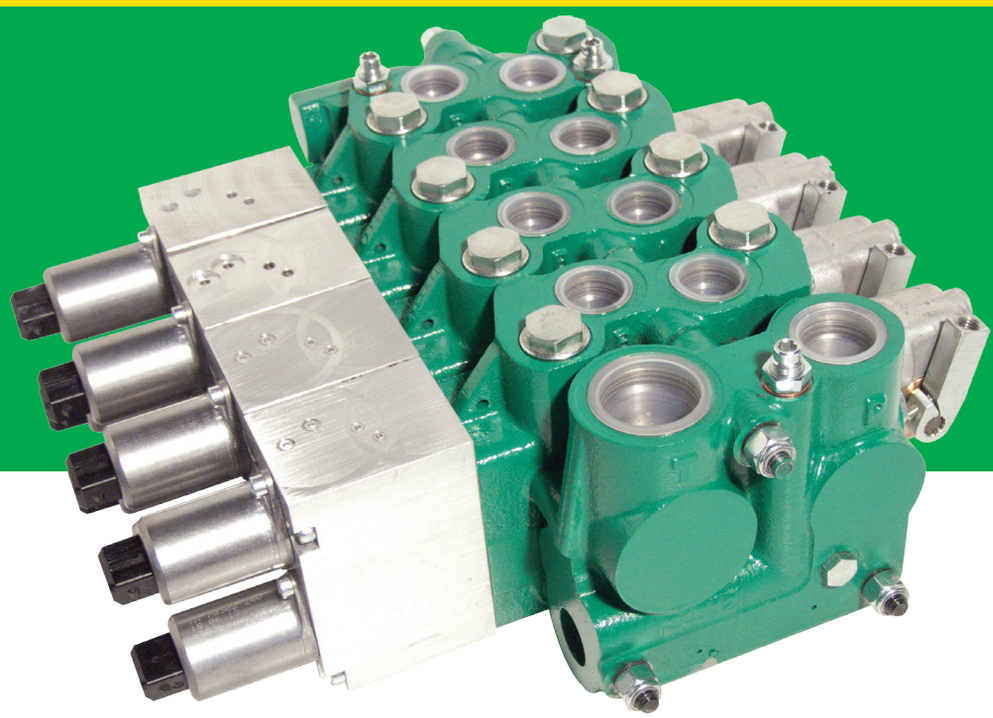
# VDP08

## Load-Sense Proportional Pressure Compensated Valve

SECTION A - Technical Catalogue

E0.241.0314.02.00IM07



salami®

# GENERAL INDEX

## SECTION A - VDP08 Technical Catalogue



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# GENERAL INDEX



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## FEATURES

## OPERATING PRINCIPLE

Load sensing directional control valve VDP08 offers a load-independent flow control (flow in each section depends only by the spool position and not by the load acting on any function), good meetering curves and chance of energy saving.
The spool acts as a variable throttling on which the pressure drop is maintained constant, so that each spool position arouses a determinate flow rate.

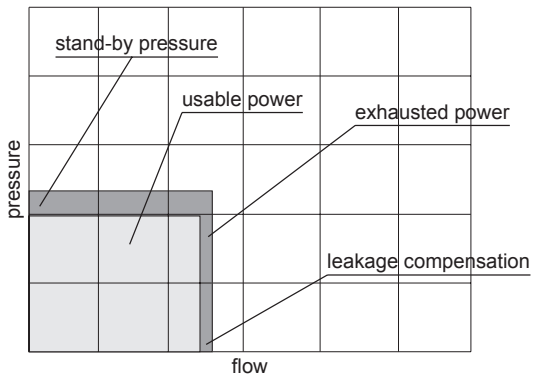
**Closed centre version for variable displacement pumps**

The valve, through the LS signal, sets the pump displacement on the value required by the actuator plus a little leakage compensation flow, the pump always working almost at minimum power possible, with clear advantages in terms of energy saving.
When several spools are actuated, only the highest of the corresponding LS signals reaches the pump; in the remaining sections the compensators keep the pressure drop on the spool constant, maintaining the flow rate equal to that required by the actuator and independent of the pump pressure.
When all the spools are in neutral position (pump stand-by), the pump is required a very little flow (leakage compensation) at the stand-by pressure (14 bar - 200 psi).

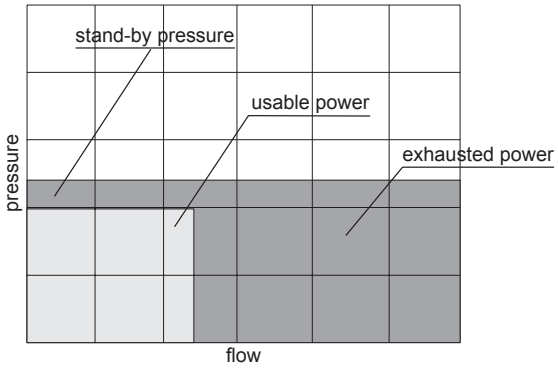
**Open centre version for fixed displacement pumps**

The flow regulator in the inlet module, controlled by the LS signal, drains to tank all the flow exceeding the value required by the actuators, generating in the valve the same working conditions as in case of variable displacement pump.
The advantages due to flow regulation hold, whereas energy saving is strongly cut down.

Load sensing circuit with variable displacement pump (closed centre)




Load sensing circuit with fixed displacement pump (open centre)




## GENERAL

Among all hydraulic directional control valves used in the field of mobile equipment applications, the spool valve is the most popular.
The sectional valve type allows construction flexibility. Salami directional control valves are modular construction and consist of an inlet/outlet section, up to 8 working sections and an end plate. All these elements are secured in one block by means of tie-rods.
Salami directional control valves have the following features :
- Special cast-iron body;
- Spool construction in steel, hardened and chromium-plated to obtain a higher surface hardness, a better corrosion resistance, and wearing reduction;
- Minimum tolerance between spools and body to obtain a minimum internal leakage;
- Interchangeability of all spools;
- Possibility of auxiliary valves on port A and B
- Several spool controls.

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## FEATURES

## WORKING CONDITION

| | | |
|---|---|---|
| HYDRAULIC FLUID | | Mineral oil according DIN 51524 |
| VISCOSITY | | |
| | Viscosity range | 10 ÷ 460 mm²/sec.<br>0,15 ÷ 7,13 sq.in./sec. |
| | Optimal viscosity | 12 ÷ 75 mm²/sec.<br>0,19 ÷ 1,16 sq.in./sec. |
| TEMPERATURE | | |
| | Fluid temperature range | - 20 ÷ + 85°C<br>- 4 ÷ + 185°F |
| | Suggested range | + 30 ÷ + 60° C<br>+ 86 ÷ + 140° F |
| MAXIMUM CONTAMINATION LEVEL | | NAS 1638: class 9<br>ISO 4406: 19/16 |
| ROOM TEMPERATURE | | - 30 ÷ + 60°C<br>- 22 ÷ + 140°F |
| WORKING LIMITS | | See diagrams |
| PRESSURE DROPS | | See diagrams |

For operation with fire resistant fluids, please contact our sales department.

## DISTRIBUTION PHASES

There are two characteristic phases in the spool stroke (7 mm - 0,275 in.):
a) the overlap phase (about 18% of the stroke) guarantees minimum internal leakages in neutral position;
b) the progressive flow regulation phase (82% of the stroke).

## TECHNICAL DATA

| | | | | |
|---|---|---|---|---|
| Max pressure | port P | | 315 bar | (4560 psi) |
| | ports A/B | | 350 bar | (5000 psi) |
| | port T* | | 10 bar | (145 psi) |
| Oil flow rate | port P | | up to 130 l/min | (34 gpm) |
| | ports A/B | | up to 95 l/min | (25 gpm) |
| Internal leakage at 160 bar (2285 psi) | ports A/B -->T | | 30 ÷ 35 cc/min | (1,8 ÷ 2,1 cu.in./min) |
| Spool stroke | | | ±7 mm | (0,28 in.) |
| Dead stroke (for spool flow control) | | | 1,8 mm | (0,07 in.) |
| Operating force (on the spool) | | to start | 90 N | (20 lbf) |
| | | end stroke | 180 N | (40 lbf) |

*For higher back pressure please consult our Sales Department.
All technical data carried out using mineral oil with viscosity of 16 cSt and contamination level 19/16 as ISO 4406.

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## FEATURES

## VALVE AND DEVICE TYPES

In order to meet the most stringent demands and to offer a wider range of applications, the following types of auxiliary valves and devices are available:

· **Valves on the inlet**

**Main relief valve - VSLS** (see page 7A): controls the maximum pressure in the circuit acting on the LS signal that pilots the flow regulator.

**Electric unloading valve - EV** (see page 9A): if not excited drains the LS signal preventing the valve operation (pump pressure set at the stand-by value 14 bar - 200 psi).

**Flow regulator** (see page 7A): in the closed centre version serves the only function, driven by VS or EV, to drain the oil flow to tank;
in the open centre version it also regulates the flow rate.

· **Valves on the outlet**

**Pressure reducing valve for electrically actuated valves** (see pages 16A and 17A): supplies the piloting pressure to electro-hydraulic remote controls.

· **Valves on the section**

**LS pressure limiting valves on A and/or B ports - VSLS** (see page 14A): limiting the LS signal of the section control the pressure that the section can impose to the circuit. The shuttle valve allows different settings on the two ports.

**Overload and anticavitation valve on port A and/or B - AR**(see page 14A): avoids pressure peaks on ports A/B connecting the port to tank when pressure exceeds the setting. It also serves an anti-cavitation function.

**Anti-cavitation valve on port A and/or B - VR** (see page 14A): avoids cavitation due to inertia in the system.

**Prearrangement for AR/VR and VSLS** (see page 14A): PR and PRVSLS.

EACH DEVICE AND EACH CONFIGURATION REPORTED IN THIS CATALOGUE HAS A CORRESPONDING PART NUMBER IN THE DEALER CATALOGUE.
FOR ORDERING PART NUMBER, PLEASE CONSIDER THE DEALER CATALOGUE.
IN CASE OF MISSING PART NUMBER, PLEASE CONTACT OUR SALES DEPARTMENT.

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## FEATURES

## INSTALLATION

When proceeding to mount the unit on the structure and to connect fittings to work ports, it is necessary to comply with the values of tightening torques (see page 18A).
The attachment of linkages to spools should not affect their operation. The mounting position can be vertical with inlet module on the top or horizontal.
We recommend to fix the valve always using only 3 of the 4 fixing holes, otherwise make sure to interpose 4 rubber insulators between the valve and the machine frame, to avoid valve distorsion and spool sticking.

## FILTRATION

The contamination of the fluid circulating in the system greatly affects the life of the unit. Above all, contamination may result in irregular operation, wear of seals in valve housings and failures. Once the initial cleanliness of the system has been attained, it is necessary to limit any increase of contamination by installing an efficient filtration system (see working conditions page 2A).

## PIPES

Pipes should be as short as possible, without restrictions or sharp bends (especially the return lines).
Before connecting pipes to the fittings of the corresponding components, make sure that they are free from burrs and other contamination.
As a first approximation, for a mobile machine with standard length pipes, their width should guarantee the following values of fluid speed*:

| | | | |
|---|---|---|---|
| 6 ÷ 10 m/sec | inlet pipe | 19,7 ÷ 32,8 ft/sec | inlet pipe |
| 3 ÷ 5 m/sec | outlet pipe | 9,9 ÷ 16,4 ft/sec | outlet pipe |

the lowest values of fluid speed are required in case of wide temperature range and/or for continuous duty.

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* [$v = \frac{21,2 \cdot Q}{d^2}$ v = fluid speed [m/sec], Q = flow [l/min], d = pipe internal diameter [mm]]

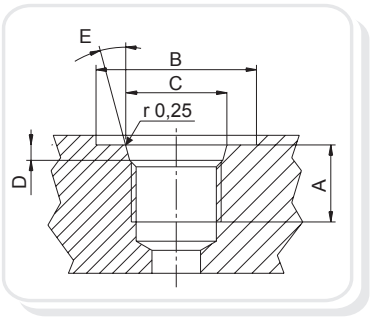
## FEATURES

### HYDRAULIC FLUID

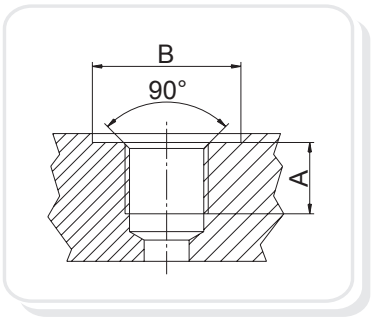
Usually a mineral-base oil with a good viscosity index should be used, preferably with good lubricating properties and corrosion, oxidation and foaming resistant.
Sometimes the fluids supplied by the manufacturers do not satisfy purity requirements (see WORKING CONDITIONS). It is therefore necessary to filter the fluid carefully before filling. Your supplier can give you the information about NAS class of its fluids. To maintain the proper purity class, the use of filters of high dirt capacity with clogging indicator is recommended.
Under humidity conditions it is necessary to use hygroscopic salts.
For operation with fire resistant and ecological fluids, please contact our technical department.

## PORTS

Following are standard ports. For different port types, please contact our sales department.




| SAE UN-UNF (ISO 725) | | | | | | |
|---|---|---|---|---|---|---|
| Dimensions mm *In.* | 7/8 -14 UNF SAE10 | | 1”1/16 -12 UN SAE12 | | 1”5/16 -12 UN SAE16 | |
| A | 17 | *0,67* | 20 | *0,79* | 20 | *0,79* |
| B | 34 | *1,34* | 41 | *1,61* | 49 | *1,92* |
| C | 23,9 | *0,94* | 29,2 | *1,15* | 35,5 | *1,40* |
| D | 2,5 | *0,10* | 3,3 | *0,13* | 3,3 | *0,13* |
| E | 15° | | 15° | | 15° | |




| BSP (ISO 228) | | | | | | |
|---|---|---|---|---|---|---|
| Dimensions mm *In.* | G1/2 | | G3/4 | | G1 | |
| A | 16 | *0,63* | 18 | *0,71* | 20 | *0,79* |
| B | 27 | *1,06* | 33 | *1,30* | 40 | *1,57* |

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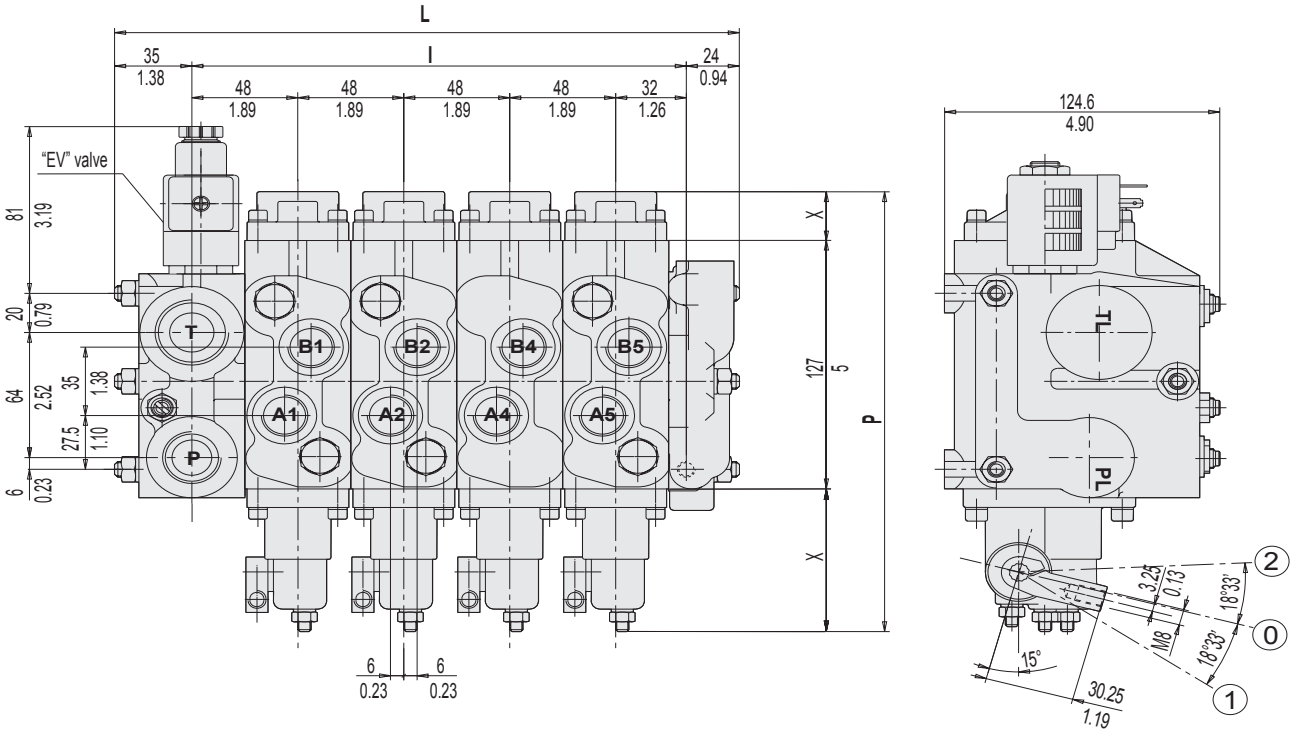
## DIMENSIONS

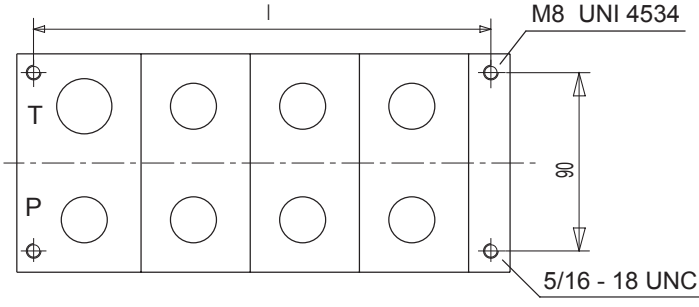
**A/B**: working ports
**P**: top inlet port
**PL**:side inlet port
**T**: top outlet port
**TL**:side outlet port
**LS** (see page 8A):
load-sensing signal port
**PG** (see page 8A):
pressure gauge port

| Ports *Orifices* | P/PL | T/TL | A/B | PG/LS |
|---|---|---|---|---|
| BSP ISO 228<br>SAE ISO 176 | G3/4<br>SAE12 | G1<br>SAE16 | G1/2<br>SAE10 | G1/4<br>SAE4 |

The drawing showned is just an example.The overall dimensions you read are valid for all the D.C.V. except the parametric dimensions "L" and "I" depending on the number of working sections.The parametric dimensions "P" depends on a fixed dimension of 127 mm (5 in.) to wich you have to had the "X" dimensions that you can find in the following pages.




| Nr. sections | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|---|
| **I** | mm | 80 | 128 | 176 | 224 | 272 | 320 | 368 | 416 |
| | in | 3,14 | 5,03 | 6,92 | 8,81 | 10,70 | 12,59 | 14,48 | 16,37 |
| **L** | mm | 107 | 155 | 203 | 251 | 299 | 347 | 395 | 443 |
| | in | 4,21 | 5,47 | 7,99 | 9,88 | 11,77 | 13,66 | 15,55 | 17,44 |
| **Mass** | kg | 8,80 | 12,8 | 16,80 | 20,80 | 24,8 | 28,8 | 32,8 | 36,8 |
| | lb | 19,42 | 28,25 | 37,08 | 45,91 | 57,74 | 83,57 | 72,40 | 81,23 |




Fixing holes distance between centers.
The END PLATES are always threaded as showned beside.
The INLET/OUTLETm odules are threaded M8 UNI 4534 when the ports are GAS threaded and 5/16 - 18 UNC 2B ANSI B1.1 when the ports are SAE threaded.

