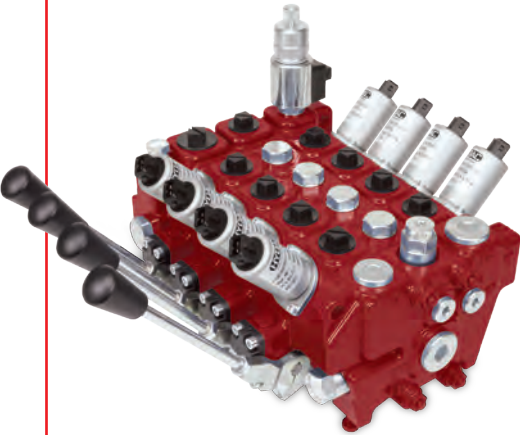


## Sectional Directional Control Valve RS 220



### Key valve features

RS 220 is a sectional open center valve designed for max. operating pressures up to 4,350 psi (300 bar) and max. pump flows up to 30 gpm (110 Lpm).

It is available with 1 to 10 working sections per valve assembly.

RS 220 is designed with an open center for fixed pumps and a restricted open center for variable displacement pumps.

It is available with electro-hydraulic or hydraulic proportional remote control, but the valve can also be manually operated.

The electro-hydraulic proportional version in particular offers compact design with internal pilot oil supply, solenoids integrated in the valve body and integral hand levers for manual override/manual operation.

RS 220 can be fully adapted for marine applications.

The valve offers excellent operating characteristics because of the specially designed spools for different applications.

Low and uniform spool forces are the result of careful balancing of the flow forces.

### Q-function

The flow control (Q-function) of the inlet section by-passes the major part of the pump flow to tank when the system is idling, still giving access to full pump flow when the services are operated. Besides greatly reducing heat generation this also provides improved operating characteristics.

### Applications

The RS 220 is ideal for applications where you need excellent control characteristics such as cranes, sky-lifts, excavators, telescopic load handlers, skid-loaders, wheel loaders etc.

### Technical data

#### Pressures / Flows

Max. operating pressure per port:

P1, A, B:	4,350 psi	300 bar
T1, T2, T3, T4:	300 psi	20 bar
Typical Nominal Inlet Flow:	30 gpm	110 Lpm
Fluid temperature range:	5°F up to 176°F	-15°C up to +80°C

#### Further data

Spool control force:

Neutral position:	25 lbs	110 N
Max. spool stroke:	29 lbs	130 N

Permissible contamination level: Equal or better than 20/18/14 as per ISO 4406

Viscosity range: 10 – 400 mm<sup>2</sup>/s (cst)  
Higher viscosity allowed at start up

Leakage A, B → T at 1,500 psi, 32 cSt and 104°F ≤ 13 cc/min (100 bar, 32 cSt and 40°C)

Pressure fluid: Mineral oil and synthetic oil based on mineral oil HL, HLP according to din 51524

Higher values are possible, depending on application. For applications with demands that exceed stated data above, please contact us for consideration.

MTTFd value after consultation with HYDAC.

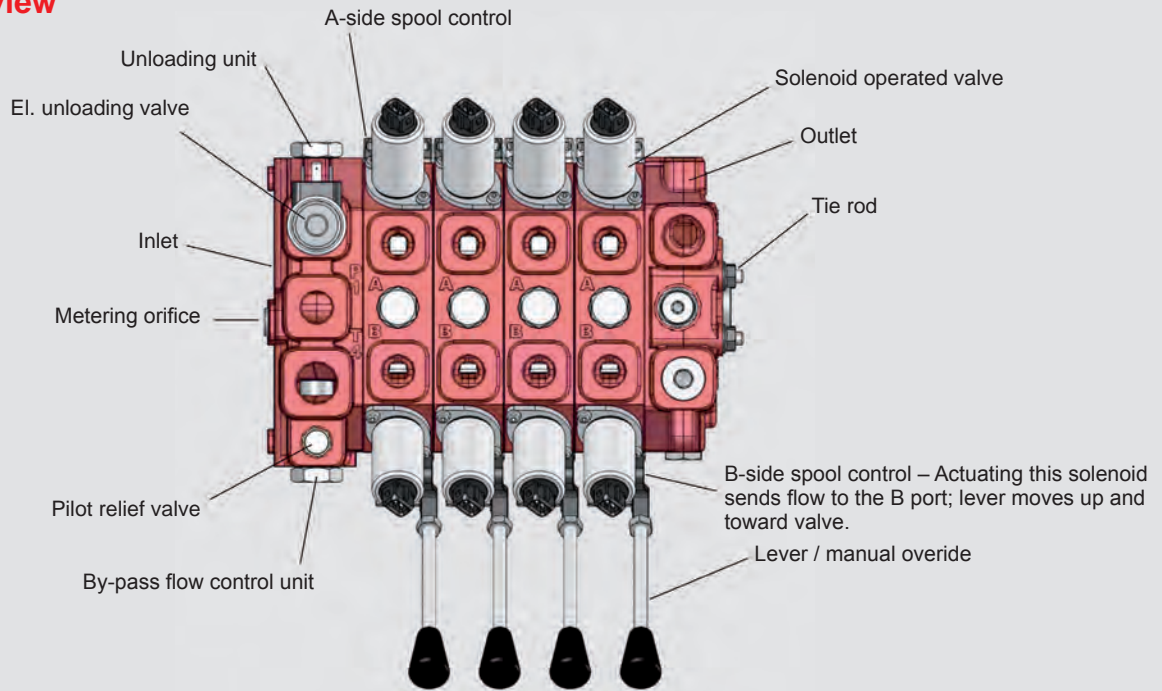
### Remote control

The RS 220 is designed with an integrated pilot supply system in order to achieve an easy installation and a reliable remote control function. It is also possible (and in some cases preferred) to supply the pilot system externally.

### Further properties and possibilities

- A wide choice of spools and spool controls for different flow combinations and for several applications and systems.
- A full range of service port valves.
- Possibility of high pressure carry-over.
- Electrical unloading for inlet safety function.
- Manual versions easily convertible to remote control.

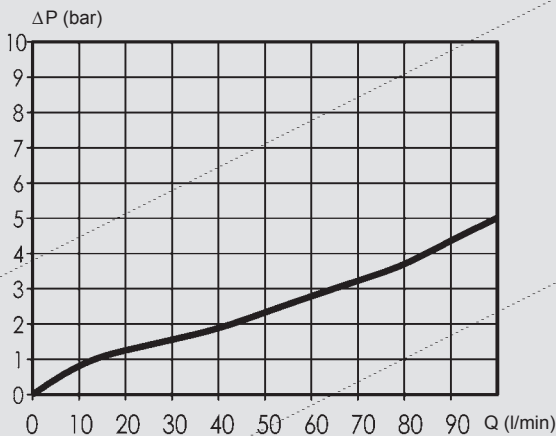
## General overview



## Pressure drop

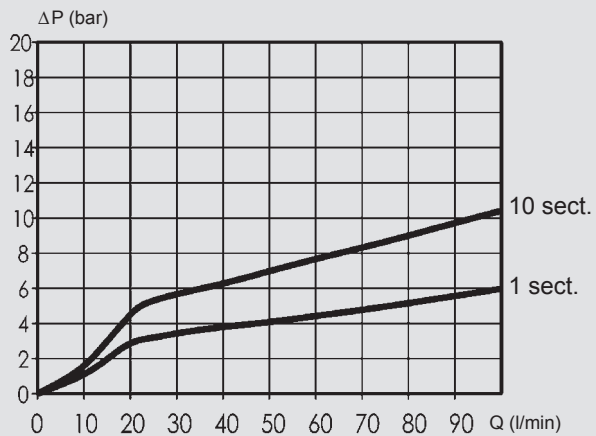
Oil temperature / viscosity for all graphs: +40 °C / 32 cSt

### Pressure drop P - T, unloaded valve

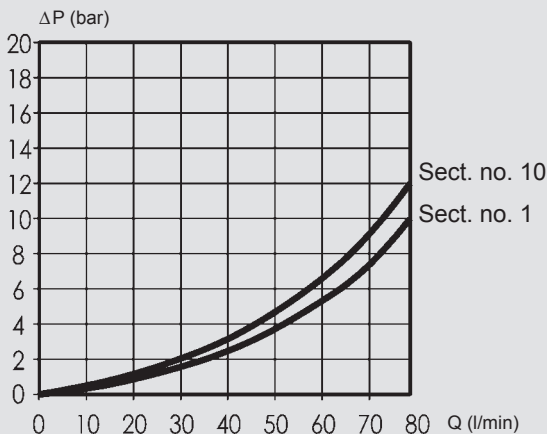


The pressure drops P - T are valid for a valve with a metering orifice PF305 for the center channel flow. Note that a valve in unloaded mode will have a small flow in the center channel.

