DANA ARON™

DBFCAT0002 - REV. 04
01 2026

Product Catalog

Dana Hydraulic Solutions
HPV41-HPV77-HPV310

Proportional Directional Valves

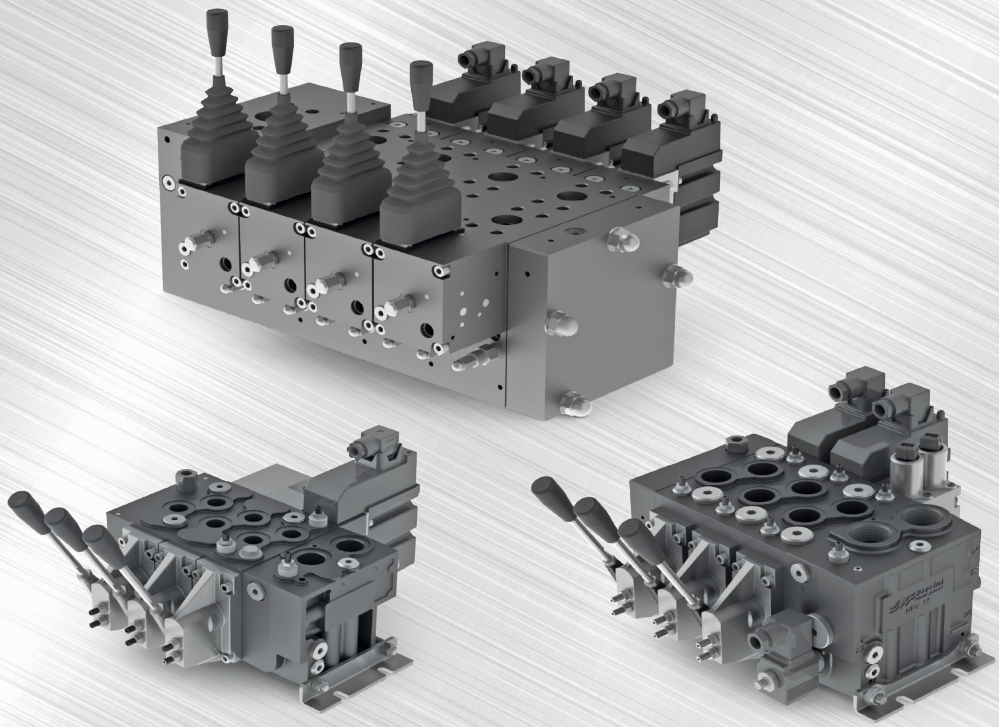


Table of contents

Introduction A-2
ATEX modules A-3
Marking and products identification A-4

HPV41 until 140 l/min [37 US gpm]
Inlet section Open Centre and Closed Centre B-1
Technical data B-8
HPV41 Composition form B-21
Order form B-23
HSE inlet sections B-27
HEM working sections B-38
HSC end sections B-88
Stay bolts kit B-94
Spare parts seals kits B-98

HPV77 until 200 l/min [58 US gpm]
Inlet section Open Centre and Closed Centre C-1
Technical data C-8
HPV77 Composition form C-25
Order form C-27
HSE inlet sections C-31
HEM working sections C-43
HSC end sections C-88
Stay bolts kit C-97
Spare parts seals kits C-102

HPV310 until 550 l/min [145 US gpm]
Technical data D-1
HPV310 Composition form D-9
Order form D-11
HSE inlet section D-14
HEM working sections D-23
HSC end sections D-42
HSRR stay bolts kit D-45
Spare parts seals kits D-48

Electrical connections
Electrical connections scheme E-2

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Each product configuration listed below is subject to availability: please contact Sales Dpt. for more commercial detailed info.

Introduction

Optimised performances and integration of the greatest number of functions are the objectives planned and achieved through the development of the HPV valves, a range of the latest generation of proportional directional valves that perform two simultaneous functions: directional control and flow control that is unaffected by load variations.

Their operation is based on the proportional hydraulic principle, i.e. keeping the pressure drop constant through a variable section.

The HPV spool can assume an infinite number of positions making the crossing areas infinitely variable, thus regulating the flow in relation to the pressure difference (Δp) throughout the entire operating range. By means of logical selection, an LS signal (feedback) is taken from the highest pressure ports and it's sent to the flow-pressure regulator in the inlet section (if the circuit operates with a fixed displacement pump) or directly to the Load Sensing pump (for a closed centre circuit).

As long as the circuit senses the Δp, the valve will maintain its proportionality properties. Instead, if Δp tends to decrease, for example if actuator flow demand exceeds the overall pump flow (multiple simultaneous operations), the flow to the ports will be completely random, and in any case will tend to flow toward the actuators which will work at the lowest pressure values.

The baric compensation provided by the two-way pressure compensators installed on each element, allows multiple operations to be performed at the same time without reciprocal effects. On the other hand, operating at the same time elements without compensators, the flows will vary in relation to the work pressure values.

The main hydraulic features of the HPV valve are summarised below:

- Flow control (metering) is independent from load, therefore the flow provided at the ports does not change with a variation in work pressure of the utilities they control.
- The flow of each function is independent from the simultaneous work pressures, thus allowing simultaneous operations to be carried out without reciprocal effects.
- Electrical unloading of the LsA and LsB signals on each element.
- Excellent flow control characteristics, without dead bands.
- Symmetrical distribution, that allows the position of the manual control to be reversed with all servocontrols.
- Precise and safe remote controls (hydraulic, proportional electrohydraulic) that are easy to install.
- Operation with both fixed displacement and variable displacement pumps with Load Sensing regulator.
- Remote control of operating pressure of each port.
- Internal pilot line supply.
- Externally fed hydraulic manipulators.
- Possibility of lowering the stand-by pressure of the pump (only with the open centre version).

Mineral oil hydraulic fluids

All mineral oil fluids are more or less suitable for use.

The properties required for such fluid include:

- high viscosity index
- low yield point
- high thermal stability
- high hydrolytic stability (minimum formation of corrosive phenomena inthe presence of water)
- excellent anti-wear, anti-corrosion and demulsification properties.

The requirements described above are generally met by the normal mineral oil fluids designated as HPL and HVLP according to DIN 51524.

Ecological hydraulic fluids

Considering the minimum requirements according to DIN 51524, the HPV can also be used with vegetal oil hydraulic fluids HGT (cole or rape oil) without particular precautions. Vegetal-based fluids can be mixed with mineral oils; however, it should be recalled that if the oil is changed, only the part consisting of the vegetal oil is biodegradable. The polyglycol biodegradable oils HPG or synthetic phosphoric ester biodegradable fluids HPDR can be used with the HPV, replacing the usual gaskets with those made with FPM (Viton). Therefore, when ordering, we recommend to indicate the use of the HPV with these types of synthetic fluids. It should also be pointed out that the synthetic fluids cannot be mixed with mineral oils.

Hydraulic fluid filtering

It has been widely demonstrated that efficient hydraulic equipment operation depends to a great extent on the degree of contamination of the circulating oil.

Today, users require hydraulic plants to have:

- high performances
- operating precision
- sensitive controls
- reduced maintenance expenses without giving up extended plant service life.

Carefully considering these requirements, it can be understood that specific filtering measures are needed with high-quality filtering elements to satisfy such conditions. The maximum degree of contaminations for particles tolerated in HPV proportional directional calves cannot be greater than contamination class 9 according to NAS 1638 (20/18/15 according to ISO 4406). This required purity class is generally achieved using filters with a retention capacity of ß20 ≥100. Our experience suggests that a pressurised filter with a nominal rating of nominal 20 µm or absolute 10 µm is suitable to maintain the required oil cleaning parameters. In addition, it is always recommended to use pressurised filters with a clogging indicator.

The HPV are equipped with some built-in filters which are not suitable to filter the oil of the entire hydraulic circuit, but only some pilot lines order to protect some important components of the HPV against large-sized contaminating particles. The internal filters of the load sensing line and the low-pressure line are easy to replace and are available as spare parts.

Safety instructions ATEX modules
Before installation, please carefully read what is illustrated in the instruction manual attached to the electro-hydraulic modules. All the maintenance operations must be carried out in accordance with what is shown in the manual.
All the installation and maintenance operations must be carried out by qualified personnel.

The modules can be combined with each other in a number that varies up to a maximum of sixteen, in order to monitor 8 HEM elements of HPV distribution.

When modules are individually supplied (not as a complete MHOX-HEM o MHPX-HEM valve), the customer has to verify the compatibility and suitability for use in the place of installation / use.

The MHOX and MHPX electro-hydraulic modules must be used in environments with low mechanical risk or it is necessary to ensure the presence of a suitable mechanical protection against a high degree of mechanical risk for the solenoid valves.
The MHOX, MHPX and MHFOX modules must be installed and maintained in accordance with the system and maintenance standards in environments classified against the risk of explosion due to the presence of gas, vapours or combustible powders (e.g. : EN 60079-14, EN 60079-17, EN 61241-14, EN61241-17 or other national norms/standards).

The solenoid valves must be earthed by means of a suitable anti-loosening and anti-rotation connection placed on the coil connector; after the connection, check the correct earthing with a continuity meter.
To make the connections to the process, the user must use metallic or anti-static tubes.

The user must provide a temperature monitoring system for the hydraulic fluid (mineral oil, phosphorous esters, water-glycol or water-oil mixtures) in such a way as not to exceed fluid temperature shown in label.
In the case of combustible powders provision must be made for the regular cleaning and removal of layers with suitable equipment, in order to limit the formation of layers.
For the safety aspects linked to the use of the coils, see the solenoid valve safety instructions; the coils must not be open when live.
The user must periodically check the level of encrustation, cleanliness, the state of wear and tear and the correction functioning of the valves, in accordance with the conditions of use and substances.

Methods of use and maintenance
Use
- Observe the functional limits shown in the technical characteristic section and those indicated in the solenoid safety instructions if they are restrictive.
- The oil used must be a part of the category of oils specified by the manufacturer and its level of contamination must be kept with the limits indicated.

Maintenance
- The user must periodically check, depending on the conditions of use and substances, the presence of encrustations, cleanliness, the state of wear and tear and the proper functioning of the valves.
- • If the O-rings are damaged, replace them only with those specifically provided by the manufacturer.

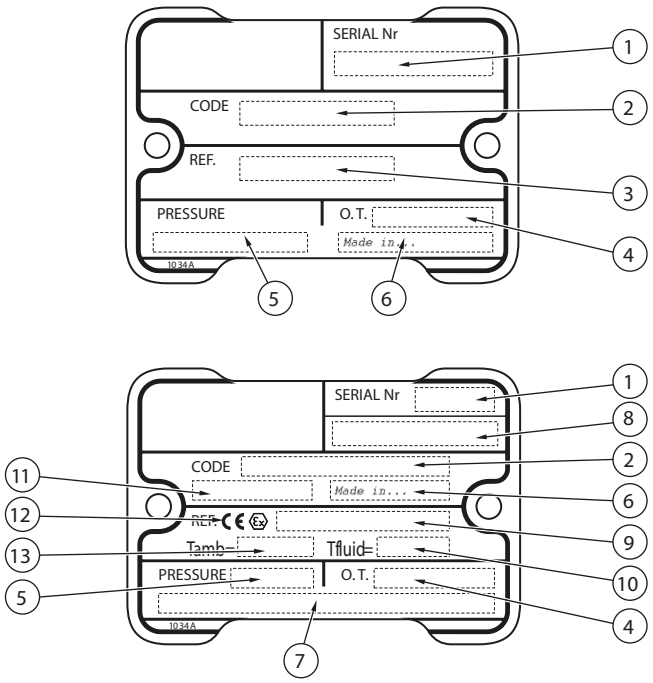
Methods of conveying and storing
The user must guarantee a correct transport and storage of the module, in order to not compromise the specific characteristics of the protection way and the good operation

In particular, don't enliven the module raising it through the cable connected to the connector.

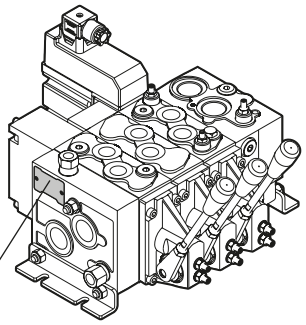
Marking and products identification

Registered mark plate for HPV distributors
The registered mark plate provides all technical information on design and operating features, it must be kept intact and visible.

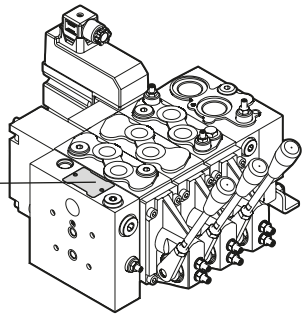
Registred mark and identification ATEX products
The distributors and the modules are equipped with a Registered mark plate and a Declaration of conformity, according to 94/4/EC Directive, reporting all the characteristic features regarding operation and identification.



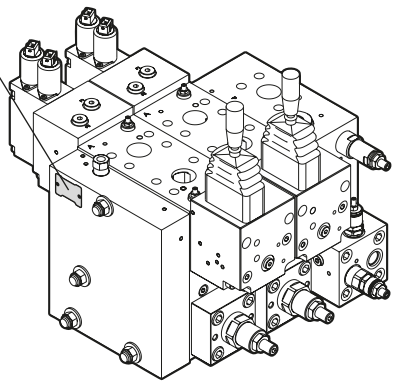
ATEX distributors



HPV41 - HPV77 distributors



HPV distributors with HSIF interface

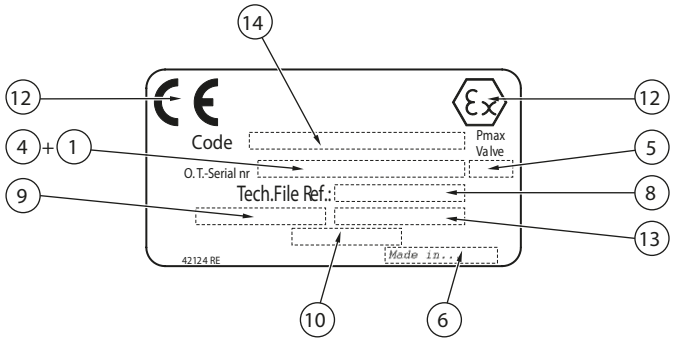


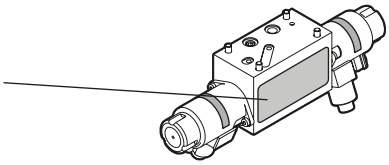
HPV310 distributors

Ref.	Description
1	Serial Nr: serial number
2	Code: product code
3	Ref: customer code
4	O.T.: batch number
5	Pressure: max working pressure
6	Made in ... : preferential origin
7	Manufacturer adress
8	ATEX certificate number
9	ATEX marking
10	Working fluid temperature
11	Product serie
12	CE marking in accordance with the ATEX directive
13	Working ambient temperature
14	Ordering code
15	ATEX certified number and IECEx certified number
16	Max nominal current
17	Max nominal voltage
18	IP protection degree
19	Product serie + "HEM" if assemblen on a working section HEM
20	Max working pressure of the HEM section
21	Working ambient temperature (printed with X)
22	Working fluid temperature (printed with X)
23	Notified number authority

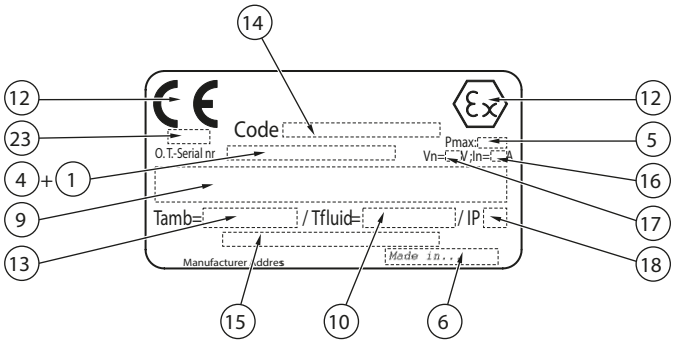
Dangerous areas		ATEX categories	EPL
Gas, vapor or mist	Zone 0	1G	Ga
Gas, vapor or mist	Zone 1	2G or 1G	Gb or Ga
Gas, vapor or mist	Zone 2	3G, 2G or 1G	Gc, Gb or Ga
Dust	Zone 20	1D	Da
Dust	Zone 21	2D or 1D	Db or Da
Dust	Zone 22	3D, 2D or 1D	Dc, Db or Da
Mine	—	M1	Ma
Mine	—	M2	Mb or Ma

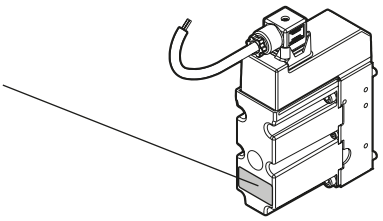
Marking and products identification



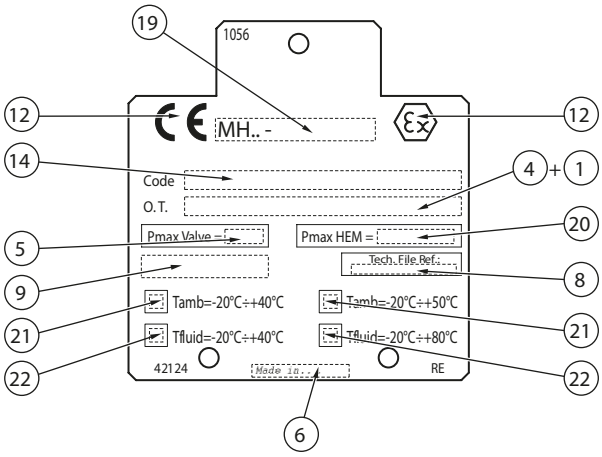


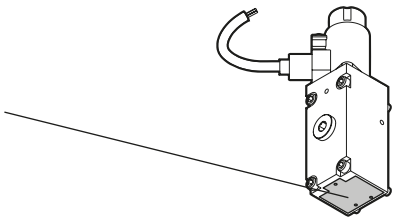
MHFOX
HSEVX



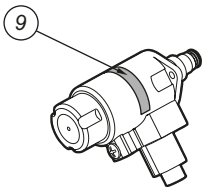


MHOFX - MHPCX
MHPODX - MHPEDX





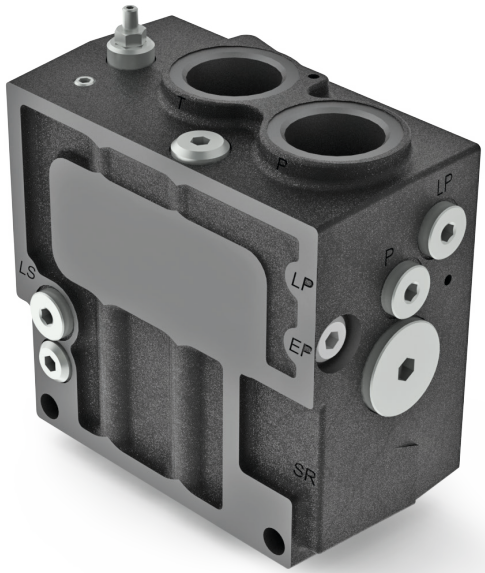
MHOX-MHPX



HSEVX


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Inlet section Open Centre and Closed Centre



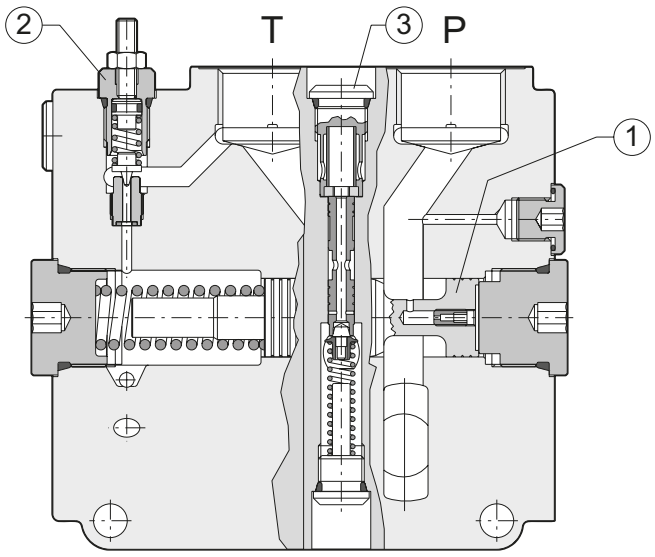
Standard HSE inlet sections
The inlet sections are availables in two versions:
- open centre for use with fixed displacement pumps
- closed centre for use with load-sensing pumps

In the open centre versions, when the spool is not working, the flow/ pressure regulator pos. 1 unloads to T the entire pump flow (see characteristic curves).

Otherwise, when the spool is working, it will feed the controlled element or elements, adapting instantaneously to the actual flow required by the ports and unloading any excess flow at the highest pressure of that moment to the tank.

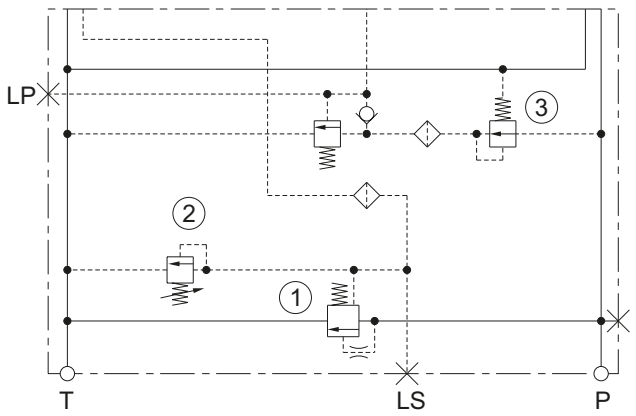
By changing two internal pilot lines, the section is converted into a closed centre version. In the closed centre versions, the regulator pos. 1 only maintains the pressure regulator function, becoming the first stage of the main pressure relief valve pos. 2, which must be calibrated to about 30 bar more than the maximum work pressure.

Both versions can be supplied with the pressure reduction valve pos. 3 where originates a low pressure line (22 bar [319 psi]) that feeds the MHPED electrohydraulic modules or also the same hydraulic manipulators. Obviously, if the valve is only equipped with manual control, the pressure reduction valve is not required.

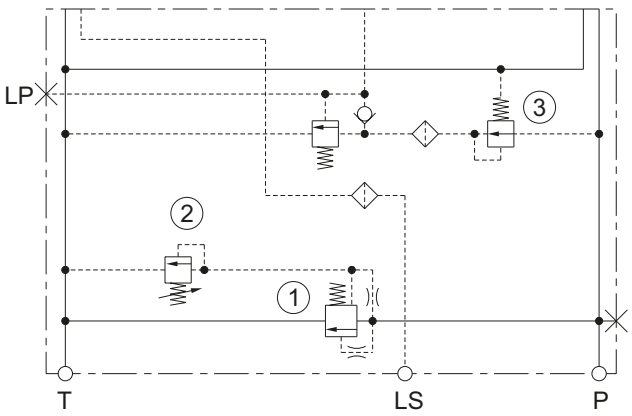


Standard HSE inlet section

1	3 way flow regulator
2	Pilot pressure relief valve
3	Pressure reduction valve
Lp	Low pressure port, 22 bar [319 psi]

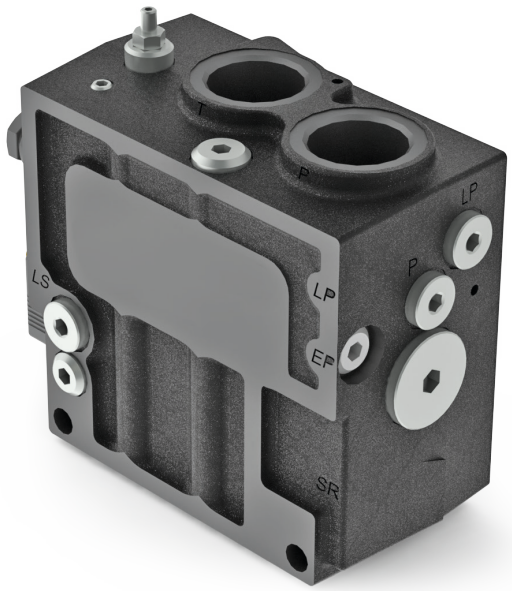


open centre



closed centre

Inlet section Open Centre and Closed Centre

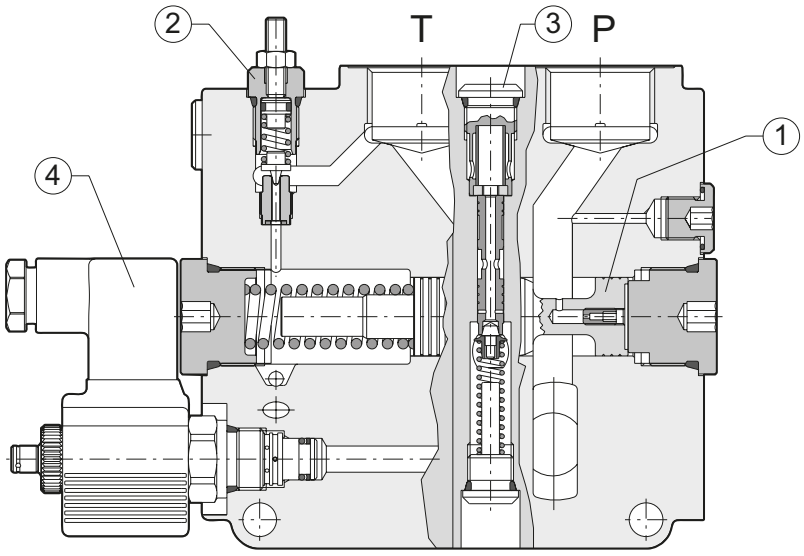


All versions can be supplied with an Ls signal unloading solenoid valve pos. 4. The solenoid valve can be normally open or normally closed. If it is activated during the work phases it immediately unloads the load sensing signal and subsequently stops all movements of the actuators.

In the open centre versions, the pump unloading pressure value is equal to the sum of the counterpressure acting on the T line plus the pressure required to open the flow/pressure regulator pos. 1 to connect P to T (often from 8 to 15 bar - 116 to 218 psi).

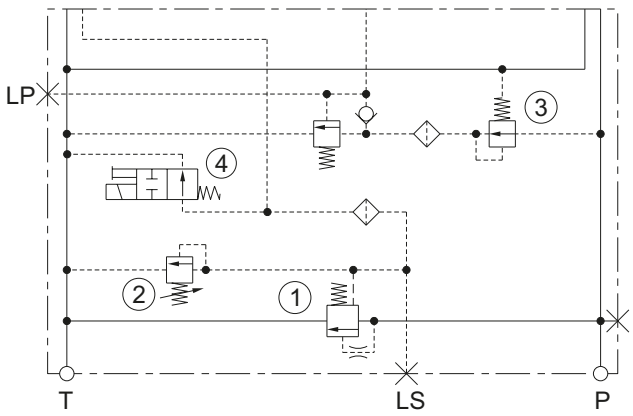
In the closed centre versions, unloading the LS signal lowers the pressure in P at a value equal to the stand-by pressure at which the pump is regulated.

Using the solenoid LS unloading valve on the inlet sections in the open and closed centre versions, we urge grate care in this method, because all functions requiring a lower working pressure, might be operated.

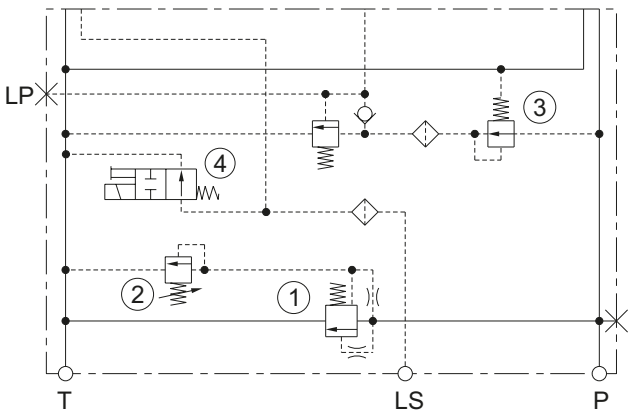


Standard HSE inlet section with solenoid Ls unloading valve (CRP04HP)

1	3 way flow regulator
2	Pilot pressure relief valve
3	Pressure reduction valve
4	Solenoid Ls unloading valve
Lp	Low pressure port, 22 bar [219 psi]

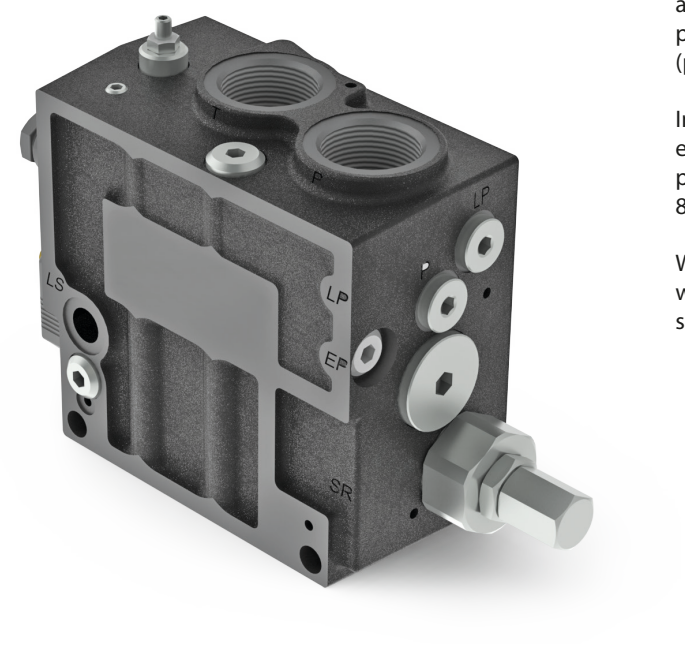


open centre



closed centre

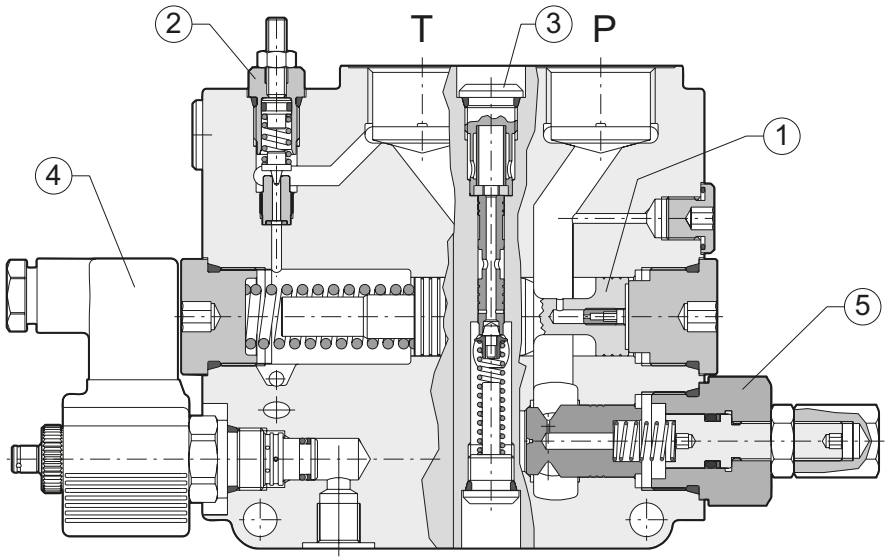
Inlet section Open Centre and Closed Centre



In the open and closed centre versions, it is possible to mount a remote-controlled cartridge logic element (pos. 5) for rapid pump unloading, thus by-passing the flow/pressure regulator (pos. 1).

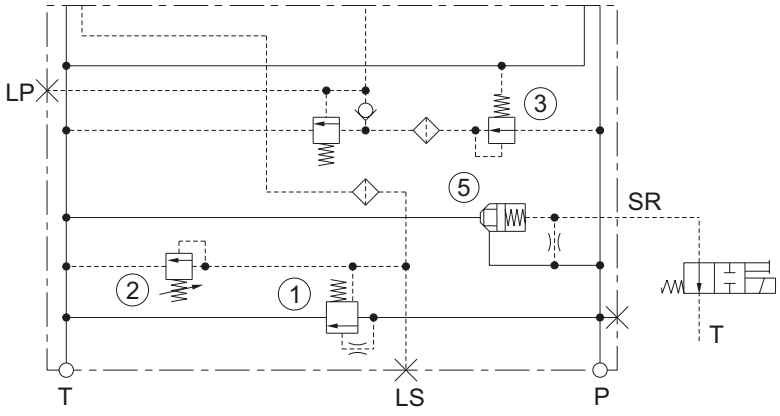
In this configuration, the pump unloading pressure value is equal to the sum of the counterpressure acting on the T line, plus the pressure required to open the HSER valve (0.6 bar - 8.7 psi) to connect P with T.

With this solution the Δp for pump unloading is much lower than what would be created instead using the Ls signal unloading solenoid valve (see characteristic curves).



1	3 way flow regulator
2	Pilot pressure relief valve
3	Pressure reduction valve
5	Cartridge logic element, HSER
Lp	Low pressure port, 22 bar [319 psi]

Standard HSE inlet section with pump unloading valve function (HSER)



open centre

Open center systems

With the spools 15 in the central position, the Ls line, the chamber on the spring side of the flow/pressure regulator (1A) and the chamber on the spring side of the pressure compensator (11) are connected with the exhaust core (T), allowing the pump flow to be conveyed to the tank through the flow/ pressure regulator (1A).

The pump flow, the spring load of the flow/pressure regulator (1A) and the counterpressure acting on the exhaust line (T), determine the pump free circulation pressure (See characteristic curves).

When the spool (15) is activated, the port selected is placed in communication with line P1 and the work pressure through line Ls is sent to the flow/pressure regulator (1A).

The flow obtained will only depend on the crossing area of the spool and the relative Δp that will be created along the spool adjustment range.

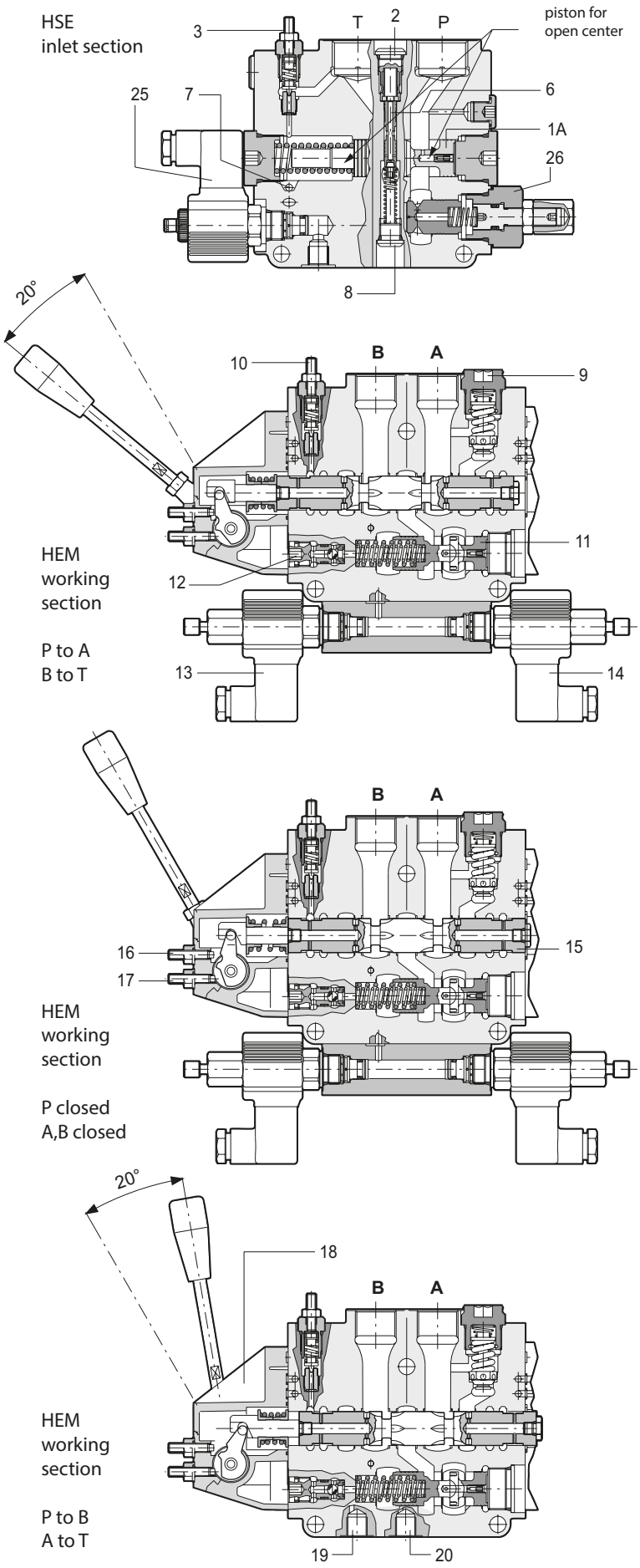
If two or more spools operating at different pressure values are activated at the same time, the pressure compensators (11) will keep the pressure drop constant (Δp) and thus the flow on the spools (15) will be constant within the maximum pump flow range.

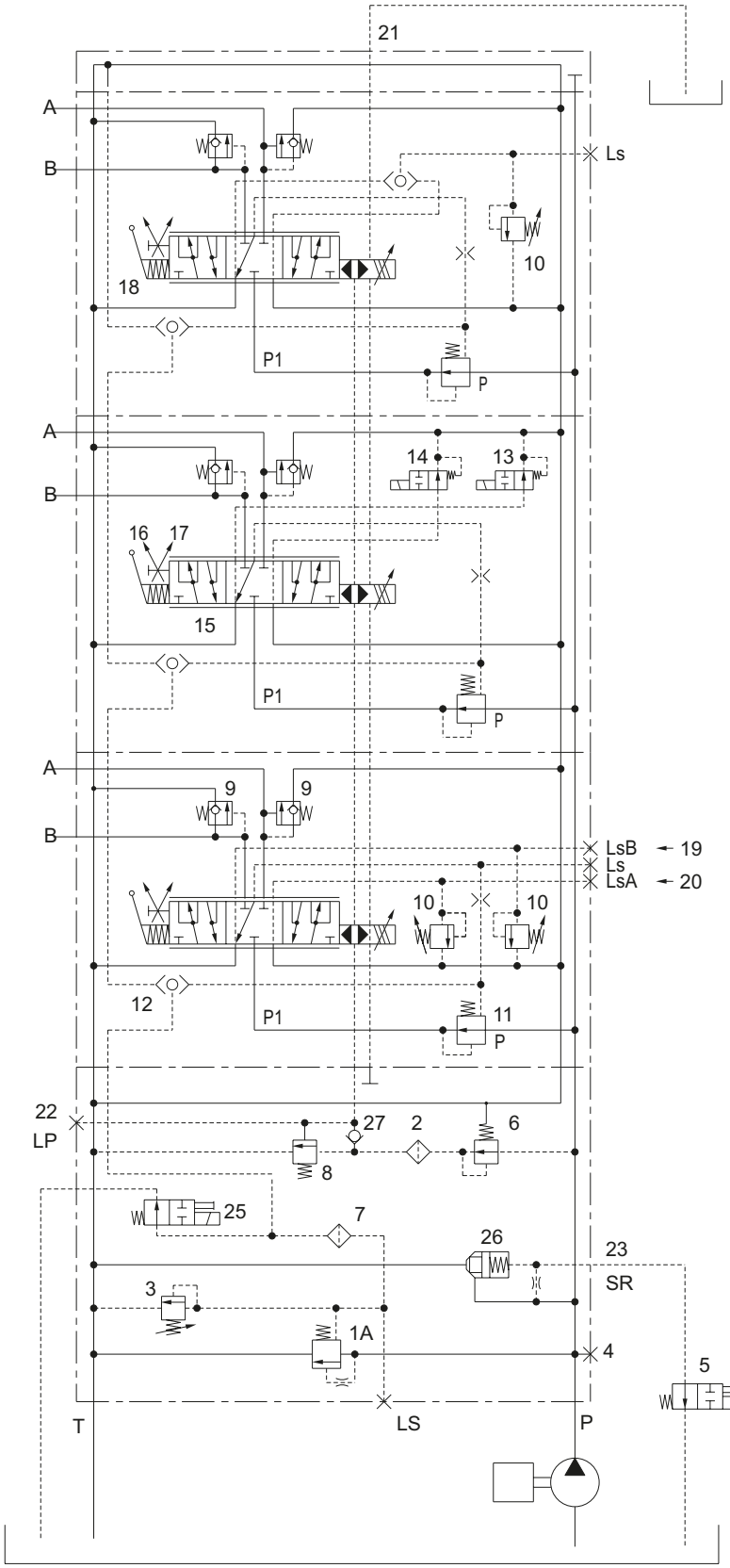
On the other hand, if two or more spools of elements without pressure compensators are activated simultaneously, the flow on the spools will not be constant but will vary according to the work pressures.

The Load Sensing pressure relief valves (10), using a small pilot line flow, precisely limit the pressure at ports A/B without wasting energy, unlike the anti-shock valve which also when unloading the entire flow of the spools, are very wasteful.

The on-off solenoid valves (13-14) which cut off the LsA and LsB pilot lines, if activated, instantaneously cancel the flow on the relative port.
The pressure reduction valve (6) supplies a low pressure line (22 bar [319 psi]) which internally feeds the MHPE electrohydraulic modules and, externally, the hydraulic manipulators through the port 22.

The max. work pressures of ports A/B of each element can be remote controlled using the LsA and LsB pilot line ports.





1A Flow/pressure regulator
2 Low pressure line filter
3 Main pressure relief valve
4 Pump pressure gauge port
5 Pump unloading valve
6 Pressure reduction valve
7 Load sensing line filter
8 Low pressure line relief valve
9 Shock and suction valve
10 Ls pressure relief valve
11 Pressure compensator
12 Shuttle valve
13 LsB signal unloading solenoid valve
14 LsA signal unloading solenoid valve
15 Spool
16 A port flow fine adjustment register
17 B port flow fine adjustment register
18 Cover for manual control kinematic motion
19 LsB pressure pilot line port
20 LsA pressure pilot line port
21 Drain port
22 Low pressure pilot line port
23 Pilot line, pump unloading valve
25 Ls signal unloading solenoid valve
26 Pump unloading valve
27 Unidirectional valve

Closed center systems

With the spools (15) in central position, the Ls line, the chamber on the spring side of the pressure compensators (11) and the pump flow/pressure regulator (24) are connected with the return line (T), allowing the pump to shift to the stand-by position.
When the spool (15) is activated, the port selected is placed in communication with line P1 and the work pressure through line Ls is sent to the pump flow/ pressure regulator (23).

The flow obtained will only depend on the crossing area uncovered by the spool stroke and on the resulting Δp.

In this way the pump flow will adjust instantaneously to the actual flow required at the ports while keeping the differential pressure constant between the pump and the Ls signal.

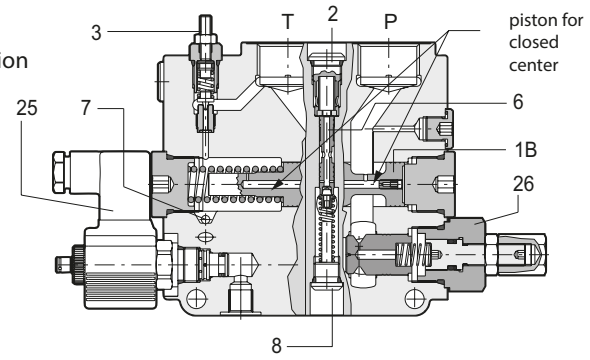
The second stage of the pilot line pressure (3) must be set at 20-30 bar [290-435 psi] more than the maximum setting of the pump pressure/flow regulator (23).
If two or more spools operating at different pressure values are activated at the same time, the pressure compensators (11) will keep the pressure drop constant (Δp) and thus the flow at the spools (15) will be constant within the maximum pump flow range.
On the other hand, if two or more spools of elements without pressure compensators are activated simultaneously, the flow on the spools will not be constant but will vary according to the work pressures.

The Load Sensing pressure relief valves (10), activated by a small pilot flow, precisely limit the pressure at ports A/B with no energy dissipation, unlike the anti-shock valves which, also when unloading the entire flow of the spools, are very dissipative.

The on-off solenoid valves (13-14) which cut off the LsA and LsB pilot lines, if activated, instantaneously cancel the flow at the relative port.
From the pressure reduction valve (6) starts a low pressure line (22 bar [319 psi]) which internally feeds the MHPE electrohydraulic modules and, externally, the hydraulic manipulators through port 22.

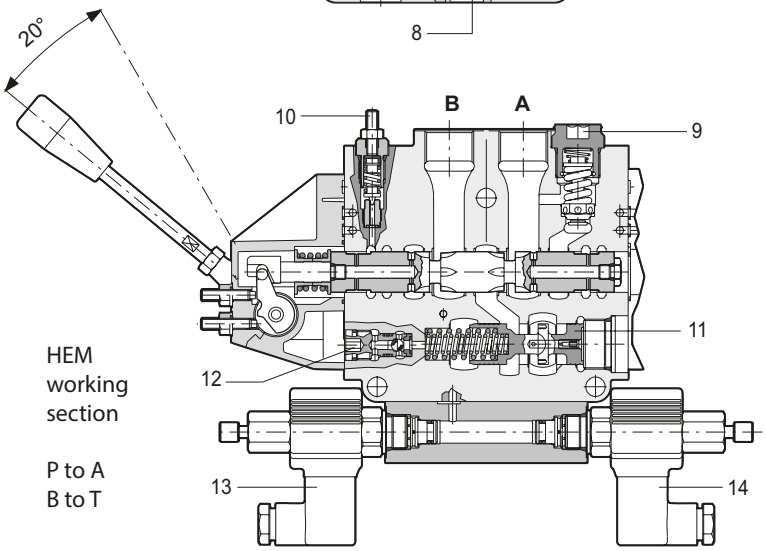
The max. work pressures of A/B ports of each element can be remote controlled using the LsA and LsB pilot line ports.

