relief plug	430195001	1	V2A	
2	Full flow pilot operated pressure relief valve	915078801	1	V3B	Setting range: 50-350 bar
		430488001	1	V4B	
3*	Electric dump valve coil	413171235	1	C12DI	DIN 43650 ISO 4400 - 12 Vdc
		413172432	1	C24DI	DIN 43650 ISO 4400 - 24 Vdc
		413171238	1	C12DE	DEUTSCH DT 4 - 12 Vdc
		413172440	1	C24DE	DEUTSCH DT 4 - 24 Vdc
		413171237	1	C12AJ	AMP JUNIOR - 12 Vdc
		413172433	1	C24AJ	AMP JUNIOR - 24 Vdc
4	LS plug	430059003	1	V10C	
		413150076	1	V11C	
5	Open centre inlet section	029800001	1	KV G07	for fixed displacement pumps
		029800002	1	KV U07	
		029800003	1	KV S35	
		029800004	1	KV S36	
	Closed centre inlet section	029800011	1	JV G07	for variable displacement pumps
		029800012	1	JV U07	
		029800013	1	JV S35	
		029800014	1	JV S36	
	Open centre inlet section with RDP	029800021	1	KVR G07	for fixed displacement pumps
		029800022	1	KVR U07	
		029800023	1	KVR S35	
		029800024	1	KVR S36	
Closed centre inlet section with RDP	029800031	1	JVR G07	for variable displacement pumps	
	029800032	1	JVR U07		
	029800033	1	JVR S35		
	029800034	1	JVR S36		

(*) = Electric dump valve coil must be ordered separately: see table "A" page 18.



Post-Compensated Work Section and Integrated Outlet Section



Rif.	Description	Order code	Q.ty	Code	Note
1	3 positions double-acting spool	421298007	1	W001C 5050	spool 50 l/min
		421298003	1	W001C 100100	spool 100 l/min
		421298004	1	W001C 150150	spool 150 l/min
		421298005	1	W001C 200200	spool 200 l/min
		421298006	1	W001C 250250	spool 250 l/min
	3 positions double-acting spool A and B to tank	421298014	1	W002C 5050	spool 50 l/min
		421298010	1	W002C 100100	spool 100 l/min
		421298011	1	W002C 150150	spool 150 l/min
		421298012	1	W002C 200200	spool 200 l/min
		421298013	1	W002C 250250	spool 250 l/min
A	Spool end	422501240	1		for hydraulic actuation
		422501275	1		for electrohydraulic actuation
2	Hydraulic actuation (ports on the top)	320598100	1	HP05A	BSP version
	Hydraulic actuation (ports on the sides)	320598106	1	HP05C	
	Hydraulic actuation with stroke limiter	320598112	1	HP05L	
	Lever actuation + hydraulic actuation	320598130	1	HP01	UNF version
	Hydraulic actuation (ports on the top)	320598103	1	HP05A	
	Hydraulic actuation (ports on the sides)	320598109	1	HP05C	
	Hydraulic actuation with stroke limiter	320598115	1	HP05L	
	Lever actuation + hydraulic actuation	320598132	1	HP01	
	Lever actuation + electrohydraulic actuation	322598002	1	HP04	
	Lever actuation + electrohydraulic actuation with stroke limiter	322598003	1	HP04L	
	Without lever + electrohydraulic actuation	322598004	1	HP07	
	Without lever + electrohydraulic actuation with stroke limiter	322598005	1	HP07L	
	Spool position indicator for electrohydraulic actuation	322598106	1	HP04S	BSP version
	Without Lever + hydraulic actuation + electrohydraulic actuation	322598008	1	HP09	
		322598009	1	HP09	UNF version