### Pressure drop P - T (idling)

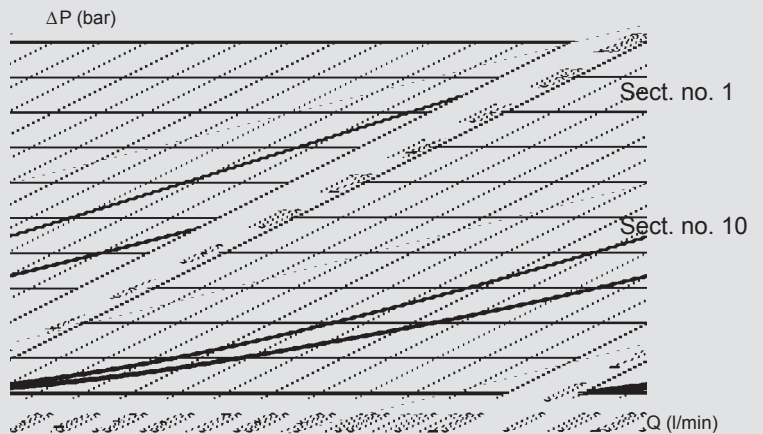


### Pressure drop P - A/B



Note that the pressure drop curves P - A/B and A/B - T are valid for sections equipped with spools that are fully open at maximum spool travel.

### Pressure drop A/B - T



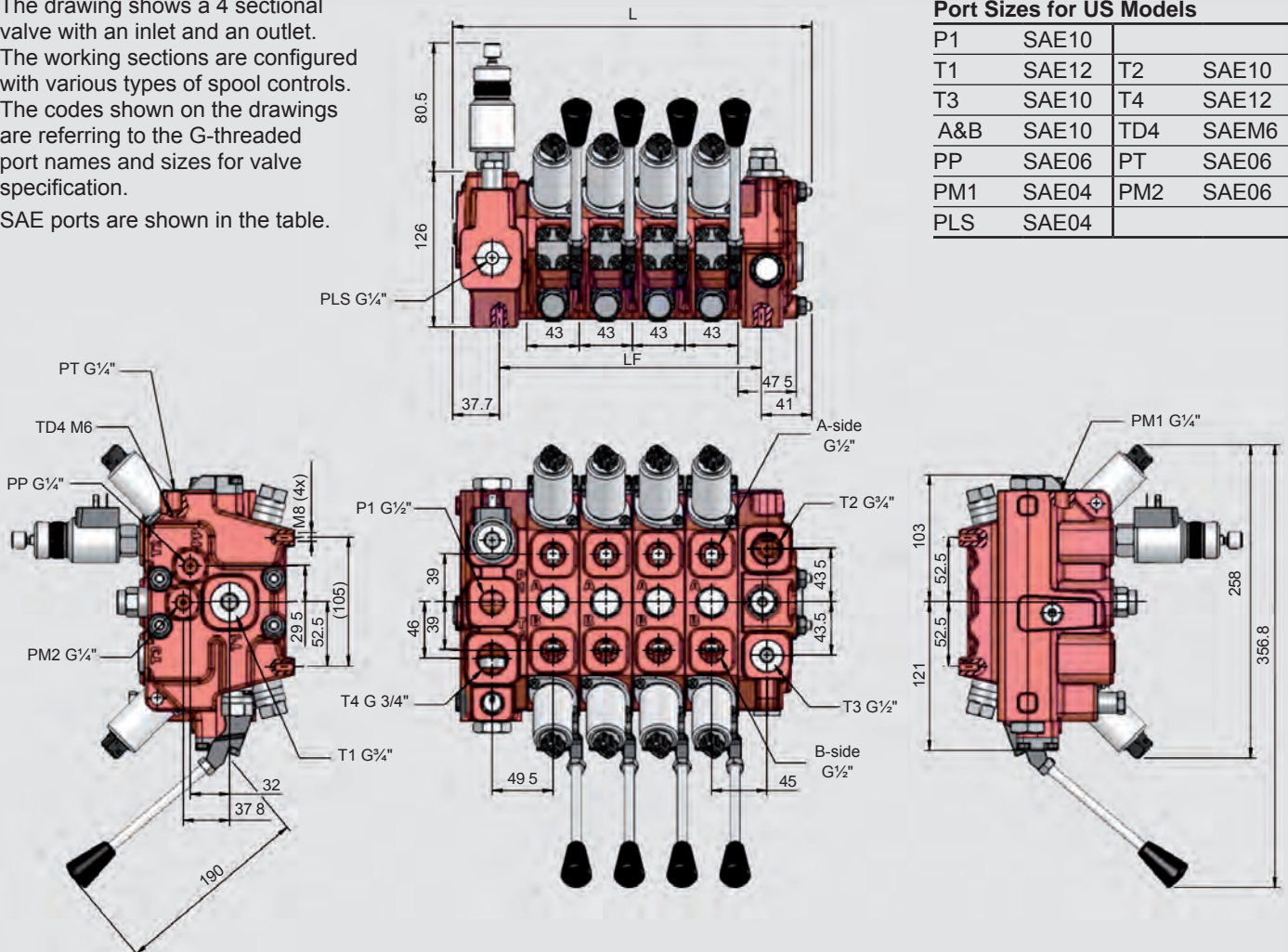
## Dimensions and weight

The drawing shows a 4 sectional valve with an inlet and an outlet. The working sections are configured with various types of spool controls. The codes shown on the drawings are referring to the G-threaded port names and sizes for valve specification.

SAE ports are shown in the table.