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## INLET/OUTLET MODULES

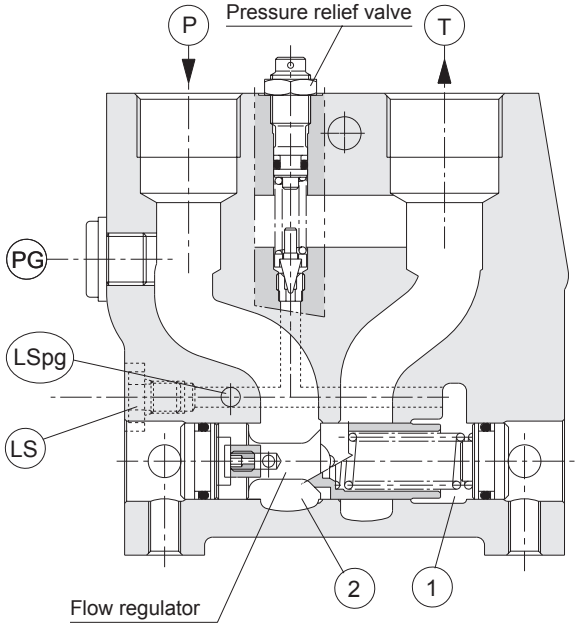
## OPERATING PRINCIPLES

OPEN CENTRE CIRCUIT WITH FIXED DISPLACEMENT PUMP
"CODE F" - SEE PAGE 8A

When the pump is started and main spools in the working modules are in neutral position, oil flows from the pump through (P) port across the flow regulator to tank (T) .
The oil flow led across the flow regulator determines the pump pressure(stand-by pressure of 14 bar - 200 psi).
When one or more of the main spools are actuated, the highest load pressure is fed through the shuttle valve circuit("LS" pilot gallery, see hydraulic circuit at pag.11A) to the spring chamber behind the flow regulator (1), completely or partially closes the connection to tank.
Pump pressure is applied to the left-hand side of the flow regulator (2).
The pressure relief valve poppet will open as soon as the load pressure will exceed the set value, so that the flow regulator will shift right diverting pump flow back to tank.

CLOSED CENTER CIRCUIT WITH VARIABLE DISPLACEMENT PUMP
"CODE V" - SEE PAGE 8A

In the closed centre version a throttling [3] and a plug [2] have been fitted instead of the plug [1].
This means that the flow regulator will only open to tank when the pressure in channel P exceeds the set value of the pressure relief valve.
In load sensing systems the load pressure is led to the pump regulator via the "LS" port.




P INLET PORT
T OUTLET PORT
PG PRESSURE GAUGE PORT
LSpg "LOAD SENSING PILOT GALLERY
LS LOAD SENSING PORT

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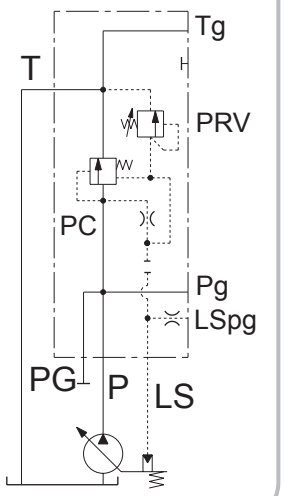
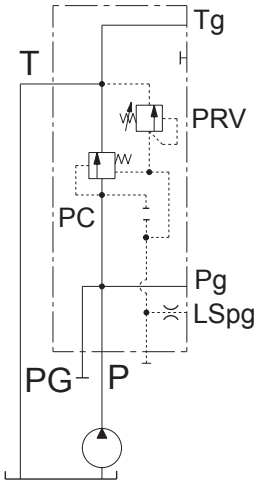
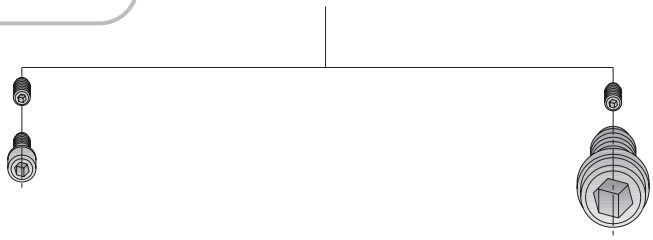
## INLET/OUTLET MODULES

Hydraulic circuit



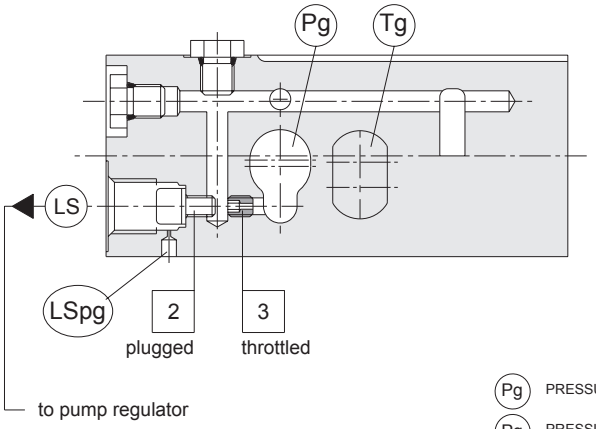

Hydraulic circuit



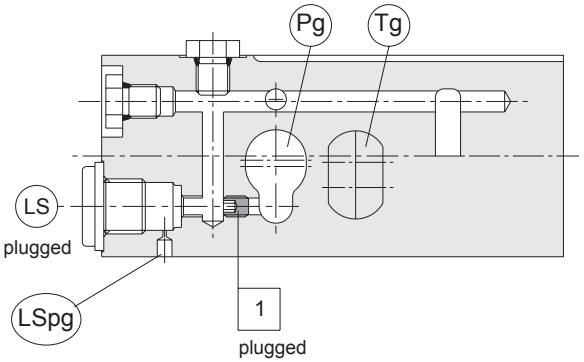
**code V**

**Closed centre for variable displacement pumps**




**code F**

**Open centre for fixed displacement pumps**




Pg PRESSURE COMPENSATOR

Pg PRESSURE GALLERY

Tg TANK GALLERY

PRV PRESSURE RELIEVE VALVE

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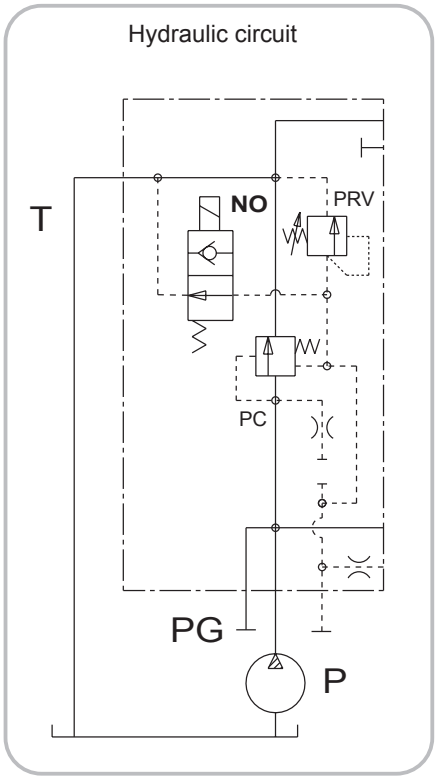
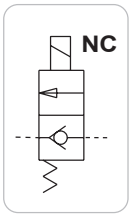
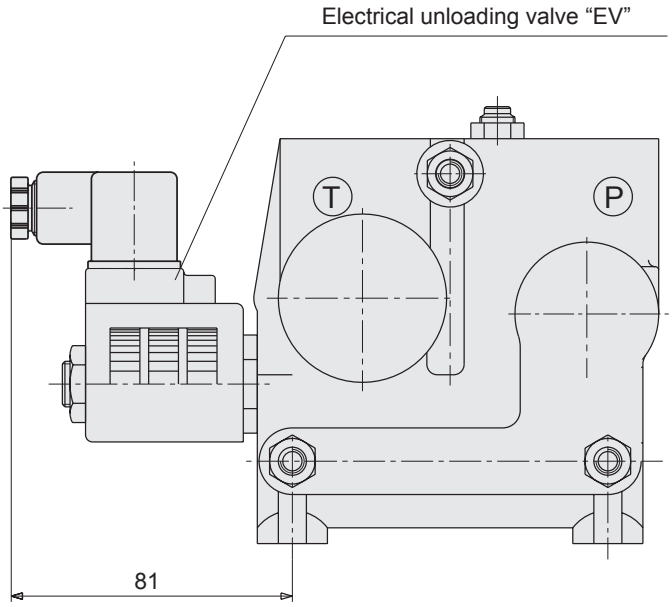
## INLET/OUTLET MODULES

### Inlet module circuit with LS electrical unloading valve - “ EV “




| | | |
|---|---|---|
| EV1<br>EV2 | 12 Vcc<br>24 Vcc | normally open |
| EV3<br>EV4 | 12 Vcc<br>24 Vcc | normally closed |

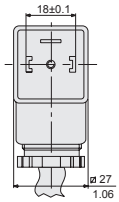



CIRCUIT DESCRIPTION:
“EV” is an unloading electrovalve of the “LS” signal. ”EV” is fitted into the inlet module enabling a connection between the “LS” and the tank lines. The “LS” signal can be relieved to tank switching the electrovalve by an electrical signal.

“EV” VALVE IN THE OPEN CENTRE CIRCUIT “CODE F”
For an open centre inlet module the relief to tank of the “LS” signal means that the pressure in the system is reduced to the difference of the tank port pressure and the inlet module pressure.

“EV” VALVE IN THE CLOSED CENTRE CIRCUIT “CODE V”
For a closed centre inlet module the relief to tank of the “LS” signal means that the pressure in the system is reduced to the difference of the tank port pressure and the stand-by pressure of the pump.

**CONNECTOR**
**DIN 43650 - A/ISO 4400**




| SPECIFICATIONS | |
|---|---|
| - MAX PRESSURE IN P” | 350 bar |
| - MAX FLOW | 10 l/min |
| - OIL LEAKAGE | 82 cc/min |
| - AVAILABLE VOLTAGE | 12 - 24 Vcc |
| - COIL RESISTANCE | 12Vcc:5.1 Ω - 24 Vcc:20.5 Ω |
| - PROTECTION INDEX WITH STANDARD CONNECTOR | IP 65 |

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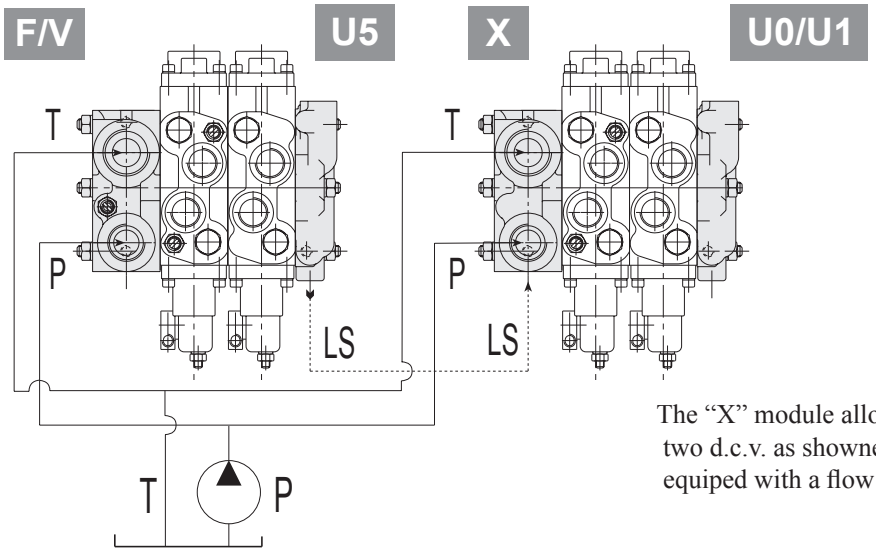
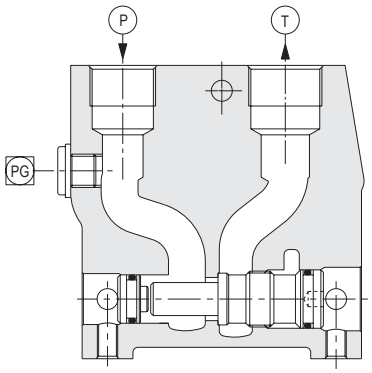
## INLET/OUTLET MODULES

**Inlet module for parallel connected valves**

**code X**

**Before to order this code, please get in touch with our sales dept.**

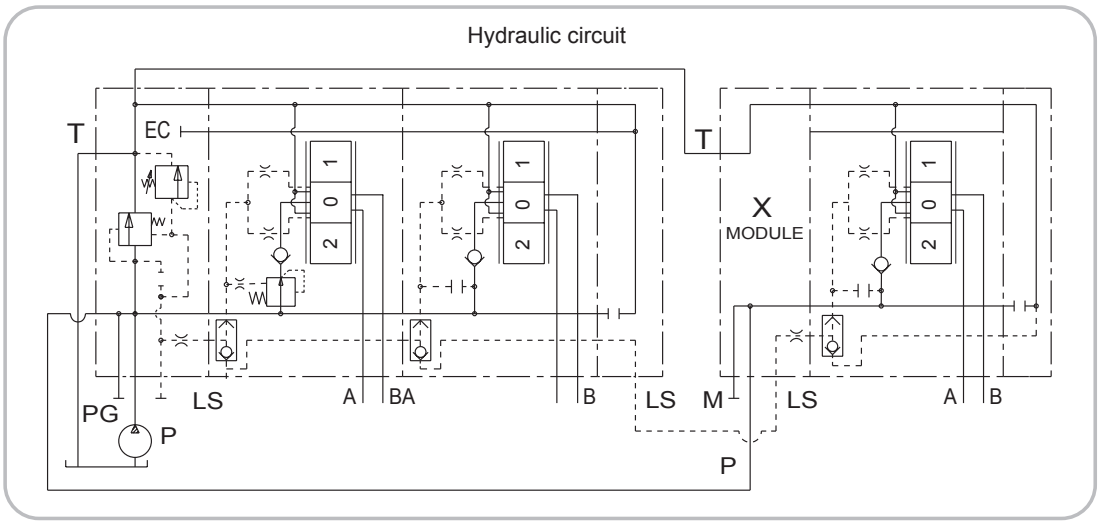



The "X" module allows to realize a parallel connection of two d.c.v. as showned on the side.The "X" module Instead to be equiped with a flow regulator it is just plugged in.

The hydraulic circuit shows the upstream d.c.v. with "F" inlet module ( for fixed displacement pump) and the downstream valve
with the "X" inlet module.The downstream d.c.v. takes the "LS" signal from the end module of the upstream d.c.v.
The same d.c.v. connection could be done with a "V" module in the upstream d.c.v. (for variable displacement pump).
The end module of the upstream d.c.v. has to be designed as "U5".

**EXAMPLE OF CIRCUIT TYPE**

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## WORKING MODULES

## WORKING MODULE WITH PRESSURE COMPENSATOR

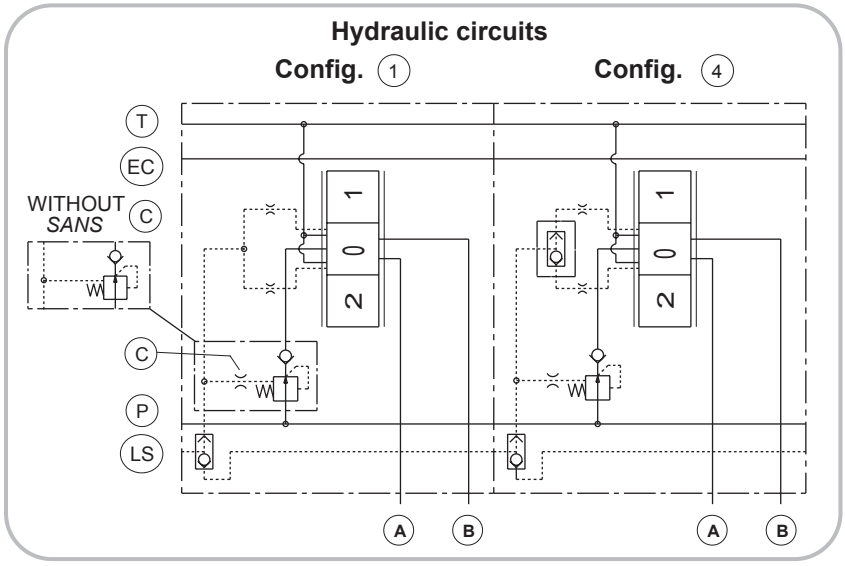
GENERAL FEATURES

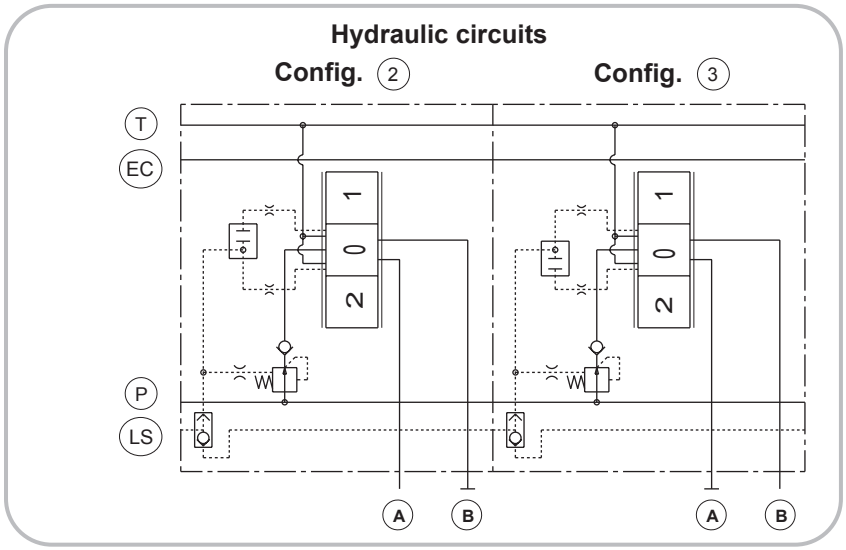
In a pressure-compensated working module the compensator maintains a constant pressure drop across the main spool - both when the load changes and when a module with a higher load pressure is actuated.