HSE
inlet section



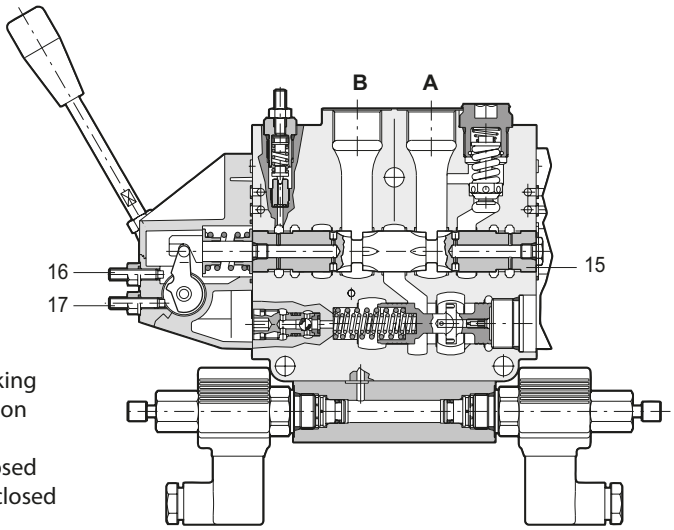
HEM
working
section

P to A
B to T



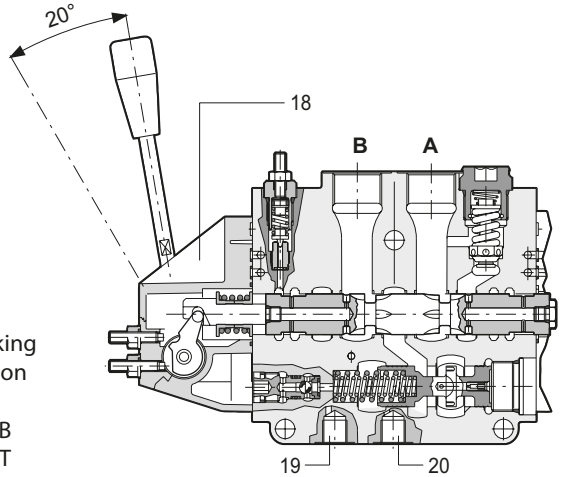
HEM
working
section

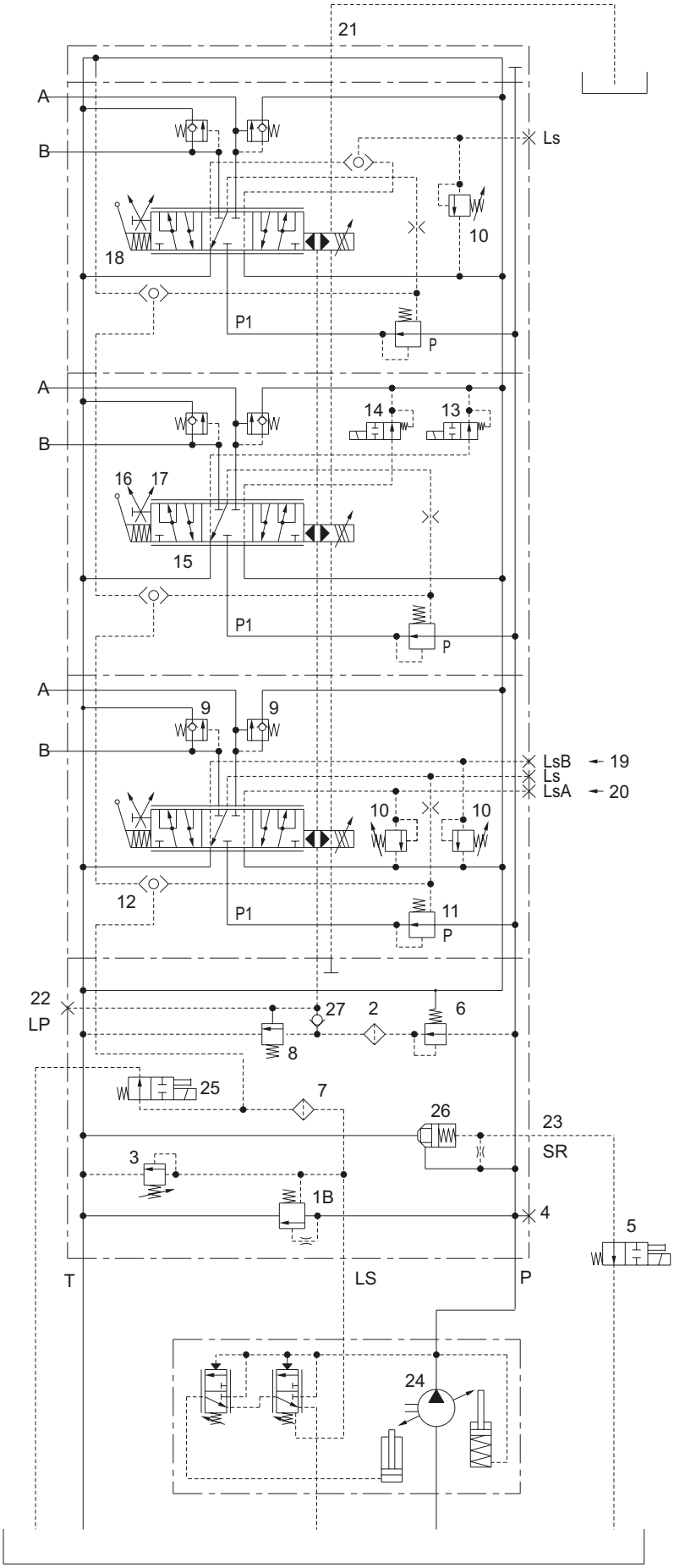
P closed
A,B closed



HEM
working
section

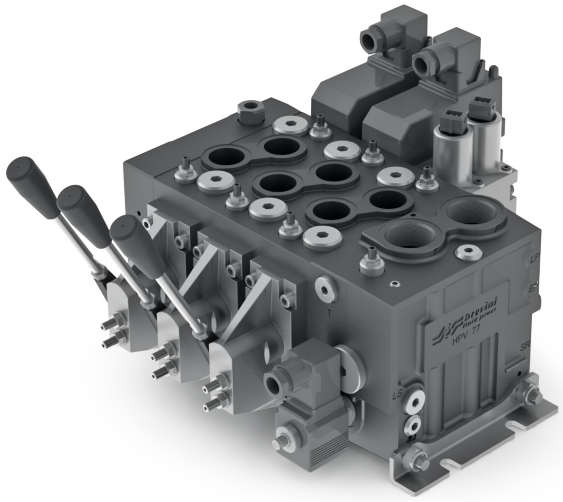
P to B
A to T





1B Pressure regulator first stage
2 Low pressure line filter
3 Main pressure relief valve
4 Pump pressure gauge port
5 Pump unloading valve
6 Pressure reduction valve
7 Load sensing line filter
8 Low pressure line relief valve
9 Shock and suction valve
10 Ls pressure relief valve
11 Pressure compensator
12 Shuttle valve
13 LsB signal unloading solenoid valve
14 LsA signal unloading solenoid valve
15 Spool
16 A port flow fine adjustment register
17 B port flow fine adjustment register
18 Cover for manual control kinematic motion
19 LsB pressure pilot line port
20 LsA pressure pilot line port
21 Drain port
22 Low pressure pilot line port
23 Pilot line, pump unloading valve
24 Pump flow/pressure regulator
25 Ls signal unloading solenoid valve
26 Pump unloading valve
27 Unidirectional valve

Technical data



General features
The HPV proportional valves are proportional directional valves with two functional characteristics:
- Directional regulation.
- Flow regulation insensitive to the variation of the load applied to the actuator.

They can be remotely controlled and represent the most advanced technology in the world of applied hydraulics.

Proportional distributors differ in "open center" and "closed center":
- Proportional open center distributors are used with fixed displacement pumps.
- The closed center proportional valves are used with variable displacement pumps with load sensing control.

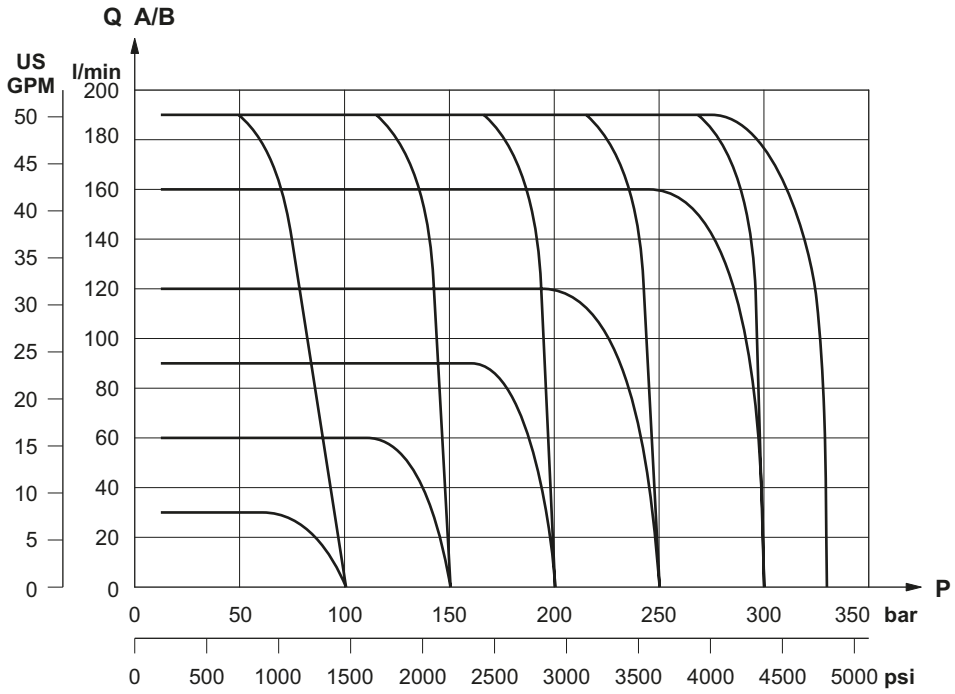
Hydraulic features
The hydraulic features reported below were measured using a mineral based hydraulic oil according to DIN 51524 or ISO 6743/4 with a viscosity of 25 mm^2/s [130 SUS] at a temperature of 50 °C [122 °F]

Rated flow	HSE inlet section, P port		250 l/min	66 US gpm
	Mid inlet section, HFLS HPV77-HPV77		390 l/min	103 US gpm
	Mid inlet section, HFLS HPV77-HPV41		340 l/min	90 US gpm
	A, B ports with pressure compensator		190 l/min	50 US gpm
	A, B ports without pressure compensator		220 l/min	58 US gpm
Max. working pressure	Connection P / P port	Pressure relief valve setting	400 bar	5800 psi
		Working pressure	370 bar	5370 psi
	Ports A, B		370 bar	5370 psi
	Connection Y		to tank	
	Connection T	Static	25 bar	363 psi
		Dynamic	35 bar	508 psi
Max. pilot pressure oil supply			18 ÷ 36 bar	260 ÷ 520 psi
Oil temperature	Recommended		-30 ÷ 60 °C	-22 ÷ +140 °F
	Min.		-25 °C	-13 °F
	Max.		+80 °C	+176 °F
Ambient temperature			-30 ÷ 60 °C	-22 ÷ +140 °F
Viscosiy	Recommended		12 ÷ 80 mm^2/s (cSt)	
	Min.		4 mm^2/s (cSt)	
	Max.		460 mm^2/s (cSt)	
Filtering	Max. contamination: class 9 according to NAS 1638 (20/18/15 according to ISO 4406)			
Stroke	Spool stroke		± 8 mm	± 0.315 in
	Proportional		± 6.5 mm	± 0.256 in
Dead band			± 1.5 mm	± 0.059 in
Nominal internal leakage at 180 bar (2611 psi)	A, B → T	Without anti-shock valves	28 cm^3/min	1.71 in^3/min
		With anti-shock valves	34 cm^3/min	2.07 in^3/min

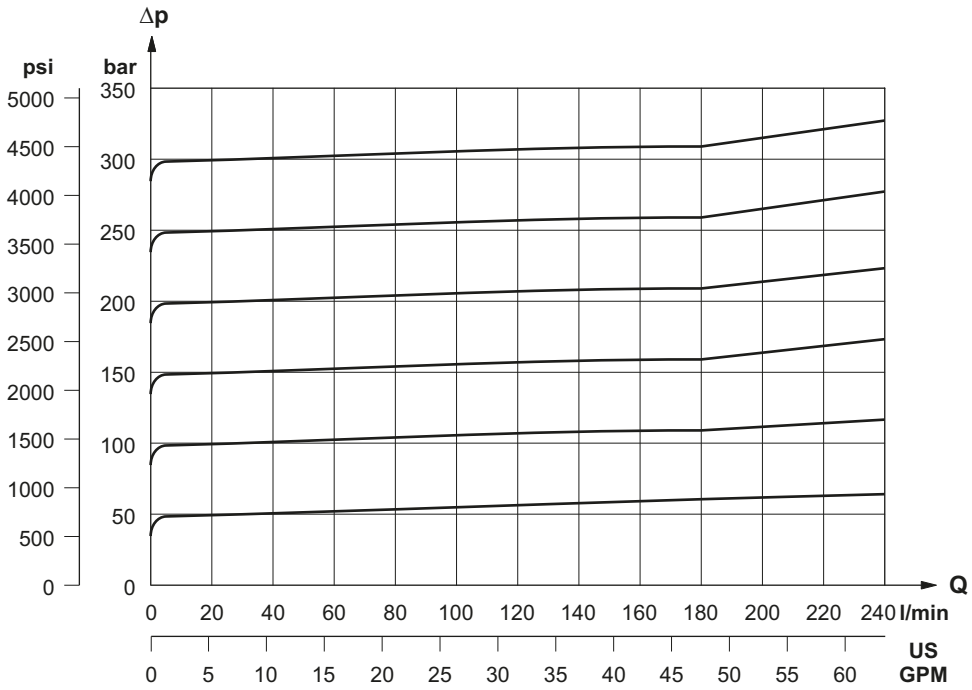
HPV 77 internal (easy replacement) filters, mesh 100 µm.
Mineral oil hydraulic fluid: according to DIN 51524 and 51525 or ISO 6743/4. HPV 77 can also be used with phosphorous esters (HFDR), water-glycol /HFC) or water-oil (HFB) mixes, subject to our Technical Dept. approval.

Hydraulic control - MHPH module			
Pilot pressure	Start	4.5 bar	65 psi
	End stroke	15 bar	218 psi
Max. pilot pressure		30 bar	436 psi

Characteristic curves



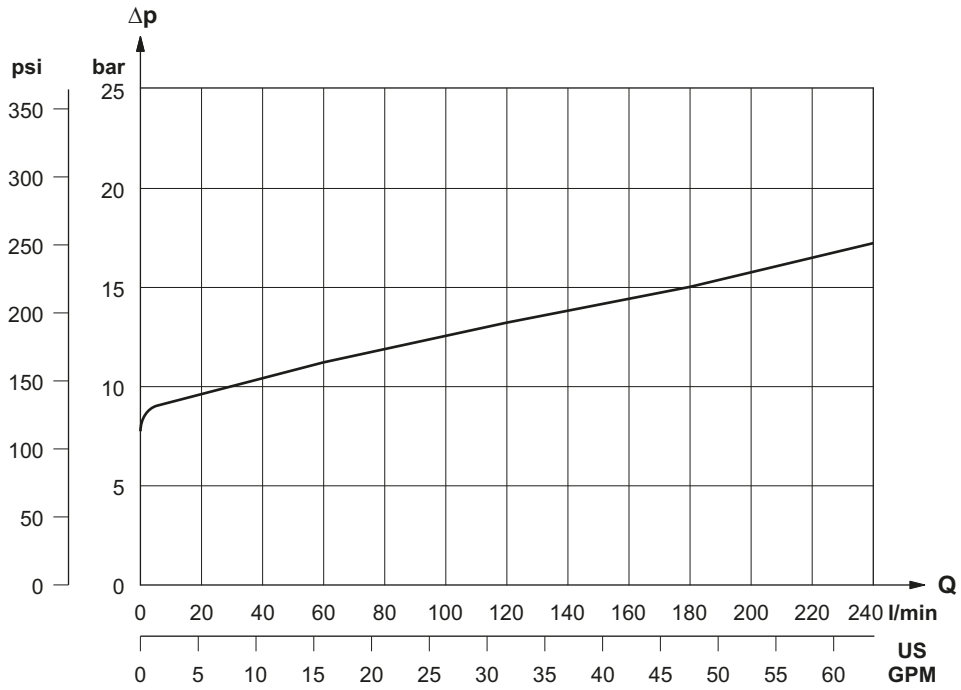
Flow characteristics at A / B ports with pressure limitation on the same (section with pressure compensator)



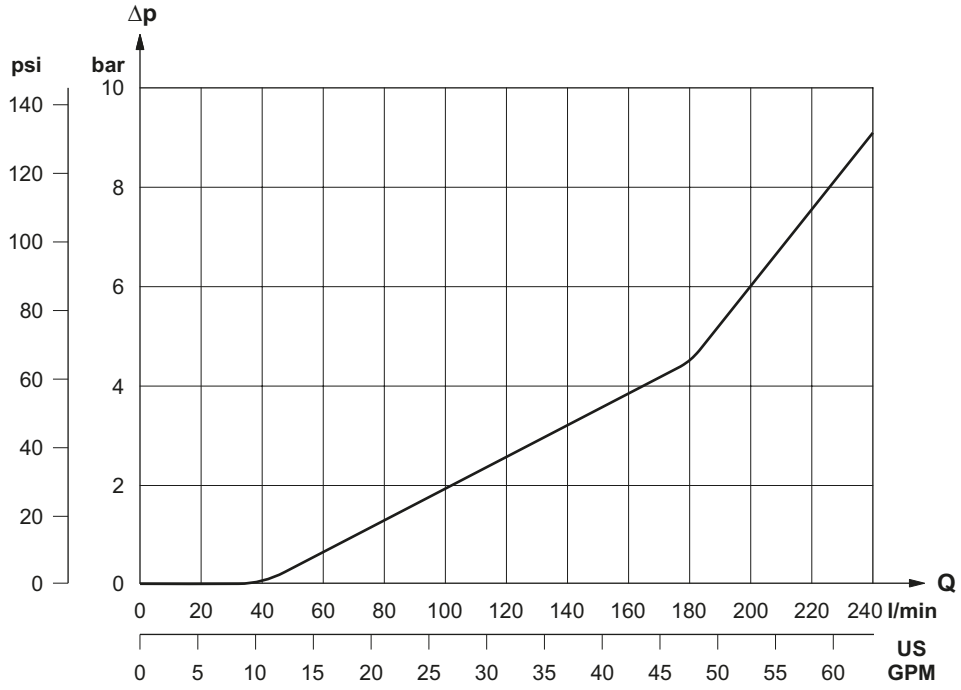
Characteristics of main pressure relief valve

Curves measured with oil viscosity of 25 mm^2/s (cSt) at a temperature of 50 °C [122 °F]

Characteristic curves



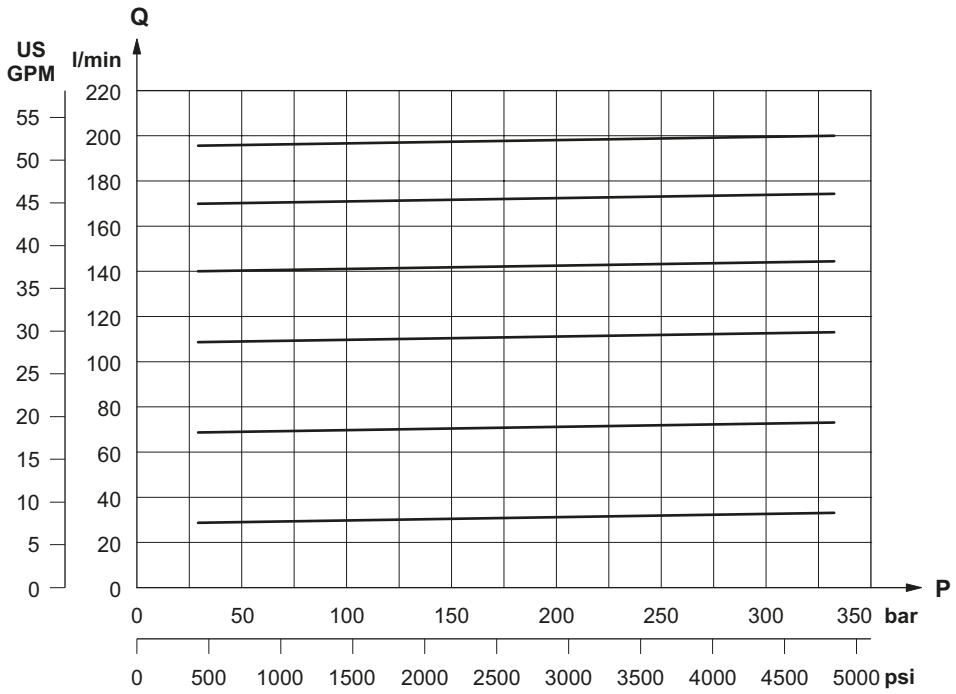
Pressure drop on inlet section, open centre type, with spools in neutral position



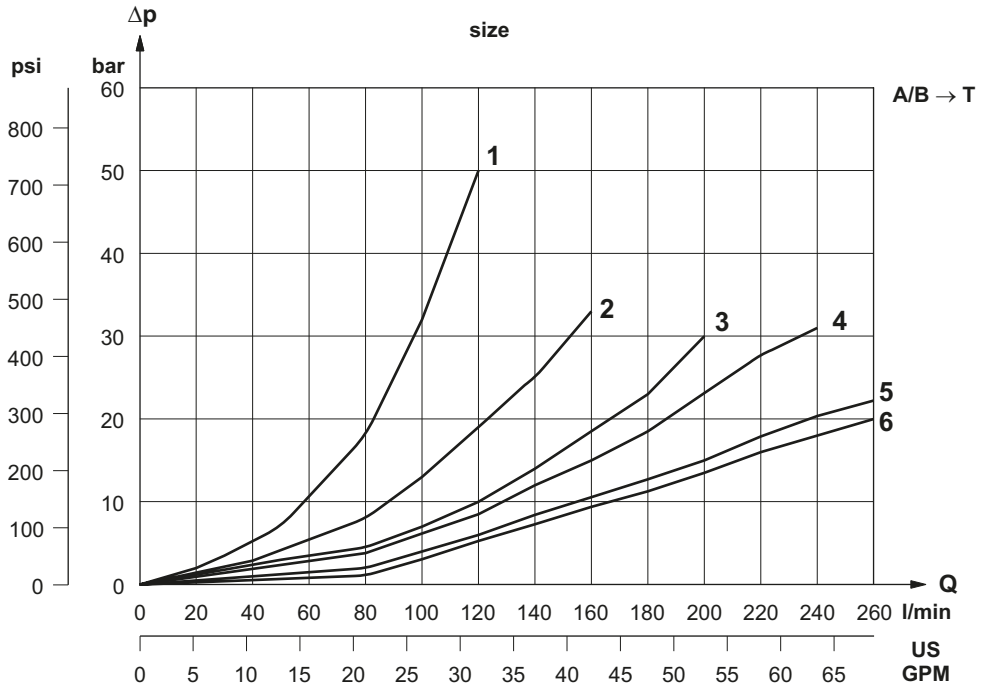
Pressure drop on inlet section with pump unloading valve and spools in neutral position (for open centre inlet sections only)

Curves measured with oil viscosity of 25 mm^2/s (cSt) at a temperature of 50 °C [122 °F]

Characteristic curves



Characteristics of baric compensation: flow independent from load

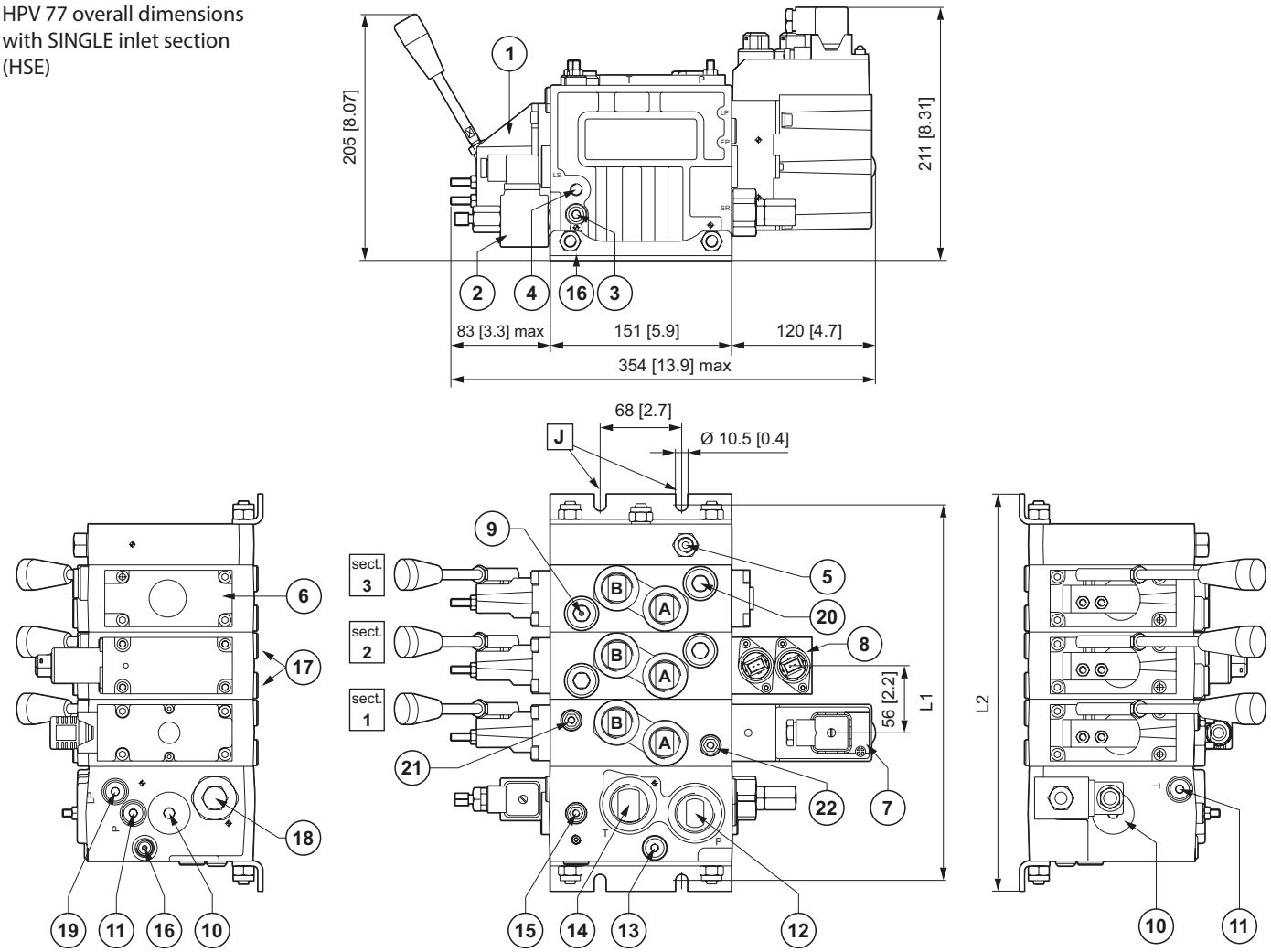


ΔP figures with spool on complete deadlock and a or B in T

Curves measured with oil viscosity of 25 mm^2/s (cSt) at a temperature of 50 °C [122 °F]

Overall dimensions and hydraulic diagrams

HPV 77 overall dimensions with SINGLE inlet section (HSE)



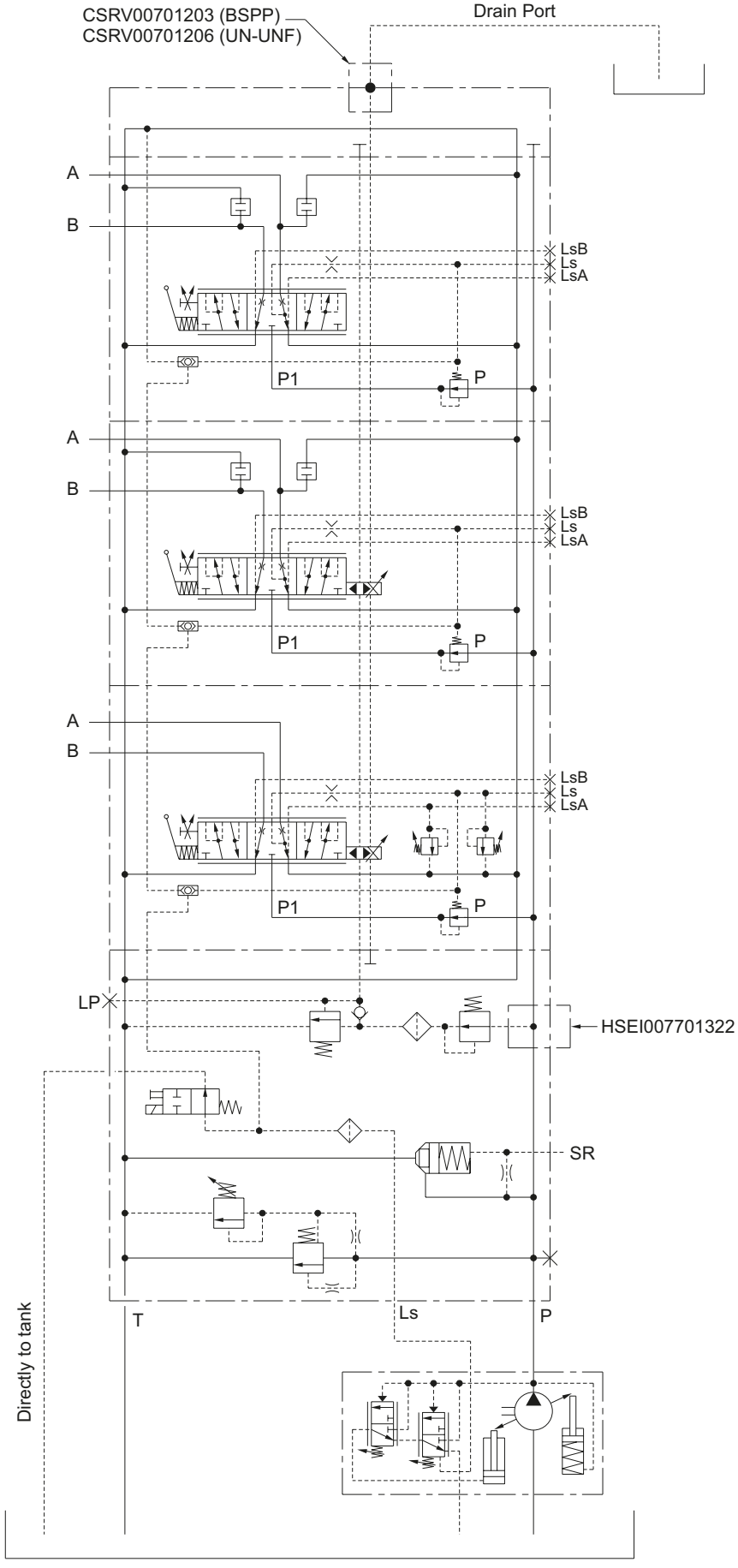
A/B Ports, G 3/4 BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
J Fixing means
1 Manual control, HCM
2 LS signal unloading solenoid valve
3 LS signal filter cartridge
4 LS port, G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
5 Return line port for electrohydraulic modules, G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
6 Manual control plate, HCP
7 Odule for ON-OFF electrohydraulic control, MHOF
8 Module for current electrohydraulic control, MHPF
9 Port B anti-shock and anti-cavitation valve
10 Flow regulator plug
11 P, T pressure ports
12 Pump side port, G 1" BSPP or 1 5/16" - 12UN - 2B (SAE 16)
13 Low pressure line filter cartridge
14 Return line port, G 1" BSPP o 1 5/16" - 12UN - 2B (SAE 16)
15 Main pressure relief valve
16 Pilot line external feed port, 1 G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
17 LSA - LSB pressure remote control port, G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4
18 HSER mechanical adjuster
19 Hydraulic manipulator feed port, G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
20 Port A anti-shock and anti-cavitation valve
21 LSB pressure relief valve
22 LSA pressure relief valve

Working Sections	L1 mm [inch]	L2 mm [inch]
1	201 [7.91]	219 [8.62]
2	257 [10.12]	275 [10.83]
3	313 [12.32]	331 [13.03]
4	369 [14.53]	387 [15.24]
5	425 [16.73]	443 [17.44]
6	481 [18.94]	499 [19.65]
7	537 [21.14]	555 [21.85]
8	593 [23.35]	611 [24.06]
9	649 [25.55]	667 [26.26]
10	705 [27.76]	723 [28.46]

Fixing instructions
The distributor must be fixed by means (J) of the slots in the feet. We decline all responsibility in the case of malfunctioning or oil leakage caused by the wrong fixing of the distributor.

Note:
See the order form, page C-28.

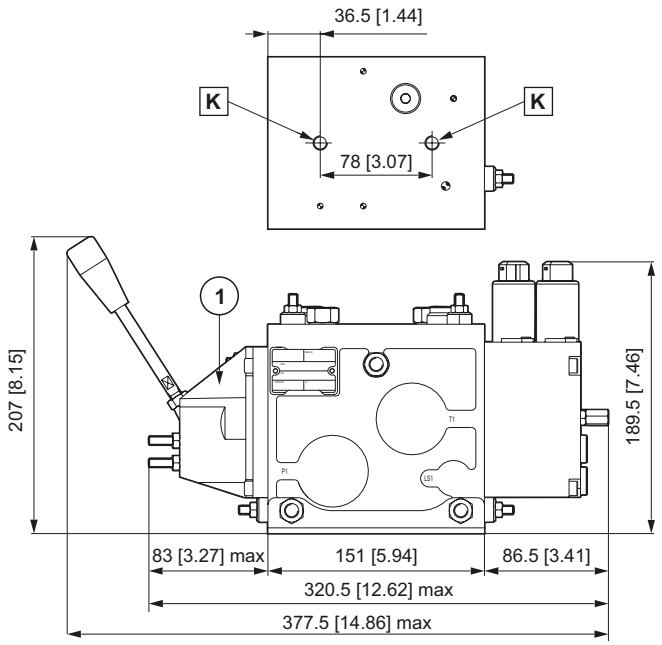
HPV 77 hydraulic diagram with SINGLE inlet section (HSE)

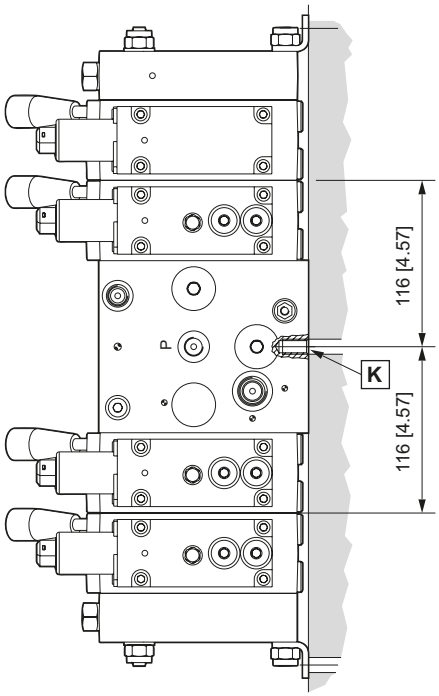


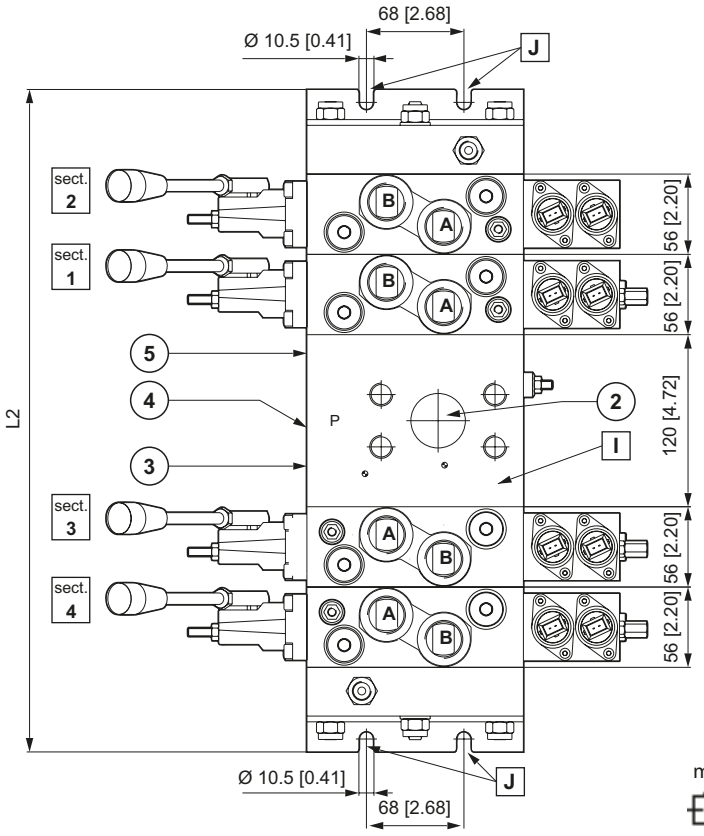
Overall dimensions and hydraulic diagrams

HPV77 overall dimensions with MID inlet section (HFLS) and HPV77

Working Sections	L1 mm [inch]	L2 mm [inch]
2	332 [13.07]	350 [13.78]
3	388 [15.28]	406 [15.98]
4	444 [17.48]	462 [18.19]
5	500 [19.68]	518 [20.39]
6	556 [21.89]	574 [22.60]
7	612 [24.09]	630 [24.80]
8	668 [26.30]	686 [27.01]





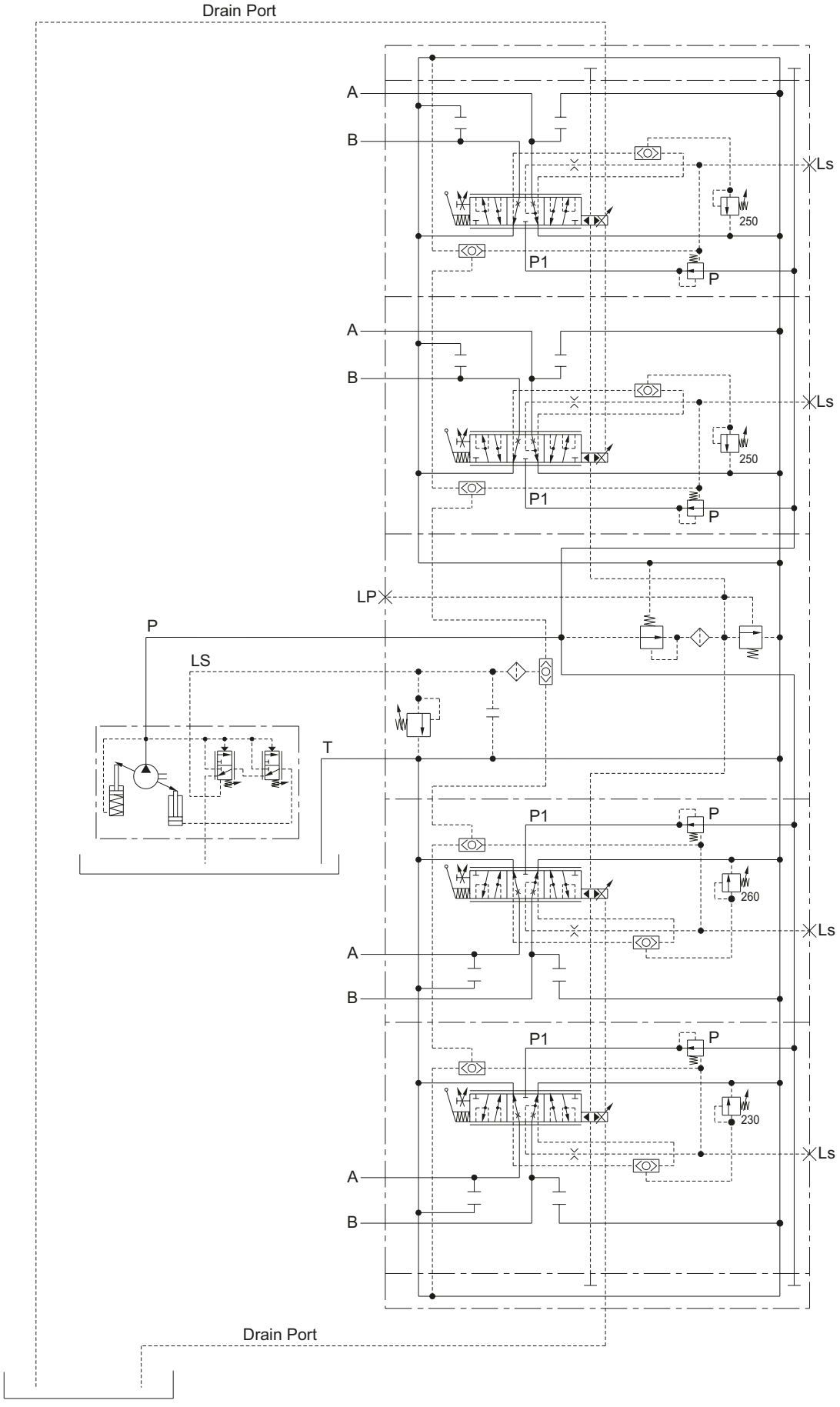


A/B Ports, G 3/4 BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
C Mid inlet section HFLS
J Fixing means
K Fixing holes M10
1 Manual control, HCM
2 Pump side port, 1" 1/2 SAE Flange 6000 psi
3 LS port, G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
4 Return line port, 1" 1/2 SAE Flange 3000 psi
5 LP port, G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)

Fixing instructions
The distributor must be fixed by means of the slots (J) in the feet and by means of the two holes M10-6H (K) in the mid inlet section HFLS (I). We decline all responsibility in the case of malfunctioning or oil leaks caused by wrong fixing of the distributor.

Note:
On the working sections no. 3, 4 (as in the above example), the A - B port positions are reversed (see also the order form, page C-29).