### Port Sizes for US Models

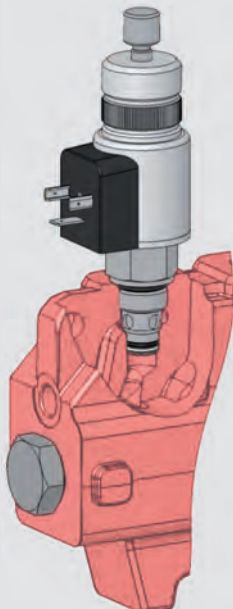
P1	SAE10	T2	SAE10
T1	SAE12	T4	SAE12
T3	SAE10	TD4	SAEM6
A&B	SAE10	PT	SAE06
PP	SAE06	PM1	SAE06
PM1	SAE04	PM2	SAE06
PLS	SAE04		



### Weight

Inlet section	13.9 lbs	6.3 kg
Working section	11.0 lbs	5.0 kg
Outlet section	10.1 lbs	4.6 kg

No. of working sections	L (in)	L (mm)	LF (in)	LF (mm)
1	6.4	163	3.3	84
2	8.1	206	5.0	127
3	9.8	249	6.7	170
4	11.5	292	8.4	213
5	13.2	335	10.1	256
6	14.9	378	11.8	299
7	16.6	421	13.5	342
8	18.3	464	15.2	385
9	20.0	507	16.9	428
10	21.7	550	18.5	471



## Electrical unloading

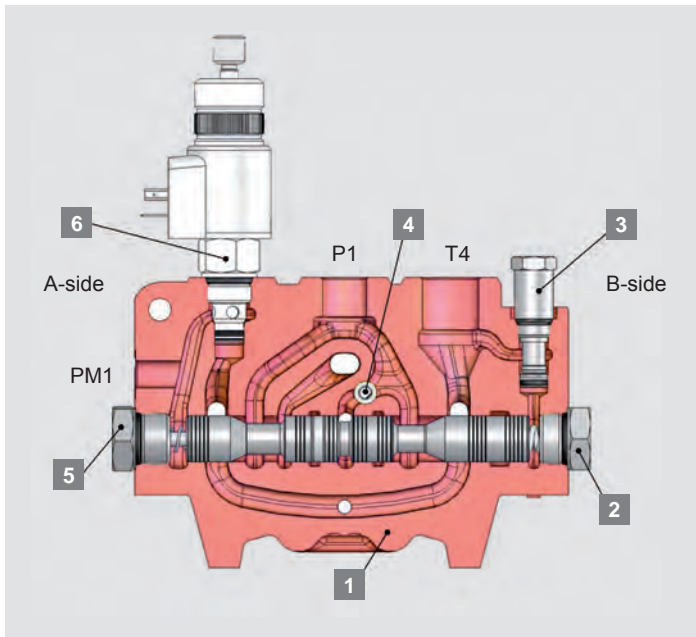
### Data

Rated flow:	10.5 gpm	40 Lpm
Power consumption:	27W	
Rated voltage EU912:	12V	
Rated voltage EU926:	24V	
Max voltage variation:	+/-15%	
Duty factor*:	100%	
Connection:	EN 175301-803 form A	
Protection class:	IP65	

\*Sufficient cooling must be secured.

The unloading valve has manual override, with twist pin operation. PE20 is the plug for the cavity.

## Inlet section – with flow control and electrical unloading



### Main relief function

The by-pass flow control valve FK301 in combination with the relief valve TB12 form the pilot operated relief valve function of the inlet section for the primary circuit (valid for all configurations).

- TB12 is adjustable and sealable
- Setting range: 500-4,500 psi (35-300 bar)
- Setting range step: 100 psi (7 bar)

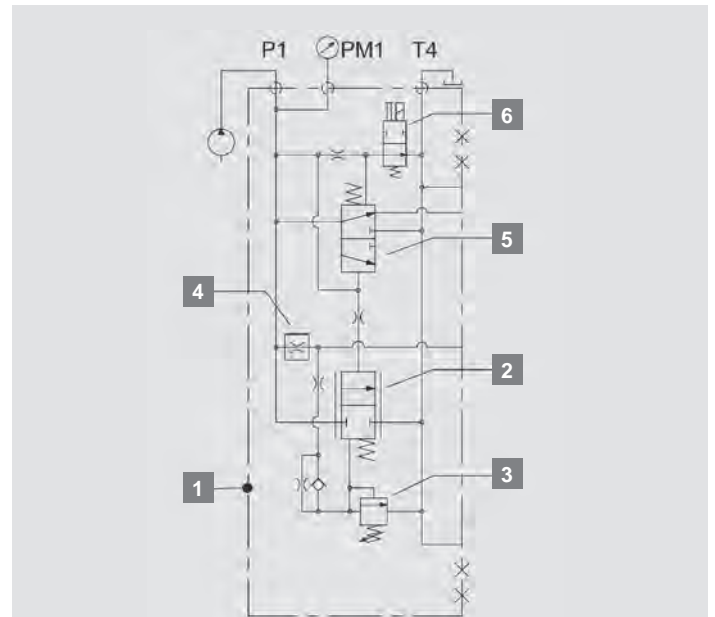
The I01U with its integral Q-function provides by-pass of pump flow to tank in idling condition, thereby reducing pressure drop and heat generation. The flow control function of the inlet also regulates the flow to the user corresponding to the travel of a partially selected spool. This, in addition to reduced flow forces and a control response to large extent unaffected by varying pump flows, contributes to the excellent operating characteristics achievable with RS 220.

An integral and from the flow control separated spool, together with a solenoid operated electrical unloading valve, unloads the pump flow to tank and disconnects the oil supply to the valve sections.

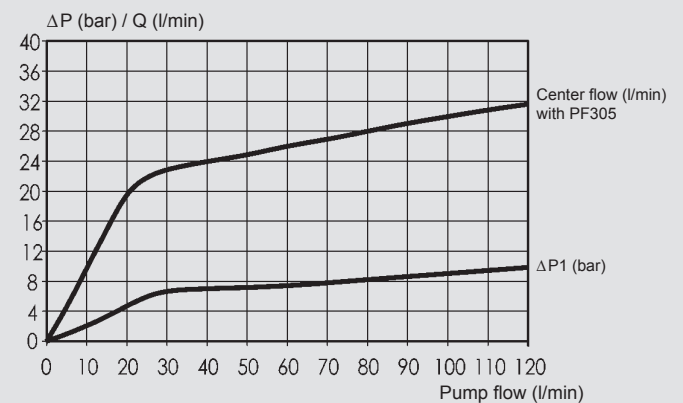
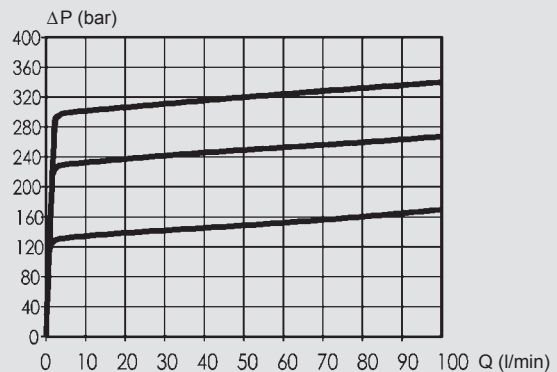
Together with a load holding valve RS 220 achieves a very safe emergency dump of pump oil to tank.

The maximum flow into the center channel is set by an exchangeable metering orifice.

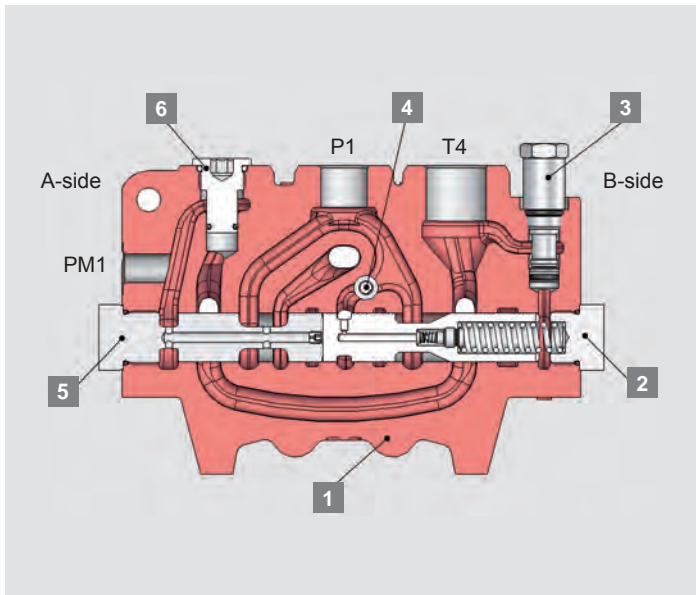
The opening of the by-pass flow control spool is cushioned by a special check valve integrated in the spool.



