DANA ARON™

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Product Catalog

Dana Hydraulic Solutions
HPV41-HPV77-HPV310

Proportional Directional Valves

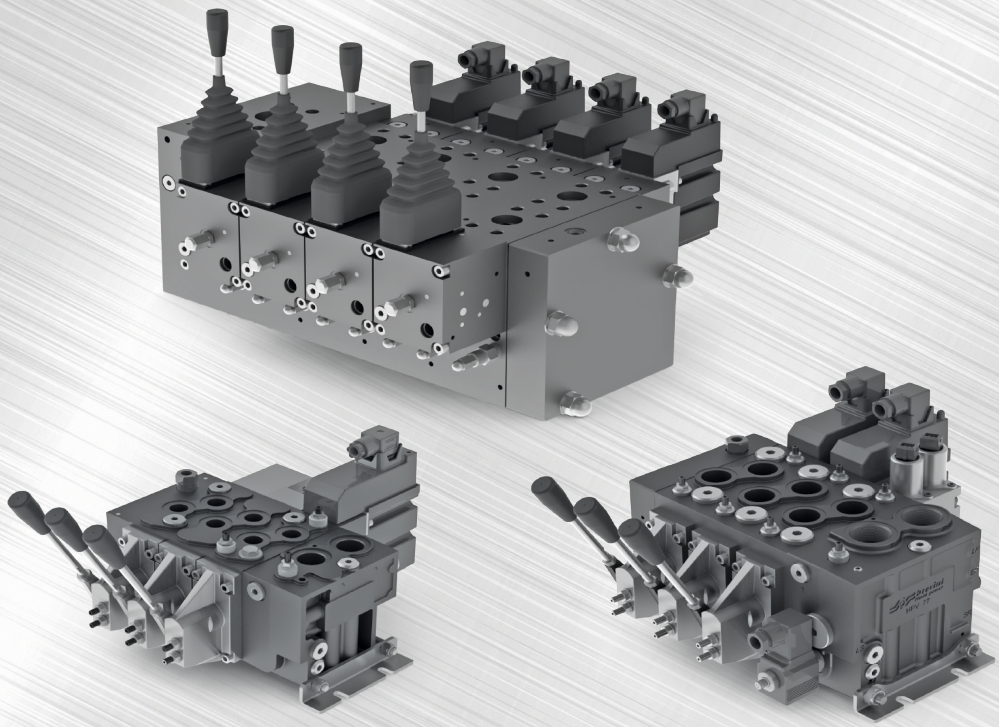


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Each product configuration listed below is subject to availability: please contact Sales Dpt. for more commercial detailed info.

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.

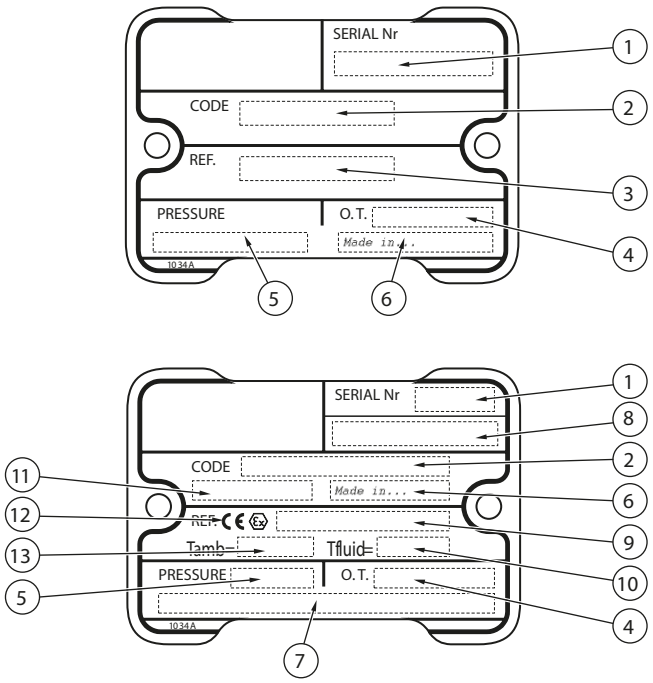
Methods of conveying and storing
The user must guarantee a correct transport and storage of the module, in order to not compromise the specific characteristics of the protection way and the good operation

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

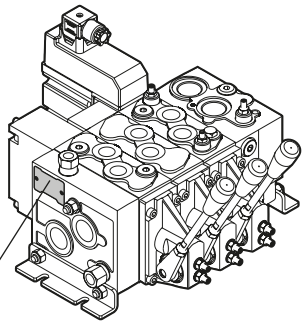
Marking and products identification

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.

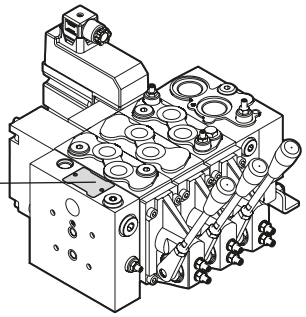
Registred mark and identification ATEX products
The distributors and the modules are equipped with a Registered mark plate and a Declaration of conformity, according to 94/4/EC Directive, reporting all the characteristic features regarding operation and identification.



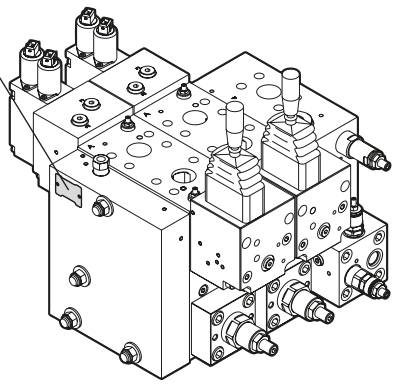
ATEX distributors



HPV41 - HPV77 distributors



HPV distributors with HSIF interface

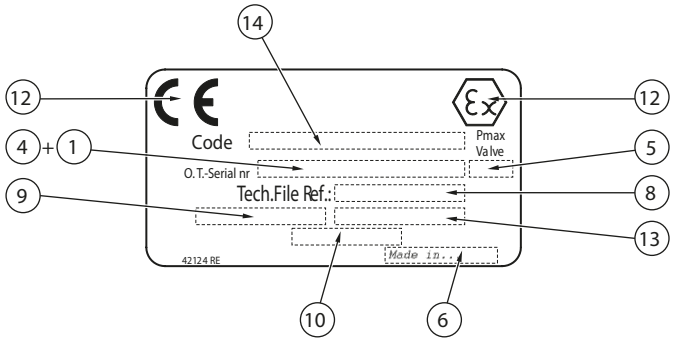


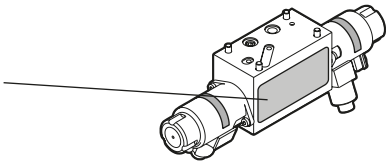
HPV310 distributors

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

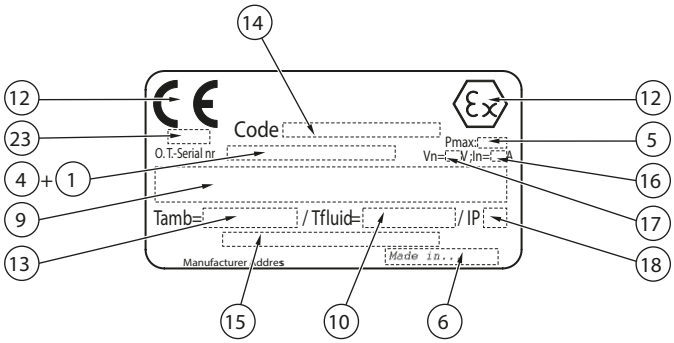
Dangerous areas		ATEX categories	EPL
Gas, vapor or mist	Zone 0	1G	Ga
Gas, vapor or mist	Zone 1	2G or 1G	Gb or Ga
Gas, vapor or mist	Zone 2	3G, 2G or 1G	Gc, Gb or Ga
Dust	Zone 20	1D	Da
Dust	Zone 21	2D or 1D	Db or Da
Dust	Zone 22	3D, 2D or 1D	Dc, Db or Da
Mine	—	M1	Ma
Mine	—	M2	Mb or Ma

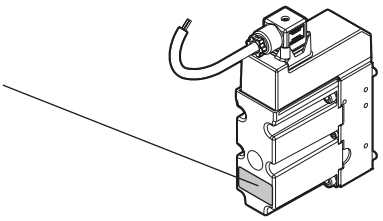
Marking and products identification



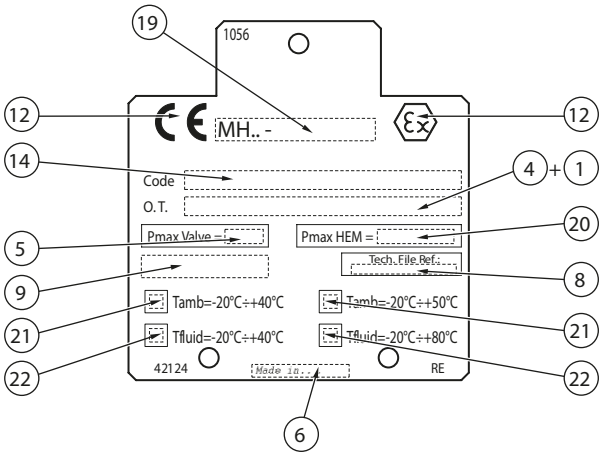


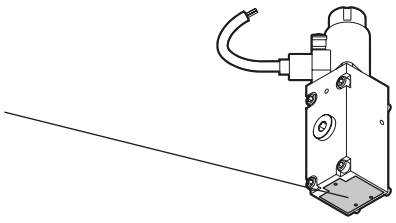
MHFOX
HSEVX



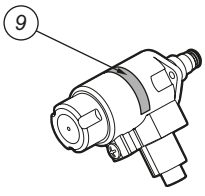


MHOFX - MHPCX
MHPODX - MHPEDX





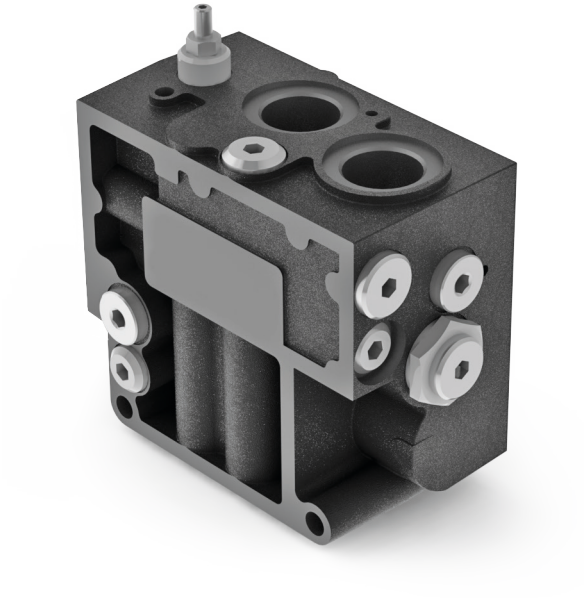
MHOX-MHPX



HSEVX


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Inlet section Open Centre and Closed Centre



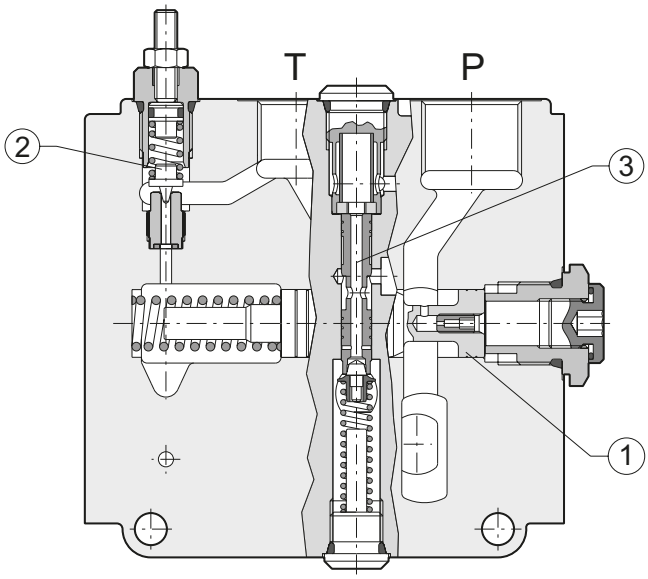
Standard HSE inlet sections
The inlet sections are availables in two versions:
- open centre for use with fixed displacement pumps
- closed centre for use with load-sensing pumps

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.

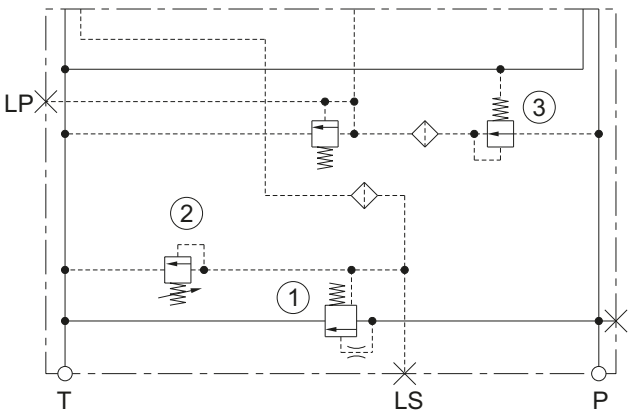
By changing two internal pilot lines, the section is converted into a closed centre version. In the closed centre versions, the regulator - pos. 1 - only maintains the pressure regulator function, becoming the first stage of the main pressure relief valve pos. 2, which must be calibrated to about 30 bar [435 psi] more than the maximum work pressure.

Both versions can be supplied with the pressure reduction valve - pos. 3 - where originates a low pressure line (18-22 bar - 261 ÷ 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.

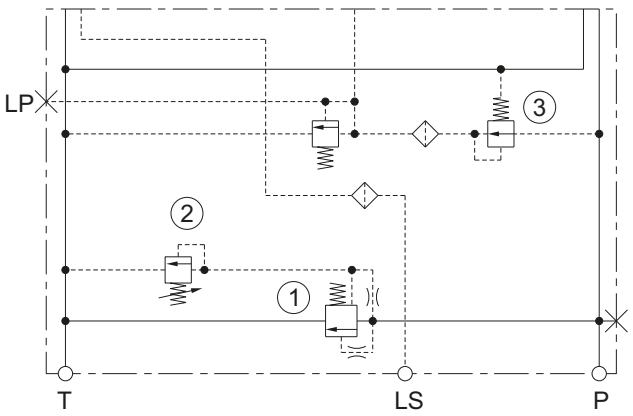


Standard HSE inlet section

1	3 way flow regulator
2	Pilot pressure relief valve
3	Pressure reduction valve
Lp	Low pressure port, 18 ÷ 22 bar [261 ÷ 319 psi]

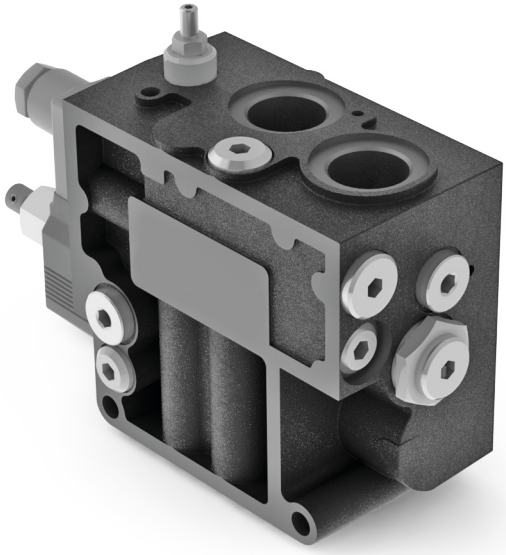


open centre



closed centre

Inlet section Open Centre and Closed Centre

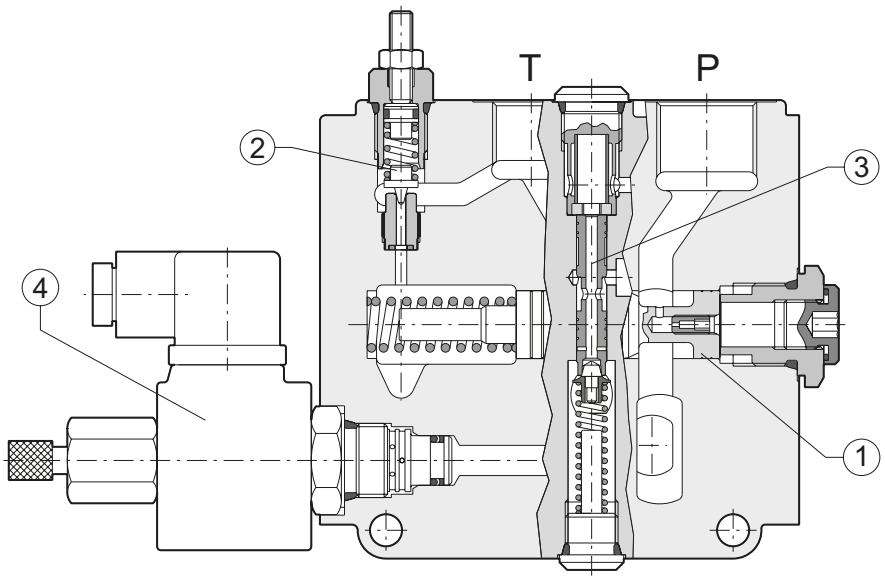


Standard HSE inlet sections with solenoid Ls unloading valve (CRP04HP)
All versions can be supplied with an Ls signal unloading solenoid valve - pos. 4. The solenoid valve can be normally open or normally closed. If it is activated during the work phases it immediately unloads the load sensing signal 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).

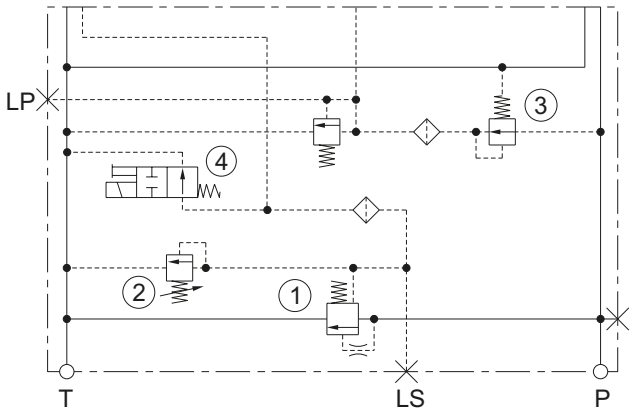
In the closed centre versions, unloading the Ls signal lowers the pressure in P at a value equal to the stand-by pressure at which the pump is regulated.

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.

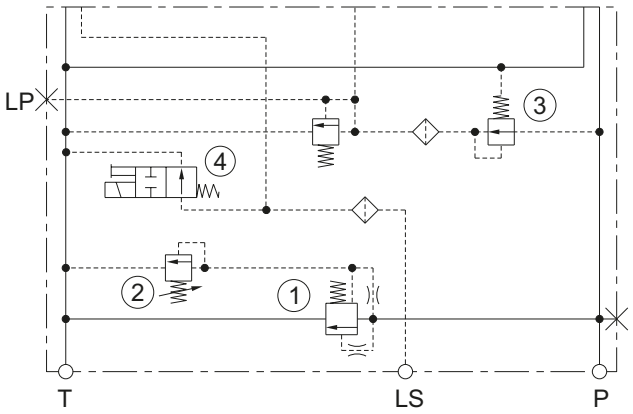


1	3 way flow regulator
2	Pilot pressure relief valve
3	Pressure reduction valve
4	Solenoid Ls unloading valve
Lp	Low pressure port, 18 ÷ 22 bar [261 ÷ 319 psi]

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

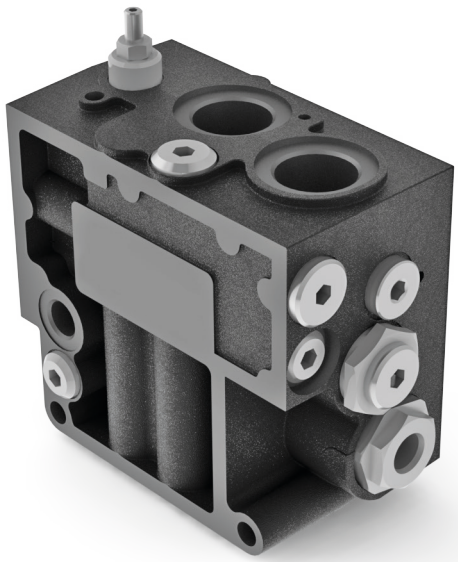


open centre



closed centre

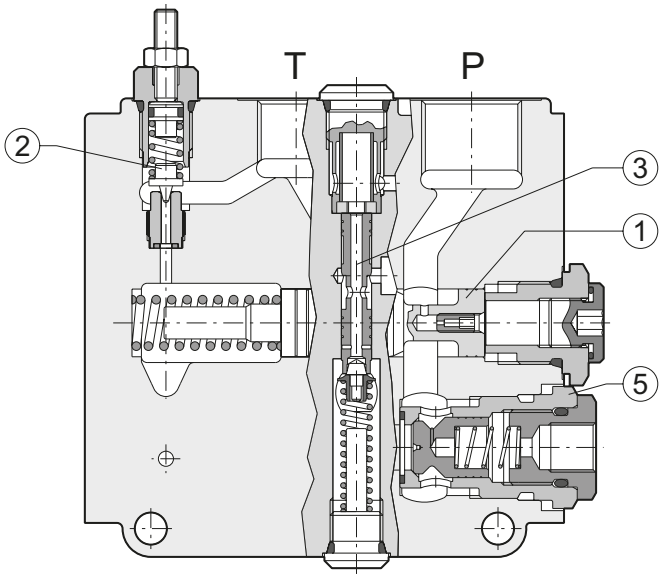
Inlet section Open Centre and Closed Centre



Standard HSE inlet sections with pump unloading valve function (HSER)
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).

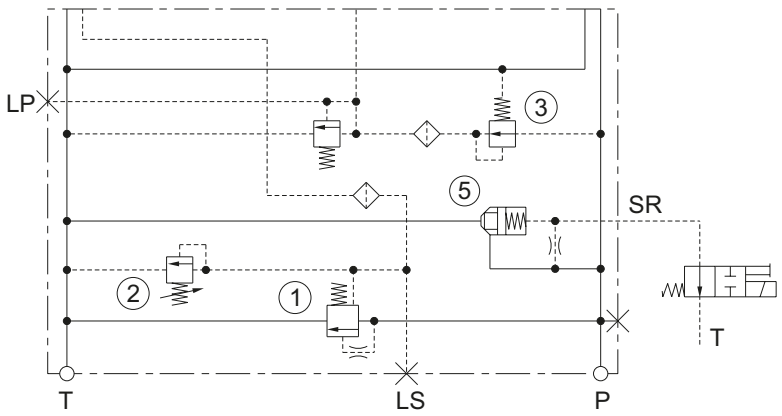
In this configuration, the pump unloading pressure value is equal to the sum of the counterpressure acting on the T line, plus the pressure required to open the HSER valve (0.6 bar - 8.7 psi) to connect P with T.

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).



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

1	3 way flow regulator
2	Pilot pressure relief valve
3	Pressure reduction valve
5	Cartridge logic element, HSER
Lp	Low pressure port, 18 ÷ 22 bar [261 ÷ 319 psi]



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.

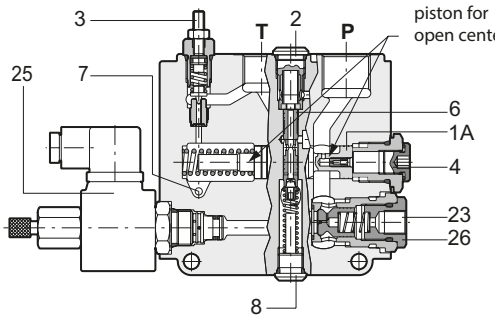
On the other hand, if two or more spools of elements without pressure compensators are activated simultaneously, the flow on the spools will not be constant but will vary according to the work pressures.

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 (18-22 bar [261-319 psi]) which internally feeds the MHPE electrohydraulic modules and, externally, the hydraulic manipulators through the port 22.

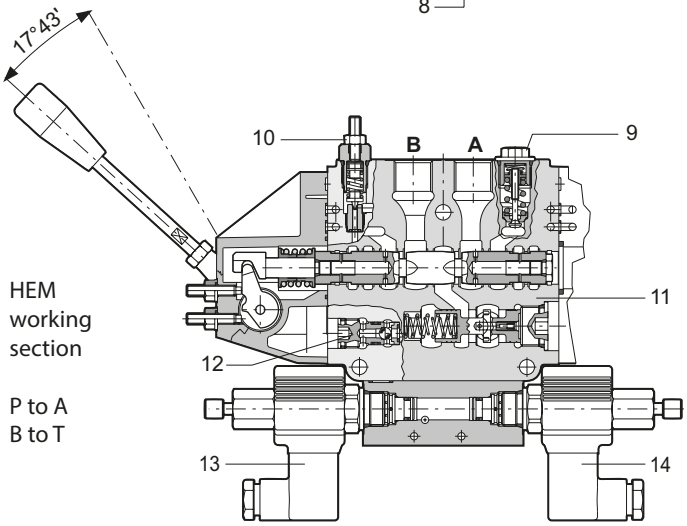
The max. work pressures of ports A/B of each element can be remote controlled using the LsA and LsB pilot line ports.

HSE
inlet section



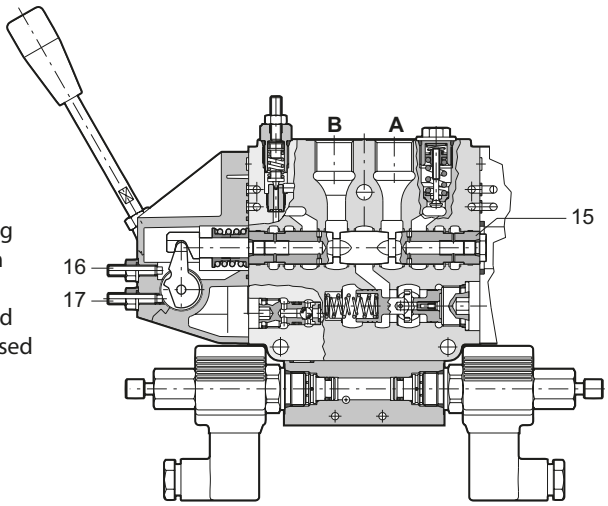
HEM
working
section

P to A
B to T



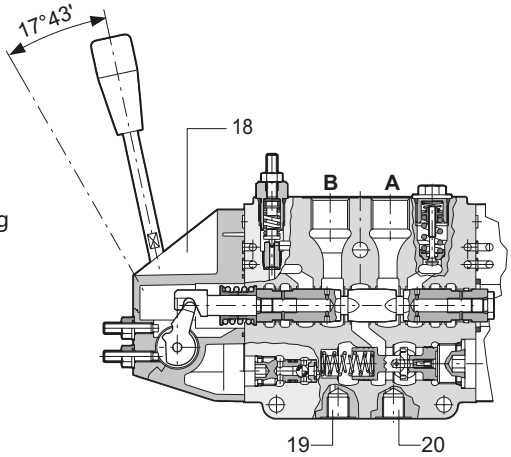
HEM
working
section

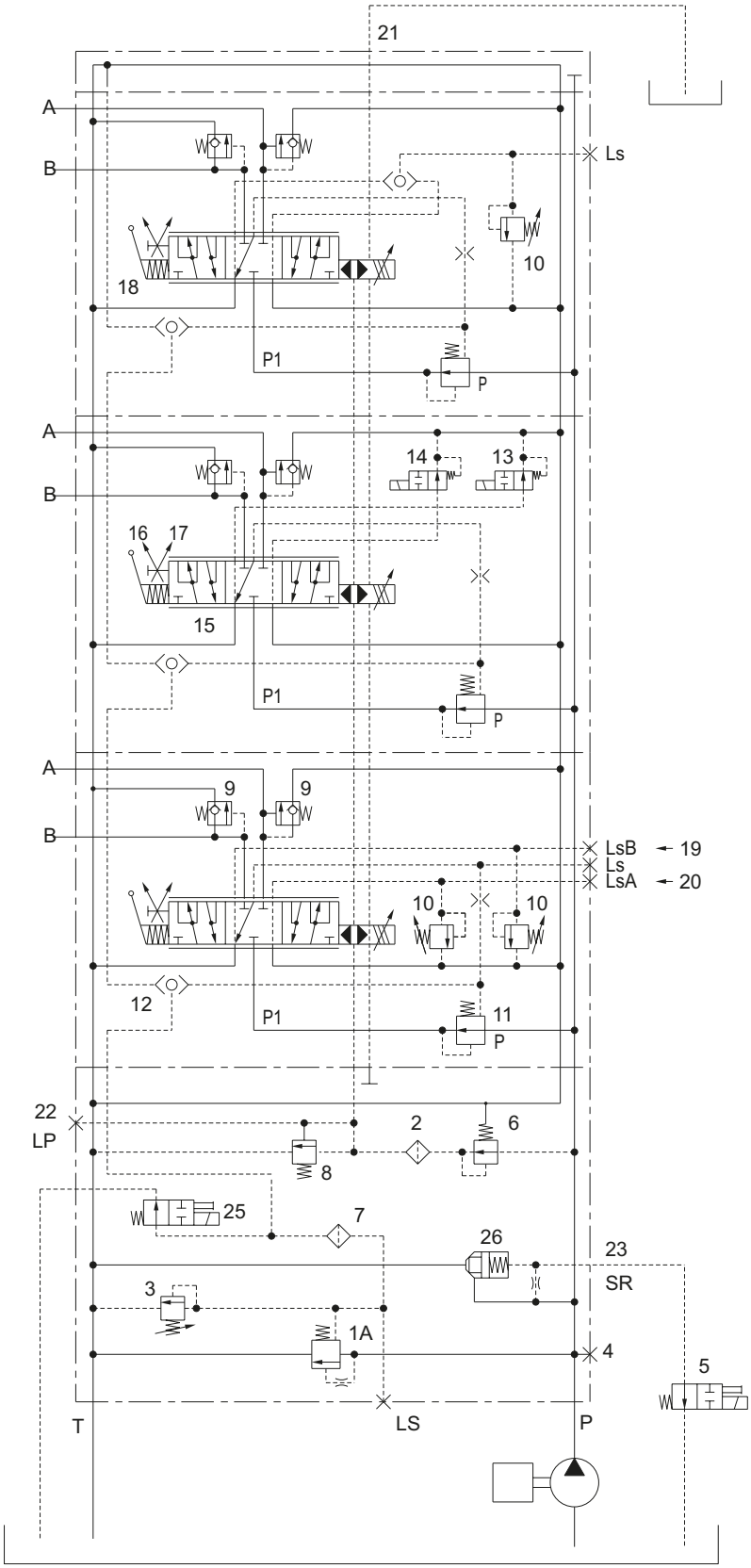
P closed
A,B closed



HEM
working
section

P to B
A to T





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

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 (24).

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.

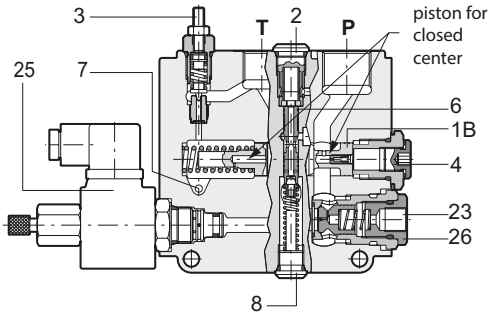
The second stage of the pilot line pressure (3) must be set at 20-30 bar [290-435 psi] more than the maximum setting of the pump pressure/flow regulator (24).
If two or more spools operating at different pressure values are activated at the same time, the pressure compensators (11) will keep the pressure 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 (18-22 bar [261-319 psi]) which internally feeds the MHPE electrohydraulic modules and, externally, the hydraulic manipulators through port 22.

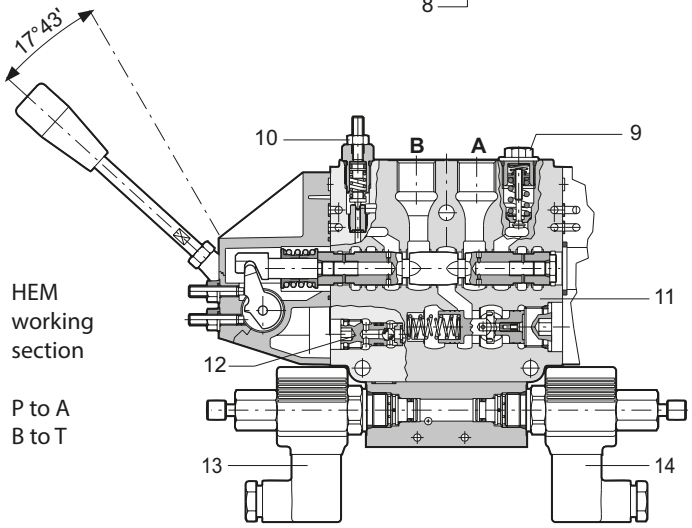
The max. work pressures of A/B ports of each element can be remote controlled using the LsA and LsB pilot line ports.