CIRCUIT CONFIGURATIONS

The pressure compensated working module is available in four circuit configurations (see figures beside), where you can introduce all the spool circuits that you can find from page 19A to page 22A.In this way we can have a vaste range of circuit types. The drawings at page 12A show the components required to obtain the four different circuit configurations.

The plug (1) is used just to close a machining hole. The pivots (2) and (3) replace the plug (1) in case we have a single acting spool instead of a duoble. The pivot (4) is used with "LS" pressure limiting valves on A and B ports.It has a shuttle valve built-in that selects the "LSA" and "LSB" signals, coming from working ports and limited by "LS" pressure valves.To ensure a stabler "LS" signal the throttling (C) is always mounted.Throttling (C) can be removed if required.

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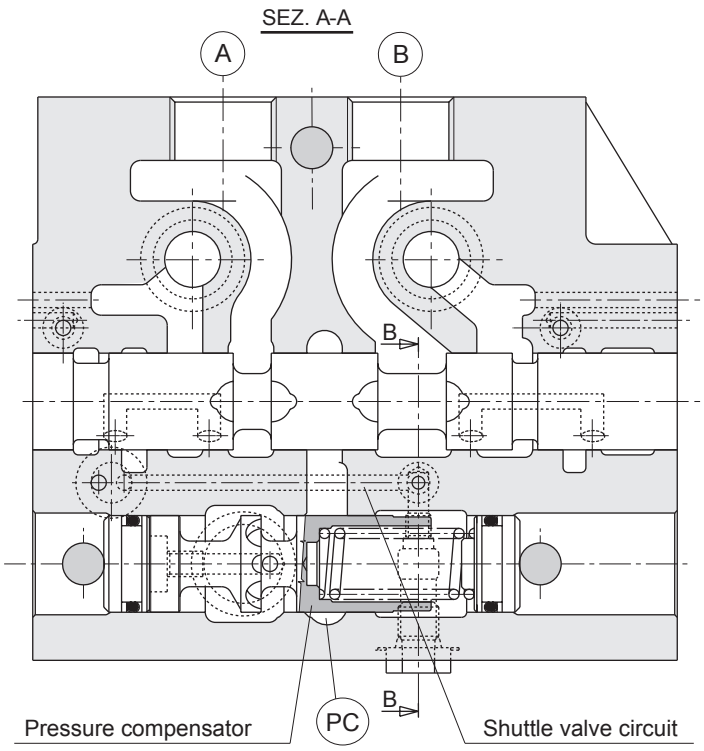
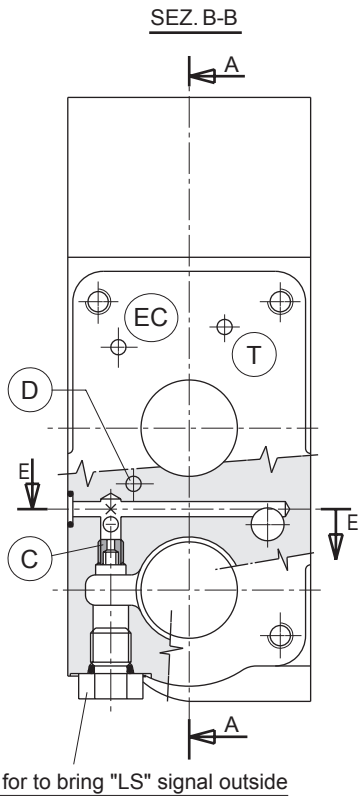
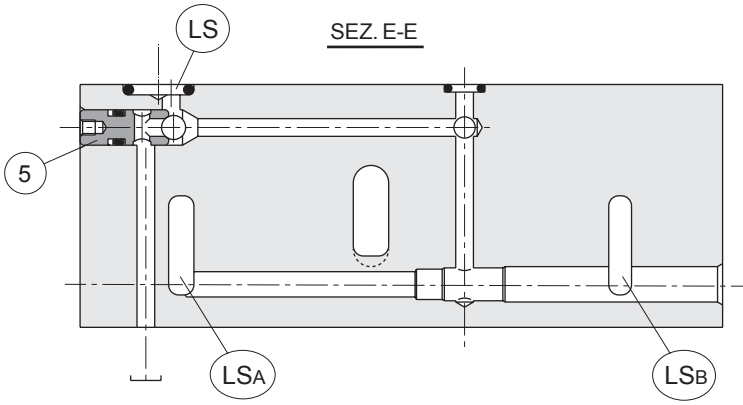
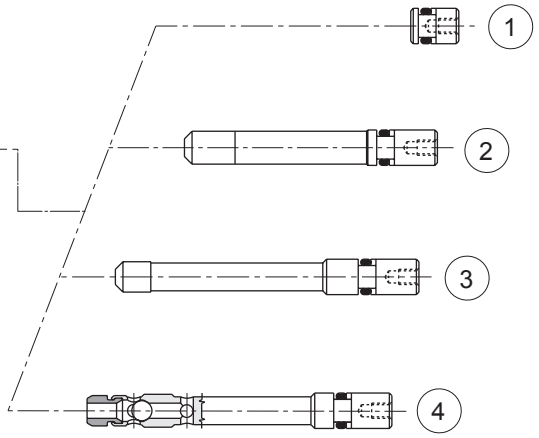
## WORKING MODULES

### WORKING MODULE WITH PRESSURE COMPENSATOR




(A) AND/*ET* (B) WORKING PORTS

(PC) COMPENSATED PRESSURE

(C) THROTTLING

(CE) PILOT SUPPLY

(D) CONNECTING ORIFICE SIDE "A" - SIDE "B"

(T) TANK

(LS) "LS" CIRCUIT

(LSA) "LS" CIRCUIT FROM PORT "A"

(LSB) "LS" CIRCUIT FROM PORT "B"

(1) PLUG

(2) SINGLE ACTING PORT (A)

(3) SINGLE ACTING PORT (B)

(4) SHUTTLE ASSY PORT (A) OR (B)

(5) SHUTTLE ASSY ELEMENTS

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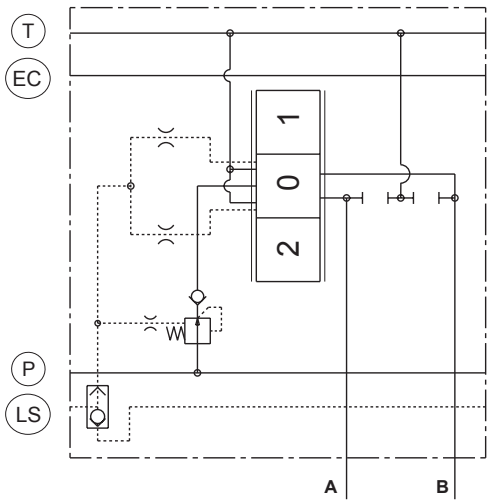
## WORKING MODULES

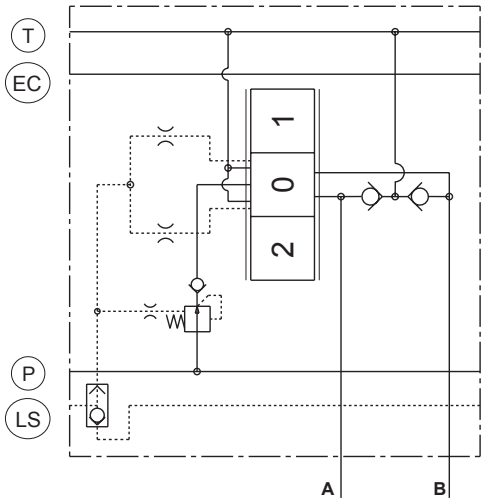
### AVAILABLE VALVE TYPES ON A/B PORTS

#### Available circuits

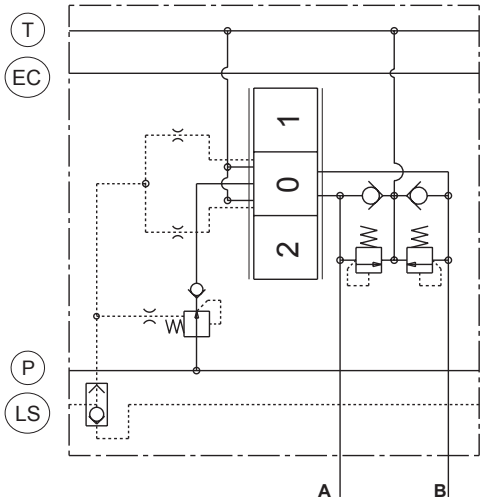
**PR - Prearranged for VR - AR**



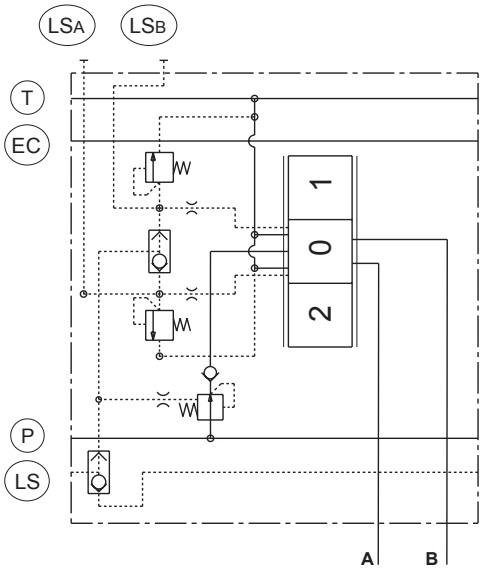

**VR - Anti-cavitation valve**




**AR - Overload and anti-cavitation valve**




**VSLS - LS$_{A/B}$- Pressure limiting valve**



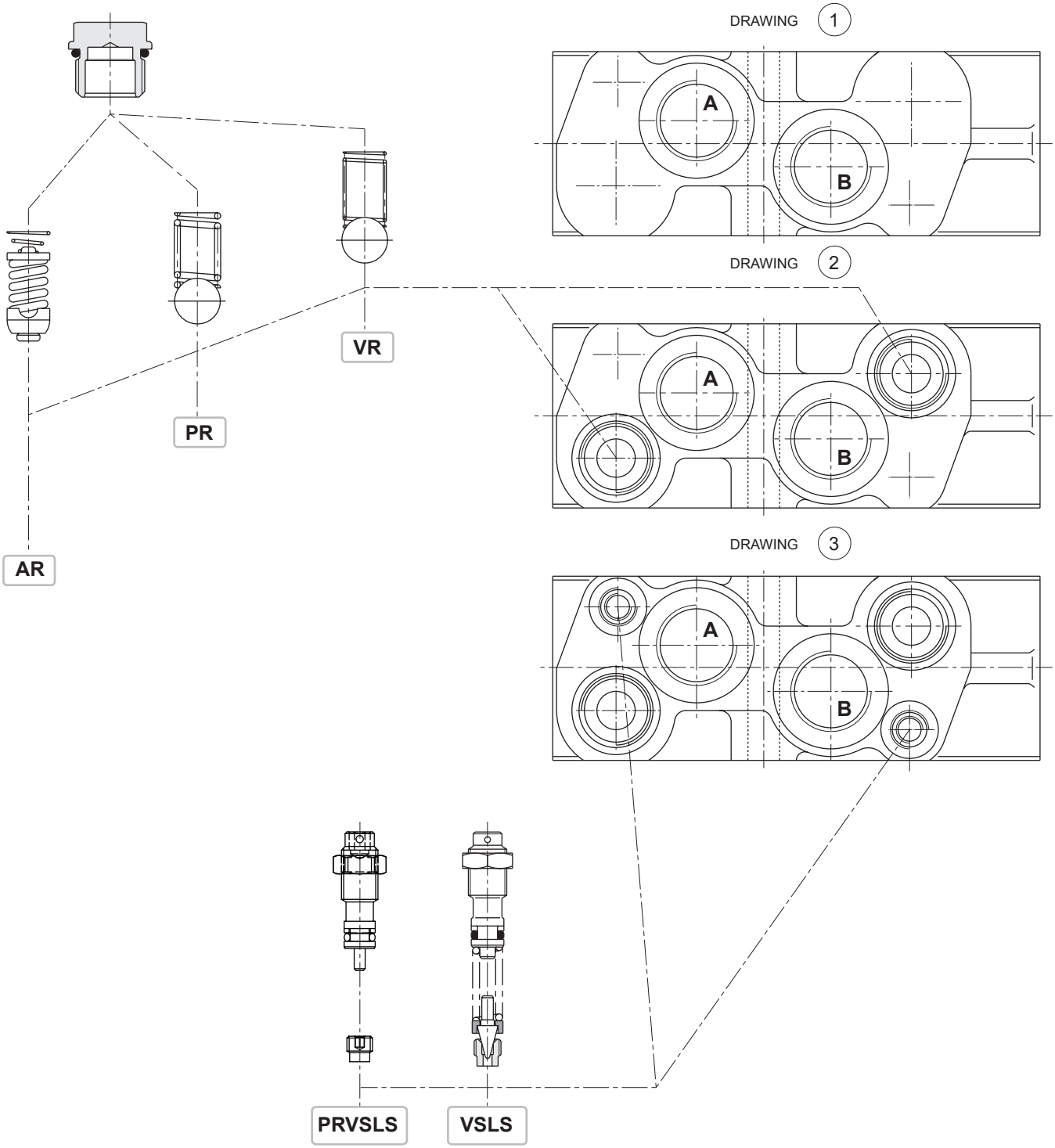

GENERAL FEATURES

The hydraulic circuits of the different available valves are here shown, in the next page the valves location on the working module.

As shown on page 14A in drawing ① a working module without valves, in drawing ② a module with pre-arrangement for (VR) - (AR). Remind that the (AR) valve setting is fixed. In drawing ③ a module wiht two additional valve seats where the (VSLS) valves can be fitted. As shown in the circuit, this module offers the chance to pick up the "LS" signals from A and B ports removing the two plugs in the bottom of the module.

## WORKING MODULES

### AVAILABLE VALVE TYPES ON A/B PORTS

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**AR - Overload and anticavitation valve**

**VR - Anticavitation valve**

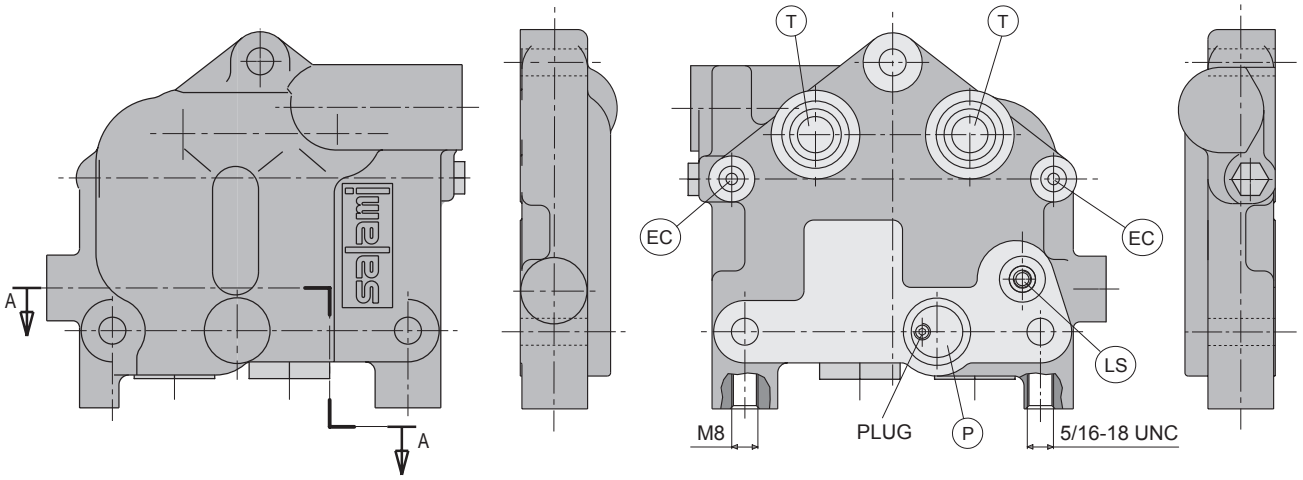
**PR - Prearranged for AR / VR**

**PRVSLS - Prearranged for VSLS**

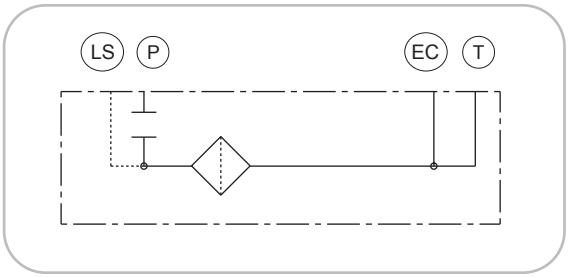
**VSLS - LS pressure limiting valve**

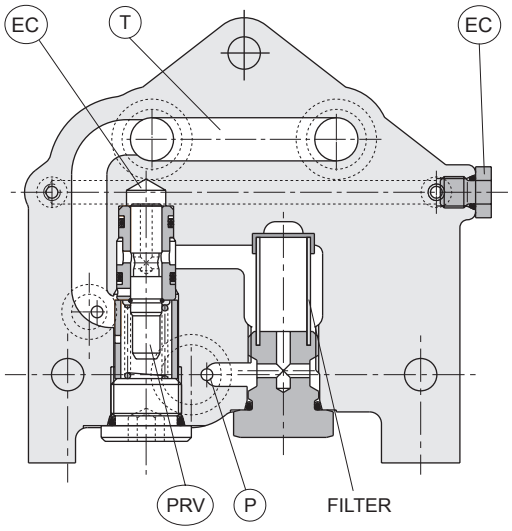
## END PLATE

### AVAILABLE CIRCUIT

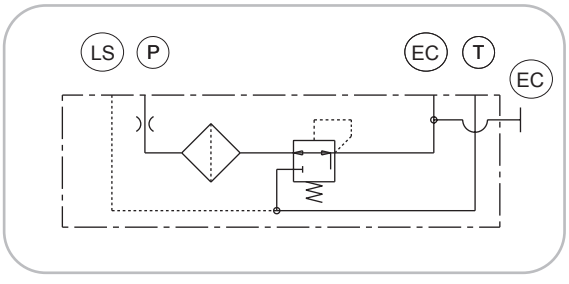



**code U0**




**code U1**

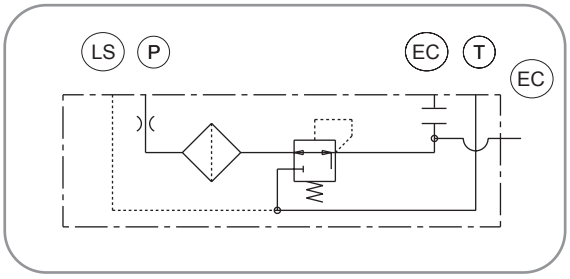


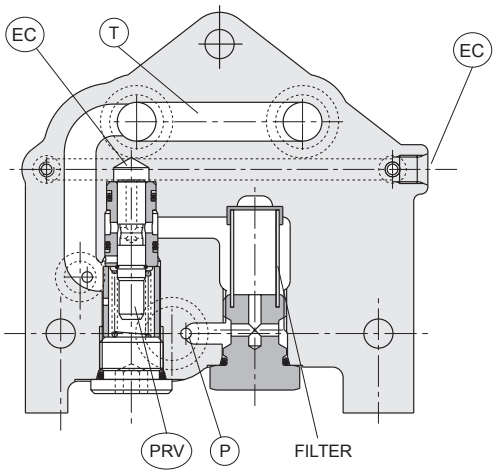

"U1" end plate integrates the reducing pressure valve (PRV) which draws "P" signal, when reducing it to a pressure of approx. 10 to 28 bar, sending it to "EC" circuit for feeding the electrohydraulic controls.