Rif.	Description	Order code	Q.ty	Code	Note
3	Lever actuation + hydraulic actuation	320598131 320598133	1	FP01	only with HP01 - BSP version only with HP01 - UNF version
	Lever actuation + electrohydraulic actuation	322598102	1	FP04	only with HP04-HP07
	Without lever + electrohydraulic actuation with stroke limiter	322598103	1	FP04L	only with HP07L
	Lever + hydraulic actuation + electrohydraulic actuation	322598104 322598105	1	FP08	only with HP08-HP09 (BSP) only with HP08-HP09 (UNF)
4	Solenoid kit	430093100	2	B12AJ	AMP JUNIOR - 12 Vdc
		430093101	2	B24AJ	AMP JUNIOR - 24 Vdc
		430093102	2	B12DE	DEUTSCH DT 4 - 12 Vdc
		430093103	2	B24DE	DEUTSCH DT 4 - 24 Vdc
5	Post compensated section standard with auxiliary valve	039800001	1	RC1 G06	Only for Hydraulic actuation
	Post compensated section with local LS relief valve with auxiliary valve	039800005	1	RCD1 G06 50/170	
	Post compensated section standard with auxiliary valve	039800006	1	RCD1 G06 171/420	
	Post compensated section standard with auxiliary valve	039800002	1	RC1 U06	
	Post compensated section with local LS relief valve with auxiliary valve	039800007	1	RCD1 U06 50/170	
	Post compensated section with local LS relief valve with auxiliary valve	039800008	1	RCD1 U06 171/420	
	Post compensated section standard with auxiliary valve	039800003	1	RC1 S03	
	Post compensated section with local LS relief valve with auxiliary valve	039800009	1	RCD1 S03 50/170	
	Post compensated section with local LS relief valve with auxiliary valve	039800010	1	RCD1 S03 171/420	Only for Electrohydraulic actuation
	Post compensated section standard with auxiliary valve	039800004	1	RC1 S04	
	Post compensated section with local LS relief valve with auxiliary valve	039800011	1	RCD1 S04 50/170	
	Post compensated section with local LS relief valve with auxiliary valve	039800012	1	RCD1 S04 171/420	
	Post compensated section standard with auxiliary valve	039800101	1	RC1 G06	
	Post compensated section with local LS relief valve with auxiliary valve	039800105	1	RCD1 G06 50/170	
	Post compensated section with local LS relief valve with auxiliary valve	039800106	1	RCD1 G06 171/420	
	Post compensated section standard with auxiliary valve	039800102	1	RC1 U06	
Post compensated section with local LS relief valve with auxiliary valve	039800107	1	RCD1 U06 50/170		
Post compensated section with local LS relief valve with auxiliary valve	039800108	1	RCD1 U06 171/420		
Post compensated section standard with auxiliary valve	039800103	1	RC1 S03		
Post compensated section with local LS relief valve with auxiliary valve	039800109	1	RCD1 S03 50/170		
Post compensated section with local LS relief valve with auxiliary valve	039800110	1	RCD1 S03 171/420		
Post compensated section standard with auxiliary valve	039800104	1	RC1 S04		
Post compensated section with local LS relief valve with auxiliary valve	039800111	1	RCD1 S04 50/170		
Post compensated section with local LS relief valve with auxiliary valve	039800112	1	RCD1 S04 171/420		

Auxiliary valve

Rif.	Description	Order code	Q.ty	Code	Note
6	Antishock valve - port A	915060601	1	01 PA	setting: (70/150 70-A/120-A bar)
		915060602	1		setting: (151/230 121-A/200-A bar)
		915060603	1		setting: (231/280 201-A/250-A bar)
		915060601	1		setting: (281/350 251-A/350-A bar)
	Anticavitation valve - port A	915080601	1	02 PA	
Pilot Combined valve - port A	915074501	1	04 PA	setting: (50/420 bar)	
Prearrangement for auxiliary valve - port A	430406001	1	05 PA		
7	Antishock valve - port B	915060601	1	01 PB	setting: (70/150 70-A/120-A bar)
		915060602	1		setting: (151/230 121-A/200-A bar)
		915060603	1		setting: (231/280 201-A/250-A bar)
		915060601	1		setting: (281/350 251-A/350-A bar)
	Anticavitation valve - port B	915080601	1	02 PB	
	Pilot Combined valve - port B	915074501	1	04 PB	setting: (50/420 bar)
Prearrangement for auxiliary valve - port B	430406001	1	05 PB		