HSE
inlet section



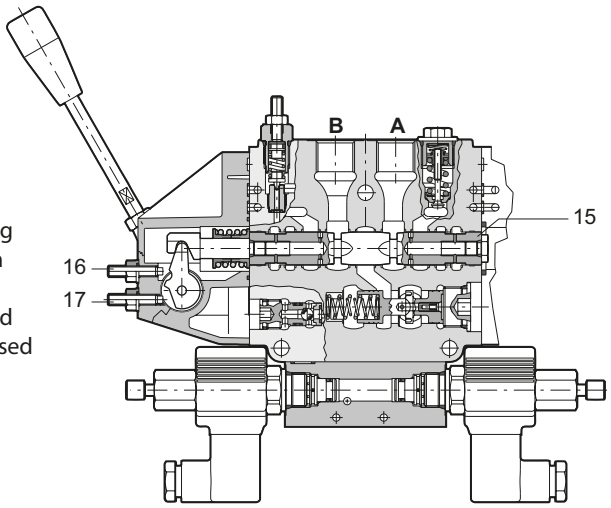
HEM
working
section

P to A
B to T



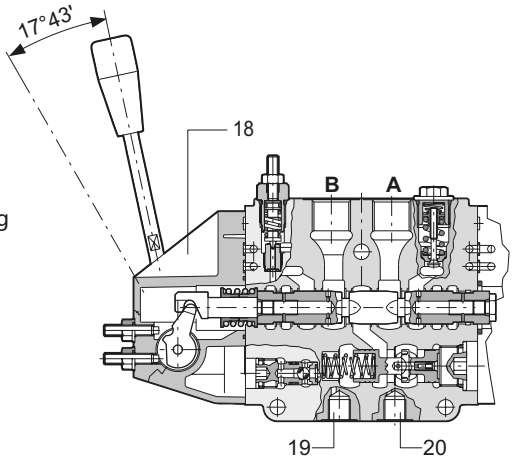
HEM
working
section

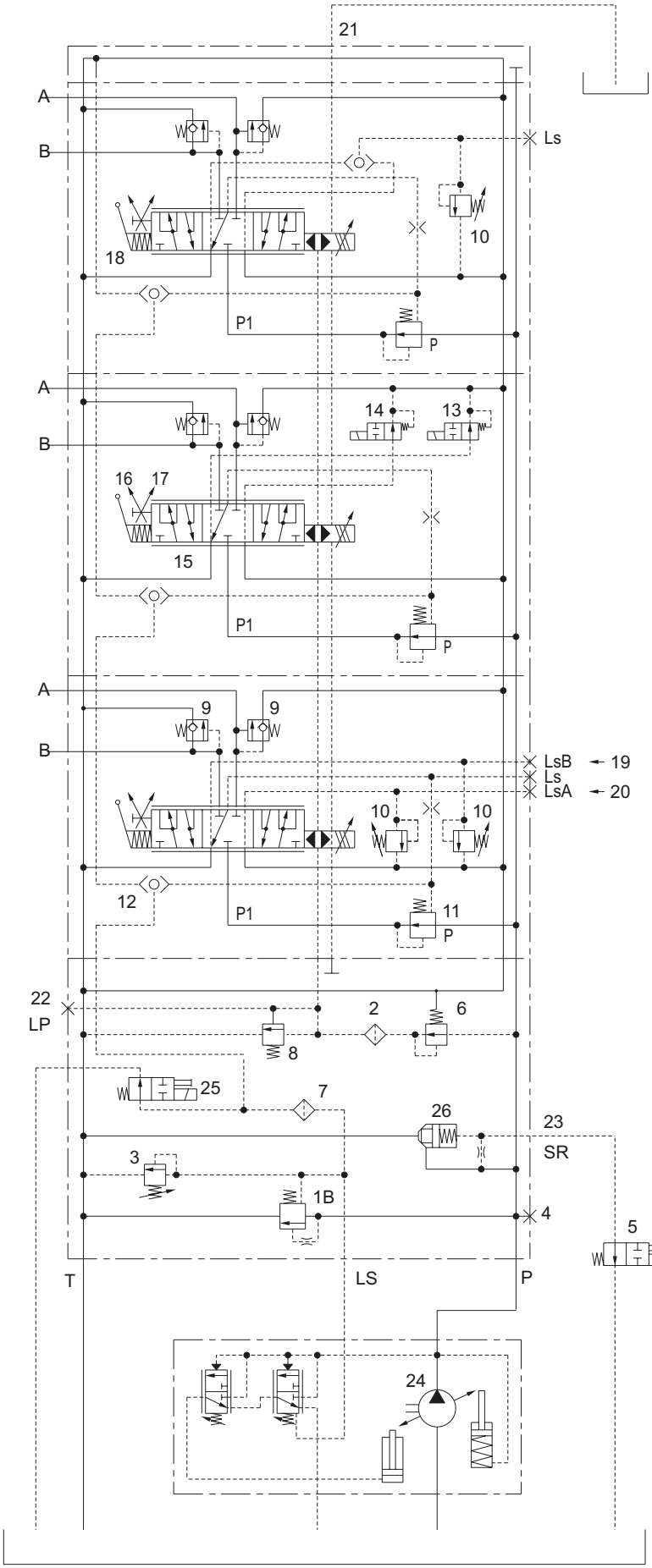
P closed
A,B closed



HEM
working
section

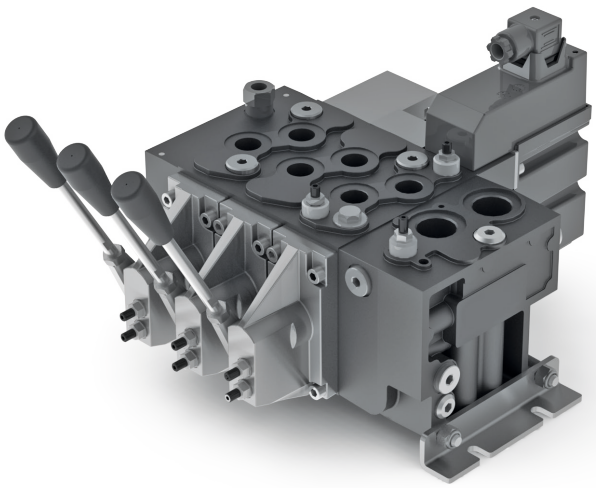
P to B
A to T





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

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.

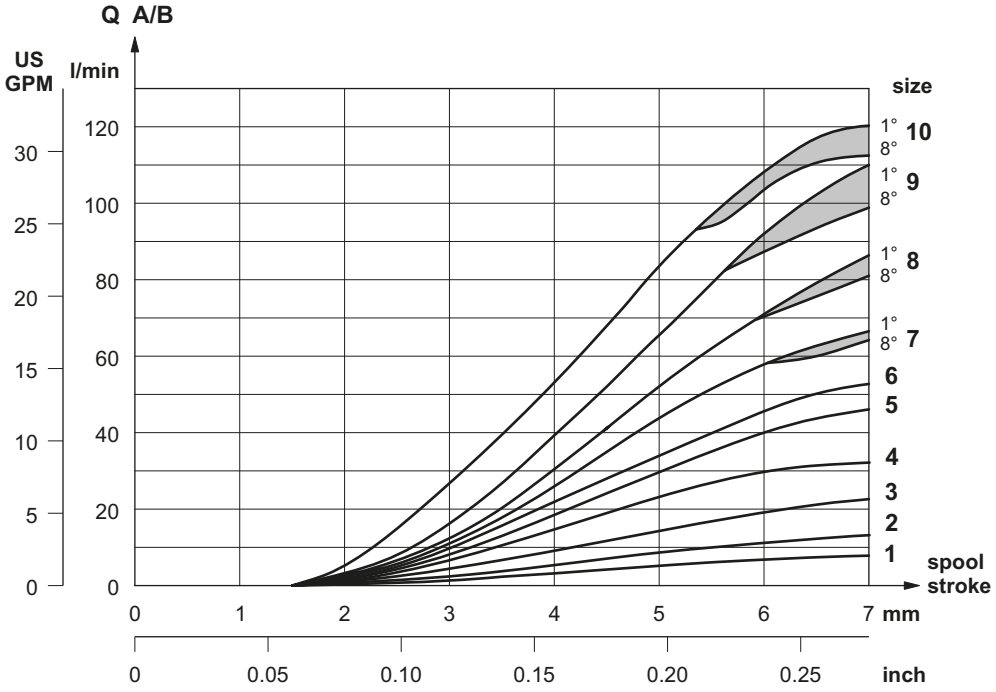
Hydraulic features
The hydraulic features reported below were measured using a mineral based hydraulic oil according to DIN 51524 or ISO 6743/4 with a viscosity of 25 mm^2/s [130 SUS] at a temperature of 50 °C [122 °F]

Rated flow	HSE inlet section, P port		160 l/min	42 US gpm
	Mid inlet section, HFLS		250 l/min	66 US gpm
	A, B ports with pressure compensator		130 l/min	34 US gpm
	A, B ports without pressure compensator		140 l/min	37 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 ÷ 22 bar	260 ÷ 320 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		± 7 mm	± 0.276 in
	Proportional		± 5.5 mm	± 0.217 in
Dead band			± 1.5 mm	± 0.059 in
Nominal internal leakage at 180 bar (2611 psi)	A, B → T	Without anti-shock valves	23 cm^3/min	1.40 in^3/min
		With anti-shock valves	29 cm^3/min	1.77 in^3/min

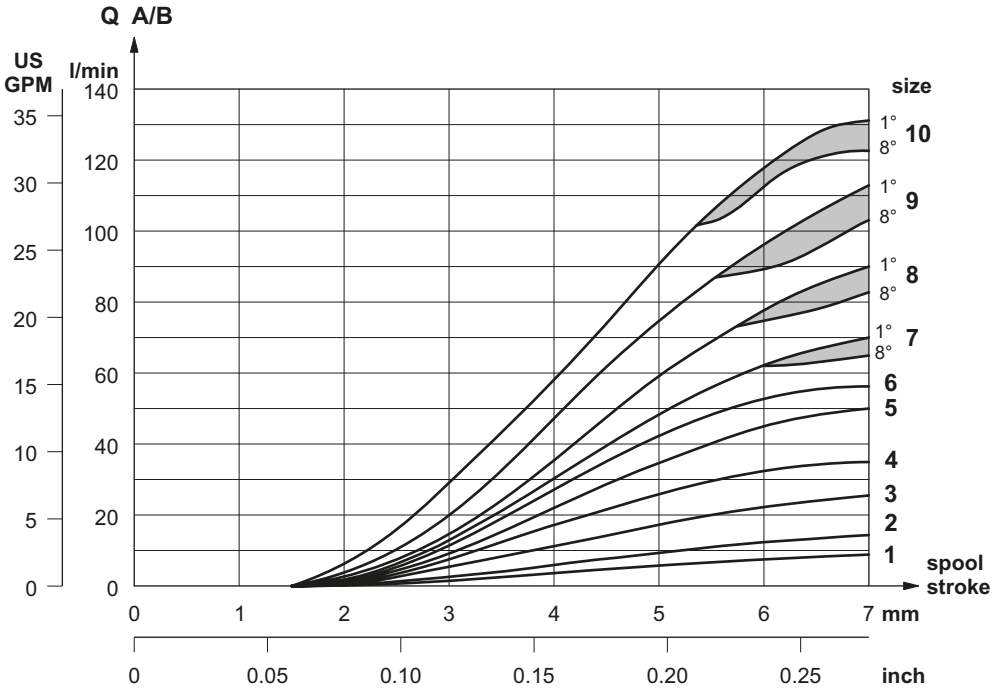
HPV 41 internal (easy replacement) filters, mesh 100 µm.
Mineral oil hydraulic fluid: according to DIN 51524 and 51525 or ISO 6743/4. HPV 41 can also be used with phosphorous esters (HFDR), water-glycol /HFC) or water-oil (HFB) mixes, subject to our Technical Dept. approval.

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 of section with compensator from 1st to 8th section with open or closed centre type inlet section

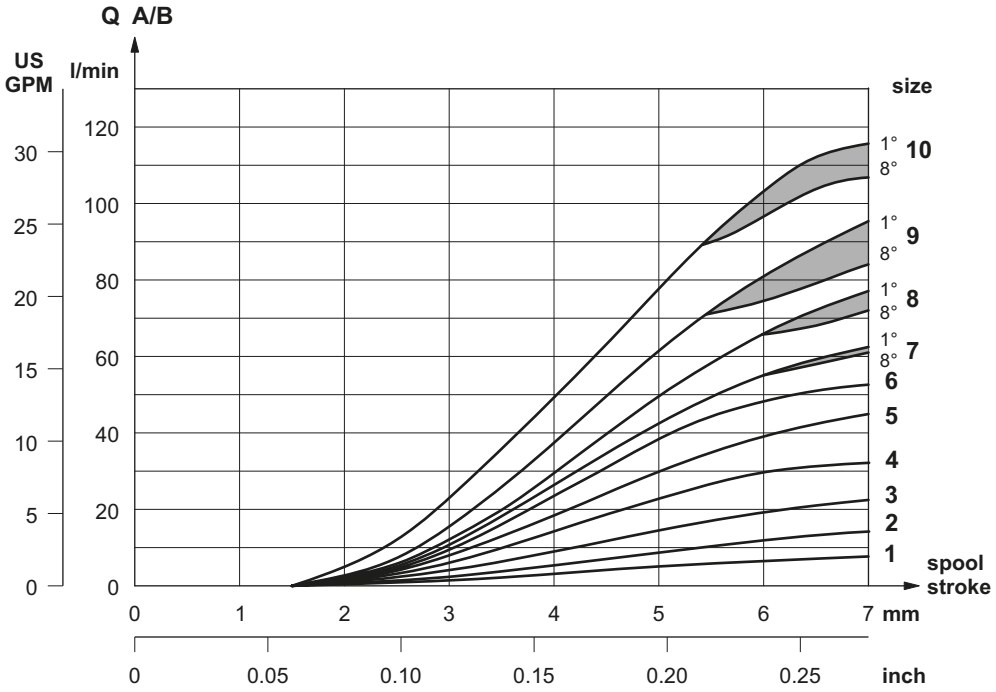


Flow characteristics of section without compensator from 1st to 8th section with open centre type inlet section

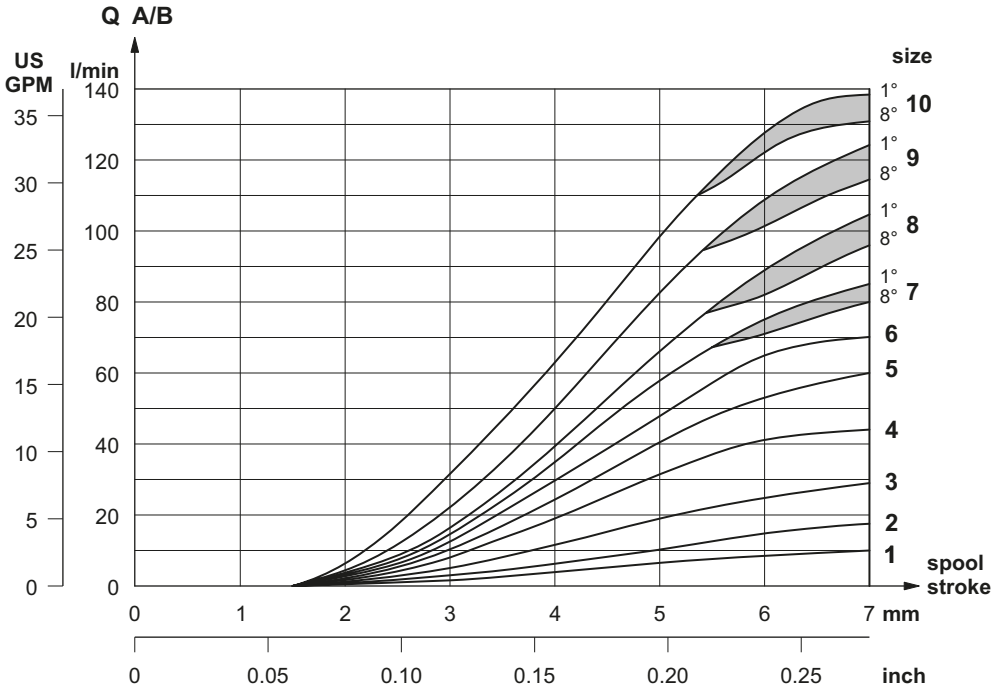
Curves measured with oil viscosity of 25 mm^2/s (cSt) at a temperature of 50 °C [122 °F]

Technical data

Characteristic curves



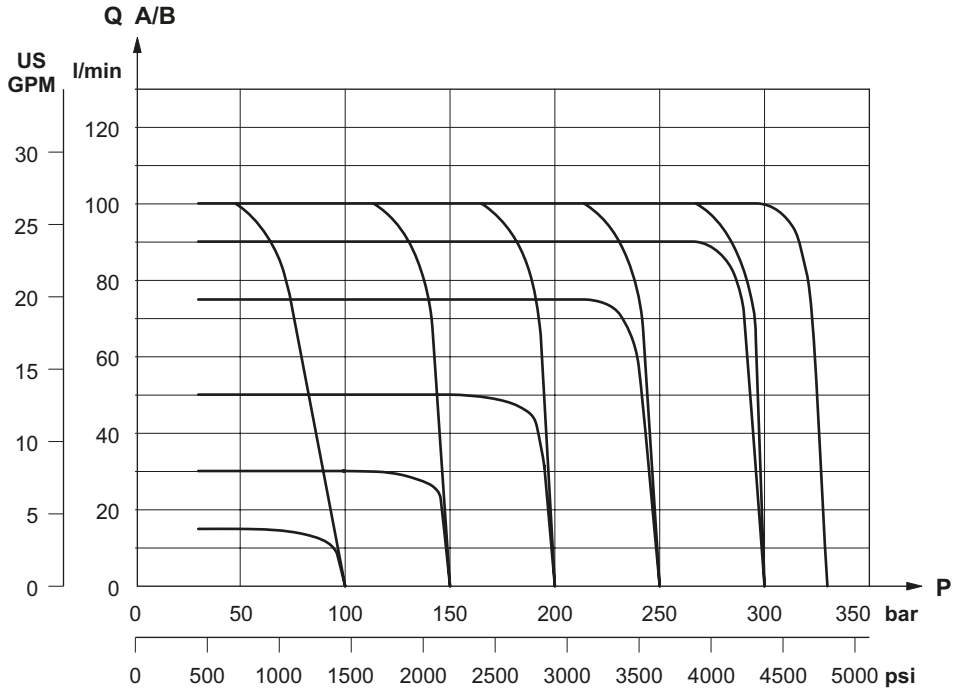
Flow characteristics of section without compensator from 1st to 8th section with closed centre type inlet section and 14 bar [203 psi] pump standby pressure



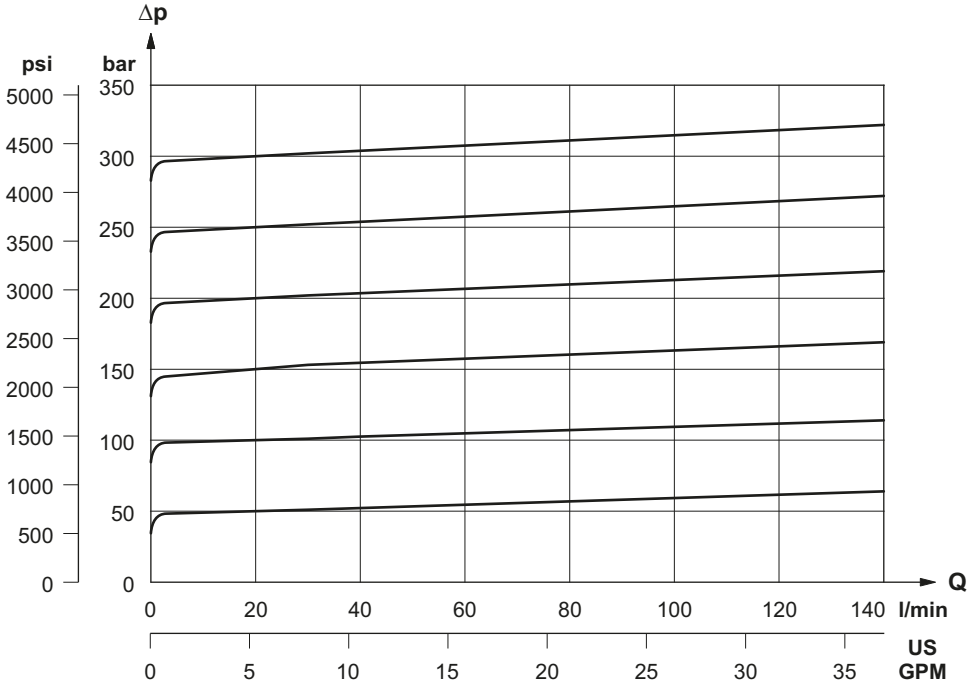
Flow characteristics of section without compensator from 1st to 8th section with closed centre type inlet section and 21 bar [305 psi] pump standby pressure

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

Characteristic curves



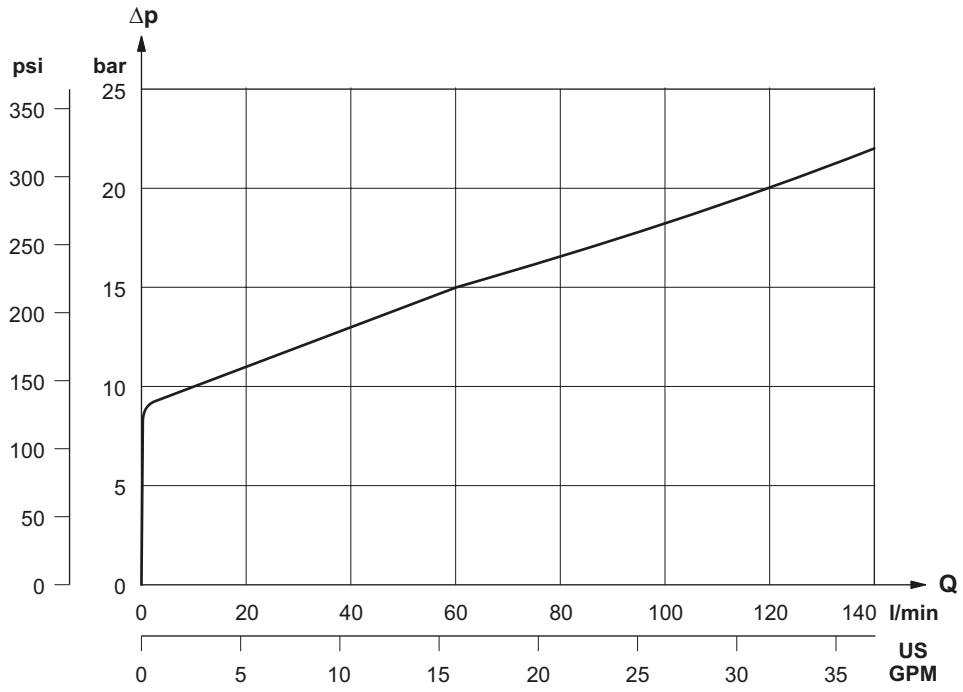
Flow characteristics at A / B ports with pressure limitation on the same (section with pressure compensator)



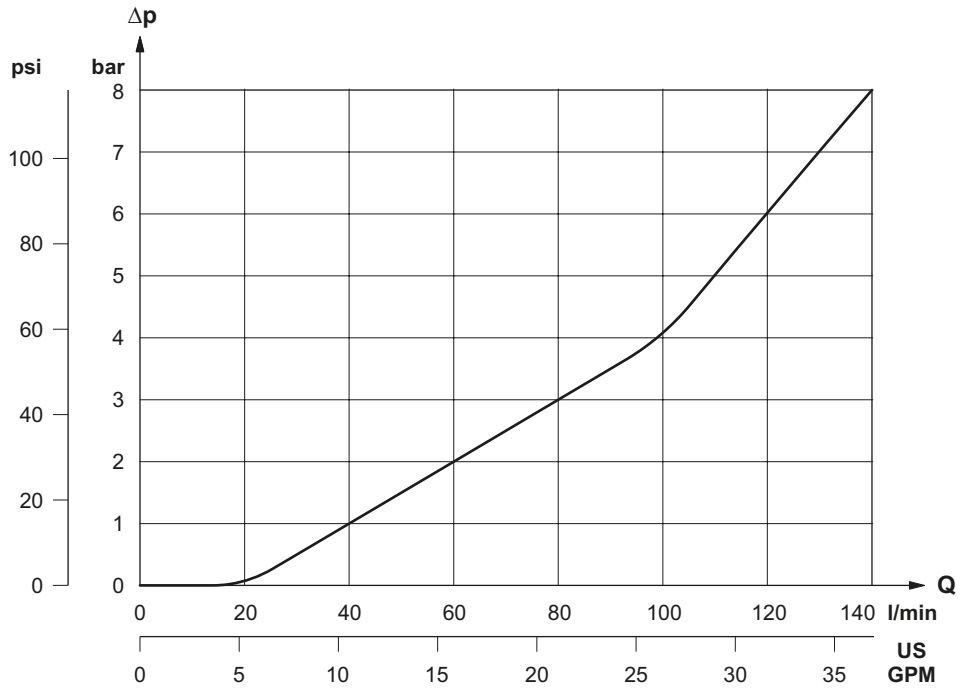
Characteristics of main pressure relief valve

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

Characteristic curves



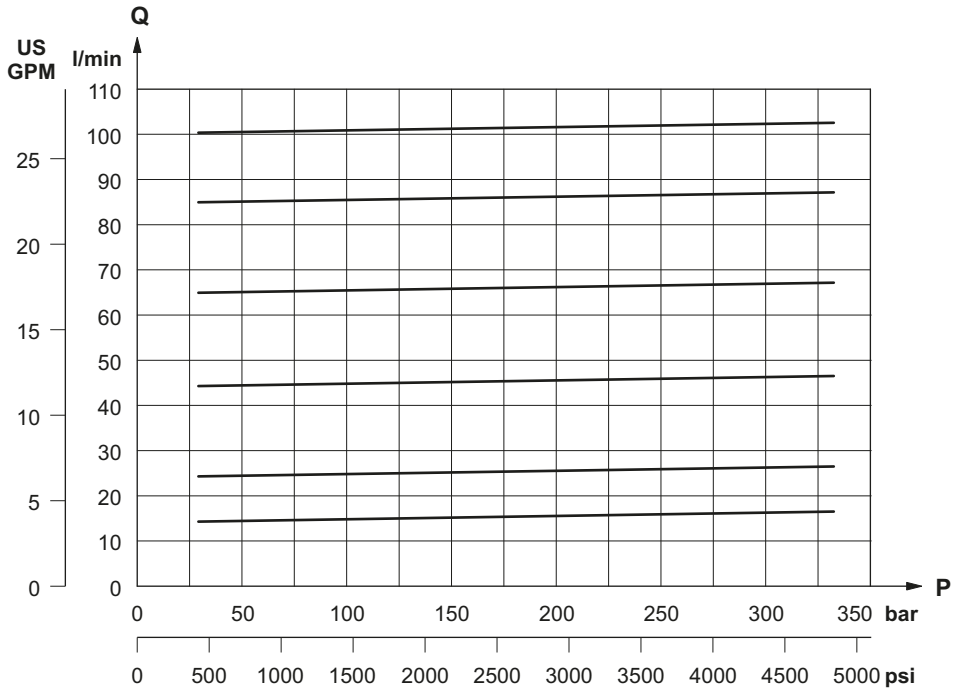
Pressure drop on inlet section, open centre type, with spools in neutral position



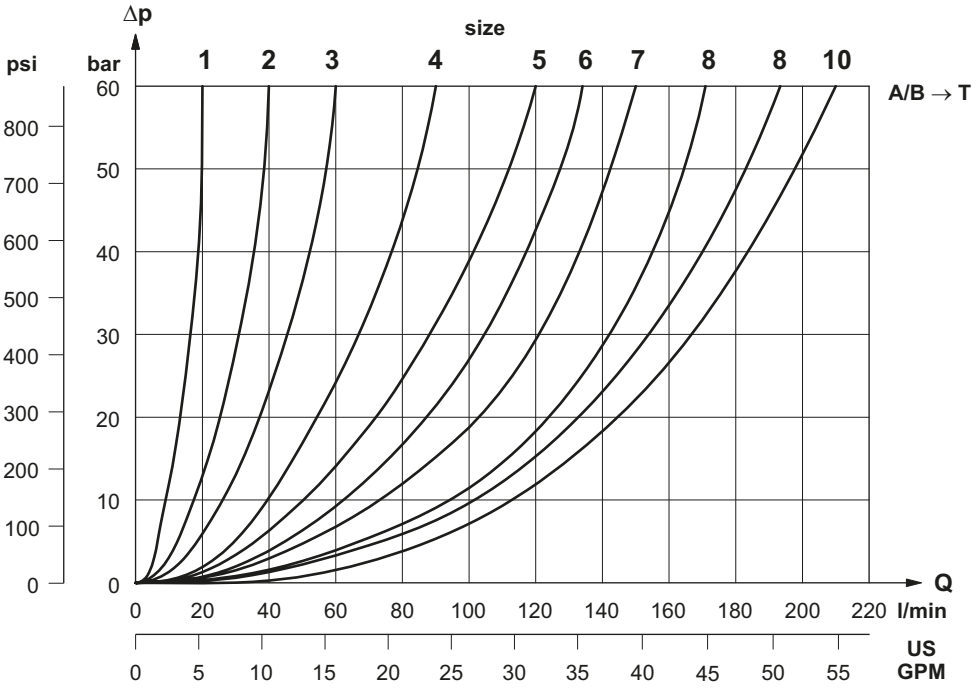
Pressure drop on inlet section with pump unloading valve and spools in neutral position (for open centre inlet sections only)

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

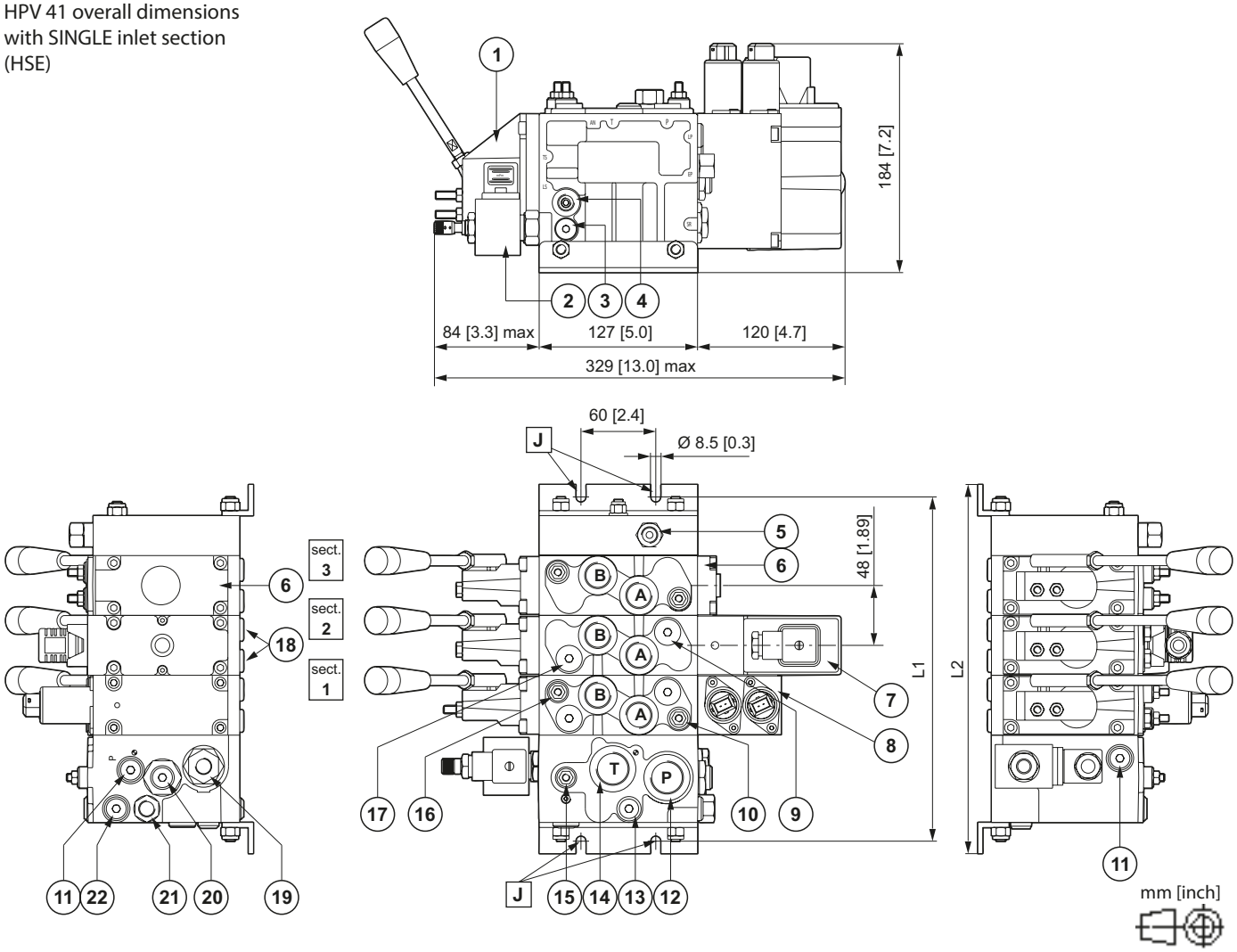


ΔP figures with spool on complete deadlock and a or B in T

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 41 overall dimensions with SINGLE inlet section (HSE)



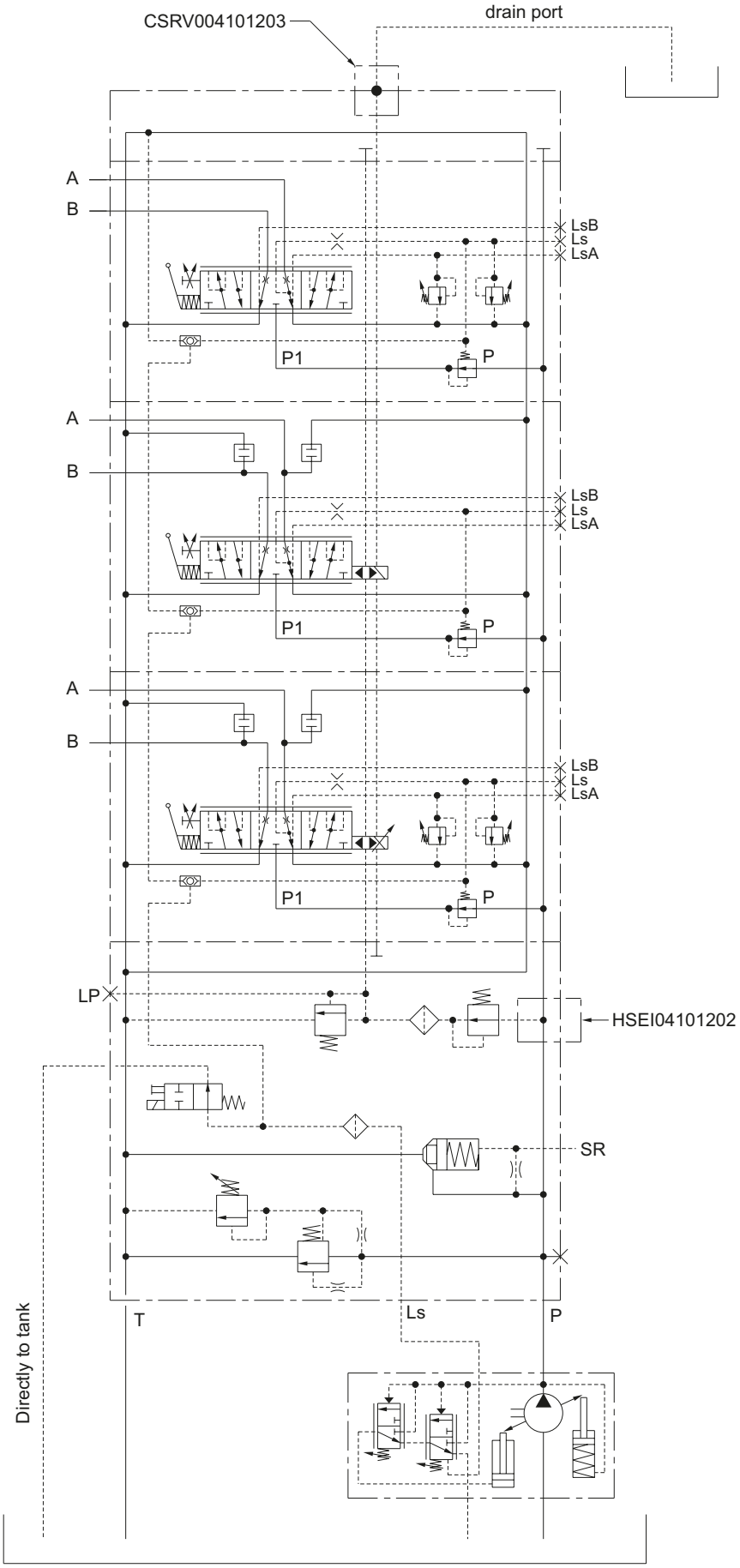
A/B Ports, 1/2" BSPP or 7/8" - 14 UNF - 2B (SAE 10)
J Fixing means
1 Manual control, HCM
2 Ls signal unloading solenoid valve
3 Ls signal filter cartridge
4 Ls port, 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
5 Electronic controls drain line
6 Manual control plate, HCP
7 ON-OFF electrohydraulic control module, MHOF
8 Module for current electrohydraulic control, MHPF
9 A port anti-shock and anti-cavitation valve
10 LsA pressure relief valve
11 P, T pressure ports
12 Pump side port, 3/4" BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
13 Low pressure line filter cartridge
14 Return line port, 3/4"BSPP or 1 1/16" - 12UN - 2B (SAE 12)
15 Main pressure relief valve
16 LsB pressure relief valve
17 B port anti-shock and anti-cavitation valve
18 LsA - LsB pressure remote control port, 1/4" BSPP or 7/16" - 20 UNF -2B
19 Pilot line port for pump stand-by, ¼" BSPP or 7/16" - 20UNF - 2B (SAE 4)
20 Pump gauge port, 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
21 Pressure reducing valve external feed port for electrohydraulic controls, 1/4" BSPP or 7/16"- 20UNF - 2B (SAE 4)
22 External pilot oil supply, 1/4" BSPP or 7/16" - 20UNF - 2B

Working Sections	L1 mm [inch]	L2 mm [inch]
1	180 [7.09]	200 [7.87]
2	228 [8.98]	248 [9.76]
3	276 [10.87]	296 [11.65]
4	324 [12.76]	344 [13.54]
5	372 [14.65]	392 [15.43]
6	420 [16.54]	440 [17.32]
7	468 [18.43]	488 [19.21]
8	516 [20.31]	536 [21.10]
9	564 [22.20]	584 [22.99]
10	612 [24.09]	632 [24.88]

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.