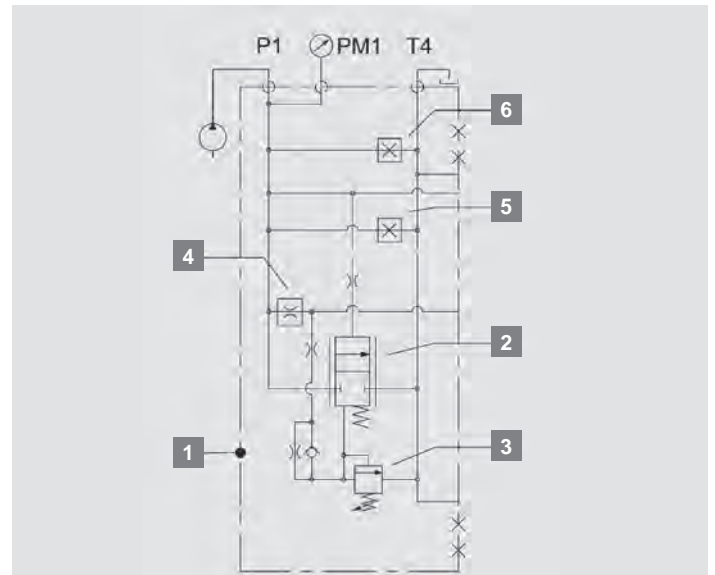
1	Inlet	I01U
2	By-pass flow control unit	FK301
3	Pilot relief valve	TB12
4	Metering orifice for center channel flow	PF305
5	Unloading unit	FU301
6	Solenoid operated valve	EU926



## Inlet section – with flow control and without unloading

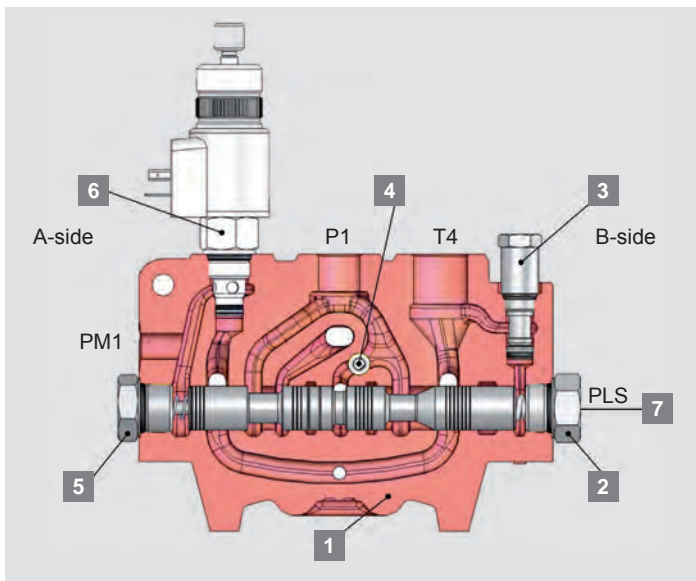


The inlet can also be delivered without the unloading function. The unloading spool and the solenoid operated valve in that case are replaced by plugs.



1	Inlet	I01U
2	By-pass flow control unit	FK301
3	Pilot relief valve	TB12
4	Metering orifice for center channel flow	PF305
5	Plug replacing unloading unit	PU300
6	Plug replacing electrical unloading valve	PE20

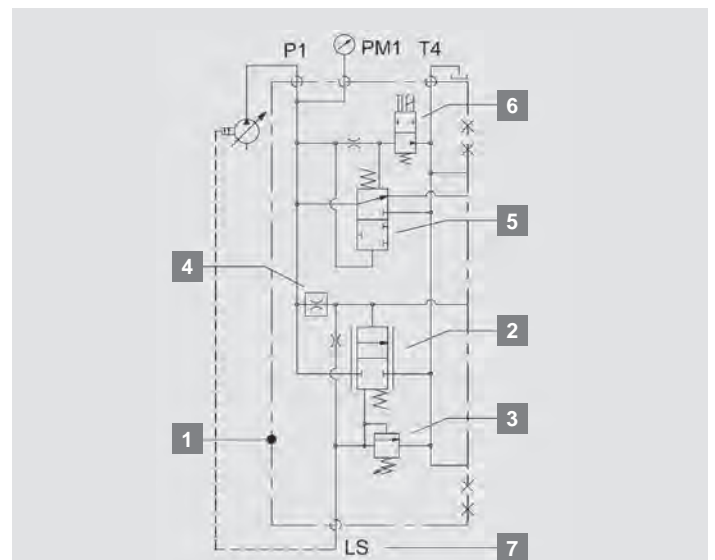
## Inlet section – variable displacement pumps



The I01U inlet can also be used in valves in systems with variable displacement pumps. The pump has to be of type LS-regulated. The inlet configured for variable pumps provides a modified Q-function. When the system is idling the pump delivers a regulated flow to the center channel. The regulated flow is set by the combination of metering orifice and actual stand-by pressure from the pump.

The maximum system pressure preferably is set in the pump but as an extra safety the inlet is equipped with a pilot operated primary relief valve. As the regulated flow is set by the combination of metering orifice and the stand by pressure, it is important to match the metering orifice to the actual pump.

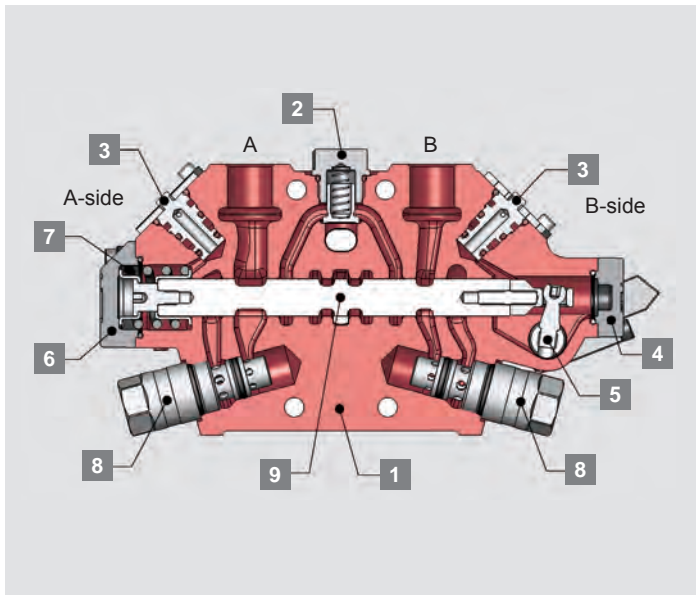
Use PF302 if the stand-by pressure is 203 psi, PF303 if it is 290 psi and PF304 if it is 350 psi. Generally the stand-by pressure is significantly higher than the pressure drop over the metering orifice in an open center system and this means that the metering orifice in a system with variable pump has to be smaller.