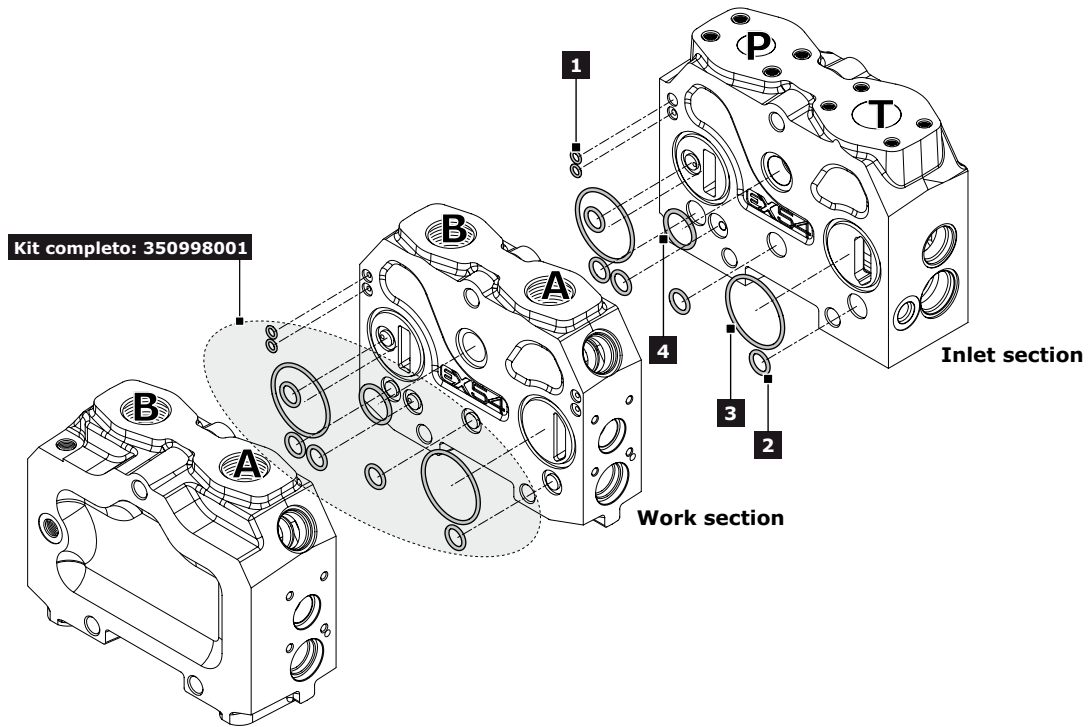
Post-Compensated Integrated Outlet Section

Integrated Outlet Sections are equipped with the same parts of work section, change only the body arrangement (see rif. 9 - drawing page 35).

Rif.	Description	Order code	Q.ty	Code	Note	
8	Integrated outlet section with LS drain - UPPER	039800201	1	RCK1A G06		
		039800202	1	RCK1A U06		
		039800203	1	RCK1A S07		
		039800204	1	RCK1A S08		
	Integrated outlet section with LS drain - SIDE	039800205	1	RCK1C G06		
		039800206	1	RCK1C U06		
		039800207	1	RCK1C S07		
		039800208	1	RCK1C S08		
	Integrated outlet section with LS drain - UPPER with local LS relief valve with auxiliary valve	039800211	1	RCDK1A G06 50/170		Only for Hydraulic actuation
		039800212	1	RCDK1A G06 171/420		
		039800213	1	RCDK1A U06 50/170		
		039800214	1	RCDK1A U06 171/420		
		039800215	1	RCDK1A S03 50/170		
		039800216	1	RCDK1A S03 171/420		
		039800217	1	RCDK1A S04 50/170		
		039800218	1	RCDK1A S04 171/420		
	Integrated outlet section with LS drain - SIDE with local LS relief valve with auxiliary valve	039800219	1	RCDK1C G06 50/170		
		039800220	1	RCDK1C G06 171/420		
		039800221	1	RCDK1C U06 50/170		
		039800222	1	RCDK1C U06 171/420		
		039800223	1	RCDK1C S03 50/170		
		039800224	1	RCDK1C S03 171/420		
		039800225	1	RCDK1C S04 50/170		
		039800226	1	RCDK1C S04 171/420		
	Integrated outlet section with LS drain - UPPER	039800231	1	RCK1A G06		
		039800232	1	RCK1A U06		
		039800233	1	RCK1A S07		
		039800234	1	RCK1A S08		
Integrated outlet section with LS drain - SIDE	039800235	1	RCK1C G06			
	039800236	1	RCK1C U06			
	039800237	1	RCK1C S07			
	039800238	1	RCK1C S08			
Integrated outlet section with LS drain - UPPER with local LS relief valve with auxiliary valve	039800241	1	RCDK1A G06 50/170	Only for Electrohydraulic actuation		
	039800242	1	RCDK1A G06 171/420			
	039800243	1	RCDK1A U06 50/170			
	039800244	1	RCDK1A U06 171/420			
	039800245	1	RCDK1A S03 50/170			
	039800246	1	RCDK1A S03 171/420			
	039800247	1	RCDK1A S04 50/170			
	039800248	1	RCDK1A S04 171/420			
Integrated outlet section with LS drain - SIDE with local LS relief valve with auxiliary valve	039800249	1	RCDK1C G06 50/170			
	039800250	1	RCDK1C G06 171/420			
	039800251	1	RCDK1C U06 50/170			
	039800252	1	RCDK1C U06 171/420			
	039800253	1	RCDK1C S03 50/170			
	039800254	1	RCDK1C S03 171/420			
	039800255	1	RCDK1C S04 50/170			
	039800256	1	RCDK1C S04 171/420			