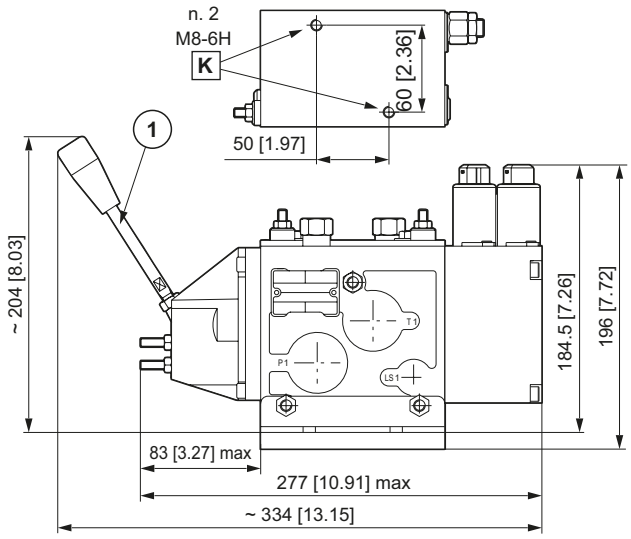
Note:
See the order form, page B-24).

HPV 41 hydraulic diagram with SINGLE inlet section (HSE)

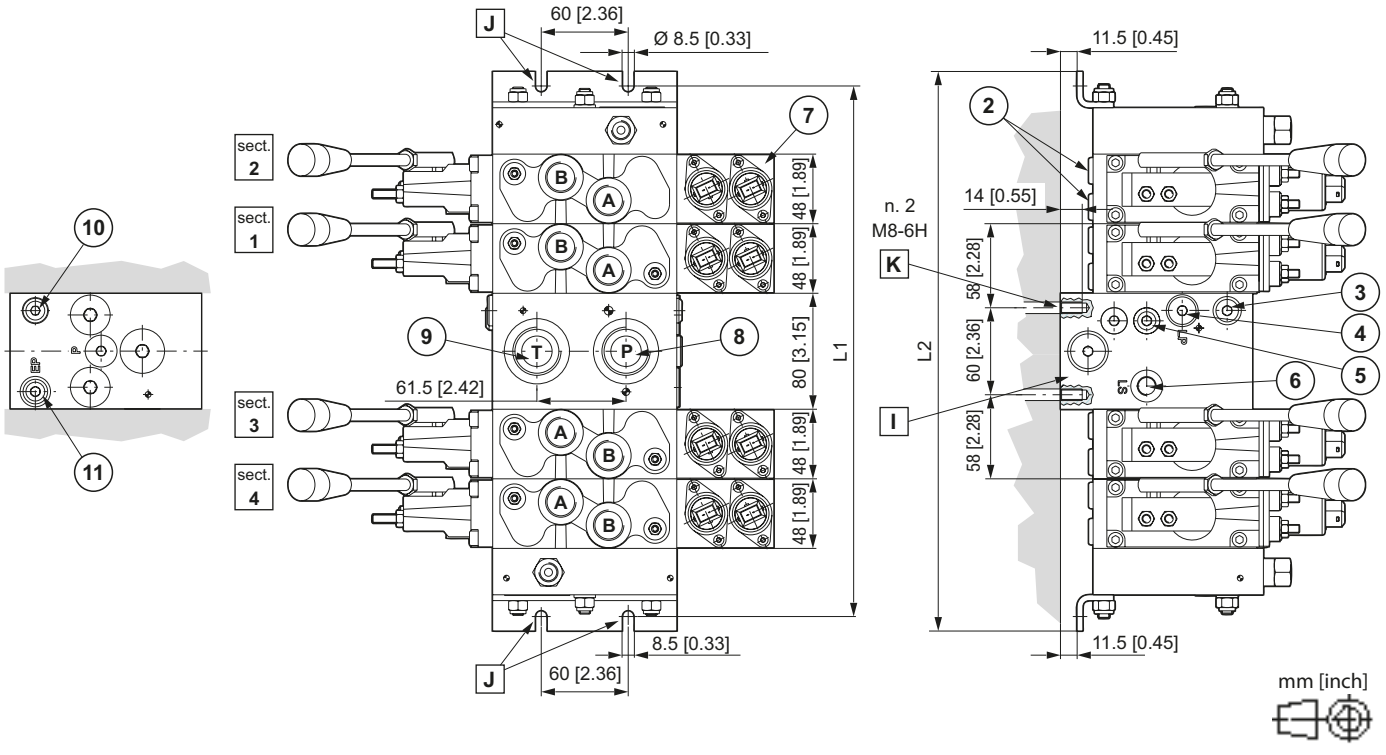


Overall dimensions and hydraulic diagrams

HPV 41 overall dimensions with MID inlet section (HFLS)



Working Sections	L1 mm [inch]	L2 mm [inch]
2	270 [10.63]	290 [11.42]
3	318 [12.52]	338 [13.31]
4	366 [14.41]	386 [15.20]
5	414 [16.30]	434 [17.09]
6	462 [18.19]	482 [18.98]
7	510 [20.08]	530 [20.87]
8	558 [21.97]	578 [22.76]
9	606 [23.86]	626 [24.65]
10	654 [25.75]	674 [26.54]



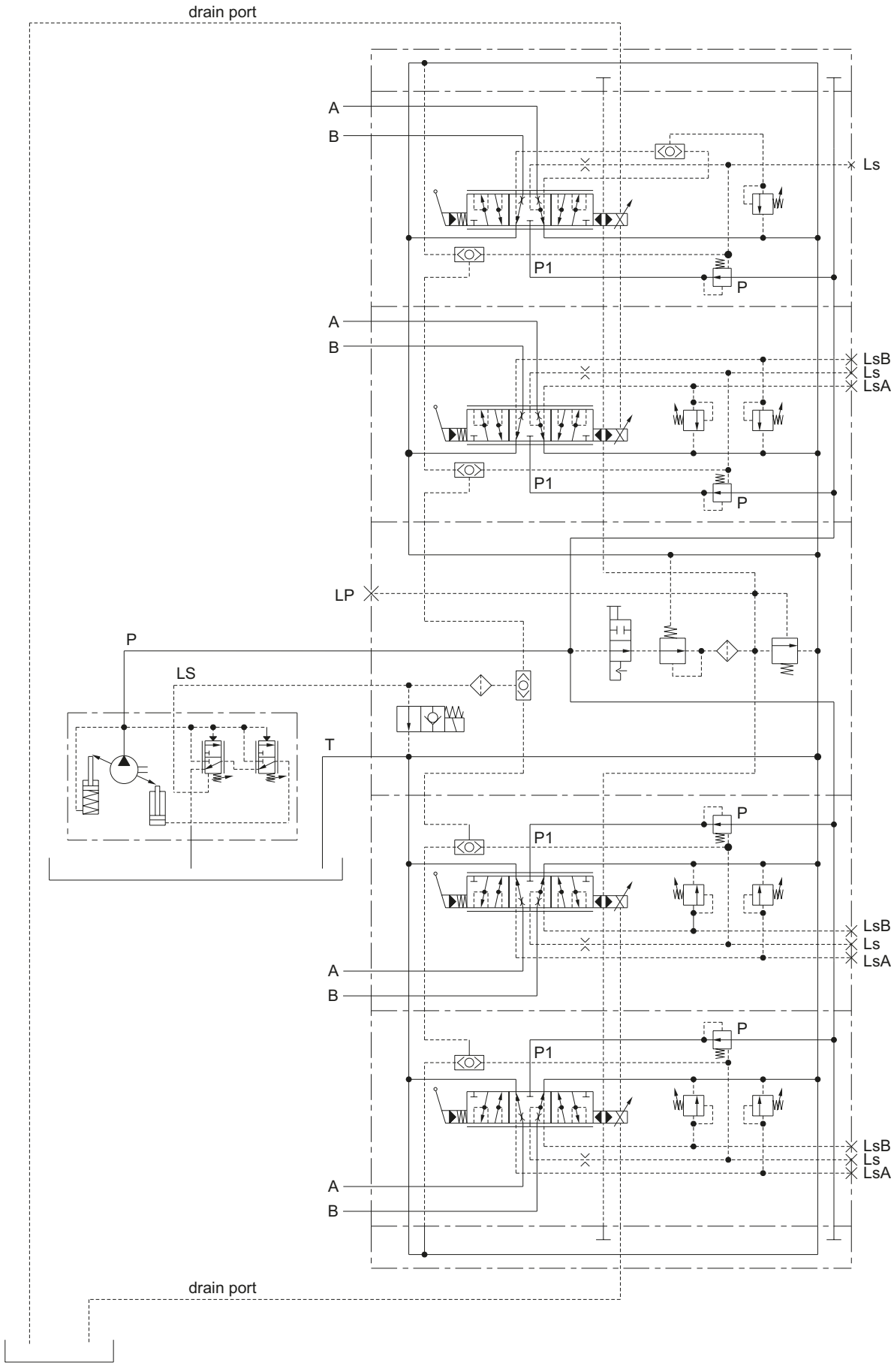
mm [inch]

A/B Ports, 1/2" BSPP or 7/8" - 14 UNF - 2B (SAE 10)
I Mid inlet section HFLS
J Fixing means
K Fixing holes M8
1 Manual control, HCM
2 LsA - LsB pressure remote control port, 1/4" BSPP or 7/16" - 20 UNF -2B
3 Low pressure line filter cartridge
4 External pilot oil supply, 1/4" BSPP or 7/16" - 20UNF - 2B
5 Ls signal filter cartridge
6 Ls port, 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
7 Module for current electrohydraulic control, MHPF
8 Pump side port, 3/4" BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
9 Return line port, 3/4"BSPP or 1 1/16" - 12UN - 2B (SAE 12)
10 Pressure reducing valve external feed port for electrohydraulic controls, 1/4" BSPP or 7/16"- 20UNF - 2B (SAE 4)
11 P, T pressure ports

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 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 B-25).

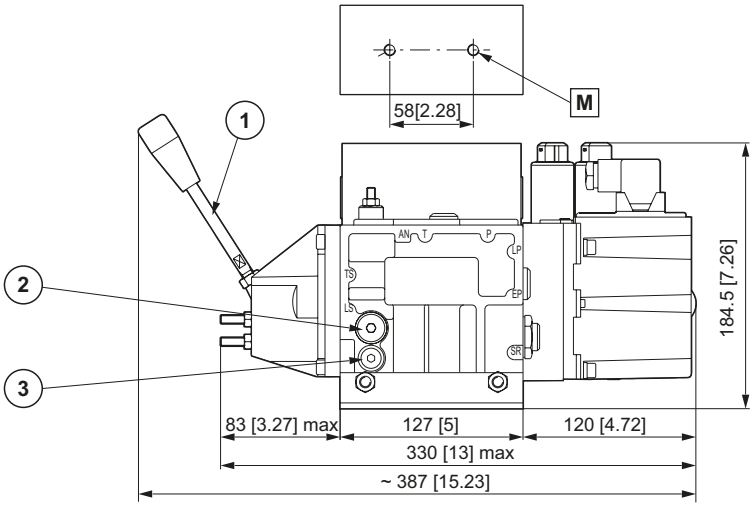
HPV 41 hydraulic diagram with MID inlet section (HFLS)

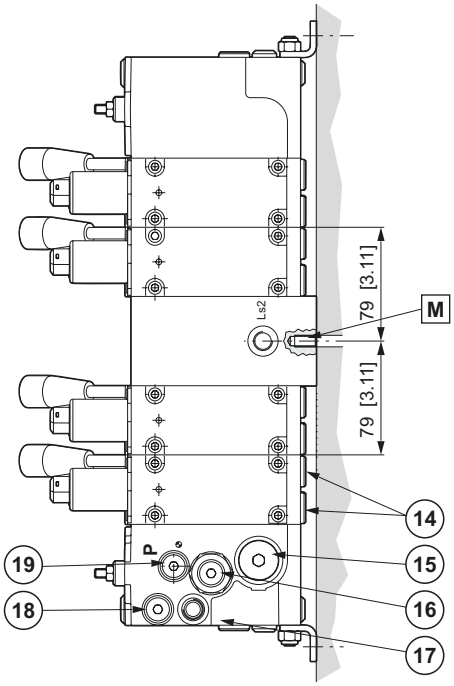


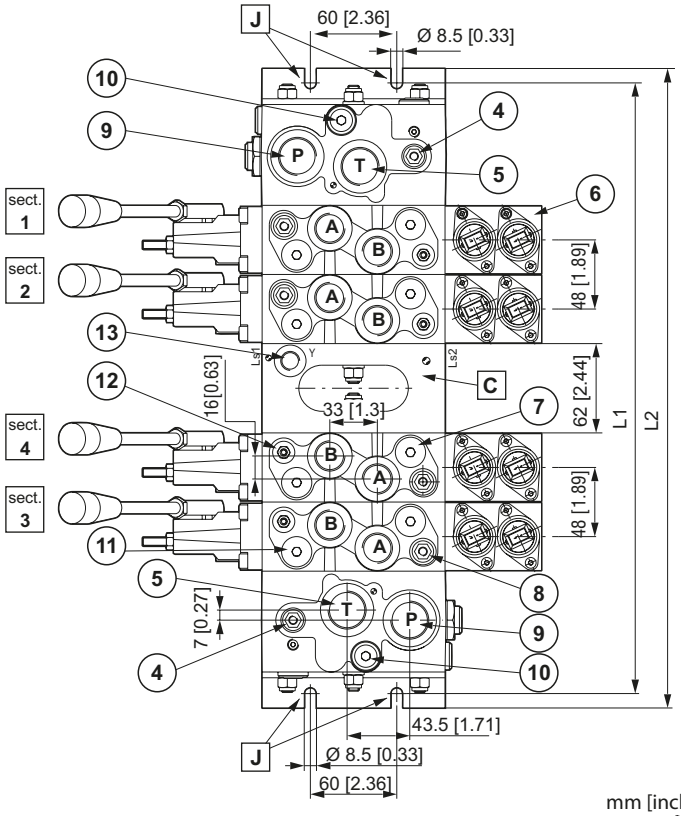
Overall dimensions and hydraulic diagrams

HPV 41 overall dimensions with 2 inlet sections (HSE) and mid end section (HPFS)

Working Sections	L1 mm [inch]	L2 mm [inch]
2	328 [12.91]	348 [13.70]
3	376 [14.80]	396 [15.59]
4	424 [16.69]	444 [17.48]
5	472 [18.58]	492 [19.37]
6	520 [20.47]	540 [21.26]
7	568 [22.36]	588 [23.15]
8	616 [24.25]	636 [25.04]
9	664 [26.14]	684 [26.93]
10	712 [28.03]	732 [28.82]







mm [inch]

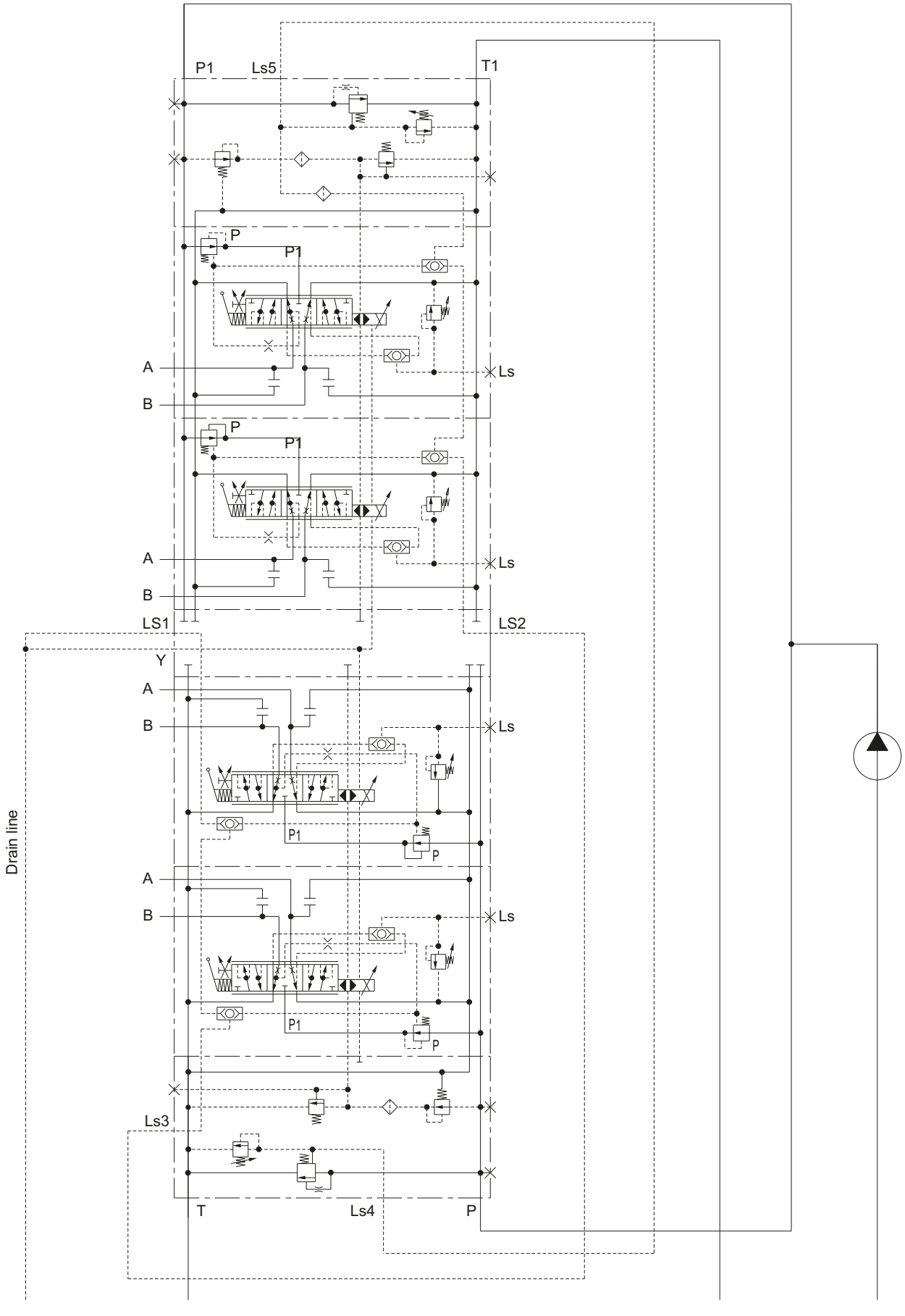
A/B Ports, 1/2" BSPP or 7/8" - 14 UNF - 2B (SAE 10)
C Mid inlet section HPFS
J Fixing means
M Fixing holes M8
1 Manual control, HCM
2 Ls port, 1/4" BSPP or 7/16" - 20UNF - 2B (SAE 4)
3 Ls signal filter cartridge
3 Module for current electrohydraulic control, MHPF
4 Main pressure relief valve
5 Return line port, 3/4"BSPP or 1 1/16" - 12UN - 2B (SAE 12)
7 A port anti-shock and anti-cavitation valve
8 LsA pressure relief valve
9 Pump side port, 3/4" BSPP or 1 1/16" - 12 UN - 2B (SAE 12)
10 Low pressure line filter cartridge
11 B port anti-shock and anti-cavitation valve
12 LsB pressure relief valve
13 Electronic controls drain line
14 Pilot line port for pump stand-by, ¼" BSPP or 7/16" - 20UNF - 2B (SAE 4)
14 LsA - LsB pressure remote control port, 1/4" BSPP or 7/16" - 20 UNF -2B
16 Pump gauge port, 1/4" BSPP or 7/16" - 20UNF - 2B
17 Pressure reducing valve external feed port for electrohydraulic controls, 1/4" BSPP or 7/16"- 20UNF - 2B (SAE 4)
18 External pilot oil supply, 1/4" BSPP or 7/16" - 20UNF - 2B
19 P, T pressure ports

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 (M) 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 B-26).

Overall dimensions and hydraulic diagrams

HPV 41 hydraulic duagram with 2 inlet sections (HSE) and mid end section (HPFS), for open centre system



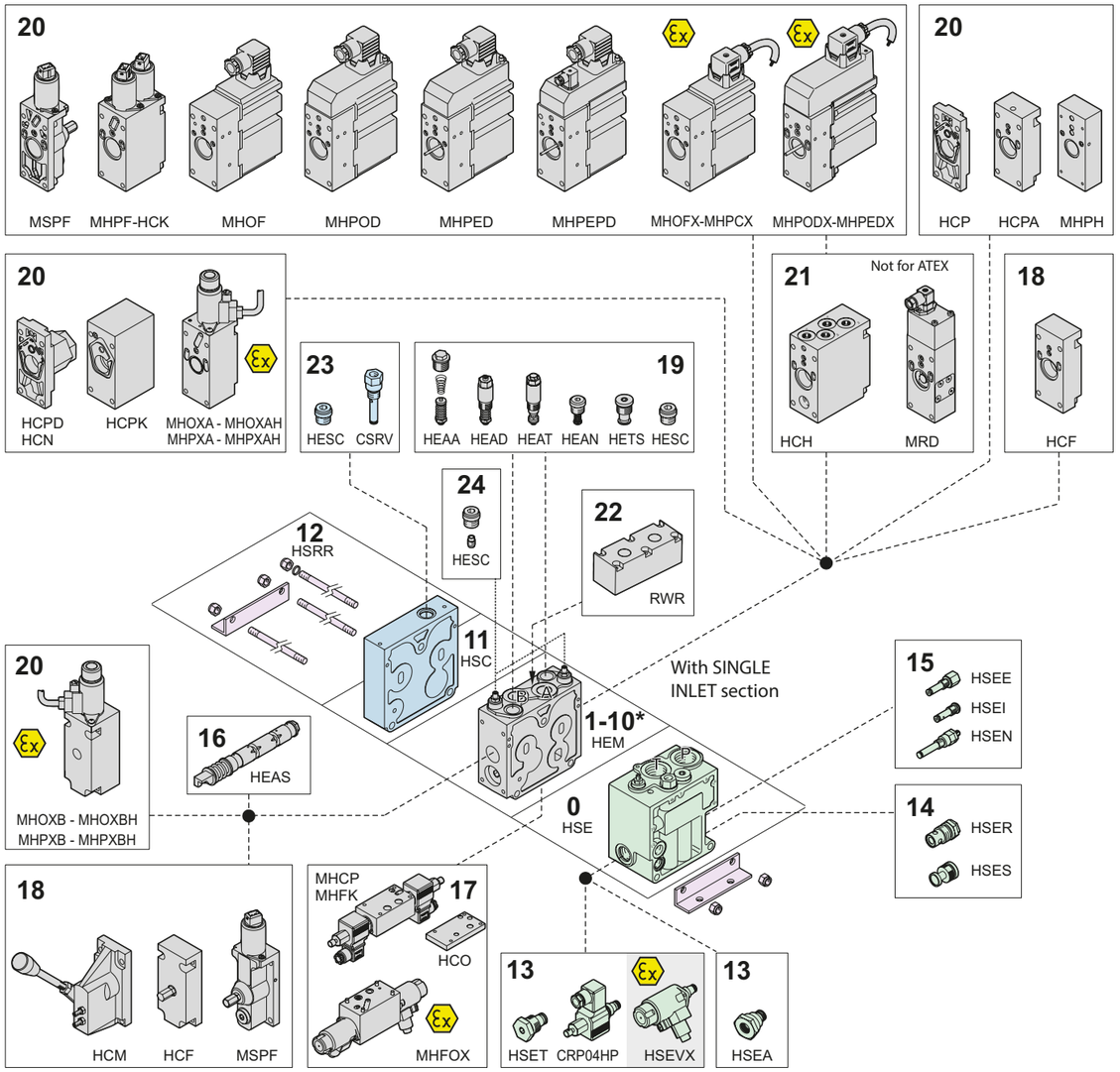

DANA
ARON™

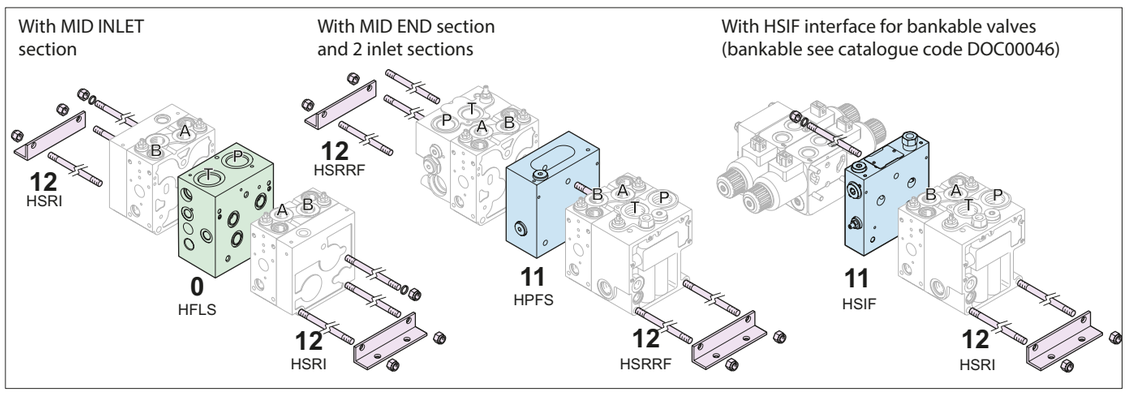
HPV41
Composition
form

HPV41
Composition
form

Cut

HPV41 Composition form





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

FIELD 0 - INLET SECTIONS
HSE - Inlet section B-27
HFLS - Mid inlet section B-33

FIELD 1 to 10 - WORKING SECTIONS
HEM - Working section B-38

FIELD 11 - END SECTIONS
HSC - End section B-88
HPFS - Intermediate end section B-90
HSIF - Interface between HPV 41 and CXDH3 / CX3 / CDH3 / CD3 / CDC3 ..... B-91

FIELD 12 - STAY BOLTS KITS
HSRR - Stay bolts kit for single inlet HSE B-94
HSRI - Stay bolts kit for mid inlet HFLS B-95
HSRRF - Stay bolts kit for mid end section HPFS B-96
HSRI - Stay bolts kit for HSIF interface B-97

FIELD 13 - FACILITIES FOR SOLENOID LS UNLOADING VALVES
HSET - Plug B-35
CRP04HP - Electrical valve B-35
HSEA - Cartridge B-35
HSEVX - ATEX electrical valve B-35

FIELD14 - FACILITIES FOR PUMP UNLOADING
HSER, HSES - Valve and plug B-37

FIELD 15 - PILOT OIL SUPPLY
HSEE, HSEI, HSEN - Cartridges B-37

FIELD 16 - SPOOLS
HEAS - Main spools B-46

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

FIELD 18 - MECHANICAL ACTUATORS
HCM Mechanical control B-53
HCF Rear cover B-53
MSPF - Current electrohydraulic proportional module B-54

FIELD 19 - SHOCK AND SUCTION VALVE
HEAA, HEAD, HEAT, HEAN, HETS, HESC - Valves and plugs B-50

FIELD 20 - MECHANICAL, HYDRAULIC AND ELECTRICAL ACTUATORS
HCN - Friction B-55
HCP - Rear cover B-55
HCPA - Adjustabler rear cover B-55
HCPK - Kick-Out device B-56
HCPD - Spool lock device B-56
MHPH - Hydraulic activation B-56
MHPF - Electrohydraulic proportional module B-57
HCK - electrohydraulic proportional modulewith pilot oil connections B-58
MHOF - On/Off electrohydraulic module B-59
MHPOD - Open loop electrohydraulic proportional module B-60
MHPED - Closed loop electrohydraulic proportional module B-61
MHPEPD - Closed loop electrohydraulic proportional module B-63
MHOX, MHOX-H - On/Off electrohydraulic modules ATEX B-65
MHPX, MHPX-H - Proportional electrohydraulic modules ATEX B-69
MHOFX - On/Off electrohydraulic ATEX module B-73
MHPCX - Proportional electrohydraulic ATEX module B-74
MHPODX - Open loop electrohydraulic proportional ATEX module B-75
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FIELD 21 - REMOTE CONTROL
HCH - Hydraulic and electrical remote control B-78
MRD - Electrical spool movement device B-80

FIELD 22 - MODULE WITH CHECK VALVE
RWR - Double pilot operated check valve module B-81

FIELD 23 - ACCESSORIES FOR HSC AND HSIF ELEMENTS
CSRV module - electrical activations external drain B-93
HESC module - manual and hydraulic activations internal drain B-93

FIELD 24 - PLUGS KIT
Kit for closing pressure relief valve cavity B-52

SPARE PARTS KIT B-98

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 B-21), i.e. the HCM module for the manual control inserted in sector of pertinence 18, and the rear modules HCP, HCPD, HCPK, 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	•	—	—	—	—	—	—
HCPK	•	—	•	•	•	•	•
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				bar	16			18	
	19		10	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		9	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		8	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		7	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		6	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		5	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		4	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		3	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		2	LsA					19	
	20			LsB		17			20	
	21				22				21	
	18				bar	16			18	
	19		1	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 B-14.

Order form

With MID inlet section (HFLS)

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

Order form

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

Controlled function	A Port		0			13		B Port		Controlled function
						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

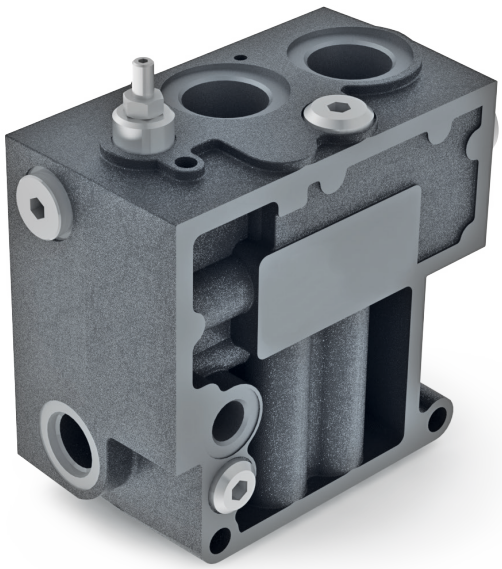
MAIN INFORMATION

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° :	

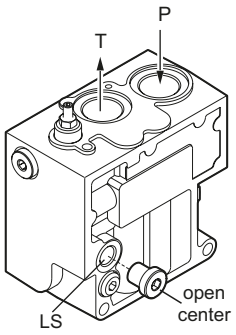
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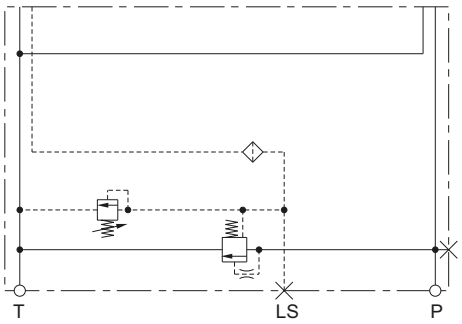
NOTE: For working sections numbering, see page B-16.

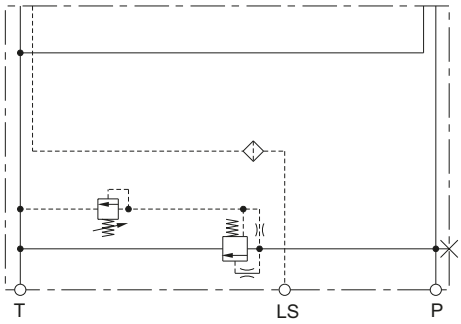


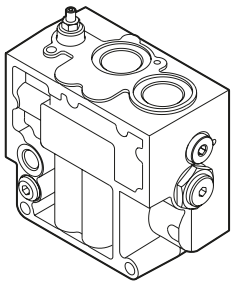
Features
- Hydraulic features: see page B-8.
- Connections: P, T: 3/4" BSPP or 1 1/16" - 12UN-2B
- Connessione Ls: 1/4" BSPP or 7/16" - 20UNF-2B
- Made in cast iron

HSE for purely mechanically activated valves









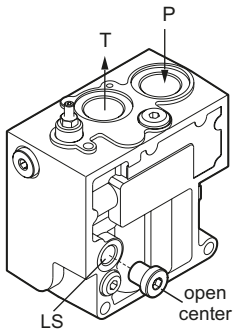
Open center circuit for fixed displacement pumps

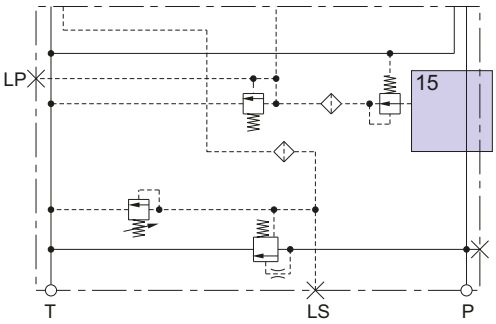
Code	
BSPP	UN - UNF
HSE0004101010	HSE0004101020

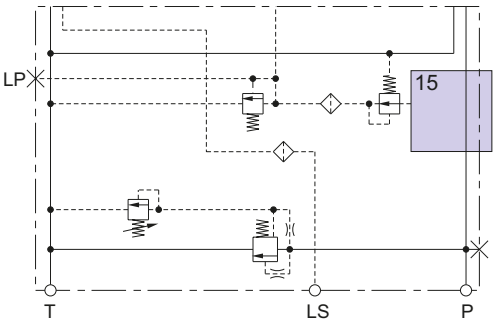
Closed center circuit for load sensing pumps

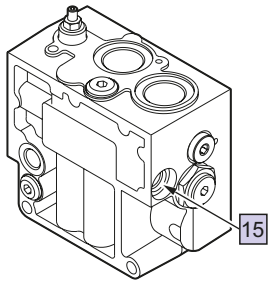
Code	
BSPP	UN - UNF
HSE0004101110	HSE0004101120

For electrically activated valves.With pilot oil supply Lp.