## END PLATE

## AVAILABLE CIRCUIT

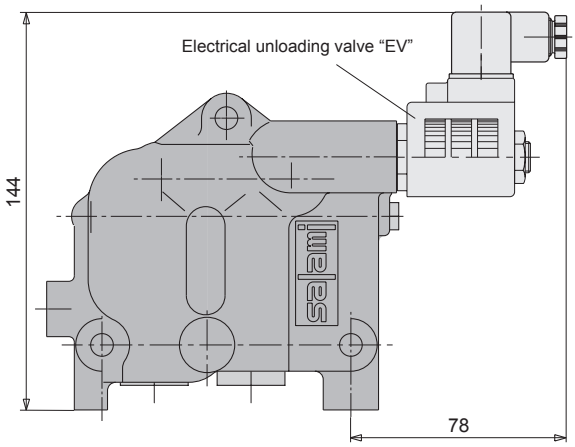
### code U2



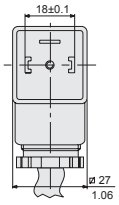




"U2" end plate integrates the reducing pressure valve (PRV) which draws "P" signal, when reducing it to a pressure of approx. 10 to 28 bar, obteining in this way an external piloting signal which can be used by a joystic or an electrovalve for to operate "IP" controls.In this case "EC" piloting inside the valve is plugged.

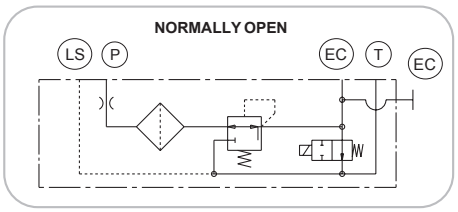
| SPECIFICATIONS | |
|---|---|
| - MAX PRESSURE IN P" | 207 bar |
| - MAX FLOW | 10 l/min |
| - OIL LEAKAGE | 82 cc/min |
| - AVAILABLE VOLTAGE | 12 - 24 Vcc |
| - COIL RESISTANCE | 12Vcc:5.1 Ω - 24 Vcc:20.5 Ω |
| - PROTECTION INDEX WITH STANDARD CONNECTOR | IP 65 |



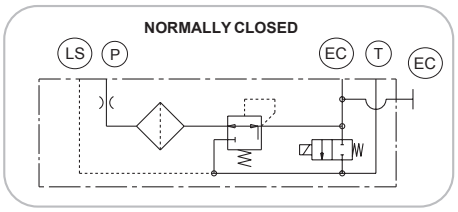

**CONNECTOR**
**DIN 43650 - A/ISO 4400**




### 12 Vcc - code U3
### 24 Vcc - code U4




### 12 Vcc - code U6
### 24 Vcc - code U7




"U3-U4" and "U6-U7" end plates integrate (PRV) valve for electrohydraulic circuits and can also release the "EC" piloting by the electrovalve, which can be normally open or closed.

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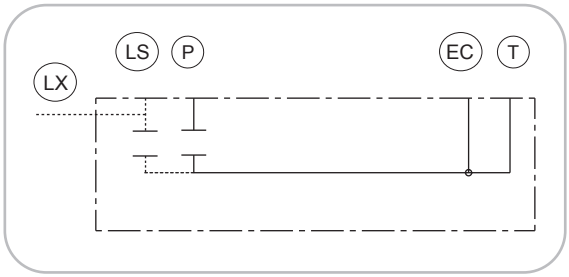
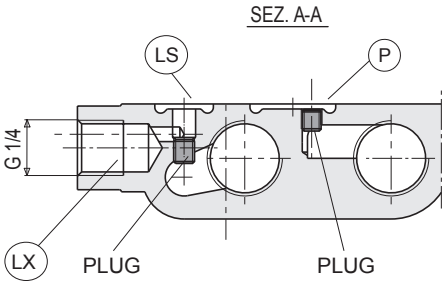
## END PLATE

## AVAILABLE CIRCUIT

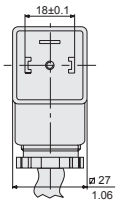
### code U5



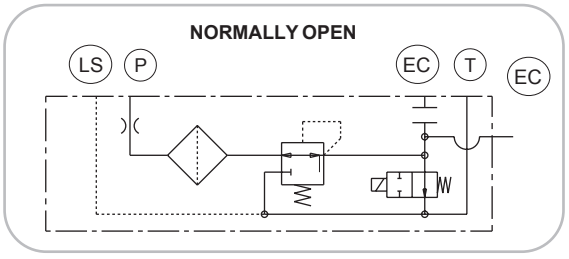

"U5" end plate allows to come out with "LS" signal in order to obtain a parellel circuit with a downstream VDP08 valve complete with a suitable inlet(see page 10A).This becomes possible when plugging "LS" signal(see figure).

**CONNECTOR**
**DIN 43650 - A/ISO 4400**

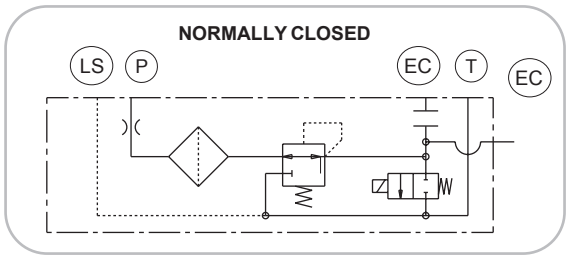


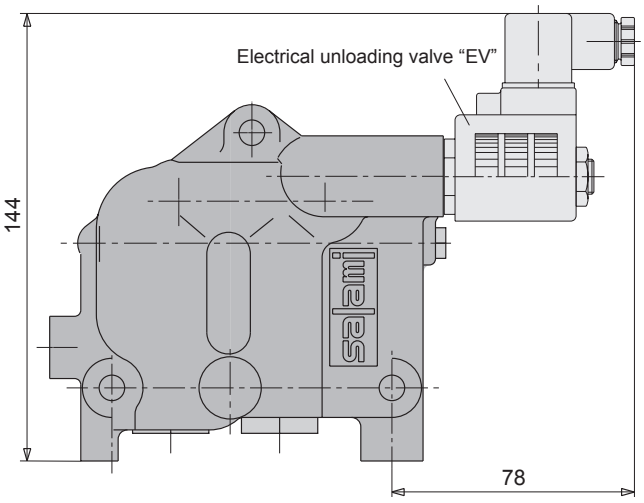

| SPECIFICATIONS | |
|---|---|
| - MAX PRESSURE IN P" | 207 bar |
| - MAX FLOW | 10 l/min |
| - OIL LEAKAGE | 82 cc/min |
| - AVAILABLE VOLTAGE | 12 - 24 Vcc |
| - COIL RESISTANCE | 12Vcc:5.1 Ω - 24 Vcc:20.5 Ω |
| - PROTECTION INDEX WITH STANDARD CONNECTOR | IP 65 |

### 12 Vcc - code U8
### 24 Vcc - code U9




### 12 Vcc - code U10
### 24 Vcc - code U11

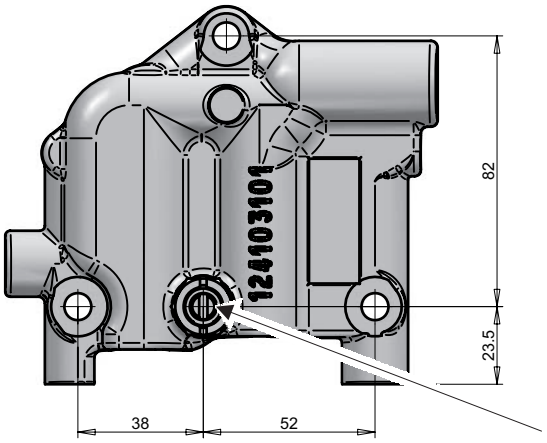


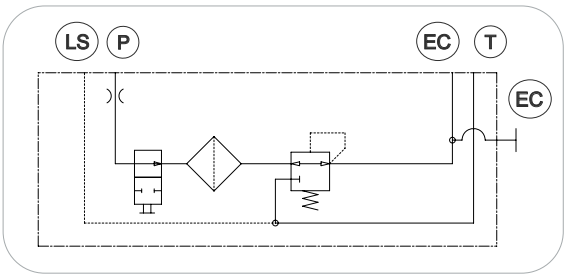

"U8-U9" and "U10-U11" end plates integrate (PRV) valve and can also release the "EC" external piloting by the electrovalve, which can be normally open or closed.

## END PLATE

### AVAILABLE CIRCUIT




**code U12**



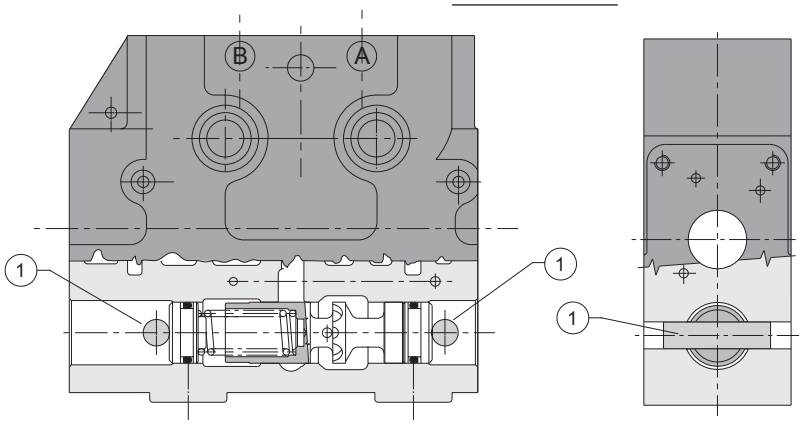

### BY-PASS VALVE

" U12 " end plate integrates the reducing pressure valve (PRV) which draws " P " signal when reducing it to a pressure of approx. 10 to 28 bar. sending it to " EC " circuit for feeding the electro-hydraulic controls.The by-pass valve can exclude the reducing pressure valve (PRV) and the electronic devices.

Special release made in order to be able to put in pressure VDP08 electro-hydraulic with a hand pump.The hand pump is commonly used as an emergency device in the field of aerial platforms. Before to order this code , please get in touch with our sales dept.

## ASSEMBLYNG SECTIONS ISTRUCTIONS


DRAWING "A"




This assembling procedure is mainly suitable for customers who purchase VDP08 complete sections and assemble them by themselves, but can also be useful to add further working sections or to modify the circuit, replacing, a few parts when having a complete valve.Working sections and inlet modules are equiped with a small cylinder of teflon (see drawing "A").This cylinder has to keep compressed the pressure compensator.If not, it could stop the fixing holes of the tie-rods.When assembling, you have to insert the tie-rods, which take out the teflon cylinder from its hole without any obstacle(see side picture).
The necessary torque for the screws is 28 Nm.

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## TYPES OF SPOOLS AVAILABLE

During the spools construction by appropiate notches dimensioning we can to obtain different type dipending of the flow rates.

Each spool has a description with three digits, that allow to understand immediatly the working principle and the flowrate.

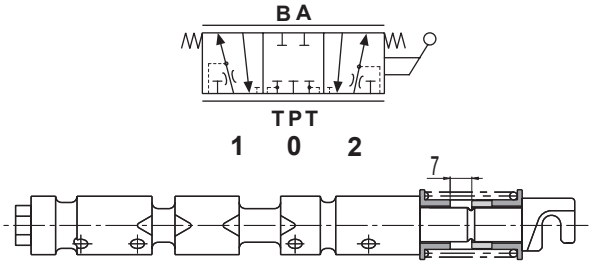
FLOWRATE
↓
**000**
↓
SPOOLS CODE

| Type | Flow control from - up to |
|---|---|
| 1 | Working port flow rate 8 l/min. - 2,1 gpm. |
| 2 | Working port flow rate 16 l/min. - 4,2 gpm. |
| 3 | Working port flow rate 25 l/min. - 6,6 gpm. |
| 4 | Working port flow rate 45 l/min. - 11,8 gpm. |
| 5 | Working port flow rate 63 l/min. - 16,6 gpm. |
| 6 | Working port flow rate 95 l/min. - 25 gpm. |

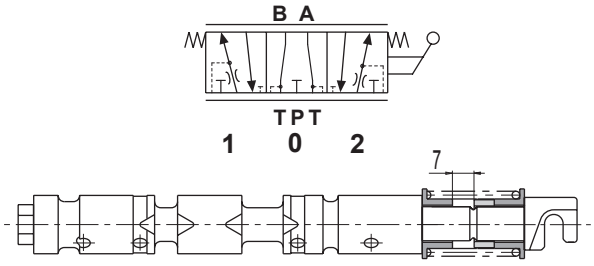
**EACH SPOOL WILL BE SUPPLIED WITH THE CORRESPONDING POSITIONING KIT**

## STANDARD MAIN SPOOLS FOR - SPS / SL / NL - CONTROLS

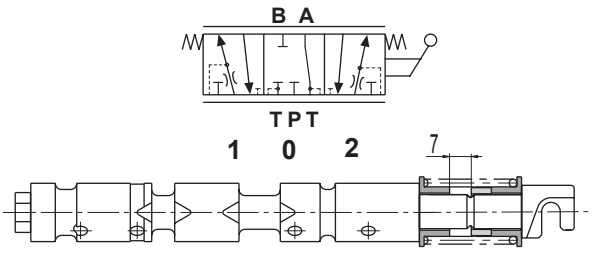
**code 01** Double acting spool
(5 ways, 3 positions, A/B closed in neutral position)



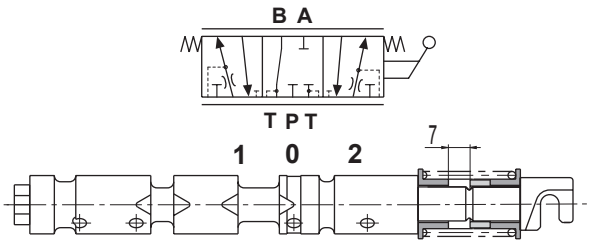

**code 02** Motor spool
(5 ways, 3 positions, A/B → T in neutral position)




**code 03** Double acting motor spool port A (B port blocked)
(5 ways, 3 positions, B closed in neutral position)




**code 04** Double acting motor spool port B (A port blocked)
(5 ways, 3 positions, A closed in neutral position)



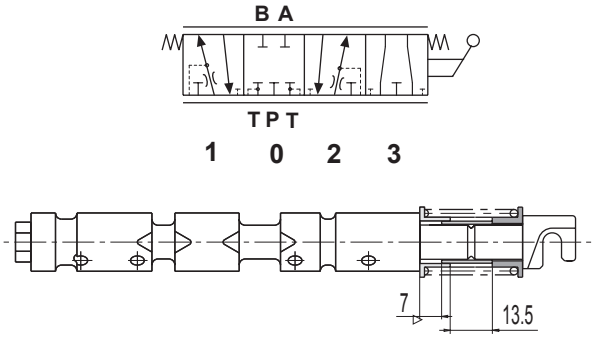
## TYPE OF SPOOLS AVAILABLE

**code 05** Single acting spool ("A" working port)
(5 ways, 3 positions, A/B closed in neutral position)

**code 06** Single acting spool ("B" working port)
(5 ways, 3 positions, A/B closed in neutral position)

The choice to have a single acting spool must be done on the body of the valve with the plugs showed at page 12A
Therefore, for realizing spools code 05 and code 06 (single acting A or B) you need the spool code 01 in a circuit described at page 19A.