Gasket kits



Ref.	Order Code	Description	Q.ty
1	412010122	O.R. 70SH 6.07 x 1,78 (2-10)	2
2	412020609	O.R. 90SH 13.11 x 2.62 (5-616)	5
3	412020615	O.R. 90SH 48.90 x 2.62 (2-135)	2
4	412021001	O.R. 90SH 23.47 x 2.95 (3-912)	1

Order code complete Gasket kit: 350998001



INSTALLATION

Guidelines

- Never use the Control Valve at a pressure exceeding the rated pressure; if not, there is the possibility of leakage in the Control Valve;
- Use the Control Valve within the rated flow; if not there might be malfunction or a deterioration in heat balance. If it is unavoidable to use the Control Valve at a level exceeding the rated flow, carry out various confirmatory tests and use it within the verified range. If the Control Valve is used under a condition beyond the verified range, we shall not be responsible for any accidents occurred as a result of the use.
- Using low-cleanliness hydraulic fluid might cause seal failure or damage to the seal part, resulting in operation failure, or operation mistake of the machine; the customer is requested to check the cleanliness of the hydraulic fluid without fail.

Storage

Do not store the HC product in:

- Places where it might be damaged;
- Very hot/humid areas;
- Where it could get wet;
- Where it could come into contact with organic solvents, acids, alkalis and/or dangerous gases;
- In places subject to sudden, significant changes in temperature;
- only remove the packaging when you have decided to assemble the product.



Warning

- Hydrocontrol is not responsible for any damages due to a storage not in compliance with our prescriptions;
- For any doubts, please contact our aftersales department.

Installation procedures

On receiving the Hydrocontrol product make sure you:

- Check if there are some sign of damage of the packaging;
- Check that the dimensions of the product seat are compatible with those of the product itself;
- Check that assembly seat is compatible with the dimensions of the part and that it has been prepared for part set-up (connection hoses ready etc.);
- Remove the plastic caps that protect the service ports and be careful not to introduce any dirt or foreign matters inside the control valve as this could damage it;
- 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; any distortion in assembly can result in spool sticking and poor control;
- Clean piping materials sufficiently before use;
- Prevent the port openings from being entered with dust or foreign matters;
- Double check that hoses are correctly connected following prescription and indication of hydraulic schema, especially:
 - (in case of EH control) be sure that drain line is directly connected to tank (avoid any back pressure)
 - (in case of variable displacement system) be sure that LS signal line is correctly connected to the pump regulator.
- tighten the port connectors surely with the recommended fastening torques (Nm) as shown in the following table;
- If possible, install the valve in a protected environment, avoiding direct exposure to weathering, water, salt or any other corrosion substances

Fittings tightening torque (Nm)

Thread Type	Port P	Port A - B	Port T
BSP (ISO - 228)	G 1"1/4	G 1	G 1"1/4
with rubber sealing (DIN 3869)	120	120	120
with copper or steel and rubber washer	120	120	120
UN-UNF (ISO - 725)	1"5/8 - 12 UNF	1"5/16 - 12 UNF	1"5/8 - 12 UNF
with O.R.	120	120	120

**Warning**

- Falling or hitting the Control Valve might bend the Spool so as to cause an accident due to an operation failure;
- If the Control Valve is mounted in a uneven surface, the Control Valve Body might be deformed, which results on a malfunction or external leakage;
- If there are foreign matters in each port, the Control Valve operation might fail so as to cause an accident;
- Do not tighten fittings with torque more than the recommended value; If not there might be strains or damage to Control Valve so as to cause a serious accident;
- If the piping are not connected to the correspondent ports, unintentional movements might cause a serious accident;
- Hydrocontrol is not responsible for any damages due to an installation procedure not in compliance with our prescriptions;
- For any doubts, please contact our aftersales department.