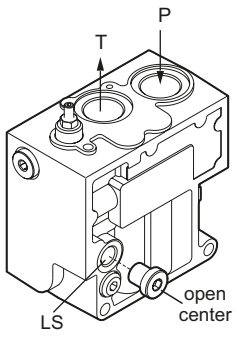
Open center circuit for fixed displacement pumps

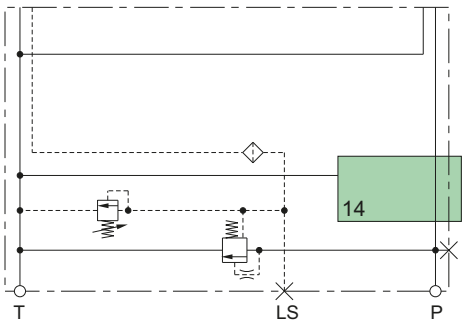
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0004101050	HSE0004101060	22	319
HSE0004101229	HSE0004101231	30	435
HSE0004101230	HSE0004101232	36	522

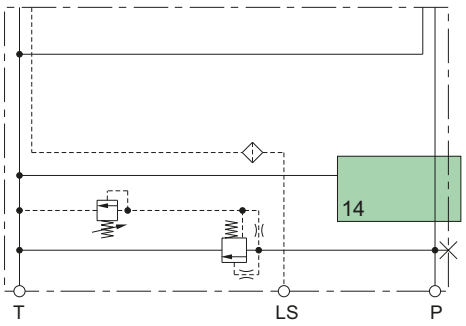
Closed center circuit for load sensing pumps

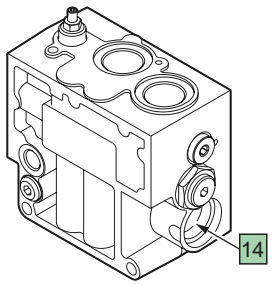
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0004101130	HSE0004101140	22	319
HSE0004101251	HSE0004101253	30	435
HSE0004101252	HSE0004101254	36	522

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









Open center circuit for fixed displacement pumps

Code	
BSPP	UN - UNF
HSE0004101030	HSE0004101040

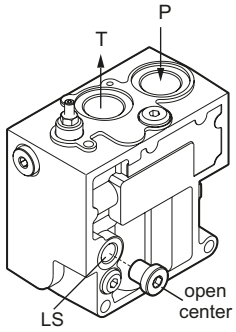
Closed center circuit for load sensing pumps

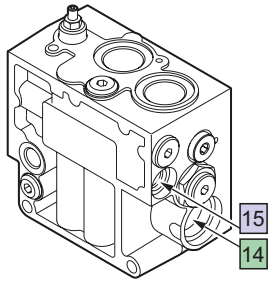
Code	
BSPP	UN - UNF
HSE0004101161	HSE0004101162

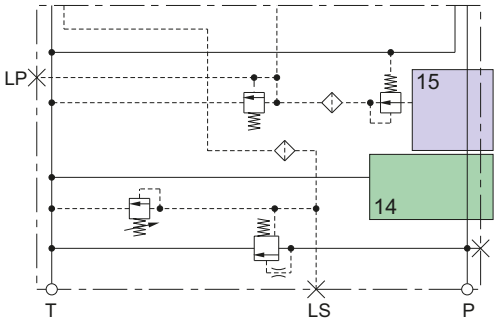
14 15 Seats, see accessories tables page B-37.

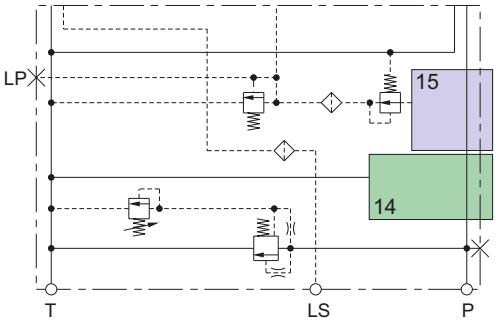
(*) LP = Pilot pressure oil supply. If not specified 22 bar [319 psi]

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









Open center circuit for fixed displacement pumps

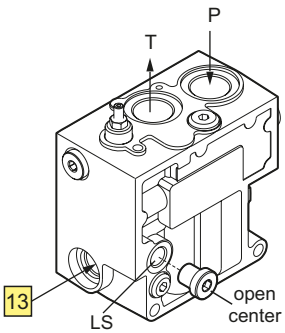
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0004101090	HSE0004101100	22	319
HSE0004101243	*	30	435
HSE0004101244	*	36	522

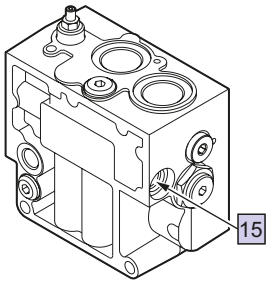
Closed center circuit for load sensing pumps

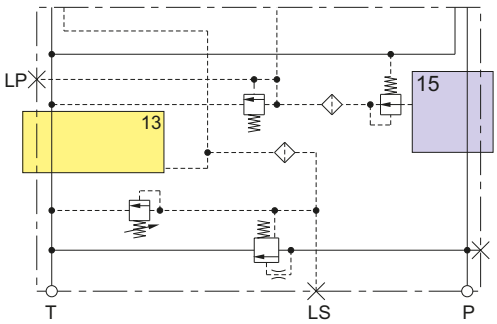
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0004101163	HSE0004101164	22	319
HSE0004101259	HSE0004101262	30	435
HSE0004101260	HSE0004101264	36	522

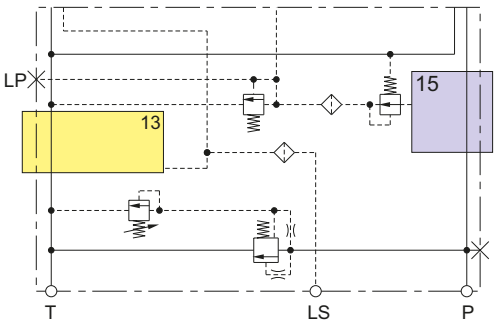
* available on request

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
HSE0004101070	HSE0004101080	22	319
HSE0004101233	HSE0004101241	30	435
HSE0004101234	HSE0004101242	36	522

Closed center circuit for load sensing pumps

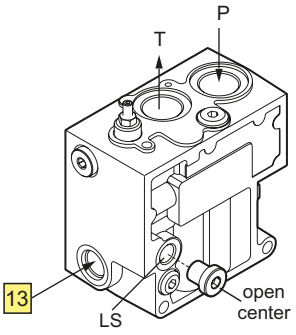
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0004101150	HSE0004101160	22	319
HSE0004101255	HSE0004101257	30	435
HSE0004101256	HSE0004101258	36	522

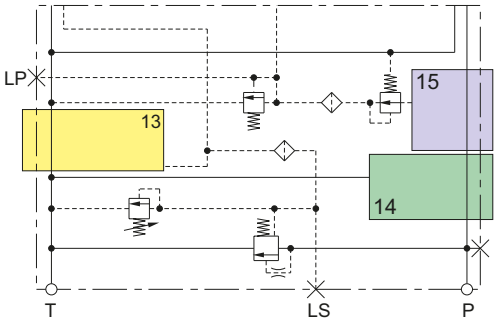
13 14 15 Seats, see accessories tables from page B-35.

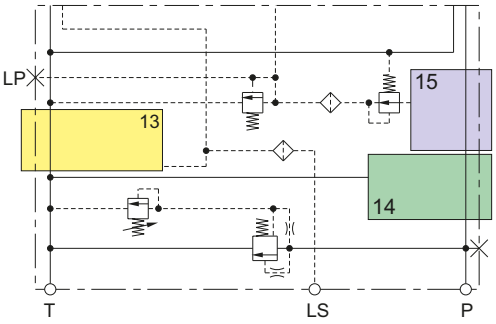
(*) LP = Pilot pressure oil supply. If not specified 22 bar [319 psi]

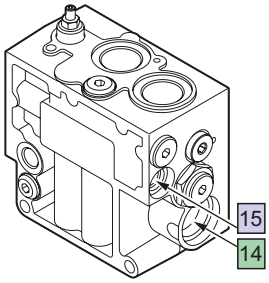
HSE inlet sections

For electrically activated valves. With pilot oil supply.
Prearranged for HSER and CRP04HP / HSEA / HSET.









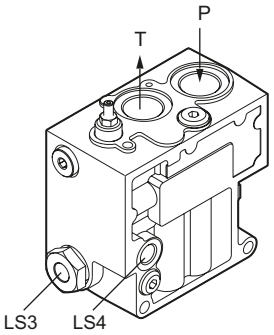
Open center circuit for fixed displacement pumps

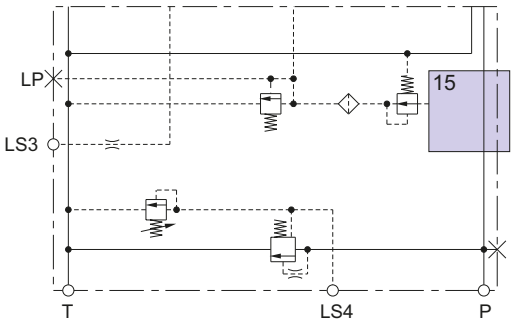
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0004101000	HSE0004101001	22	319
HSE0004101225	HSE0004101227	30	435
HSE0004101226	HSE0004101228	36	522

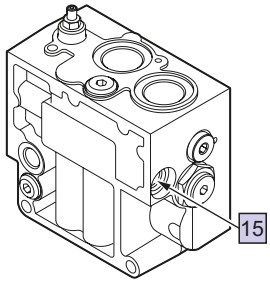
Closed center circuit for load sensing pumps

Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0004101125	HSE0004101126	22	319
HSE0004101247	HSE0004101249	30	435
HSE0004101248	HSE0004101250	36	522

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







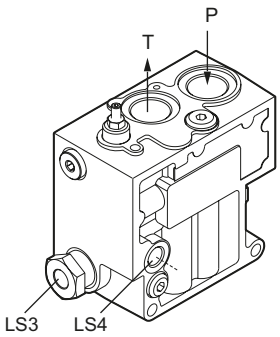
Open center circuit for fixed displacement pumps

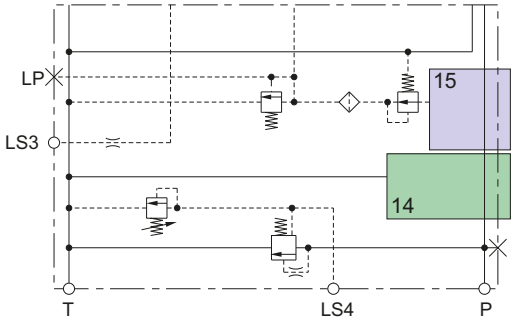
Code		LP(*)	
BSPP	UN - UNF	bar	psi
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HSE0004101235	HSE0004101237	30	435
HSE0004101236	HSE0004101238	36	522

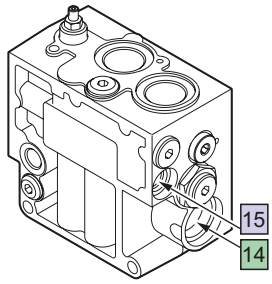
13 14 15 Seats, see accessories tables from page B-35.

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

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





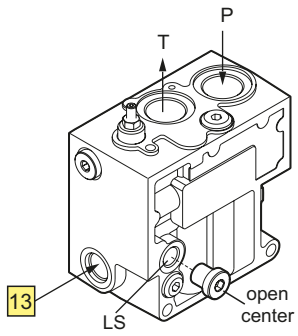


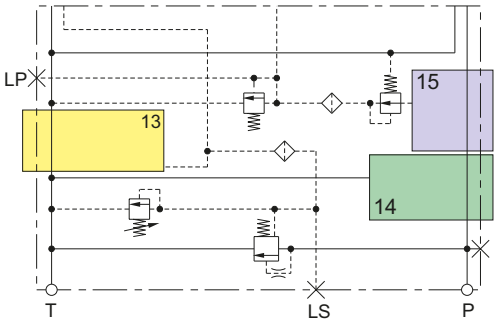
Open center circuit for fixed displacement pumps

Code		LP(*)	
BSPP	UN - UNF	bar	psi
HSE0004101073	HSE0004101074	22	319
*	HSE0004101239	30	435
*	HSE0004101240	36	522

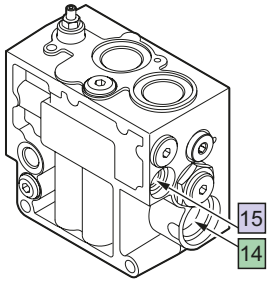
* available on request

For electrically activated valves. With pilot oil supply.
Prearranged for HSER and HSEVX. ATEX version.





13 : can be assembled only with the electrical valves ATEX type HSEVX.



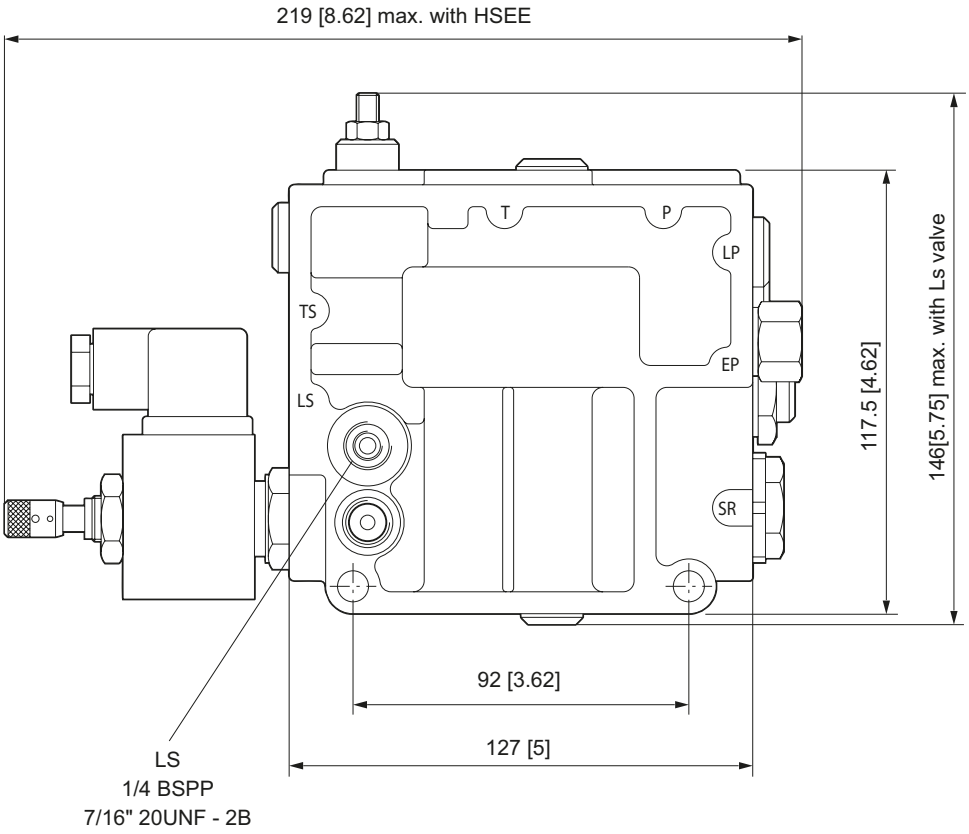
Open center circuit for fixed displacement pumps

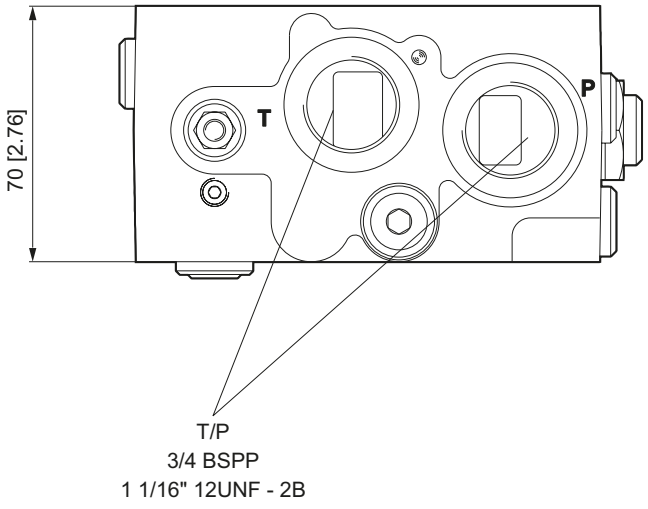
Code BSPP	LP(*)	
	bar	psi
HSE0004101275	22	319

13 14 15 Seats, see accessories tables from page B-35.

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

HSE inlet module overall dimensions



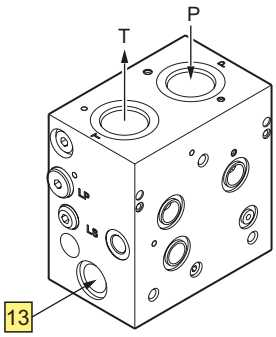


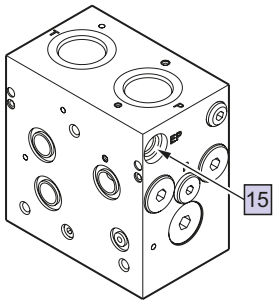
mm [inch]

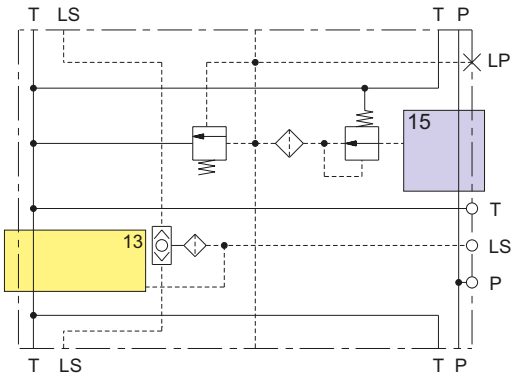
HFLS Mid inlet sections (for Ls pumps only)



- Features
- Other hydraulic features: see page B-8.
- Connections: P, T: 3/4" BSPP o 1 1/16" - 12UNF-2B
- Connessione Ls, LP: 1/4" BSPP or 7/16" - 20UNF-2B
- Prearranged for CRP04HP / HSEA / HSET
- Cast iron body.







Closed center circuit for load sensing pumps

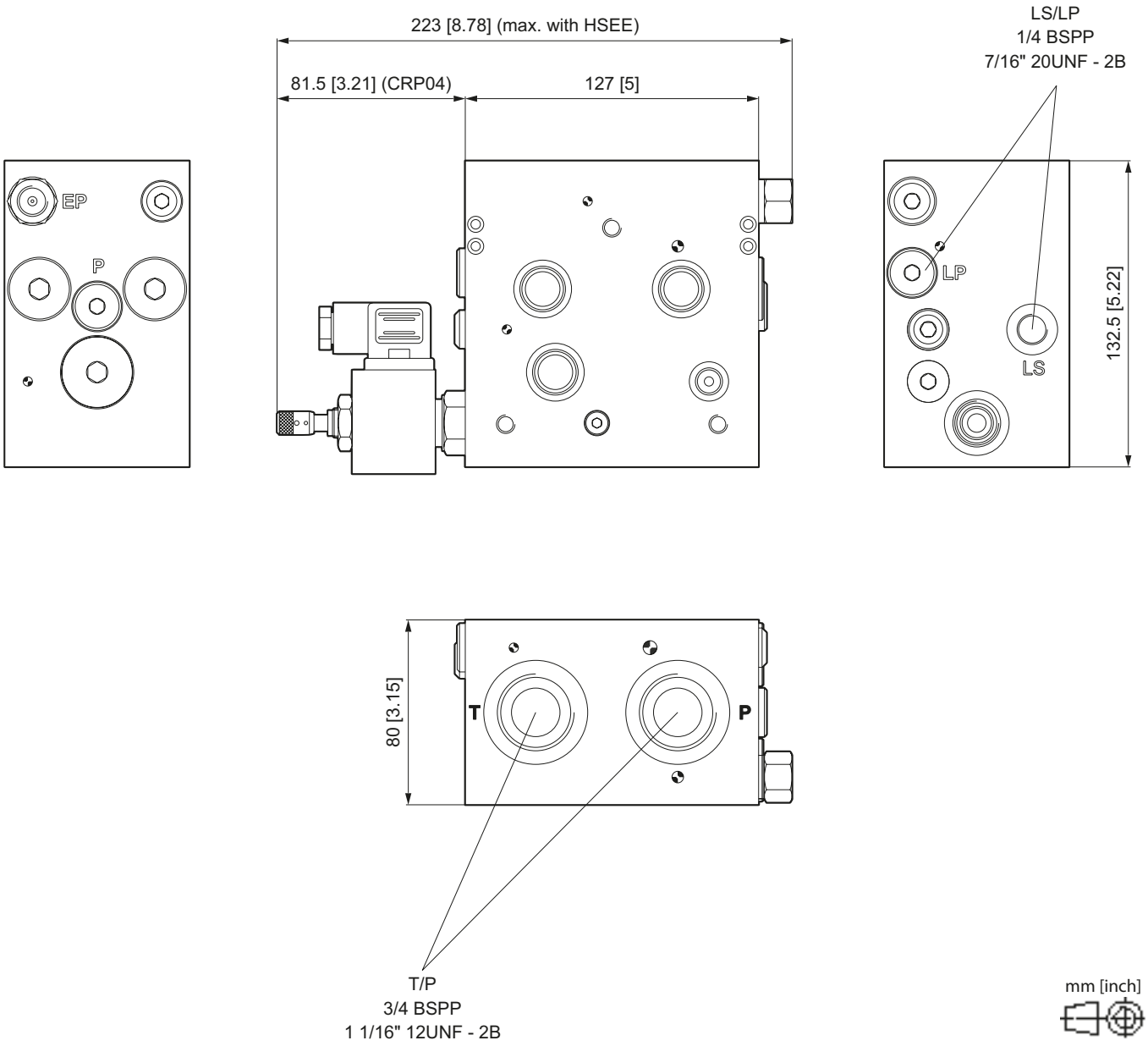
Code		LP(*)	
BSPP	UN - UNF	bar	psi
HFLS004101157	HFLS004101158	22	319
HFLS004101266	HFLS004101269	30	435
HFLS004101268	HFLS004101270	36	522

13 15 Seats, see accessories tables from page B-35.

(*) LP = Pilot pressure oil supply

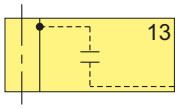
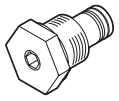
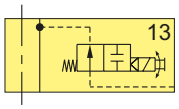
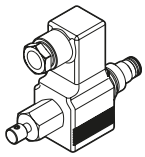
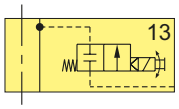
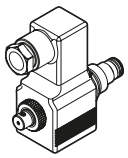
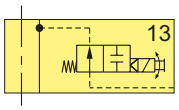
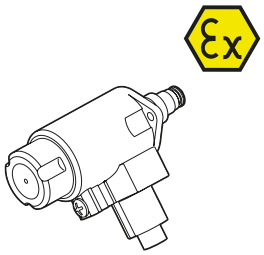
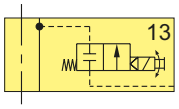
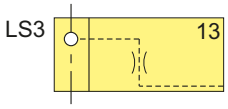
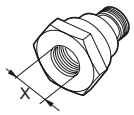
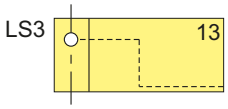
HFLS Mid inlet sections (for Ls pumps only)

HFLS inlet module overall dimensions



mm [inch]

Field 13 - Facilities for solenoid Ls unloading valve

Code	Description	Symbol / Field	Draw
HSET004101185	HSET Plug		
CRP04HPNAAE4P71 14 Vdc CRP04HPNAAEVP71 28 Vdc	CRP04HP Electrical Ls unloading valve Normally open		
CRP04HPNCAE4P01 14 Vdc CRP04HPNCAEVP01 28 Vdc	CRP04HP Electrical Ls unloading valve Normally closed		
HSEVX0NA12000 12 Vdc HSEVX0NA24000 24 Vdc	HSEVX (*) Electrical Ls unloading valve Normally open ATEX		
HSEVX0NC12000 12 Vdc HSEVX0NC24000 24 Vdc	HSEVX (*) Electrical Ls unloading valve Normally closed ATEX		
HSEA004101181 (connection X G 1/4)	HSEA Screw-in cartridge, Ls pilot pressure for HSE inlet sections, with Ø 0.8 mm [0.03 inch] orifice		
HSEA004101182 (connection X G 1/4)	HSEA Screw-in cartridge, Ls pilot pressure for HSE inlet sections		

(*) The eletrical valves ATEX type XSEVX can be assembled only with the inlect section code HSE0004101275, page B-31.

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 B-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:

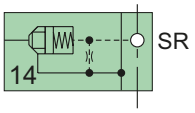
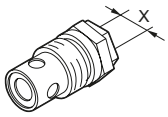
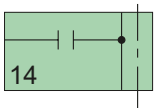
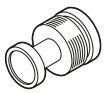
CE Ex II 2 GD c T4 / T135°C
T_{amb}= -20 °C ÷ +50 °C
T_{fluid}= -20 °C ÷ +80 °C

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

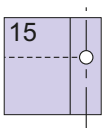
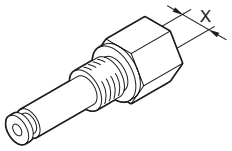
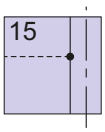
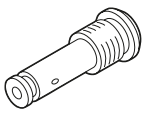
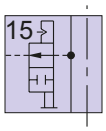
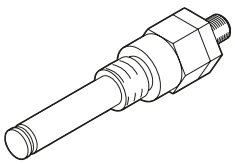
For the wiring diagram of module, please refer to Instruction manual.

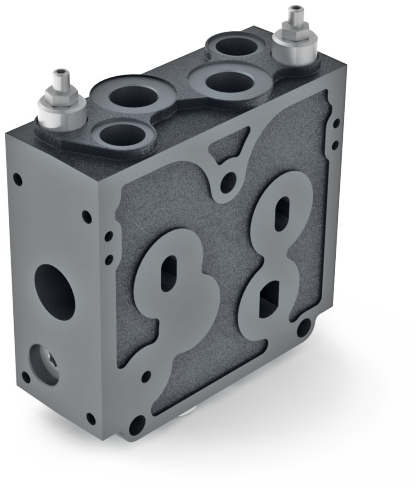
Nominal voltage	12 VDC	24 VDC
Coil resistance, R_{20}	9 Ω ± 6%	35.8 Ω ± 6%
Min. current	700 mA	350 mA
Max. current	1850 mA	930 mA
Limit power	14.3 W	14.4 W
Ambient temperature	-20 ÷ +50 °C [-4 ÷ +122 °F]	
Connection cable	FL4G11Y - 3 x 1.5 mm^2 [3 x 15 AWG] L = 5-5.1 mt [197-201 inch]	
Integrated diode 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 14 - Pilot oil supply

Code		Description	Symbol / Field	Draw
BSPP	UN - UNF			
HSER004101190 (connection X G 1/4)	HSER004101191 (connection X 7/16 UNF)	HSER Pump unloading cartridge valve, for HSE modules only, key 30 mm [1.18 inch]. Tightening torque 24 ± 2 Nm [17.7 ± 1.5 lbt.ft]		
HSES004101195		HSES Plug for HSER cavity. HSE modules only.		

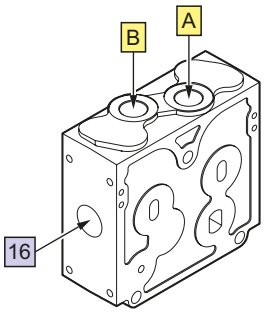
Field 15 - Facilities for pump unloading

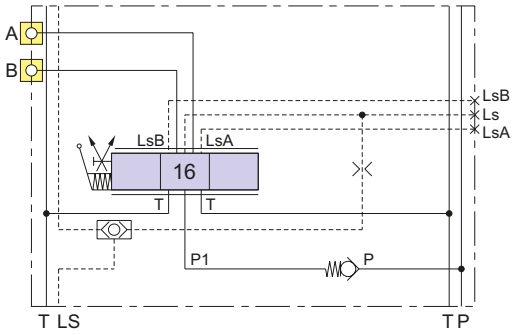
Code		Description	Symbol / Field	Draw
BSPP	UN - UNF			
HSEE004101200 (connection X G 1/4)	HSEE004101201 (connection X 7/16 UNF)	HSEE External pilot oil supply cartridge		
HSEI004101202		HSEI Internal pilot oil supply cartridge		
HSEN004101206		HSEN Internal pilot oil supply and cut-off cartridge		



- Features
- Other hydraulic features: see page B-8.
- Connections: A,B: 1/2" BSPP or 7/8" - 14UNF-2B
- Made in cast iron

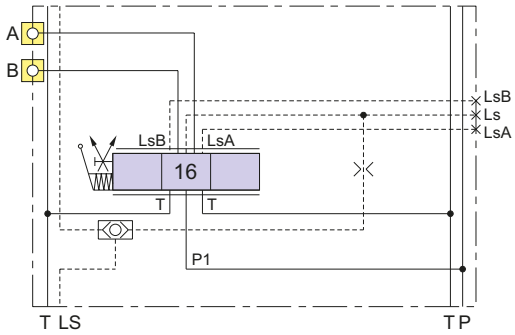
With no facilities for valves





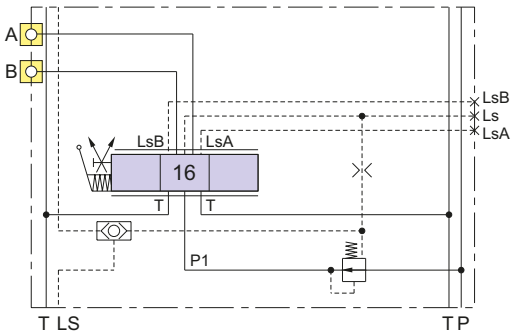
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0004102071	HEM0004102081



Without pressure compensator

Code	
BSPP	UN - UNF
HEM0004102070	HEM0004102080



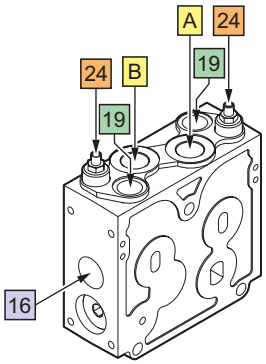
With pressure compensator

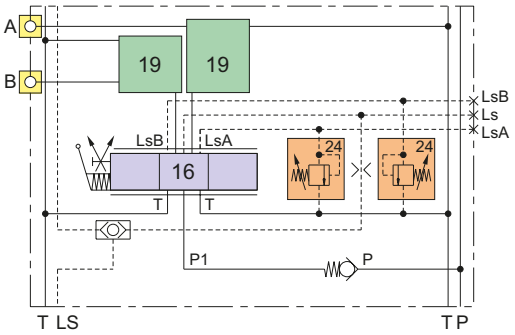
Code	
BSPP	UN - UNF
HEM0004102190	HEM0004102200

16 Spool page B-46

A/B Alternatively closing plug HETS004103002 page B-52

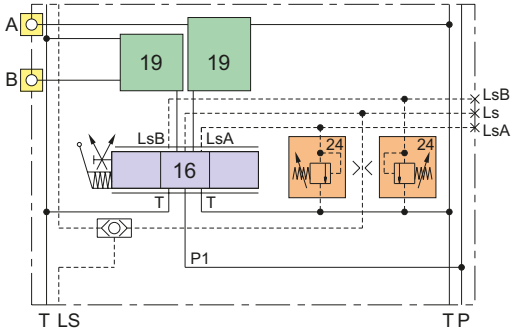
With adjustable LsA LsB pressure relief valves.
Prearranged for shock-suction valves





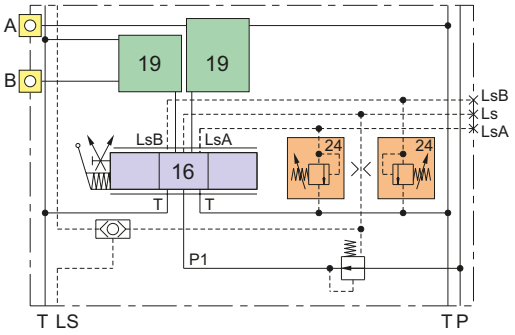
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0004102031	HEM0004102041



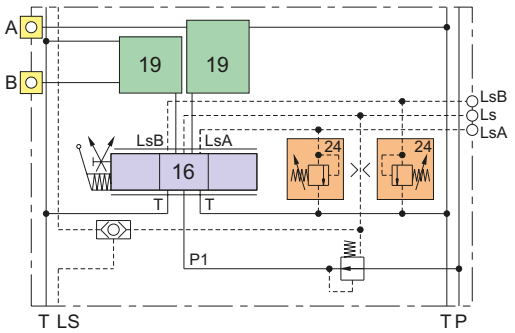
Without pressure compensator

Code	
BSPP	UN - UNF
HEM0004102030	HEM0004102040



With pressure compensator

Code	
BSPP	UN - UNF
HEM0004102150	HEM0004102160



With pressure compensator

Code	
BSPP	UN - UNF
HEM0004102130	HEM0004102140

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

16 Spool page B-46

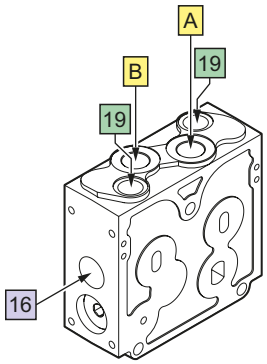
19 Seats for valve HEAA - HEAD - HEAT - HEAN or plug HETS page B-50