**code 11** Double acting spool with float position
(5 ways, 4 positions, A/B closed in neutral position)

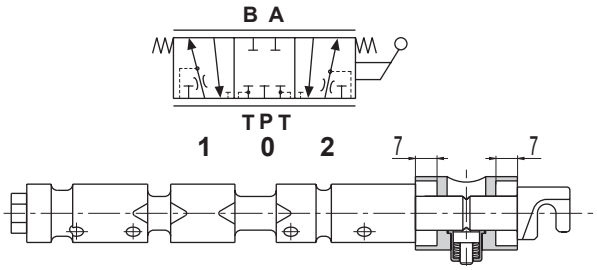



**AVAILABLE ONLY WITH MANUAL CONTROL NL.
FLOAT POSITION CAN BE ACHIEVED ONLY PUSHING FORWARD THE LEVER.
THIS SPOOL CAN BE MOUNTED ONLY WITH LEVER ON "A" SIDE.**

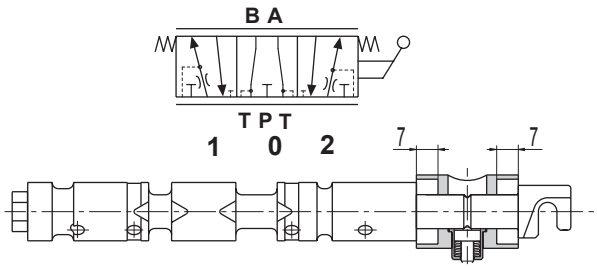
**Before to order this code, please get in touch with our sales dept.**

## STANDARD MAIN SPOOLS FOR - FL - CONTROLS

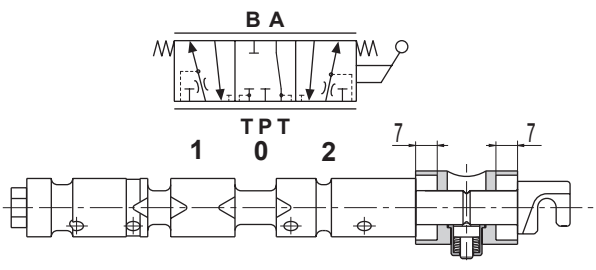
**code 01** Double acting spool
(5 ways, 3 positions, A/B closed in neutral position)



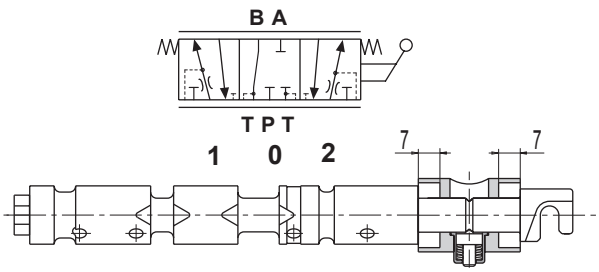

**code 02** Motor spool
(5 ways, 3 positions, A/B → T in neutral position)




**code 03** Double acting motor spool port A (B port blocked)
(5 ways, 3 positions, B closed in neutral position)




**code 04** Double acting motor spool port B (A port blocked)
(5 ways, 3 positions, A closed in neutral position)l

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## TYPE OF SPOOLS AVAILABLE

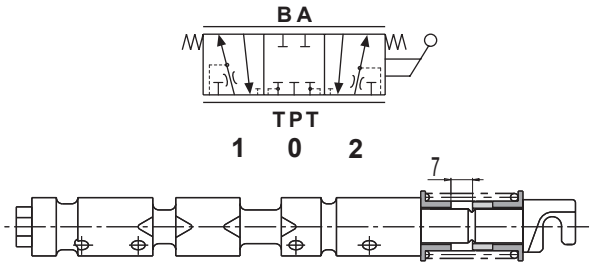
**code 05** Single acting spool ("A" working port)
(5 ways, 3 positions, A/B closed in neutral position)

**code 06** Single acting spool ("B" working port)
(5 ways, 3 positions, A/B closed in neutral position)

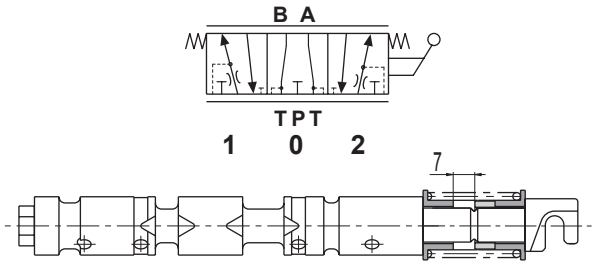
The choice to have a single acting spool must be done on the body of the valve with the plugs showed at page 12A Therefore, for realizing spools code 05 and code 06 (single acting A or B) you need the spool code 01 in a circuit described at page 20A.

## STANDARD MAIN SPOOLS FOR - IP - CONTROLS

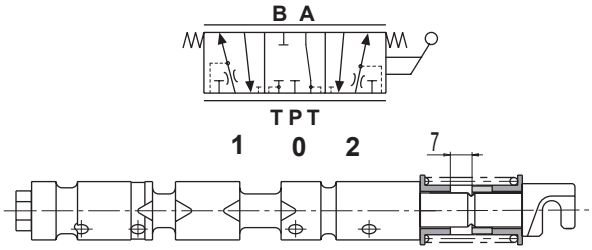
**code 01** Double acting spool
(5 ways, 3 positions, A/B closed in neutral position)



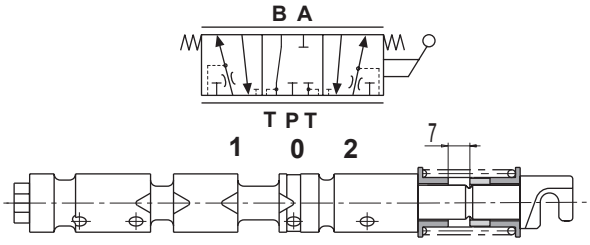

**code 02** Motor spool
(5 ways, 3 positions, A/B → T in neutral position)




**code 03** Double acting motor spool port A (B port blocked)
(5 ways, 3 positions, B closed in neutral position)




**code 04** Double acting motor spool port B (A port blocked)
(5 ways, 3 positions, A closed in neutral position)




**code 05** Single acting spool ("A" working port)
(5 ways, 3 positions, A/B closed in neutral position)

**code 06** Single acting spool ("B" working port)
(5 ways, 3 positions, A/B closed in neutral position)

The choice to have a single acting spool must be done on the body of the valve with the plugs showed at page 12A
Therefore, for realizing spools code 05 and code 06 (single acting A or B) you need the spool code 01 in a circuit described above.

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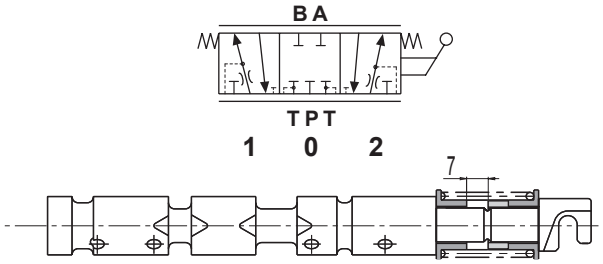
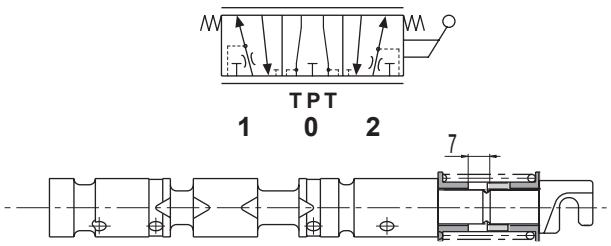
## TYPE OF SPOOLS AVAILABLE

### STANDARD MAIN SPOOLS FOR - PP - CONTROLS

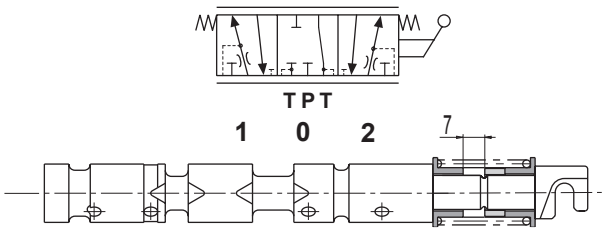
**code 01** Double acting spool
(5 ways, 3 positions, A/B closed in neutral position)



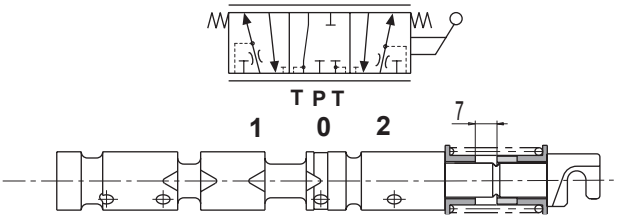

**code 02** Motor spool
(5 ways, 3 positions, A/B → T in neutral position)




**code 03** Double acting motor spool port A (B port blocked)
(5 ways, 3 positions, B closed in neutral position)




**code 04** Double acting motor spool port B (A port blocked)
(5 ways, 3 positions, A closed in neutral position)



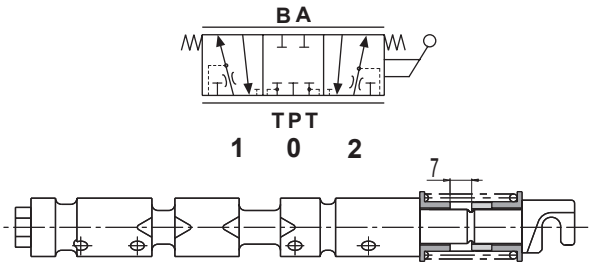

**code 05** Single acting spool ("A" working port)
(5 ways, 3 positions, A/B closed in neutral position)

**code 06** Single acting spool ("B" working port)
(5 ways, 3 positions, A/B closed in neutral position)

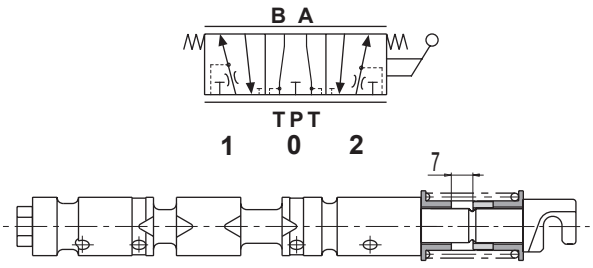
The choice to have a single acting spool must be done on the body of the valve with the plugs showed at page 12A
Therefore, for realizing spools code 05 and code 06 (single acting A or B) you need the spool code 01 in a circuit described above.

### STANDARD MAIN SPOOLS FOR - KE / H - CONTROLS

**code 01** Double acting spool
(5 ways, 3 positions, A/B closed in neutral position)




**code 02** Motor spool
(5 ways, 3 positions, A/B → T in neutral position)

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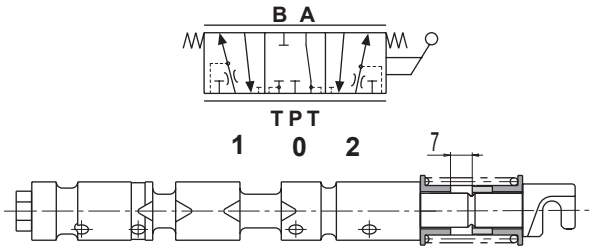
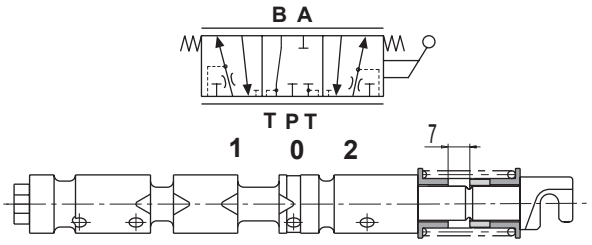
## TYPE OF SPOOLS AVAILABLE

**code 03** Double acting motor spool port A (B port blocked)
(5 ways, 3 positions, B closed in neutral position)




**code 04** Double acting motor spool port B (A port blocked)
(5 ways, 3 positions, A closed in neutral position)



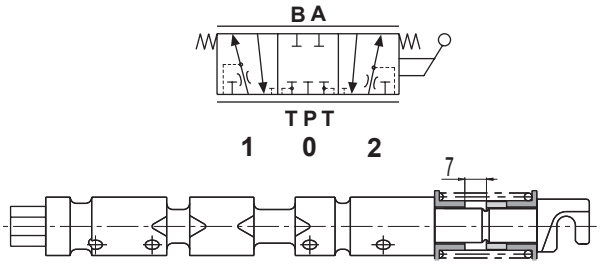

**code 05** Single acting spool ("A" working port)
(5 ways, 3 positions, A/B closed in neutral position)

**code 06** Single acting spool ("B" working port)
(5 ways, 3 positions, A/B closed in neutral position)

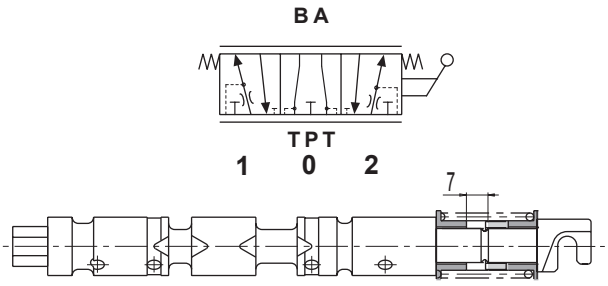
The choice to have a single acting spool must be done on the body of the valve with the plugs showed at page 12A
Therefore, for realizing spools code 05 and code 06 (single acting A or B) you need the spool code 01 in a circuit described at page 22A.

## STANDARD MAIN SPOOLS FOR - KM - CONTROLS

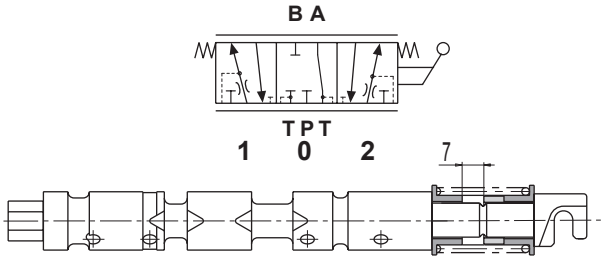
**code 01** Double acting spool
(5 ways, 3 positions, A/B closed in neutral position)



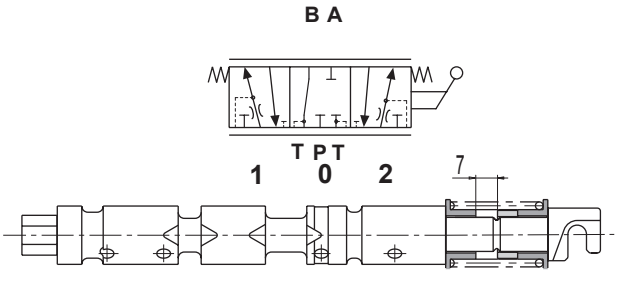

**code 02** Motor spool
(5 ways, 3 positions, A/B → T in neutral position)




**code 03** Double acting motor spool port A (B port blocked)
(5 ways, 3 positions, B closed in neutral position)




**code 04** Double acting motor spool port B (A port blocked)
(5 ways, 3 positions, A closed in neutral position)



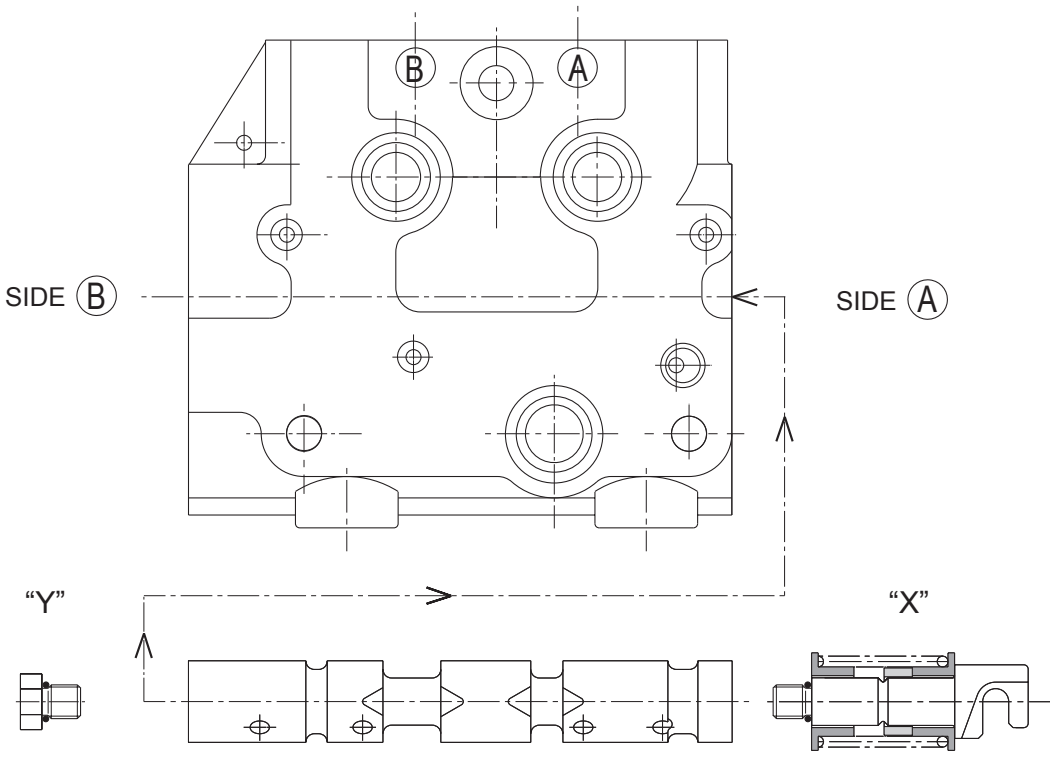

**code 05** Single acting spool ("A" working port)
(5 ways, 3 positions, A/B closed in neutral position)

**code 06** Single acting spool ("B" working port)
(5 ways, 3 positions, A/B closed in neutral position)

The choice to have a single acting spool must be done on the body of the valve with the plugs showed at page 12A
Therefore, for realizing spools code 05 and code 06 (single acting A or B) you need the spool code 01 in a circuit described atbove.