Handling Precautions

When the Control Valve is handled, ensure:

- that you do not drop, hit or damage the product;
- that you do 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

Handling Precautions

Disassembly and assembly should be carried out by Hydrocontrol technicians. If the Control Valve doesn't work in the adequate way, we advise you to contact our aftersales department. However if the disassembly and assembly operations are strictly unavoidable, you must observe the following prescriptions and charge the carrying out of the operations to technicians high qualified in hydraulic field.

- The Control Valve reaches high temperature after operating the machine; start the work only after checking that the temperature is low;
- The valve can hold high internal pressure; release the inside pressure and ensure all machine actuators are in a rest position before removing the piping. In any case safely and carefully unscrew connections and fittings. If not, there might be a fall of attachments or high-temperature hydraulic fluid jet. Remind to wear the safety equipment and goggles;
- Pay attention in removing electrical connectors;
- Since hydraulic devices are all machined precisely with very accurate clearances, carry out the disassembly adassembly work at a clean place;
- Make sure to prevent the device form being entered with dust, sand and the like;
- Before removing the pipes, attach suitable indications on them to be able to locate their positions late. It is also advisable to label dismantled parts and write down their original location;
- Before disassembly work, get the assembly instructions by requiring to our aftersales department and prepare all the material needed for the task;
- To disassemble and assemble the valve observe strictly our mounting instructions;
- Since there is the possibility of rust when the disassembled parts are left, apply anticorrosive oil to the parts and seal them;
- If it is unavoidable to dismount spring kit from the spool, ensure to clamp the spool through plastic or aluminum devices;
- Before remounting the Control Valve on the operating machine, ensure that the Control Valve has not been affected by carrying out various hydraulic tests (e.g. Relief Valve setting, Leak test..);
- Before reassembling electrical connectors, verify their integrity and check if they are dry

**Warning**

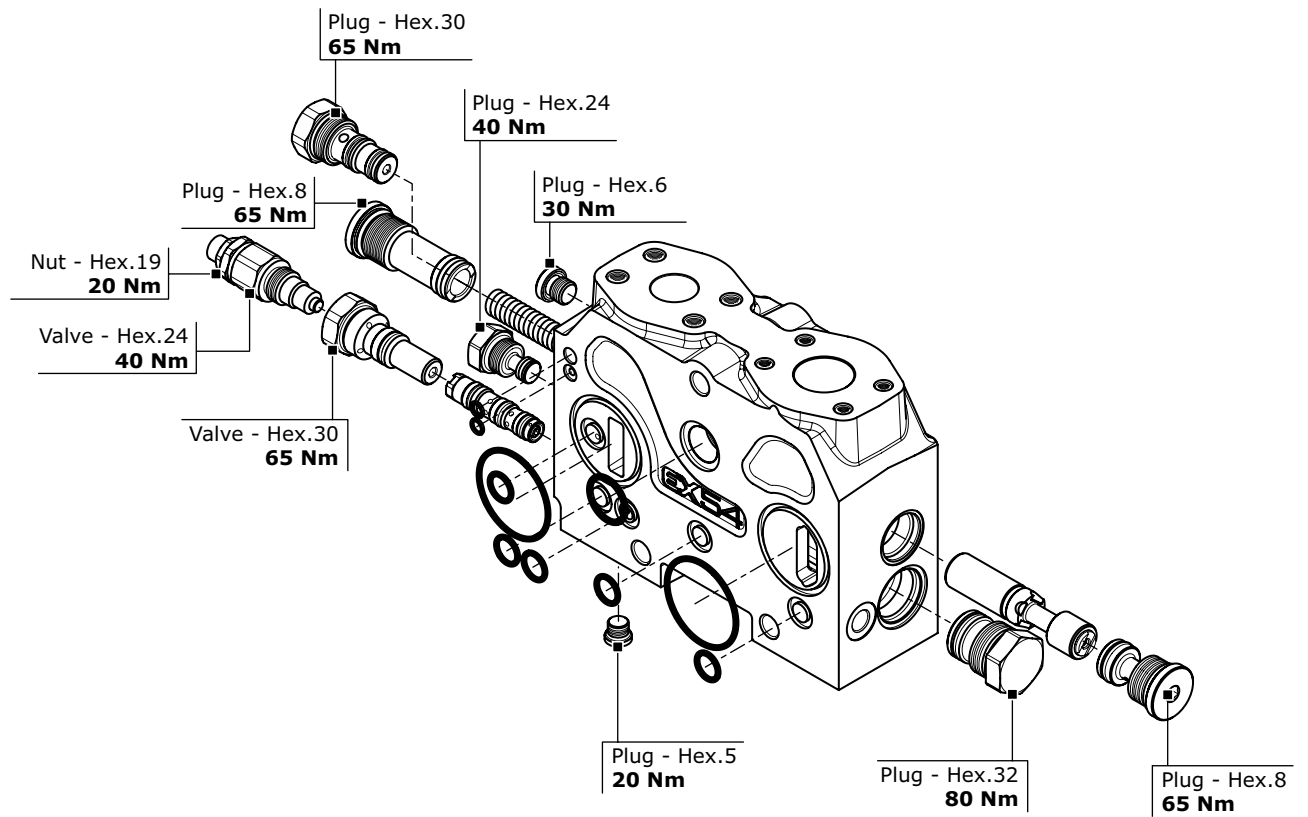
- Always bear in mind that "all workers must act responsibly to ensure their own health and safety"; use of personal protection equipment is therefore essential. All the disassembly and assembly operations must observe strictly the procedures listed in the Hydrocontrol Mounting Instruction.
- Hydrocontrol is not responsible for any damages due to disassembly and assembly procedures not in compliance with our prescriptions.
- For any doubts, please contact our aftersales department.