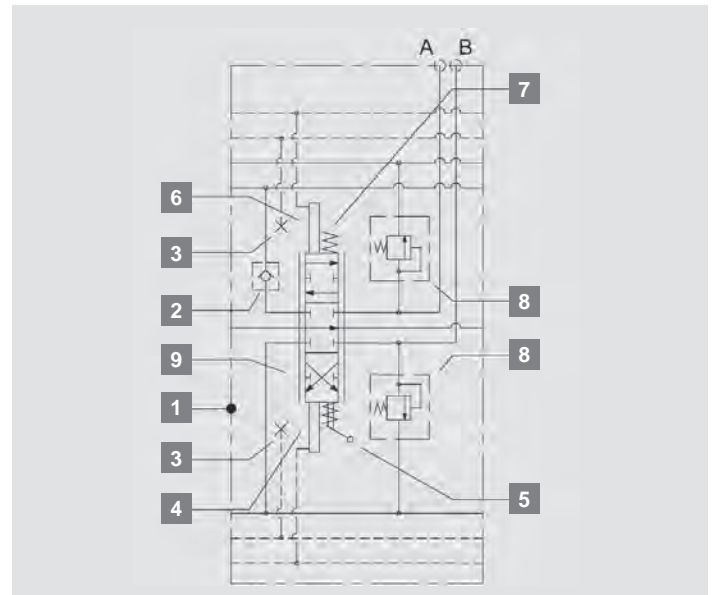
1	Inlet	I01U
2	Primary relief valve	FK310
3	Pilot relief valve	TB12
4	Metering orifice for center channel flow	PF302
4	Metering orifice for center channel flow	PF303
4	Metering orifice for center channel flow	PF304
5	Shut off unit	FU302
6	Solenoid operated valve	EU926
7	LS port	

An integral spool which is isolated from the relief valve, together with a solenoid operated valve, shuts off the oil supply to the valve sections. Together with a load holding valve this achieves emergency shut off of the oil supply.

## Working section – manually operated

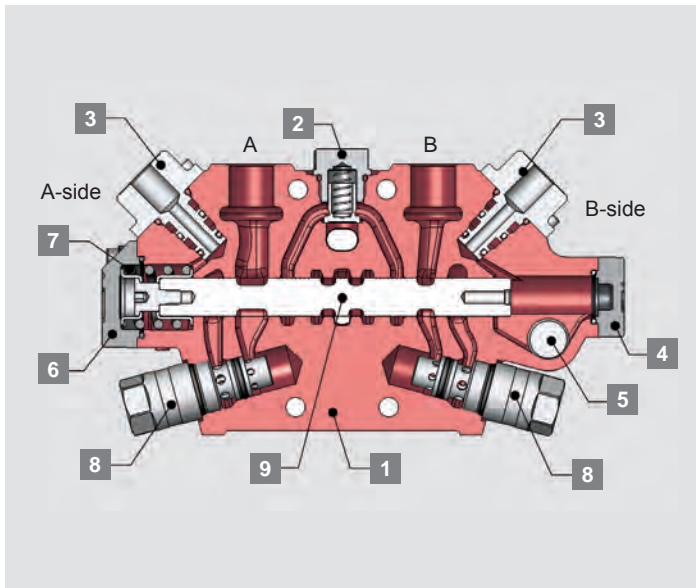


Section S01U equipped as manually operated. Existing cavities for solenoid valves are fitted with plugs (PE11) which connect (drain) the spool ends to the tank. That is necessary since no spool seals separate the return line galleries from the spool ends. This feature provides very good protection for spool ends (ideal for marine use) and minimizes external leakage risks.

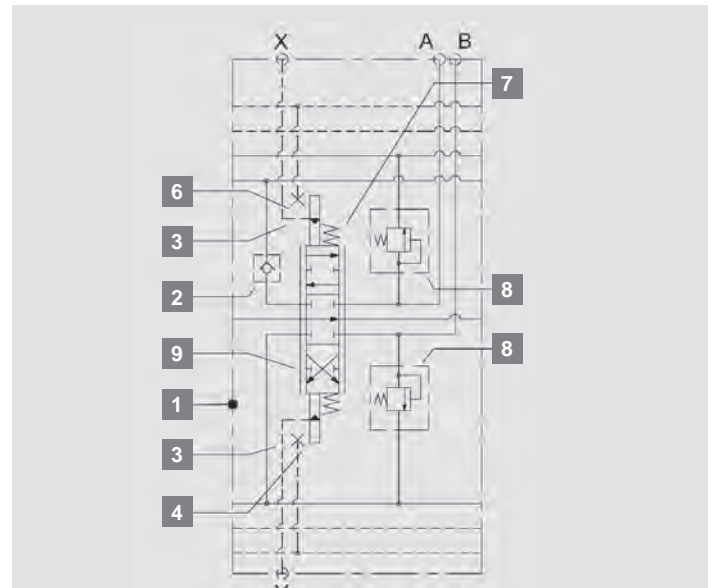


1	Section	S01U
2	Load check valve	MB22
3	Plug	PE11
4	Spool control, B-side	B01
5	Lever mechanism	LMA
6	Spool control, A-side	9
7	Centering spring for manual control	MS
8	Service port valve	TBSD160
9	Spool	

## Working section – hydraulically operated

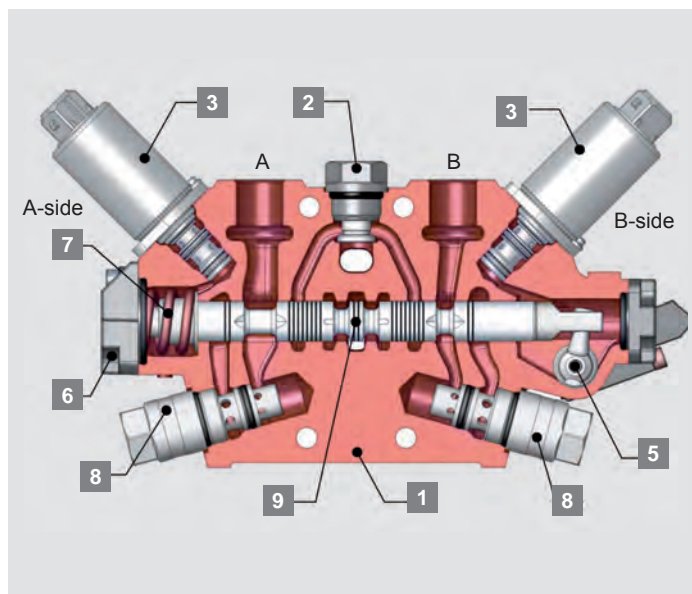


Section S01U equipped as hydraulically operated and without manual override. Adapters (HU10) are fitted into the solenoid valve cavities. They connect the pressure from a hydraulic control valve to the spool ends.



1	Section	S01U
2	Load check valve	MB22
3	Adapter for hydraulic remote control	HU10
4	Spool control, B-side	B01
5	Plug, replacing lever mechanism	PM02
6	Spool control, A-side	9
7	Centering spring for proportional control	PS
8	Service port valve	TBSD160
9	Spool	

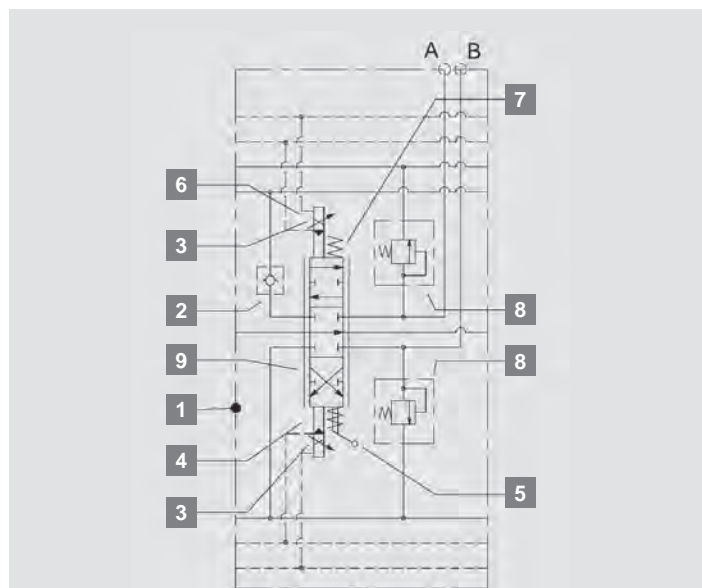
## Working section – electro-hydraulically operated



Section S01U equipped as electro-hydraulically operated and with manual override. The mechanism for the manual override is an option and can be replaced by a plug.