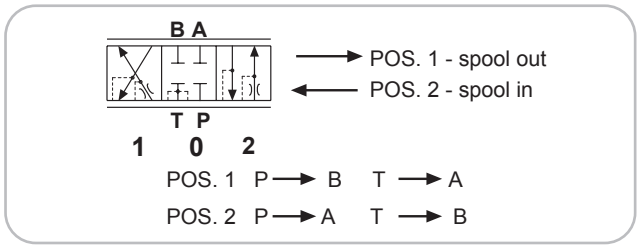
## SPOOL CONTROL

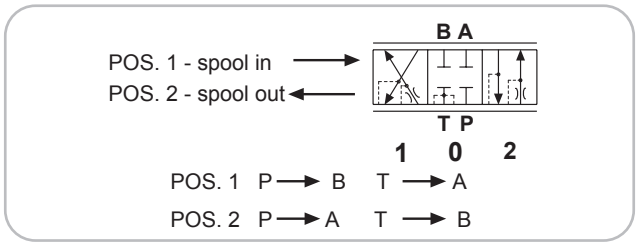
### GENERAL CAUTIONS FOR SPOOL CONTROL ASSEMBLING

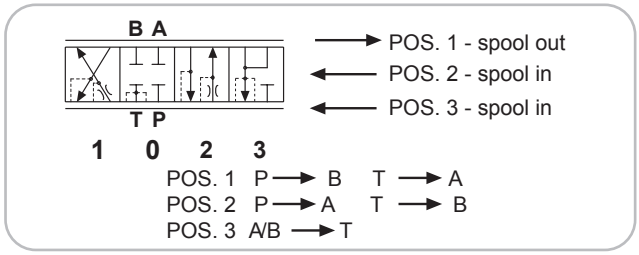


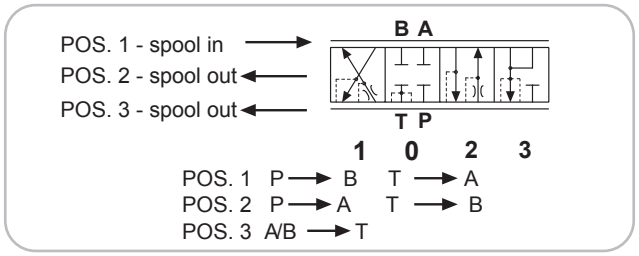

### GENERAL FEATURES

**On this and following pages are showned in details all the spool controls available.All the spool control and positioning devices can be mounted on both (A) and (B) sides, taking care to introduce always the spool in the (A) to (B) side direction. Because spool end threads are identical we can fit "X" hook spring device and "Y" plug on both spool end sides.**

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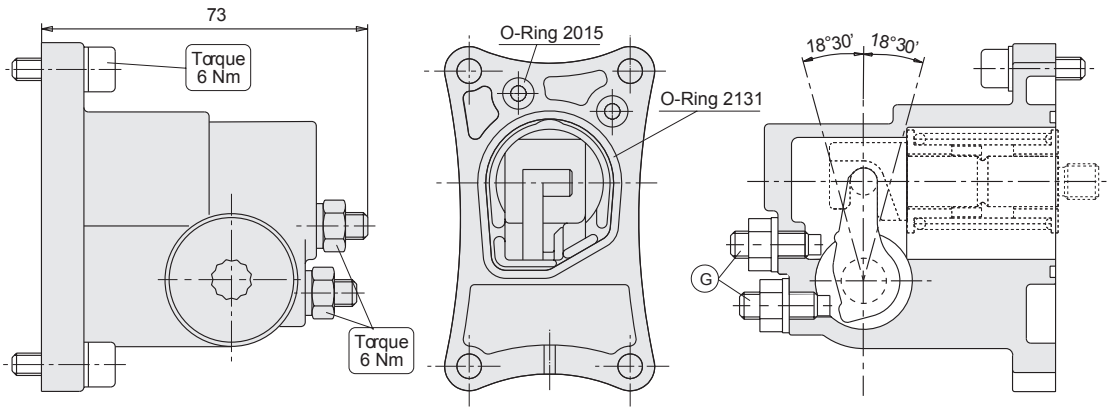
## SPOOL CONTROL

SPS

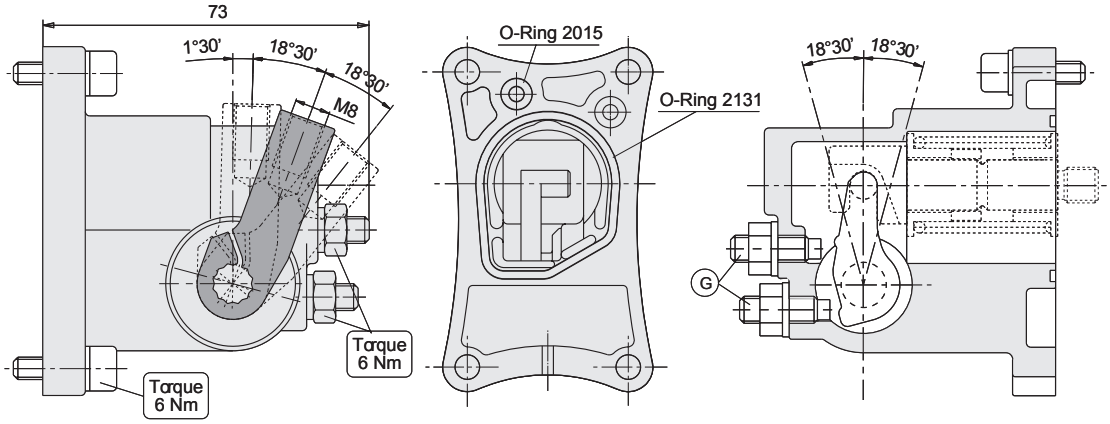
### WITHOUT SHAFT SUPPORT




The code " SPS " is a spool positioning kit that can be used with spool controls " PP-IP-KM " .The external adjusting screws " G " have to be used to reduced the spool stroke and consequently the port flow.

SL

### WITH SHAFT SUPPORT (WITHOUT LEVER)




The code " SL " is the standard lever mechanism and can be used tigether with all spool controls.In case we have spool remote controls the " SL " device can be used as emergency lever.Also in this case the external adjusting screws " G " have to be used to reduced the spool stroke and consequently the port flow.

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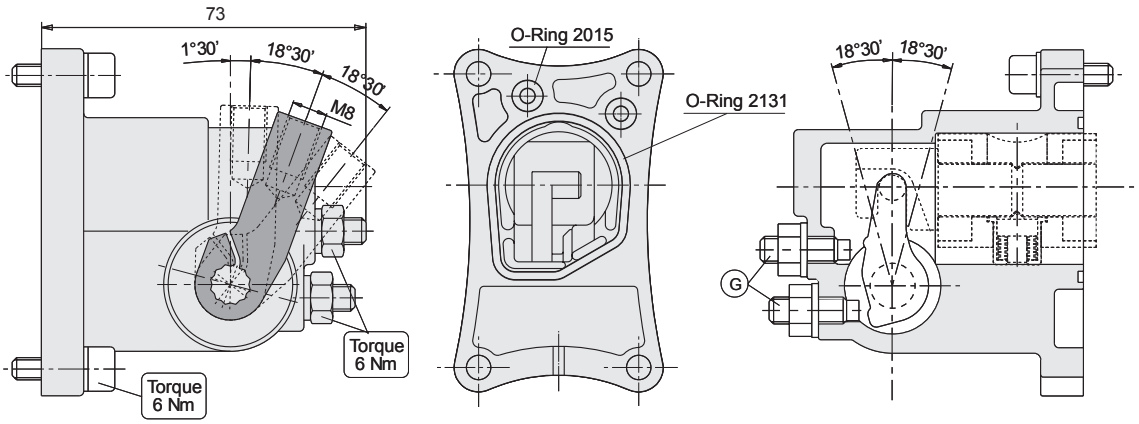
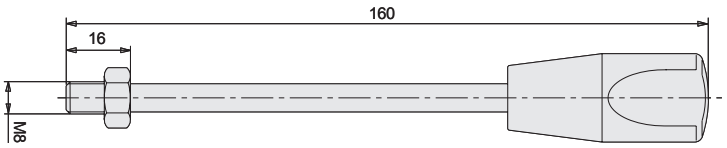
## SPOOL CONTROL

NL / FL

### WITH LEVER




The code “NL” is the standard lever mechanism and can be used together with all spool controls. In case we have spool remote controls the “NL” device can be used as emergency lever. Also in this case the external adjusting screw “G” have to be used to reduce spool stroke and consequently port flow.
This device cannot be used with remote spool controls.

The code “FL” is a manual lever mechanism with friction detent built-in, this device has to be used with spools shown on page 20A
This device cannot be used with remote spool controls.

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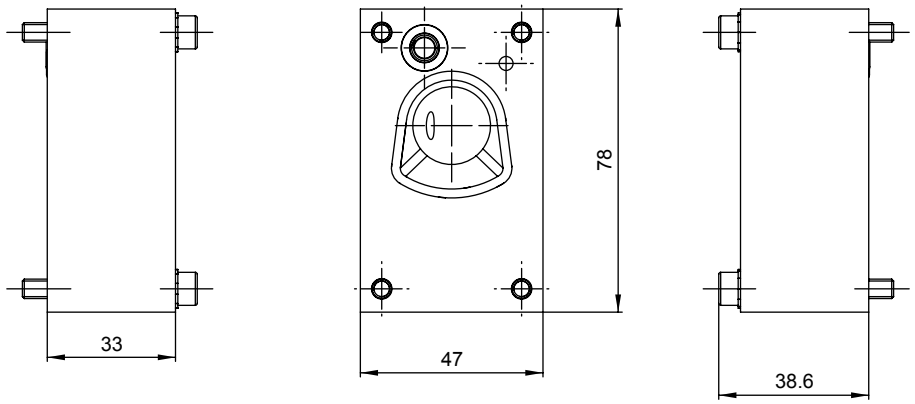
## SPOOL CONTROL

C0 - C2

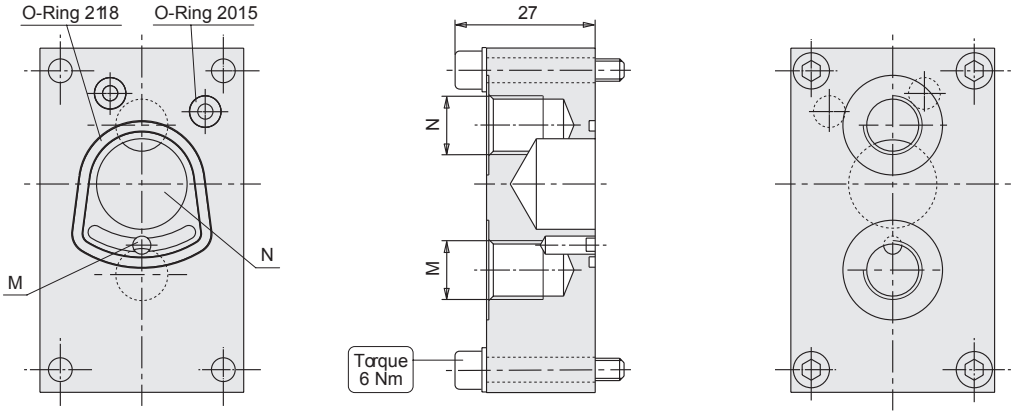
### MANUAL CONTROL

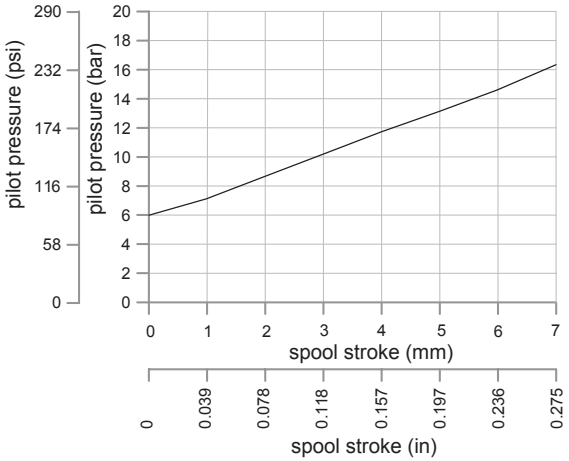



The code " C2-CO " is a simple end plate used all the time we have " NL-FL " spool controls.

IP

### HYDRAULIC PROPORTIONAL CONTROL




| PORT SIZES | M - N |
|---|---|
| BSP ISO 228 | G 1/4 |
| SAE ISO 176 | SAE4 7/16 - 20 UNF |

The code "IP" is a hydraulic proportional spool control.
"M and N" are the pilot pressure ports.
For example if we fit the "IP" device on "A" side the pilot pressure going in "N" port push the spool to "B" side direction allowing pump flow through working port "A".When we supply pilot pressure to "M" port we pull the spool to "A" side allowing pump flow through working port "B".

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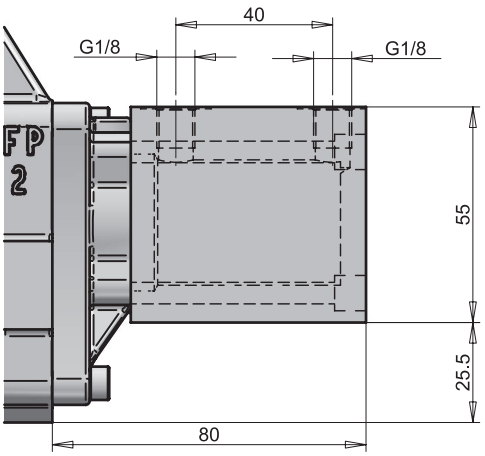
## SPOOL CONTROL

PP

### PNEUMATIC PROPORTIONAL CONTROL

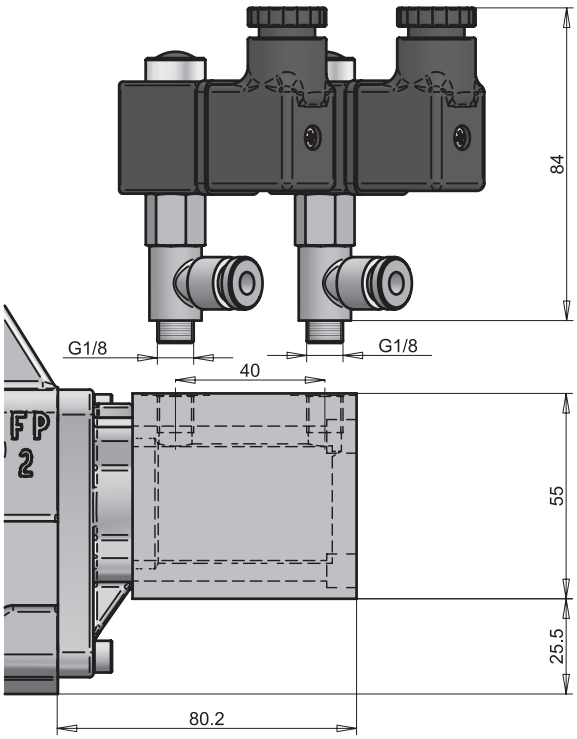



P1 - P2

### ELECTRO-PNEUMATIC ON-OFF CONTROL

**12 V.d.c. - code P1**

**24 V.d.c. - code P2**

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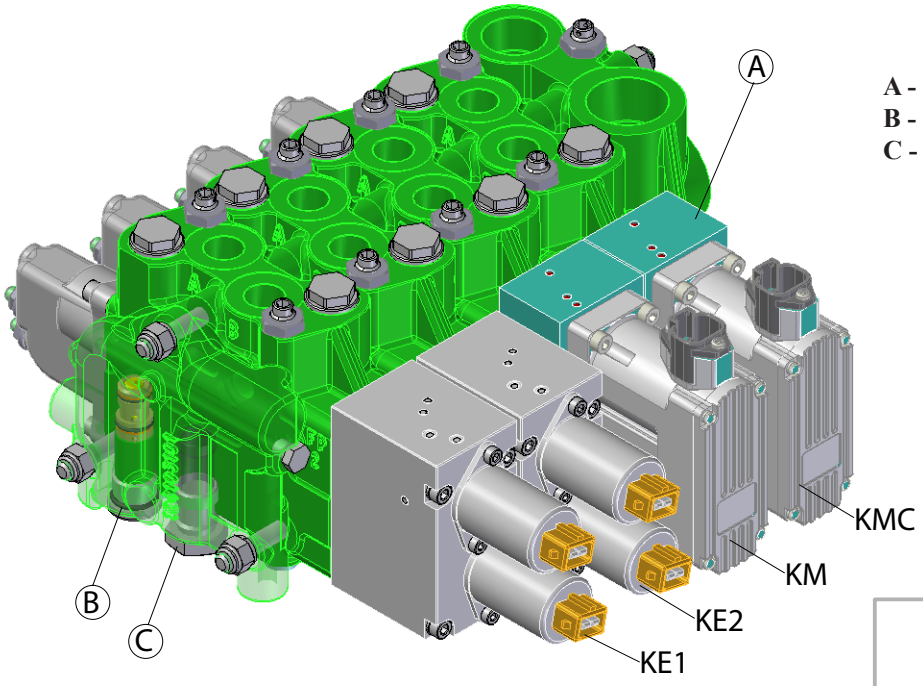
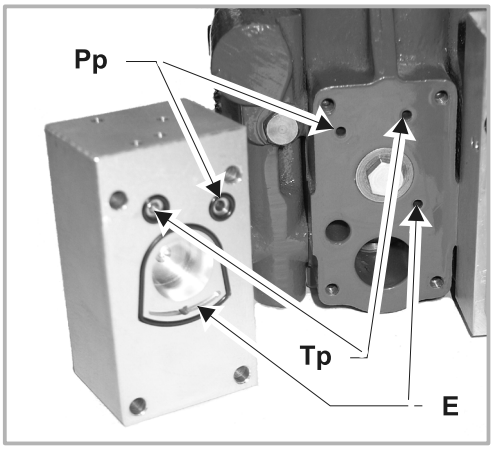
## SPOOL CONTROL

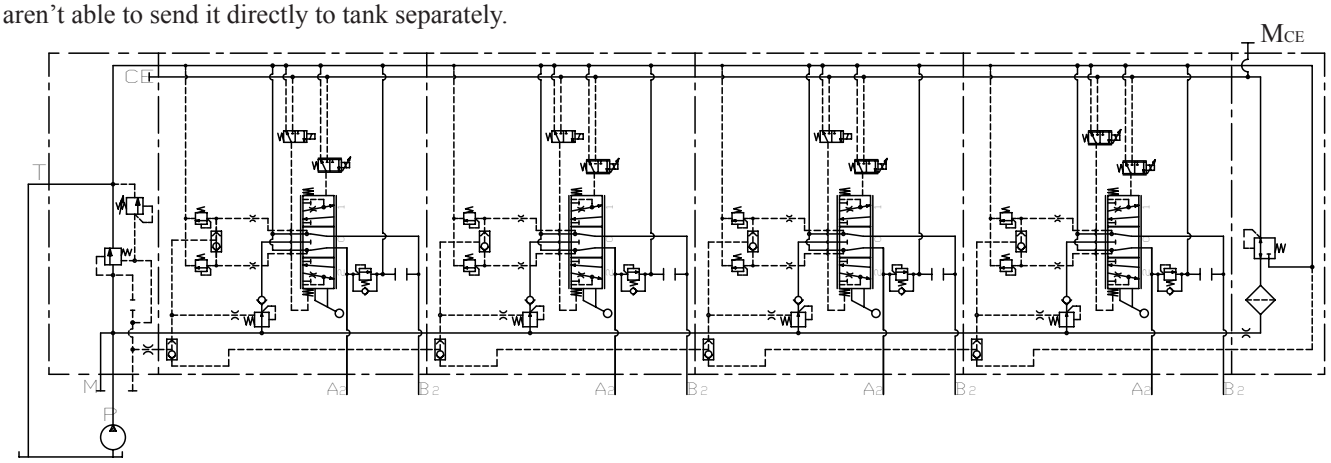
### ASSEMBLING COMPONENTS




**A - mechanical interface.**
**B - pressure reducing valve.**
**C - filter before the Pp line.**




In this type of valve the piloting lines " Pp and Tp" are built-into the casting, for this reason we can assemble the pressure reducing
valve "C", and the filter "D" directly on the end cover.
Moreover VDP08 doesn't need of a servo-piston to slide the spool on the working positions, in this valve the Pp line acts directly on the area made by the spool diameter.
In order to send the Pp line at the other spool side, the casting is pre-arranged with the cavity "E".
In this assembly the mechanical interfaces "A" need only to assemble the "KE1/KE2" rather than the "KM/KMC" on the VDP08 side.
With the actual working modules the Tp line goes into the main T line, we aren't able to send it directly to tank separately.