HPV 77 hydraulic diagram with MID inlet section (HFLS) and HPV77

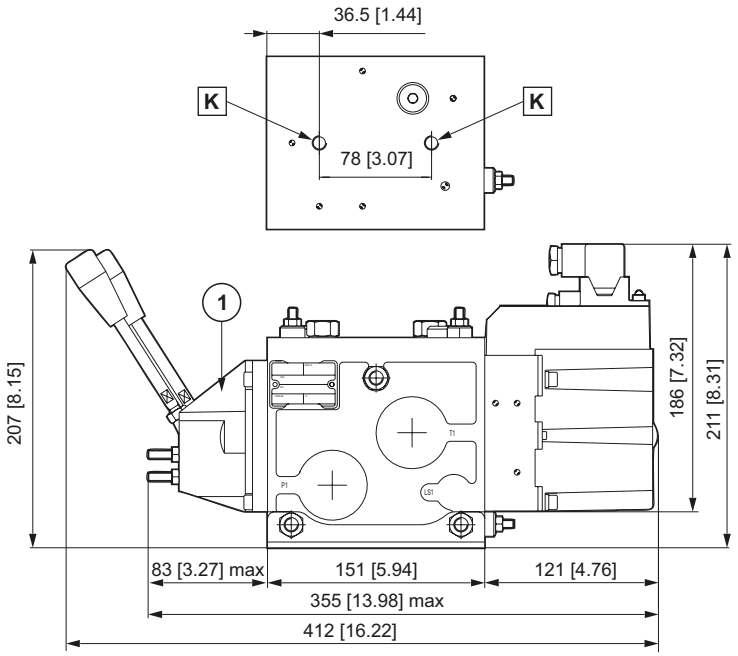


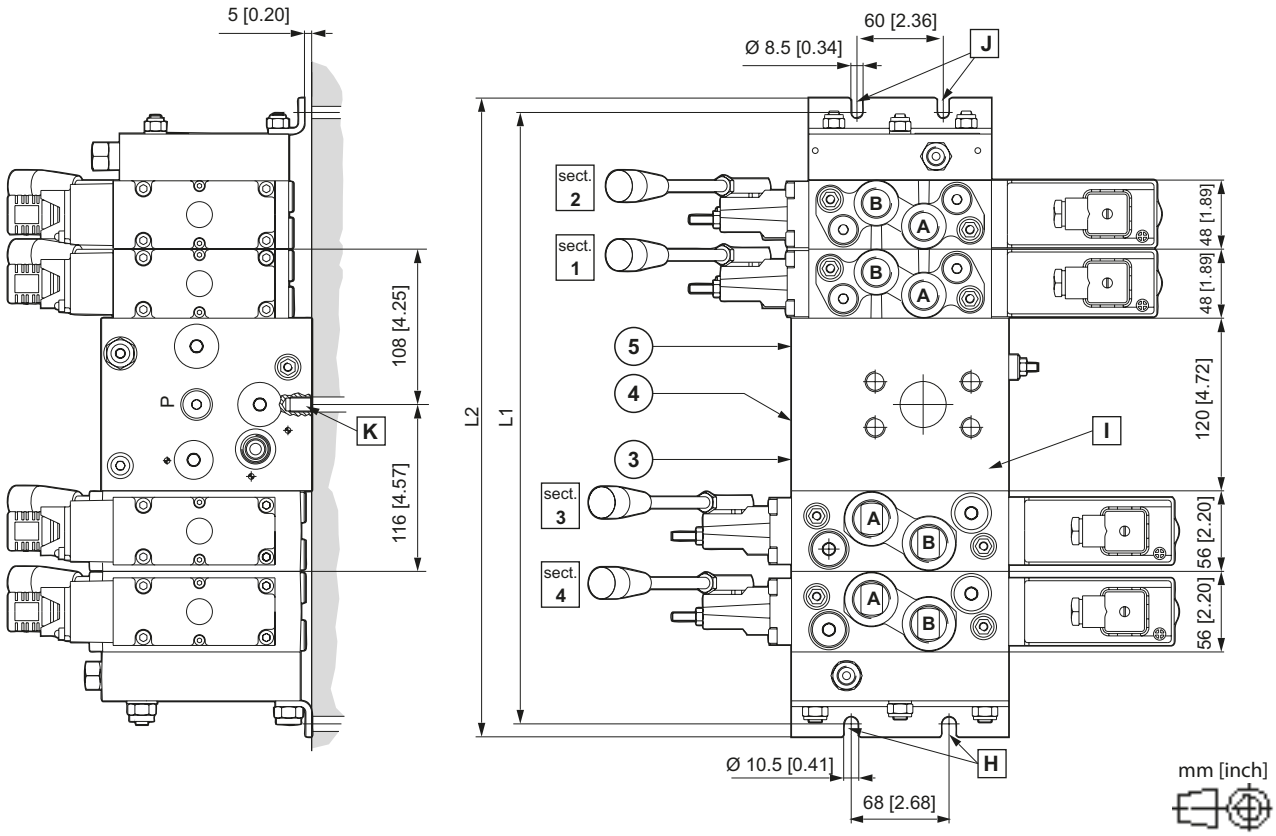
Overall dimensions and hydraulic diagrams

HPV77 overall dimensions with MID inlet section (HFLS) and HPV41

L2 mm [inch]	Working Sections HPV41						
Working Sections HPV77	1	2	3	4	5	6	7
1	340 [13.39]	388 [15.28]	436 [17.17]	484 [19.06]	532 [20.94]	580 [22.83]	628 [24.72]
2	396 [15.59]	444 [17.48]	492 [19.37]	540 [21.26]	588 [23.15]	636 [25.04]	684 [26.93]
3	452 [17.8]	500 [19.68]	548 [21.57]	596 [23.46]	644 [25.35]	692 [27.24]	740 [29.13]
4	508 [20]	556 [21.89]	604 [23.78]	652 [25.67]	700 [27.56]	748 [29.45]	796 [31.34]
5	564 [22.2]	612 [24.09]	660 [25.98]	708 [27.87]	756 [29.76]	804 [31.65]	852 [33.54]
6	620 [24.41]	668 [26.3]	716 [28.19]	764 [30.08]	812 [31.97]	860 [33.86]	908 [35.75]
7	676 [26.61]	724 [28.5]	772 [30.39]	820 [32.28]	868 [34.17]	916 [36.06]	964 [37.95]

L1 = (L2-19 mm) L1= (L2-0.75 inches)



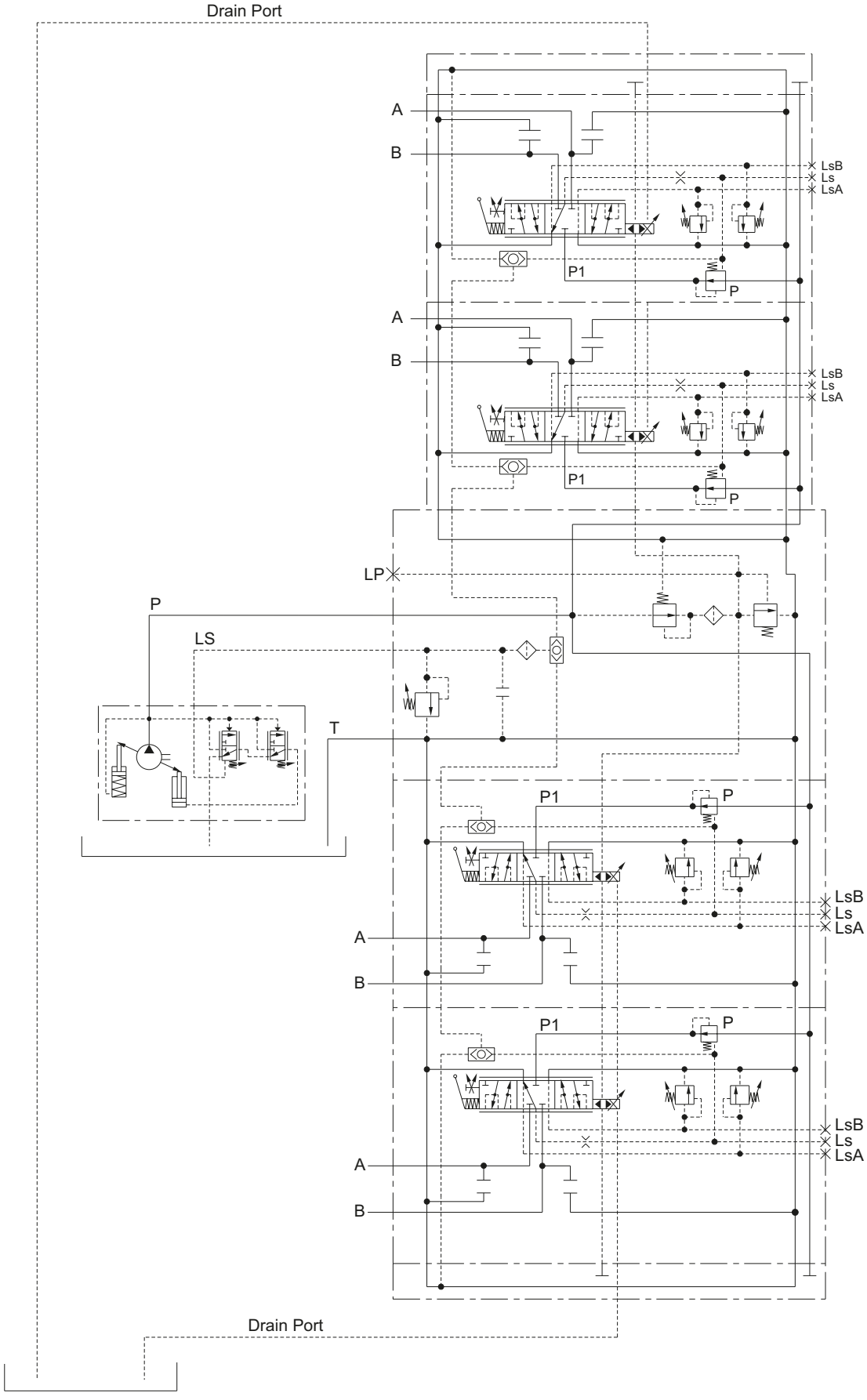


A/B Side HPV77: Ports, G 3/4 BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
Side HPV41: Ports, G 1/2 BSPP or 7/8" - 14 UNF - 2B (SAE 10)
I Mid inlet section HFLS
J Fixing means
K Fixing holes M10
1 Manual control, HCM
2 Pump side port, 1" 1/4 SAE Flange 6000 psi
3 LS port, G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
4 Return line port, 1" 1/4 SAE Flange 3000 psi
5 LP port, G 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)

Fixing instructions
The distributor must be fixed by means of the slots (J) in the feet and by means of the two holes M10-6H (K) in the mid inlet section HFLS (I). We decline all responsibility in the case of malfunctioning or oil leaks caused by wrong fixing of the distributor.

Note:
On the working sections no. 3, 4 (as in the above example), the A - B port positions are reversed (see also the order form, page C-29).

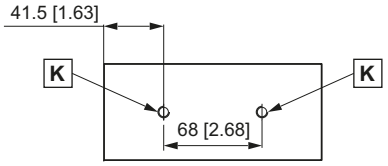
HPV 77 hydraulic diagram with MID inlet section (HFLS) and HPV41

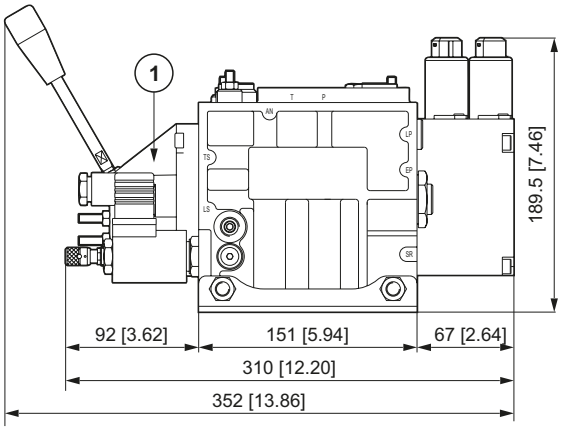


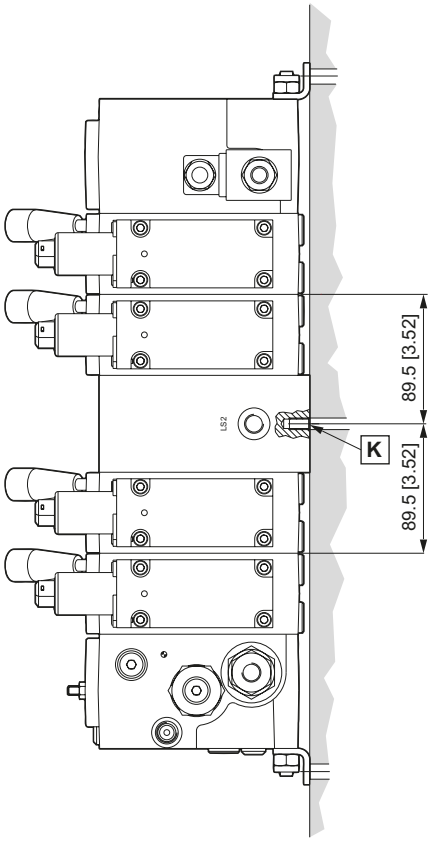
Overall dimensions and hydraulic diagrams

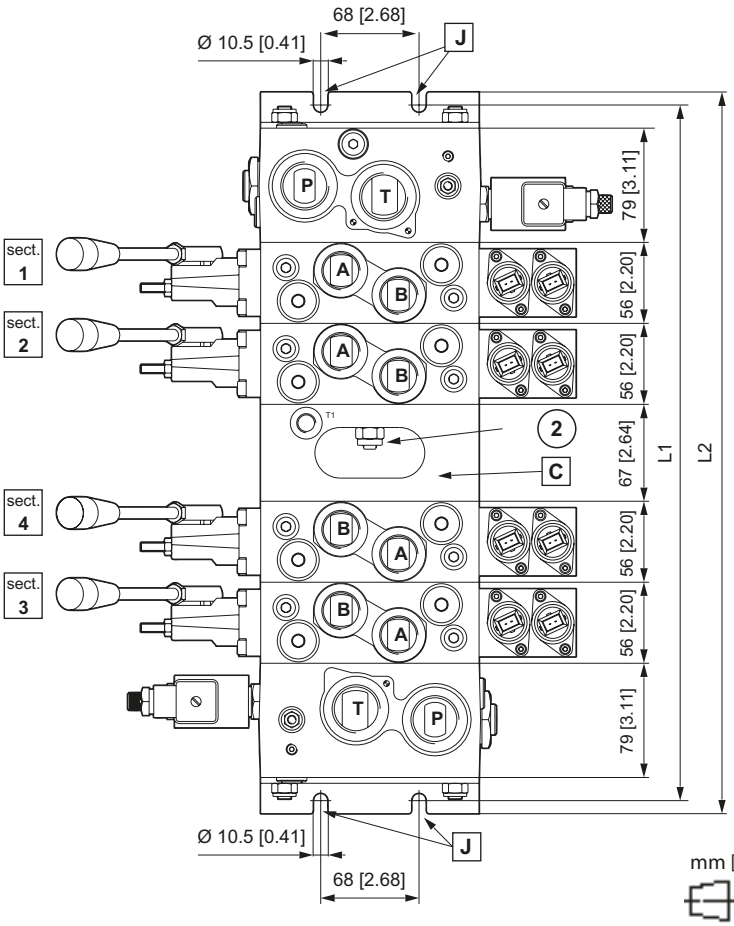
HPV 77 overall dimensions with 2 inlet sections (HSE) and mid end section (HPFS)

Working Sections	L1 mm [inch]	L2 mm [inch]
2	369 [14.53]	387 [15.24]
3	425 [16.73]	443 [17.44]
4	481 [18.94]	499 [19.65]
5	537 [21.14]	555 [21.85]
6	593 [23.35]	611 [24.06]
7	649 [25.55]	667 [26.26]
8	705 [27.76]	723 [28.46]









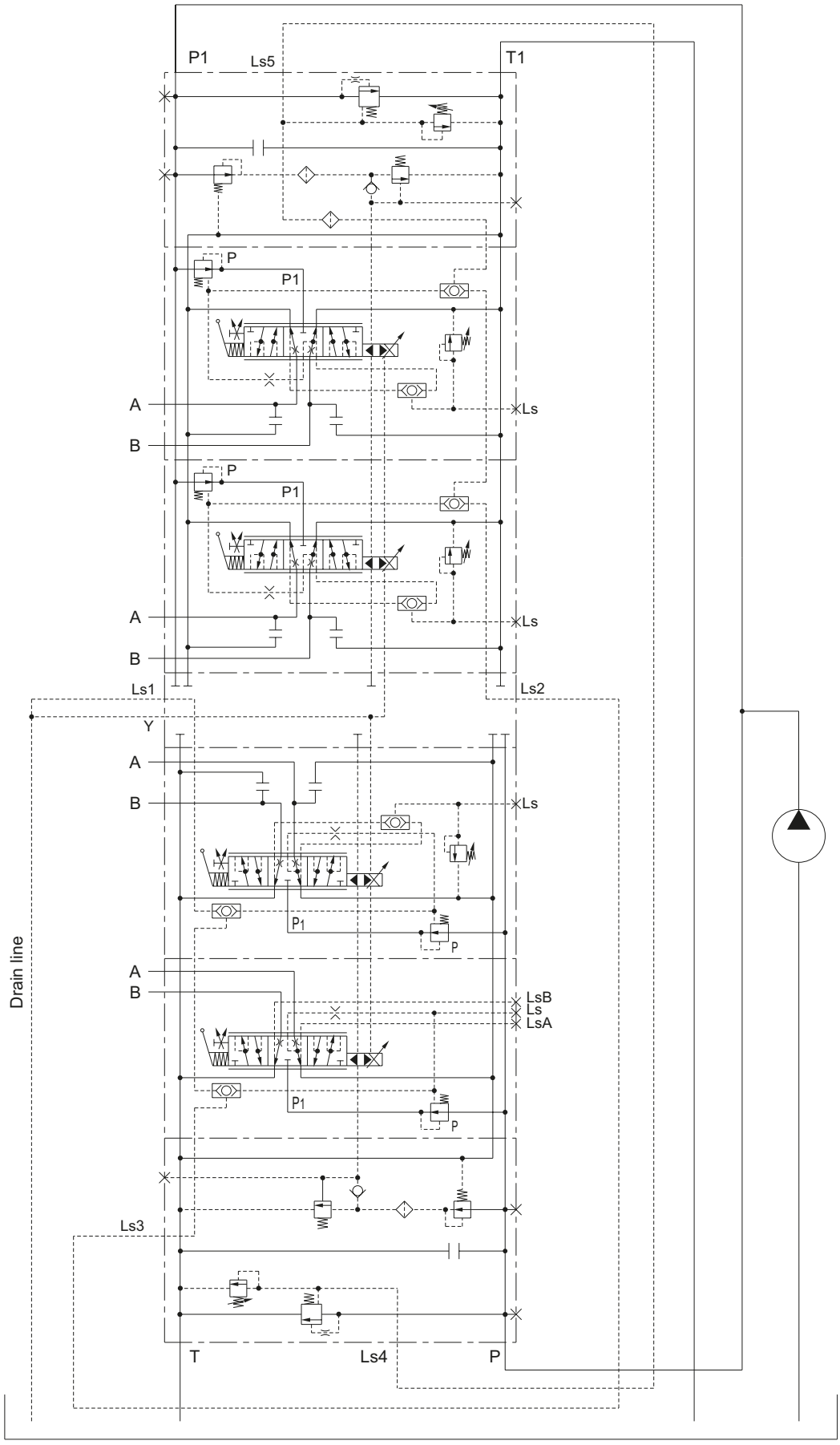
A/B Ports, G 3/4 BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
C Mid inlet section HPFS
J Fixing means
K Fixing holes M10
P Pump side port, G 1" BSPP or 1 5/16" - 12UN - 2B (SAE 16)
T Return line port, G 1" BSPP or 1 5/16" - 12UN - 2B (SAE 16)
1 Manual control, HCM

Fixing instructions
The distributor must be fixed by means of the slots (J) in the feet and by means of the two holes M10-6H (K) in the mid end section HPFS (C). We decline all responsibility in the case of malfunctioning or oil leaks caused by wrong fixing of the distributor.

Note:
On the working sections no. 1, 2 (as in the above example), the A - B port positions are reversed (see also the order form, page C-30).

Overall dimensions and hydraulic diagrams

HPV 77 hydraulic duagram with 2 inlet sections (HSE) and mid end section (HPFS), for open centre system

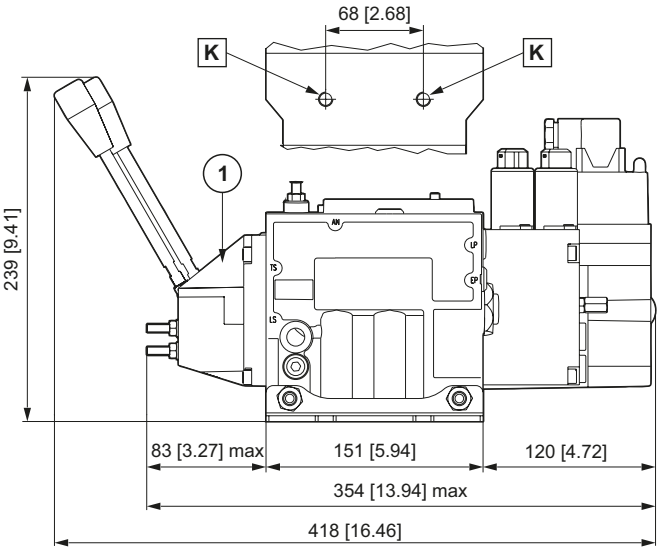


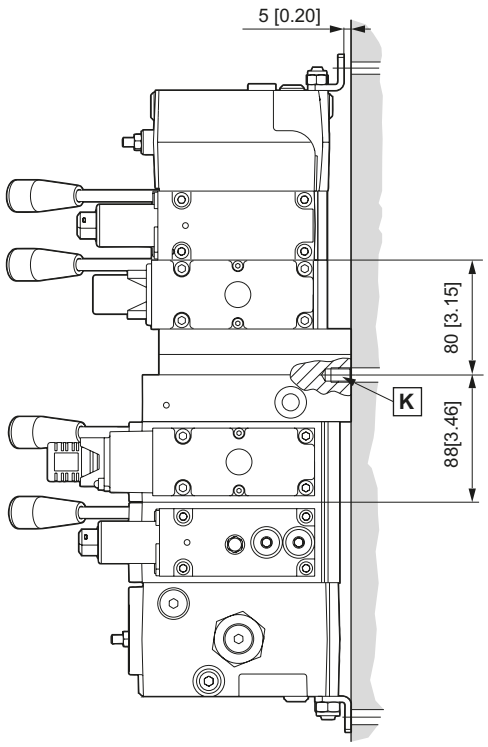
Overall dimensions and hydraulic diagrams

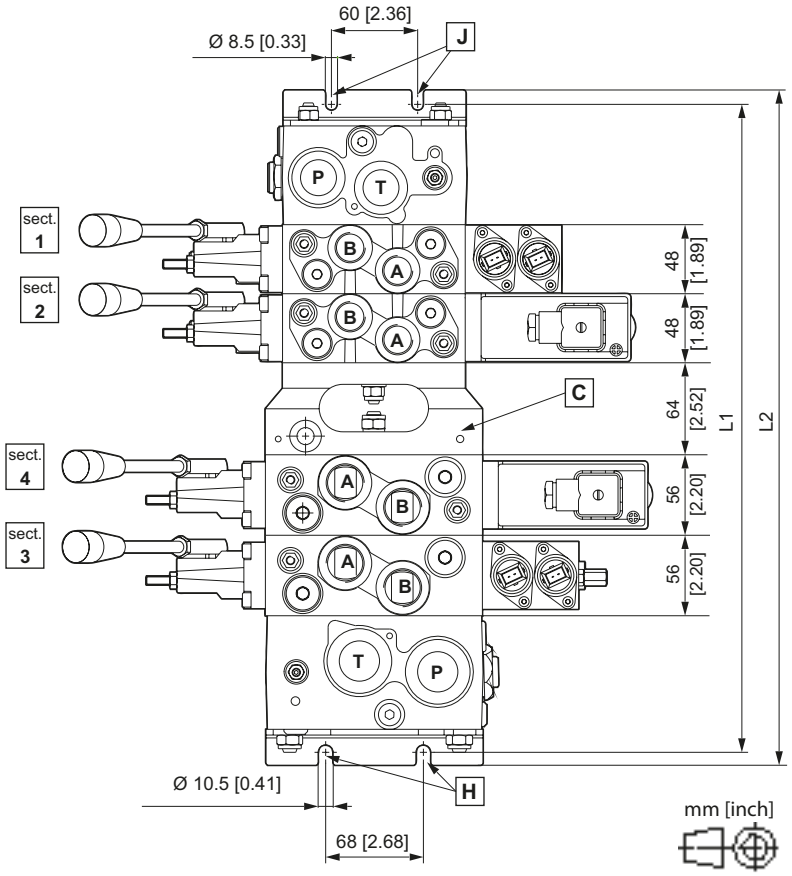
HPV 77 overall dimensions with MID END section (HPFS) and HPV 41 distributor

L2 mm [inch]	Working Sections HPV41						
Working Sections HPV77	1	2	3	4	5	6	7
1	367 [14.45]	415 [16.34]	463 [18.23]	511 [20.12]	559 [22.01]	607 [23.9]	655 [25.79]
2	423 [16.65]	471 [18.54]	519 [20.43]	567 [22.32]	615 [24.21]	663 [26.1]	711 [27.99]
3	479 [18.86]	527 [20.75]	575 [22.64]	623 [24.53]	671 [26.42]	719 [28.31]	767 [30.20]
4	535 [21.06]	583 [22.95]	631 [24.84]	679 [26.73]	727 [28.62]	775 [30.51]	823 [32.40]
5	591 [23.27]	639 [25.16]	687 [27.05]	735 [28.94]	783 [30.83]	831 [32.72]	879 [34.61]
6	647 [25.47]	695 [27.36]	743 [29.25]	791 [31.14]	839 [33.03]	887 [34.92]	935 [36.81]
7	703 [27.68]	751 [29.57]	799 [31.46]	847 [33.35]	895 [35.24]	943 [37.13]	991 [39.02]

L1 = (L2-19 mm) L1= (L2-0.75 inches)







A/B side HPV77: Ports, G 3/4 BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
side HPV41: Ports, G 1/2 BSPP or 7/8" - 14 UNF - 2B (SAE 10)

P/T pump and return connections
side HPV77: G 1" BSPP or 1 5/16" - 12UN - 2B (SAE 16)
side HPV41: G 3/4" BSPP or 1 1/16" - 12UN - 2B (SAE 12)

C Mid inlet section HPFS

J Fixing means

K Fixing holes M10

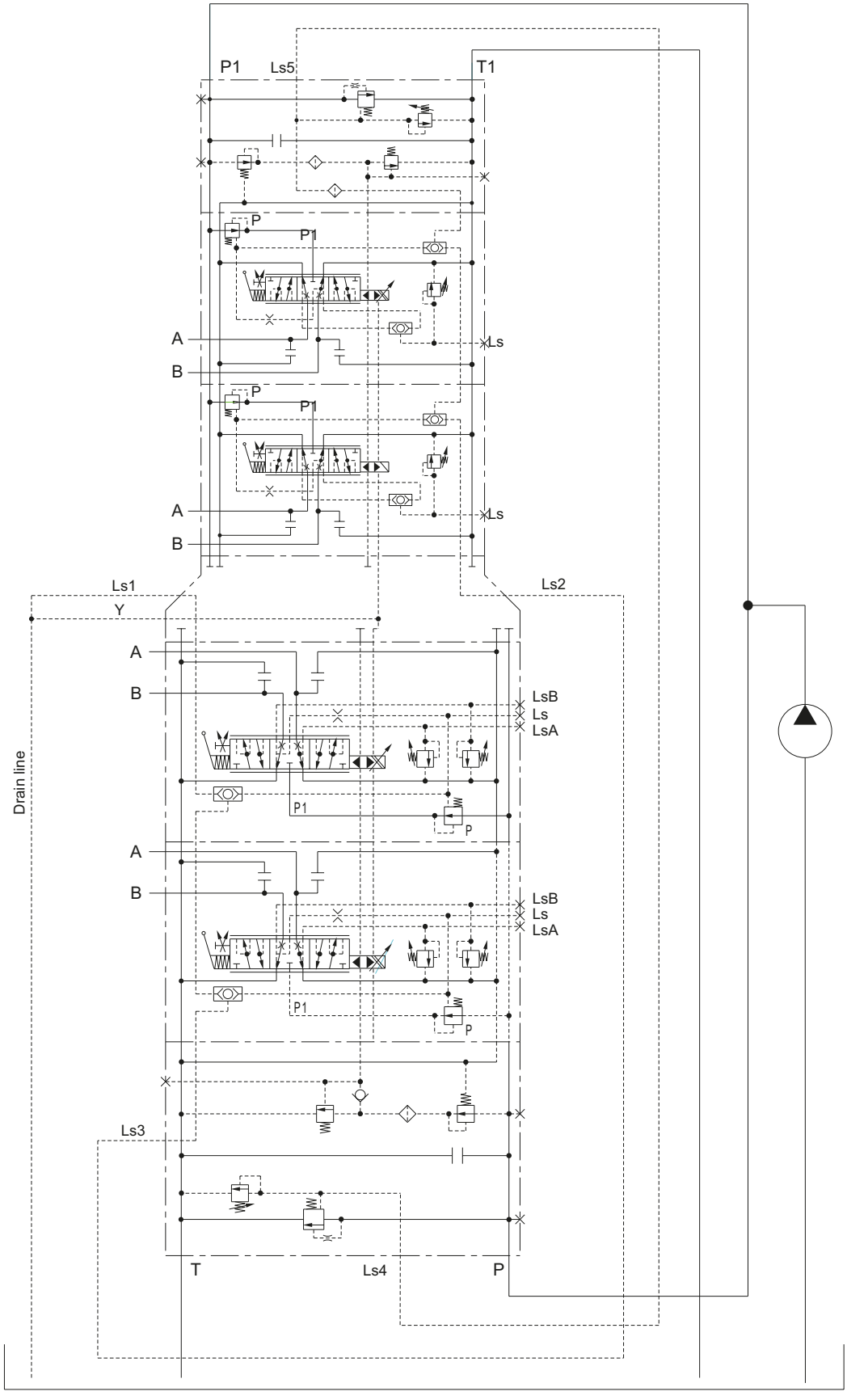
1 Manual control, HCM

Fixing instructions
The distributor must be fixed by means of the slots (J) in the feet and by means of the two holes M10-6H (K) in the mid end section HPFS (C). We decline all responsibility in the case of malfunctioning or oil leaks caused by wrong fixing of the distributor.

Note:
On the working sections no. 1, 2 (as in the above example), the A - B port positions are reversed (see also the order form, page C-30).

Overall dimensions and hydraulic diagrams

HPV 77 hydraulic diagram with MID END section (HPFS) and HPV 41 distributor

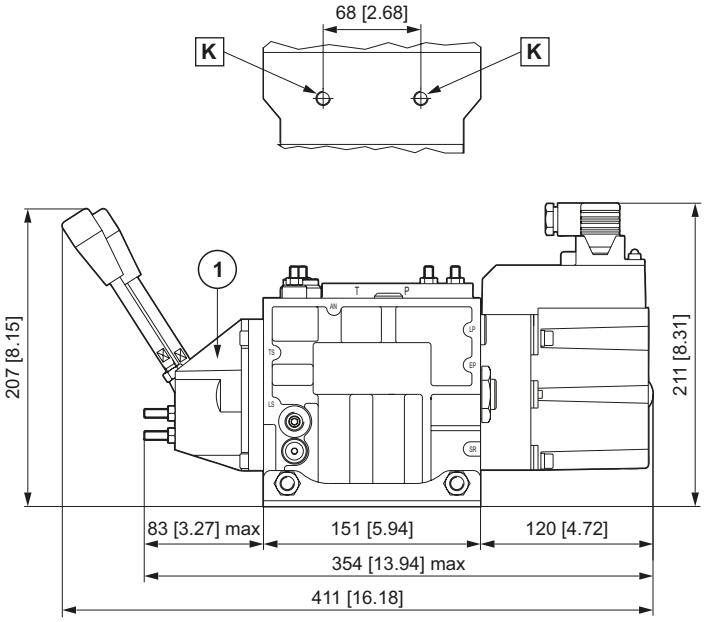


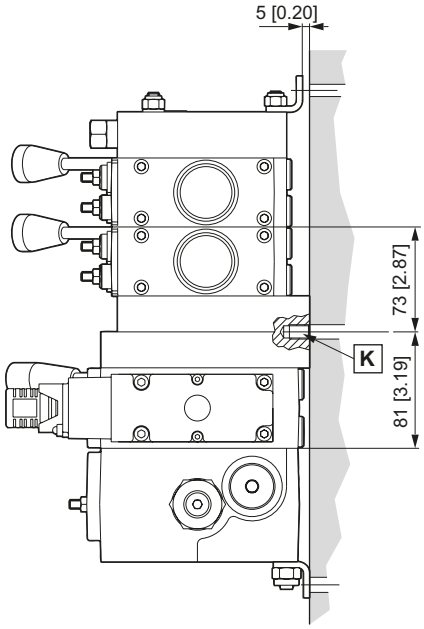
Overall dimensions and hydraulic diagrams

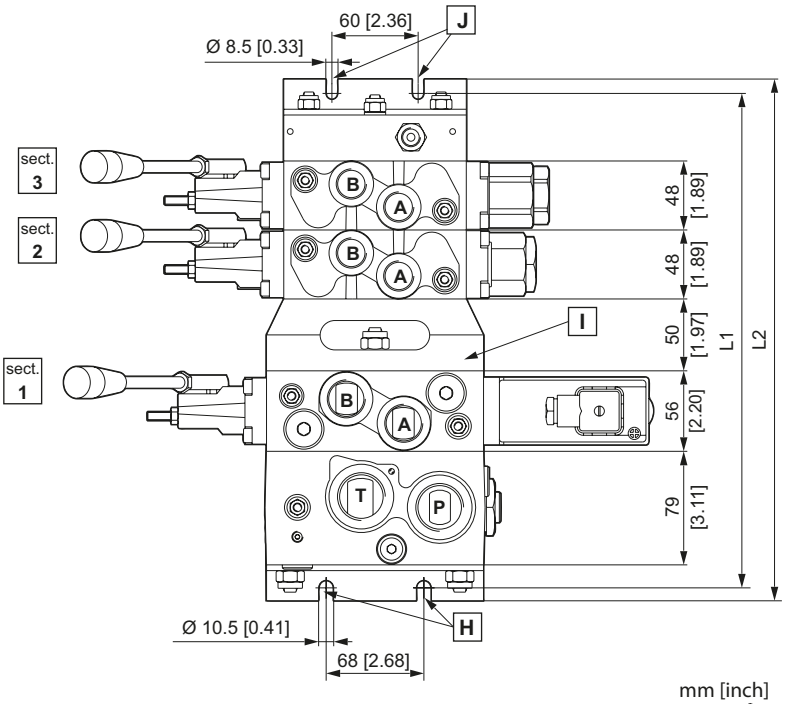
HPV 77 overall dimensions with INTERFACE (HSIF)
for HPV 41 distributor

L2 mm [inch]	Working Sections HPV41						
Working Sections HPV77	1	2	3	4	5	6	7
1	315 [12.40]	363 [14.29]	411 [16.18]	459 [18.07]	507 [19.96]	555 [21.85]	603 [23.74]
2	371 [14.61]	419 [16.50]	467 [18.39]	515 [20.28]	563 [22.17]	611 [24.06]	659 [25.94]
3	427 [16.81]	475 [18.70]	523 [20.59]	571 [22.48]	619 [24.37]	667 [26.26]	715 [28.15]
4	483 [19.02]	531 [20.91]	579 [22.80]	627 [24.68]	675 [26.57]	723 [28.46]	771 [30.35]
5	539 [21.22]	587 [23.11]	635 [25.00]	683 [26.89]	731 [28.78]	779 [30.67]	827 [32.56]
6	595 [23.43]	643 [25.31]	691 [27.20]	739 [29.09]	787 [30.98]	835 [32.87]	883 [34.76]
7	651 [25.63]	699 [27.52]	747 [29.41]	795 [31.30]	843 [33.19]	891 [35.08]	939 [36.97]

L1 = (L2-19 mm) L1= (L2-0.75 inches)







mm [inch]

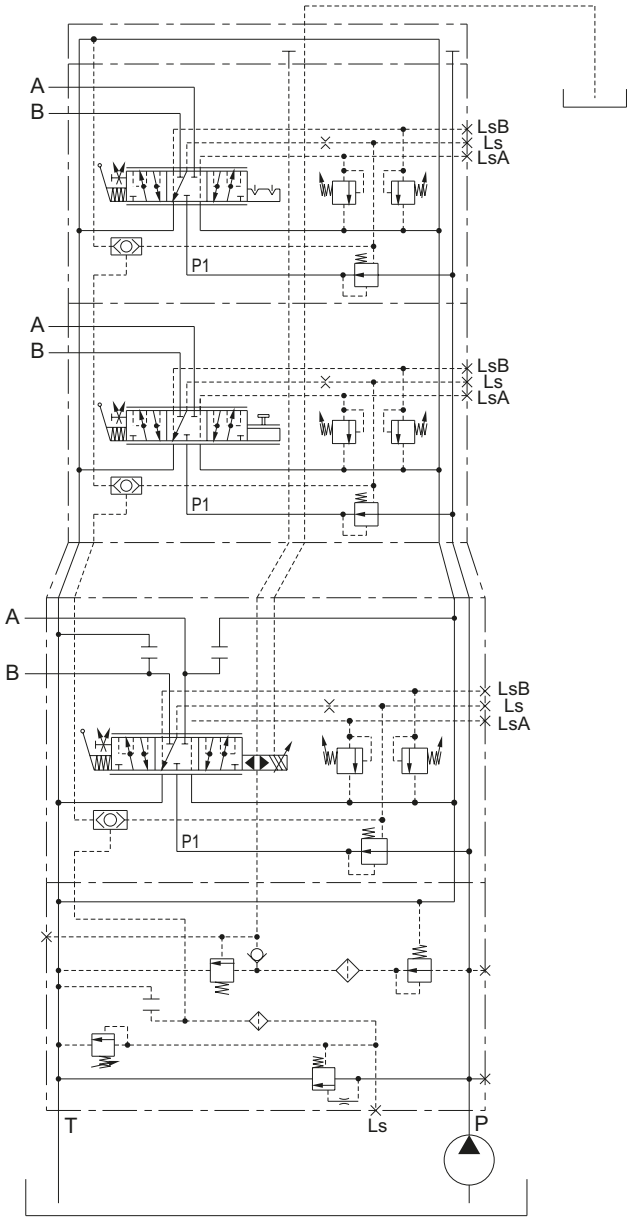
A/B side HPV77: Ports, G 3/4 BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
side HPV41: Ports, G 1/2 BSPP or 7/8" - 14 UNF - 2B (SAE 10)
I Interface HSIF
J Fixing means
K Fixing holes M10
P Pump side port, G 1" BSPP or 1 5/16" - 12UN - 2B (SAE 16)
T Return line port, G 1" BSPP or 1 5/16" - 12UN - 2B (SAE 16)
1 Manual control, HCM

Fixing instructions
The distributor must be fixed by means of the slots (J) in the feet and by means of the two holes M8-6H (K) in the HSIF interface (I). We decline all responsibility in the case of malfunctioning or oil leaks caused by wrong fixing of the distributor.

Note:
See the order form, page C-28.

Overall dimensions and hydraulic diagrams

HPV 77 hydraulic diagram with INTERFACE (HSIF) for HPV 41 distributor



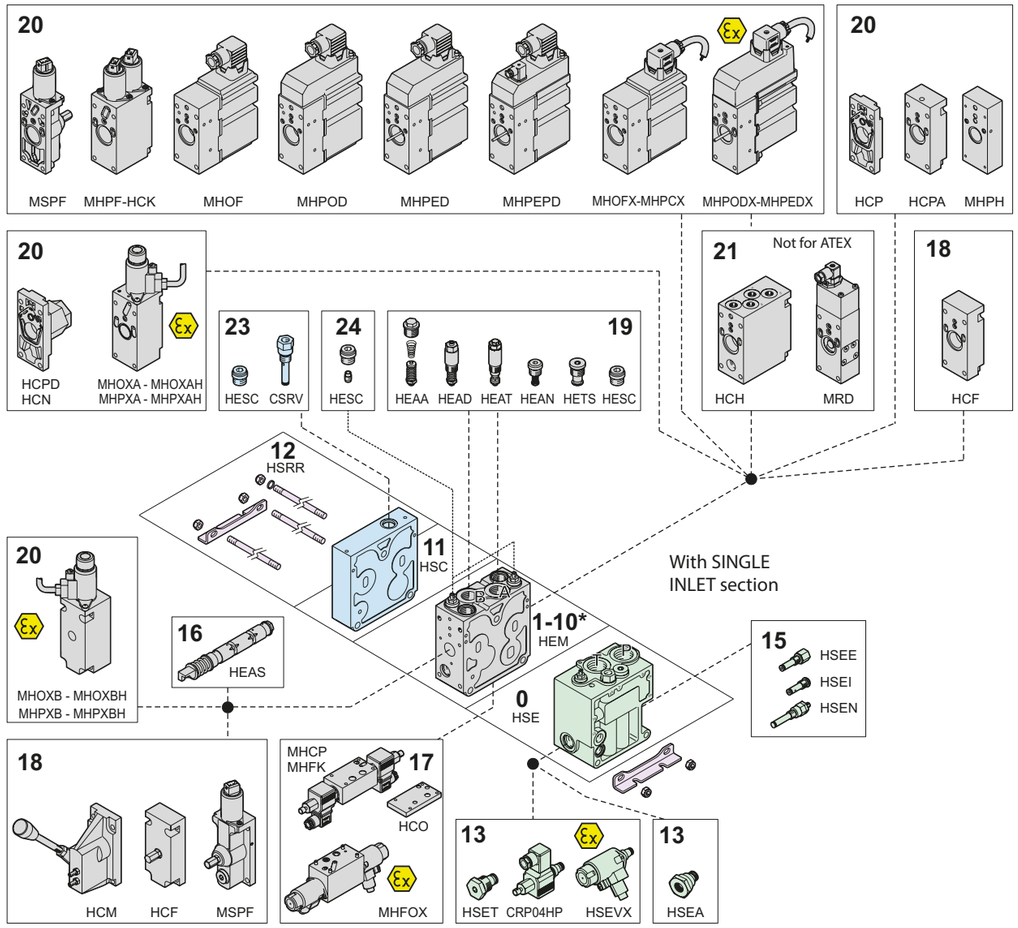

DANA
ARON™

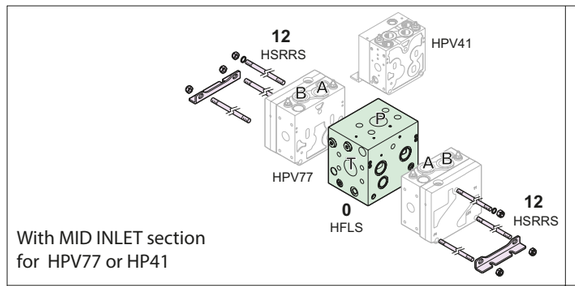
HPV77
Composition
form

HPV77
Composition
form

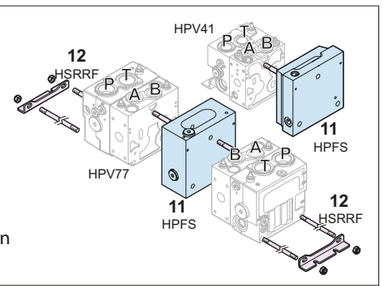
Cut

HPV77 Composition form

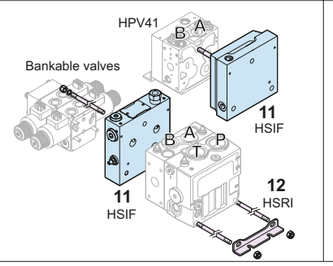




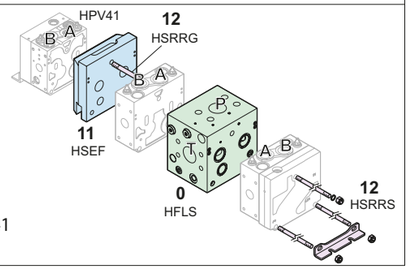
With MID INLET section
for HPV77 or HP41



With MID END section
and 2 inlet sections



With HSIF interface for
bankable valves
(see catalogue code
DOC00046) or HPV41



With MID INLET
section and HPV41
interface

* Working sections HEM (1-10) are reversibles, actuators (18-20-21) can be assembled on side X or Y of element.

FIELD 0 - INLET SECTIONS
HSE - Inlet section C-31
HFLS - Intermediate inlet section HPV77 + HPV77 ..... C-36
HFLS - Intermediate inlet section HPV77 + HPV41 ..... C-38

FIELD 1 to 10 - WORKING SECTIONS
HEM - Working section C-43

FIELD 11 - END SECTIONS
HSC - End section C-88
HPFS - Intermediate end section HPV77 + HPV77 ..... C-90
HPFS - Intermediate end section HPV77 + HPV41 ..... C-91
HSIF - Interface between HPV77 and CXDH3 / CX3 / CDH3 / CD3 / CDC3 ..... C-92
HSIF - Interface between HPV77 and HPV41 ..... C-94
HSEF - Interface between HPV77 and HPV41 intermediate inlet HFLS C-95

FIELD 12 - STAY BOLTS KITS
HSRR - Stay bolts kit for single inlet HSE C-97
HSRRS - Stay bolts kit for mid inlet HFLS C-98
HSRRF - Stay bolts kit for mid end section HPFS C-99
HSRI - Stay bolts kit for HSIF interfaca C-100
HSRS+HSRRG - Stay bolts kit for mid inlet HFLS + HSIF interface C-101

FIELD 13 - FACILITIES FOR SOLENOID LS UNLOADING VALVES
HSET - Plug C-40
CRP04HP - Electrical valve C-40
HSEA - Cartridge C-40
HSEVX - ATEX electrical valve C-40

FIELD 15 - PILOT OIL SUPPLY
HSEE, HSEI, HSEN - Cartridges C-42

FIELD 16 - SPOOLS
HEAS - Main spools C-49

FIELD 17 - ELECTRICAL UNLOADING LSA-B MODULE
MHFK, MHCP - Unloading modules C-82
MHFOX - ATEX unloading module C-84
HCO - Closing module C-87

FIELD 18 - MECHANICAL ACTUATORS
HCM Mechanical control C-54
HCF Rear cover C-54
MSPF - Current electrohydraulic proportional module C-55

FIELD 19 - SHOCK AND SUCTION VALVE
HEAA, HEAD, HEAT, HEAN, HETS, HESC - Valves and plugs C-51

FIELD 20 - MECHANICAL, HYDRAULIC AND ELECTRICAL ACTUATORS
HCN - Friction C-56
HCP - Rear cover C-56
HCPA - Adjustabler rear cover C-56
HCPD - Spool lock device C-57
MHPH - Hydraulic activation C-57
MHPF - Electrohydraulic proportional module C-58
HCK - electrohydraulic proportional modulewith pilot oil connections C-59
MHOF - On/Off electrohydraulic module C-60
MHPOD - Open loop electrohydraulic proportional module C-61
MHPED - Closed loop electrohydraulic proportional module C-62
MHPEPD - Closed loop electrohydraulic proportional module C-64
MHOX, MHOX-H - On/Off electrohydraulic modules ATEX C-66
MHPX, MHPX-H - Proportional electrohydraulic modules ATEX C-70
MHOFX - On/Off electrohydraulic ATEX module C-74
MHPCX - Proportional electrohydraulic ATEX module C-75
MHPODX - Open loop electrohydraulic proportional ATEX module C-76
MHPEDX - Closed loop electrohydraulic proportiona ATEX module C-77

FIELD 21 - REMOTE CONTROL
HCH - Hydraulic and electrical remote control C-79
MRD - Electrical spool movement device C-81

FIELD 23 - ACCESSORIES FOR HSC AND HSIF ELEMENTS
CSRV module - electrical activations external drain C-96

FIELD 24 - PLUGS KIT
Kit for closing pressure relief valve cavity C-53

SPARE PARTS KIT C-102

Cut

Order form

This order form is the only one ensuring that the product will be defined and ordered correctly without any possible mistakes. It is divided into sectors of pertinence, from 0 to 24, within which the code of the required module must be inserted.

It is also necessary to indicate:
- the setting in bar of the pressure relief valve (sector 0, inlet section);
- when requested, the setting in bar of the LsA/LsB pressure relief valves (sectors 1 to 10, HEM spool elements);

Dana suggests to indicate the pump type and the flow that feeds the proportional valve, so it is possible to test it in working conditions.
The valve is always assembled as indicated in the module assembly selection table (see page C-25), i.e. the HCM module for the manual control inserted in sector of pertinence 18, and the rear modules HCP, HCPD, MHPH, MHPE, MHPO, MHOF etc. inserted into sectors of pertinence 20, 21.

If the opposite assembly is required, just select from menu the desired assembly mode: Right / Left HPV feed, HPV feed with HFLS / HPFS module.

Combination table controls

Controls	HCM	HCF	MSPF	MHOXB	MHOXBH	MHPXB	MHPXBH
HCPD HCN	•	—	—	—	—	—	—
MHOXA	•	—	—	•	—	—	—
MHOXAH	•	—	—	—	•	—	—
MHPXA	•	—	—	—	—	•	—
MHPXAH	•	—	—	—	—	—	•
MSPF	•	•	•	—	—	—	—
MHPF-HCK	•	—	—	—	—	—	—
MHOF	•	—	—	—	—	—	—
MHPOD	•	—	—	—	—	—	—
MHPED	•	—	—	—	—	—	—
MHPEPD	•	—	—	—	—	—	—
MHOFX MHPCX	•	—	—	—	—	—	—
MHPODX MHPEDX	•	—	—	—	—	—	—
HCP	•	—	—	—	—	—	—
HCPA	•	—	—	—	—	—	—
MHPH	•	•	—	—	—	—	—
HCF	—	—	•	•	•	•	•

• = combinable — = not combinable

ATEX controls. For the ATEX versions you need to use the cast iron controls.