General clamping torque

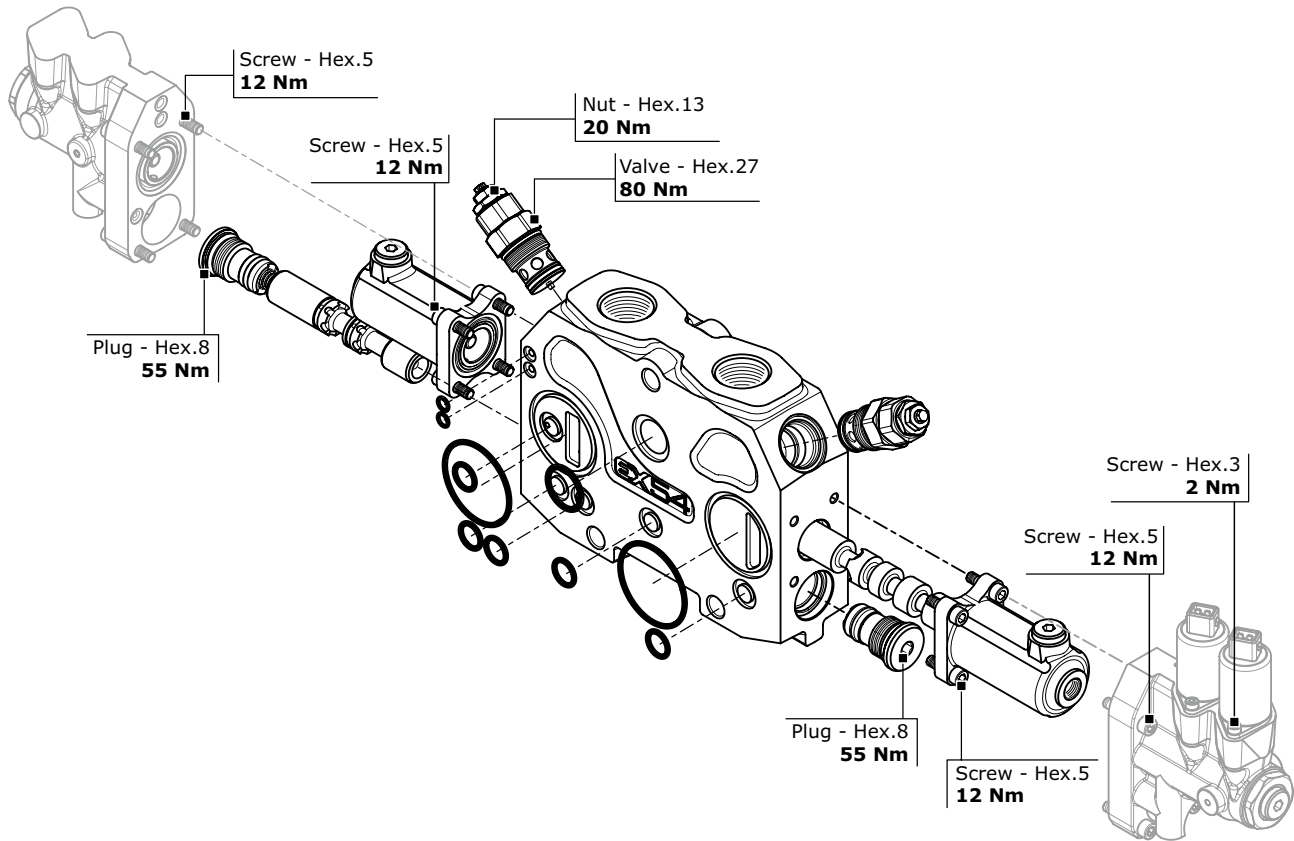
The following table provides the main tightening torques of the distributor EX54; are highlighted in 3 separate drawings depicting the inlet section, the working section and the integrated outlet section.