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## SPOOL CONTROL

KE1-KE2 / H1-H2

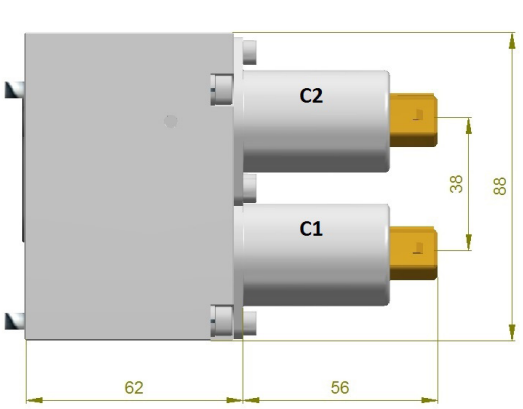
## ELECTRO-HYDRAULIC CONTROL (PROPORTIONAL / ON-OFF) OPEN LOOP

**12 V.d.c. - code KE1 / H1**

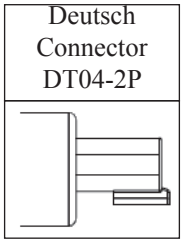
**24 V.d.c. - code KE2 / H2**

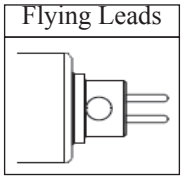
**OPERATING INSTRUCTIONS**
**please see the hydraulic circuit.**

| Electrical Data | | |
|---|---|---|
| Voltage | 12V | 24V |
| Current | 1500 mA | 750 mA |
| Resistance | 4.72 Ω ± 5% | 20.8 Ω ± 5% |
| Type of Control | Current Control<br>PWM 100 Hz Recommended | |
| Connector | AMP Junior Timer (Standard)<br>Deutsch Connector DT04-2P<br>Flying Leads | |




**FUNCTIONAL SCHEME**




**C1 - C2 COILS DE-ENERGIZED => POS. 0**
**C1 COIL ENERGIZED => POS. 2**
**C2 COIL ENERGIZED => POS. 1**

| Hydraulic Data | |
|---|---|
| Max Pressure (P, T) | pP = 50 bar, pT = 30 bar |
| Hysteresis (w/ PWM) | < 0.7 bar (pA=20)<br>< 1.0 bar (pA=25)<br>< 1.5 bar (pA=35) |
| Filter Screen | 125 µm |
| Contamination Level | Min Filtration: 20/18/15<br>According to ISO 4406 |
| Fluid | Mineral Oil According to DIN 51524 |
| Temperature Range Fluid | -40 to +105°C |
| Valve Specifications According to Thomas LHP-39 | |

| Features | Benefits |
|---|---|
| Integrated Relief Function | Protection Against Pressure Spikes |
| Compact Dimensions | Reduced Packaging Dimensions |
| Low Leakage | Lower Energy Losses |
| Precise Current vs Pressure Control | Excellent Controllability |
| Teflon Coated Bronze Bearings | Small Hysteresis, Improved Resolution |
| Excellent Repeatability | No Calibration Over The Lifetime of The Machine |
| Highest Quality Standards | No Maintenance, No Downtime |
| Small Valve to Valve Variance | Easy Replacement, No Service Calibration |

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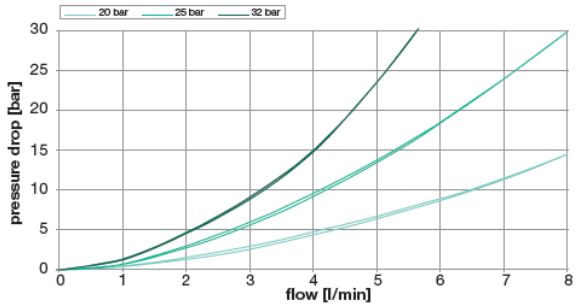
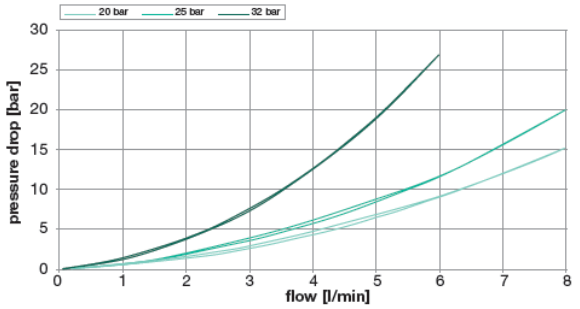
## SPOOL CONTROL

### Flow Characteristics

Pressure Drop Control Port to Tank

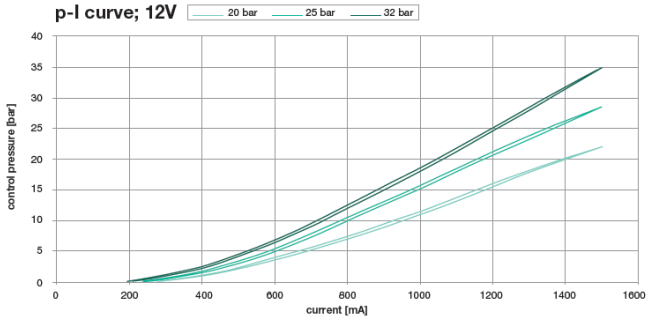



Pressure Drop Pump to Control Port

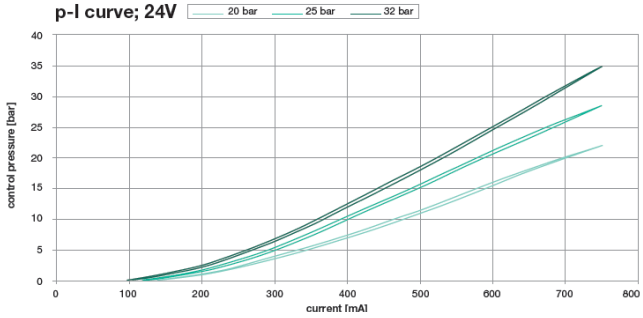



### Current vs. Pressure
Less than 2% Hystereris

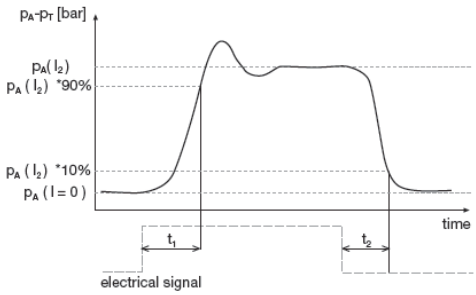
p-I curve; 12V

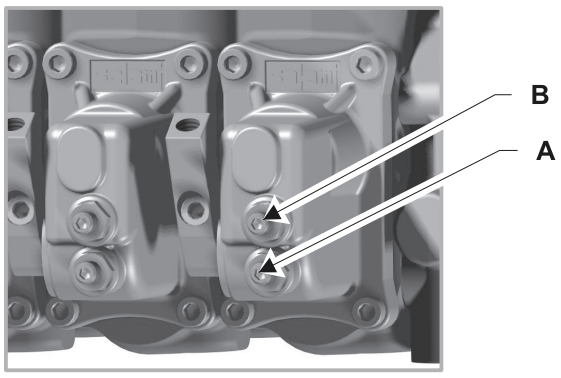



p-I curve; 24V




### Step Response
(50°C Oil Temperature) $t_1$, $t_2$ < 50 ms




In the VDP08 assembling the electronic spool positioning slides together in axis with the spool.
In order to adjust the flow with accuracy, we can reduce the spool stroke with the registers showed on the left.

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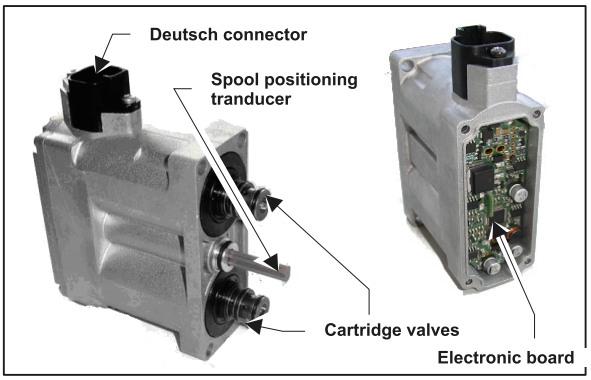
## SPOOL CONTROL

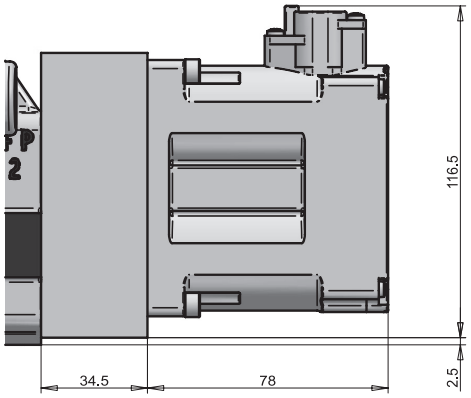
KM - KMC

## ELECTRONIC-HYDRAULIC CONTROL (PROPORTIONAL) CLOSED LOOP

**ANALOGIC - code KM**

**CAN BUS - code KMC**




## CLOSED-LOOP ELECTRONIC-HYDRAULIC PROPORTIONAL ACTUATOR

The KM porportional actuator is designed to control the stroke of the main spool of the Salami directional control valve in response to a control signal. The control signal can be provided by an analog voltage source (e. g. a potentiometer) or the module can be integrated in a digital control environment.

The KM carries its function by controlling the currents of two proportional electrovalves and by measuring the spool position by means of an Hall effect linear transducer. This internal closed-loop position control makes the valve spool achieve the desired position with accuracy levels approaching the performance of a servo-valve.

The KM may shift the valve spool either directly (VDP08 version) or by means of a servo-position mechanically connected to it.
In a CAN bus operating mode, the remote control set point is processed via CAN bus according to ISO 11898 at 250 kbit/s by means of address-based (SAE J1939) or message-based (CAN 2.0B) protocols .

The microprocessor-based digital control of inherent functions (response time, flow rate presetting and spool position recovery after cut-off) makes it possible to adjust relevant parameters like PWM and DITHER frequencies, feedback algorithm during motion and under varying operative conditions (temperature changes, varying flow forces and off-set conditions of any kind) through a continuous teach-in process that will then maintain said parameters at their optimum level throughout the operative phase.

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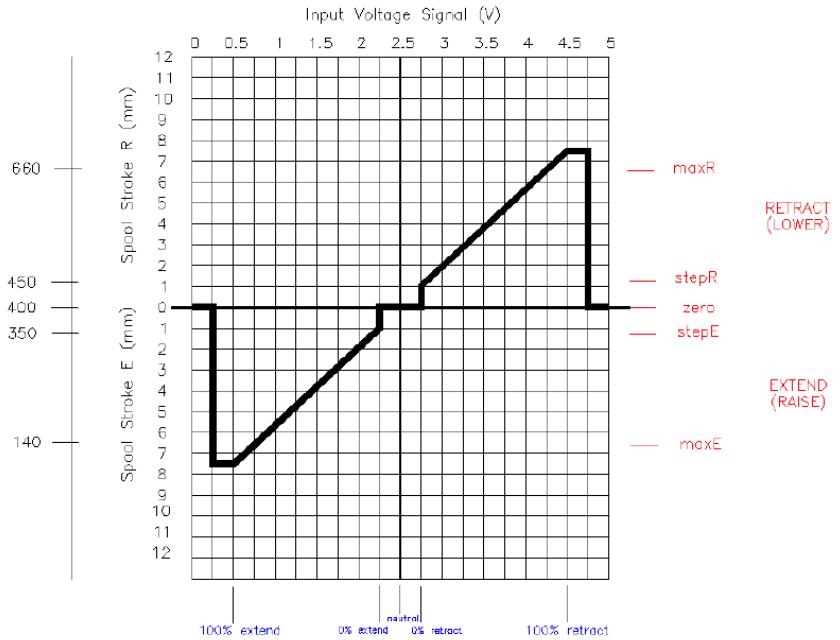
## SPOOL CONTROL




***Remarks:*** Input Signal :

Neutral position on 2,5VDC - MAX stroke A at 4,5 VDC - MAX stroke B at 0,5 VDC

Neutral Position Dead Band from 2,25 to 2,75 VDC.

Signal cut-off is triggered at < 0,25V and > 4,75V

| | |
|---|---|
| Dead band in neutral | ±0. 5mm |
| Step from neutral | ±1 mm |

### *Hydraulic Specifications*

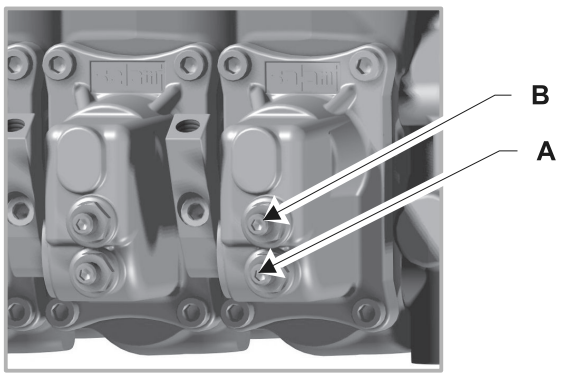
| | |
|---|---|
| . Max. spool stroke (each side): | 8.5 mm<br>up to 13.5 mm on "float" |
| . Max. supply pressure: | 35 bar |
| . Min. supply pressure: | 12 bar |
| . Max. retrun line pressure: | 5 bar |
| . Pilot flow requirement: | 0.2 lt/min |
| . Oil temperature range: | -20 / + 95°C |
| . Oil viscosity range: | 3-650 cSt |
| . Filtration: | 18/15 (ISO 4406) |
| . Weight | 1.1 kg |

. Response time: Neutral to max: < 180 ms
Max to Neutral: < 250 ms

### *Electrical Specifications*

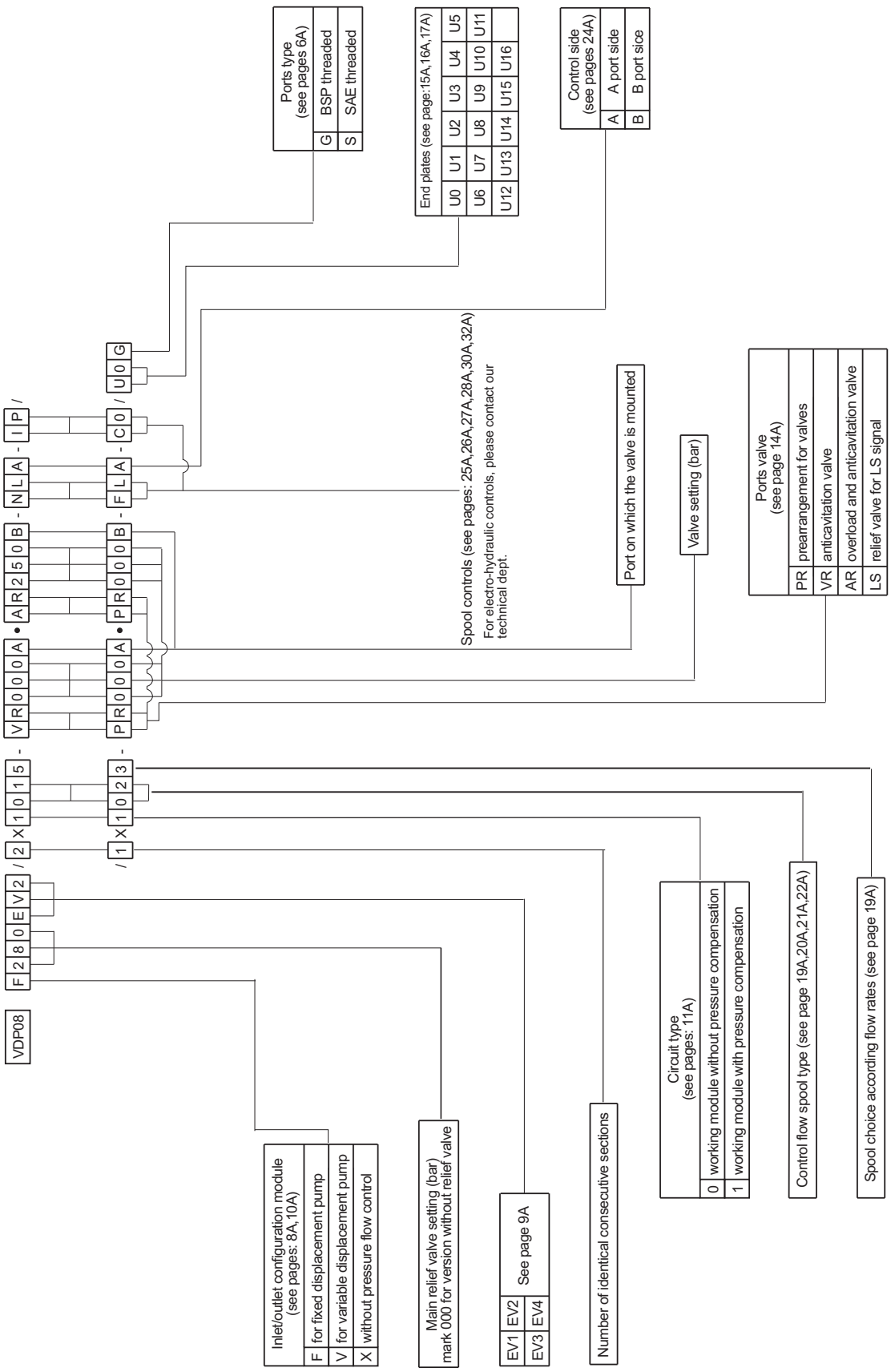
| | |
|---|---|
| . Operating voltage: | 8-30 VDC |
| . Max current consumption: | 750 mA/section |
| . Operating temperature: | -20 / + 95°C |
| . Analog Input impedance | >'40 Kohm |
| . Control pot. configuration: | 3-pins |
| . Typical control pot. resistance: | 1-10 Kohm |
| . Analog input signal (D/A version) : | 0-5V |
| . CAN bus interface (D/C version) : | ISO 11898 |
| . Environmental protection: | IP 68 |
| . EMC characteristics | ISO 7637 |

. Resolution: +/- 0.06 mm
. Ramp time: 0 to 5 sec.




In the VDP08 assembling the electronic spool positioning slides together in axis with the spool.
In order to adjust the flow with accuracy, we can reduce the spool stroke with the registers showed on the left. In this case we are able to re-set the electronic board parameters to optimize the voltage signal with the new spool strokes. The working diagram above shows the comparison between the voltage signal and the standard spool stroke.