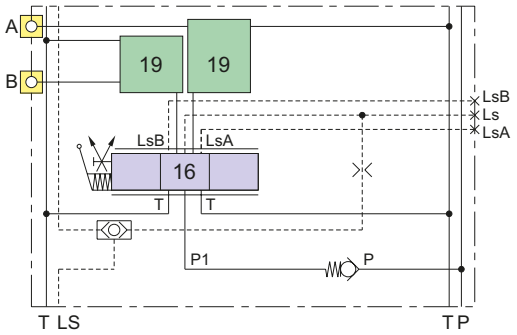
24 Pressure relief valves LsA e LsB, alternatively kit for closing seat HESC004103007 page B-52

A/B + 19 Alternatively plugs kit HESC004103008 page B-52

A/B + 19 + 24 Alternatively plugs kit HESC004103009 page B-52

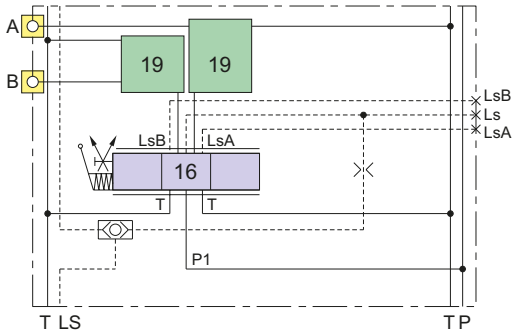
Prearranged for shock-suction valves





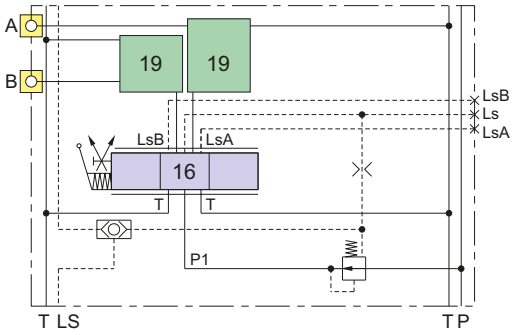
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0004102051	HEM0004102061



Without pressure compensator

Code	
BSPP	UN - UNF
HEM0004102050	HEM0004102060



With pressure compensator

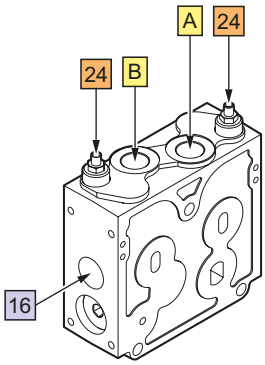
Code	
BSPP	UN - UNF
HEM0004102170	HEM0004102180

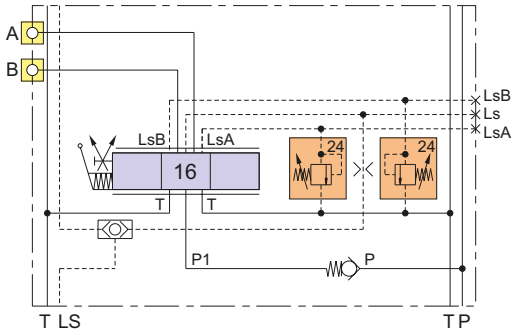
16 Spool page B-46

19 Seats for valve HEAA - HEAD - HEAT - HEAN or plug HETS page B-50

A/B + 19 Alternatively plugs kit HESC004103008 page B-52

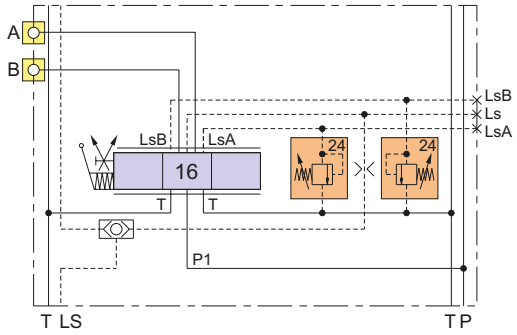
With adjustable LsA LsB pressure relief valves





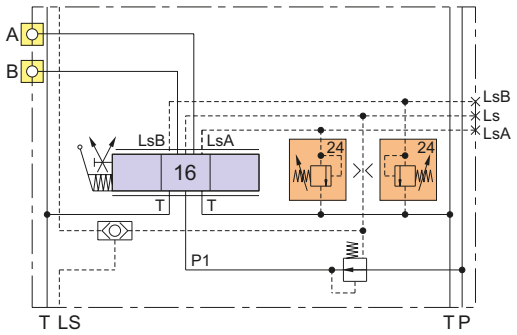
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0004102091	HEM0004102101



Without pressure compensator

Code	
BSPP	UN - UNF
HEM0004102090	HEM0004102100



With pressure compensator

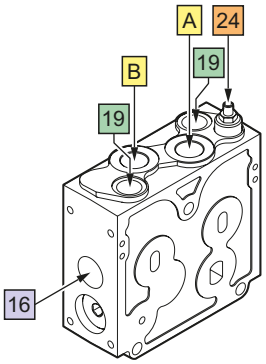
Code	
BSPP	UN - UNF
HEM0004102210	HEM0004102220

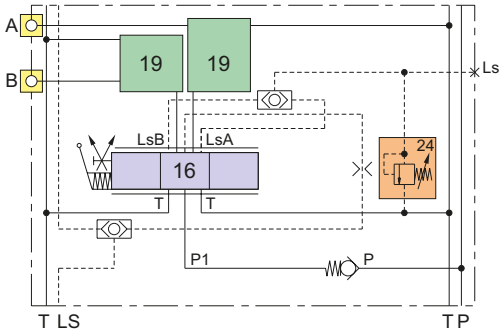
16 Spool page B-46

24 Pressure relief valves LsA e LsB, alternatively kit for closing seat HESC004103007 page B-52

A/B Alternatively closing plug HETS004103002 page B-52

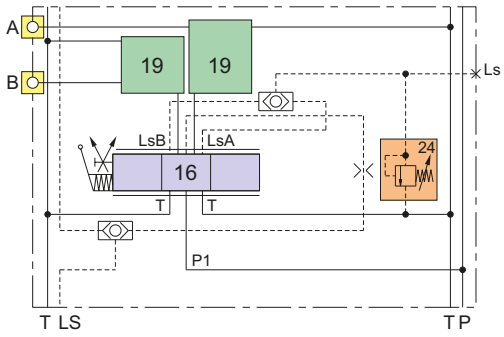
With single adjustable Ls pressure relief valve.
Prearranged for shock-suction valves





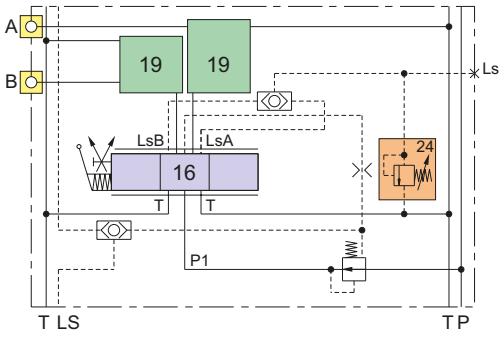
Without pressure compensator
With load drop check valve

Code	
BSPP	UN - UNF
HEM0004102111	HEM0004102121



Without pressure compensator

Code	
BSPP	UN - UNF
HEM0004102110	HEM0004102120



With pressure compensator

Code	
BSPP	UN - UNF
HEM0004102230	HEM0004102240

16 Spool page B-46

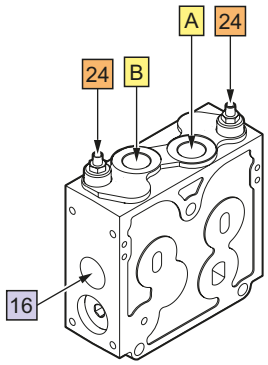
19 Seats for valve HEAA - HEAD - HEAT - HEAN or plug HETS page B-50

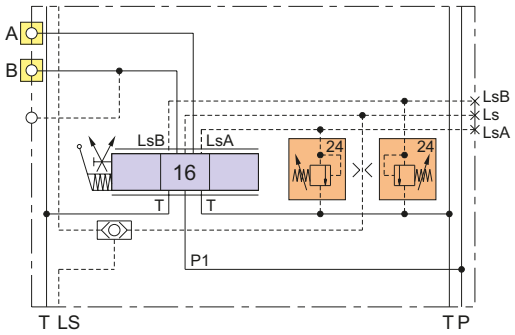
24 Pressure relief valves LsA e LsB, alternatively kit for closing seat HESC004103007 page B-52

A/B + 19 Alternatively plugs kit HESC004103008 page B-52

A/B + 19 + 24 Alternatively plugs kit HESC004103009 page B-52

With adjustable LsA LsB pressure relief valves.
Prearranged for automatic hydraulic release (kick-out) in B port

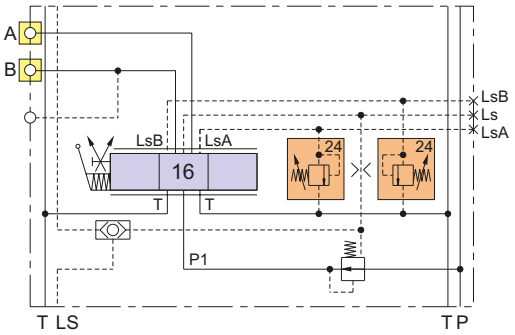




Without pressure compensator

Code	
BSPP	UN - UNF
*	HEM0004102104

* available on request



With pressure compensator

Code	
BSPP	UN - UNF
HEM0004102221	*

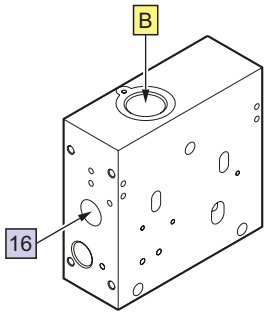
* available on request

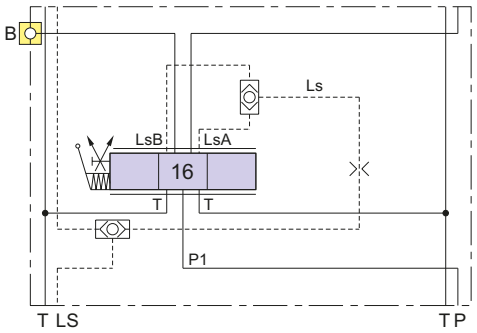
16 Spool page B-46

24 Pressure relief valves LsA e LsB, alternatively kit for closing seat HESC004103007 page B-52

A/B Alternatively closing plug HETS004103002 page B-52

D. S. version (Special Distribution) for upstream / downstream subordinate actuator supply





Without pressure compensator

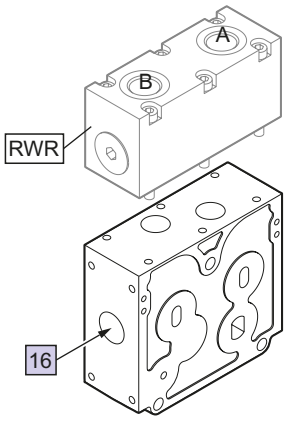
Code	
BSPP	UN - UNF
HEM0004102123	*

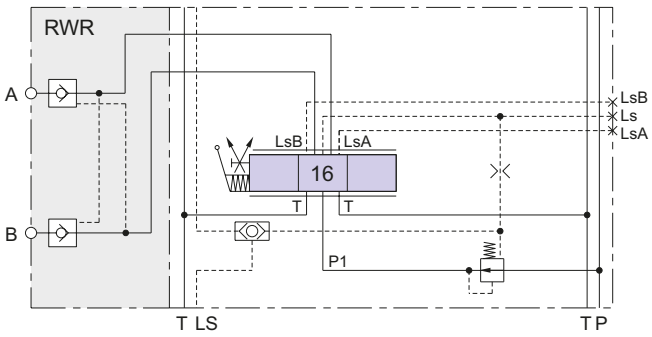
* available on request

16 Spool page B-46

B Alternatively closing plug HETS004103002 page B-52

Prearranged for RWR module (double pilot operated check valve) only



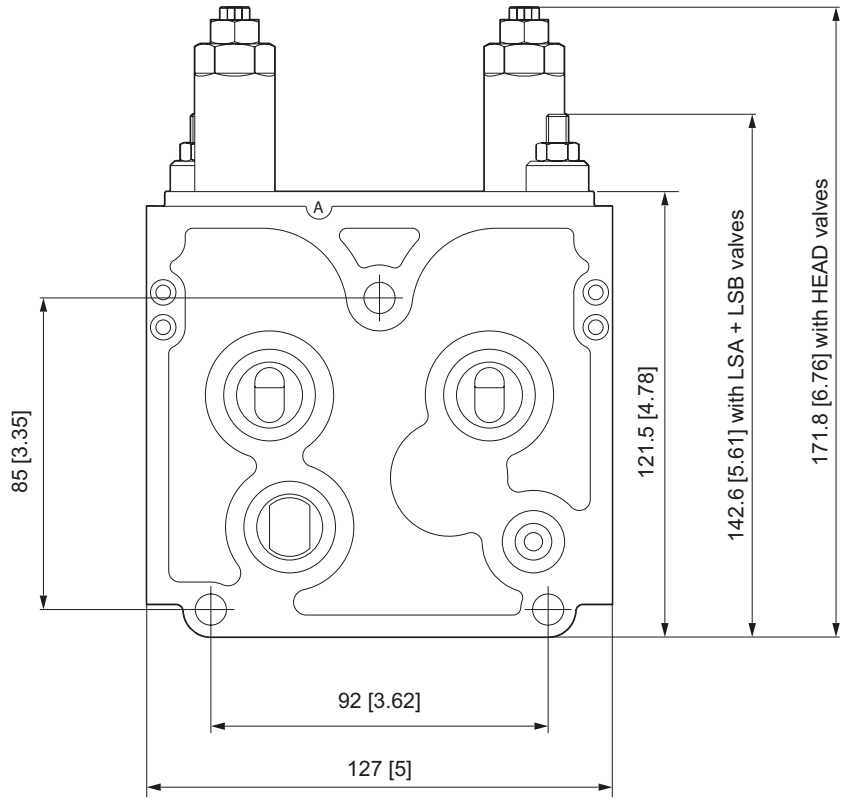


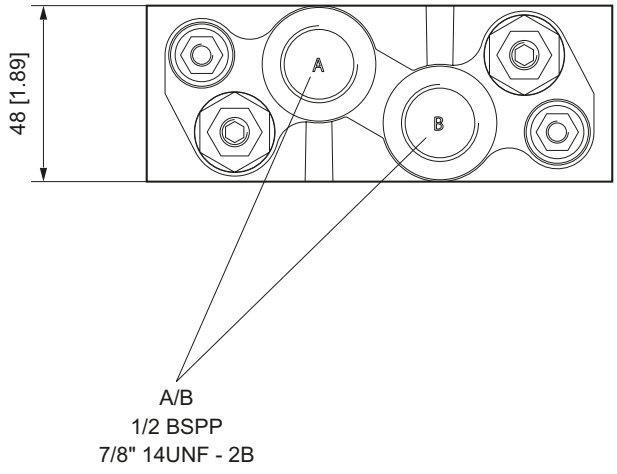
With pressure compensator

Code	
BSPP	UN - UNF
HEM0004102400	HEM0004102401

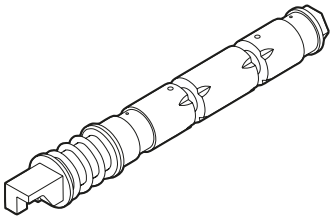
16 Spool page B-46

HEM module overall dimensions

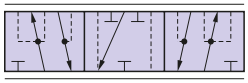
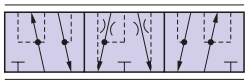
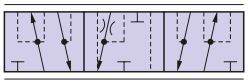
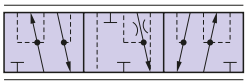




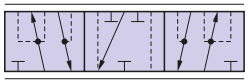
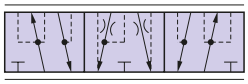
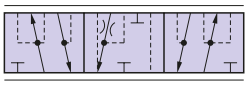
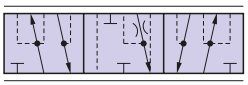
mm [inch]



Main spool for flow control, double acting

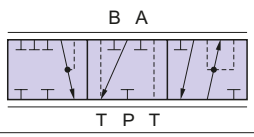
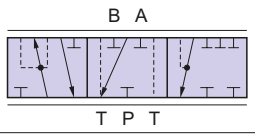
Size	Max. pressure compensated oil flow l/min [US gpm]	Symbol and ordering code			
		B A  T P T	B A  T P T	B A  T P T	B A  T P T
		4-way. 3-position A. B closed	4-way. 3-position A. B → T	4-way. 3-position B → T; A closed	4-way. 3-position A → T; B closed
	3 [0.8]	HEAS004104014	HEAS004104038	—	—
	5 [1.3]	HEAS004104009	HEAS004104039	—	—
1	7.5 [2]	HEAS004104010	HEAS004104040	HEAS004104070	HEAS004104100
	12 [3.2]	HEAS004104012	HEAS004104042	—	—
2	15 [4]	HEAS004104013	HEAS004104043	HEAS004104073	HEAS004104103
3	20 [5.3]	HEAS004104015	HEAS004104045	HEAS004104075	HEAS004104105
	25 [6.6]	HEAS004104016	HEAS004104046	-	-
4	30 [7.9]	HEAS004104018	HEAS004104048	HEAS004104078	HEAS004104108
5	40 [10.6]	HEAS004104020	HEAS004104050	HEAS004104080	HEAS004104110
6	50 [13.2]	HEAS004104021	HEAS004104051	HEAS004104081	HEAS004104111
7	60 [15.9]	HEAS004104025	HEAS004104055	HEAS004104085	HEAS004104115
8	80 [21.1]	HEAS004104030	HEAS004104060	HEAS004104090	HEAS004104120
9	100 [26.4]	HEAS004104035	HEAS004104065	HEAS004104095	HEAS004104125
10	130 [34.3]	HEAS004104036	HEAS004104066	—	—

Main spool for flow control, double acting, asymmetric flow

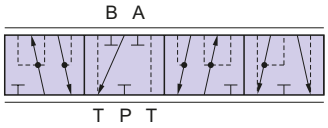
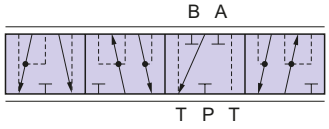
Max. pressure compensated oil flow l/min [US gpm]		Symbol and ordering code			
		B A  T P T	B A  T P T	B A  T P T	B A  T P T
A	B	4-way. 3-position A. B closed	4-way. 3-position A. B → T	4-way. 3-position B → T; A closed	4-way. 3-position A → T; B closed
7.5 [2]	15 [4]	HEAS00410AAAB (*)	HEAS00410ABAB (*)	—	—
7.5 [2]	20 [5.3]	HEAS00410AAAD (*)	—	—	—
7.5 [2]	30 [7.9]	—	—	HEAS00410ACCF (*)	—
10 [2.6]	20 [5.3]	HEAS00410AACD (*)	—	—	—
12 [3.2]	20 [5.3]	HEAS004104017 (*)	HEAS004104047 (*)	—	—
12 [3.2]	30 [7.9]	—	—	—	HEAS004104076 (*)
15 [4]	30 [7.9]	HEAS00410AABF (*)	—	—	—
20 [5.3]	40 [10.6]	—	—	—	HEAS00410ACDH (*)
30 [7.9]	50 [13.2]	HEAS00410AAFI (*)	HEAS00410ABIF (*)	—	—
30 [7.9]	70 [18.5]	HEAS00410AAFO (*)	-	—	—
30 [7.9]	130 [34.3]	—	HEAS00410ABFZ (*)	—	—
40 [10.6]	60 [15.9]	—	HEAS00410ABMH (*)	—	—
50 [13.2]	80 [21.1]	HEAS00410AAIQ (*)	—	—	—
60 [15.9]	100 [26.4]	HEAS00410AAMU (*)	—	—	—
60 [15.9]	80 [21.1]	HEAS00410AAMQ (*)	—	—	—
70 [18.5]	130 [34.3]	—	HEAS00410ABOZ (*)	—	—

(*) Special spool, available upon request

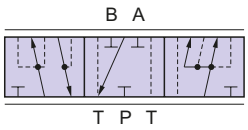
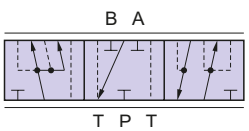
Main spool for flow control, single acting

Size	Max. pressure compensated oil flow l/min [US gpm]	Symbol and ordering code	
			
		3-way, 3-position P → A	3-way, 3-position P → B
1	7.5 [2]	HEAS004104130 (*)	HEAS004104160 (*)
2	15 [4]	HEAS004104133 (*)	HEAS004104163 (*)
3	20 [5.3]	HEAS004104135 (*)	HEAS004104165 (*)
4	30 [7.9]	HEAS004104138 (*)	HEAS004104168 (*)
5	40 [10.6]	HEAS004104140 (*)	HEAS004104170 (*)
6	50 [13.2]	HEAS004104141 (*)	HEAS004104171 (*)
7	60 [15.9]	HEAS004104145 (*)	HEAS004104175 (*)
8	80 [21.1]	HEAS004104150 (*)	HEAS004104180 (*)
9	100 [26.4]	HEAS004104155 (*)	HEAS004104185 (*)

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	7.5 [2]	HEAS004104190 (*)	HEAS004104390 (*)
2	15 [4]	HEAS004104193 (*)	HEAS004104393 (*)
3	20 [5.3]	HEAS004104195 (*)	HEAS004104395 (*)
4	30 [7.9]	HEAS004104198 (*)	HEAS004104398 (*)
5	40 [10.6]	HEAS004104200 (*)	HEAS004104400 (*)
6	50 [13.2]	HEAS004104201 (*)	HEAS004104401 (*)
7	60 [15.9]	HEAS004104205 (*)	HEAS004104405 (*)
8	80 [21.1]	HEAS004104210 (*)	HEAS004104410 (*)
9	100 [26.4]	HEAS004104215 (*)	HEAS004104415 (*)

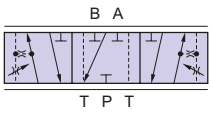
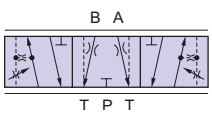
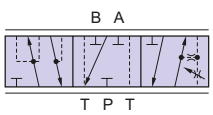
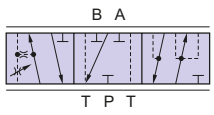
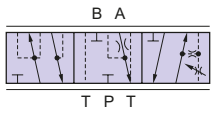
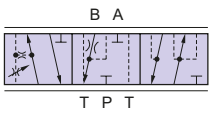
HEAS modules - Main spool for flow control, double acting, regenerative function

Size	Max. pressure compensated oil flow l/min [US gpm]	Symbol and ordering code	
			
		Regenerative circuit on A port	Regenerative circuit on B port
5	40 [10.6]	HEAS004104500 (*)	HEAS004104600 (*)
6	50 [13.2]	HEAS004104501 (*)	HEAS004104601 (*)

(*) Special spool, available upon request

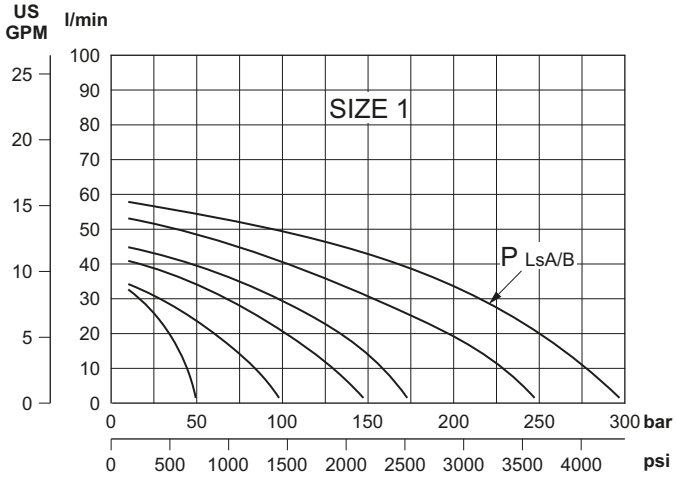
Main spool for pressure control
When using a proportional directional valve, where the overcenter valves are present, instability problems can happen to the whole system, in the form of a rise and fall of pressure. A new series of spools will suit these kinds of problems.
This system of control is called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

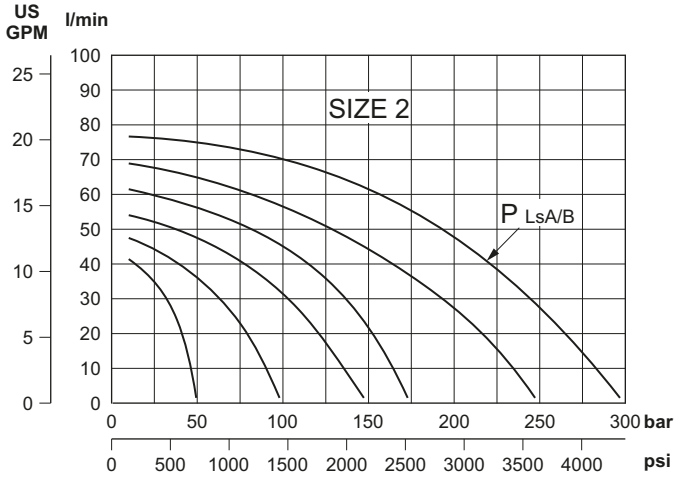
- The valve loses own compensation, becoming "load dependent": namely, its performance varies at the variation of the working pressure;
- The pump pressure could be considerably higher than that necessary to move the load (the Δp through the spool is no more constant and controllable).

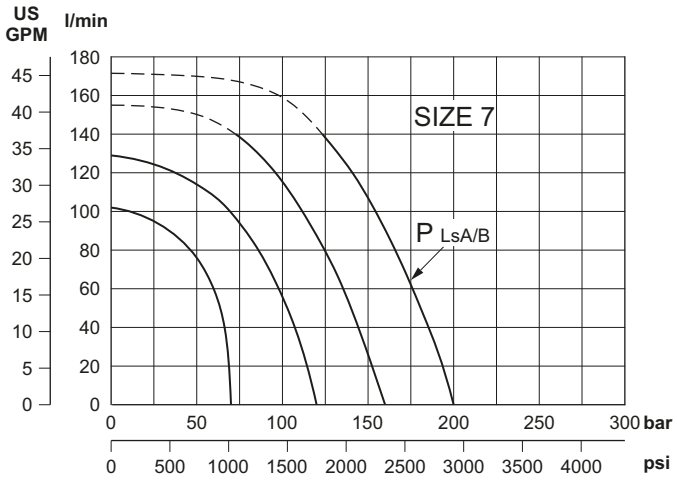
Size	Symbol and ordering code (PC = Pressure Control - FC = Flow control)					
						
	4-way, 3-position, A, B closed	4-way, 3-position, A, B throttled open to T	4-way, 3-position, A, B closed	4-way, 3-position, A, B closed	4-way, 3-position, A throttled open to T, B closed	4-way, 3-position, A closed, B throttled open to T
1	HEAS00410AD07 (*) PC → A + B	HEAS00410AD11 (*) PC → A + B	HEAS00410AMAF (*) PC → A FC → B Q=30 l/min [7.9 US gpm]	—	HEAS00410AVAF (*) PC → A FC → B Q=30 l/min [7.9 US gpm]	—
	—	—	HEAS00410AMAI (*) PC → A FC → B Q=50 l/min [13.2 US gpm]	—	HEAS00410AVAI (*) PC → A FC → B Q=50 l/min [13.2 US gpm]	—
2	HEAS00410AD15 (*) PC → A + B	HEAS00410AD16 (*) PC → A + B	HEAS00410A040 (*) PC → A FC → B Q=60 l/min [15.8 US gpm]	—	—	—
7	—	—	HEAS00410A060 (*) PC → A FC → B Q=100 l/min [26.4 US gpm]	—	—	—

(*) Special spool, available upon request

Pressure control flow characteristics, with end spool travel



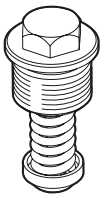




P LsA/B: Pilot pressure relief valve setting

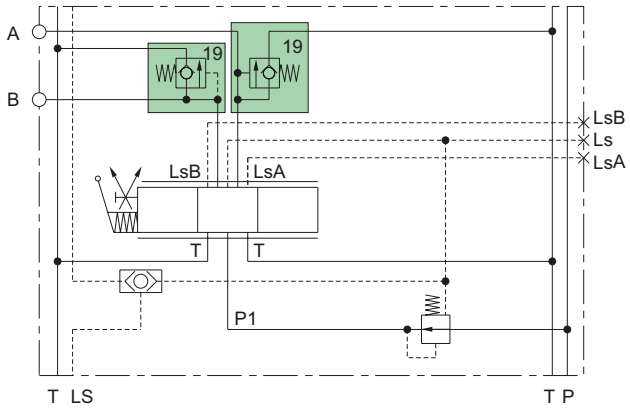
Typical spool oil flow tolerances

Size	Oil flow at max. spool travel	
	min l/min [US gpm]	max l/min [US gpm]
1	7 [1.8]	8.5 [2.2]
2	14.5 [3.8]	16 [4.2]
3	19 [5]	21 [5.5]
4	29 [7.7]	33 [8.7]
5	39 [10.3]	44 [11.6]
6	48.5 [12.8]	54 [14.3]
7	59 [15.6]	65 [17.2]
8	79 [20.9]	85 [22.5]
9	94 [24.8]	101 [26.7]
10	118 [31.2]	128 [33.8]

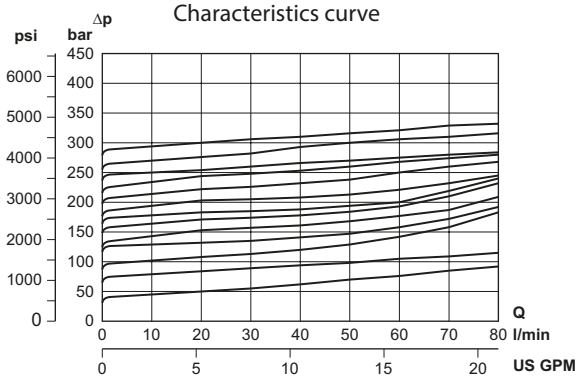


HEAA

Hydraulic diagram example



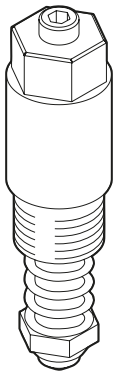
Characteristics curve



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

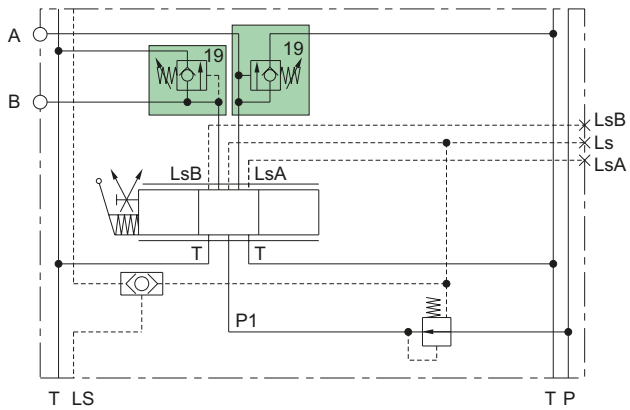
HEAA is designed to absorb shock effects only.
Don't use it as a pressure relief valve.

Range setting bar [psi]	Code (*)
45 [653]	HEAA004103045
60 [870]	HEAA004103060
75 [1088]	HEAA004103075
95 [1378]	HEAA004103095
120 [1740]	HEAA004103120
135 [1958]	HEAA004103135
155 [2248]	HEAA004103155
170 [2466]	HEAA004103170
190 [2756]	HEAA004103190
220 [3191]	HEAA004103220
240 [3481]	HEAA004103240
250 [3626]	HEAA004103250
270 [3916]	HEAA004103270
290 [4206]	HEAA004103290
320 [4641]	HEAA004103320

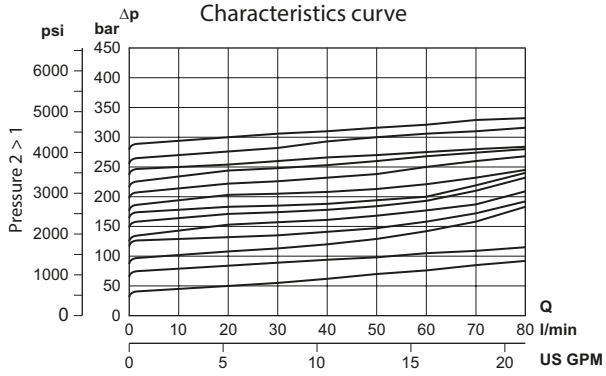


HEAD

Hydraulic diagram example



Characteristics curve

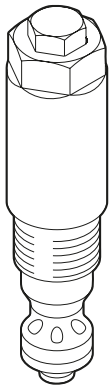


Adjustable shock and suction valve for A – B ports.

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

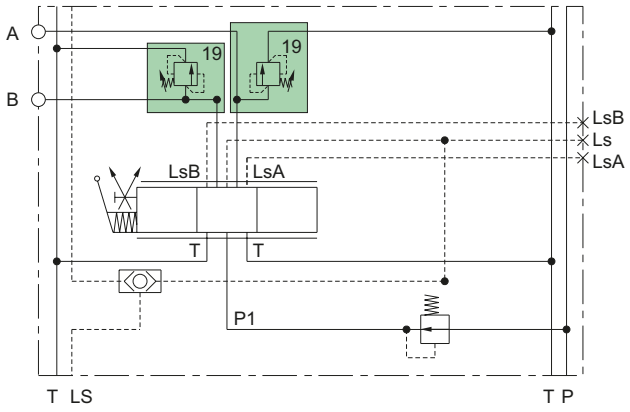
Range setting bar [psi]	Code (*)
10 ÷ 70 [150 ÷ 1020]	HEAD004103020
71 ÷ 120 [1021 ÷ 1740]	HEAD004103022
121 ÷ 200 [1741 ÷ 2900]	HEAD004103024
201 ÷ 270 [2901 ÷ 3920]	HEAD004103026
271 ÷ 320 [3921 ÷ 4640]	HEAD004103028
321 ÷ 380 [4641 ÷ 5510]	HEAD004103030

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

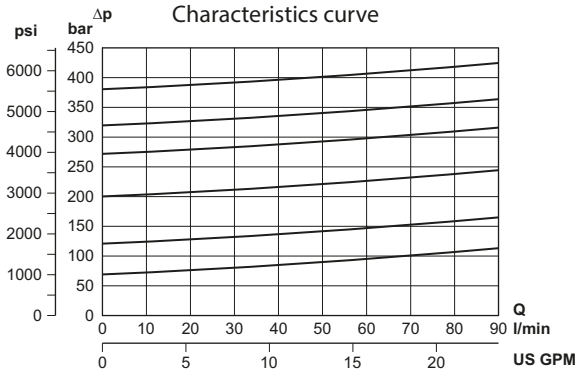


HEAT

Hydraulic diagram example



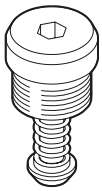
Characteristics curve



Adjustable shock valve for A – B ports

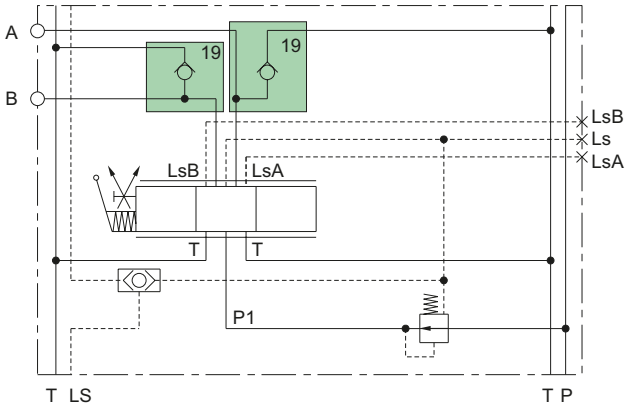
Don't use it as a pressure relief valve.