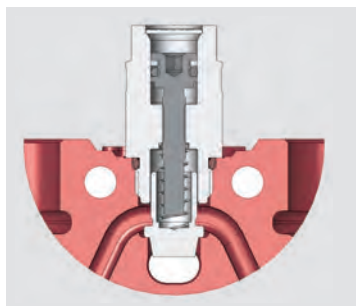
It is possible to mix valve sections that are configured for the different types of controls.

The centering springs are specified separately.



1	Section	S01U
2	Load check valve	MB22
3	Solenoid operated valve for proportional control	ER54
4	Spool control, B-side	B01
5	Lever mechanism without lever	LMA
6	Spool control, A-side	9
7	Centering spring for proportional control	PS
8	Service port valve	TBSD160
9	Spool	

## Load check valve



Check valve MF22

The main function of the load check valve is to prevent the load from moving backwards if the load pressure is higher than pump pressure when operating.

**MB22**  
Load check valve.

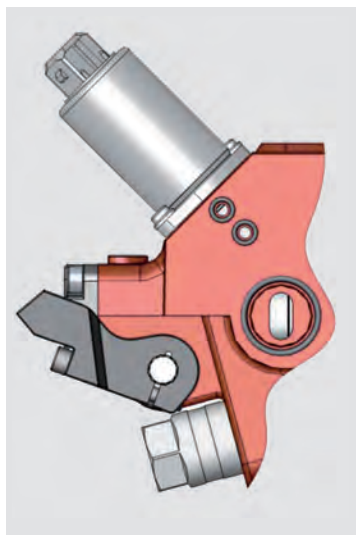
### MF22

Load check valve with adjustable flow limitation. MF22 maximizes the flow out from a section. Typical application is a slewing function.

### MP22

Plug without load check valve. This option is usable for example when the function is equipped with pilot operated load holding valves.

## Solenoid valve for EHP – ER52 / 54



**Note: If used as “on-off” it is recommended to limit the current by using for example a coupling resistance. Please contact HYDAC for detailed information.**

**Important:**  
The capacity of the current source must be higher than the current demand of all parallel active solenoids in order to provide the PWM effect.

### ER62/64

Functional principle:	PWM (Pulse Width Modulation)
Duty factor:	100 %
Connection:	Deutsch DT4 or AMP Junior-Power-Timer
Recommended PMW frequency:	100 Hz
Protection class:	IP 65
Ambient temperature:	-22°F up to 176°F (-30°C up to +80°C)

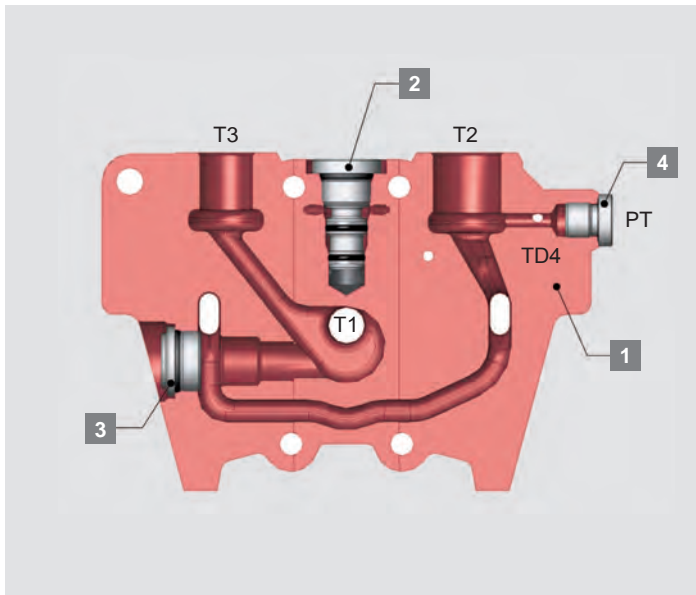
### ER62

Rated voltage	12 V DC
Starting current	600 mA
Fully shifted	1,500 mA
Coil resistance @ +20 °C	4.72 Ohm

### ER64

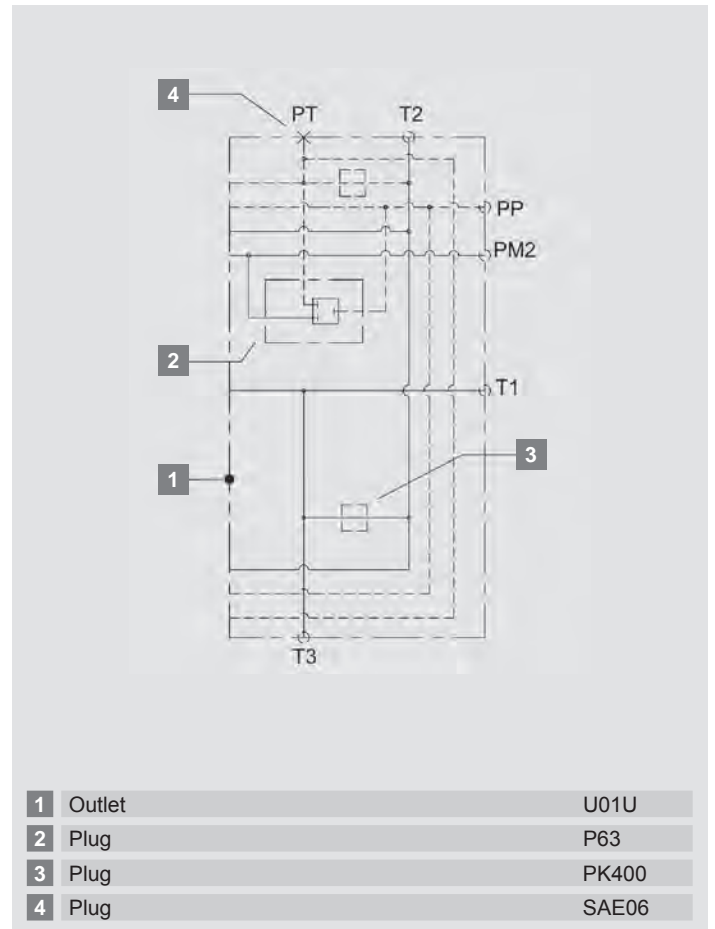
Rated voltage	24 V DC
Starting current	300 mA
Fully shifted	750 mA
Coil resistance @ +20 °C	20.8 Ohm

## Outlet section – without internal pilot oil supply function

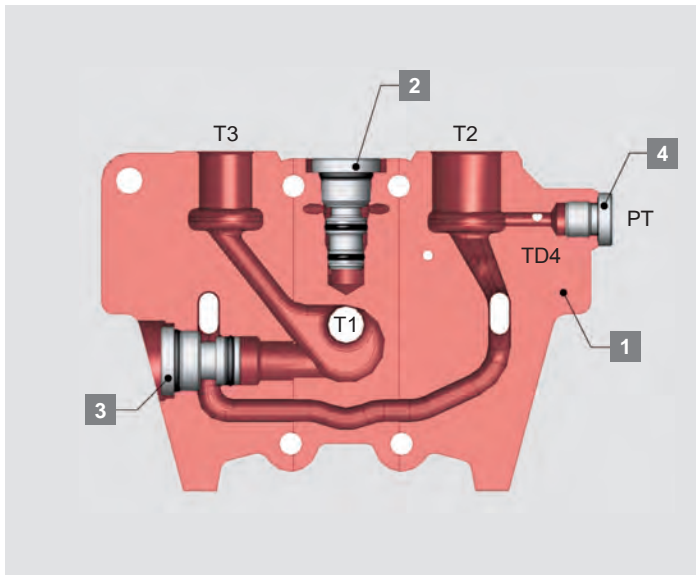


Outlet U01U equipped for hydraulically or manually operated sections.