## HOW TO ORDER

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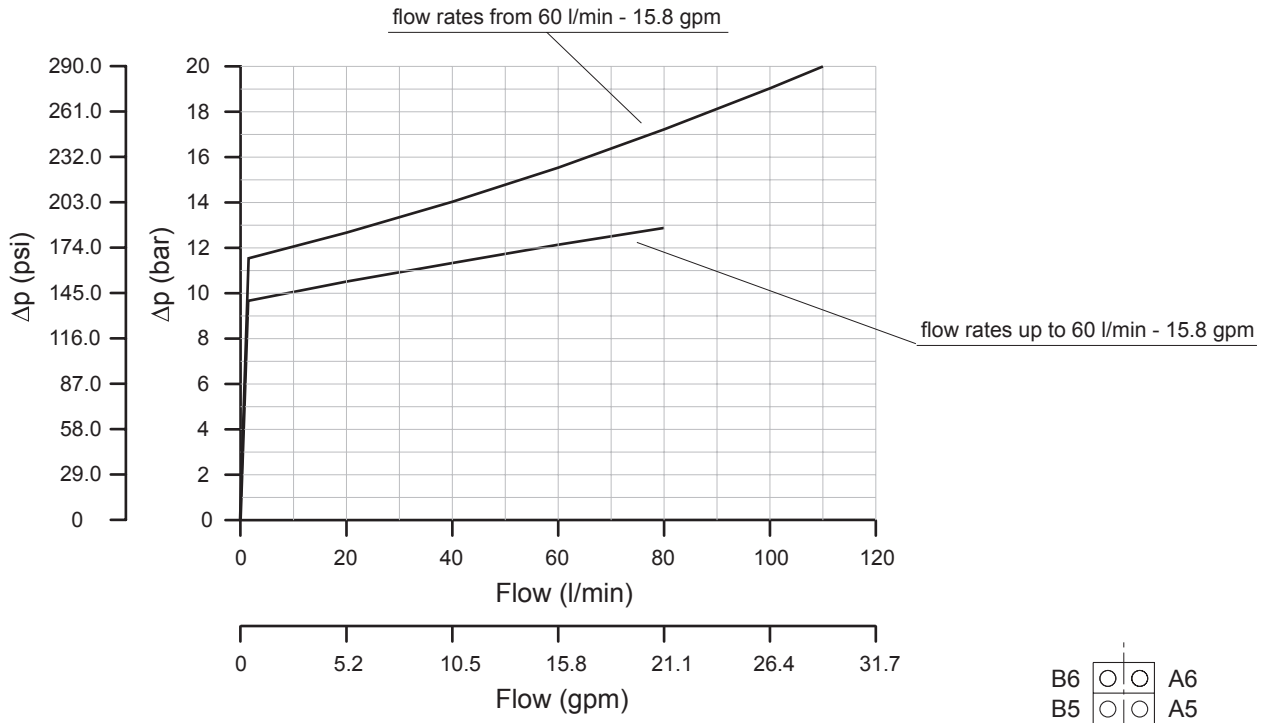
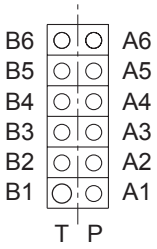
## TECHNICAL DATA

**All the characteristics are measured using a mineral oil with a viscosity of 15 mm 2/sec at a temperature of 60° C (140°F)**

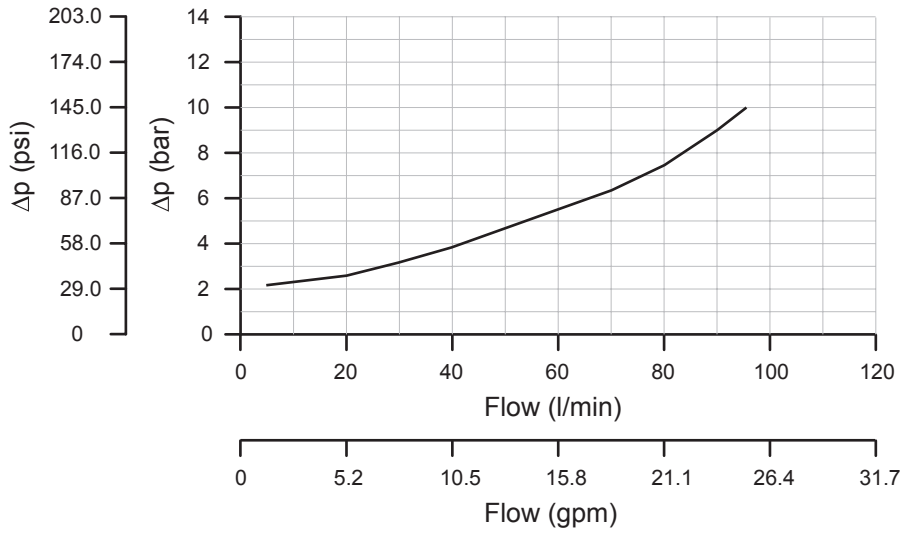
OPEN CENTER - NEUTRAL FLOW PRESSURE INLET/OUTLET MODULE




CLOSED CENTER - WORKING MODULES PRESSURE DROP

P → A3/B3

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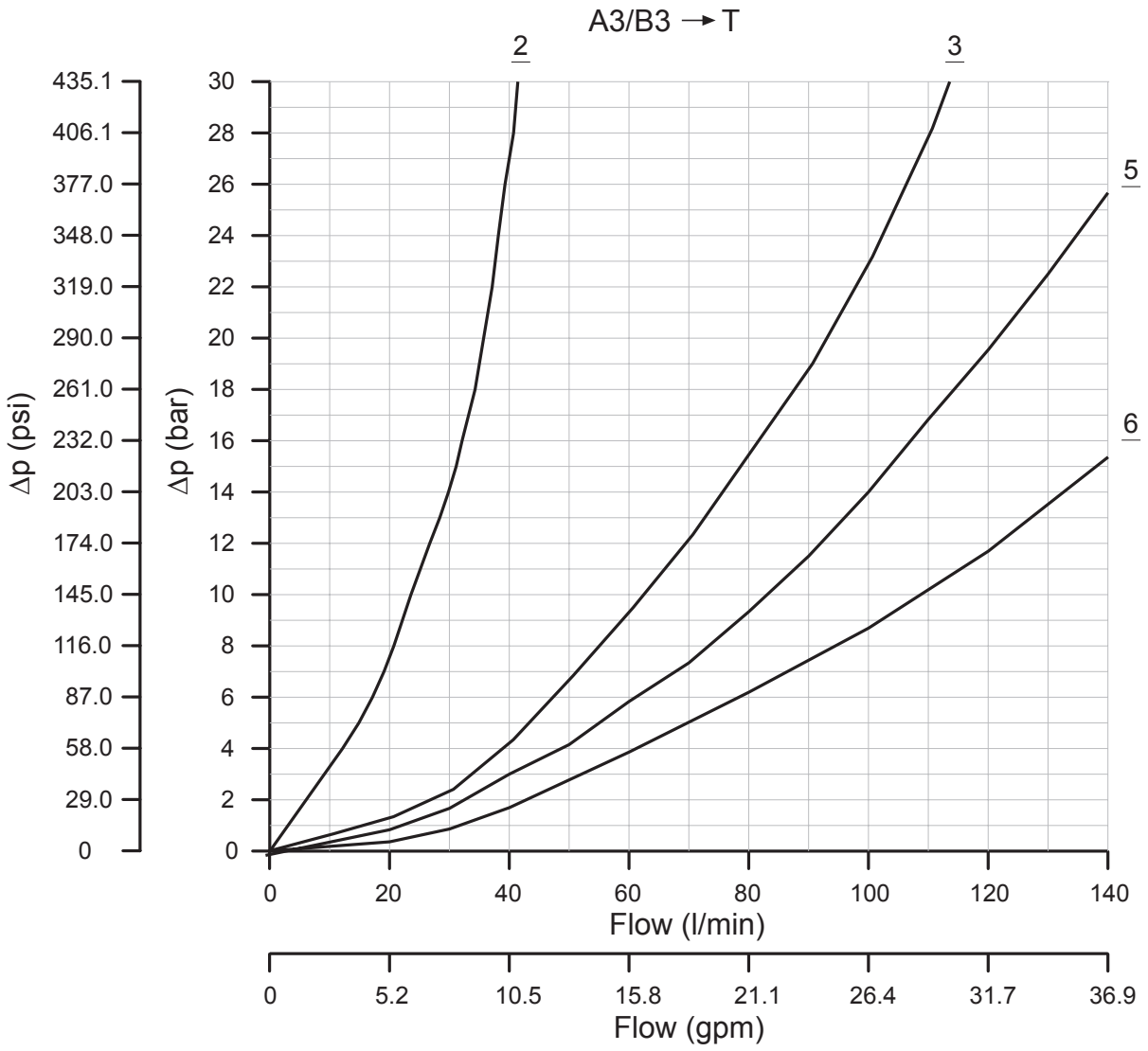
## TECHNICAL DATA

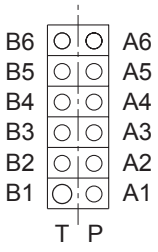
**All the characteristics are measured using a mineral oil with a viscosity of 15 mm 2/sec at a temperature of 60° C (140°F)**

WORKING MODULES PRESSURE DROP FROM A/B TO T




SPOOLS (page 19A...)

| Type *Mod.* |
|---|
| 1 |
| 2 |
| 3 |
| 4 |
| 5 |
| 6 |

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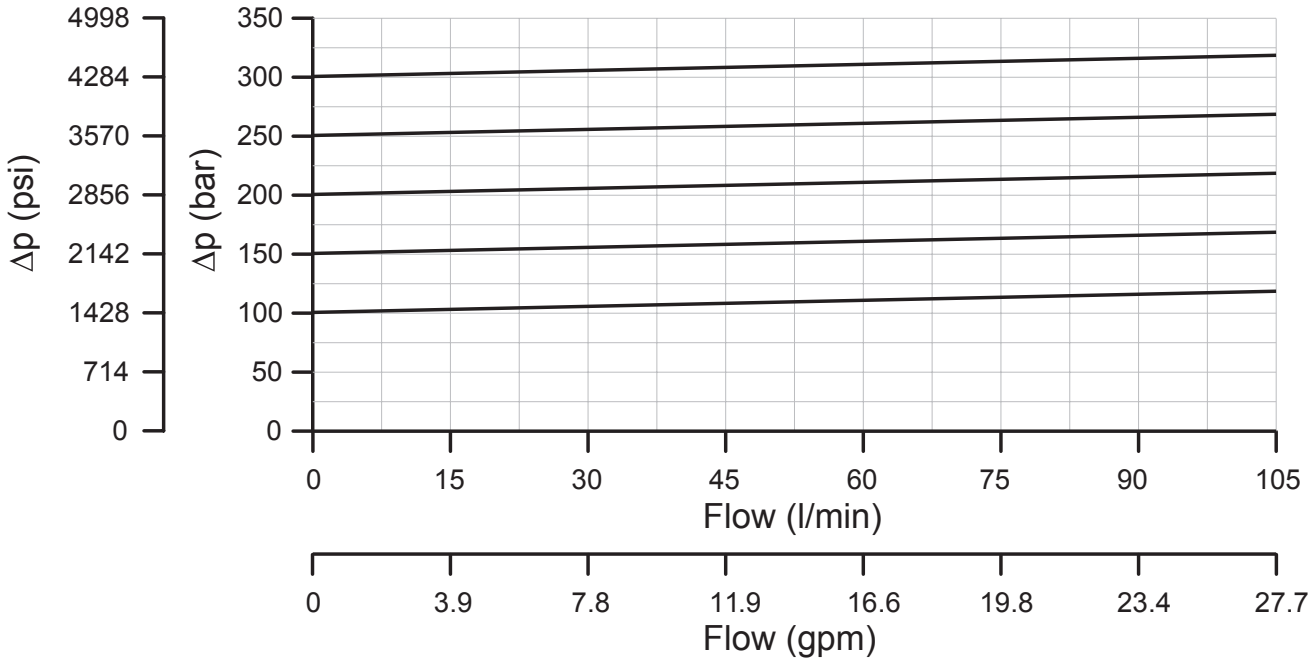
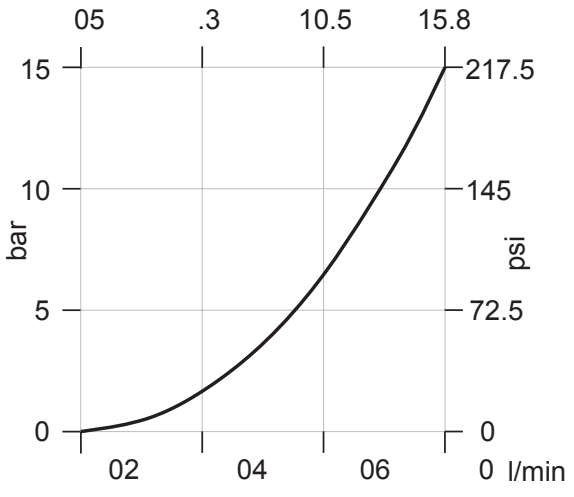
## TECHNICAL DATA

**All the characteristics are measured using a mineral oil with a viscosity of 15 mm 2/sec at a temperature of 60° C (140°F)**

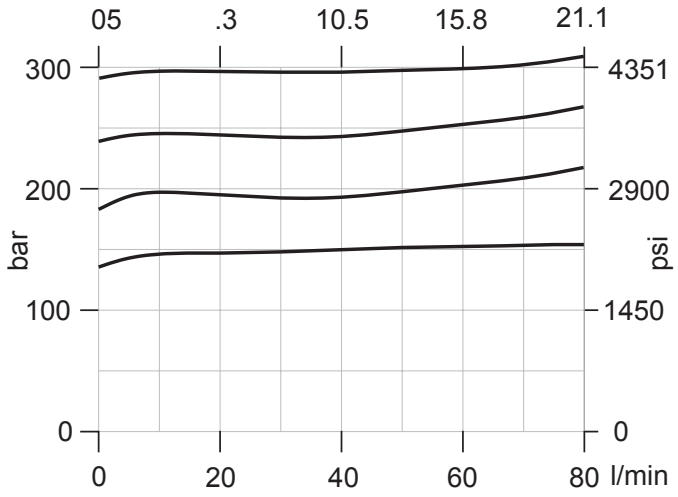
ADJUSTABLE PILOTED MAIN RELIEF VALVE




VR - Anti-cavitation valve (page 14 A)
US gal./min

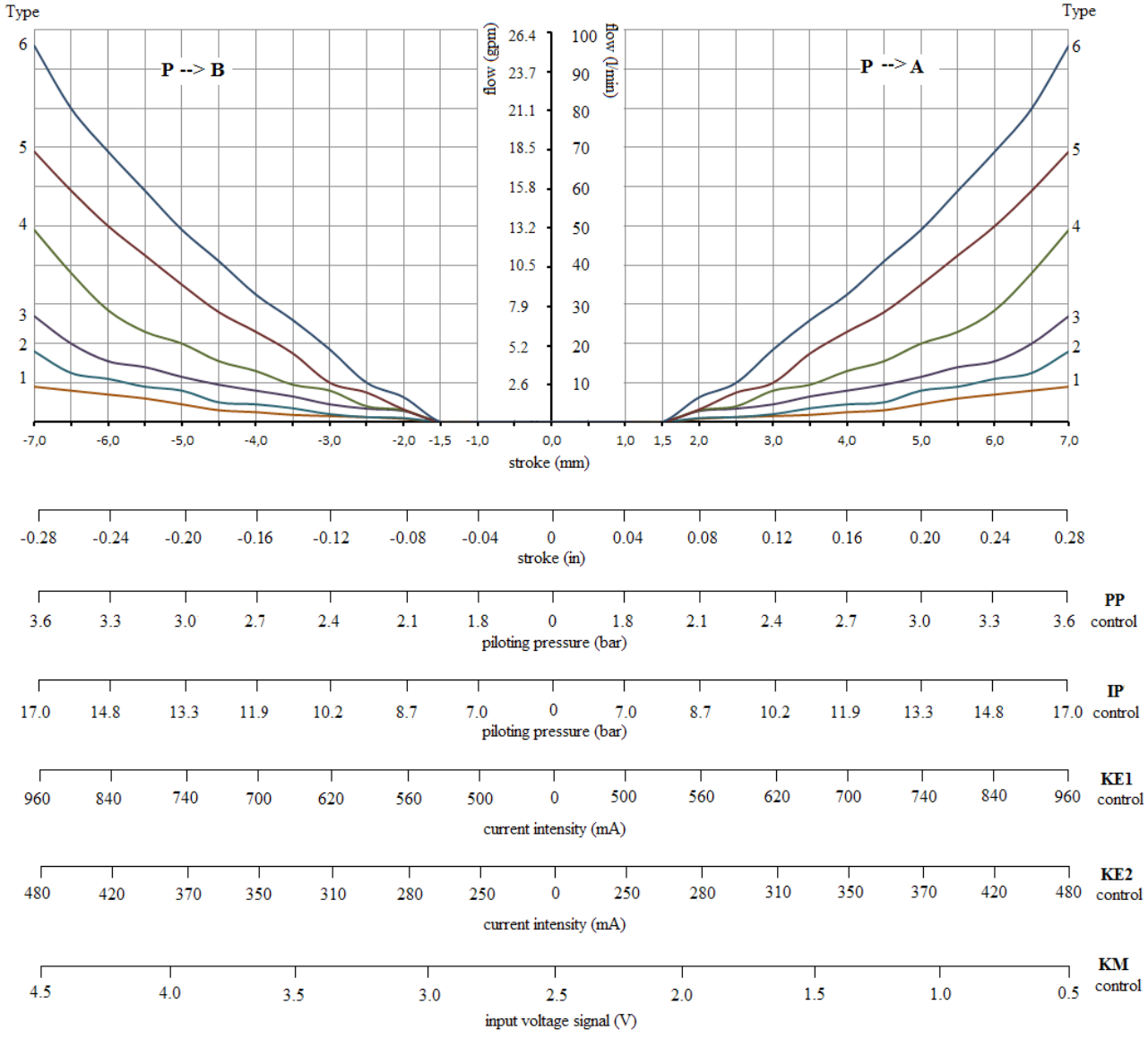



AR - Overload and anti-cavitation vale (page 14 A)
US gal./min



## TECHNICAL DATA

### MEETERING CHARACTERISTICS WITH AVAILABLE CONTROLS




**All the characteristics are measured using a mineral oil with a viscosity of 15 mm 2/sec at a temperature of 60° C (140°F)**

**INLET FLOW = 130 l/min (34 GPM)**

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