Range setting bar [psi]	Code (*)
10 ÷ 70 [150 ÷ 1020]	HEAT004103020
71 ÷ 120 [1021 ÷ 1740]	HEAT004103022
121 ÷ 200 [1741 ÷ 2900]	HEAT004103024
201 ÷ 270 [2901 ÷ 3920]	HEAT004103026
271 ÷ 320 [3921 ÷ 4640]	HEAT004103028
321 ÷ 380 [4641 ÷ 5510]	HEAT004103030



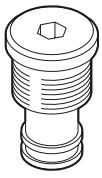
HEAN

Hydraulic diagram example



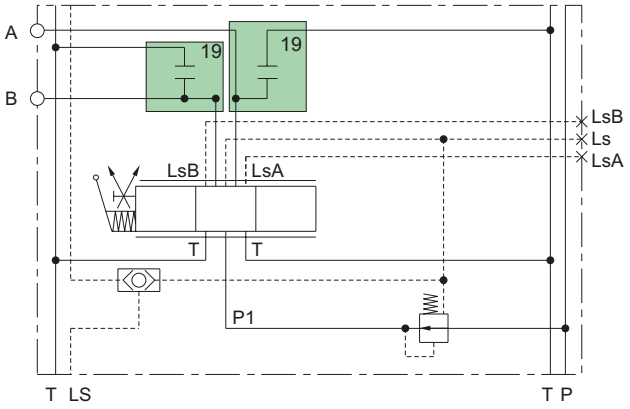
Suction valve

Code (*)
HEAN004103005



HETS

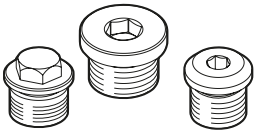
Hydraulic diagram example



Replacing plug

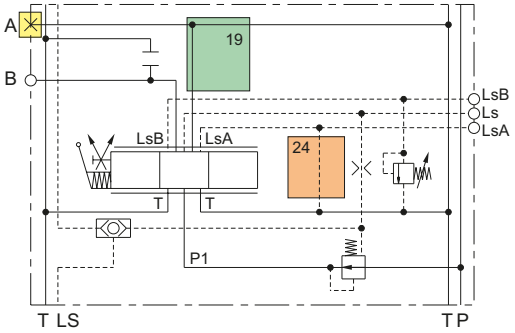
Code (*)
HETS004103000

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



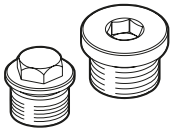
HESC

Hydraulic diagram example



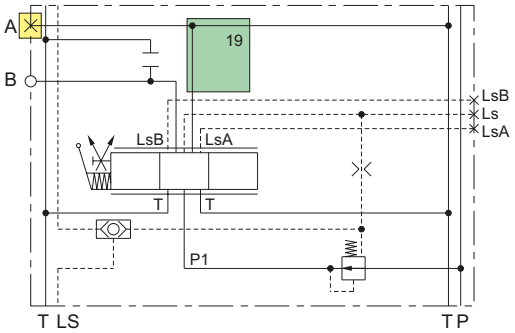
Kit for connecting the non-active port to tank, when using a single acting spool - to be fitted with HEM modules with LsA-LsB + shock and suction valves cavities

Code (*)
HESC004103009



HESC

Hydraulic diagram example



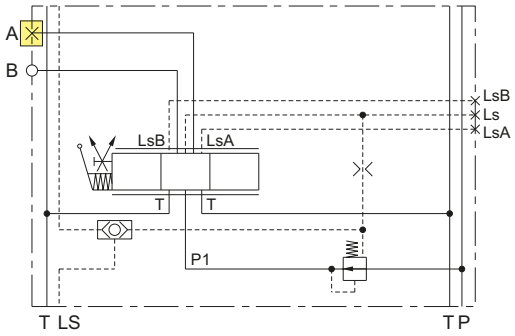
Plug for connecting the non-active port to tank, when using a single acting spool

Code (*)
HESC004103008



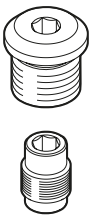
HETS

Hydraulic diagram example



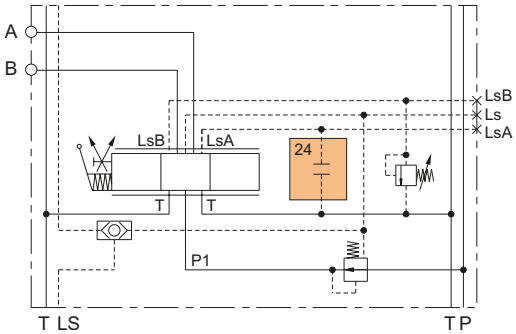
Plug for closing A or B port

Code (*)
HETS004103002



HESC

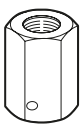
Hydraulic diagram example



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

Code (*)
HESC004103007

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

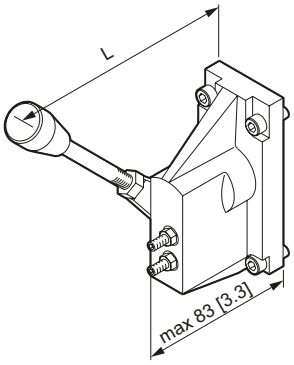


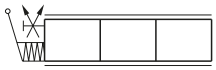
Protection cap for Ls pressure relief valve regulation screw for HEM (working sections) and HSE (inlet sections). Code number and quantity (related to no. of Ls valve mounted) must be indicated under the HEM.. or HSE.. field of the order form.

Code
KIT0004103995

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

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.



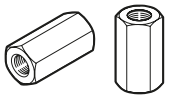


HCM

Mechanical control
Control positions: see page B-4.

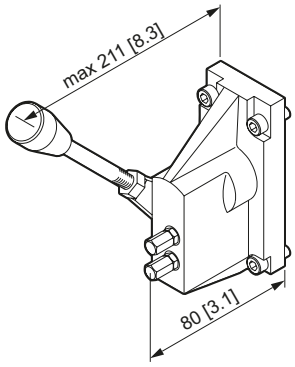
L mm [inch]	Code (Aluminum)	Code (Cast iron)
211 [8.3]	HCM0004104001	HCM0004104000
261 [10.3]	HCM000410C000	*

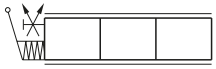
* available on request



Code
KIT0004103994

Flow adjustement protective nuts kit for HCM mechanical control

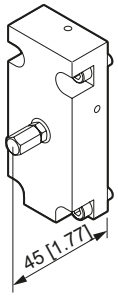


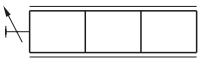


HCM

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

Code (Aluminum)	Code (Cast iron)
HCM0004104801	HCM0004104800

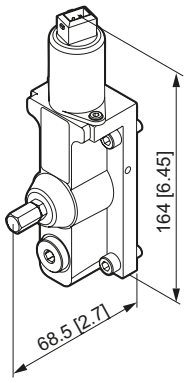




HCF

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

Code (Aluminum)	Code (Cast iron)
HCF0004103996	HCF0004103997



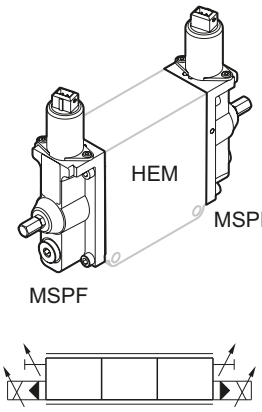
MSPF

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.

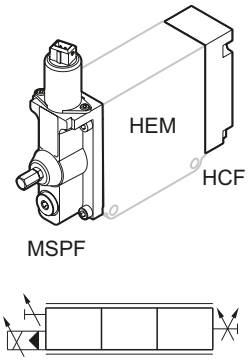
MSPF is being supplied without manual spool control, thus allowing both smaller overall dimensions and cost effective compared to MHPF, HCK modules.

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 B-53).



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	MSPF004107065	*
24 Vdc	MSPF004107066	*

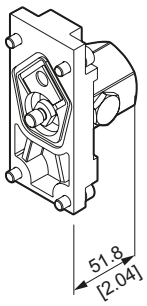
* available on request

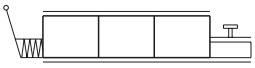
Rated voltage		12 Vdc	24 Vdc
Supply voltage		11 to 15 V	22 to 30 V
Max. ripple		8 %	
Max. current		1500 mA ± 10	750 mA ± 10
Power consumption		18 W at 22 °C [71.6 °F] coil temperature	
Start spool travel		560 mA	260 mA
End spool travel		1050 mA	520 mA
R_{20}		4.72 Ω ± 5 %	20.8 Ω ± 5 %
Heat insulation		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

HCN-HCP-HCPA controls for HEM working sections

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.

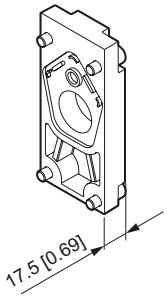




HCN

Friction control

Code (Aluminum)	Code (Cast iron)
HCN0004103501	HCN0004103500

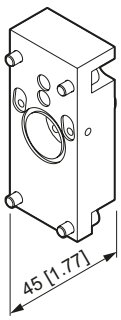


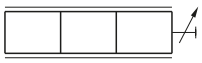


HCP

Rear cover

Code (Aluminum)	Code (Cast iron)
HCP0004104002	HCP0004104008





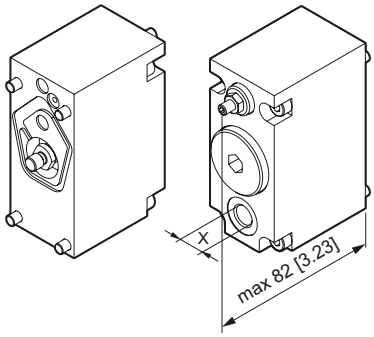
HCPA

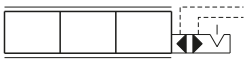
Rear cover with stroke adjustment

Code (Aluminum)	Code (Cast iron)
—	HCPA004103990

HCPK-HCPD-MHPH controls for HEM working sections

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.

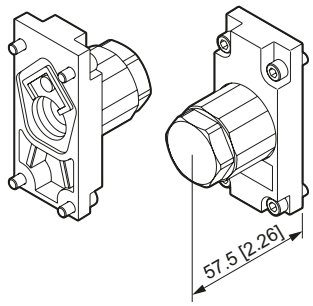


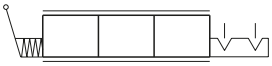


HCPK

Mechanical B-port lock device, with automatic hydraulic release (kick-out)
For the working section HEM0004102221 (see page B-43).

Control	Code (Cast iron)
	(X) 1/4 BSPP
P → B lock P → A free	HCPK004104218

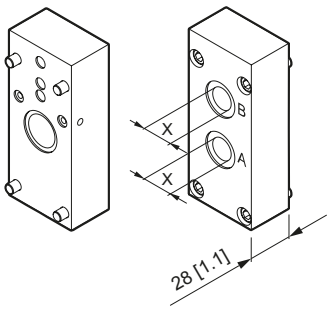


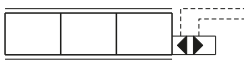


HCPD

Mechanical spool lock device, manual release

Control	Code (Aluminum)	Code (Cast iron)
P → A lock P → B free	HCPD004104003	HCPD004103900
P → B lock P → A free	HCPD004104004	HCPD004103901
P → A lock P → B lock	HCPD004104005	HCPD004103902
P → A float P → B free	HCPD004103998	HCPD004103898
P → B float P → A free	HCPD004103999	HCPD004103899

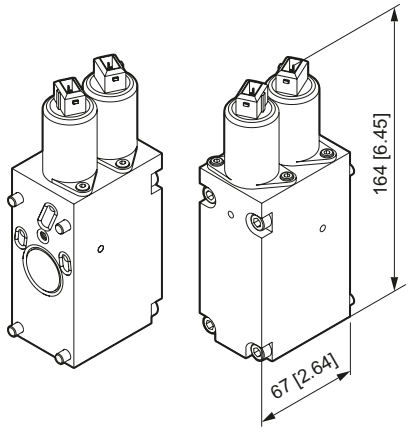


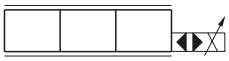


MHPH

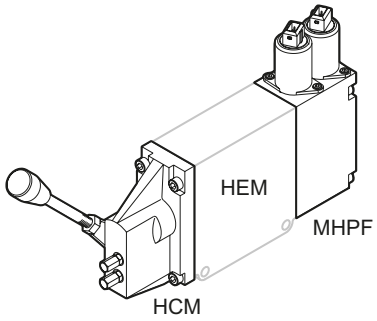
Hydraulic activation
- Start pilot pressure: 4.5 bar [65 psi]
- End stroke pressure: 15 bar [218 psi]
- Max. pilot pressure: 30 bar [435 psi]

Thread	Code (Aluminum)	Code (Cast iron)
(X) 1/4 BSPP	MHPH004104222	MHPH004104229
(X) 7/16" - 20 UNF	MHPH004104223	MHPH004104235





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.

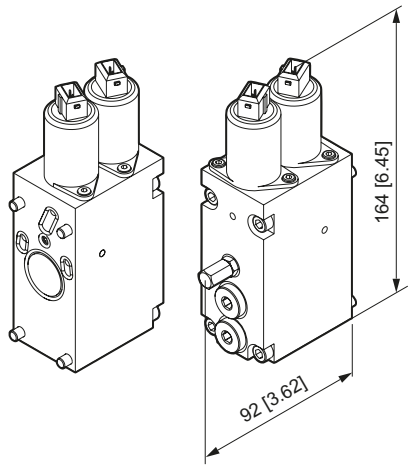
The spool is shifted by means of the hydraulic pressure generated by the pressure-reduction proportional solenoid valves. The MHPF module is not equipped with an inductive position transducer (LVDT) and the entire electronic circuit to detect and signal faults.
This means that in the joystick remote 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.

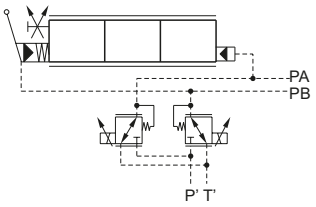
MHPF module has the following main features:
- It can be operated with on-off signals also
- Short response time
- Electro-proportional pressure reduction valves
- PWM electric control of low-frequency solenoid valves
- Any adjustment to limit the flow or to create work ramps will be made direcly on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

Voltage	Code (Aluminum)	Code (Cast iron)
12 Vdc	MHPF004107051	MHPF004107053
24 Vdc	MHPF004107052	MHPF004107054

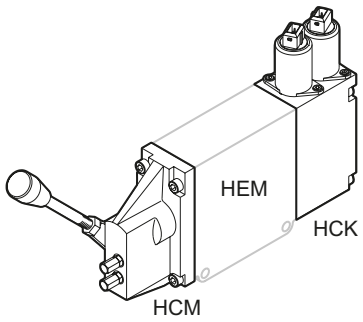
Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 to 15 V	22 to 30 V
Max. ripple		8 %	
Max. current		1500 mA ± 10	750 mA ± 10
Power consumption		18 W at 22 °C [71.6 °F] coil temperature	
Start spool travel		560 mA	280 mA
End spool travel		1080 mA	520 mA
R_{20}		4.72 Ω ± 5 %	20.8 Ω ± 5 %
Heat 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 current controls for HEM working sections





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.

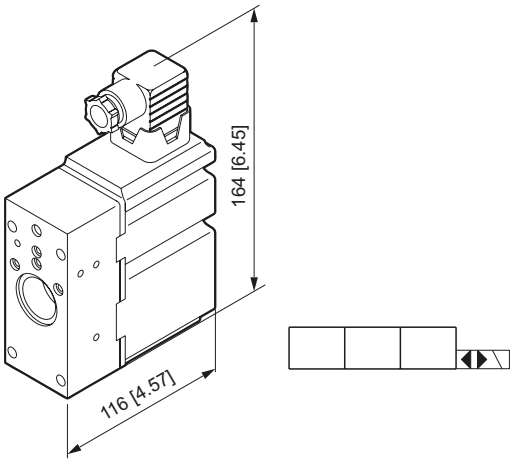
HCK module has the following main features:

- 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 (Cast iron)
12 Vdc	HCK0004108100
24 Vdc	HCK0004108101

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

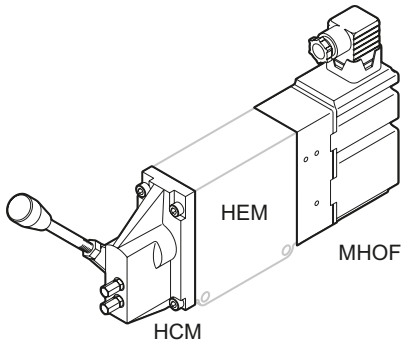


MHOF

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	MHOF004107027
24 Vdc	MHOF004107028

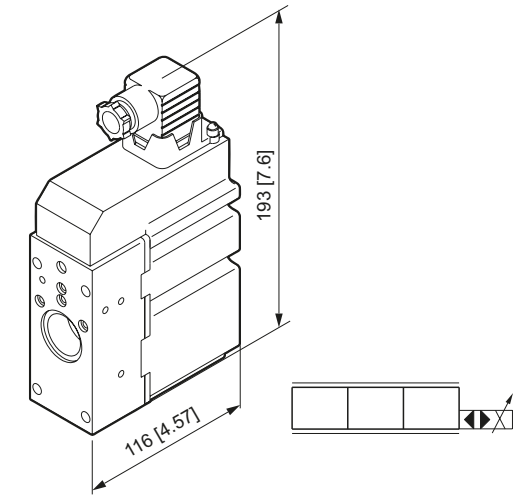


Example with module MHOF and manual control HCM

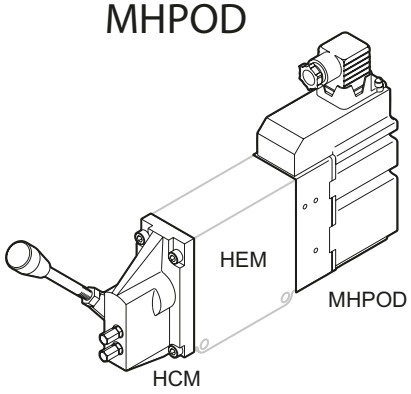
Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		11 to 15 V	21 to 28 V
Resistance at 20 °C [68 °F]		9.1 Ω	36.2 Ω
Current consumption		1480 mA	750 mA
Rated absorbed power		16 W	
Heat insulation		Class H, 180 °C [356 °F]	
Duty cycle		ED 100%	
Reaction time	From neutral position to max. spool travel	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 voltage controls for HEM working sections



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:

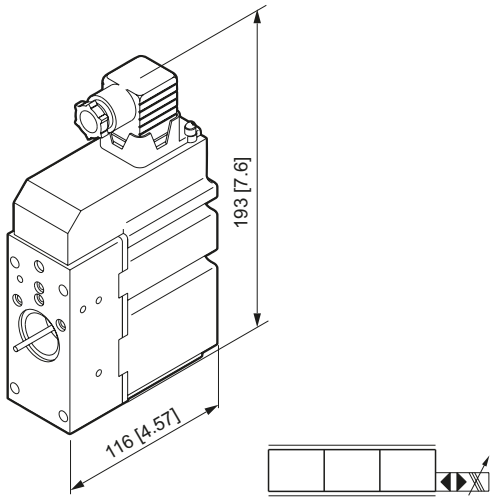
- Capacity to handle three different kinds of input signal control (see chart below).
- The required signal control is to be stated in the order phase
- Integrated PWM (Pulse Width Modulator)
- Good flow regulation
- Simple built-up.

Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPOD04108077	MHPOD04108082	MHPOD04108086
24 Vdc	MHPOD04108075	MHPOD04108084	MHPOD04108088

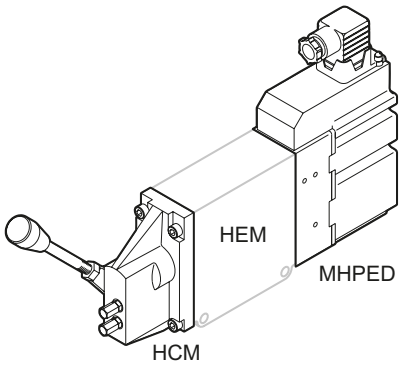
Aluminum body

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	MHPED04108011	MHPED04108018	MHPED04108026
24 Vdc	MHPED04108010	MHPED04108020	MHPED04108028

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	MHPED04108009	MHPED04108022	MHPED04108030
24 Vdc	MHPED04108007	MHPED04108024	MHPED04108032

Aluminum body

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

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	

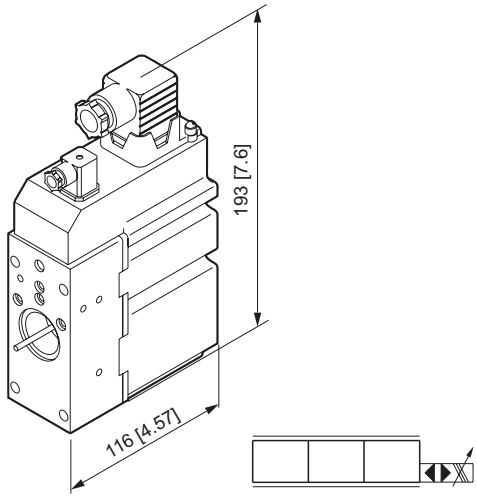
MHPED (active version) modules behaviour in relation to the signal control

UDC	Signal control	Ground	Safety output (pin no. 3)	Effect
24 V	12 V (50% of UDC)	Connected	No output	Spool held electrical 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)

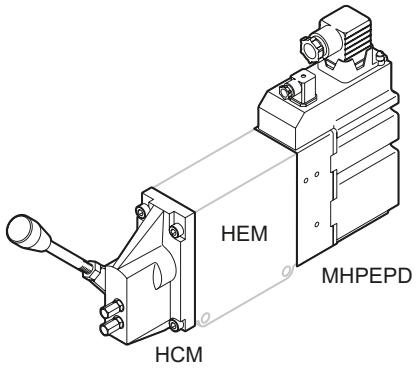
With the same data, given in percentages, the behaviour of the module is equal to the 12 VDC, 0 ÷ 20 mA and 0 ÷ 10 V also.

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
12 Vdc	MHPEPD4108048	MHPEPD4108058	MHPEPD4108066
24 Vdc	MHPEPD4108047	MHPEPD4108060	MHPEPD4108068

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	MHPEPD4108046	MHPEPD4108054	MHPEPD4108062
24 Vdc	MHPEPD4108045	MHPEPD4108056	MHPEPD4108064

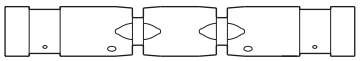
Aluminum body

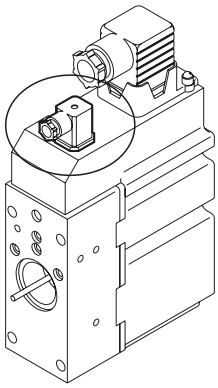
Electrical connections for MHPEPD working sections, see page: E-11

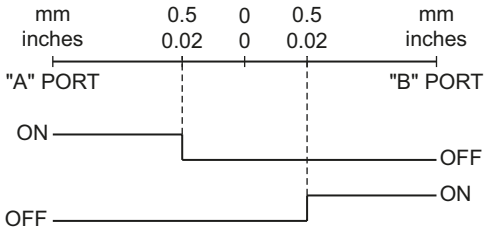
Rated voltage			12 Vdc	24 Vdc
Power supply voltage range			11 ÷ 15 V	20 ÷ 28 V
Max. ripple			5 %	
End stroke spool current consumption			520 mA	260 mA
Current consumption (neutral position, constant voltage)			36 mA	46 mA
Power consumption			6 W	
Heat insulation			Class H 180 °C [356 °F]	
Fault monitoring 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) according 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	

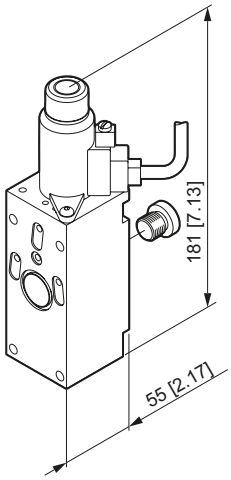
Spool direction signals



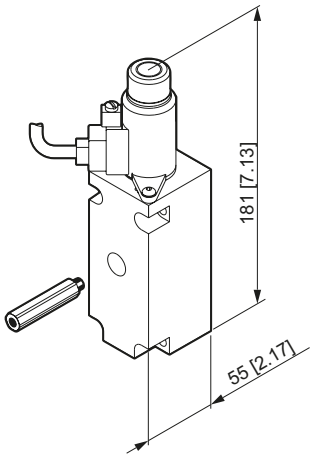




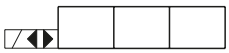
PIN	Center position	Movement to A port	Movement to B port
1	free	free	free
2	no output	Udc (+)	no output
3	no output	no output	Udc (+)
4	To get the manual control this pin must be feeded with the supply voltage. To get the remote control the supply voltage must be taken off from this pin.		

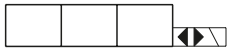


MHOXA



MHOXB





MHOX electro-hydraulic ON/OFF operated
The MHOXA and MHOXA 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.

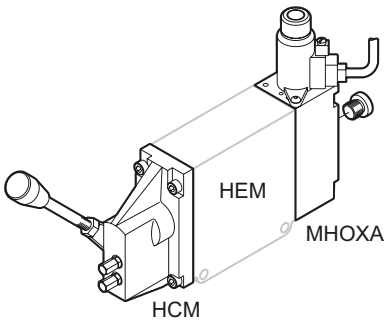
HCM/HCF cast iron modules must be used.

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

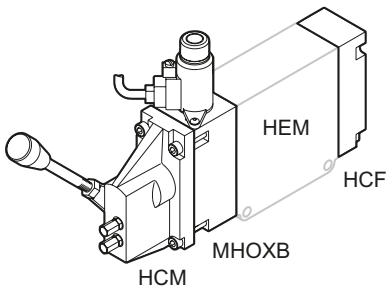
For the wiring diagram of module, please refer to Instruction manual.

Voltage	Code	
	Port A	Port B
12 Vdc	MHOXA04107157	MHOXB04107159
24 Vdc	MHOXA04107158	MHOXB04107160

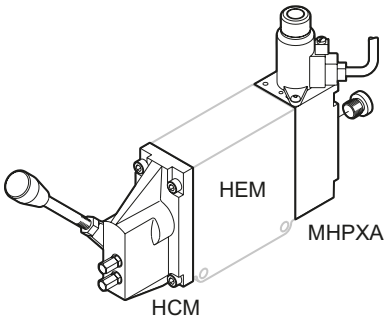
Cast iron body



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

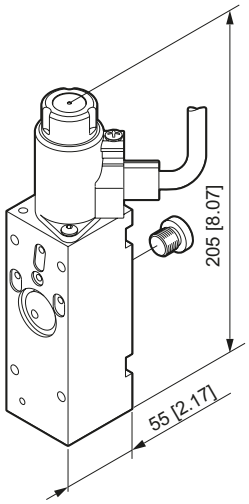
Max pilot pressure oil supply	30 bar [435 psi]
Start spool flow	4.5 bar [65 psi]
End spool flow	15 bar [218 psi]

HEM module hydraulic data

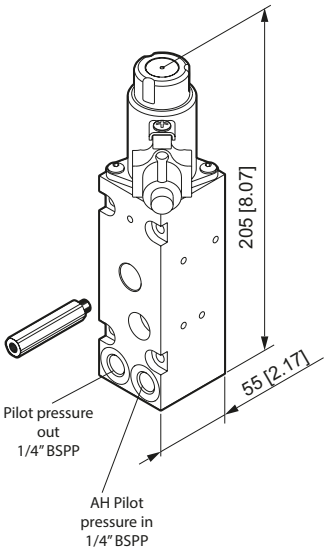
Max pressure (static - input)	350 bar [5076 psi]
Max flow	130 l/min [34.3 US gpm]

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 electro-hydraulic ON/OFF operated and hydraulic activation

The MHOXAH and MHOXAH 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.

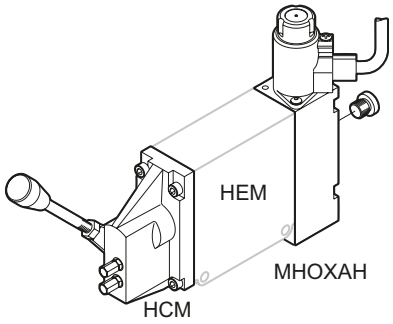
The operating principle is similar to that of the two separate modules, with the V1 and V2 solenoid valves that, alternatively, can adjust the pilot pressure on the distribution spool.

HCM/HCF cast iron modules must be used.

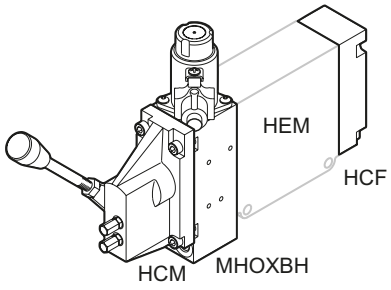
Voltage	Code	
	Port A	Port B
12 Vdc	MHOXAH4107357	MHOXBH4107359
24 Vdc	MHOXAH4107358	MHOXBH4107360

Cast iron body

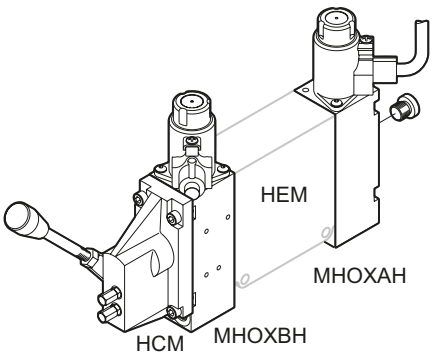
Hydraulic command outputs 1/4" BSPP.



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

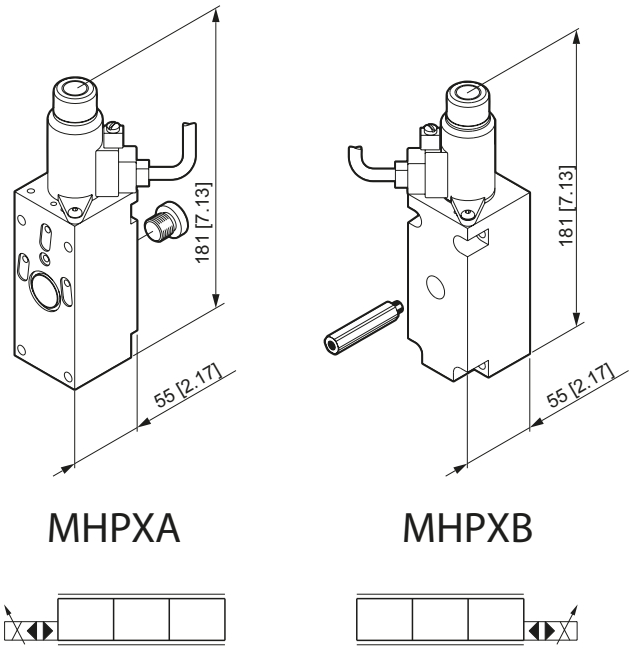
Max pilot pressure oil supply	30 bar [435 psi]
Start spool flow	4.5 bar [65 psi]
End spool flow	15 bar [218 psi]

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



MHPX electro-hydraulic PROPORTIONAL operated
The MHPXA module is an electro-hydraulic proportional device 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:
I moduli MHPXA e MHPXB possono essere accoppiati affinché tramite il comando remoto sia possibile azionare entrambi i moduli. Il principio di funzionamento è analogo a quello dei due moduli separati, con le elettrovalvole V1 e V2 che, alternativamente, possono regolare in modo continuo la pressione pilota agente sull'asta di distribuzione.

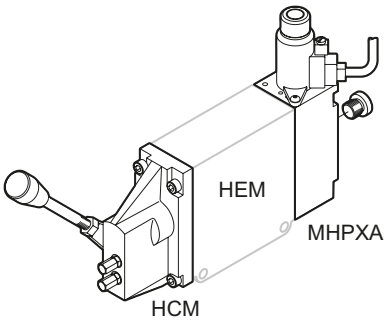
HCM/HCF cast iron modules must be used.

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

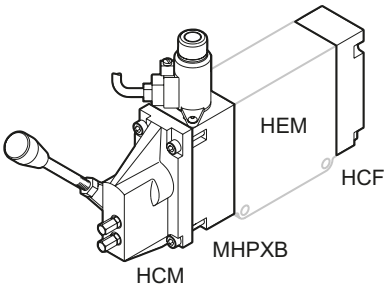
For the wiring diagram of module, please refer to Instruction manual.