The cavity for the pressure reducing valve is plugged, P63.

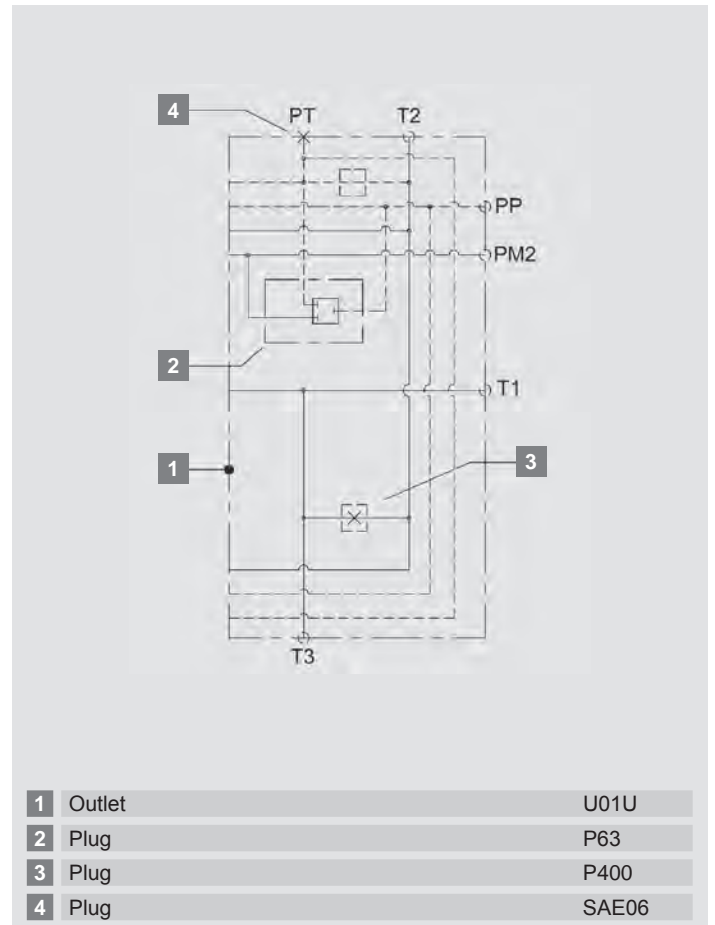


## Outlet section – with high pressure carry-over function



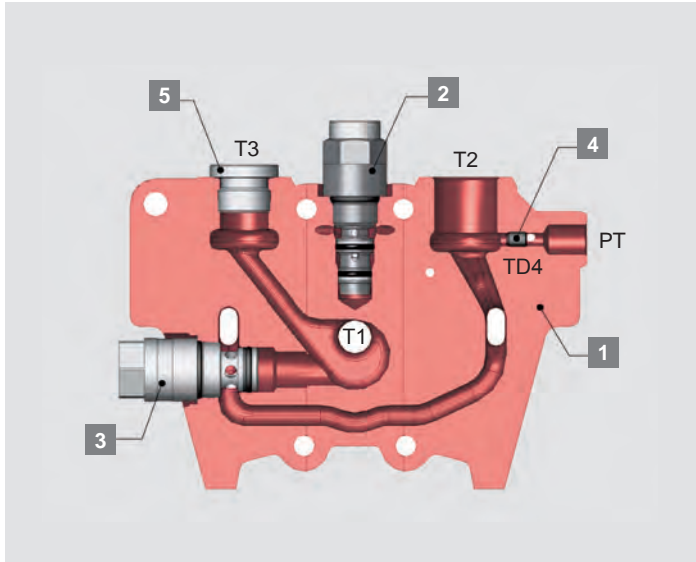
Outlet U01U equipped for hydraulically or manually operated sections and for high pressure carry-over function. Note that the carry-over flow is the flow that is regulated into the center channel i. e. the flow determined by the metering orifice of the inlet section. With PF305 - 6.5 gpm (25 Lpm). The plug P400 is fitted. High pressure carry-over ports can be either T1 or T3. The cavity for the pressure reducing valve is plugged with plug P63. Only T2 can be used as tank connection.

If in this case the plug P400 is replaced by the relief cartridge TBD160, it functions as relief valve for downstream services.





## Outlet section – with internal pilot oil supply function

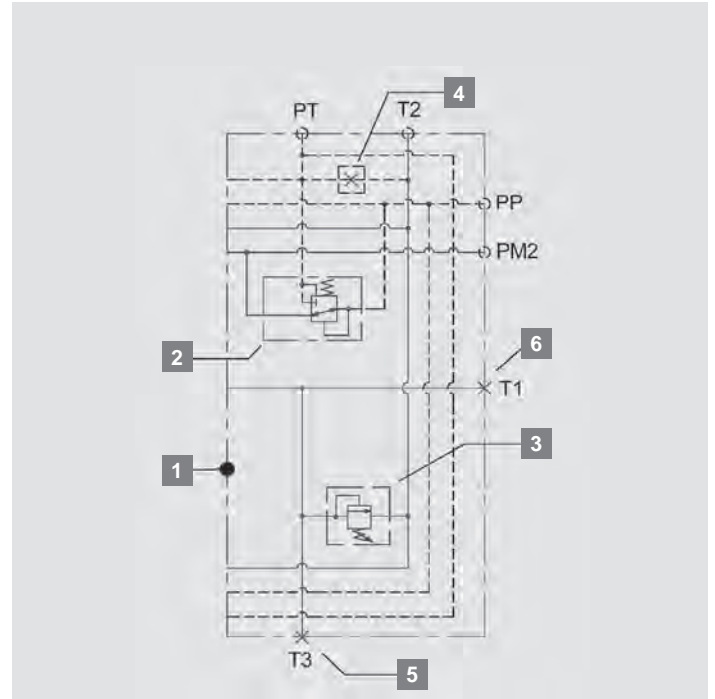


Outlet U01U equipped for use in an electro hydraulically operated valve. The outlet is configured for pilot supply to the valve sections.

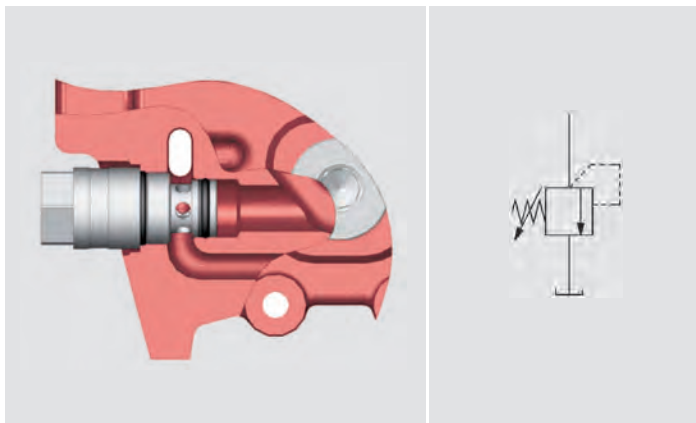
An initial pressure is built up by a pilot pressure valve in the center channel. Ports T1 and T3 have to be plugged.

The pilot pressure is limited by a pressure reducing valve connected to the parallel channel. Due to the fact that the unloading unit in the inlet shuts off the flow supply to the parallel channel an emergency stop will also shut off the oil supply to the pilot circuit.

The return flow from the spool controls and the pressure reducing valve should be drained directly to tank in a separate piping. In order to achieve this it is recommended to use PT and plug the connection between pilot drain and ordinary tank line.