Order form

With SINGLE inlet section (HSE)

Controlled function	B Port		Field						A Port		Controlled function
					11		23				
					12						
	18		10		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		9		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		8		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		7		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		6		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		5		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		4		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		3		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		2		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
	18		1		bar		16			18	
	19			LsA						19	
	20			LsB			17			20	
	21				22					21	
Note			0	P			13		Note		
							14				
				bar			15				

Right HPV feed (Standard)
Left HPV feed



MAIN INFORMATION

Pump type	○ Fixed displ. ○ LS control ○ Constantpressure
Pump flow, l/1'	000liter/min
Type of threads	○ UNF ○ BSPP
Reference tension	○ 12 V ○ 24 V ○ Not required
Electric devices	○ Standard ○ Atex PWM ○ ATEX Tens

Customer:			
Item description:			
Compilation form date:			
Our valve internal code			
Customer reference code			
Compilation form modification index			
Order No.:		Order quantity	
Order Date:		Net price EUR	
Delivery date:		PRICE LIST 2018 - vers. BSPP (GAS)	
Order ack. N°.:		Quotazione n° :	

This composition form shall not be deemed as a Manufacturer's recommendation. We decline any responsibilities.

NOTE: For working sections numbering, see page C-12.

Order form

With MID inlet section (HFLS)

Controlled function	B Port	Field		A Port	Controlled function
			11		
			12		
	18	6	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	5	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	4	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	3	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	2	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	1	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
HFLS	A Port	0	P 13	B Port	HFLS
			14		
			bar 15		
	18	7	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	8	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	9	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	10	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	11	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
	18	12	bar 16	18	
	19		LsA	19	
	20		LsB 17	20	
	21		22	21	
Note			11 23	Note	
			12		

HPV feed with HFLS module
HPV feed with HPFS module

MAIN INFORMATION

Pump type	○ Fixed displ. ○ LS control ○ Constantpressure
Pump flow, l/1'	000liter/min
Type of threads	○ UNF ○ BSPP
Reference tension	○ 12 V ○ 24 V ○ Not required
Electric devices	○ Standard ○ Atex PWM ○ ATEX Tens

Customer:			
Item description:			
Compilation form date:			
Our valve internal code			
Customer reference code			
Compilation form modification index			
Order No.:		Order quantity	
Order Date:		Net price EUR	
Delivery date:		PRICE LIST 2018 - vers. BSPP (GAS)	
Order ack. N°.:		Quotazione n° :	

This composition form shall not be deemed as a Manufacturer's recommendation. We decline any responsibilities.

NOTE: For working sections numbering, see page C-14.

Order form

With 2 inlet sections (HSE) and mid end section (HPFS)

Controlled function	A Port								B Port		Controlled function
			0				13				
							14				
				12			15				
	18		1	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		2	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		3	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		4	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		5	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		6	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
HPFS	B Port		Field		11				A Port		HPFS
	18		12	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		11	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		10	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		9	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		8	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
	18		7	bar			16			18	
	19			LsA						19	
	20			LsB			17			20	
	21			22						21	
Note			0				13		Note		
							14				
				12			15				

HPV feed with HPFS module
HPV feed with HFLS module

MAIN INFORMATION

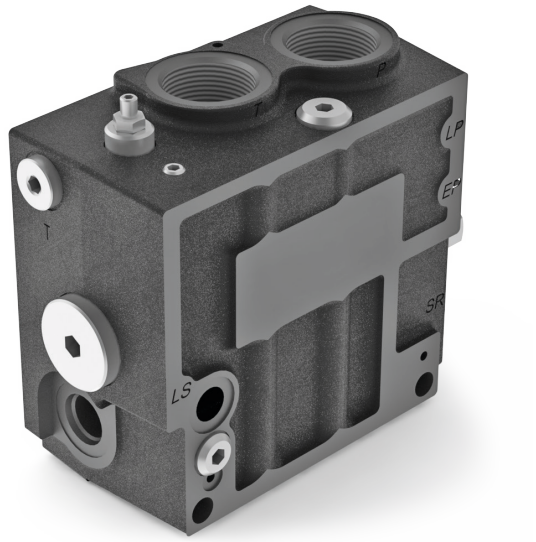
Pump type	○ Fixed displ. ○ LS control ○ Constantpressure
Pump flow, l/1'	000liter/min
Type of threads	○ UNF ○ BSPP
Reference tension	○ 12 V ○ 24 V ○ Not required
Electric devices	○ Standard ○ Atex PWM ○ ATEX Tens

Customer:			
Item description:			
Compilation form date:			
Our valve internal code			
Customer reference code			
Compilation form modification index			
Order No.:		Order quantity	
Order Date:		Net price EUR	
Delivery date:		PRICE LIST 2018 - vers. BSPP (GAS)	
Order ack. N°.:		Quotazione n° :	

This composition form shall not be deemed as a Manufacturer's recommendation. We decline any responsibilities.

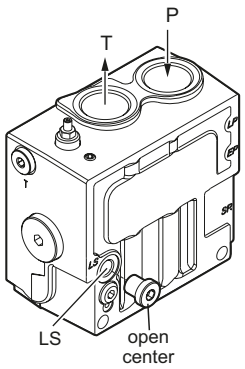
NOTE: For working sections numbering, see page C-20.

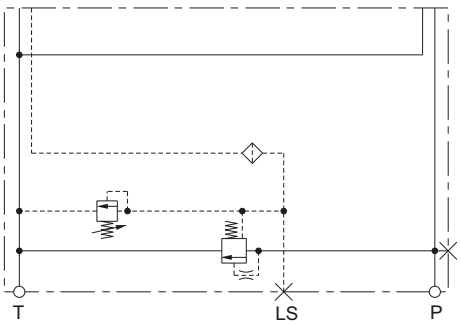
HSE inlet sections

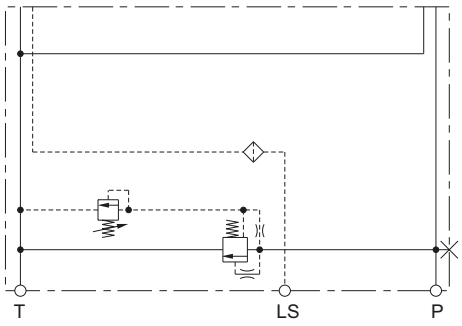


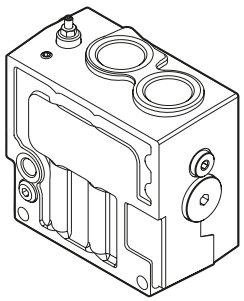
Features
- Hydraulic features: see page C-8.
- Connections: P, T: G 1" BSPP or 1 5/16" - 12UN - 2B.
- Connessione Ls: 1/4" BSPP or 7/16" - 20UNF-2B.
- Cast iron body.

HSE for purely mechanically activated valves









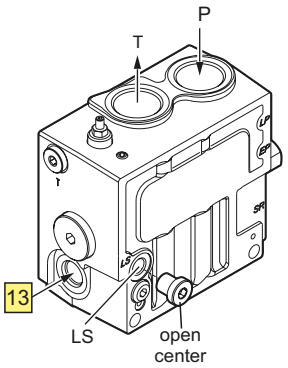
Open center circuit for fixed displacement pumps

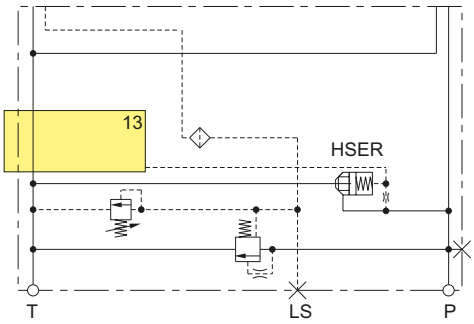
Code	
BSPP	UN - UNF
HSE0007701205	HSE0007701210

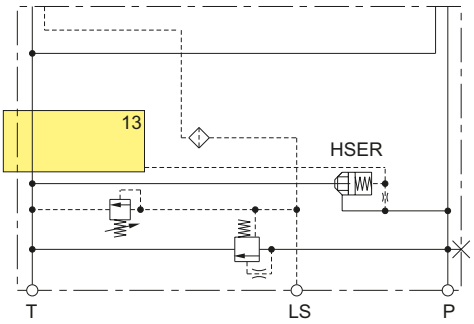
Closed center circuit for load sensing pumps

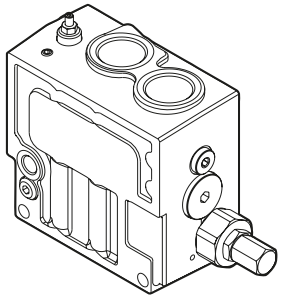
Code	
BSPP	UN - UNF
HSE0007701255	HSE0007701260

For purely mechanically activated valves.
HSER pump unloading valve. Prearranged for CRP04HP, HSET, HSEA.









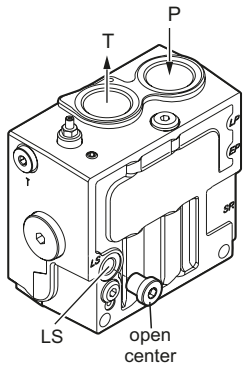
Open center circuit for fixed displacement pumps

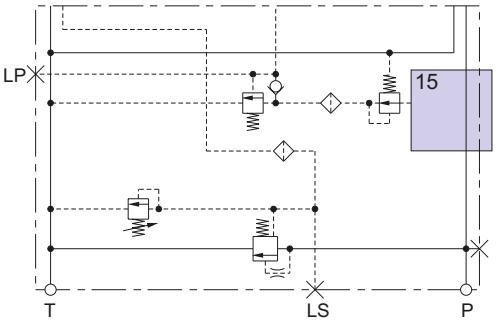
Code	
BSPP	UN - UNF
HSE0007701213	HSE0007701214

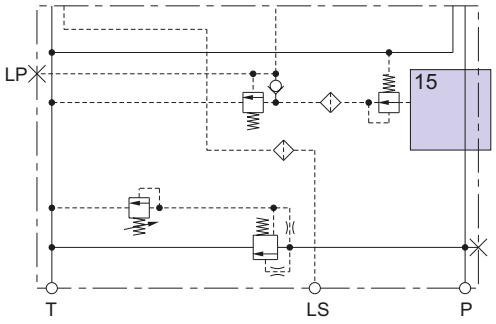
Closed center circuit for load sensing pumps

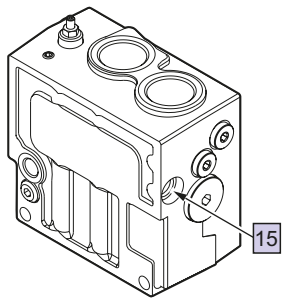
Code	
BSPP	UN - UNF
HSE0007701223	HSE0007701224

For electrically activated valves.With pilot oil supply Lp.









Open center circuit for fixed displacement pumps

Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0007701225	HSE0007701230	22	319
HSE0007701286	HSE0007701288	30	435
HSE0007701287	HSE0007701289	36	522

Closed center circuit for load sensing pumps

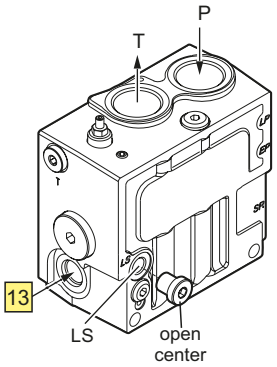
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0007701265	HSE0007701270	22	319
HSE0007701306	HSE0007701330	30	435
HSE0007701307	HSE0007701331	36	522

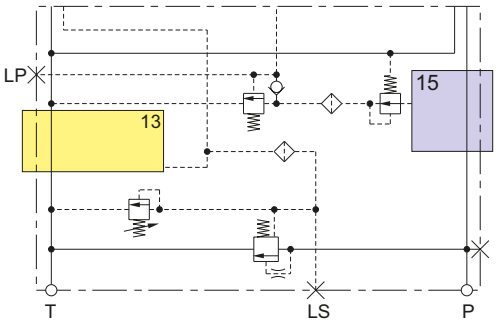
13 15 Seats, see accessories tables from page C-40.

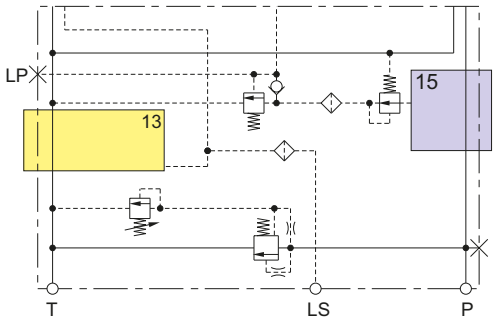
(*) LP = Pilot pressure oil supply. If not specified 22 bar [319 psi]

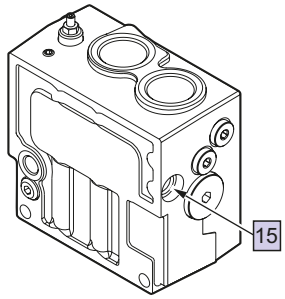
HSE inlet sections

For electrically activated valves. With pilot oil supply.
Prearranged for valves CRP04HP, HSET, HSEA









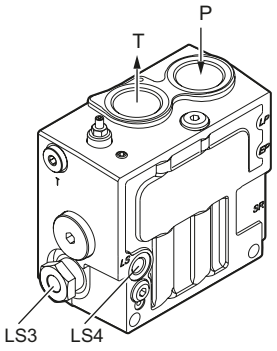
Open center circuit for fixed displacement pumps

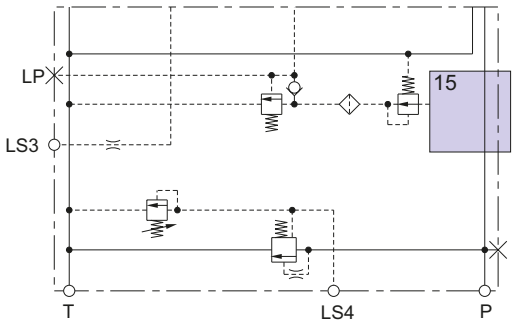
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0007701235	HSE0007701240	22	319
HSE0007701290	HSE0007701296	30	435
HSE0007701291	HSE0007701297	36	522

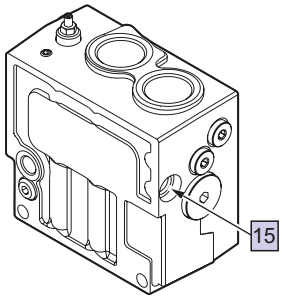
Closed center circuit for load sensing pumps

Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0007701275	HSE0007701280	22	319
HSE0007701332	HSE0007701334	30	435
HSE0007701333	HSE0007701335	36	522

For electrically activated valves.
With pilot oil supply. For system with 2 inlet sections supplied by 1 pump only.







Open center circuit for fixed displacement pumps

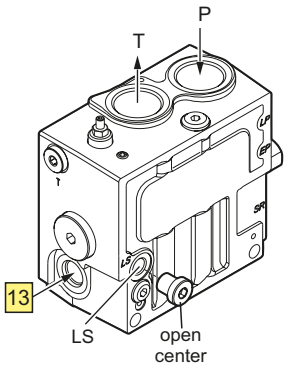
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0007701237	*	22	319
HSE0007701294	*	30	435
HSE0007701295	*	36	522

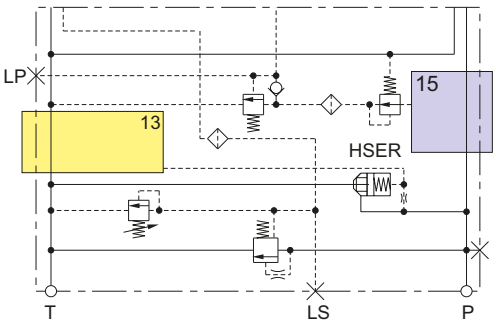
* available on request

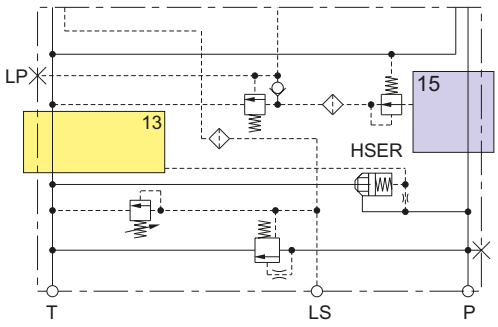
13 15 Seats, see accessories tables from page C-40.

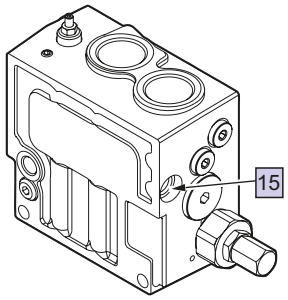
(*) LP = Pilot pressure oil supply. If not specified 22 bar [319 psi]

For electrically activated valves. With pilot oil supply.
HSER pump unloading valve. Prearranged for CRP04HP, HSET, HSEA.









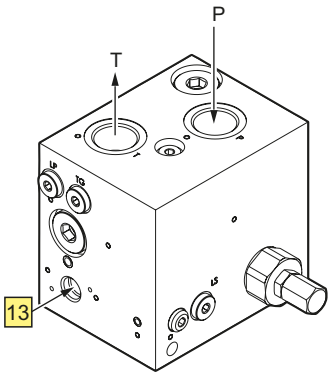
Open center circuit for fixed displacement pumps

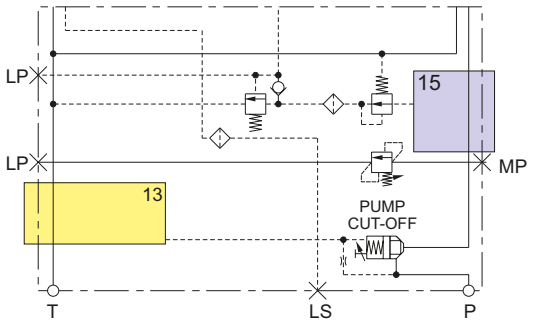
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0007701204	HSE0007701206	22	319
HSE0007701282	HSE0007701284	30	435
HSE0007701283	HSE0007701285	36	522

Closed center circuit for load sensing pumps

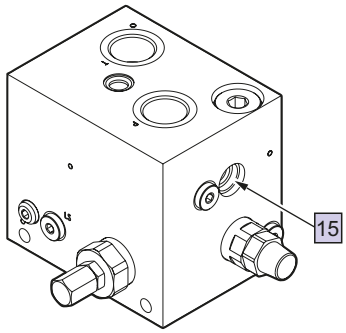
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0007701264	HSE0007701266	22	319
HSE0007701303	HSE0007701308	30	435
HSE0007701304	HSE0007701309	36	522

Constant pressure inlet section. For electrically activated valves.
Prearranged for HSEVX and CUT-OFF pump. ATEX version.





13 : can be assembled only with the electrical valves ATEX type HSEVX.
Stay bolts kit, please contact our sales department.



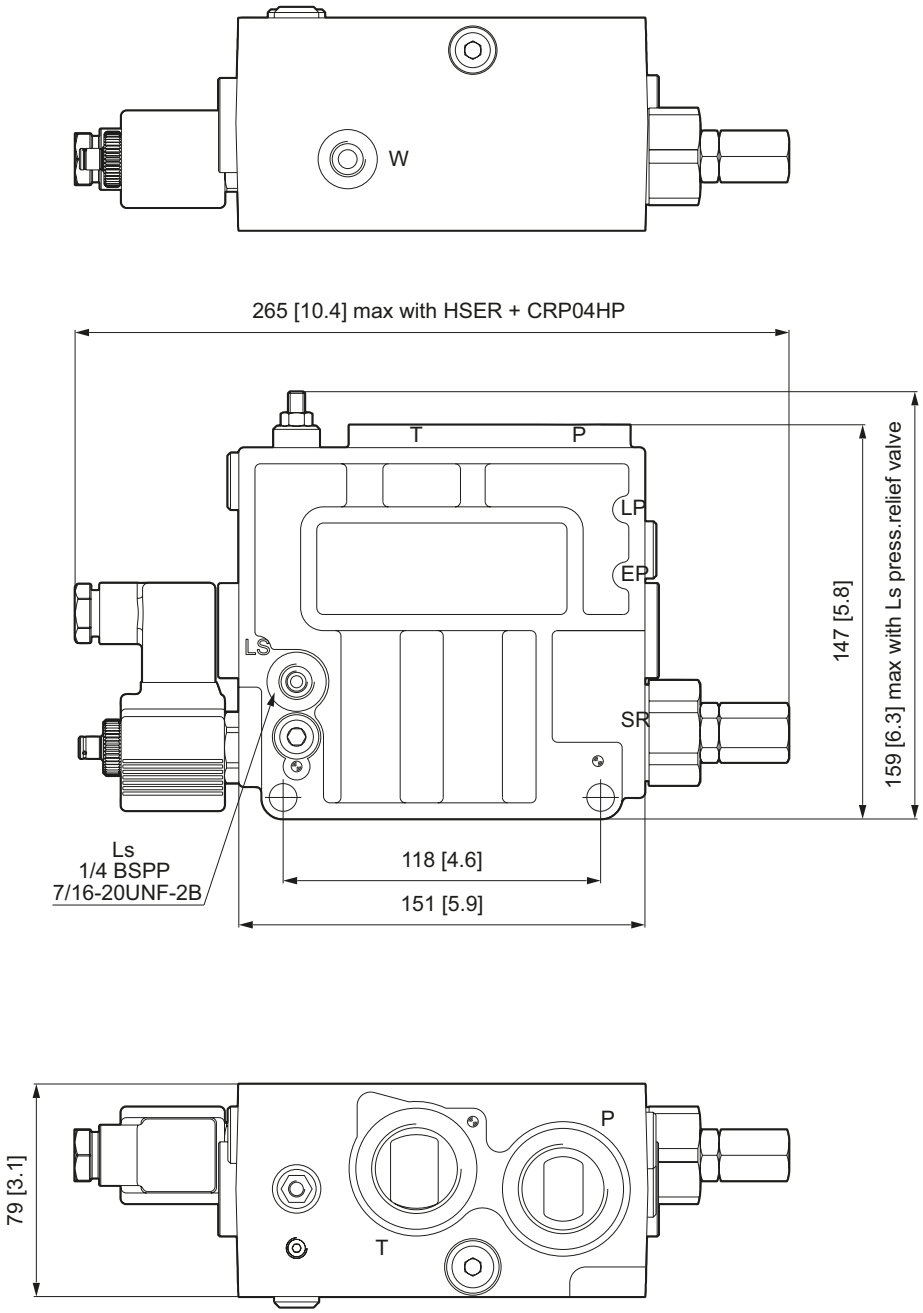
Open center circuit for fixed displacement pumps

Code BSPP	LP(*)	
	bar	psi
HSE0007701400	22	319

13 15 Seats, see accessories tables from page C-40.

(*) LP = Pilot pressure oil supply. If not specified 22 bar [319 psi]

HSE inlet module overall dimensions

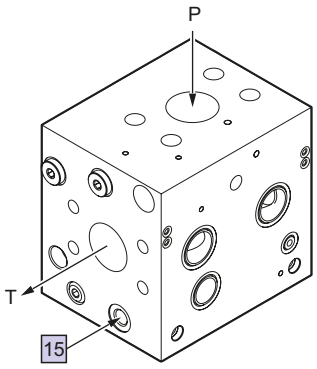


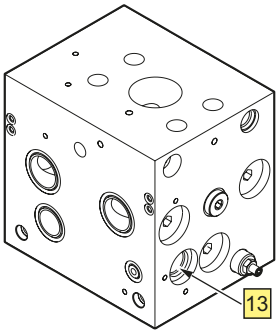
mm [inch]

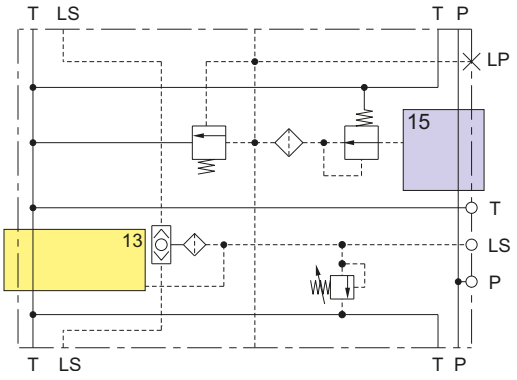


Features

- Max. flow. Q = 390 l/min [103 US GPM]
- Max. pressure = 400 bar [5800 psi]
- Pilot pressure Pmax = 22 bar [319 psi]
- CRP04HP (electrical Ls unloading valve) prearranged
- Connections
  - P = 1 1/2" SAE Flange 6000 psi
  - T = 1 1/2" SAE Flange 3000 psi
  - LS. LP = 1/4" BSPP
- Other hydraulic features: see page C-8.







Closed center circuit for load sensing pumps

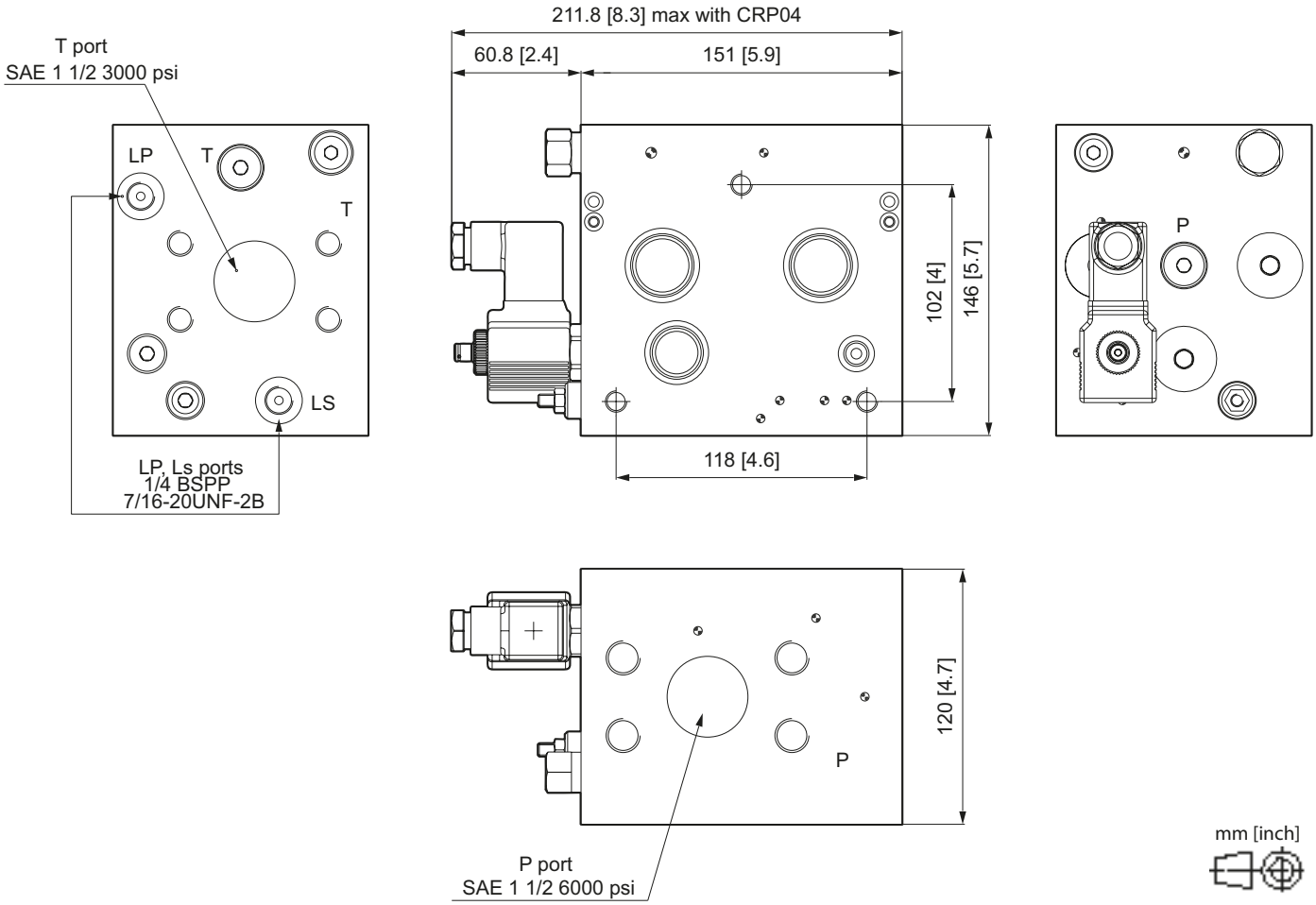
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HFLS007701271	*	22	319
HFLS007701340	*	30	435
HFLS007701341	*	36	522

* available on request

13 15 Seats, see accessories tables page C-40.

(*) LP = Pilot pressure oil supply

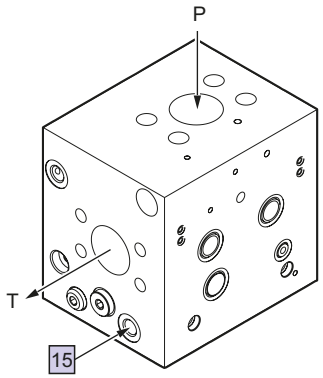
HFLS inlet module overall dimensions

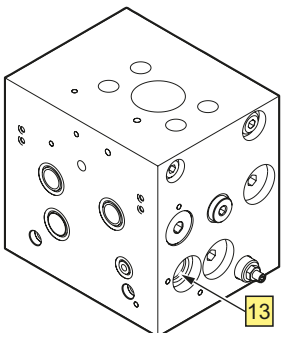


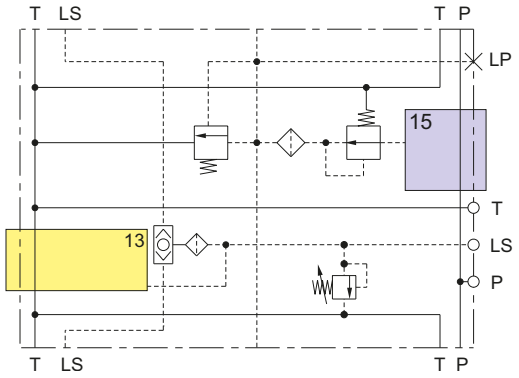


Features

- Max. flow. Q = 340 l/min [89.8 US GPM]
- Max. pressure = 400 bar [5800 psi]
- Pilot pressure Pmax = 22 bar [319 psi]
- CRP04HP (electrical Ls unloading valve) prearranged
- Connections
  - P = 1 1/4" SAE Flange 6000 psi
  - T = 1 1/4" SAE Flange 3000 psi
  - LS. LP = 1/4" BSPP or 7/16"-20UNF-2B
- Other hydraulic features: see page C-8.







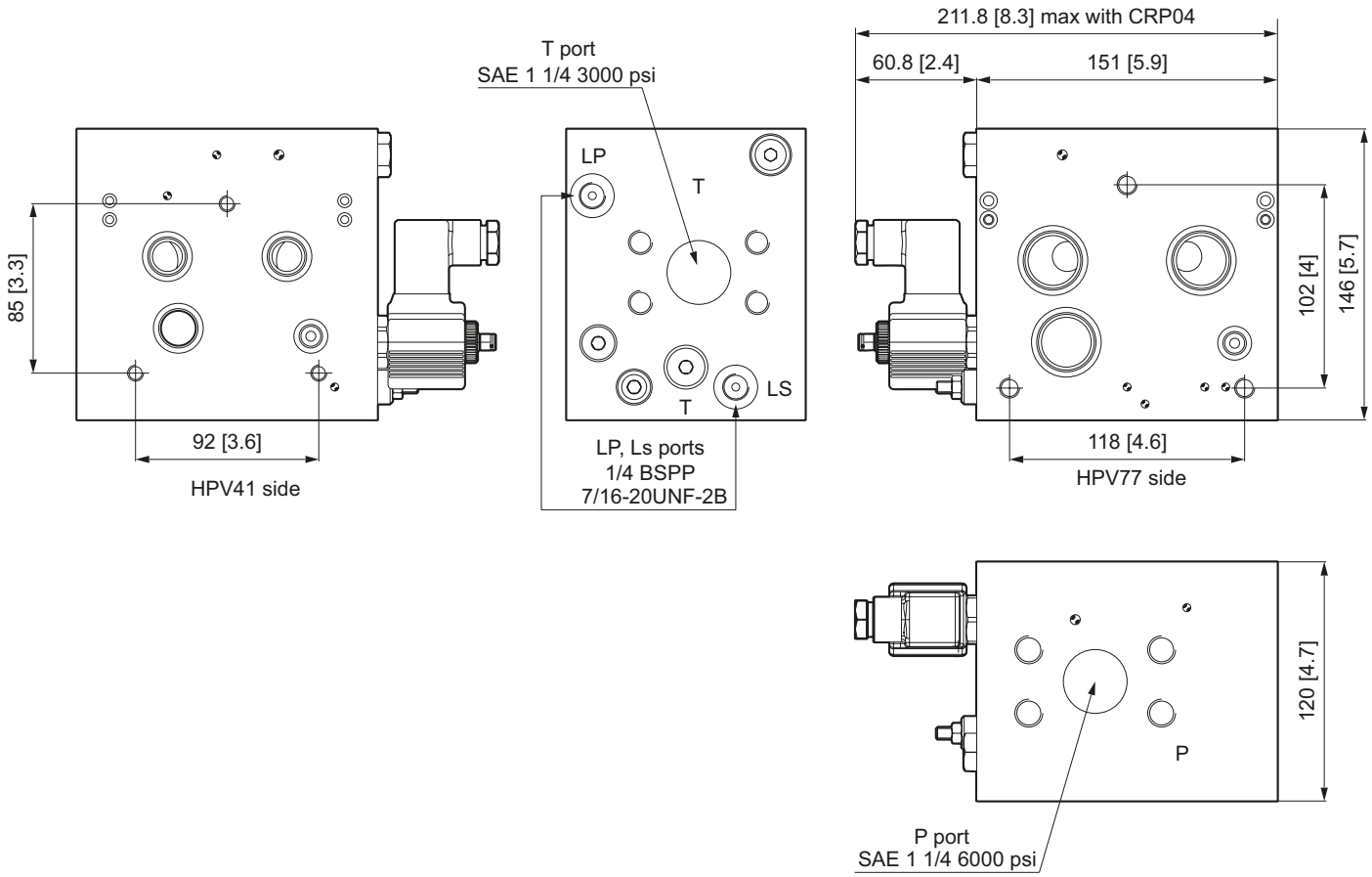
Closed center circuit for load sensing pumps

Code		LP(*)	
BSPP	UN - UNF	bar	psi
HFLS007701200	HFLS007701201	22	319

13 15 Seats, see accessories tables page C-40.

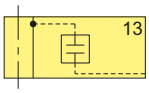
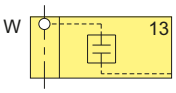
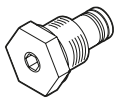
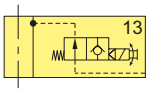
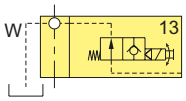
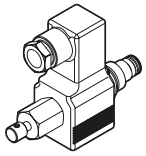
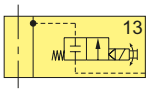
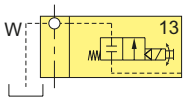
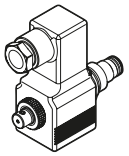
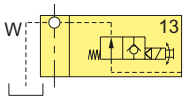
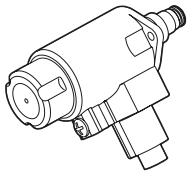
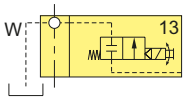
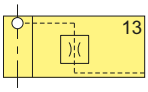
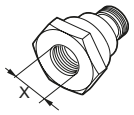
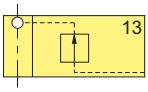
(*) LP = Pilot pressure oil supply

HFLS inlet module overall dimensions



mm [inch]

Field 13 - Facilities for solenoid Ls unloading valve

Code	Description	Ls unloading valve	HSER pilot	Draw
		Symbol / Field		
HSET007701305	HSET Plug			
CRP04HPNAAE4P71 14 Vdc CRP04HPNAAEVP71 28 Vdc	CRP04HP Electrical valve normally open			
CRP04HPNCAE4P01 14 Vdc CRP04HPNCAEVP01 28 Vdc	CRP04HP Electrical valve normally closed			
HSEVX0NA12000 12 Vdc HSEVX0NA24000 24 Vdc	HSEVX (*) Electrical valve normally open ATEX	—	 CUT-OFF	 
HSEVX0NC12000 12 Vdc HSEVX0NC24000 24 Vdc	HSEVX (*) Electrical valve normally closed ATEX	—	 CUT-OFF	
HSEA007701301 (connection X G 1/4) HSEA007701303 (connection X 7/16 20 UNF)	HSEA Screw-in cartridge, Ls pilot pressure for HSE inlet sections, with Ø 0.8 mm [0.03 inch] orifice			
HSEA007701302 (connection X G 1/4) HSEA007701304 (connection X 7/16 20 UNF)	HSEA Screw-in cartridge, Ls pilot pressure for HSE inlet sections			

W Drain port

(*) The eletrical valves ATEX type XSEVX can be assembled only with the inlect section code HFLS007701200, page C-34.

1) CRP04HP valve features
Pilot-operated, electrically controlled 2-way / 2-position Ls unloading directional valve.For high pressures.
When energized (N.C.) or deenergized (N.O.), it enables a connection between the Ls signal and tank port and every machine's function will be cut-off except the ones whose pressure is lower than the remaining Δp (see page C-1).
Tapered poppet made up in tempered and ground steel.
Available in normally open (NA) or normally closed (NC) versions.
- NA, free flow from 2 to 1 with de-energized coil.
- NC, free flow from 2 to 1 with energized coil or from 1 to 2 with de-energized coil.

The valves work with DC coils whereas RAC coils with a connector with incorporated rectifier must be used for AC applications.
Sleeve made up in galvanised steel.

Further details of the CRP04 valve, see Dana catalog code DOC00044.

Max. operating pressure	370 bar [5366 psi]
Max. flow	30 l/min [7.93 US gpm]
Max. Leakage (0-5 drops/min)	0 ÷ 0,25 cm^3/min [0.015 $inch^3$/min]
Max. excitation frequency	2 Hz
Duty cycle	100% ED
Hydraulic fluids	Mineral oil
Oil viscosity	10 ÷ 500 mm^2/s (cSt)
Oil temperature	-25 ÷ +75 °C [-13 ÷ +167 °F]
Ambient temperature	-25 ÷ +60 °C [-13 ÷ +140 °F]
Max. contamination level class with filter	ISO 4406:1999 class 21/19/16
Cartridge filter	280 µm
Degree of enclosure (depending on connector)	IP 65
Weight (with coil)	0,350 kg [0.77 lb]
Cartridge tightening torque	25 ÷ 30 Nm [18.4 ÷ 22.2 lbf.ft]
Coil ring nut tightening torque	7 Nm [5.2 lbf.ft]

2) HSEVX - ATEX valve features

In combination with the MHPX and MHOX electro-hydraulic modules another safety solenoid valve, HSEVX, can be inserted in the inlet sections.

The HSEVX solenoid valve can be configured normally open or normally closed. When deactivated (NO) or active (NC), it provides the immediate discharging of the signal with the consequent close down of all actuator movements (venting condition of the entire hydraulic system).
HSEVX solenoid valve can be inserted into those inlet sections that are prearranged with the proper cavity:
for further informations please refer to our Technical Dept.

The conformity certification of the solenoids of HSEVX will be provided separately, according to the ATEX 2014/34/UE Directive.

When the modules are individually supplied, a label is attached to the module with the following labelling:

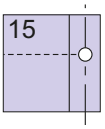
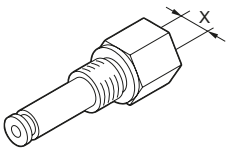
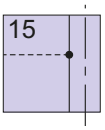
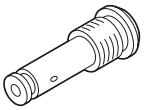
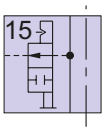
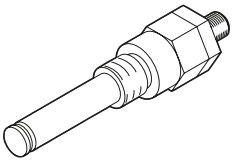
II 2 GD c T4 / T135°C
T_{amb}= -20 °C ÷ +50 °C
T_{fluid}= -20 °C ÷ +80 °C

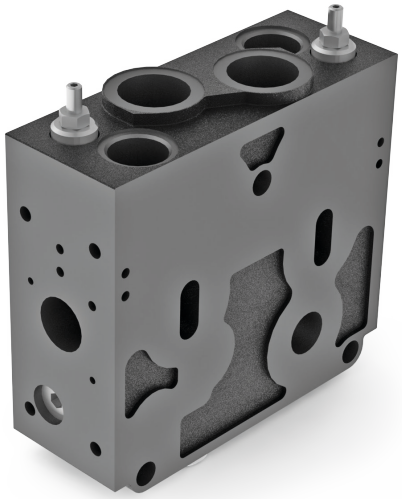
ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

For the wiring diagram of module, please refer to Instruction manual.

Nominal voltage	12 VDC	24 VDC
Coil resistance, R20	9 Ω ± 6%	35.8 Ω ± 6%
Min. current	700 mA	350 mA
Max. current	1850 mA	930 mA
Limit power	14.3 W	14.4 W
Ambient temperature	-20 ÷ +50 °C [-4 ÷ +122 °F]	
Connection cable	FL4G11Y - 3 x 1.5 mm^2 [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Integrated diode to limit switch-off overvoltage	See coil manufacturer manual	
Short-circuit protection	With fuse - See coil manufacturer manual	
Duty cycle	100%	
Input pressure	Max. 400 bar [5800 psi]	
Switching pressure	Max 200 bar [2900 psi]	
Operating Limits	400 bar at max. flow 7 l/min [5800 psi at max. flow 1.85 US gpm]	
Flow P →T at Δp = 2 bar [29 psi]	> 6.5 l/min [1.71 US gpm]	
Leakage P →T (Oil Temp. 50°C [122 °F] / Input press. 400 bar [5800 psi])	< 20 ml/min [< 0.005 US gpm	
Fluid temperature	-20 ÷ +80 °C [-4 ÷ +176 °F]	
Ground connection	Up to 4 mm^2 [11 AWG]	
Protection class (DIN VDE 0580)	I	
Fluids	Hydraulic oil to DIN 51524. ATF-oil	
Protection ratings (DIN VDE 0470 / EN 60529)	IP67 / IP69K	
Shock-resistance to EN 50014	4 J	
ATEX directive	See page A-3	
ATEX marking	See page A-4	

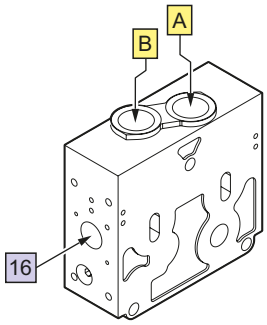
Field 15 - Facilities for pump unloading

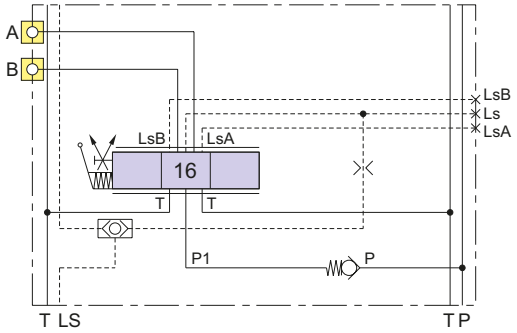
Code		Description	Symbol / Field	Draw
BSPP	UN - UNF			
HSEE007701320 (connection X G 1/4)	HSEE007701321 (connection X 7/16 UNF)	HSEE External pilot oil supply cartridge		
HSEI007701322		HSEI Internal pilot oil supply cartridge		
HSEN007701326		HSEN Internal pilot oil supply and cut-off cartridge		



- Features
- Other hydraulic features: see page C-8.
- Connections: A,B: 3/4" BSPP or 11/16" - 12UN-2B
- Cast iron body.