Voltage	Code	
	Port A	Port B
12 Vdc	MHPXA04107147	MHPXB04107149
24 Vdc	MHPXA04107148	MHPXB04107150

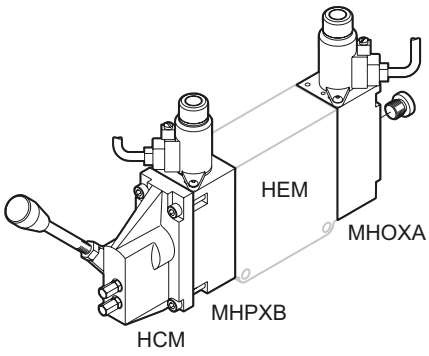
Cast iron body



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

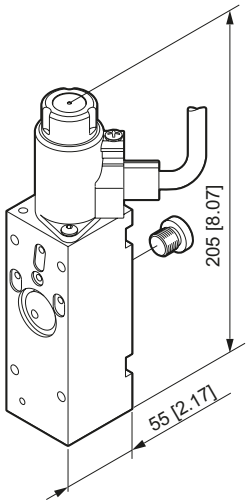
Max pilot pressure oil supply	30 bar [435 psi]
Start spool flow	4.5 bar [65 psi]
End spool flow	15 bar [218 psi]

HEM module hydraulic data

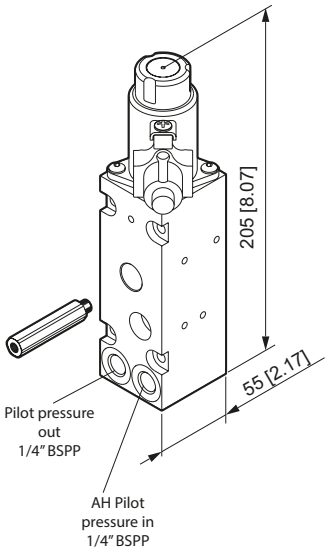
Max pressure (static - input)	350 bar [5076 psi]
Max flow	130 l/min [34.3 US gpm]

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 module is an electro-hydraulic proportional device 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.

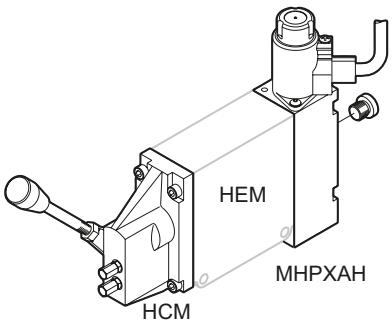
MHPXBH: , the distribution spool in the HEM element is moved onto the A port by means of a manual control and onto port B by the side MHPXBH module.

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.

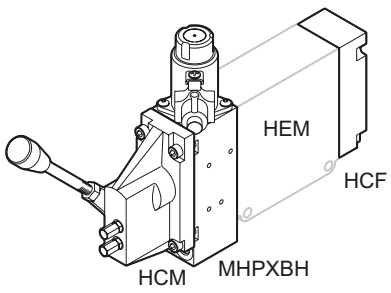
HCM/HCF cast iron modules must be used.

Voltage	Code	
	Port A	Port B
12 Vdc	MHPXAH4107347	MHPXBH4107349
24 Vdc	MHPXAH4107348	MHPXBH4107350

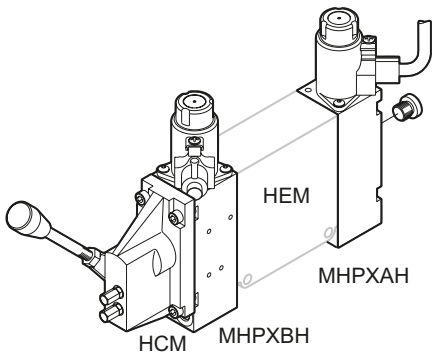
Cast iron body
Hydraulic command outputs 1/4" BSPP.



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

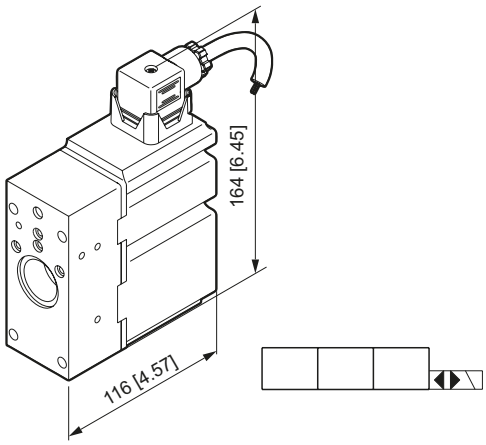
Max pilot pressure oil supply	30 bar [435 psi]
Start spool flow	4.5 bar [65 psi]
End spool flow	15 bar [218 psi]

HEM module hydraulic data

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

ATEX modules marking

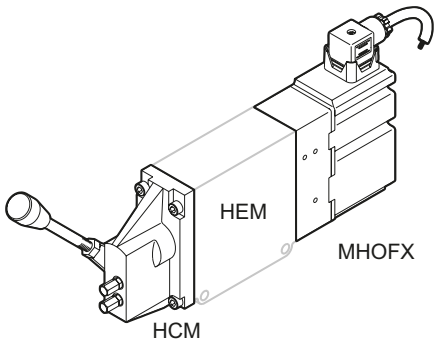
MHPX on complete proportional valve with or without HSEVX valve	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20° C ÷ +80°C p max HEM = 350 bar
MHOX individually supplied	CE Ex	II GD C T4 / T135°C T_{amb} = -20°C ÷ +50°C T_{fluid} = -20°C ÷ +80°C
Solenoids mounted on MHPX modules	CE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

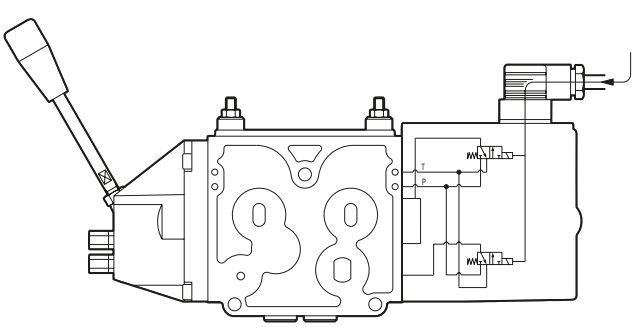
Voltage	Code
12 Vdc	MHOFX041E7025
24 Vdc	MHOFX041E7030

D-Type connector

Voltage	Code
12 Vdc	MHOFX041E7027
24 Vdc	MHOFX041E7028

Cast iron body

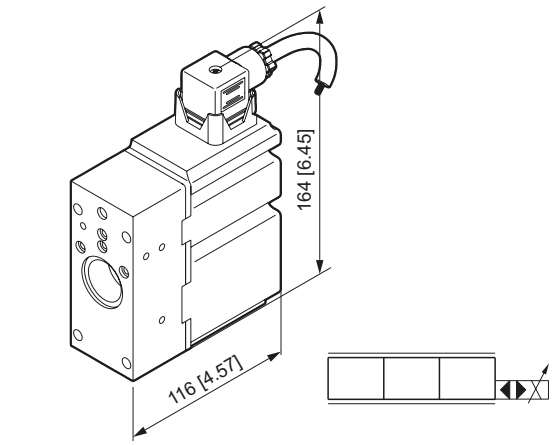
Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		10.8 ÷ 13.2 V	21.6 ÷ 26.4 V
Resistance at 20 °C [68 °F]		9.2 Ω	34.8 Ω
Rated absorbed power		16 W	
Heat insulation		Class H, 180 °C [356 °F]	
Duty cycle		ED 100%	
Reaction time	From neutral position to max. spool travel	130 ms	
	From max. spool 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.

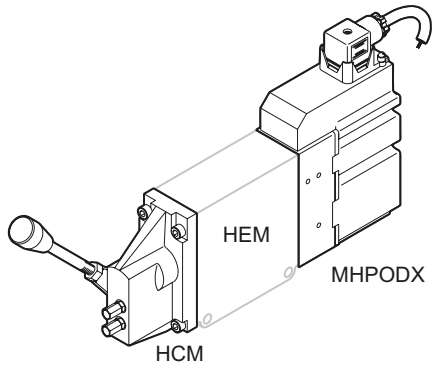
For the wiring diagram of module, please refer to Instruction manual.



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.

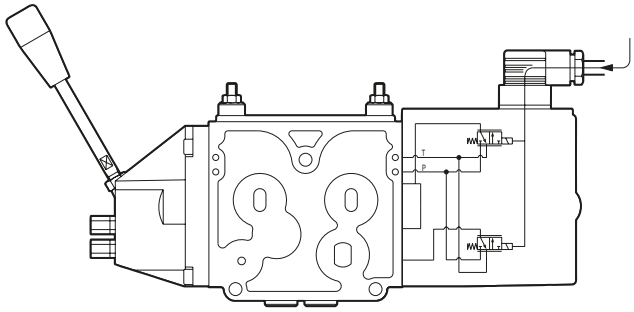


Example with module MHPCX and manual control HCM

Voltage	Code
12 Vdc	MHPCX041E7014
24 Vdc	MHPCX041E7013

Cast iron body

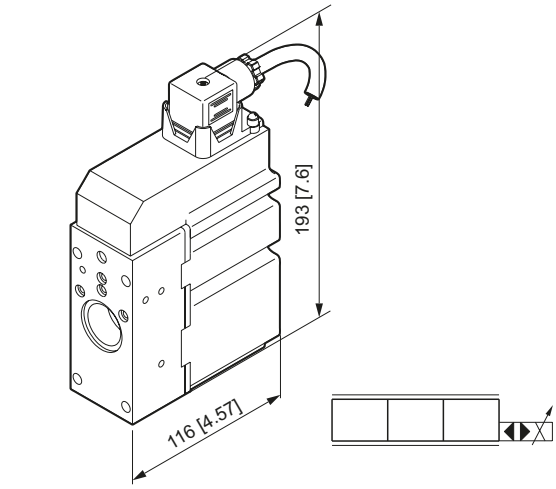
Rated voltage		12 Vdc	24 Vdc
Power supply voltage range		10.8 ÷ 13.2 V	21.6 ÷ 26.4 V
Resistance at 20 °C [68 °F]		9.2 Ω	34.8 Ω
Rated absorbed power		16 W	
Heat insulation		Class H, 180 °C [356 °F]	
Duty cycle		ED 100%	
Reaction time	From neutral position to max. spool travel	130 ms	
	From max. spool 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	



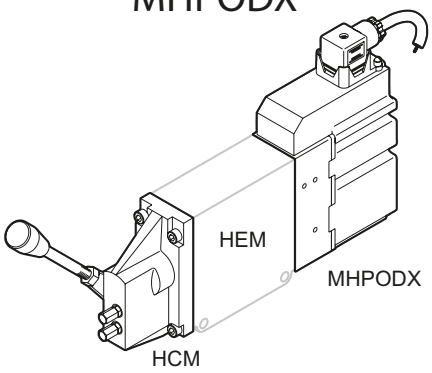
ATEX marking	CE Ex	II 2G Ex mb IIC T4 Gb II 2D Ex mb IIIC T135 °C Db
IECEx marking	CE Ex	Ex mb IIC T4 Gb Ex mb IIIC T135 °C Db

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.



MHPODX



Example with module MHPODX and manual control HCM

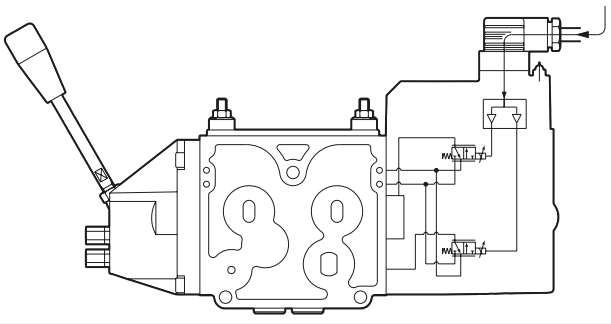
MHPODX electrohydraulic PROPORTIONAL module
MHPOD is a open loop electrohydraulic activation unit, whose design is based on digital technology.
MHPOD has been specially developed to meet the harsh operating requirements of today's mobile machine market.
MHPOD electrical open loop proportional actuation 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	MHPODX41E8077	MHPODX41E8082	MHPODX41E8086
24 Vdc	MHPODX41E8075	MHPODX41E8084	MHPODX41E8088

Cast iron body

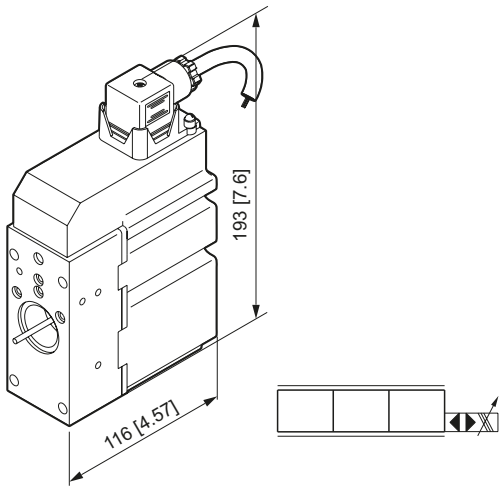
Rated voltage	12 V ± 10%	24 V ± 10%
Max. power consumption	6 W	
Analog control input (Us) to choose from:	Ratiometric 0.25xUDC ÷0.75xUDC	
	0 ÷ 10 V (available signal 2.5 ÷ 7.5 V)	
	0 ÷ 20 mA (available signal 5 ÷ 15 mA)	
	3.5 V (available signal 2 ÷ 5 V)	
Analog input impedance, ratiometric version, 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	



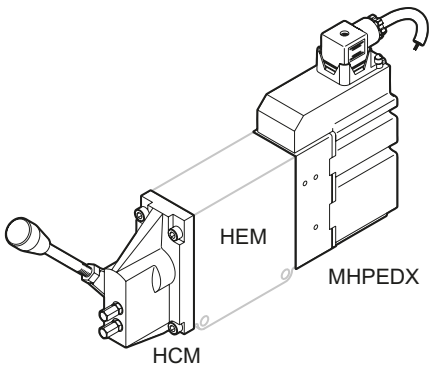
ATEX marking	CE Ex	II 2G Ex mb IIC T4 Gb II 2D Ex mb IIIC T135 °C Db
IECEx marking	CE Ex	Ex mb IIC T4 Gb Ex mb IIIC T135 °C Db

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.



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

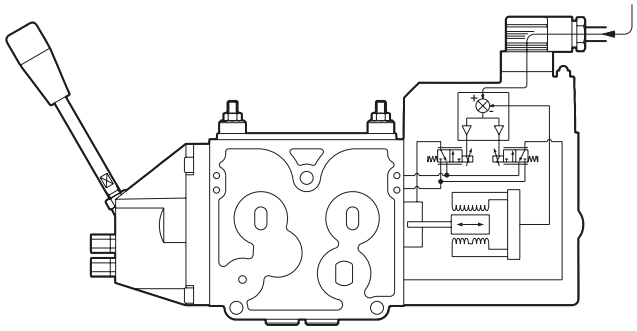
Voltage	Input signal control		
	0.5 x U_{DC} (A) joystick	0 ÷ 10 V_{DC} (B) PLC	0 ÷ 20 mA (C) PLC
12 Vdc	MHPEDX41E8011	MHPEDX41E8018	MHPEDX41E8026
24 Vdc	MHPEDX41E8010	MHPEDX41E8020	MHPEDX41E8028

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	MHPEDX41E8009	MHPEDX41E8022	MHPEDX41E8030
24 Vdc	MHPEDX41E8007	MHPEDX41E8024	MHPEDX41E8032

Cast iron body

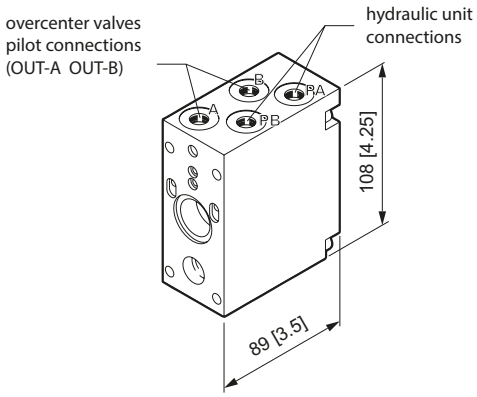
Rated voltage	12 V ± 10%	24 V ± 10%
Max. power consumption	6 W	
Analog control input (Us) to choose from:	Ratiometric 0.25xUDC ÷0.75xUDC	
	0 ÷ 10 V (available signal 2.5 ÷ 7.5 V)	
	0 ÷ 20 mA (available signal 5 ÷ 15 mA)	
	3.5 V (available signal 2 ÷ 5 V)	
Analog input impedance, ratiometric version, 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.



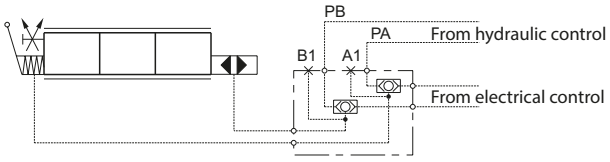
HCH

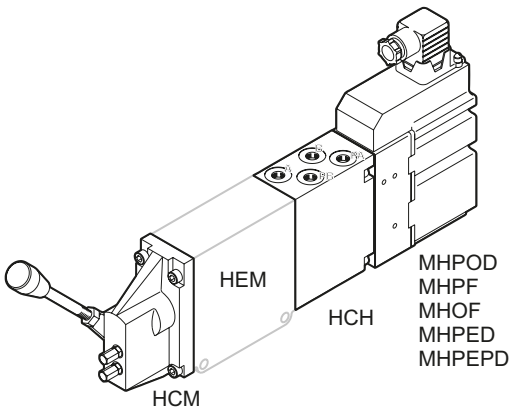
HCH module to get hydraulic and electrical remote control HCH module is a small manifold that can be matched with all the HPV 41 proportional directional valves' elements, and with all the HPV electrohydraulic controls. The use of the HCH module, besides and in conjunction with electrohydraulic proportional, 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)

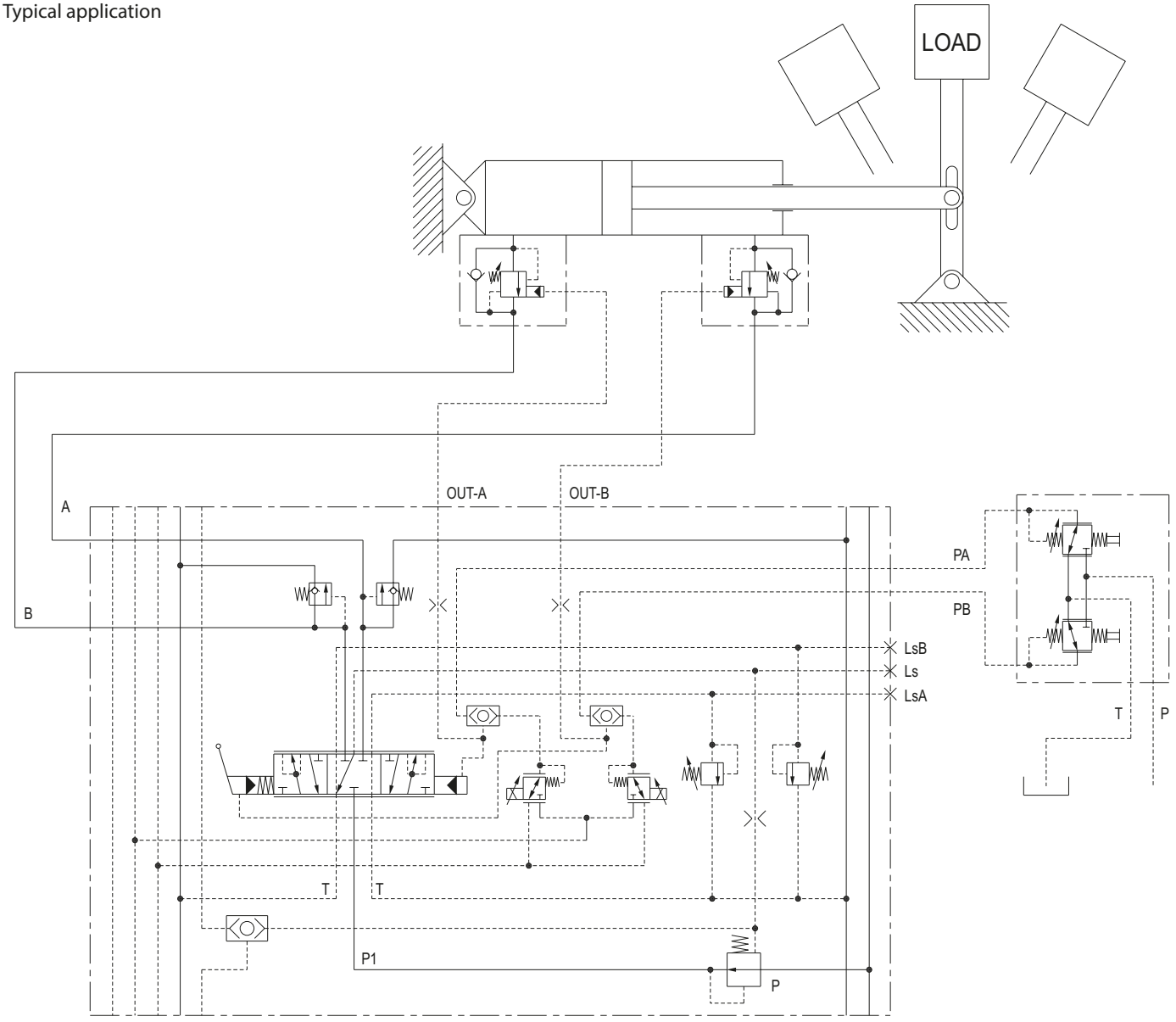


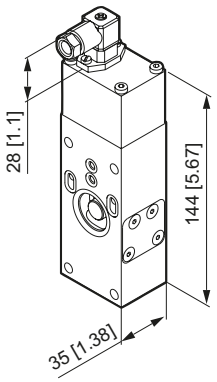


Example with module HCH, manual control HCM and MHPOD module

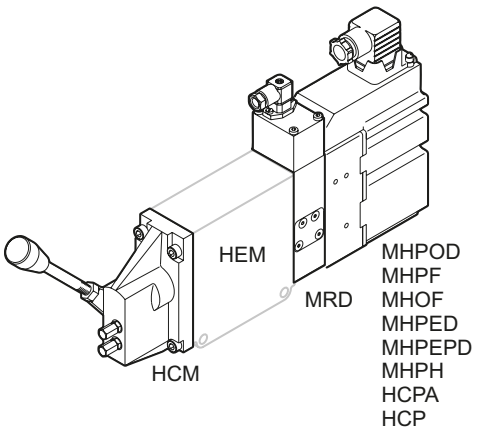
Type	Code (Aluminum)	
	Connections 1/4 BSPP	Connections 7/16" - 20 UNF - 2B
For MHPOD. MHPF, MHOF modules (open ring version)	HCH0004104225	HCH0004104226
For MHPED. MHPEPD modules (closed ring version)	HCH0004104227	HCH0004104228

Typical application





MRD



Example with module MRD, manual control HCM and MHPOD module

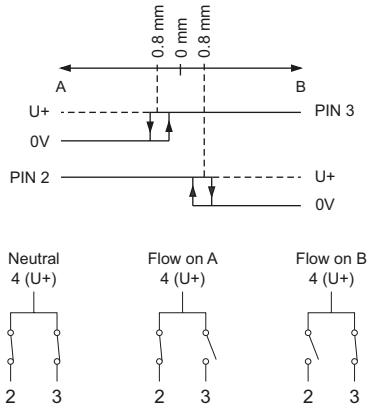
MRD electrical spool movement device
The main purpose of this module is to give an indication of the spool's movement, by mean of an on-off signal. Suitable for all those applications where, to satisfy the safety demands, the spool travel has to be remotely monitored or integrated wiht the whole machine 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

Not suitable for ATEX modules.

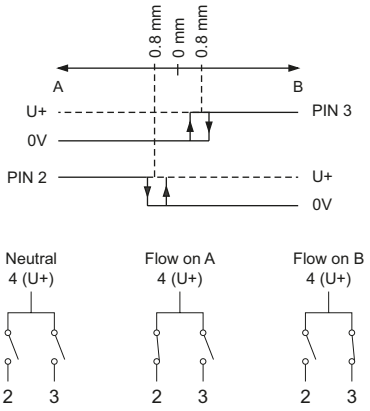
Type	Code
Normally closed	MRD0004104243
Normally open	MRD0004104245

Normally closed

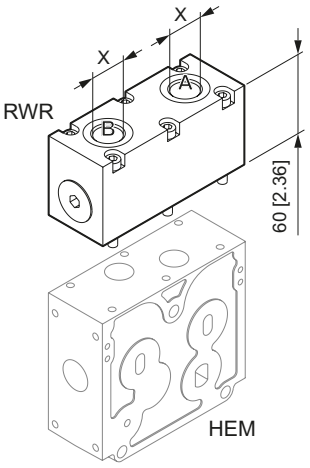


PIN No.	Neutral position	B port	A port
2	U+	0V	U+
3	U+	U+	0V
4	Common		

Normally open



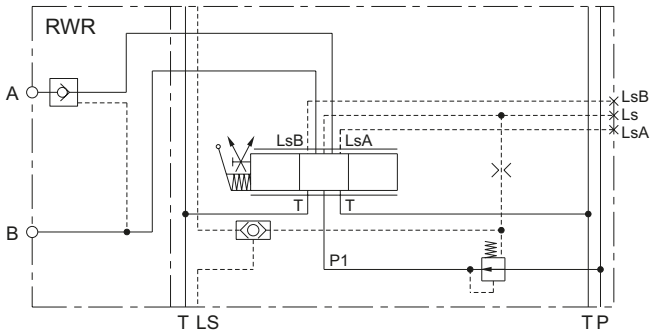
PIN No.	Neutral position	B port	A port
2	0V	0V	U+
3	0V	U+	0V
4	Common		



RWR double pilot operated check valve module
Developed for applications where integrated pilot operated check valves in the work ports are required to limit the port leakage down to zero. Suitable for load locking applications.

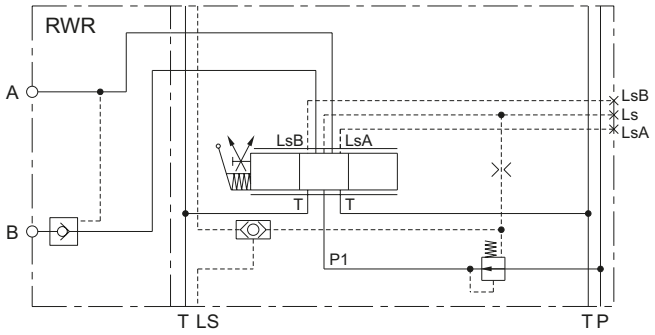
Cast iron body.

Suitable on prearranged elements only, HEM0004102400 - HEM0004102401.



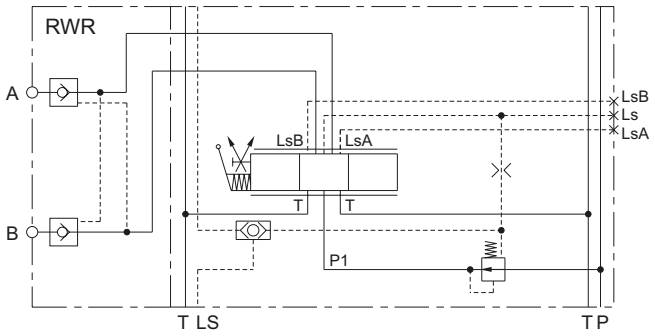
Check valve on A port

Code	
(X) Ports 1/2 BSPP	(X) Ports 7/8″ - 14 UNF - 2B
RWR0004102506	RWR0004102507



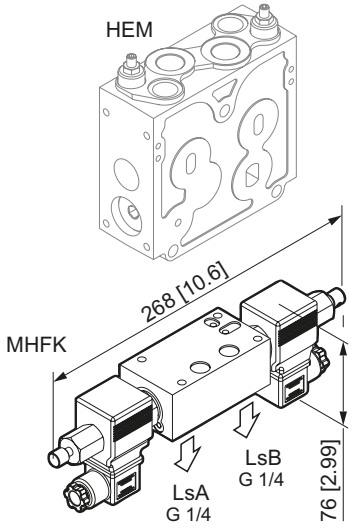
Check valve on B port

Code	
(X) Ports 1/2 BSPP	(X) Ports 7/8″ - 14 UNF - 2B
RWR0004102508	RWR0004102509



Check valve on A and B ports

Code	
(X) Ports 1/2 BSPP	(X) Ports 7/8″ UNF - 2B
RWR0004102510	RWR0004102511

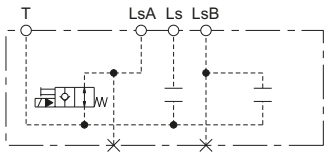


With the electrical LsA/B unloading modules, the EU flow restrictors must always be mounted onto the spools (HEAS) see page B-86.

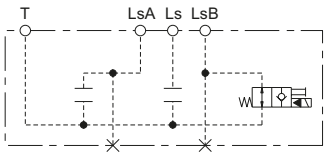
MHFK electrical Ls A/B unloading module
Developed for those applications where the max. working pressure can be selected according to an on-off electric signal. Normally open valves. Aluminum body.

Technical featues

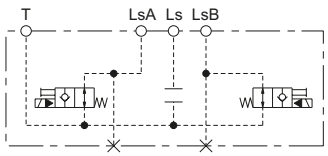
Max. operating pressure	370 bar [5366 psi]
Max. flow	30 l/min [7.9 US gpm]
Max. Leakage (0-5 drops/min)	0-0,25 cm^3/min
Max. excitation frequency	2 Hz
Duty cycle	100% ED
Hydraulic fluids	Mineral Oil DIN 51524
Oil viscosity	10 ÷ 500 mm^2/s (cSt)
Oil temperature	-25 ÷ +75 °C [-13 ÷ +167 °F]
Ambient temperature	-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]

Active on LsA	Voltage	Code
	14 VDC	MHFK004106430
	28 VDC	MHFK004106438

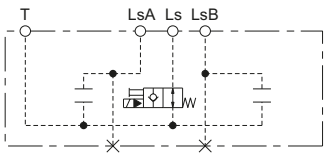
Thread BSPP G 1/4

Active on LsB	Voltage	Code
	14 VDC	MHFK004106432
	28 VDC	MHFK004106440

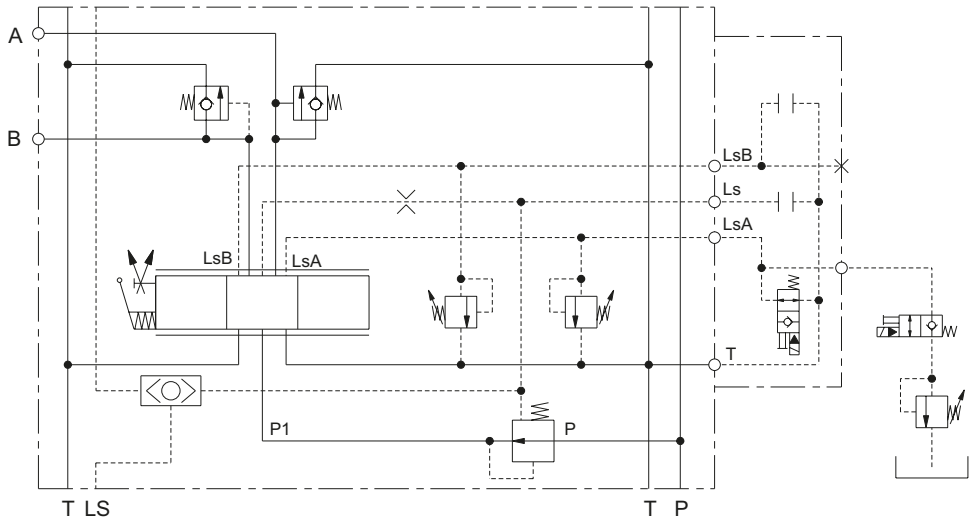
Thread BSPP G 1/4

Active on LsA + LsB	Voltage	Code
	14 VDC	MHFK004106434
	28 VDC	MHFK004106442

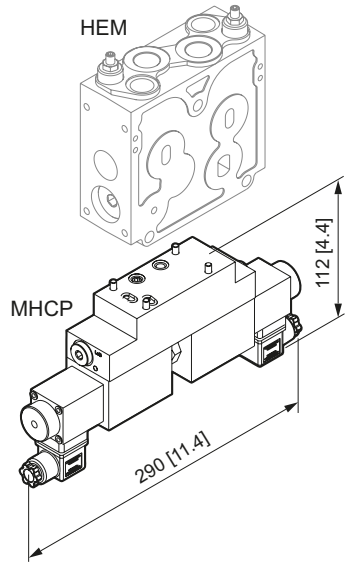
Thread BSPP G 1/4

Active on Ls	Voltage	Code
	14 VDC	MHFK004106436
	28 VDC	MHFK004106444

Thread BSPP G 1/4



MHCP module for HEM working sections



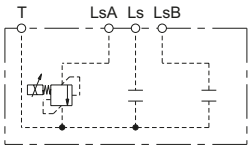
Electrohydraulic proportional module for remote A / B ports working pressure control
MHCP is a electric proportional module that allows the working pressure to be remotely operated by means of a current signal MHPF is designed to ensure system pressure to be infinitely adjust in accordance upon the electrical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

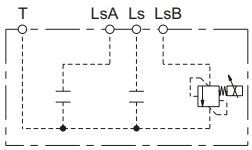
When MHCP is not energized, both pressure and flow will be maintain close to zero.

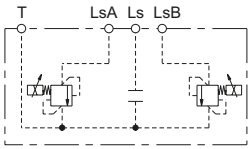
MHCP is always to be used with pressure compensated working sections.

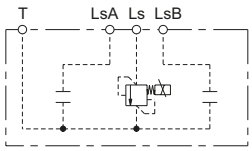
Cast iron body.

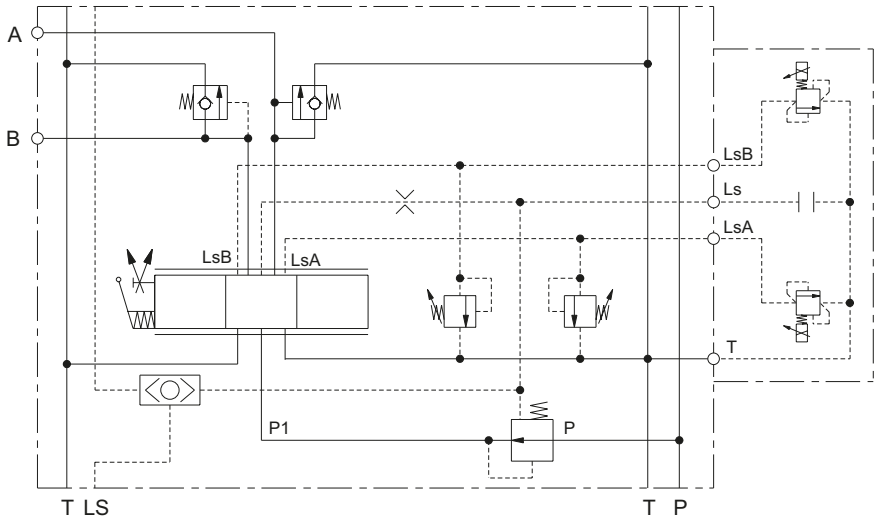
With the electrical LsA/B unloading modules, the EU flow restrictors must always be mounted onto the spools (HEAS) see page B-86.