Inlet Section



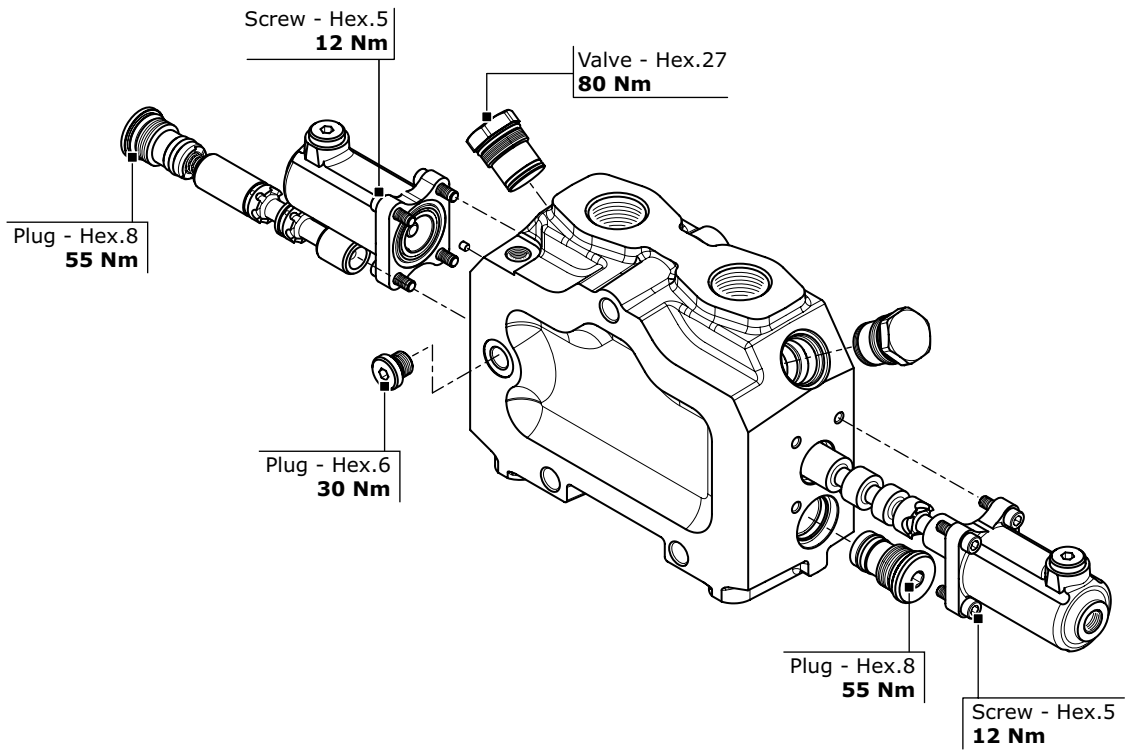


Work Section





Integrated Outlet Section





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	M01	M02	M03

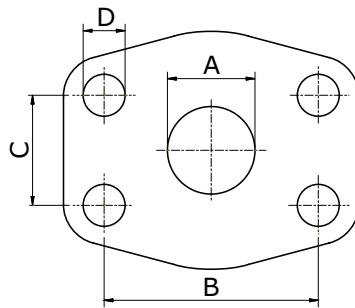
BSP THREAD (ISO 1179-1)

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

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	U02	U03	U04	U05	U06	U07

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	S03	S04	S05	S06	S07	S08	S09	S10	S11	S12	S15	S16
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	S33	S34	S35	S36	S37	S38	S39	S40
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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