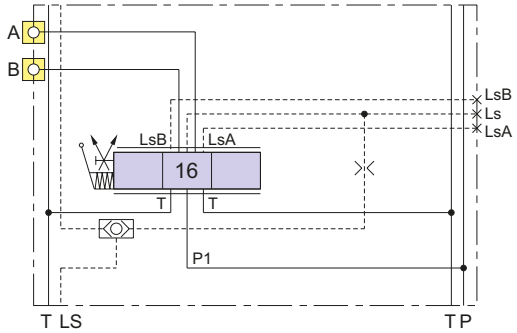
With no facilities for valves





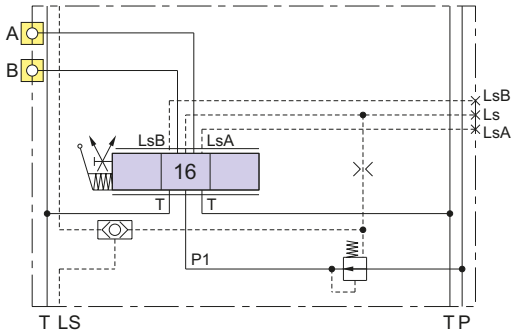
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0007702276	HEM0007702281



Without pressure compensator

Code	
BSPP	UN - UNF
HEM0007702275	HEM0007702280



With pressure compensator

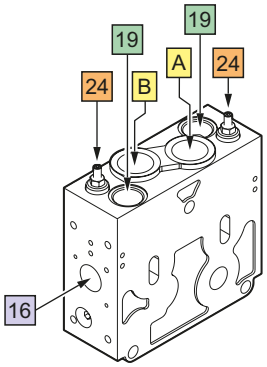
Code	
BSPP	UN - UNF
HEM0007702335	HEM0007702340

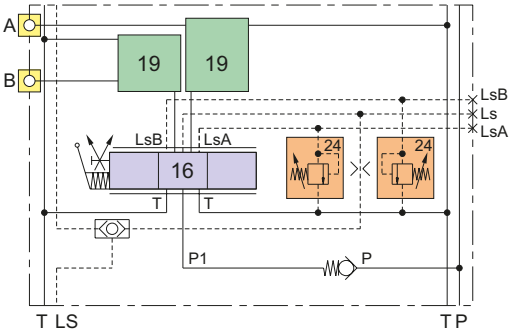
16 Spool page C-49

A/B Alternatively closing plug HETS004103002 page C-53

HPV 77

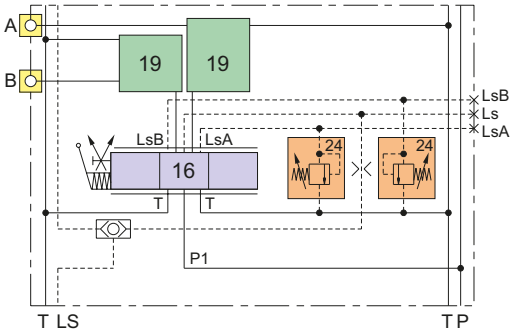
With adjustable LsA LsB pressure relief valves.
Prearranged for shock-suction valves





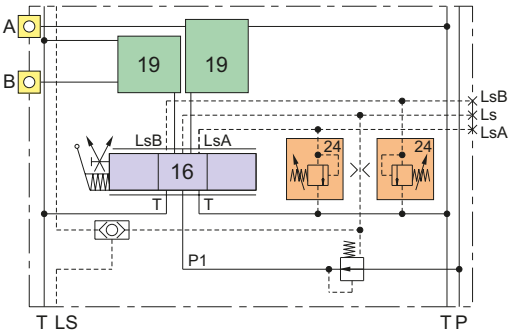
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0007702256	HEM0007702261



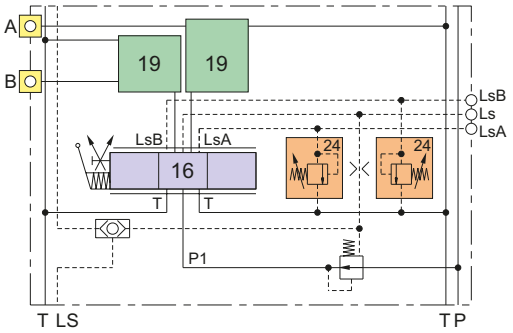
Without pressure compensator

Code	
BSPP	UN - UNF
HEM0007702255	HEM0007702260



With pressure compensator

Code	
BSPP	UN - UNF
HEM0007702315	HEM0007702320



With pressure compensator

Code	
BSPP	UN - UNF
HEM0007702305	HEM0007702310

Prearranged for: shock-suction valves electrical LsA - LsB signal unloading modules (MHFO, MHFK modules)

16 Spool page C-49

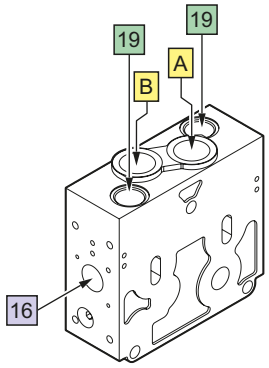
19 Seats for valve HEAA - HEAD - HEAT - HEAN or plug HETS page C-51

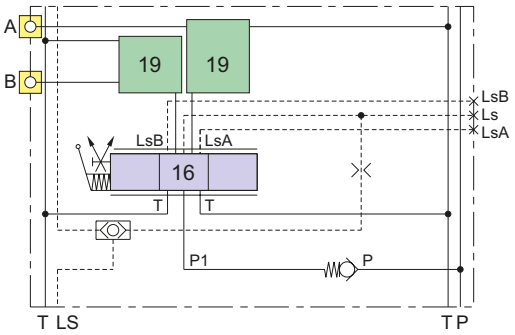
24 Pressure relief valves LsA e LsB, alternatively kit for closing seat HESC007703007 page C-53

A/B + 19 Alternatively plugs kit HESC007703012 page C-53

A/B + 19 + 24 Alternatively plugs kit HESC007703013 page C-53

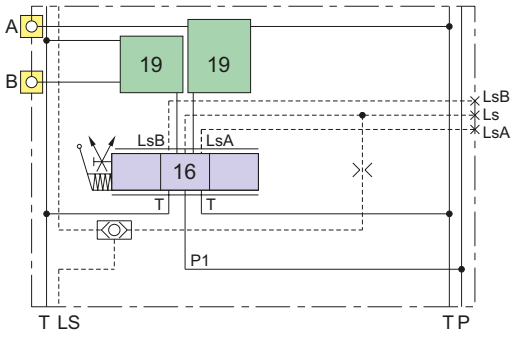
Prearranged for shock-suction valves





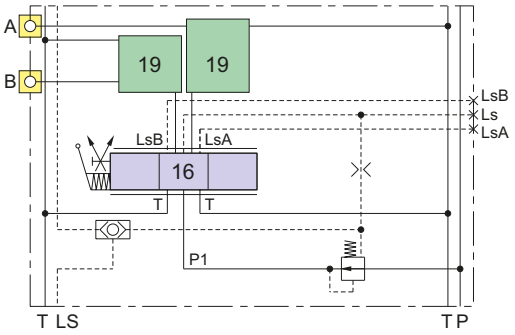
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0007702266	HEM0007702271



Without pressure compensator

Code	
BSPP	UN - UNF
HEM0007702265	HEM0007702270



With pressure compensator

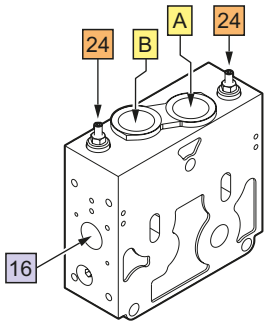
Code	
BSPP	UN - UNF
HEM0007702325	HEM0007702330

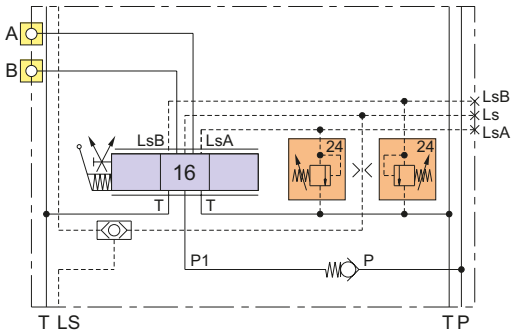
16 Spool page C-49

19 Seats for valve HEAA - HEAD - HEAT - HEAN or plug HETS page C-51

A/B + 19 Alternatively plugs kit HESC004103008 page C-53

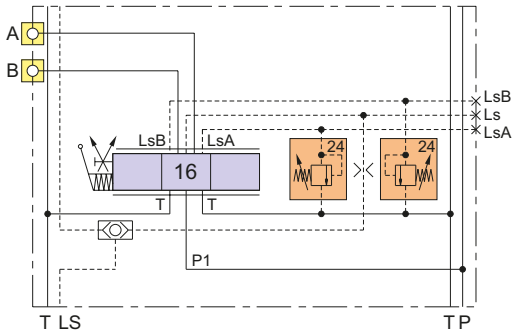
With adjustable LsA LsB pressure relief valves





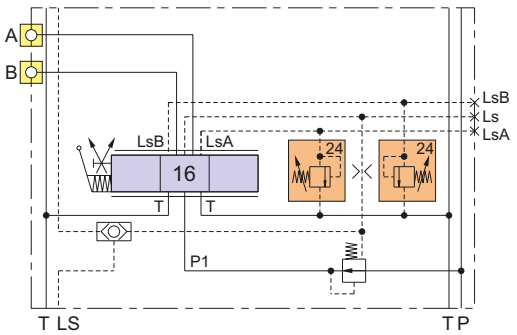
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0007702286	HEM0007702291



Without pressure compensator

Code	
BSPP	UN - UNF
HEM0007702285	HEM0007702290



With pressure compensator

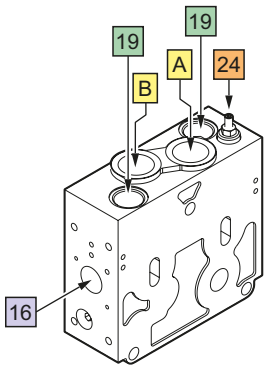
Code	
BSPP	UN - UNF
HEM0007702345	HEM0007702350

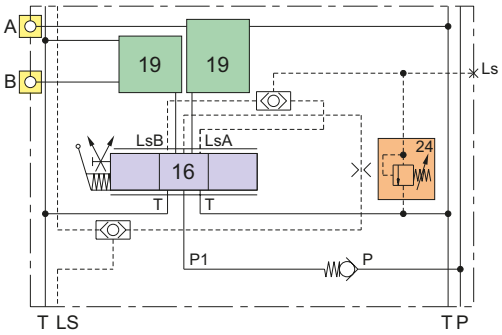
16 Spool page C-49

24 Pressure relief valves LsA e LsB, alternatively kit for closing seat HESC004103007 page C-53

A/B Alternatively closing plug HETS007701303 page C-53

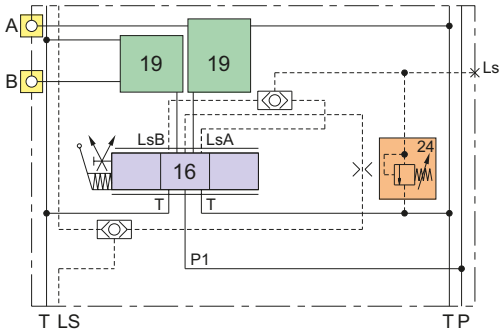
With single adjustable Ls pressure relief valve.
Prearranged for shock-suction valves





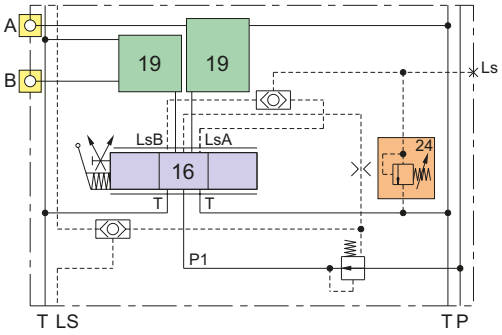
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0007702296	HEM0007702301



Without pressure compensator

Code	
BSPP	UN - UNF
HEM0007702295	HEM0007702300



With pressure compensator

Code	
BSPP	UN - UNF
HEM0007702355	HEM0007702360

16 Spool page C-49

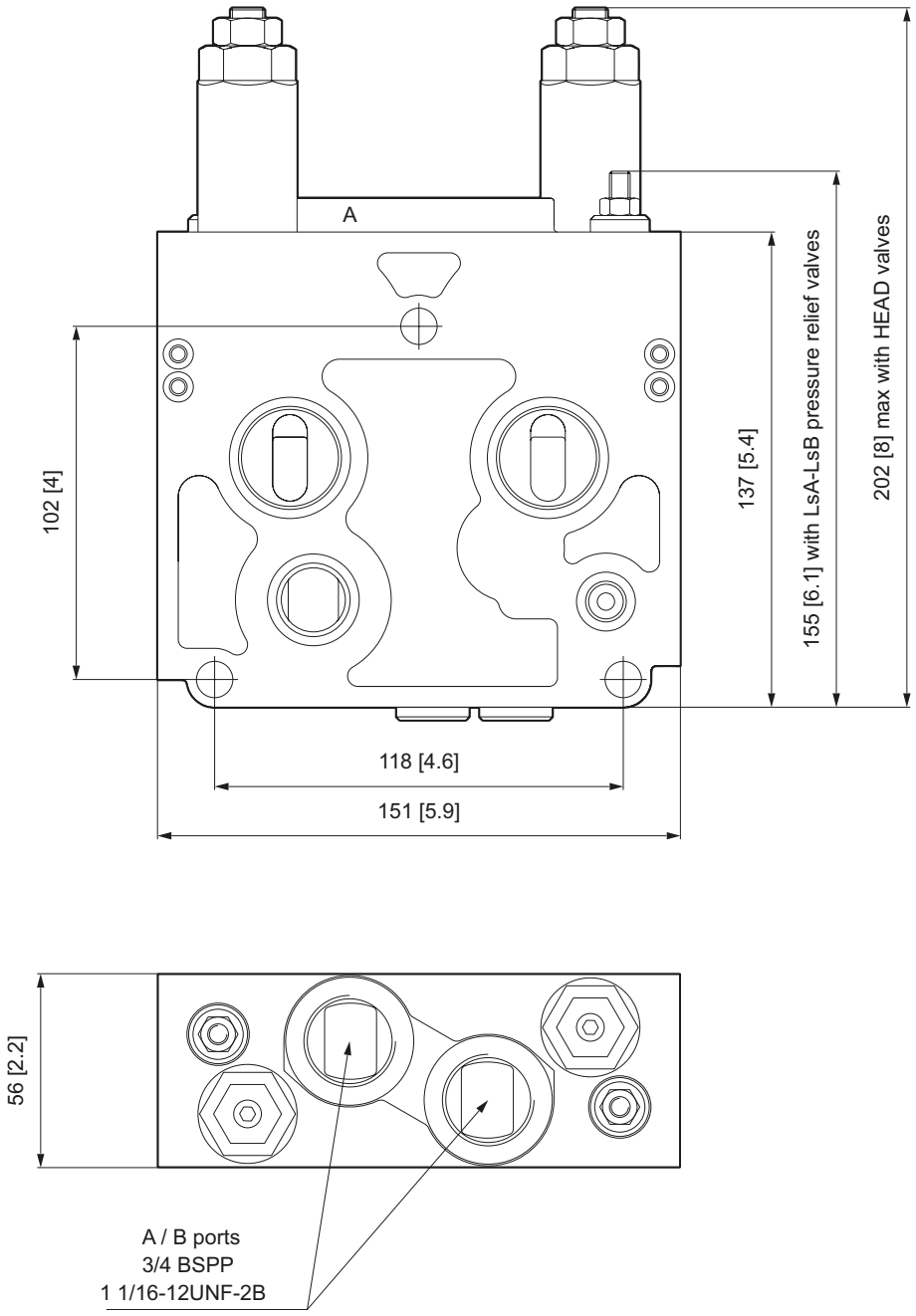
19 Seats for valve HEAA - HEAD - HEAT - HEAN or plug HETS page C-51

24 Pressure relief valves LsA e LsB, alternatively kit for closing seat HESC007703007 page C-53

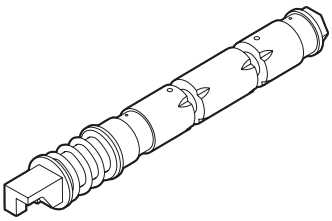
A/B + 19 Alternatively plugs kit HESC007703012 page C-53

A/B + 19 + 24 Alternatively plugs kit HESC007703013 page C-53

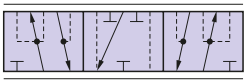
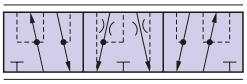
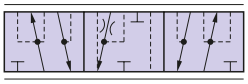
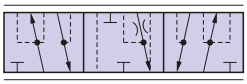
HEM module overall dimensions



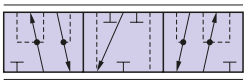
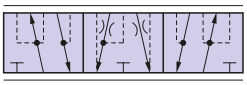
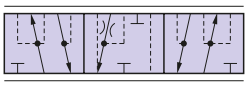
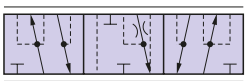
mm [inch]



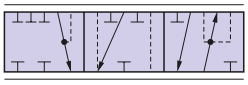
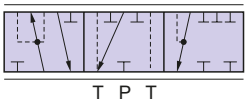
Main spool for flow control, double acting

Size	Max. pressure compensated oil flow l/min [US gpm]	Symbol and ordering code			
		B A  T P T	B A  T P T	B A  T P T	B A  T P T
		4-way. 3-position A. B closed	4-way. 3-position A. B → T	4-way. 3-position B → T; A closed	4-way. 3-position A → T; B closed
1	100 [26.4]	HEAS007704305	HEAS007704335	HEAS007704365	HEAS007704395
2	115 [30.4]	HEAS007704310	HEAS007704340	HEAS007704370	HEAS007704400
3	135 [35.7]	HEAS007704315	HEAS007704345	HEAS007704375	HEAS007704405
4	155 [40.9]	HEAS007704320	HEAS007704350	HEAS007704380	HEAS007704410
5	175 [46.2]	HEAS007704325	HEAS007704355	HEAS007704385	HEAS007704415
6	190 [50.2]	HEAS007704330	HEAS007704360	HEAS007704390	HEAS007704420

Main spool for flow control, double acting, asymmetric flow

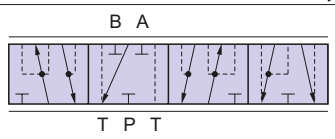
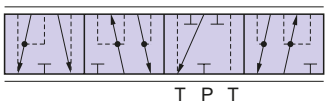
Max. pressure compensated oil flow l/min [US gpm]		Symbol and ordering code			
		B A  T P T	B A  T P T	B A  T P T	B A  T P T
A	B	4-way. 3-position A. B closed	4-way. 3-position A. B → T	4-way. 3-position B → T; A closed	4-way. 3-position A → T; B closed
45 [11.9]	220 [58.1]	—	HEAS007704192 (*)	—	—
60 [15.9]	155 [40.9]	—	HEAS007704180 (*)	—	—
100 [26.4]	220 [58.1]	—	HEAS007704186 (*)	—	—
115 [30.4]	200 [52.8]	HEAS007704164 (*)	—	—	—
135 [35.7]	190 [50.2]	HEAS007704170 (*)	—	—	—

Main spool for flow control, single acting

Size	Max. pressure compensated oil flow l/min [US gpm]	Symbol and ordering code	
		B A  T P T	B A  T P T
		3-way, 3-position P → A	3-way, 3-position P → B
1	100 [26.4]	HEAS007704425 (*)	HEAS007704455 (*)
2	115 [30.4]	HEAS007704430 (*)	HEAS007704460 (*)
3	135 [35.7]	HEAS007704435 (*)	HEAS007704465 (*)
4	155 [40.9]	HEAS007704440 (*)	HEAS007704470 (*)
5	175 [46.2]	HEAS007704445 (*)	HEAS007704475 (*)
6	190 [50.2]	HEAS007704450 (*)	HEAS007704480 (*)

(*) Special spool, available upon request

Main spool for flow control, double acting, with 4th floating position

Size	Max. pressure compensated oil flow l/min [US gpm]	Symbol and ordering code	
			
		3-way, 4-position floating position on A port	3-way, 4-position floating position on B port
1	100 [26.4]	HEAS007704485 (*)	HEAS007704515 (*)
2	115 [30.4]	HEAS007704490 (*)	HEAS007704520 (*)
3	135 [35.7]	HEAS007704495 (*)	HEAS007704525 (*)
4	155 [40.9]	HEAS007704500 (*)	HEAS007704530 (*)
5	175 [46.2]	HEAS007704505 (*)	HEAS007704535 (*)
6	190 [50.2]	HEAS007704510 (*)	HEAS007704540 (*)

Main spool for pressure control

When using a proportional directional valve, where the overcenter valves are present, instability problems can happen to the whole system, in the form of a rise and fall of pressure. A new series of spools will suit these kinds of problems.

This system of control is called Pressure Control, and has been devised to make the overcenter valves pilot pressure more stable.

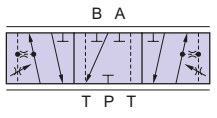
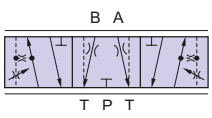
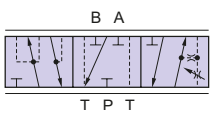
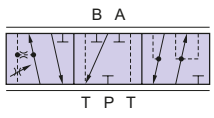
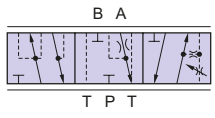
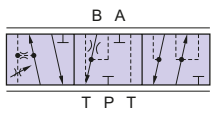
Generally, the Pressure Control function is requested for only one port (A or B), while the other port maintains the normal flow control function.

The problem manifests almost always during the re-entry of the rod, under the force of the positive load, where the only pressure requested is that which is necessary to pilot the overcenter valves, to lower and control the load.

The Pressure Control spools must always be used with compensating elements and with pilot load sensing relief valves for A/B ports.

Using the Pressure Control solution allows a higher degree of stability to the system and the control of the function, however, we advise its use exclusively in severe cases, since:

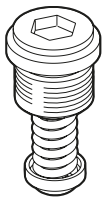
- The valve loses own compensation, becoming "load dependent": namely, its performance varies at the variation of the working pressure;
- The pump pressure could be considerably higher than that necessary to move the load (the Δp through the spool is no more constant and controllable).

Grandezza	Symbol and ordering code (PC = Pressure Control - FC = Flow control)					
						
	4-way, 3-position, A, B closed	4-way, 3-position, A, B throttled open to T	4-way, 3-position, A, B closed	4-way, 3-position, A, B closed	4-way, 3-position, A throttled open to T, B closed	4-way, 3-position, A closed, B throttled open to T
1	-	HEAS00770AD00 (*)	-	-	-	-

Typical spool oil flow tolerances

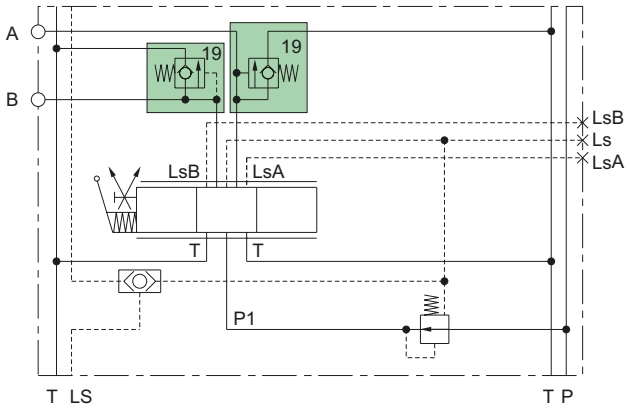
Size	Oil flow at max. spool travel	
	min l/min [US gpm]	max l/min [US gpm]
1	97 [25.6]	105 [27.7]
2	108 [28.5]	115 [30.4]
3	158 [41.7]	138 [36.5]
4	150 [39.6]	160 [42.3]
5	170 [44.9]	176 [46.5]
6	185 [48.9]	191 [50.5]

(*) Special spool, available upon request

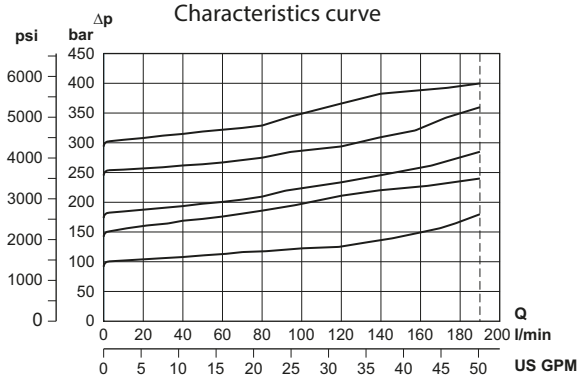


HEAA

Hydraulic diagram example



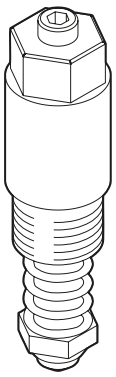
Characteristics curve



Not adjustable shock and suction valve for A – B ports,

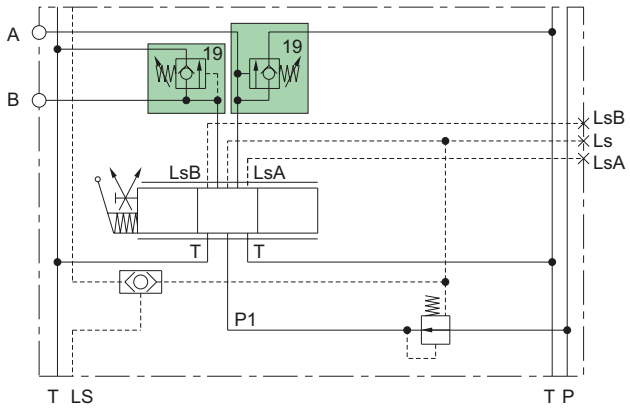
HEAA is designed to absorb shock effects only.
Don't use it as a pressure relief valve.

Range setting bar [psi]	Code (*)
45 [653]	HEAA007709045
60 [870]	HEAA007709060
75 [1088]	HEAA007709075
95 [1378]	HEAA007709095
120 [1740]	HEAA007709120
135 [1958]	HEAA007709135
155 [2248]	HEAA007709155
170 [2466]	HEAA007709170
190 [2756]	HEAA007709190
220 [3191]	HEAA007709220
240 [3481]	HEAA007709240
250 [3626]	HEAA007709250
270 [3916]	HEAA007709270
290 [4206]	HEAA007709290
320 [4641]	HEAA007709320

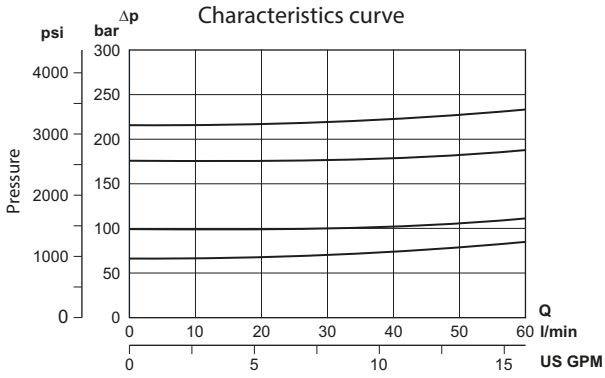


HEAD

Hydraulic diagram example



Characteristics curve

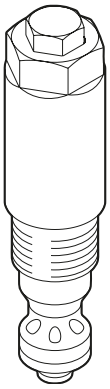


Adjustable shock and suction valve for A – B ports.

HEAD is designed to absorb shock effects only.
Don't use it as a pressure relief valve.

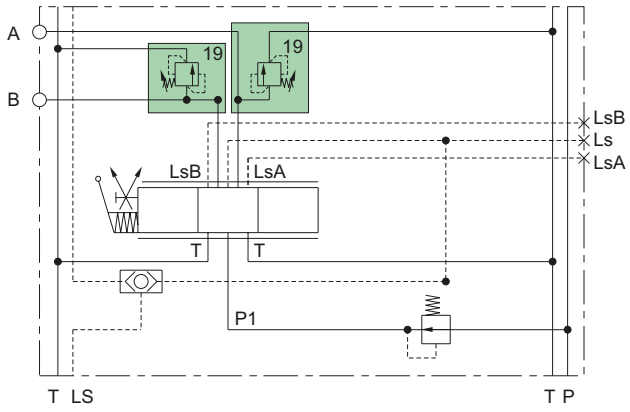
Range setting bar [psi]	Code (*)
20 ÷ 90 [5,3 ÷ 23,8]	HEAD007708996
91 ÷140 [24 ÷ 37]	HEAD007708998
141 ÷ 270 [37,2 ÷ 71,3]	HEAD007709000
271 ÷ 350 [71,6 ÷ 92,5]	HEAD007709001

(*) In the order form indicate the lines A and/or B on which the valves are to be mounted

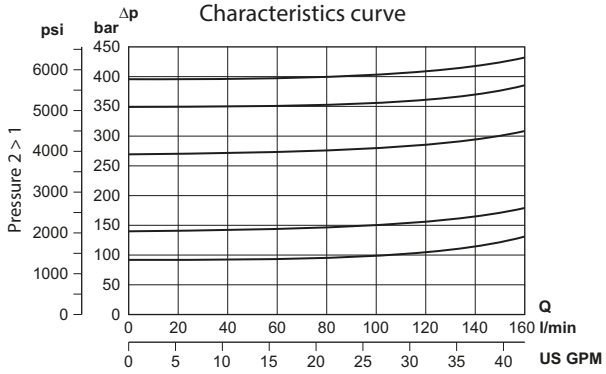


HEAT

Hydraulic diagram example



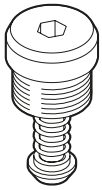
Characteristics curve



Adjustable shock valve for A – B ports

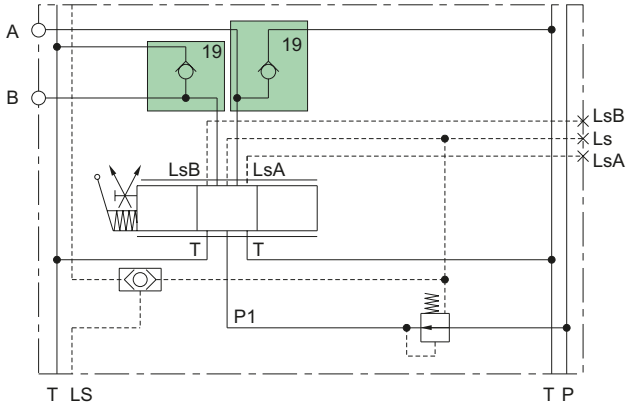
Don't use it as a pressure relief valve.

Range setting bar [psi]	Code (*)
20 ÷ 90 [5,3 ÷ 23,8]	HEAT007708996
91 ÷140 [24 ÷ 37]	HEAT007708998
141 ÷ 270 [37,2 ÷ 71,3]	HEAT007709000
271 ÷ 350 [71,6 ÷ 92,5]	HEAT007709001



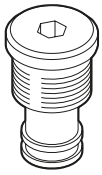
HEAN

Hydraulic diagram example



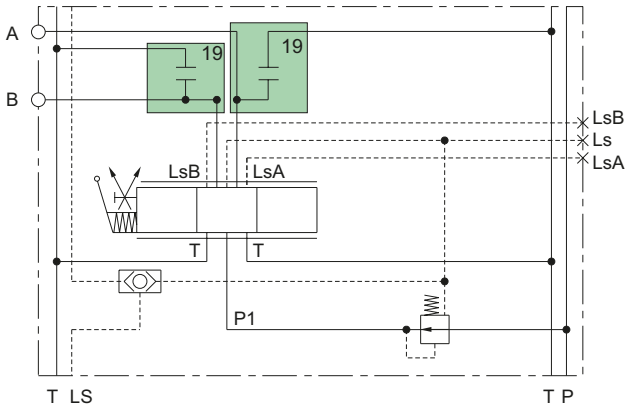
Suction valve

Code (*)
HEAN007703011



HETS

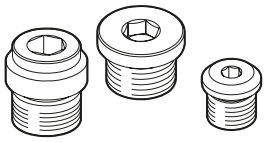
Hydraulic diagram example



Replacing plug

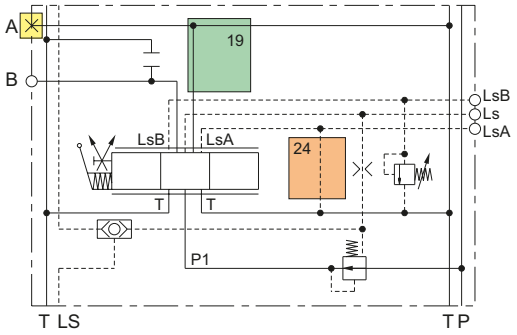
Code (*)
HETS007703010

(*) In the order form indicate the lines A and/or B on which the valves are to be mounted



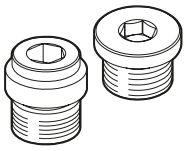
HESC

Hydraulic diagram example



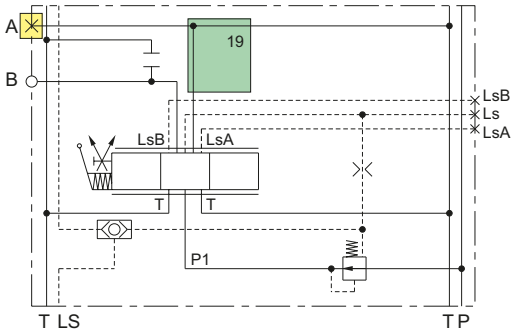
Kit for connecting the non-active port to tank, when using a single acting spool - to be fitted with HEM modules with LsA-LsB + shock and suction valves cavities (lines A or B)

Code (*)
HESC007703013



HESC

Hydraulic diagram example



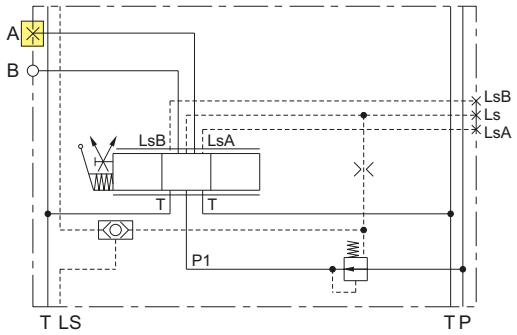
Plug for connecting the non-active port to tank, when using a single acting spool (A or B)

Code (*)
HESC007703012



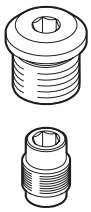
HETS

Hydraulic diagram example



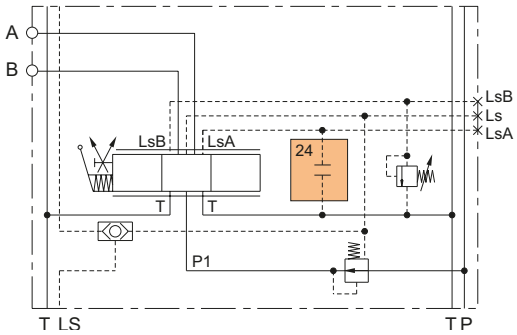
Plug for closing A or B port

Code (*)
HETS007701303



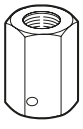
HESC

Hydraulic diagram example



Kit for closing Ls pressure relief valve cavity LsA and/or LsB

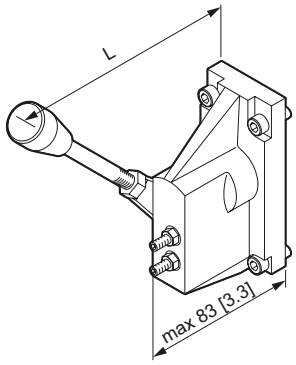
Code (*)
HESC007703007

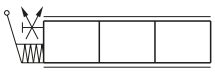


Protection cap for Ls pressure relief valve regulation screw for HEM (working sections) and HSE (inlet sections). Code number and quantity (related to no. of Ls valve mounted) must be indicated under the HEM…... or HSE….. field of the order form.

Code (*)
KIT0007703995

The control modules can be made up in aluminum or cast iron. For standard applications aluminum is used normally, for marine or mining applications we advise the choice of cast iron. For the ATEX versions you need to use the cast iron controls.



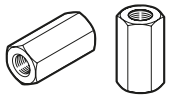


HCM

Mechanical control
Control positions: see page A-4.

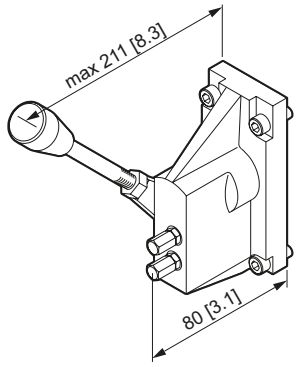
L mm [inch]	Code (Aluminum)	Code (Cast iron)
211 [8.3]	HCM0007704590	HCM0007704589
261 [10.3]	HCM000770C000	*

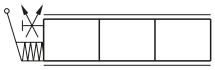
* available on request



Code
KIT0007704610

Flow adjustement protective nuts kit for HCM mechanical control

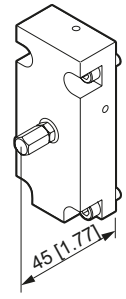


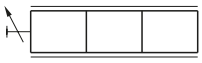


HCM

Mechanical control, with flow adjustement nuts protection
Control positions: see page A-4.

Code (Aluminum)	Code (Cast iron)
HCM0007704690	HCM0007704689

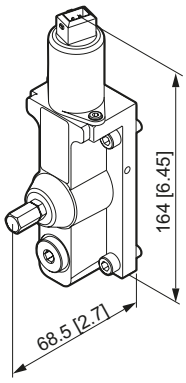




HCF

Rear cover flow adjustement for:
- MHPF electrical module
- MHPH module with stroke adjustment
- ATEX modules.

Code (Aluminum)	Code (Cast iron)
HCF0007704587	HCF0007704584



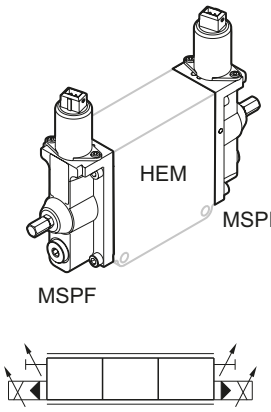
MSPF

MSPF electrohydraulic proportional module
MSPF is one of the series of PWM open loop electrical activation units.
MSPF can be controlled either in proportional or in on-off mode.
With electrical proportional actuation, the main spool position is adjusted by the pilot pressure, so that it corresponds to an electrical signal (PWM) coming from a remote control unit.
With electrical on-off actuation, the main spool is moved from neutral to maximum stroke when one of the two pressure reducing solenoid valves is energized.
MSPF is recommended where there is a requirement for medium resolution proportional control and where hysteresis is not critical.

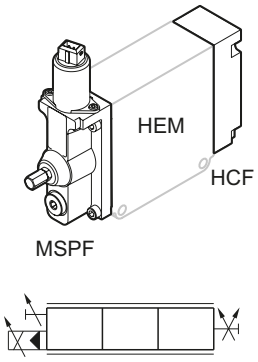
MSPF is being supplied without manual spool control, thus allowing both smaller overall dimensions and cost effective compared to MHPF, HCK modules.

The MSPF module has the following main features:

- On-off and proportional mode;
- Quick reaction time;
- Electro-proportional pressure reducing valves;
- PWM control of low-frequency solenoid valves;
- Low hysteresis and good sensitivity;
- Mechanical flow adjustment;
- Pilot pressure ports;
- Possibility of operating in double acting or single acting with HCF module (see page C-54).



Example with 2 modules MSPF (double effect)



Example with 1 module MSPF and rear cover HCF (single effect in B)

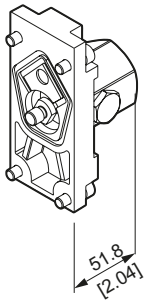
Voltage	Code (Aluminum)	
	BSPP	UN - UNF
12 Vdc	MSPF007707070	*
24 Vdc	MSPF007707071	*

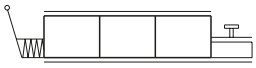
* available on request

Rated voltage		12 Vdc	24 Vdc
Supply voltage		11 to 15 V	22 to 30 V
Max. ripple		8 %	
Max. current		1500 mA ± 10	750 mA ± 10
Power consumption		18 W at 22 °C [71.6 °F] coil temperature	
Start spool travel		600 mA	280 mA
End spool travel		1170 mA	530 mA
R_{20}		4.72 Ω ± 5 %	20.8 Ω ± 5 %
Heat insulation		Class H, 180 °C [356 °F]	
Oil temperature	Recommended	-30 ÷ +60 °C [-22 ÷ +140 °F]	
	Min	-30 °C [-22 °F]	
	Max	+90 °C [+194 °F]	
Dither adjustment		75 Hz	
Inductance		8.5 mH	70 mH
Current variation		100 mA/s	50 mA/s
Duty cycle % ED on-off operating		14 V = 100	28 V = 100
		15 V = 50	30 V = 50
Plug connector		2-pole AMP Junior Power Timer	
Reaction time from neutral position to end spool stroke (constant voltage)		120 ms	
Reaction time from end spool stroke to neutral position (constant voltage)		90 ms	
Grade of enclosure to IEC 529, with female connector		IP 65	

Electrical connections for MSPF-MHPF-HCK working sections, see page: E-2

The control modules can be made up in aluminum or cast iron. For standard applications aluminum is used normally, for marine or mining applications we advise the choice of cast iron. For the ATEX versions you need to use the cast iron controls.

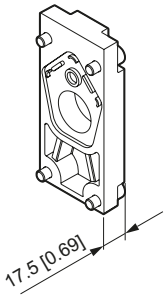




HCN

Friction control

Code (Aluminum)	Code (Cast iron)
HCN0007704628	HCN0007704627

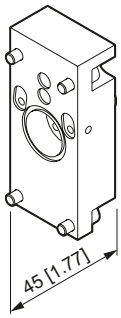


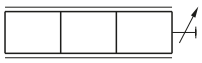


HCP

Rear cover

Code (Aluminum)	Code (Cast iron)
HCP0007704591	HCP0007704588



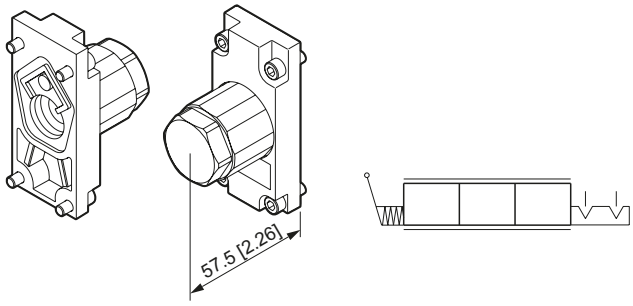


HCPA

Rear cover with stroke adjustment

Code (Aluminum)	Code (Cast iron)
—	HCPA007704580

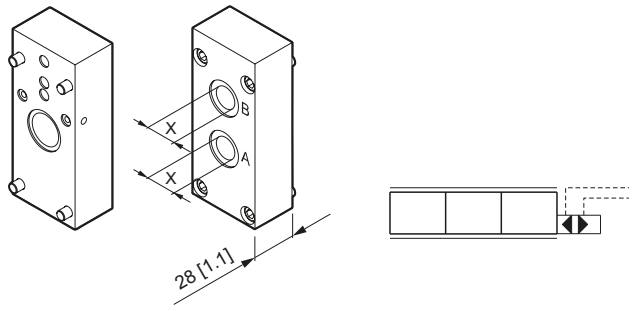
The control modules can be made up in aluminum or cast iron. For standard applications aluminum is used normally, for marine or mining applications we advise the choice of cast iron. For the ATEX versions you need to use the cast iron controls.



HCPD

Mechanical spool lock device, manual release

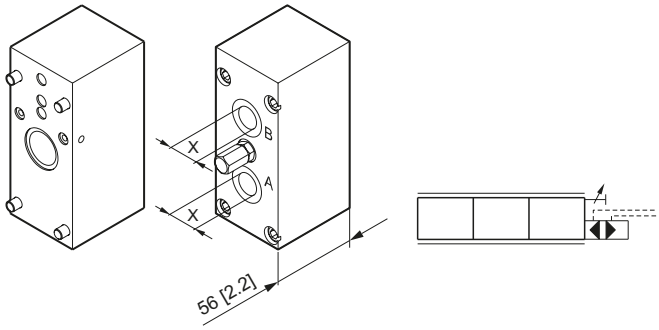
Control	Code (Aluminum)	Code (Cast iron)
P → A lock P → B free	HCPD007704592	HCPD007704547
P → B lock P → A free	HCPD007704593	HCPD007704548
P → A lock P → B lock	HCPD007704594	HCPD007704549
P → A float P → B free	HCPD007704585	HCPD007704545
P → B float P → A free	HCPD007704586	HCPD007704546



MHPH

Hydraulic activation
- Start pilot pressure: 4.5 bar [65 psi]
- End stroke pressure: 15 bar [218 psi]
- Max. pilot pressure: 30 bar [435 psi]

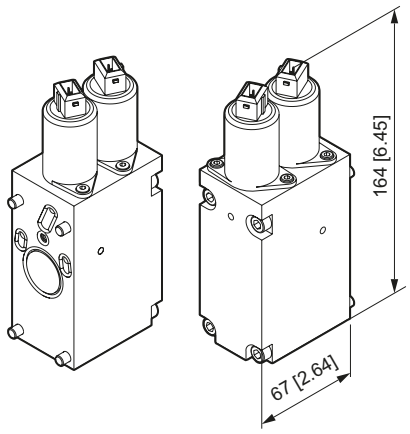
Thread	Code (Aluminum)	Code (Cast iron)
(X) 1/4 BSPP	MHPH007704601	MHPH007704621
(X) 7/16" - 20 UNF	MHPH007704602	MHPH007704622

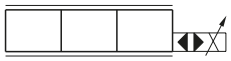


MHPH

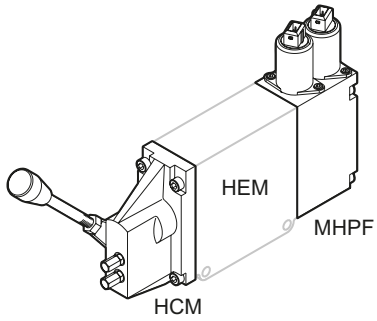
Hydraulic activation with stroke adjustment
- Start pilot pressure: 4.5 bar [65 psi]
- End stroke pressure: 15 bar [218 psi]
- Max. pilot pressure: 30 bar [435 psi]

Thread	Code (Aluminum)	Code (Cast iron)
(X) 7/16" - 20 UNF	MHPH007704612	MHPH007704614





MHPF



Example with module MHPF and manual control HCM

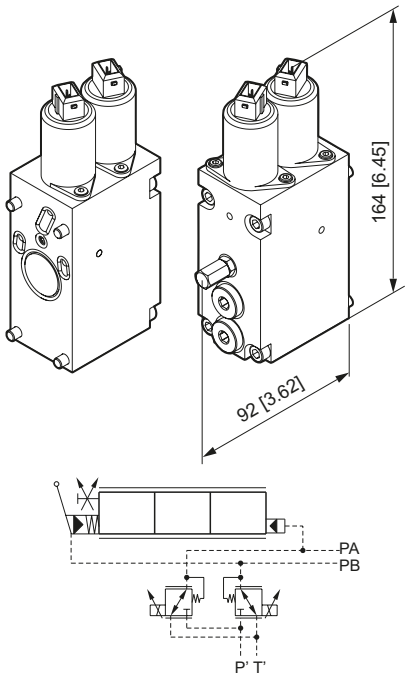
MHPF electrohydraulic PROPORTIONAL module
MHPF proportional electrohydraulic module shifts the position of the spool precisely in proportion to an electric current signal generated by the remote control.

The spool is shifted by means of the hydraulic pressure generated by the pressure-reduction proportional solenoid valves. The MHPF module is not equipped with an inductive position transducer (LVDT) and the entire electronic circuit to detect and signal faults.
This means that in the joystick remote control phase, any control (for example a manual control) that overrides the force exerted by the pressure reduction valves on the spool, may vary the position of that spool without any error signal and without inhibition, leavingthe safety of the entire hydraulic system to the visual operator control, only.