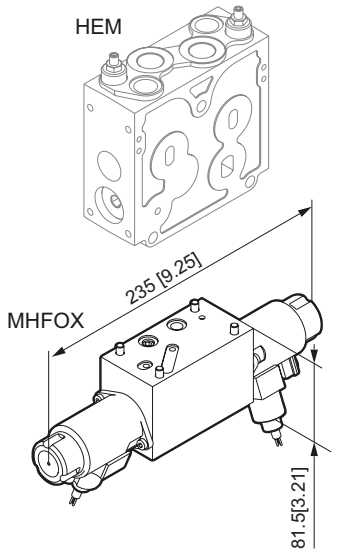
Active on LsA	Voltage	Code
	24 VDC	MHCP004106020

Active on LsB	Voltage	Code
	24 VDC	MHCP004106040

Active on LsA + LsB	Voltage	Code
	24 VDC	MHCP004106060

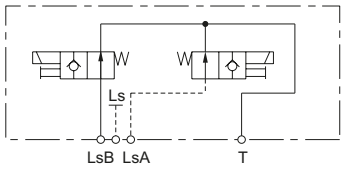
Active on Ls	Voltage	Code
	24 VDC	MHCP004106275





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

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.

Active on LsA + LsB	Voltage	Code
	12 VDC	MHFOX04106050
	24 VDC	MHFOX04106060

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.

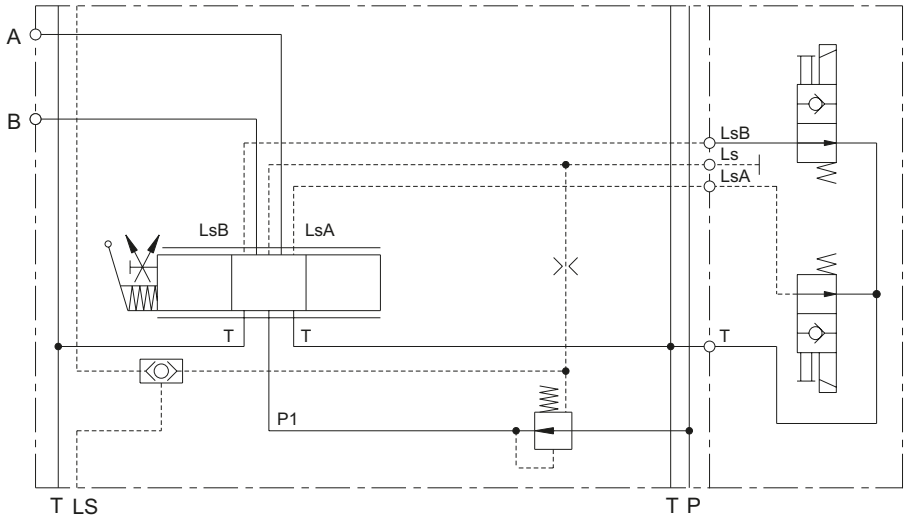
These modules, fitted on the proportional valve with MHOX modules, are subject to the complete certification of the valve; in this case the label will refer to the complete valve: MHOX - HEM.
When the modules are individually supplied, a label is attached to the module with the following labelling:

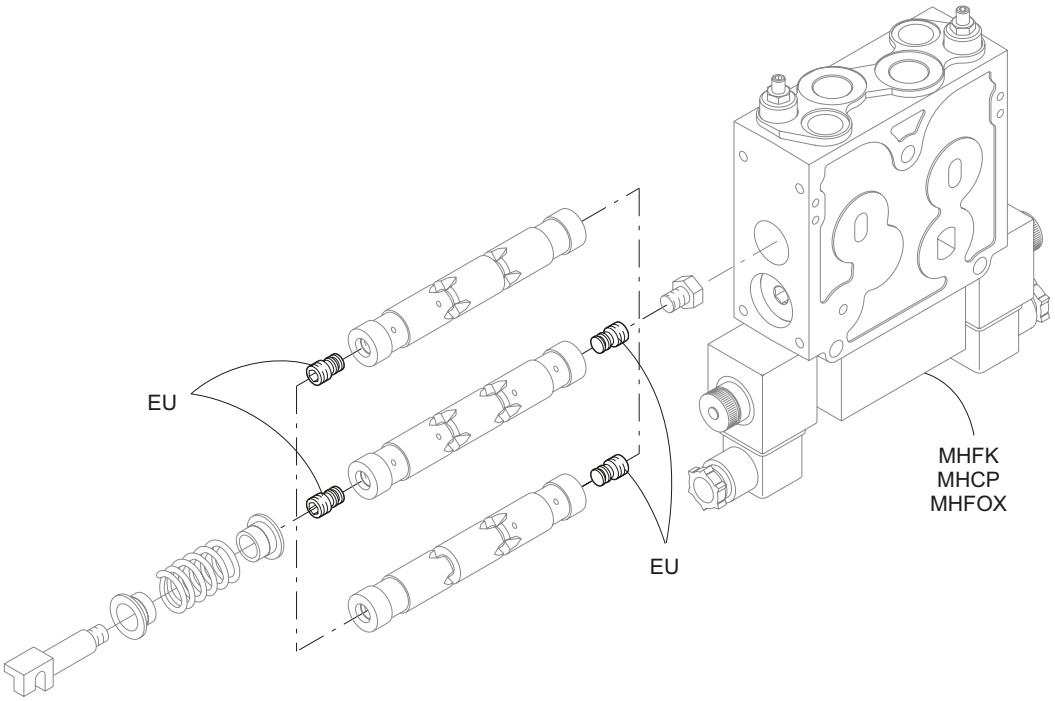
This labelling is printed on the label of modules, in a visible position.
The final customer, when buying this module individually, is in charge of the assembly and coupling of such component with others ATEX components of different classes, groups and temperatures.

CE Ex 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.





Modules, EU flow restrictors for HPV 41 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).

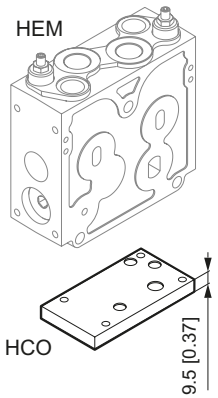
The code number has to be indicated under the spool code field in the order form.

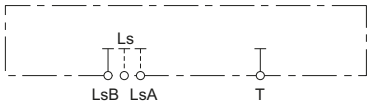
Any kind of spool are always prearranged for EU modules.

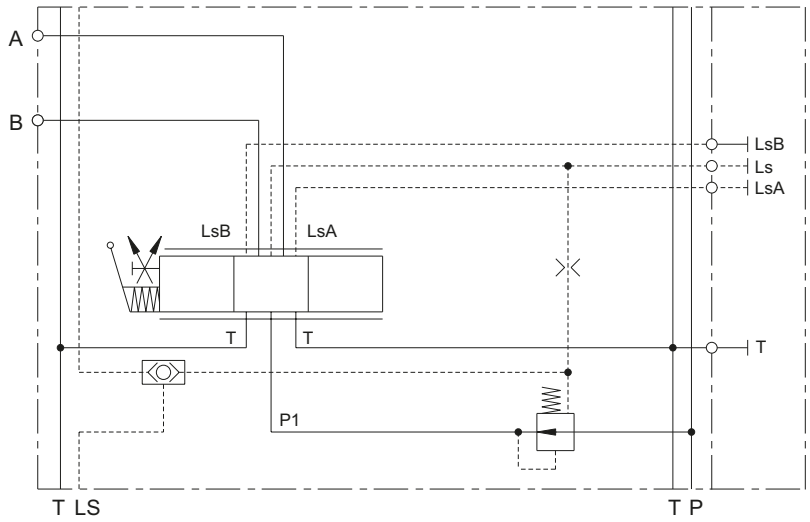
Description	Code
Active on LsA or LsB only	HEAU004104700
Active on LsA + LsB and Ls	HEAU004104701

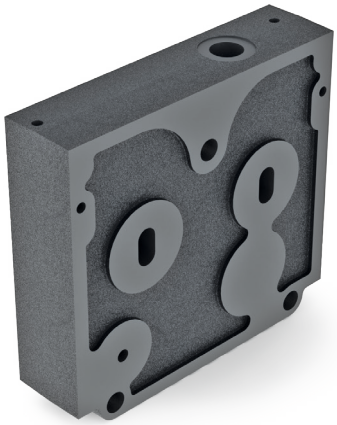
HCO module - bottom plate to close the MHFK, MHCP facilities

Aluminum body.



HCO	Code
	HCO0004104224

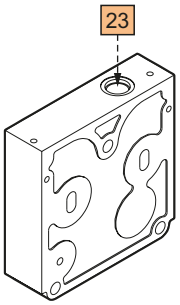


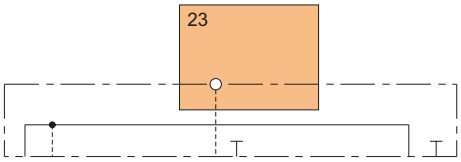


HSC end sections

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

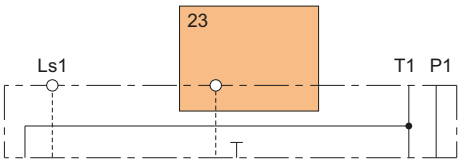
Made in cast iron.





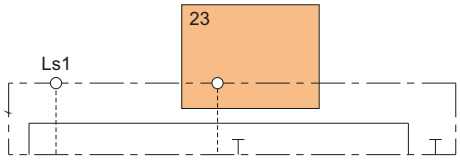
With no ports

Code	
BSPP	UN - UNF
HSC0004105005	



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)
HSC0004105010	HSC0004105015

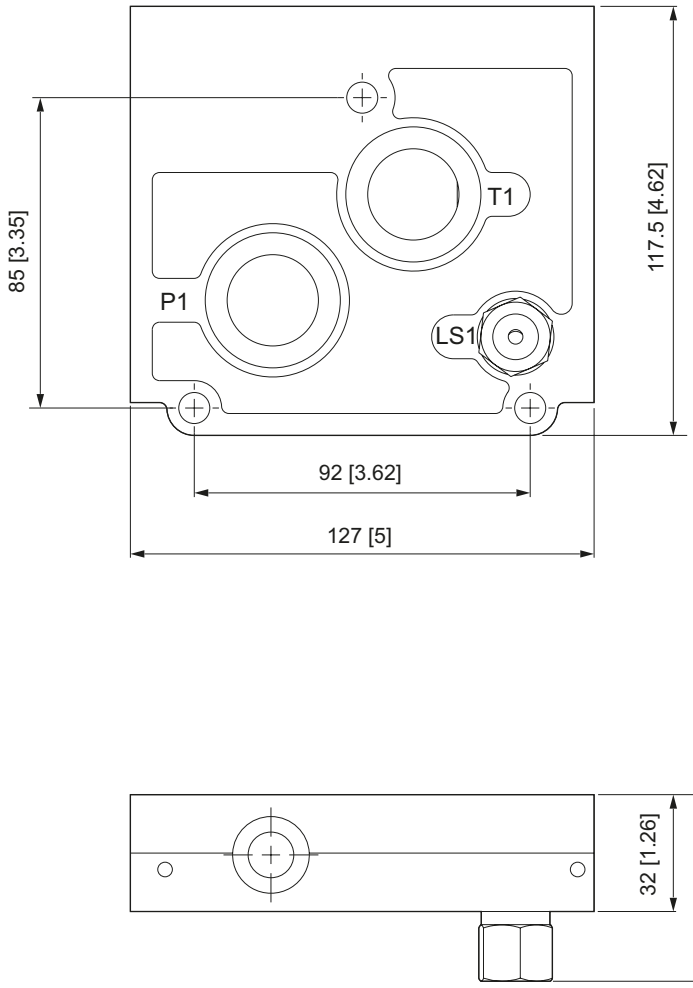


With Ls1 port

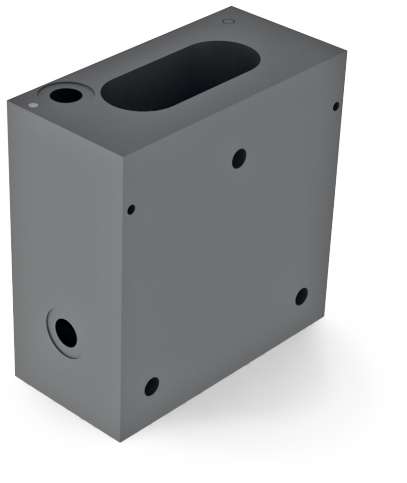
Code	
Ports Ls1 (1/4" BSPP)	Ports Ls1 (7/16"-12UNF-2B)
HSC0004105011	HSC0004105016

23 Plug or cartridge page B-93

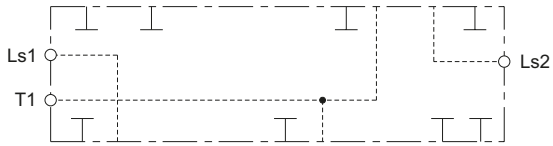
HSC end section overall dimensions



mm [inch]

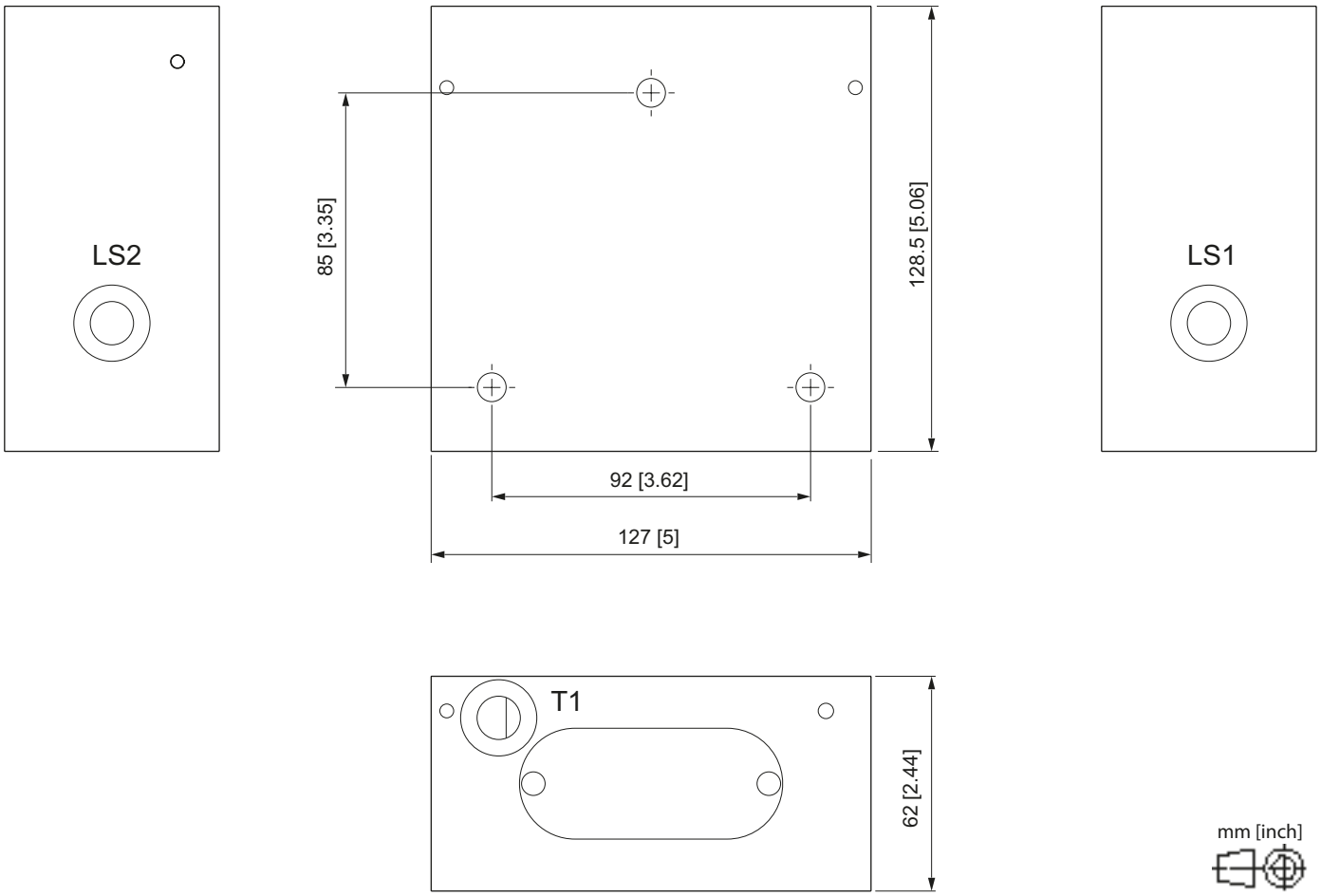


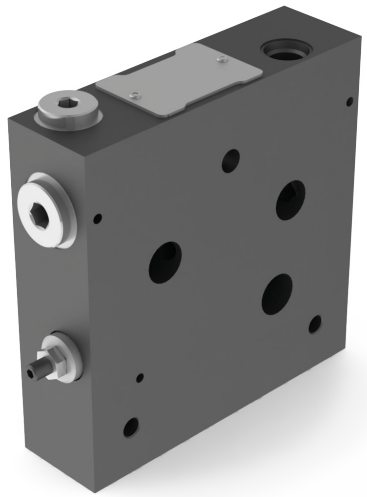
HPFS mid end section
HPFS mid end section allows two inlet sections HSE in one HPV. Cast iron body.



Code	
Ports T1 (1/4" BSPP)	Ports T1 (7/16"-20UNF-2B)
HPFS004106121	HPFS004106122

HPFS mid end section overall dimensions

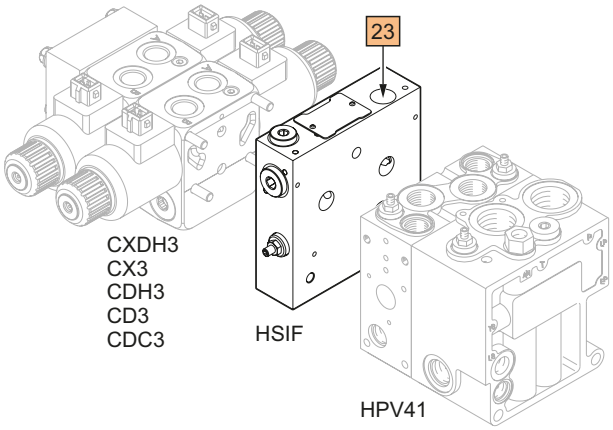




The HSIF interface allows an hydrauli connection between the elements of HPV41proportional valves with the elements of CXDH3 / CX3 proportional valves or CDH3 / CD3 / CDC3 on/ off valves.
This type of combination is highly appreciated in case of high flow differences between the controlled actuators.
The HSIF module must be inserted into the proportional valve configuration between the last HPV41 working section and the first CXDH3 / CX3 / CDH3 / CD3 / CDC3 working section.
Up to 8 elements of HPV41 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.

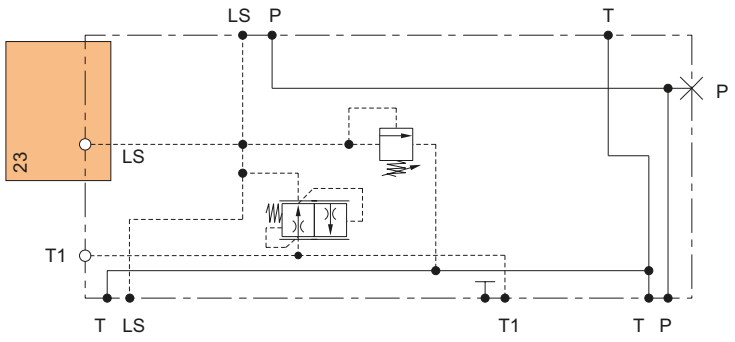
NOTE: You have to indicate in composition module the plug or the cartridge (see page B-93).

Max. operating pressure	300 bar [4351 psi]
Max. flow	80 l/1' [21 US gpm]
Weight (with coil)	3.8 kg [8.4 lb]



Description	Code
Cast iron HSIF interface	HSIF004105033

Side CXDH3 / CX3 / CDH3 / CD3 / CDC3

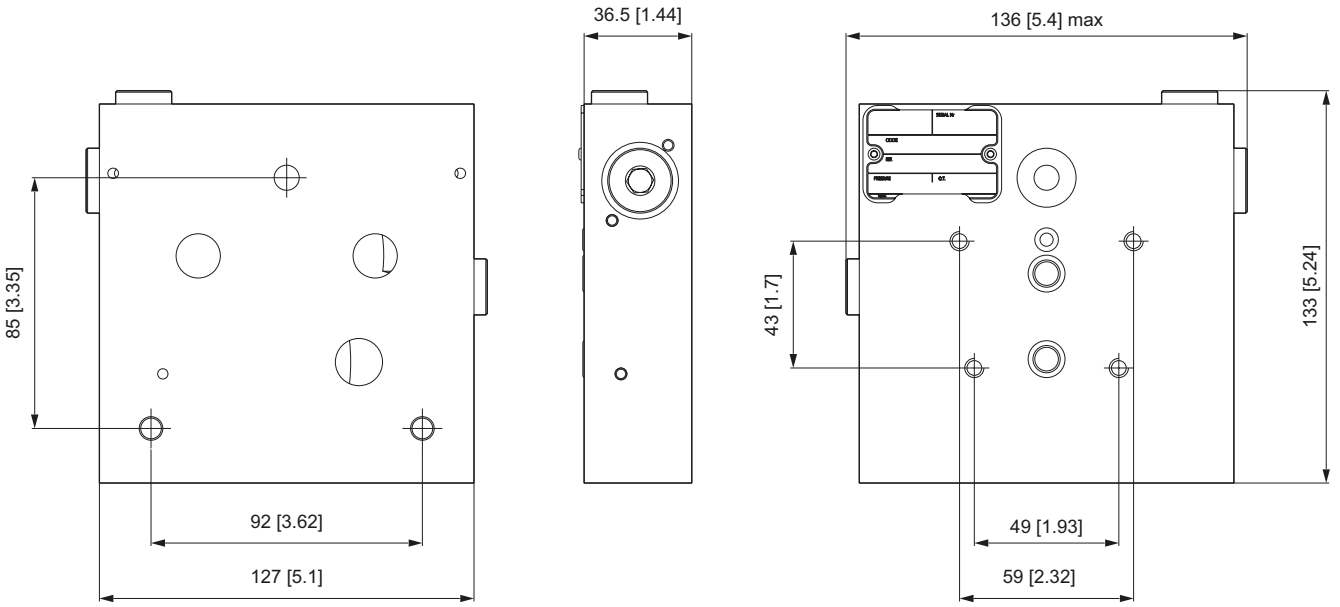


Side HPV 41

23 Plug or cartridge page B-93

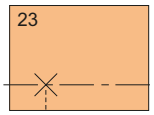
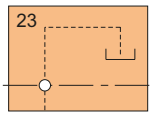
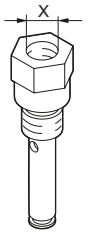
Bankable valves CXDH3 / CX3 / CDH3 / CD3 / CDC3 see catalogue code DOC00046)

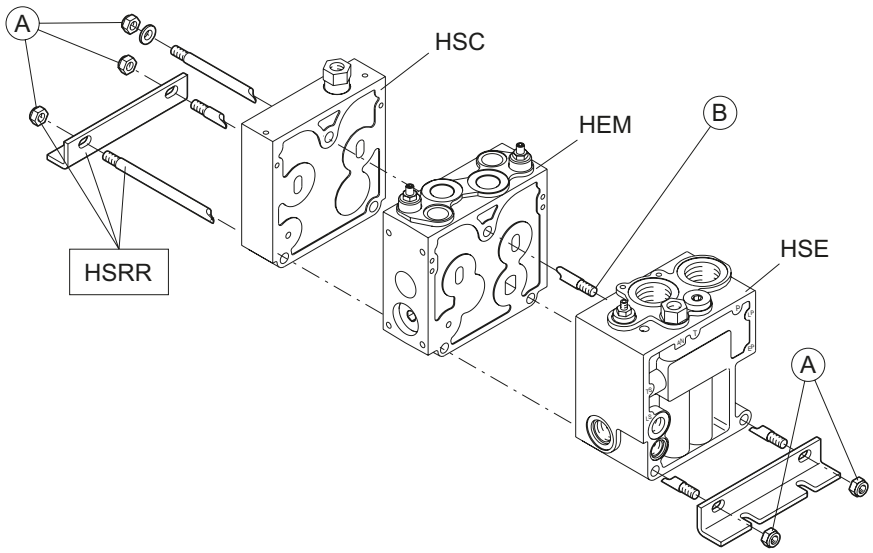
HSIF interface overall dimensions



mm [inch]

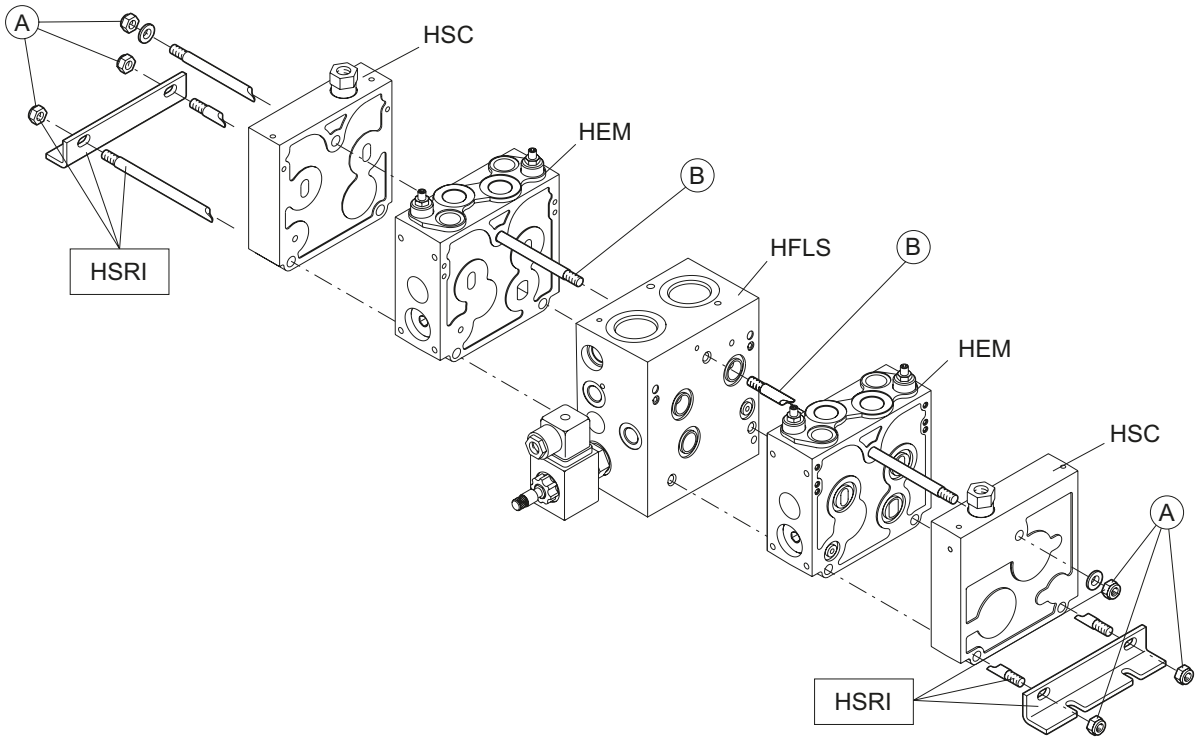
Accessories for HSC end section and HSIF interface

Code		Description	Symbol / Field	Draw
BSPP	UN - UNF			
HESC004103010		HESC Internal drain plug for HSC module, for mechanical or hydraulic controls		
CSRV004101203 1/4" BSPP	CSRV004101204 7/16"-20UNF-2B	CSRV External drain cartridge for HSC module, for electrical activations (to be connected to drain line)		



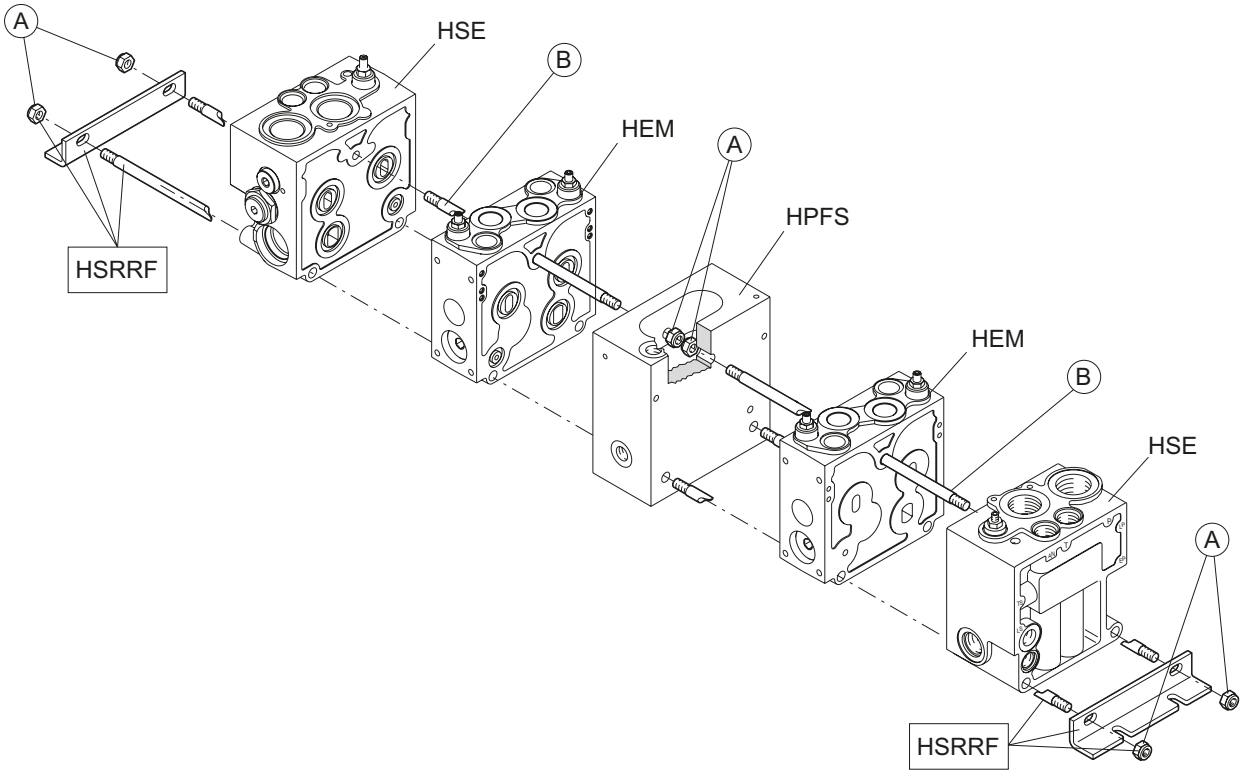
No. of working sections (HEM)	Code
1	HSRR004105551
2	HSRR004105552
3	HSRR004105553
4	HSRR004105554
5	HSRR004105555
6	HSRR004105556
7	HSRR004105557
8	HSRR004105558
9	HSRR004105559
10	HSRR004105560

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)



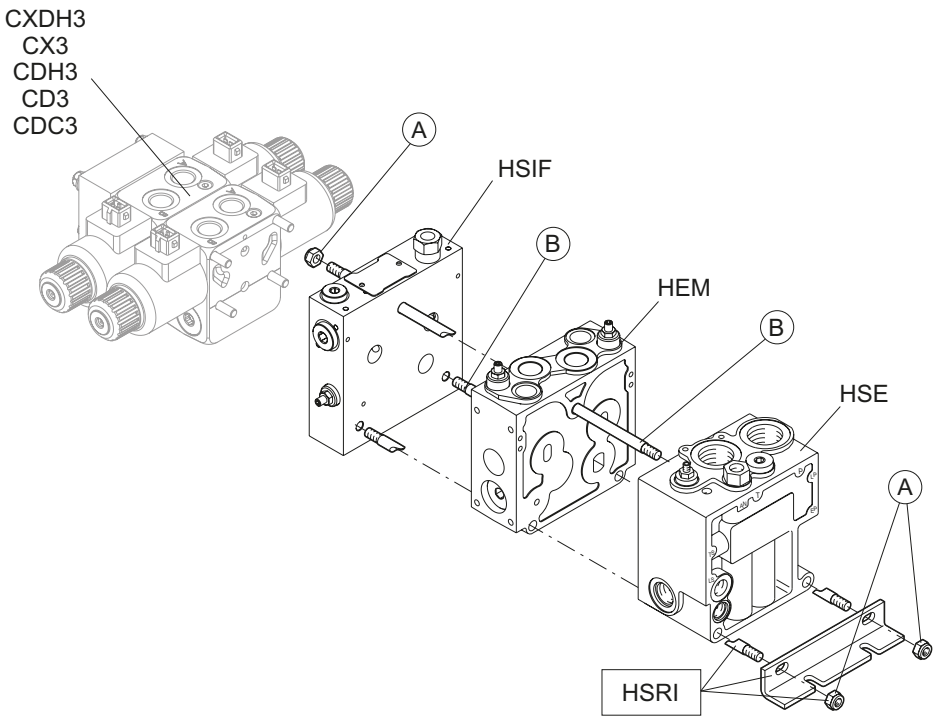
No. of working sections (HEM)	Code
1	HSRI004105561
2	HSRI004105562
3	HSRI004105563
4	HSRI004105564
5	HSRI004105565
6	HSRI004105566
7	HSRI004105567
8	HSRI004105568
9	HSRI004105569
10	HSRI004105570

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)



No. of working sections (HEM)	Code
1	HSRRF04105651
2	HSRRF04105652
3	HSRRF04105653
4	HSRRF04105654
5	HSRRF04105655
6	HSRRF04105656
7	HSRRF04105657
8	HSRRF04105658

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)



No. of working sections (HEM)	Code
1	HSRI004105701
2	HSRI004105702
3	HSRI004105703
4	HSRI004105704
5	HSRI004105705
6	HSRI004105706

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	RKRC1757000	2005502	2005506
Rear cover	HCF		•						
Hydraukic remote control	HCH			•					
Electrical	HCK	•							
Mechanical control	HCM				•				
Friction	HCN					•			
Rear cover	HCP					•			
Rear cover	HCPA		•						
Spool lock device	HCPD					•			
Kick-out device	HCPK							•	
Working section	HEM						•		
Intermediate inlet section	HFLS						•		
Intermediate end section	HPFS								
End section	HSC								
Inlet section	HSE						•		
Bankables interface	HSIF						•		
Electrical	MHOF			•					
Electrical	MHPED			•					
Electrical	MHPEPD			•					
Electrical activation	MHPH			•					
Electrical	MHPOD			•					
Electrical	MSPF	•							
Double pilot operated check valve	RWR								•

See composition form page B-21.