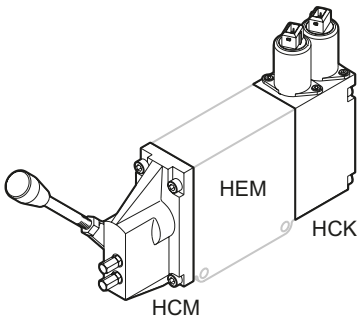
MHPF module has the following main features:
- It can be operated with on-off signals also
- Short response time
- Electro-proportional pressure reduction valves
- PWM electric control of low-frequency solenoid valves
- Any adjustment to limit the flow or to create work ramps will be made direcly on the remote control
- Very low hysteresis and excellent sensitivity

Voltage	Code (Aluminum)	Code (Cast iron)
12 Vdc	MHPF007707088	MHPF007707090
24 Vdc	MHPF007707089	MHPF007707091

Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 to 15 V	22 to 30 V
Max. ripple		8 %	
Max. current		1500 mA ± 10	750 mA ± 10
Power consumption		18 W at 22 °C [71.6 °F] coil temperature	
Start spool travel		630 mA	280 mA
End spool travel		1170 mA	610 mA
R_{20}		4.72 Ω ± 5 %	20.8 Ω ± 5 %
Heat insulation		Class H, 180 °C [356 °F]	
Oil temperature	Recommended	-30 ÷ +60 °C [-22 ÷ +140 °F]	
	Min	-30 °C [-22 °F]	
	Max	+90 °C [+194 °F]	
Dither adjustment		75 Hz	
Inductance		8.5 mH	70 mH
Current variation		100 mA/s	50 mA/s
Duty cycle % ED on-off operating		14 V = 100	28 V = 100
		15 V = 50	30 V = 50
Plug connector		2-pole AMP Junior Power Timer	
Reaction time from neutral position to end spool stroke (constant voltage)		120 ms	
Reaction time from end spool stroke to neutral position (constant voltage)		90 ms	
Grade of enclosure to IEC 529, with female connector		IP 65	



HCK



Example with module HCK and manual control HCM

HCK electrohydraulic PROPORTIONAL module with pilot oil connections

HCK proportional electrohydraulic module shifts the position of the spool precisely in proportion to an electric current signal generated by the remote control.

The spool is shifted by means of the hydraulic pressure generated by the pressure-reduction proportional solenoid valves. HCK module is not equipped with an inductive position transducer (LVDT) and the entire electronic circuit to detect and signal faults. This means that in the joystick remote control phase, any control (for example a manual control) that overrides the force exerted by the pressure reduction valves on the spool, may vary the position of that spool without any error signal and without inhibition, leavingthe safety of the entire hydraulic system to the visual operator control, only.

Thanks to the 2 additional pilot oil supply connections, HCK is recommended where there is a requirement for a single output control to be used to achieve 2 simultaneously or sequence spool movements, or to change the displacement onto hydraulic motors, making the use of HPV even more flexible.

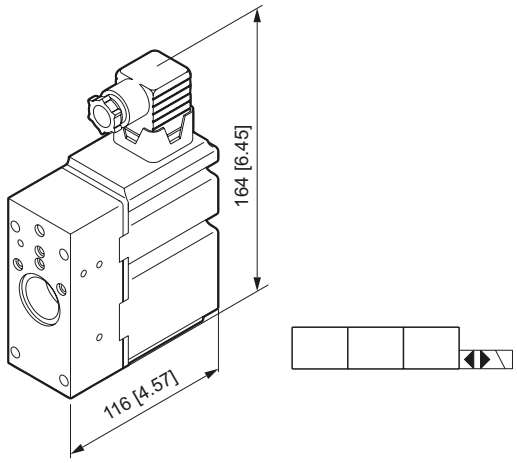
HCK module has the following main features:

- It can be operated with on-off signals also
- Short response time
- Electro-proportional pressure reduction valves
- PWM electric control of low-frequency solenoid valves
- Any adjustment to limit the flow or to create work ramps can be made directly on the remote control
- Very low hysteresis and excellent sensitivity

Voltage	Code (Aluminum)	Code (Cast iron)
12 Vdc	—	HCK0007708100
24 Vdc	—	HCK0007708101

Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 to 15 V	22 to 30 V
Max. ripple		8 %	
Max. current		1500 mA ± 10	750 mA ± 10
Power consumption		18 W at 22 °C [71.6 °F] coil temperature	
Start spool travel		560 mA	280 mA
End spool travel		1080 mA	520 mA
R_{20}		4.72 Ω ± 5 %	20.8 Ω ± 5 %
Max. pressure pilot oil supply		30 bar [435 psi]	
Heat insulation		Class H, 180 °C [356 °F]	
Oil temperature	Recommended	-30 ÷ +60 °C [-22 ÷ +140 °F]	
	Min	-30 °C [-22 °F]	
	Max	+90 °C [+194 °F]	
Dither adjustment		75 Hz	
Inductance		8.5 mH	70 mH
Current variation		100 mA/s	50 mA/s
Duty cycle % ED on-off operating		14 V = 100	28 V = 100
		15 V = 50	30 V = 50
Plug connector		2-pole AMP Junior Power Timer	
Reaction time from neutral position to end spool stroke (constant voltage)		120 ms	
Reaction time from end spool stroke to neutral position (constant voltage)		90 ms	
Grade of enclosure to IEC 529, with female connector		IP 65	

Electrical connections for MSPF-MHPF-HCK working sections, see page: E-2



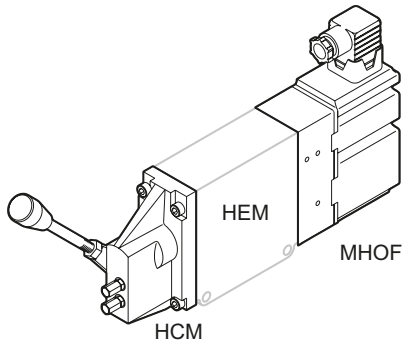
MHOF

MHOF electrohydraulic ON-OFF module
The MHOF electrohydraulic module moves the spool in relation to an electric signal generated by the joystick or by a switch.

The hydraulic pressure generated by the on-off solenoid valves forces the spool not to stop in any intermediate position between the neutral position and the maximum stroke.

Voltage	Code(Aluminum)
12 Vdc	MHOF007707068
24 Vdc	MHOF007707070

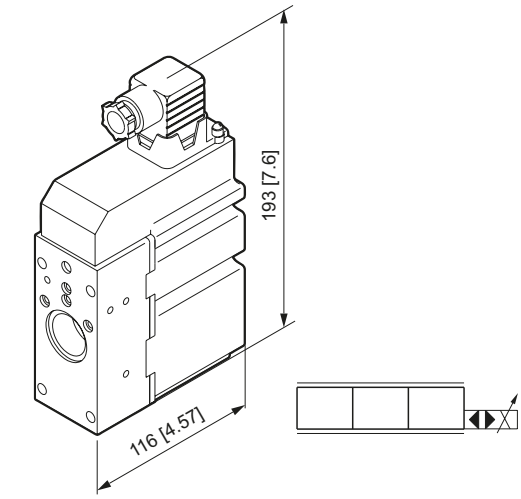
Aluminum body



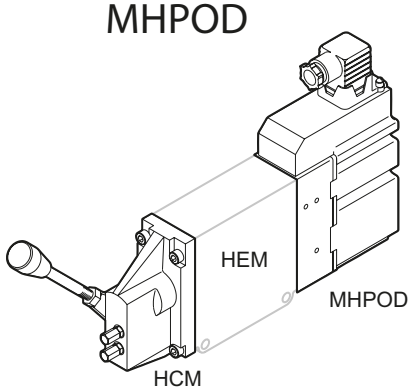
Example with module MHOF and manual control HCM

Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 to 15 V	21 to 28 V
Resistance at 20 °C [68 °F]		9.1 Ω	36.2 Ω
Current consumption		1480 mA	750 mA
Rated absorbed power		16 W	
Heat insulation		Class H, 180 °C [356 °F]	
Duty cycle		ED 100%	
Reaction time	From neutral position to max. spool travel	130 ms	
	From max. spool travel to neutral position	110 ms	
Max. operating temperature		80° C [176 °F]	
Ambient temperature		-30 ÷ +60 °C [-22 ÷ +140 °F]	
Connector		Standard (IP 65) according to DIN 43650 / ISO 4400	
Enclosure to IEC 529		IP 65	

Electrical connections for MHOF controls, see page: E-3



MHPOD



Example with module MHPOD and manual control HCM

MHPOD electrohydraulic PROPORTIONAL module
MHPOD is a open loop electrohydraulic activation unit, whose design is based on digital technology.
MHPOD has been specially developed to meet the harsh operating requirements of today's mobile machine market.
MHPOD electrical open loop proportional actuation operates the main spool's shift according to an electrical signal coming from a remote control unit, and is recommended where a simple proportional control is required, and where hysteresis and reaction time are not critical.
MHPOD does not have the inductive position transceiver (LVDT) and any electronic circuit for faults monitoring. This means that any forces that override the pilot pressure spool forces may change the spool position with no error signal, and the safety of the whole system is left to the operator's visual control, only.

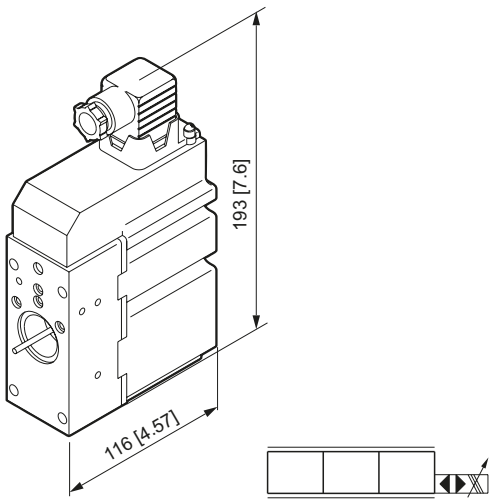
MHPOD is defined by:
- Capacity to handle three different kinds of input signal control (see chart below).
- The required signal control is to be stated in the order phase
- Integrated PWM (Pulse Width Modulator)
- Good flow regulation
- Simple built-up.

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPOD07708077	MHPOD07708082	MHPOD07708086
24 Vdc	MHPOD07708075	MHPOD07708084	MHPOD07708088

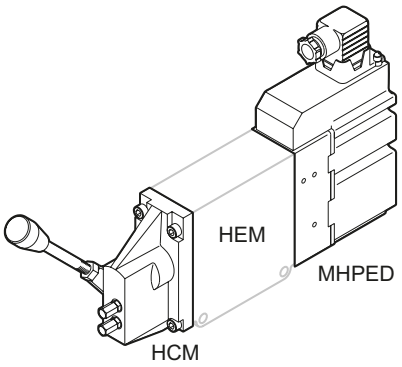
Aluminum body

Rated voltage			12 Vdc	24 Vdc
Power supply voltage range			11 ÷ 15 V	20 ÷ 28 V
Max. ripple			5 %	
Current supply			520 mA	260 mA
Current consumption (neutral position, constant voltage)			36 mA	46 mA
Power consumption			6 W	
Heat insulation			Class H 180 °C [256 °F]	
Reaction time (constant voltage)		From neutral position to max. spool travel	110 ÷ 140 ms	
		From max. spool travel to neutral position	70 ÷ 90 ms	
Reaction time (neutral switch)		From neutral position to max. spool travel	130 ÷ 170 ms	
		From max. spool travel to neutral position	70 ÷ 90 ms	
Connector			Standard (IP 65) according to DIN 43650 / ISO 4400	
Enclosure to IEC 529			IP 65	
(A) joystick	Input signal control	Neutral position	0.5 x UDC	
		Control range	0.25 x UDC to 0.75 x UDC	
	Max. current signal control		0.5 mA	1 mA
	Input impedance in relation to 0.5 x UDC		12 kΩ	
(B) PLC	Input signal control	Voltage	0 ÷ 10 VDC	
		Neutral position	5 VDC	
		Control range	0.25 x 10 VDC to 0.75 x 10 VDC	
	Current signal control		0.5 mA	
	Input impedance in relation to 0 ÷ 10 VDC		20 kΩ	
(C) PLC	Input signal control	Current	0 ÷ 20 mA	
		Neutral position	10 mA	
		Control range	0.25 x 20 mA to 0.75 x 20 mA	
	Input impedance in relation to 0 ÷ 20 mA		0.5 kΩ	

Electrical connections for MHPOD controls, see page: E-4



MHPED



Example with module MHPED and manual control HCM

MHPED electrohydraulic PROPORTIONAL module
MHPED is a closed loop electrohydraulic activation unit, whose design is based on digital technology.
MHPED has been specially developed to meet the harsh operating requirements of today's mobile machine market.

MHPED electrical closed loop proportional actuation operates safely and precisely the main spool's shift according to an electrical signal coming from a remote control unit, and is recommended where precise metering control, low hysteresis, fault monitoring, and fast system reaction are paramount.

The input signal, by means of the PCB and the two reducing proportional solenoid valves, is converted into a low pilot pressure which inturn moves the HPV's spool.

The inductive transducer position (LVDT) ensures that the spool is being moved in the correct position, otherwise, in the event of uncontrolled spool positioning, the feed-back signal wuill detect it as an error and it will fast react operator independent (fault monitoring system, see diagrams in the following pages).

MHPED is defined by:
- Capacity to handle three different kinds of input signal control (see chart below).
  The required signal control is to be stated in the order phase.
- Inductive transducer position, LVDT (Linear Variable Differential Transformer)
- Integrated PWM (Pulse Width Modulator)
- Fault monitoring, transistor output for signal source
- Excellent regulation
- Low hysteresis
- Short reaction time

Thanks to the developments in digital electronics, it has been possible to integrate in the MHPED modules, besides all the algorithms needed for the spool movement control, also a wide range of advanced circuits above all conceived for the safety and handling of complete systems.

The use of the module in the passive or active version allows the electrohydraulic system to be obtained with different safety degrees, for the choice of which it is essential to know the required functions exactly.

Once this condition has been fullfilled, and work is going on in the area stated above, with the four examples described in the following pages, we can always give you the best solution.

The diagrams represents just a few possibilities, advised by experience, of how the assesment of degree of protection system ought always to be made.
This does not mean that considering the enormity of the subject and need for ever-increasing flexibility and performance of the industrial machinery with tighter and tighter safety rules, custom-built solutions can not be taken into account.

Active version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPED07708011	MHPED07708018	MHPED07708026
24 Vdc	MHPED07708010	MHPED07708020	MHPED07708028

Passive version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPED07708009	MHPED07708022	MHPED07708030
24 Vdc	MHPED07708007	MHPED07708024	MHPED07708032

Aluminum body

Electrical connections for MHPED controls, see page: E-5

MHPED voltage controls for HEM working sections

Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 ÷ 15 V	20 ÷ 28 V
Max. ripple		5 %	
End stroke spool current consumption		520 mA	260 mA
Current consumption (neutral position, constant voltage)		36 mA	46 mA
Power consumption		6 W	
Heat insulation		Class H 180 °C [356 °F]	
Fault monitoring system	Max. current on safety output (pin no. 3, page D-5)	50 mA	
	Reaction time at fault	550 ms	
Reaction time (constant voltage)	From neutral position to max. spool travel	110 ÷ 140 ms	
	From max. spool travel to neutral position	70 ÷ 90 ms	
Reaction time (neutral switch)	From neutral position to max. spool travel	130 ÷ 170 ms	
	From max. spool travel to neutral position	70 ÷ 90 ms	
Connector		Standard (IP 65) according to DIN 43650 / ISO 4400	
Enclosure to IEC 529		IP 65	

(A) joystick	Input signal control	Neutral position	0.5 x UDC	
		Control range	0.25 x UDC ÷ 0.75 x UDC	
	Max. current signal control		0.5 mA	1 mA
	Input impedance in relation to 0.5 x UDC		12 kΩ	
(B) PLC	Input signal control	Voltage	0 ÷ 10 VDC	
		Neutral position	5 VDC	
		Control range	0.25 x 10 VDC ÷ 0.75 x 10 VDC	
	Current signal contro		0.5 mA	
	Input impedance in relation to 0 ÷ 10 VDC		20 kΩ	
(C) PLC	Input signal control	Current	0 ÷ 20 mA	
		Neutral position	10 mA	
		Control range	0.25 x 20 mA ÷ 0.75 x 20 mA	
	Input impedance in relation to 0 ÷ 20 mA		0.5 kΩ	

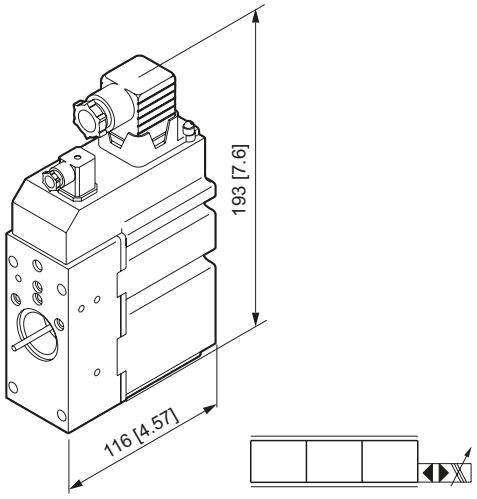
MHPED (active version) modules behaviour in relation to the signal control

UDC	Signal control	Ground	Safety output (pin no. 3)	Effect
24 V	12 V (50% of UDC)	Connected	No output	Spool held electrically in neutral position
24 V	6 V (25% of UDC)	Connected	No output	Full flow P → A
24 V	18 V (75% of UDC)	Connected	No output	Full flow P → B
24 V	20.4 V (85% of UDC)	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	21.6 V (90% of UDC)	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	24 V (100% of UDC)	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	0 V (0% of UDC) selected	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	0 V (0% of UDC) interrupted	Connected	Output	Spool stays in neutral position (red light comes on)
24 V	1 V (4% of UDC)	Connected	Output	Spool stays in neutral position (red light comes on)
0 V	15.6 V (65% of UDC)	Connected	No output	Spool stays in neutral position (no light)
24 V	15.6 V (65% of UDC)	Disconnected	No output	Spool stays in neutral position (no light)

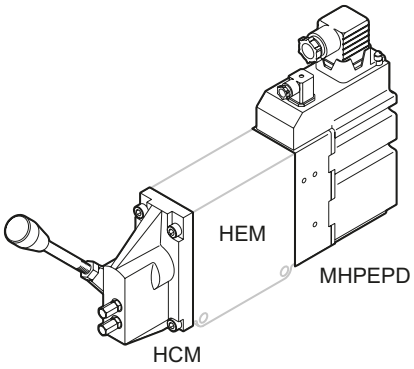
With the same data, given in percentages, the behaviour of the module is equal to the 12 VDC, 0 ÷ 20 mA and 0 ÷ 10 V also.

No. of flashes	Cause
1	LVDT outside of its own position
2	The demanded spool position doesn't correspond to the input signal
3	LVDT is broken
4	Short circuit in the output signal for direction indicator (MHPEPD)
5	Internal electrical faults
6	Short circuit in the proportional solenoid valves
7	Short circuit in the warning output signal (pin no. 3)
8	Input signal control exceeds min. / max. values (15% ÷ 85% of supply voltage)

When an error state is detected the lamp of the module starts flashing red, and the number of flashes indicates the probable cause of failure.



MHPEPD



Example with module MHPEPD and manual control HCM

MHPEPD electrohydraulic PROPORTIONAL module
MHPEPD closed loop electrohydraulic proportional activation unit is the most advanced version of the closed loop control modules.

MHPEPD is defined by:
- Spool direction indicator output;
- Capacity to handle three different kinds of input signal control. The required signal control is to be stated in the order phase;
- Inductive transducer position, LVDT (Linear Variable Differential Transformer);
- Integrated PWM (Pulse Width Modulator);
- Fault monitoring, transistor output for signal source;
- Excellent regulation;
- Low hysteresis;
- Short reaction time.

Besides the afore mentioned features, another purpose of the module is to give an indication of the spool's movement, through an on/off output signal in the smaller connector (also when the spool is manually activated).

The diagrams on page E-11 show an example of how the direction output can be handled to activate or deactivate the Ls on/off pilot solenoid valve by means of the two relay (K1 - K2) and two electrical end of strokes.

This is just an example, as the use of MHPEPD is also destined for more demanding surroundings, that is solutions using artificial intelligence which dialogue at the higher level via bus, and which realize a real distributed control system able to carry out "stand-alone" processes.

This in turn send to the raised level only that information read as "positive" for the safe handling of machine.
All the electrohydraulics features, performance, and choice of safety degree system, are the same of those already described for the MHPED module.

Active version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
Versione attiva			
12 Vdc	MHPEPD7708048	MHPEPD7708058	MHPEPD7708066
24 Vdc	MHPEPD7708047	MHPEPD7708060	MHPEPD7708068

Passive version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPEPD7708046	MHPEPD7708054	MHPEPD7708062
24 Vdc	MHPEPD7708045	MHPEPD7708056	MHPEPD7708064

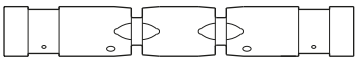
Aluminum body

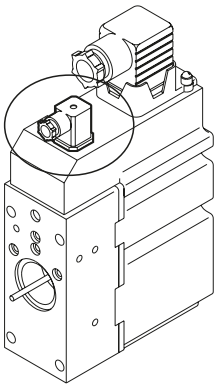
Electrical connections for MHPEPD working sections, see page: E-11

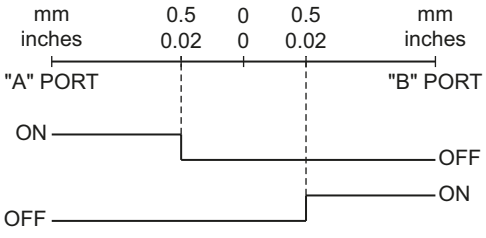
Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 ÷ 15 V	20 ÷ 28 V
Max. ripple		5 %	
End stroke spool current consumption		520 mA	260 mA
Current consumption (neutral position, constant voltage)		36 mA	46 mA
Power consumption		6 W	
Heat insulation		Class H 180 °C [356 °F]	
Fault monitoring system	Max. current on safety output (pin no. 3)	50 mA	
	Reaction time at fault	550 ms	
Max. current output signal for indication actuating direction		50 mA	
Reaction time (constant voltage)	From neutral position to max. spool travel	110 ÷ 140 ms	
	From max. spool travel to neutral position	70 ÷ 90 ms	
Reaction time (neutral switch)	From neutral position to max. spool travel	130 ÷ 170 ms	
	From max. spool travel to neutral position	70 ÷ 90 ms	
Connectors		Standard (IP 65) according to DIN 43650 / ISO 4400	
		Spool direction indicator output (IP 65) a ccording to DIN 40050	
Enclosure to IEC 529		IP 65	

(A) joystick	Input signal control	Neutral position	0.5 x UDC	
		Control range	0.25 x UDC ÷ 0.75 x UDC	
	Max. current signal control		0.5 mA	1 mA
	Input impedance in relation to 0.5 x UDC		12 kΩ	
(B) PLC	Input signal control	Voltage	0 ÷ 10 VDC	
		Neutral position	5 VDC	
		Control range	0.25 x 10 VDC ÷ 0.75 x 10 VDC	
	Current signal contro		0.5 mA	
	Input impedance in relation to 0 ÷ 10 VDC		20 kΩ	
(C) PLC	Input signal control	Current	0 ÷ 20 mA	
		Neutral position	10 mA	
		Control range	0.25 x 20 mA ÷ 0.75 x 20 mA	
	Input impedance in relation to 0 ÷ 20 mA		0.5 kΩ	

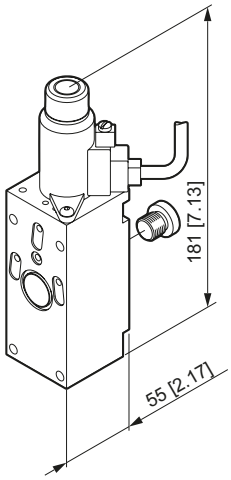
Spool direction signals



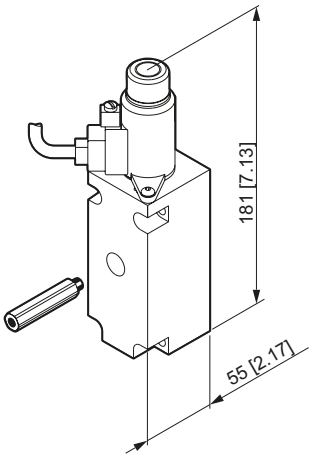




PIN	Center position	Movement to A port	Movement to B port
1	free	free	free
2	no output	Udc (+)	no output
3	no output	no output	Udc (+)
4	To get the manual control this pin must be feeded with the supply voltage. To get the remote control the supply voltage must be taken off from this pin.		



MHOXA



MHOXB



MHOX electro-hydraulic ON/OFF operated
The MHOXA and MHOXB modules are electro-hydraulics ON/OFF devices that allows the primary hydraulic state (HEM) to be monitored at a distance by means of an electric signal.

Single acting for A or B ports:
MHOXA: the distribution spool in the HEM element is moved onto port B by a manual HCM command and onto port A by the side MHOXA module.

MHOXB: the distribution spool in the HEM element is moved onto port A by a manual HCM command and onto port B by the side MHOXB module

Double acting for A and B ports:
The MHOXA and MHOXB modules can be coupled in order to activate both modules by means of the remote control. The operating principle is similar to that of the two separate modules, with the V1 and V2 solenoid valves that, alternatively, can adjust the pilot pressure on the distribution spool.

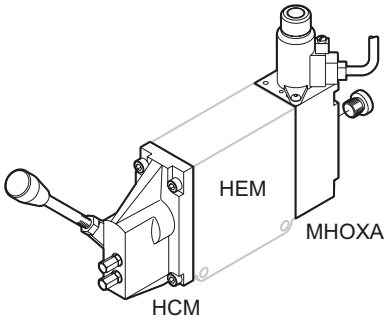
HCM/HCF cast iron modules must be used.

ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

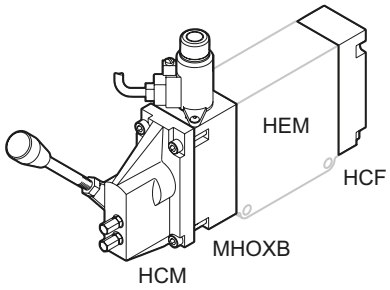
For the wiring diagram of module, please refer to Instruction manual.

Voltage	Code	
	Port A	Port B
12 Vdc	MHOXA07707192	MHOXB07707194
24 Vdc	MHOXA07707193	MHOXB07707195

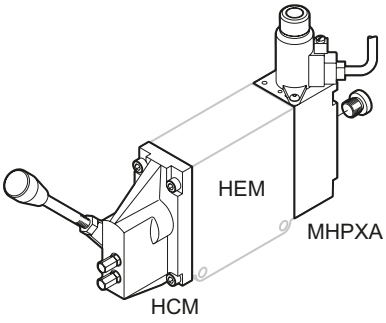
Cast iron body



Example with module MHOXA, single acting for A port



Example with module MHOXA, single acting for A port



Example with moduli MHOXA-MHOXB, double acting for A and B ports

Nominal voltage	12 Vdc	24 Vdc
Coil resistance, R20	9 Ω ± 6 %	35.8 Ω ± 6 %
Min. current	700 mA	350 mA
Rated current	1330 mA	670 mA
Max. current	1850 mA	930 mA
Limit power	14.3 W	14.4 W
Ambient temperature	-20 ÷ +50 °C [-4 ÷ +122 °F]	
Connection cable	FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Integrated diode to limit switch-off overvoltage	See coil manufacturer manual	
Short-circuit protection	With fuse - See coil manufacturer manual	
Duty cycle	100%	
Input pressure	Max. 50 bar [725 psi]	
Switching pressure	>23 bar [334 psi]	
Fluid temperature	-20 ÷ +80 °C [-4 ÷ +176 °F]	
Ground connection	Up to 4 mm² - 11 AWG	
Protection class (DIN VDE 0580)	I	
Fluids	Hydraulic oil to DIN 51524.ATF-oil	
Protection ratings (DIN VDE 0470 / EN 60529)	IP67 / IP69K	
Shock-resistance to EN 50014	4 J	

Hydraulic features

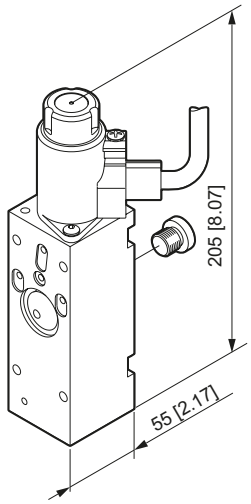
Max pilot pressure oil supply	30 bar [435 psi]
Start spool flow	4.5 bar [65 psi]
End spool flow	15 bar [218 psi]

HEM module hydraulic data

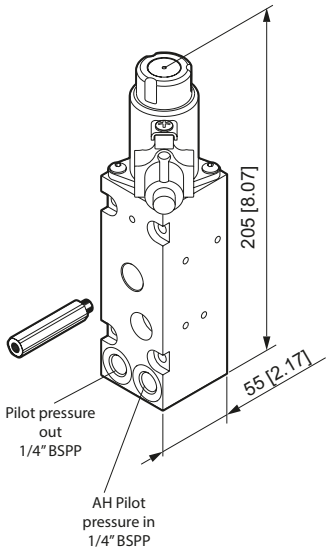
Max pressure (static - input)	350 bar [5076 psi]
Max flow	130 l/min [34.3 US gpm]

ATEX modules marking

MHOX on complete proportional valve with or without HSEVX valve	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20° C ÷ +80°C p max HEM = 350 bar
MHOX individually supplied	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C
Solenoids mounted on MHOX modules	CE Ex	II GEx mb II T4 II D Ex mbD 21 T130°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C

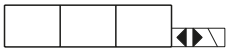


MHOXAH



MHOXBH





ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

For the wiring diagram of module, please refer to Instruction manual.

MHOXAH - MHOXBH electro-hydraulic ON/OFF operated and hydraulic activation

The MHOXAH and MHOXBH modules are electro-hydraulics ON/OFF devices that allows the primary hydraulic state (HEM) to be monitored at a distance by means of both an electric signal and hydraulic control.

Especially designed for those applications where the HPV (distributor) proportional valves must be controlled with a double remote control (electric and hydraulic). The module maintains the same electrical characteristics already described for the MHOXA / MHOXB modules. The value of the pilot pressure of the hydraulic control (coming from hydraulic manipulators) must be included between 3.5 bar and 28 bar [51 and 406 psi].

The distribution spool is positioned precisely by the hydraulic pressure generated by the hydraulic manipulator or, alternatively, by the solenoid valve V1 proportionally with an electric signal generated by the remote control. The solenoid valve and the hydraulic manipulator are fed by an internal line P at a pressure ranging between 20 and 35 bar [290 and 507 psi], while the discharges are gathered in line T.

Single acting for A or B ports:

MHOXAH: the distribution spool in the HEM element is moved onto the B port by means of a manual control HCM and onto port A by the side MHOXAH module.

MHOXBH: the distribution spool in the HEM element is moved onto the B port by means of a manual control HCM and onto port B by the side MHOXBH module.

Double acting for A and B ports:

The MHOXAH and MHOXBH modules can be coupled in order to activate both modules by means of the remote control.

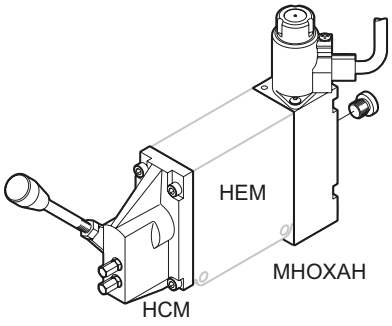
The operating principle is similar to that of the two separate modules, with the V1 and V2 solenoid valves that, alternatively, can adjust the pilot pressure on the distribution spool.

HCM/HCF cast iron modules must be used.

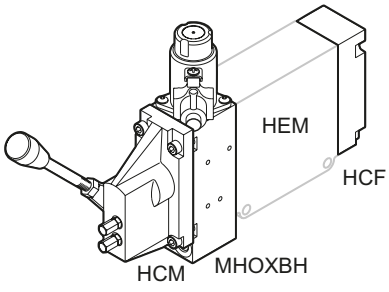
Voltage	Code	
	Port A	Port B
12 Vdc	MHOXAH7707392	MHOXBH7707394
24 Vdc	MHOXAH7707393	MHOXBH7707395

Cast iron body

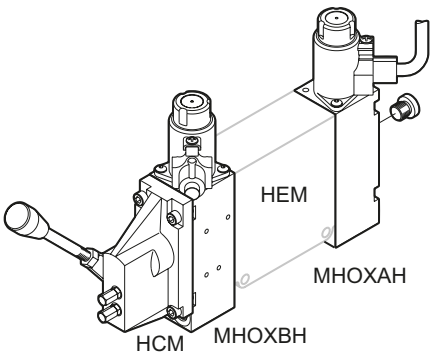
Hydraulic command outputs 1/4" BSPP.



Example with module MHOXAH, single acting for A port



Example with module MHOXBH, single acting for A port



Example with moduli MHOXAH-MHOXBH, double acting for A and B ports

Nominal voltage	12 Vdc	24 Vdc
Coil resistance, R20	9 Ω ± 6 %	35.8 Ω ± 6 %
Min. current	700 mA	350 mA
Rated current	1330 mA	670 mA
Max. current	1850 mA	930 mA
Limit power	14.3 W	14.4 W
Ambient temperature	-20 ÷ +50 °C [-4 ÷ +122 °F]	
Connection cable	FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Integrated diode to limit switch-off overvoltage	See coil manufacturer manual	
Short-circuit protection	With fuse - See coil manufacturer manual	
Duty cycle	100%	
Input pressure	Max. 50 bar [725 psi]	
Switching pressure	>23 bar [334 psi]	
Fluid temperature	-20 ÷ +80 °C [-68 ÷ +176 °F]	
Ground connection	Up to 4 mm² - 11 AWG	
Protection class (DIN VDE 0580)	I	
Fluids	Hydraulic oil to DIN 51524.ATF-oil	
Protection ratings (DIN VDE 0470 / EN 60529)	IP67 / IP69K	
Shock-resistance to EN 50014	4 J	

Hydraulic features

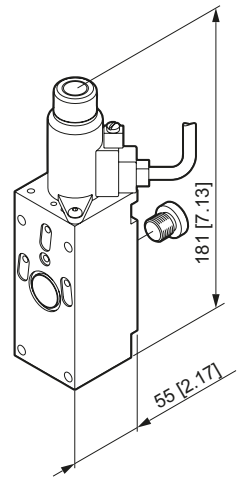
Max pilot pressure oil supply	30 bar [435 psi]
Start spool flow	4.5 bar [65 psi]
End spool flow	15 bar [218 psi]

HEM module hydraulic data

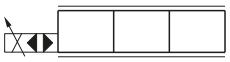
Max pressure (static - input)	350 bar [5076 psi]
Max flow	130 l/min [34.3 US gpm]

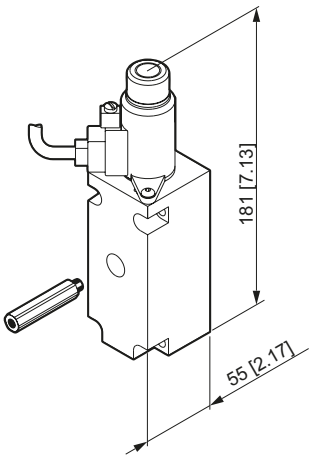
ATEX modules marking

MHOX on complete proportional valve with or without HSEVX valve	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20° C ÷ +80°C p max HEM = 350 bar
MHOX individually supplied	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C
Solenoids mounted on MHOX modules	CE Ex	II GEx mb II T4 II D Ex mbD 21 T130°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C

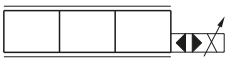


MHPXA





MHPXB



MHPXA/MHPXB electro-hydraulic PROPORTIONAL operated
The MHPXA and MHPXB modules are electro-hydraulics proportional devices that allows the primary hydraulic state (HEM) to be monitored at a distance by means of an electric signal.

Single acting for A or B ports:
MHPXA: the distribution spool in the HEM element is moved onto port B by a manual HCM command and onto port A by the side MHPXA module.

MHPXB: the distribution spool in the HEM element is moved onto port A by a manual HCM command and onto port B by the side MHPXB module .

Double acting for A and B ports:
The MHPXA and MHPXB modules can be coupled in order to activate both modules by means of the remote control. The operating principle is similar to that of the two separate modules, with the V1 and V2 solenoid valves that, alternatively, can adjust the pilot pressure on the distribution spool.

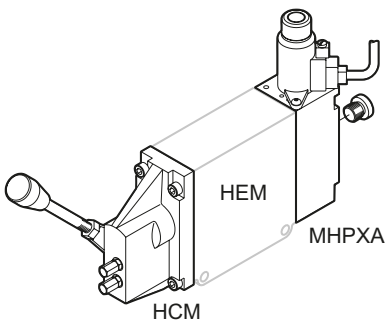
HCM/HCF cast iron modules must be used.

ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

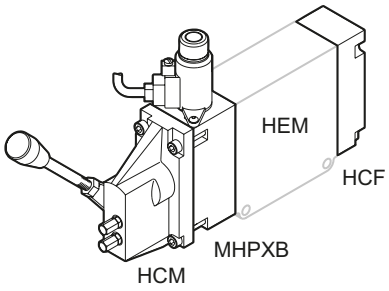
For the wiring diagram of module, please refer to Instruction manual.

Voltage	Code	
	Port A	Port B
12 Vdc	MHPXA07707182	MHPXB07707184
24 Vdc	MHPXA07707183	MHPXB07707185

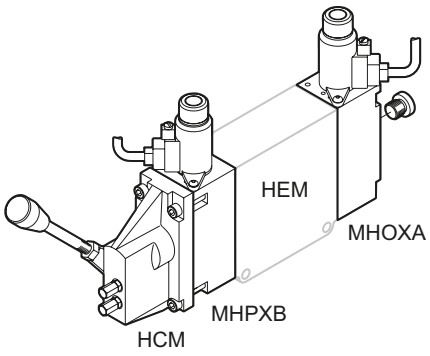
Cast iron body



Example with module MHPXA, single acting for A port



Example with module MHPXA, single acting for A port



Example with moduli MHPXA-MHPXB, double acting for A and B ports

Nominal voltage	12 Vdc	24 Vdc
Voltage range	11 ÷ 15 Vdc	22 ÷ 28 Vdc
Coil resistance, R20	4.3 Ω	15.3 Ω
Rated current, IN	1360 mA	686 mA
Max. current regulation range	0 ÷ 1500 mA	0 ÷ 750 mA
Max. power	14.8 W	12.8 W
Start spool travel	490 mA	240 mA
Start spool flow	510 mA	260 mA
End spool travel	875 mA	500 mA
Pilot pressure	28 bar [406 psi]	
Power supply	PWM 100 Hz	
Max. pressure (static)	50 bar [725 psi]	
Ambient temperature	-20 ÷ +50 °C [-4 ÷ +122 °F]	
Fluid temperature	-20 ÷ +80 °C [-4 ÷ +176 °F]	
Connection cable	FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Integrated diode to limit switch-off overvoltage	See coil manufacturer manual	
Short-circuit protection	With fuse - See coil manufacturer manual	
Groud connection	Up to 4 mm² - 11 AWG	
Fluids	Hydraulic oil to DIN 51524.ATF-oil	
Grade of enclosure (DIN VDE 0470 / EN 60529)	IP67 / IP69K	
Shock-resistance to EN 50014	4 J	

Hydraulic features

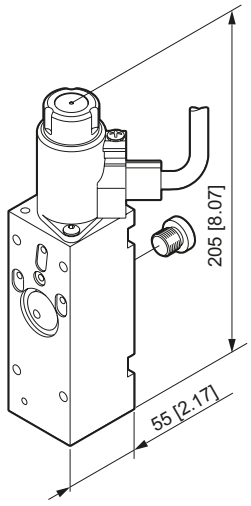
Max pilot pressure oil supply	30 bar [435 psi]
Start spool flow	4.5 bar [65 psi]
End spool flow	15 bar [218 psi]

HEM module hydraulic data

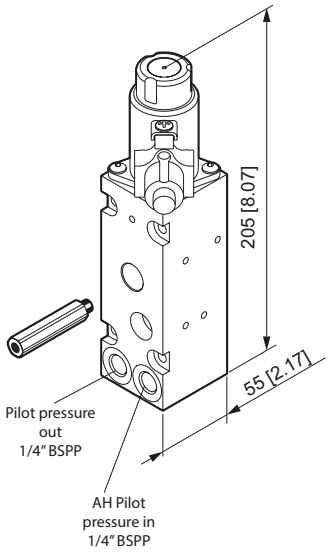
Max pressure (static - input)	350 bar [5076 psi]
Max flow	130 l/min [34.3 US gpm]

ATEX modules marking

MHPX on complete proportional valve with or without HSEVX valve	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20° C ÷ +80°C p max HEM = 350 bar
MHPX individually supplied	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C
Solenoids mounted on MHPX modules	CE Ex	II GEx mb II T4 II D Ex mbD 21 T130°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C



MHPXAH



MHPXBH



ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

For the wiring diagram of module, please refer to Instruction manual.

MHPXAH electro-hydraulic PROPORTIONAL operated and hydraulic activation

The MHPXAH and MHPXBH modules are electro-hydraulics proportional devices that allows the primary hydraulic state (HEM) to be monitored at a distance by means of both an electric signal and hydraulic control.

Especially designed for those applications where the HPV (distributor) proportional valves must be controlled with a double remote control (electric and hydraulic). The module maintains the same electrical characteristics already described for the MHPXA / MHPXB modules. The value of the pilot pressure of the hydraulic control (coming from hydraulic manipulators) must be included between 3.5 bar and 28 bar [51 and 406 psi].

The distribution spool is positioned precisely by the hydraulic pressure generated by the hydraulic manipulator or, alternatively, by the solenoid valve V1 proportionally with an electric signal generated by the remote control. The solenoid valve and the hydraulic manipulator are fed by an internal line P at a pressure ranging between 20 and 35 bar [290 and 507 psi], while the discharges are gathered in line T.

Single acting for A or B ports:

MHPXAH: the distribution spool in the HEM element is moved onto the B port by means of a manual control and onto port A by the side MHPXAH module.

MHPXBH: , the distribution spool in the HEM element is moved onto the A port by means of a manual control and onto port B by the side MHPXBH module.

Double acting for A and B ports:

The MHPXAH and MHPXBH modules can be coupled in order to activate both modules by means of the remote control.

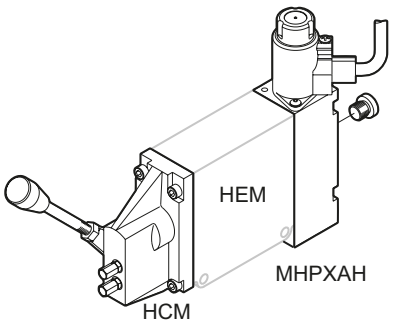
The operating principle is similar to that of the two separate modules, with the V1 and V2 solenoid valves that, alternatively, can adjust the pilot pressure on the distribution spool.

HCM/HCF cast iron modules must be used.

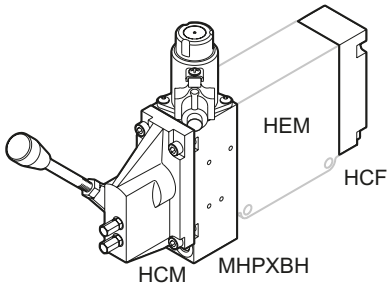
Voltage	Code	
	Port A	Port B
12 Vdc	MHPXAH7707382	MHPXBH7707384
24 Vdc	MHPXAH7707383	MHPXBH7707385

Cast iron body

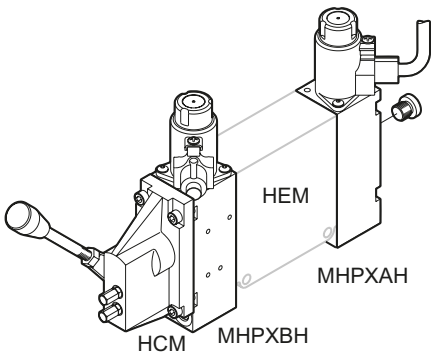
Hydraulic command outputs 1/4" BSPP.



Example with module MHPXAH, single acting for A port



Example with module MHPXBH, single acting for A port



Example with moduli MHPXAH-MHPXBH, double acting for A and B ports

Nominal voltage	12 Vdc	24 Vdc
Voltage range	11 ÷ 15 Vdc	22 ÷ 28 Vdc
Coil resistance, R20	4.3 Ω	15.3 Ω
Rated current, IN	1360 mA	686 mA
Max. current regulation range	0 ÷ 1500 mA	0 ÷ 750 mA
Max. power	14.8 W	12.8 W
Start spool travel	490 mA	240 mA
Start spool flow	510 mA	260 mA
End spool travel	875 mA	500 mA
Pilot pressure	28 bar [406 pasi]	
Power supply	PWM 100 Hz	
Max. pressure (static)	50 bar [725 psi]	
Ambient temperature	-20 ÷ +50 °C [-4 ÷ +122 °F]	
Fluid temperature	-20 ÷ +80 °C [-4 ÷ +176 °F]	
Connection cable	FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Integrated diode to limit switch-off overvoltage	See coil manufacturer manual	
Short-circuit protection	With fuse - See coil manufacturer manual	
Groud connection	Up to 4 mm² - 11 AWG	
Fluids	Hydraulic oil to DIN 51524.ATF-oil	
Grade of enclosure (DIN VDE 0470 / EN 60529)	IP67 / IP69K	
Shock-resistance to EN 50014	4 J	

Hydraulic features

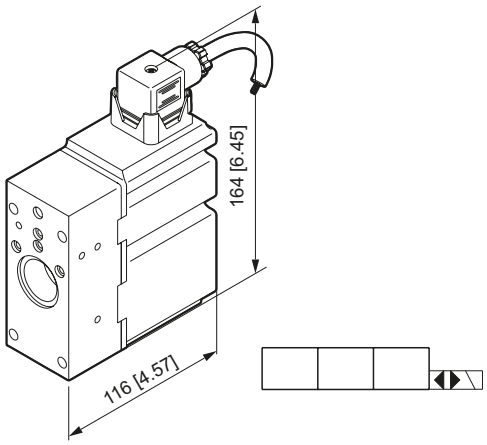
Max pilot pressure oil supply	30 bar [435 psi]
Start spool flow	4.5 bar [65 psi]
End spool flow	15 bar [218 psi]

HEM module hydraulic data

Max pressure (static - input)	350 bar [5076 psi]
Max flow	130 l/min [34.3 US gpm]

ATEX modules marking

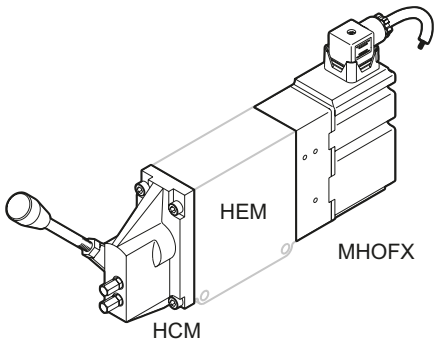
MHPX on complete proportional valve with or without HSEVX valve	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20° C ÷ +80°C p max HEM = 350 bar
MHOX individually supplied	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C
Solenoids mounted on MHPX modules	CE Ex	II GEx mb II T4 II D Ex mbD 21 T130°C T_{amb} = –20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C



MHOF electrohydraulic ON-OFF module
The MHOF electrohydraulic module moves the spool in relation to an electric signal generated by the joystick or by a switch.

The hydraulic pressure generated by the on-off solenoid valves forces the spool not to stop in any intermediate position between the neutral position and the maximum stroke

MHOFX



Example with module MHOFX and manual control HCM

Standard connector

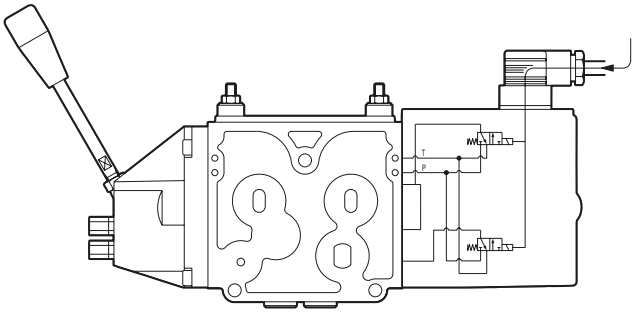
Voltage	Code
12 Vdc	MHOFX077E7060
24 Vdc	MHOFX077E7065

D-Type connector

Voltage	Code
12 Vdc	MHOFX077E7068
24 Vdc	MHOFX077E7070

Cast iron body

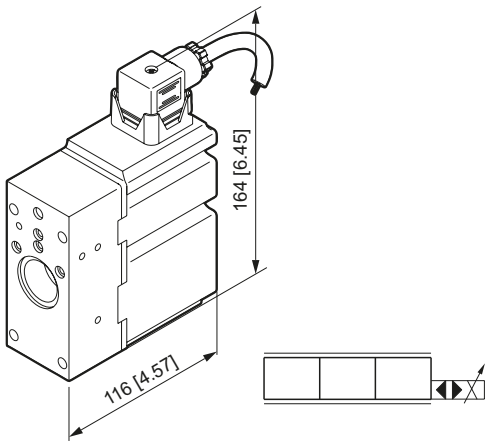
Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		10.8 ÷ 13.2 V	21.6 ÷ 26.4 V
Resistance at 20 °C [68 °F]		9.2 Ω	34.8 Ω
Rated absorbed power		16 W	
Heat insulation		Class H, 180 °C [356 °F]	
Duty cycle		ED 100%	
Reaction time	From neutral position to max. spool travel	130 ms	
	From max. spool travel to neutral position	110 ms	
Ambient temperature		-35° ÷ 60 °C [-31 ÷ +140 °F]	
Connector		DIN 43650 / ISO 4400	
Connection cable		FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Enclosure to IEC 529		IP 67	



ATEX marking	CE Ex	II 2G Ex mb IIC T4 Gb II 2D Ex mb IIIC T135 °C Db
IECEx marking	CE Ex	Ex mb IIC T4 Gb Ex mb IIIC T135 °C Db

ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

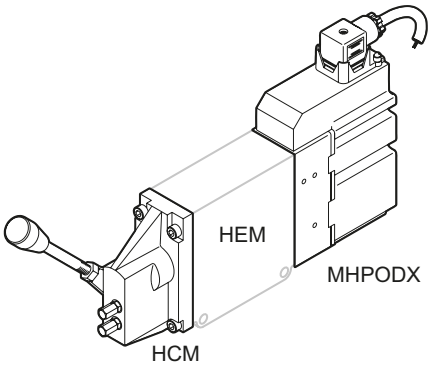
For the wiring diagram of module, please refer to Instruction manual.



MHPCX

MHPCX electrohydraulic PROPORTIONAL module
MHPCX proportional electrohydraulic module shifts the position of the spool precisely in proportion to an electric current signal generated by the remote control.

The spool is shifted by means of the hydraulic pressure generated by the pressure-reduction proportional solenoid valves. The MHPCX module is not equipped with an inductive position transducer (LVDT) and the entire electronic circuit to detect and signal faults.
This means that in the joystick remote control phase, any control (for example a manual control) that overrides the force exerted by the pressure reduction valves on the spool, may vary the position of that spool without any error signal and without inhibition, leavingthe safety of the entire hydraulic system to the visual operator control only.

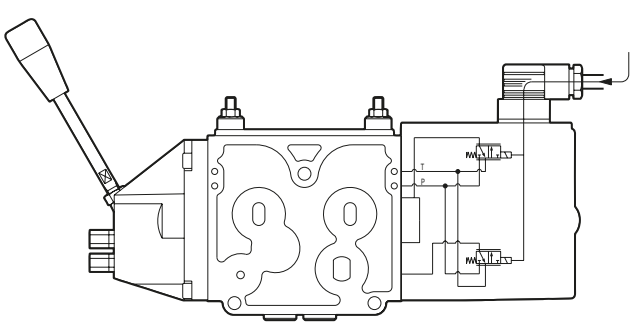


Example with module MHPCX and manual control HCM

Voltage	Code
12 Vdc	MHPCX077E7067
24 Vdc	MHPCX077E7066

Cast iron body

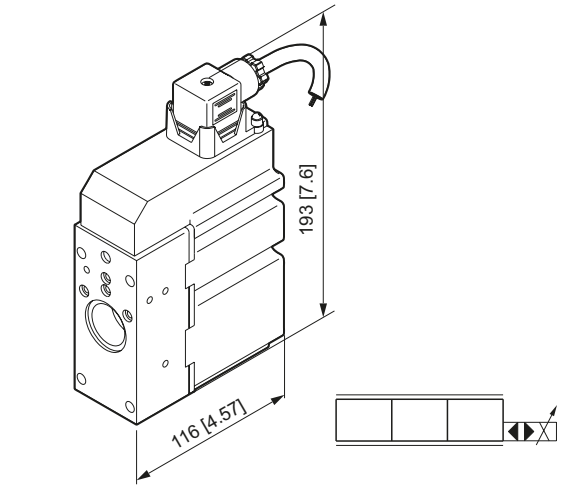
Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		10.8 ÷ 13.2 V	21.6 ÷ 26.4 V
Resistance at 20 °C [68 °F]		9.2 Ω	34.8 Ω
Rated absorbed power		16 W	
Heat insulation		Class H, 180 °C [356 °F]	
Duty cycle		ED 100%	
Reaction time	From neutral position to max. spool travel	130 ms	
	From max. spool travel to neutral position	110 ms	
Ambient temperature		-35 ÷ +60 °C [-31 ÷ +140 °F]	
Connector		DIN 43650 / ISO 4400	
Connection cable		FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Enclosure to IEC 529		IP 67	



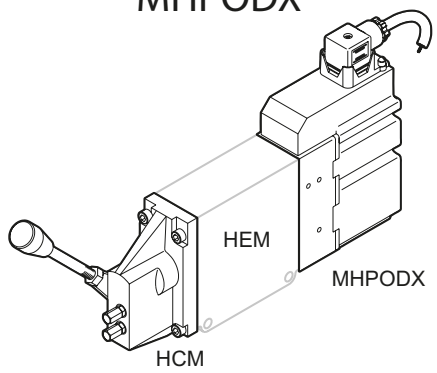
ATEX marking	II 2G Ex mb IIC T4 Gb II 2D Ex mb IIIC T135 °C Db
IECEx marking	Ex mb IIC T4 Gb Ex mb IIIC T135 °C Db

ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

For the wiring diagram of module, please refer to Instruction manual.



MHPODX



Example with module MHPODX and manual control HCM

MHPODX electrohydraulic PROPORTIONAL module
MHPODX is a open loop electrohydraulic activation unit, whose design is based on digital technology.
MHPODX has been specially developed to meet the harsh operating requirements of today's mobile machine market.
MHPODX electrical open loop proportional actuation operates the main spool's shift according to an electrical signal coming from a remote control unit, and is recommended where a simple proportional control is required, and where hysteresis and reaction time are not critical.
MHPODX does not have the inductive position transceiver (LVDT) and any electronic circuit for faults monitoring. This means that any forces that override the pilot pressure spool forces may change the spool position with no error signal, and the safety of the whole system is left to the operator's visual control, only.

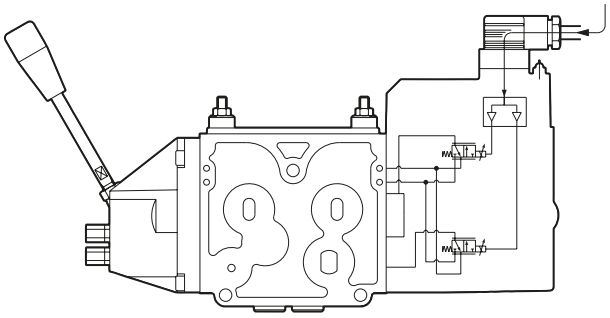
MHPODX is defined by:

- Capacity to handle three different kinds of input signal control (see chart below).
- The required signal control is to be stated in the order phase
- Integrated PWM (Pulse Width Modulator)
- Good flow regulation
- Simple built-up.

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPODX77E8077	MHPODX77E8082	MHPODX77E8086
24 Vdc	MHPODX77E8075	MHPODX77E8084	MHPODX77E8088

Cast iron body

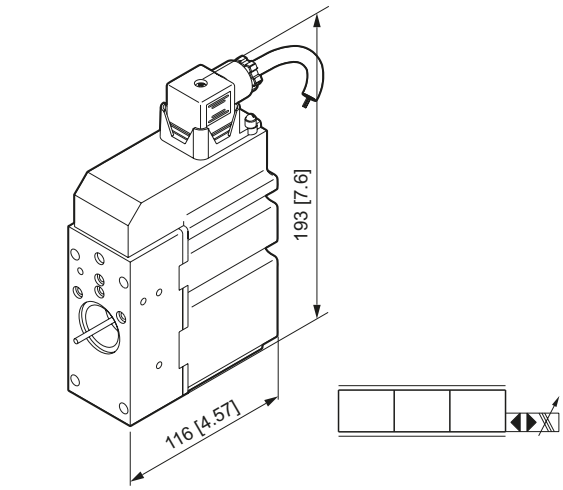
Rated voltage	12 V ± 10%	24 V ± 10%
Max. power consumption	6 W	
Analog control input (Us) to choose from:	Ratiometric 0.25xUDC ÷0.75xUDC	
	0 ÷ 10 V (available signal 2.5 ÷ 7.5 V)	
	0 ÷ 20 mA (available signal 5 ÷ 15 mA)	
	3.5 V (available signal 2 ÷ 5 V)	
Analog input impedance, ratiometric version, 0.25xUDC ÷0.75xUDC	12 kΩ	
Analog input impedance 0 ÷ 10 V version	10 kΩ	
Analog input impedance 0 ÷ 20 mA	500 Ω	
Spool positioning sensor	LVDT	
PWM outputs with current feedback	2	
PWM frequency	80 ÷ 250 Hz	
Max. current consumption	600 mA	330 mA
Error / Fault Message output (pin 3)	Max. Load 50 mA	
Working parameters setting	By software and serial interface	
Main electrical connection	3 pins Connector +PE	
Connection cable	FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Enclosure	IP67	
Ambient working temperature	-35 ÷ +60 °C [-31 ÷ +140 °F]	
EMC requirements	EN61000-6-2, EN61000-6-4	



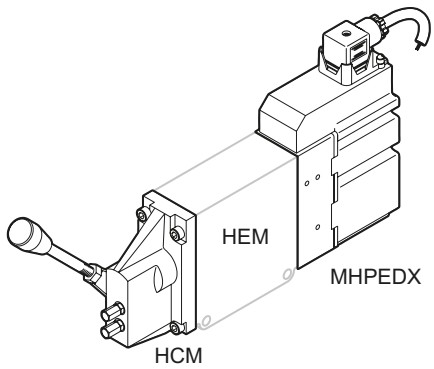
ATEX marking	II 2G Ex mb IIC T4 Gb II 2D Ex mb IIIC T135 °C Db
IECEx marking	Ex mb IIC T4 Gb Ex mb IIIC T135 °C Db

ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

For the wiring diagram of module, please refer to Instruction manual.



MHPEDX



Example with module MHPEDX and manual control HCM

MHPEDX electrohydraulic PROPORTIONAL module
MHPEDX is a closed loop electrohydraulic activation unit, whose design is based on digital technology.
MHPEDX has been specially developed to meet the harsh operating requirements of today's mobile machine market.

MHPEDX electrical closed loop proportional actuation operates safely and precisely the main spool's shift according to an electrical signal coming from a remote control unit, and is recommended where precise metering control, low hysteresis, fault monitoring, and fast system reaction are paramount.
The input signal, by means of the PCB and the two reducing proportional solenoid valves, is converted into a low pilot pressure which inturn moves the HPV's spool.

The inductive transducer position (LVDT) ensures that the spool is being moved in the correct position, otherwise, in the event of uncontrolled spool positioning, the feed-back signal will detect it as an error and it will fast react operator independent (fault monitoring system, see diagrams in the following pages)

MHPEDX is defined by:
- Capacity to handle three different kinds of input signal control (see chart below). The required signal control is to be stated in the order phase.
- Inductive transducer position, LVDT (Linear Variable Differential Transformer)
- Integrated PWM (Pulse Width Modulator)
- Fault monitoring, transistor output for signal source
- Excellent regulation
- Low hysteresis
- Short reaction time

Active version

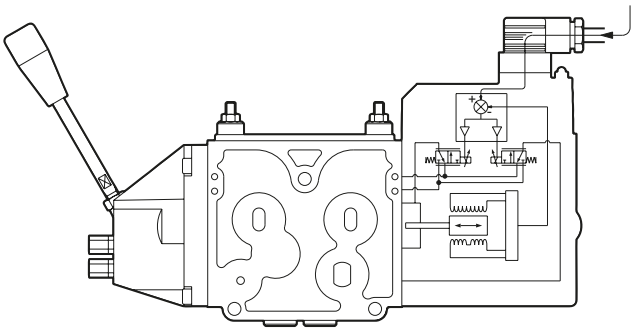
Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPEDX77E8011	MHPEDX77E8018	MHPEDX77E8026
24 Vdc	MHPEDX77E8010	MHPEDX77E8020	MHPEDX77E8028

Passive version

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPEDX77E8009	MHPEDX77E8022	MHPEDX77E8030
24 Vdc	MHPEDX77E8007	MHPEDX77E8024	MHPEDX77E8032

Cast iron body

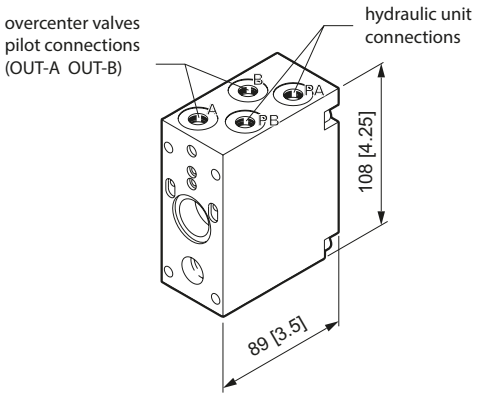
Rated voltage	12 V ± 10%	24 V ± 10%
Max. power consumption	6 W	
Analog control input (Us) to choose from:	Ratiometric 0.25xUDC ÷0.75xUDC	
	0 ÷ 10 V (available signal 2.5 ÷ 7.5 V)	
	0 ÷ 20 mA (available signal 5 ÷ 15 mA)	
	3.5 V (available signal 2 ÷ 5 V)	
Analog input impedance, ratiometric version, 0.25xUDC ÷0.75xUDC	12 kΩ	
Analog input impedance 0 ÷ 10 V version	10 kΩ	
Analog input impedance 0 ÷ 20 mA	500 Ω	
Spool positioning sensor	LVDT	
PWM outputs with current feedback	2	
PWM frequency	80 ÷ 250 Hz	
Max. current consumption	600 mA	330 mA
Error / Fault Message output (pin 3)	Max. Load 50 mA	
Working parameters setting	By software and serial interface	
Main electrical connection	3 pins Connector +PE	
Connection cable	FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Enclosure	IP67	
Ambient working temperature	-35 ÷ +60 °C [-31 ÷ +140 °F]	
EMC requirements	EN61000-6-2, EN61000-6-4	



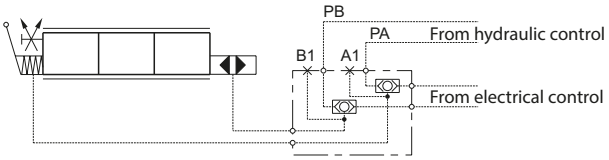
ATEX marking	CE Ex	II 2G Ex mb IIC T4 Gb II 2D Ex mb IIIC T135 °C Db
IECEx marking	CE Ex	Ex mb IIC T4 Gb Ex mb IIIC T135 °C Db

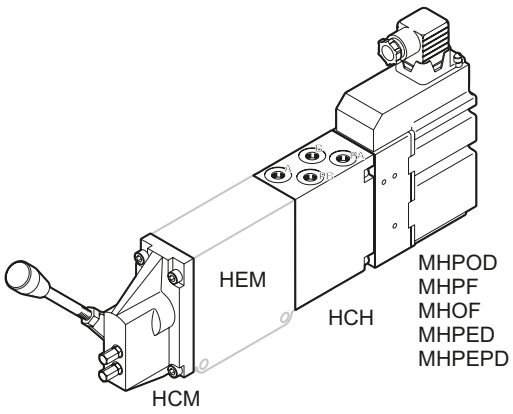
ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

For the wiring diagram of module, please refer to Instruction manual.



HCH





Example with module HCH, manual control HCM and MHPOD module

HCH module to get hydraulic and electrical remote control HCH module is a small manifold that can be matched with all the HPV 77 proportional directional valves' elements, and with all the HPV electrohydraulic controls. The use of the HCH module, besides and in conjunction with electrohydraulic proportional, radio and on-off controls, also allows the hydraulic proportional control to be reached.

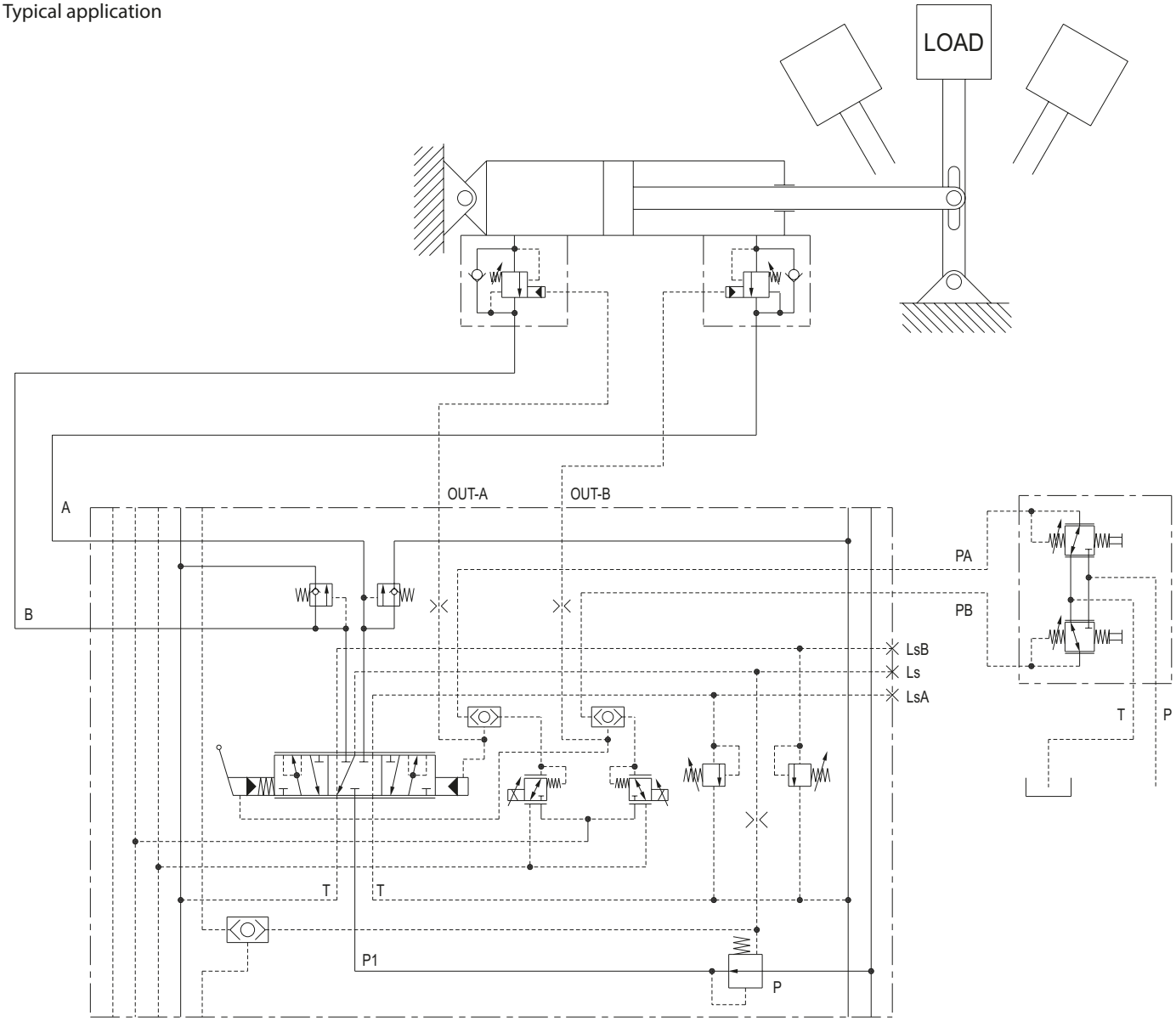
This new device features two supplementary work ports which can be used to pilot the overcenter valves through the same low pressure HPV spool. With this solution the control of the overcenter valves turns out to be much more precise, since the pilot pressure acting on them is never influenced by variations in pressure owing to moving loads.

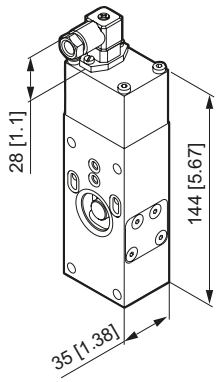
Max. pilot pressure 36 bar [522 psi].

It is essential to use overcenter valves with high pilot ratio (15:1 ÷ 20:1)

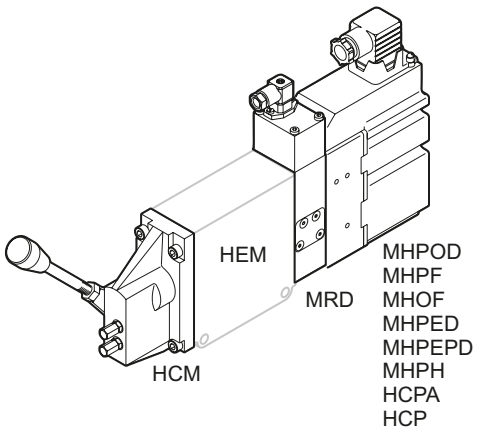
Type	Code (Aluminum)	
	Connections 1/4 BSPP	Connections 7/16" - 20 UNF - 2B
For MHPOD. MHPF, MHOF modules (open ring version)	HCH0007704605	HCH0007704606
For MHPED. MHPEPD modules (closed ring version)	HCH0007704607	HCH0007704608

Typical application





MRD



Example with module MRD, manual control HCM and MHPOD module

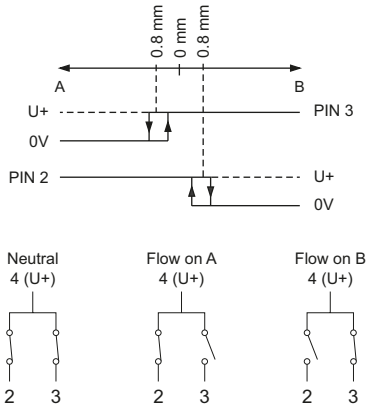
MRD electrical spool movement device
The main purpose of this module is to give an indication of the spool's movement, by mean of an on-off signal. Suitable for all those applications where, the spool travel has to be remotely monitored or integrated wiht the whole machine electrical system.
Spool direction indicator output Hirshmann connector according to DIN 40050.

Voltave	12 VDC – 24 VDC (min. 10 VDC - max. 30 VDC)
Maximum current	Resistive load 5A Inductive load: 3A
Switch position	± 0.8 mm (+0.2 / 0.3 mm)
Protection degree	IP40

Type	Code
Normally closed	MRD000774263
Normally open	MRD000774265

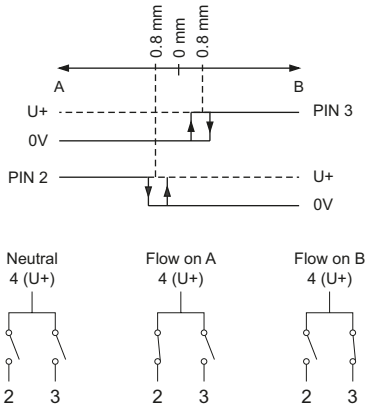
HPV 77

Normally closed

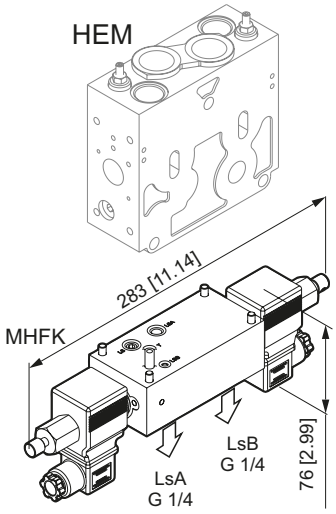


PIN No.	Neutral position	B port	A port
2	U+	0V	U+
3	U+	U+	0V
4	Common		

Normally open



PIN No.	Neutral position	B port	A port
2	0V	0V	U+
3	0V	U+	0V
4	Common		

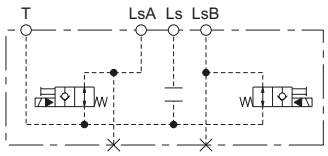


MHFK electrical Ls A/B unloading module
Developed for those applications where the max. working pressure can be selected according to an on-off electric signal.
Normally open valves. Aluminum body.

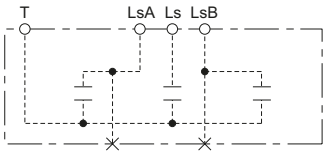
Technical featues

Max. operating pressure	370 bar [5366 psi]
Max. flow	30 l/min [7.9 US gpm]
Max. Leakage (0-5 drops/min)	0-0.25 cm^3/min
Max. excitation frequency	2 Hz
Duty cycle	100% ED
Hydraulic fluids	Mineral Oil DIN 51524
Oil viscosity	10 ÷ 500 mm^2/s (cSt]
Oil temperature	-25 ÷ +75 °C [-13 ÷ +167 °F]
Ambient temperature	-25 ÷ +60 °C [-13 ÷ +140 °F]
Max. contamination level class with filter	ISO 4406:1999 class 21/19/16
Cartridge filter	280µm
Degree of enclosure (depending on connector)	IP 65
Weight (with coil)	0.350 kg [0.77 lb]
Cartridge tightening torque	25 ÷ 30 Nm [18.4 ÷ 22 lbf·ft]
Coil ring nut tightening torque	7 Nm [5.2 lbf·ft]

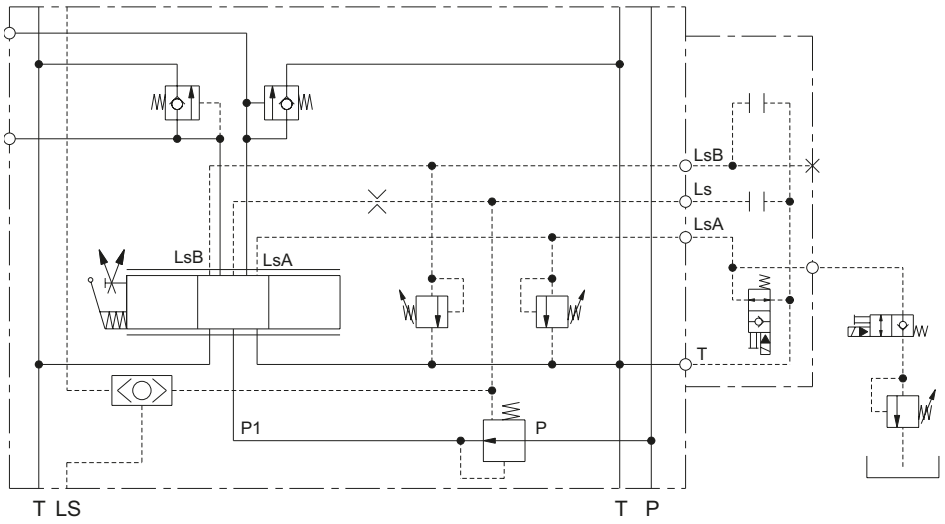
With the electrical LsA/B unloading modules, the EU flow restrictors must always be mounted onto the spools (HEAS) see page C-86.

Active on LsA + LsB	Voltage	Code
	14 VDC	on request
	28 VDC	MHFK007706630

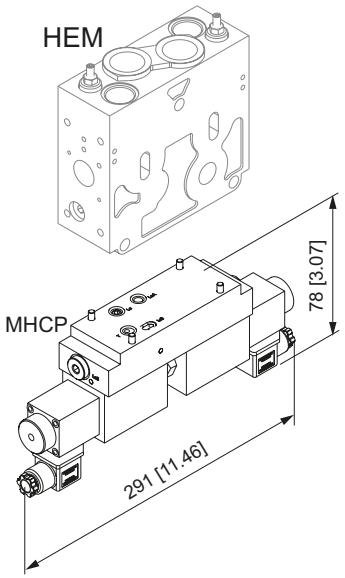
Thread BSPP G 1/4

Plugs	Code
	RCRP20300000

HSET plugs in CRP04HP cavities
1/4" BSPP plugs in LSA, LSB cavities



MHCP module for HEM working sections



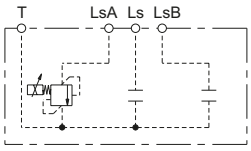
Electrohydraulic proportional module for remote A / B ports working pressure control
MHCP is a electric proportional module that allows the working pressure to be remotely operated by means of a current signal MHPF is designed to ensure system pressure to be infinitely adjust in accordance upon the electrical command valve. When the working pressure exceed the setting pressure value, the A – B ports flow is being cut-off.

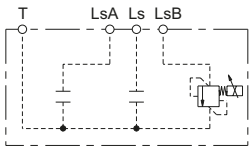
When MHCP is not energized, both pressure and flow will be maintain close to zero.

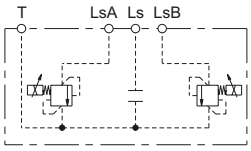
MHCP is always to be used with pressure compensated working sections.

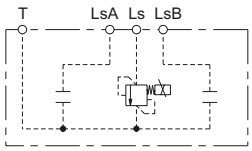
Cast iron body.

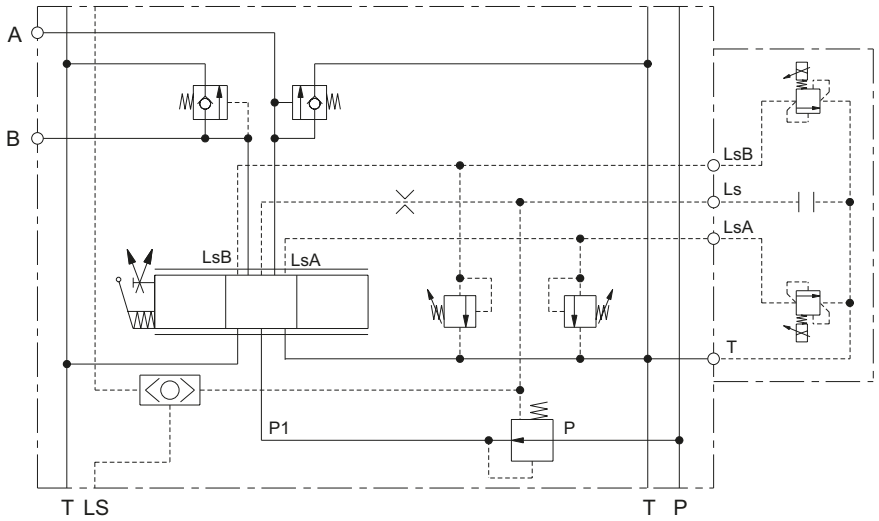
With the electrical LsA/B unloading modules, the EU flow restrictors must always be mounted onto the spools (HEAS) see page C-86.

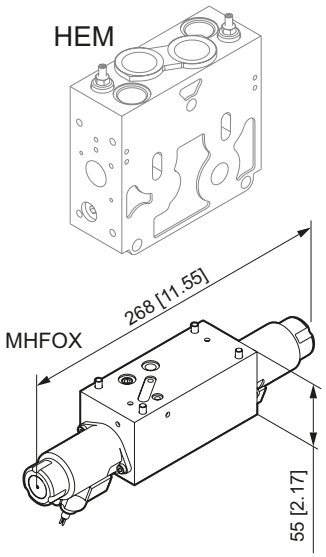
Active on LsA	Voltage	Code
	24 VDC	MHCP007706210

Active on LsB	Voltage	Code
	24 VDC	MHCP007706220

Active on LsA + LsB	Voltage	Code
	24 VDC	MHCP007706230

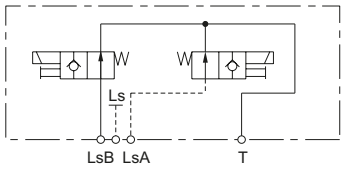
Active on Ls	Voltage	Code
	24 VDC	MHCP007706305





MHFOX electrical LsA/B signal unloading module Atex version
LsA / LsB pilot signal unloading solenoid valve. If the Atex on/off solenoids are not energized, there is no flow on A/B work ports, while the pressure in the open centre circuits will be equal to the P → T unloading pressure value on the inlet section, plus the counterpressure acting on T line. In closed centre circuits (under the same operating conditions) the pressure will be equal to the stand-by pump pressure.
Normally open valves. Cast iron body.

With the electrical LsA/B unloading modules, the EU flow restrictors must always be mounted onto the spools (HEAS) see page C-86.

Active on LsA + LsB	Voltage	Code
	12 VDC	MHFOX07706225
	24 VDC	MHFOX07706230

Technical featues

Nominal voltage	12 VDC	24 VDC
Coil resistance, R20	9 Ω ± 6%	35.8 Ω ± 6%
Min. current	700 mA	350 mA
Max. current	1850 mA	930 mA
Limit power	14.3 W	14.4 W
Ambient temperature	-20 ÷ +50 °C [-4 ÷ +122 °F]	
Connection cable	FL4G11Y - 3 x 1.5 mm² [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Integrated diode to limit switch-off overvoltage	See coil manufacturer manual	
Short-circuit protection	With fuse - See coil manufacturer manual	
Duty cycle	100%	
Input pressure	Max. 400 bar [5800 psi]	
Switching pressure	Max 200 bar [2900 psi]	
Operating Limits	400 bar at max. flow 7 l/min [2900 psi at max. flow 1.85 US gpm]	
Flow P → T at Δp =2 bar [19 psi]	> 6.5 l/min [1.72 UD gpm]	
Leakage P → T (Oil Temp. 50°C / Input press. 400 bar [5800 psi])	< 20 ml/min [0.002 UD gpm]	
Fluid temperature	-20 ÷ +80 °C [-4 ÷ +176 °F]	
Ground connection	Up to 4 mm² - 11 AWG	
Protection class (DIN VDE 0580)	I	
Fluids	Hydraulic oil to DIN 51524.ATF-oil	
Protection ratings (DIN VDE 0470 / EN 60529)	IP67 / IP69K	
Shock-resistance to EN 50014	4 J	

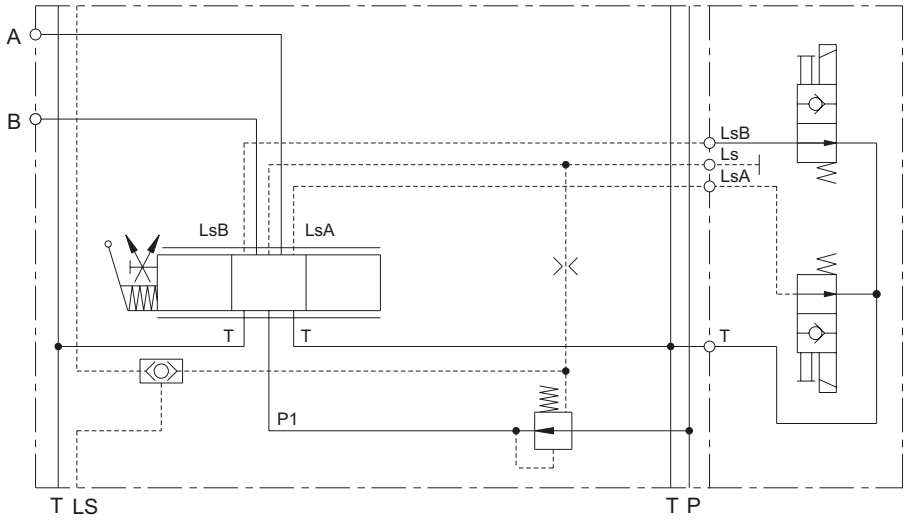
ATEX electro-hydraulic modules for HPV features and safety instructions see page A-3.

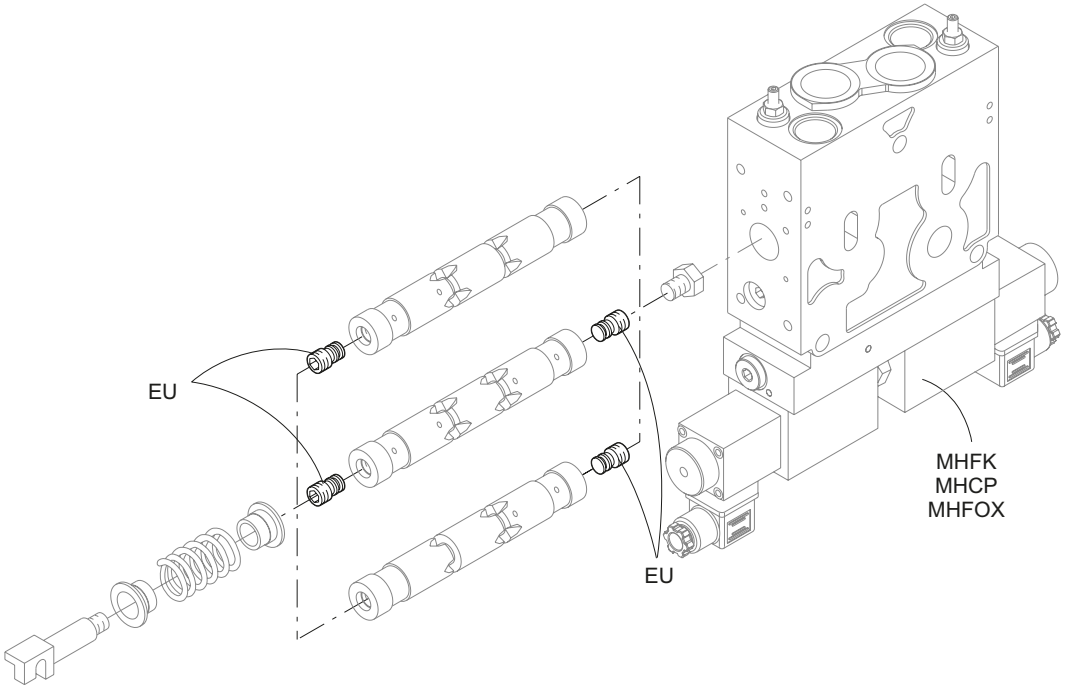
For the wiring diagram of module, please refer to Instruction manual.

These modules, fitted on the proportional valve with MHOX modules, are subject to the complete certification of the valve; in this case the label will refer to the complete valve: MHOX - HEM.
When the modules are individually supplied, a label is attached to the module with the following labelling:

CE Ex II 2 GD c T4 / T135°C
T_{amb}= -20 °C ÷ +50 °C
T_{fluid}= -20 °C ÷ +80 °C

This labelling is printed on the label of modules, in a visible position.
The final customer, when buying this module individually, is in charge of the assembly and coupling of such component with others ATEX components of different classes, groups and temperatures.



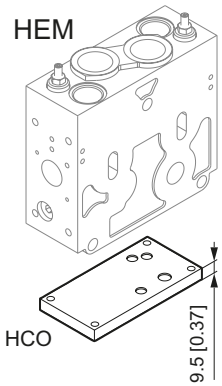


Modules, EU flow restrictors for HPV 77 spools, for LsA/B electrical unloading modules
When the working sections (HEM) are equipped with the MHFK-MHCP-MHFOX electrical LsA/B unloading modules, the EU flow restrictors must always be mounted onto the spools (HEAS).

The code number has to be indicated under the spool code field in the order form.

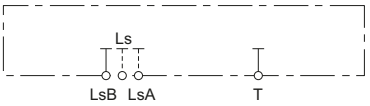
Any kind of spool are always prearranged for EU modules.

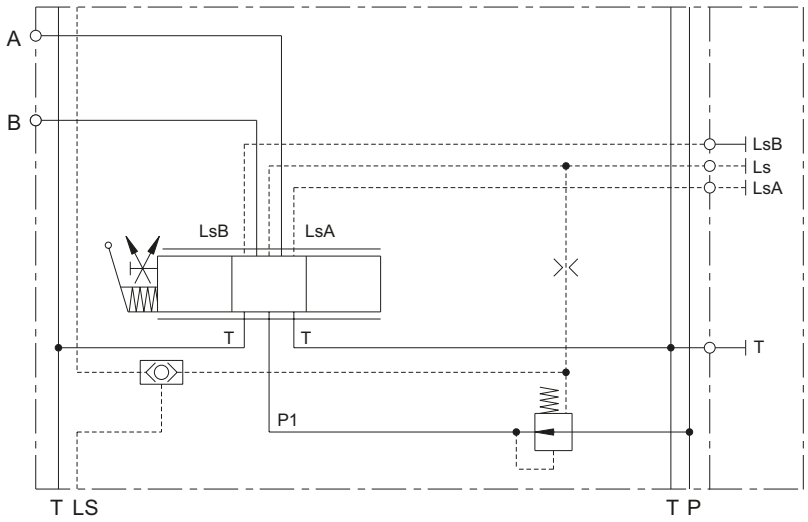
Description	Code
Active on LsA or LsB only	HEAU007704200
Active on LsA + LsB and Ls	HEAU007704201



HCO module - bottom plate to close the MHFO, MHFK, MHFP facilities

Aluminum body.

HCO	Code
	HCO0007704603

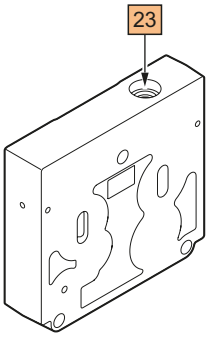


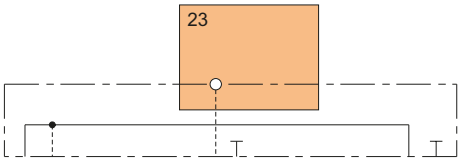


HSC end sections

Available versions:
- With no ports
- With Ls1, P1, T1 ports
- With Ls1 port

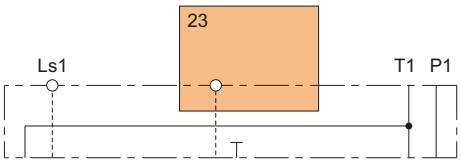
Cast iron body.





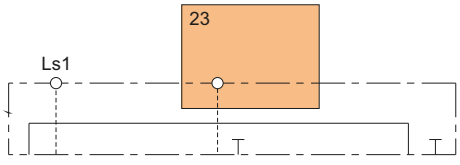
With no ports

Code	
BSPP	UN - UNF
HSC0007705020	



With Ls1, P1, T1 ports

Code	
Ports P1, T1 (3/4" BSPP) Ls1 (1/4" BSPP)	Ports P1, T1 (1 1/16"-12UNF-2B) Ls1 (7/16"-12UNF-2B)
HSC0007705025	HSC0007705030

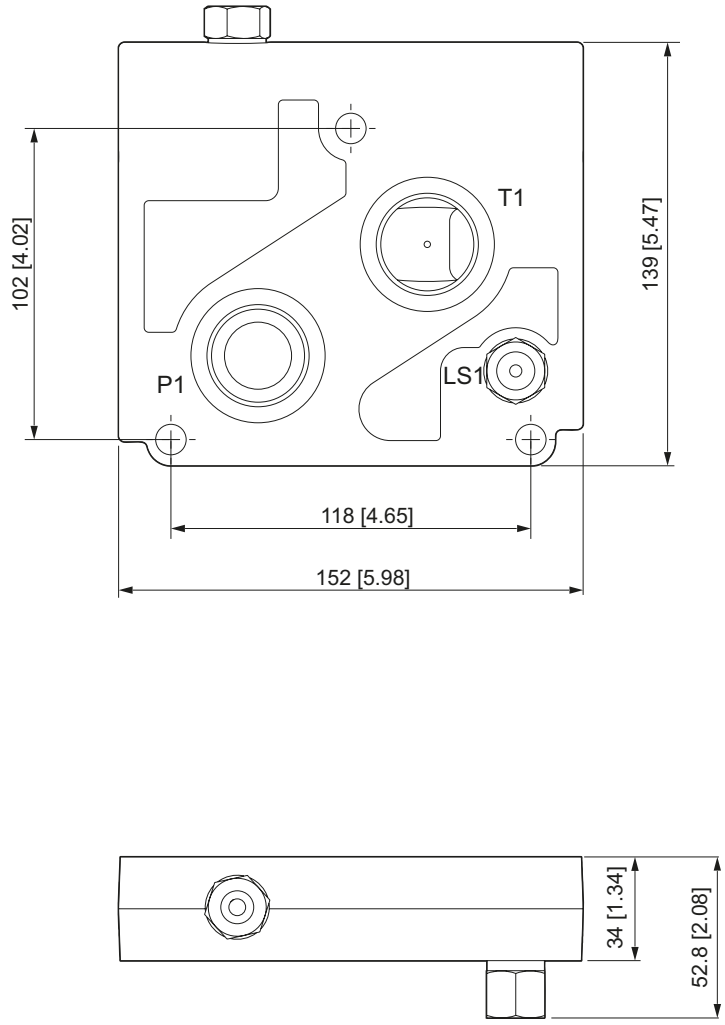


Con connessione Ls1

Code	
Ports Ls1 (1/4" BSPP)	Ports Ls1 (7/16"-12UNF-2B)
HSC0007705026	HSC0007705027

23 Plug or cartridge page C-96

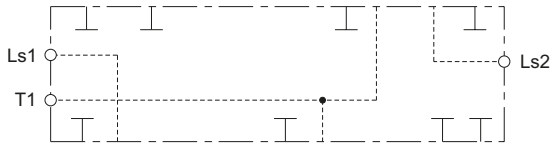
HSC end section overall dimensions



mm [inch]

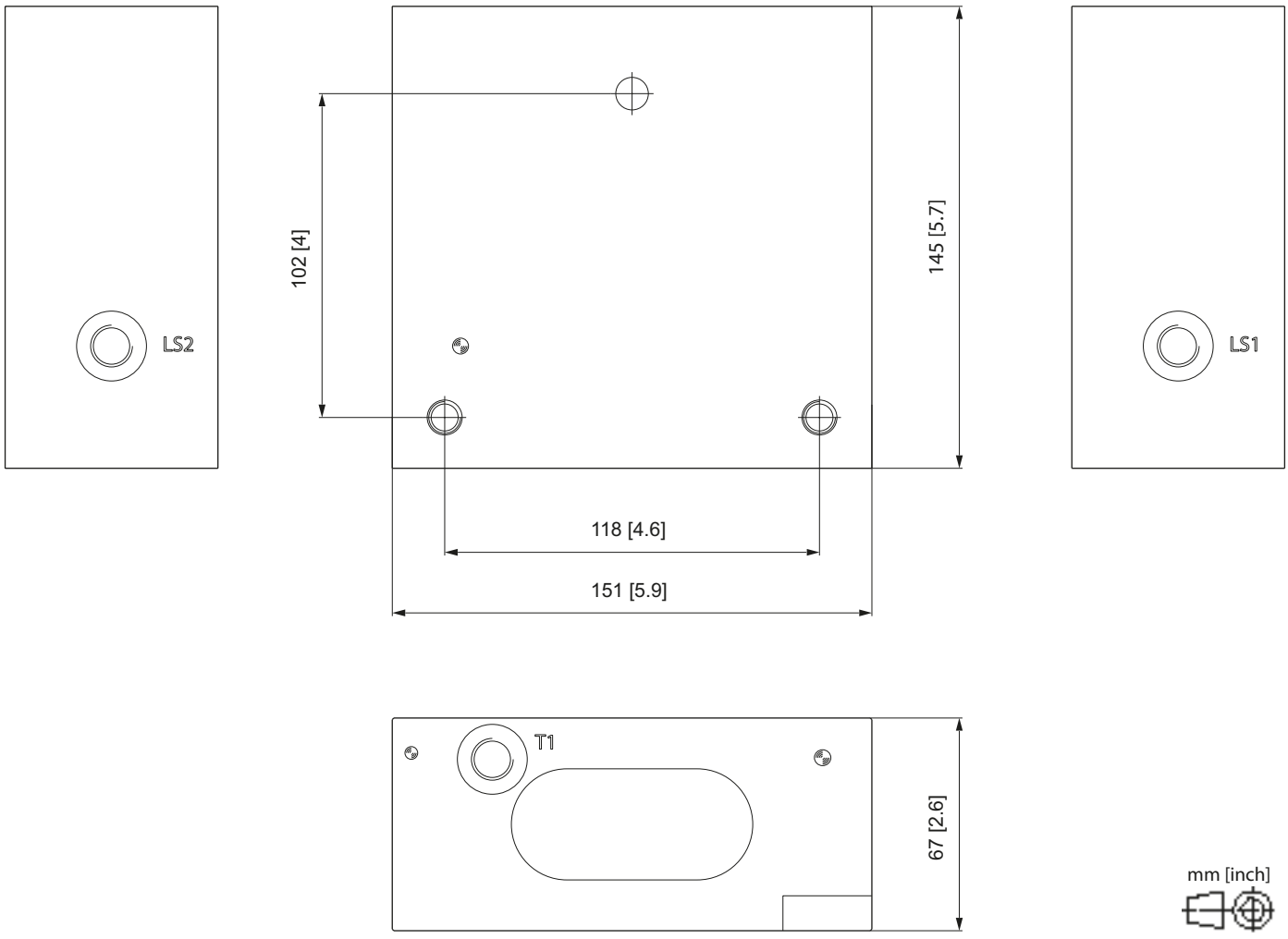


HPFS mid end section
HPFS mid end section allows two inlet sections HSE in one HPV. Cast iron body.

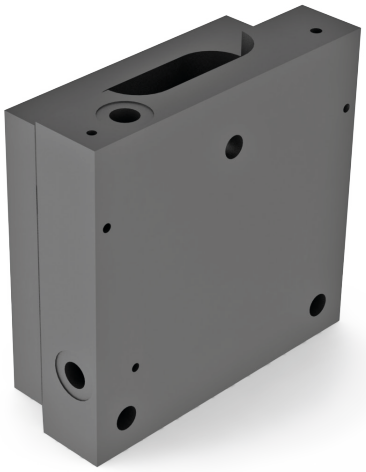


Code	
Ports T1 (1/4" BSPP)	Ports T1 (7/16"-20UNF-2B)
HPFS007705032	HPFS007705034

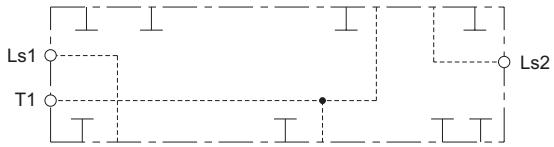
HPFS mid end section overall dimensions



mm [inch]

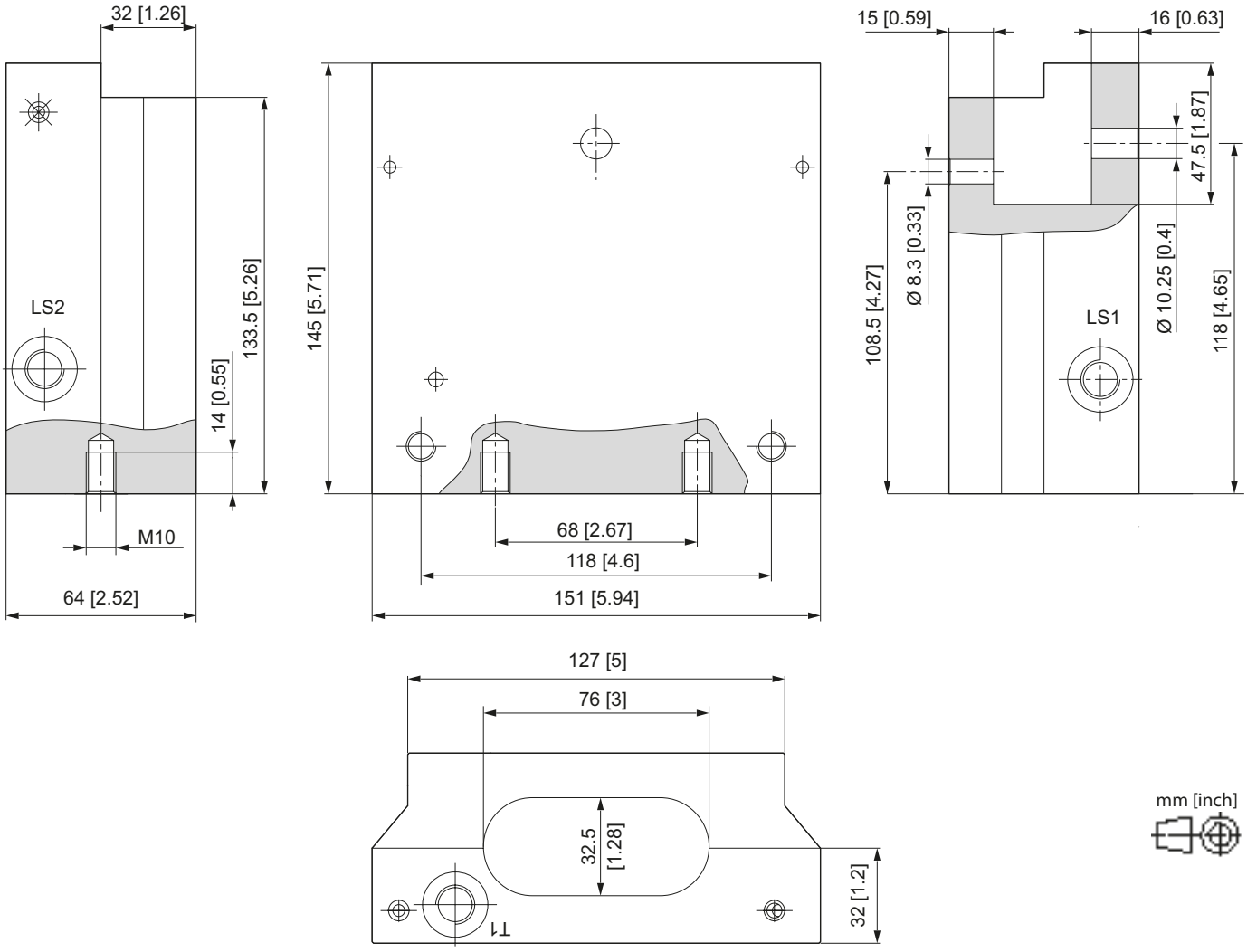


HPFS mid end section
HPFS mid end section allows assembling an HPV77 directional valve with an HPV41 directional valve, each of them with its own HSE inlet section. Cast iron body.

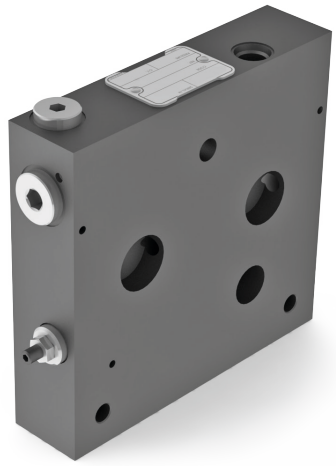


Code
Ports T1 (1/4" BSPP)
HPFS007705039

HPFS mid end section overall dimensions

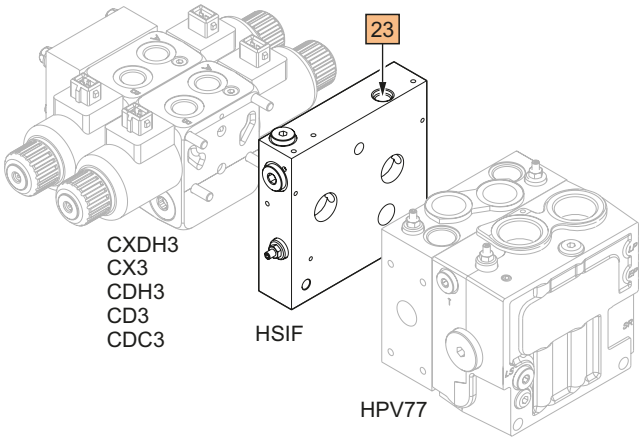


mm [inch]



The HSIF interface allows an hydrauli connection between the elements of HPV77proportional valves with the elements of CXDH3 / CX3 proportional valves or CDH3 / CD3 / CDC3 on/ off valves.
This type of combination is highly appreciated in case of high flow differences between the controlled actuators.
The HSIF module must be inserted into the proportional valve configuration between the last HPV77 working section and the first CXDH3 / CX3 / CDH3 / CD3 / CDC3 working section.
Up to 8 elements of HPV77 and 8 elements of CXDH3 / CX3 / CDH3 / CD3 / CDC3 can be installed.
The HSIF interface replaces the inlet module for CXDH3 / CX3 / CDH3 / CD3 / CDC3.

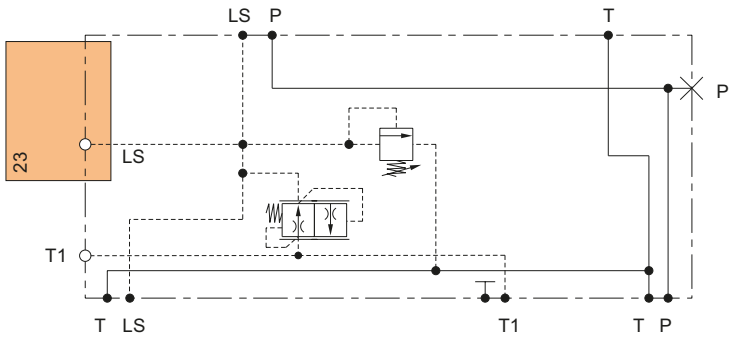
NOTE: You have to indicate in composition module the plug or the cartridge (see page C-96).



Max. operating pressure	300 bar [4351 psi]
Max. flow	80 l/1' [21 US gpm]
Weight (with coil)	5.4 kg [11.9 lb]

Description	Code
Cast iron HSIF interface	HSIF007705034

Side CXDH3 / CX3 / CDH3 / CD3 / CDC3



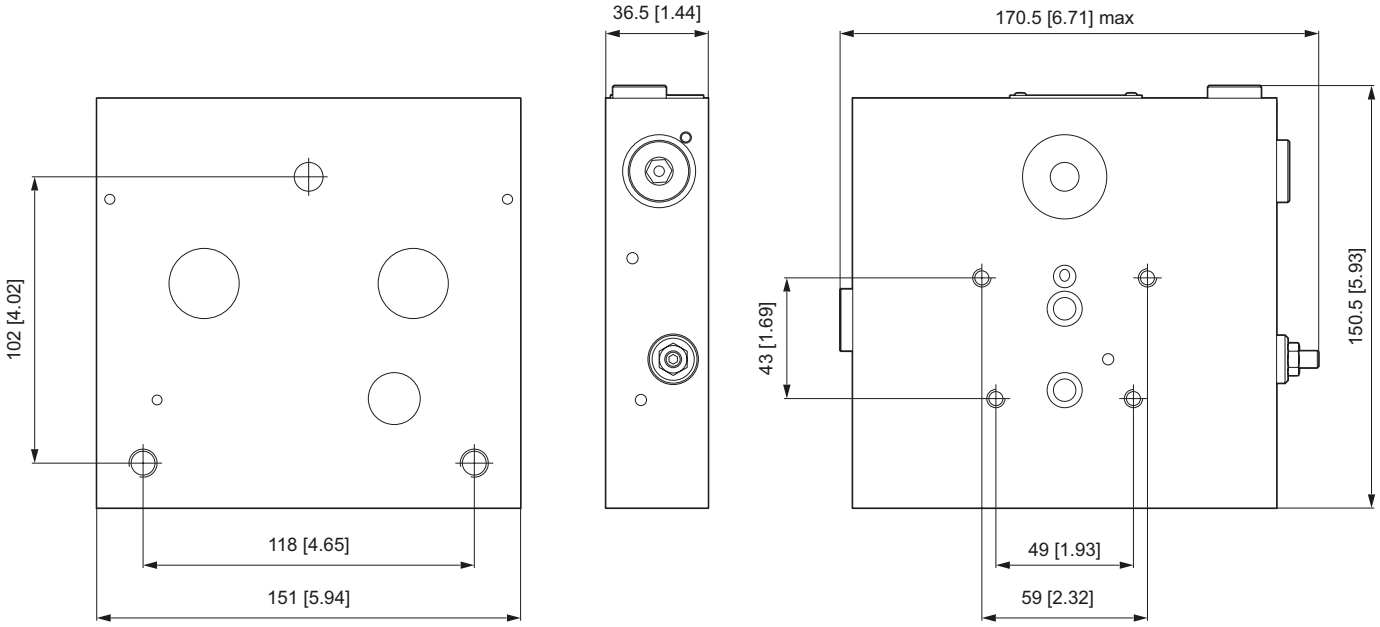
Side HPV 77

mm [inch]

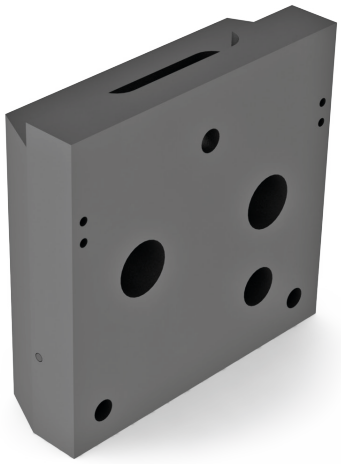
23 Cartridge, page C-96

Bankable valves CXDH3 / CX3 / CDH3 / CD3 / CDC3 see catalogue code DOC00046)

HSIF interface overall dimensions

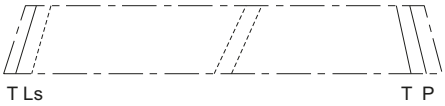


mm [inch]

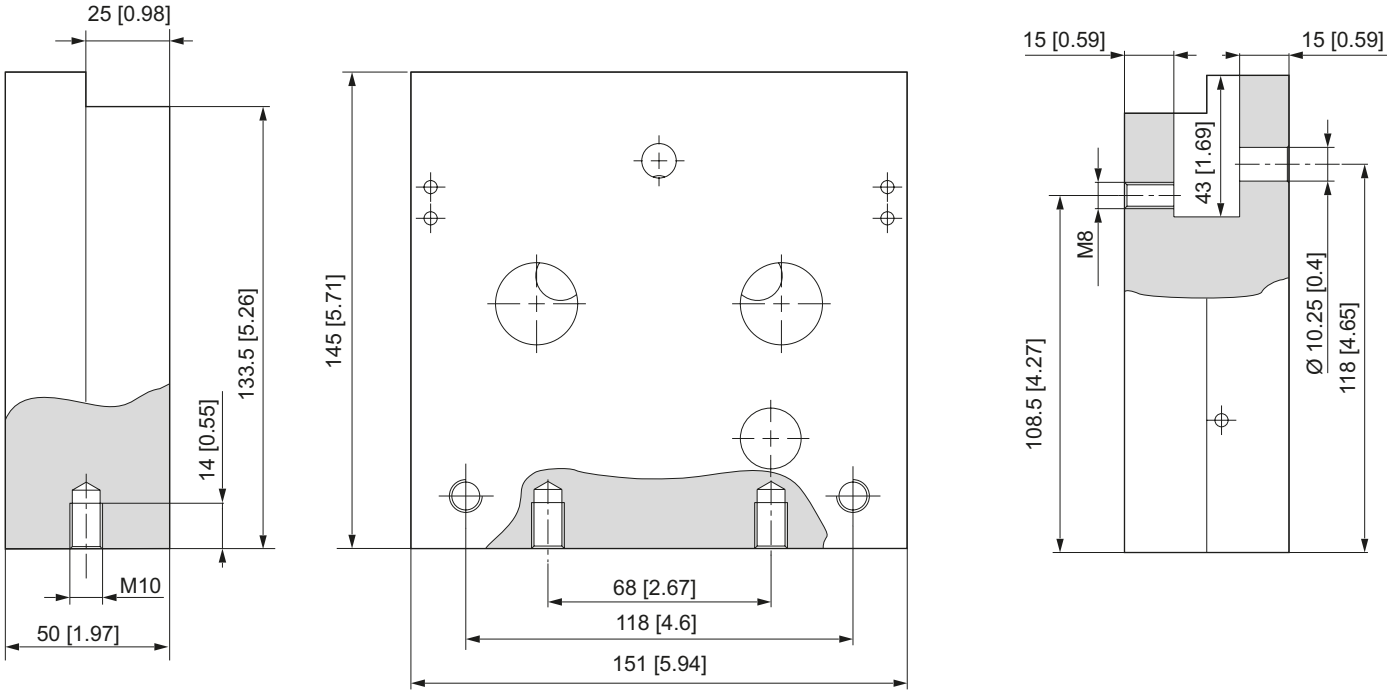


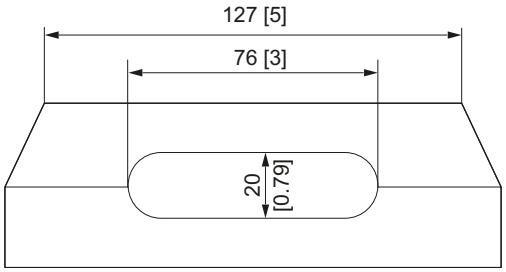
The HSIF interface hydraulically connects the elements of proportional valve HPV 77 with the elements of proportional valve HPV 41.
This type of combination is highly appreciated in those cases involving great differences in flow between the controlled actuators.
The HSIF module must be inserted into the proportional valve configuration between the last HPV77 working section and the first HPV41 working section.
Up to 6 HPV77 working sections and 8 HPV41 working sections can be installed.

Description	Code
Cast iron HSIF interface	HSIF007705031



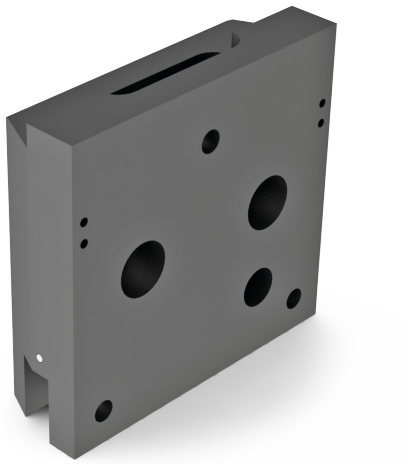
HSIF interface overall dimensions





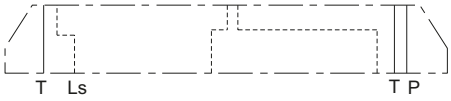
mm [inch]

HSEF Interface between HPV 77 with HFLS and HPV 41

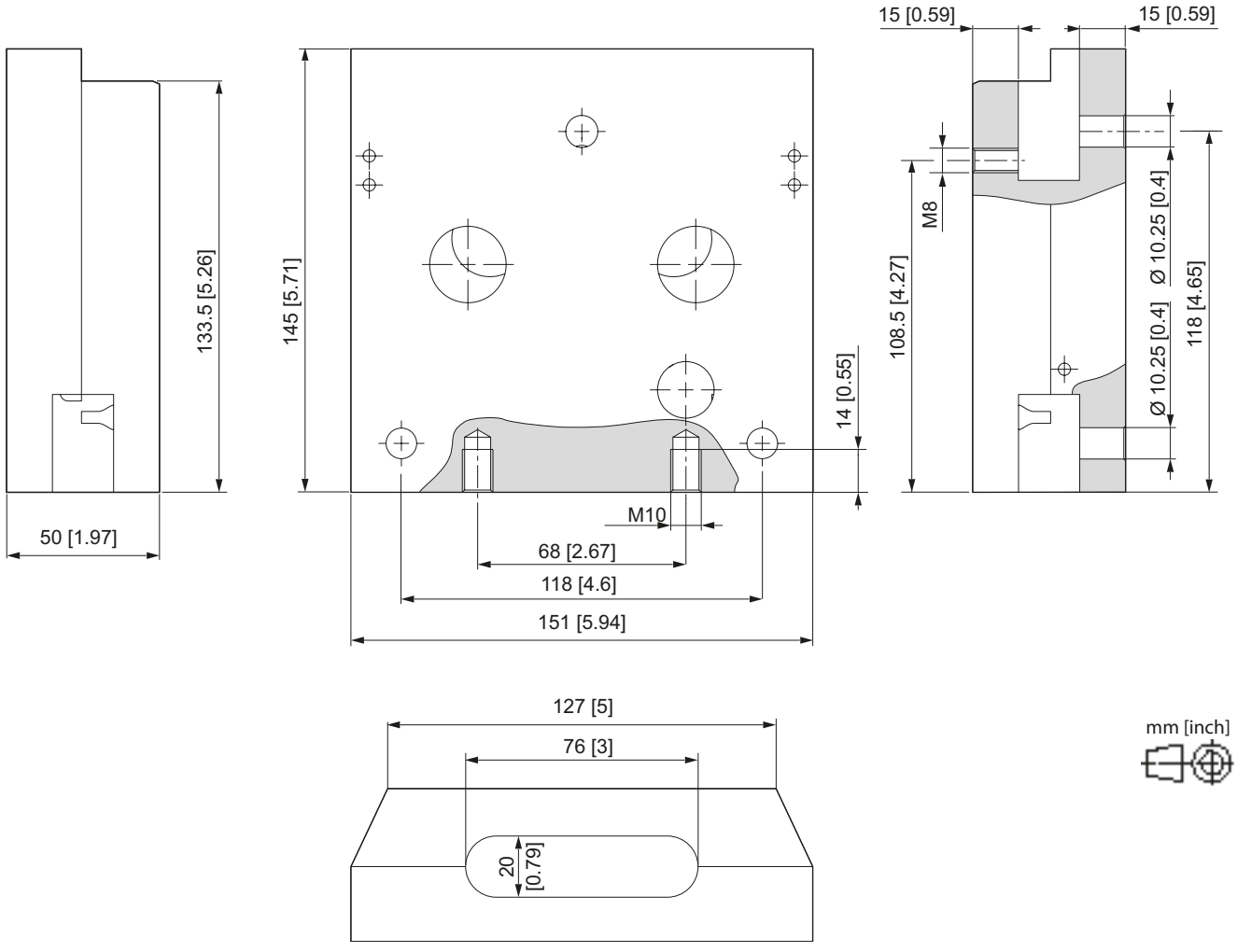


The HSEF interface hydraulically connects the elements of proportional valve HPV 77 with the elements of proportional valve HPV 41 when there is HFLS mid end section in HPV77 side.
The HSEF module must be inserted into the proportional valve configuration between the last HPV77 working section and the first HPV41 working section.
Up to 6 HPV77 working sections and 8 HPV41 working sections can be installed..

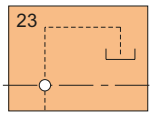
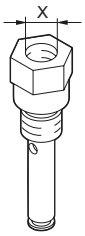
Description	Code
Cast iron HSEF interface	HSEF007705041

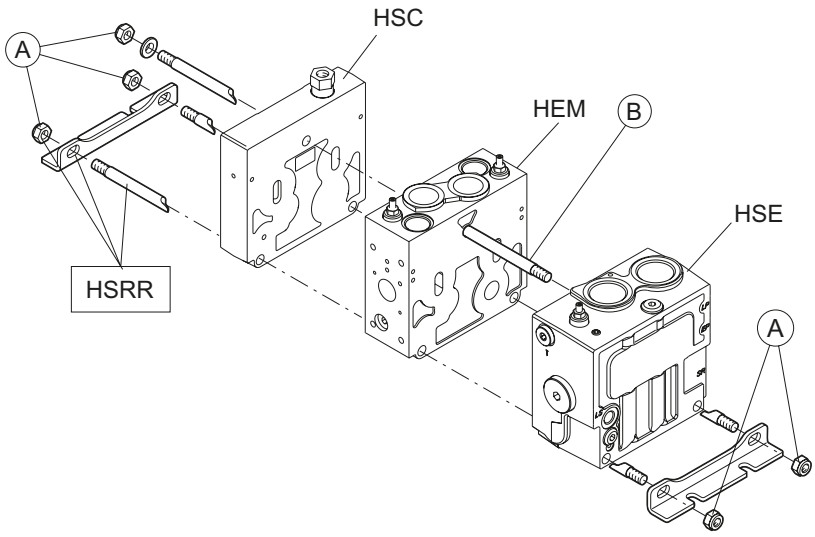


HSEF interface overall dimensions



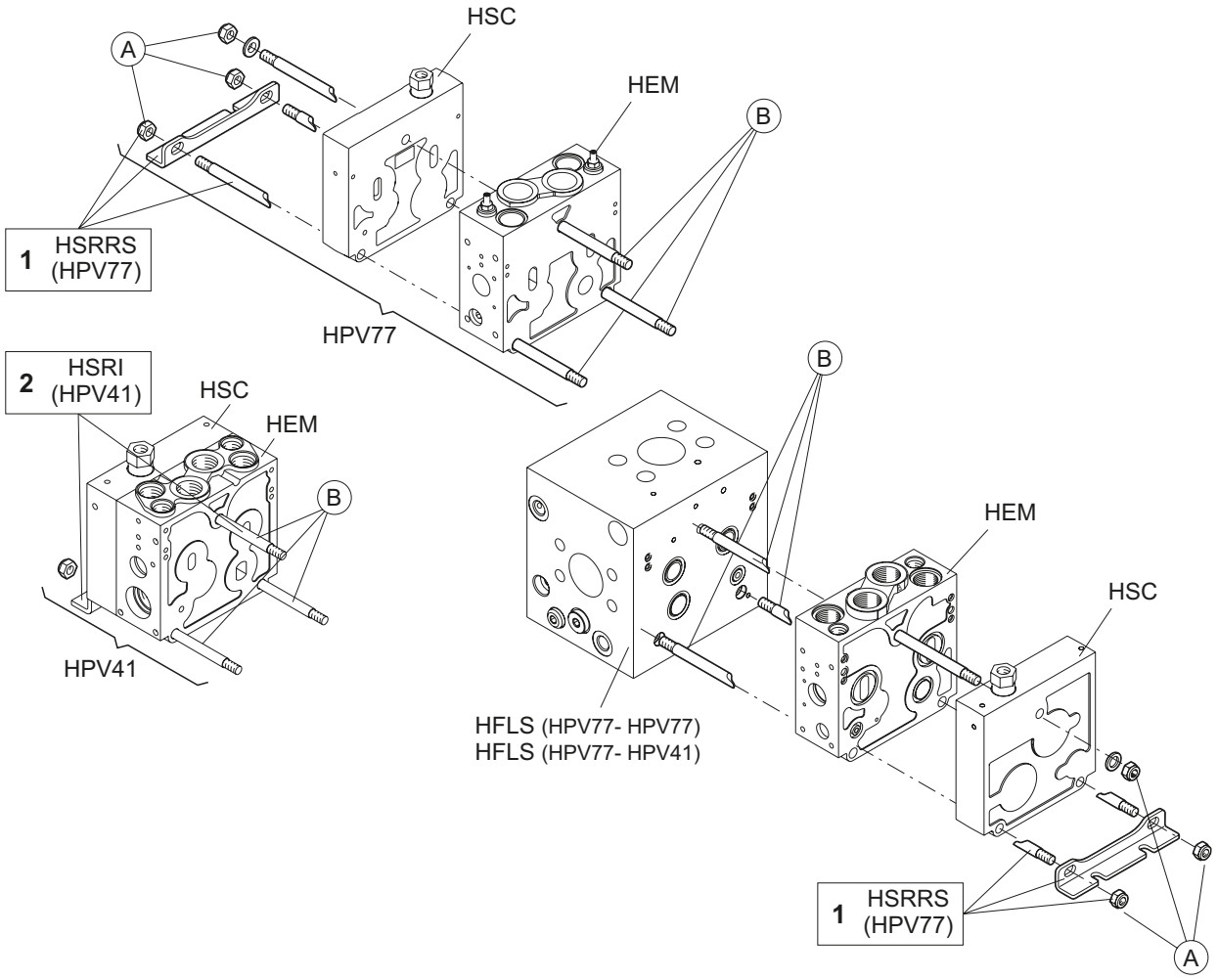
Accessories for HSC end section and HSIF interface

Code		Description	Symbol / Field	Draw
BSPP	UN - UNF			
CSRV007701203 1/4" BSPP	CSRV007701206 7/16"-20UNF-2B	CSRV External drain cartridge for HSC module (to be connected to drain line)		



No. of working sections (HEM)	Code
1	HSRR007705561
2	HSRR007705562
3	HSRR007705563
4	HSRR007705564
5	HSRR007705565
6	HSRR007705566
7	HSRR007705567
8	HSRR007705568
9	HSRR007705569
10	HSRR007705570

Tightening torques nuts "A" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]



1 - Stay bolts kit for HPV77

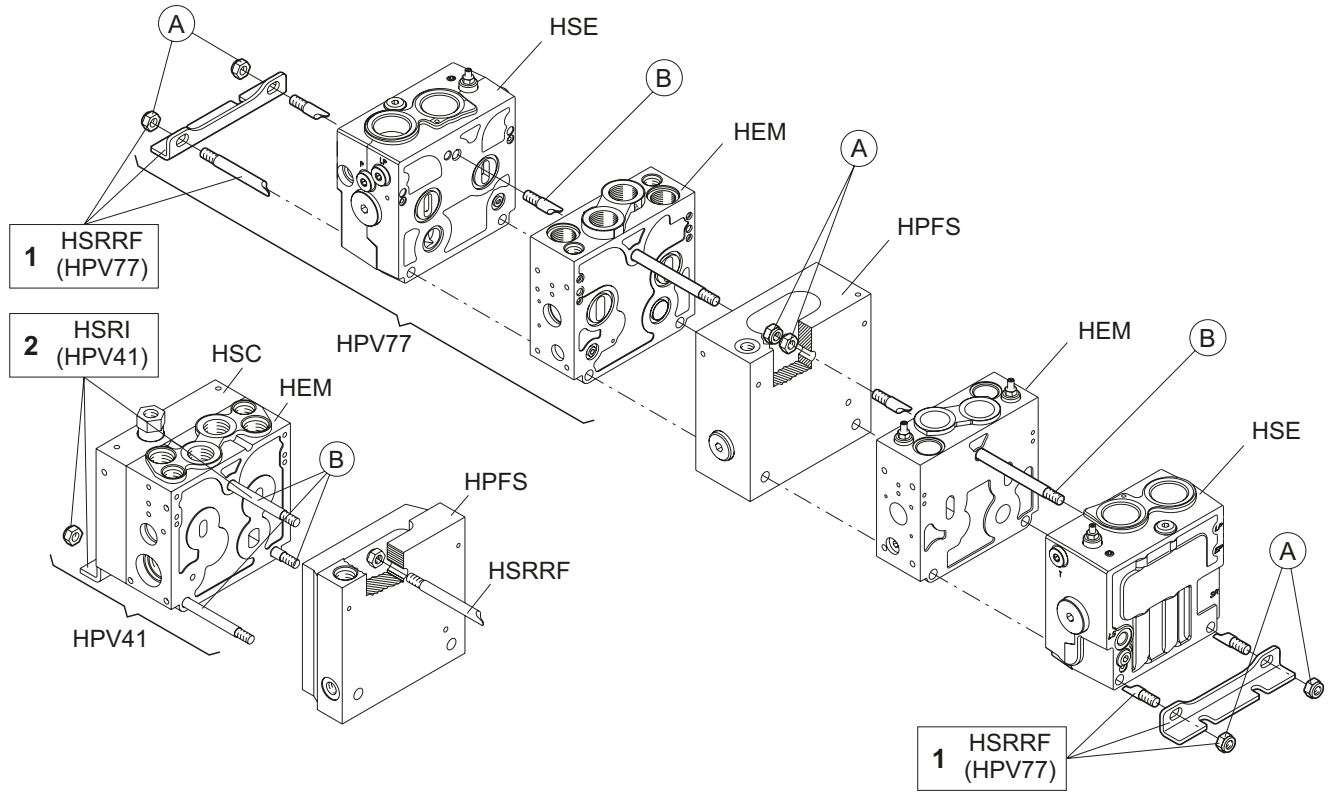
No. of working sections (HEM 77)	Code
1	HSRRS07705771
2	HSRRS07705772
3	HSRRS07705773
4	HSRRS07705774
5	HSRRS07705775
6	HSRRS07705776

Tightening torques nuts "A" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]

2 - Stay bolts kit for HPV41

No. of working sections (HEM 41)	Code
1	HSRI004105561
2	HSRI004105562
3	HSRI004105563
4	HSRI004105564
5	HSRI004105565
6	HSRI004105566
7	HSRI004105567
8	HSRI004105568
9	HSRI004105569
10	HSRI004105570

Tightening torques nuts "A" : 22.5 ± 2 Nm [16.6 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 25 ± 2 Nm [18.4 ± 1.5 lbf·ft)



1 - Stay bolts kit for HPV77

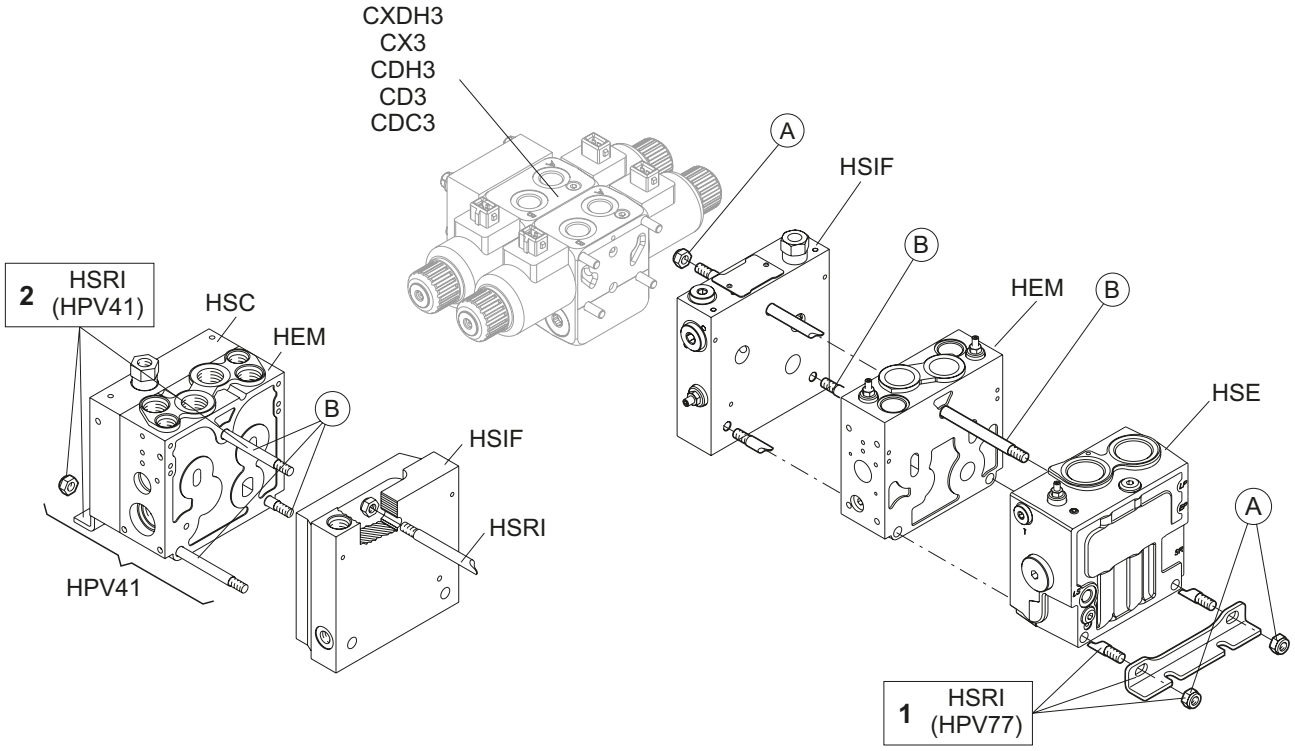
No. of working sections (HEM 77)	Code
1	HSRRF07705671
2	HSRRF07705672
3	HSRRF07705673
4	HSRRF07705674
5	HSRRF07705675
6	HSRRF07705676
7	HSRRF07705677
8	HSRRF07705678

Tightening torques nuts "A" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]

2 - Stay bolts kit for HPV41

No. of working sections (HEM 41)	Code
1	HSRI004105561
2	HSRI004105562
3	HSRI004105563
4	HSRI004105564
5	HSRI004105565
6	HSRI004105566
7	HSRI004105567
8	HSRI004105568
9	HSRI004105569
10	HSRI004105570

Tightening torques nuts "A" : 22.5 ± 2 Nm [16.6 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 25 ± 2 Nm [18.4 ± 1.5 lbf·ft)



1 - Stay bolts kit for HPV77

No. of working sections (HEM 77)	Codice
0	HSRI007705570
1	HSRI007705571
2	HSRI007705572
3	HSRI007705573
4	HSRI007705574
5	HSRI007705575
6	HSRI007705576

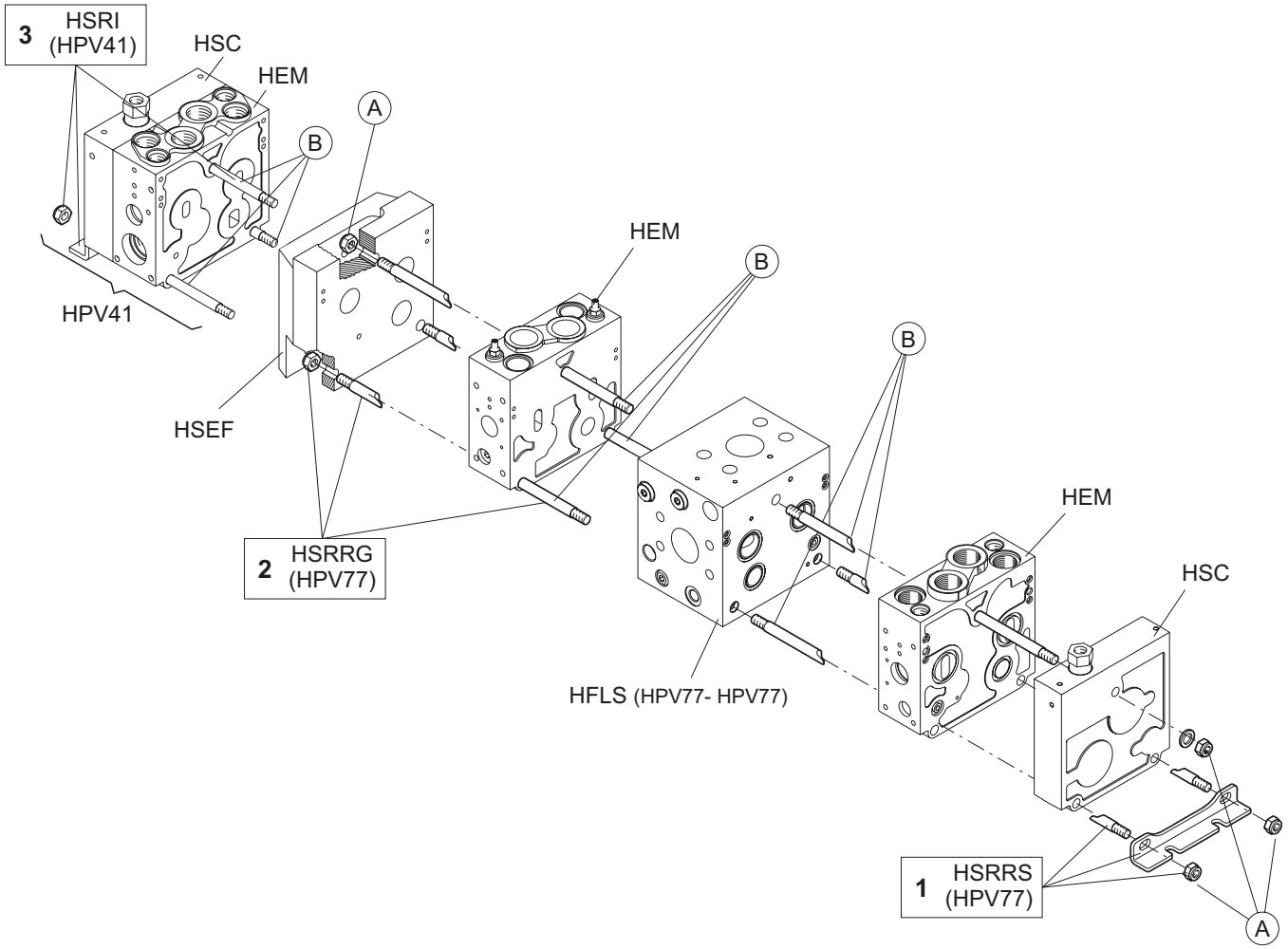
Tightening torques nuts "A" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]

2 - Stay bolts kit for HPV41

No. of working sections (HEM 41)	Code
1	HSRI004105561
2	HSRI004105562
3	HSRI004105563
4	HSRI004105564
5	HSRI004105565
6	HSRI004105566
7	HSRI004105567
8	HSRI004105568
9	HSRI004105569
10	HSRI004105570

Tightening torques nuts "A" : 22.5 ± 2 Nm [16.6 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 25 ± 2 Nm [18.4 ± 1.5 lbf·ft)

Stay bolts kit for mid inlet HFLS + HSIF interface



1 - Stay bolts kit for HPV77

No. of working sections (HEM 77)	Codice
1	HSRRS07705771
2	HSRRS07705772
3	HSRRS07705773
4	HSRRS07705774
5	HSRRS07705775
6	HSRRS07705776

Tightening torques nuts "A" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]

2 - Stay bolts kit for HPV77 + interface HSIF + HPV41

No. of working sections (HEM)	Code
1	HSRRG07705589
2	HSRRG07705590

Tightening torques nuts "A" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 50 ± 2 Nm [36.9 ± 1.5 lbf·ft]

3 - Stay bolts kit for HPV41

No. of working sections (HEM 41)	Code
1	HSRI004105561
2	HSRI004105562
3	HSRI004105563
4	HSRI004105564
5	HSRI004105565
6	HSRI004105566
7	HSRI004105567
8	HSRI004105568
9	HSRI004105569
10	HSRI004105570

Tightening torques nuts "A" : 22.5 ± 2 Nm [16.6 ± 1.5 lbf·ft]
Tightening torques stud bolts "B" : 25 ± 2 Nm [18.4 ± 1.5 lbf·ft]

Spare parts seals kits

For sections and controls		Code					
		RKRC0723000	RKRC0730000	RKRC1751000	RKRC1752000	RKRC1754000	RKRC2757000
Rear cover	HCF		•				
Hydraukic remote control	HCH			•			
Electrical	HCK	•					
Mechanical control	HCM				•		
Friction	HCN					•	
Rear cover	HCP					•	
Rear cover	HCPA		•				
Spool lock device	HCPD					•	
Working section	HEM						•
Intermediate inlet section	HFLS						•
Intermediate end section	HPFS						
End section	HSC						
Inlet section	HSE						•
Electrical	MHOF			•			
Electrical	MHPED			•			
Electrical	MHPEPD			•			
Electrical activation	MHPH			•			
Electrical	MHPOD			•			
Electrical	MSPF	•					

See composition form page C-25.