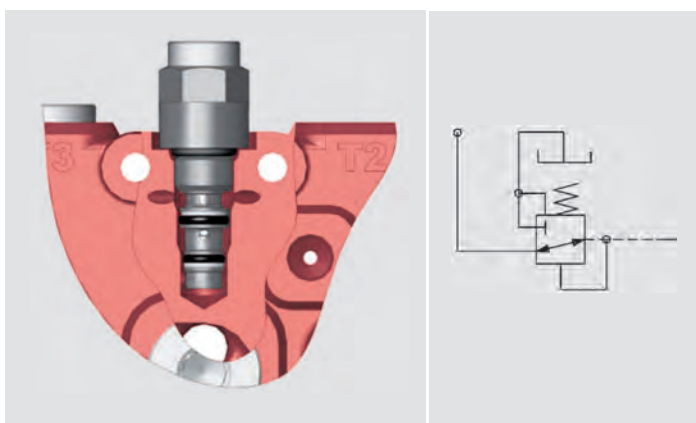
1	Outlet	U01U
2	Pilot pressure reducing valve	TRA63
3	Pilot pressure valve	TMB210/2
4	Plug for isolate pilot drain from ordinary tank line	PMS6
5	Plug in T3	SAE10
6	Plug in T1	SAE12



### Pilot pressure valve TMB210/2

The cartridge type pilot pressure valve TMB210/2, normally set at minimum 200 psi, is used in outlet section to secure available pilot pressure build-up for remote control. Depending on system design this necessary starting pressure could also be achieved through downstream arrangements, for example a support leg valve.

TMB210/2 is adjustable and sealable.



### Pressure reducing valve TRA63

The cartridge type pressure reducing valve TRA63 is used in the outlet to provide pilot oil supply for remote control.

TRA63 is fixed set at 350 psi which consequently is the maximum available pressure level in the pilot system.

## Spool Controls – A-Side

### Spool control 9

Spring centering



### Spool control LA

External hydraulic kick-out from spool position III to I



### Spool control for remote control

Electro hydraulic control is achieved by using spool controls in combination with solenoid valves ER52/54 both on A-side and B-side.

The control will be proportional with the spring PS



The control will be on-off in combination with the spring MS

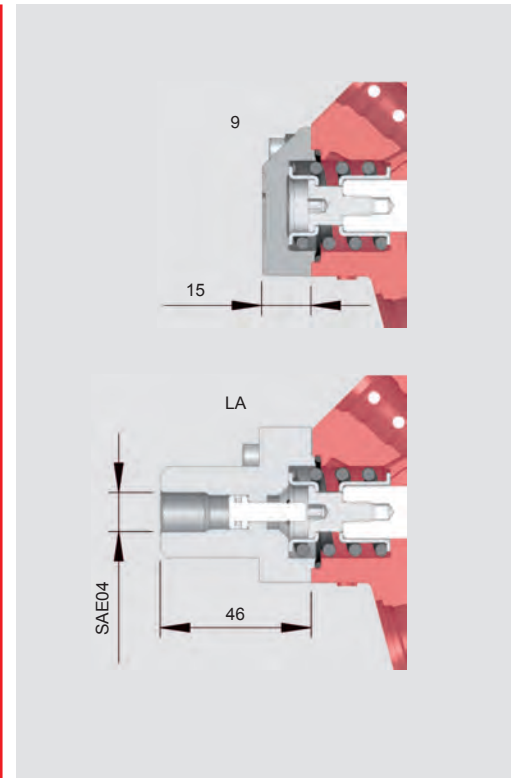


Hydraulic control is achieved by using spool controls in combination with adapters HG10 both on A-side and B-side.

The control will be proportional in combination with the spring PS



The control will be on-off in combination with the spring MS



### Spring - spool control

Type of centering spring has to be specified in the valve configuration

**MS** spring for manual operation, Forces 24.7-29.2 lbs (110-130 N)

**PS** spring for proportional remote control, Forces 27-71.9 lbs (120-320 N)



## Spool Controls – B-Side

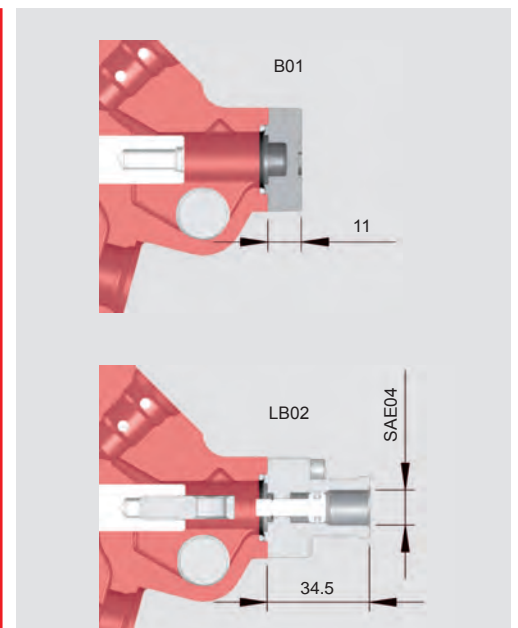
### Spool control B01

Cap.



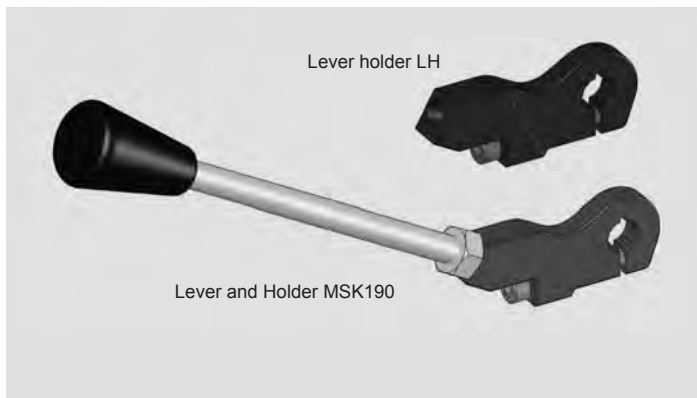
### Spool control LB01

External hydraulic kick-out from spool position II to I. For sections with lever mechanism



Note: Lever mechanism / cavity plugs as shown in pictures above are independent items to be separately configured.

## Lever mechanism on B-side



### LM2

Lever mechanism without lever holder, lock nut and handle (9 mm HEX).

### PM02

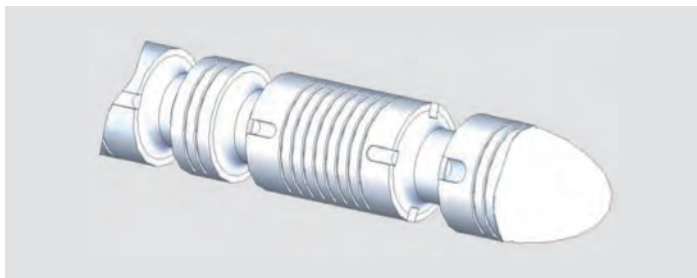
Plug replacing lever mechanism.

### Lever and Holder MSK190

The lever holder (LH) is for use together with spool actuator of type M1/EHM.

The lever holder is delivered in combination with a lever as MSK190.

## Spools - main design parameters



The RS 220 spools are available in a variety of flows and styles to accommodate most design requirements. The spool matrix configurator below will help and guide you to select the correct spool for your application. The development of new spools is a continuous process and all available spools are not described in this data sheet.

For further details on spools please contact HYDAC.

### Spool code

6 K A A

1 e:	Symbol	Type of application:	Pump flow, Q-inlet:	Detailed demands:	Function:
	 	<p>A Spool general use</p> <p>K Crane optimized</p> <p>L Loader optimized</p>	<p>6 8-13 gpm (30-50 Lpm)</p> <p>8 13-20 gpm (50-75 Lpm)</p>	<p>A Standard</p> <p>Example:</p> <ul style="list-style-type: none"> <li>- Restricted flow</li> <li>- Asymmetric</li> <li>- Spool end</li> </ul>	<p>A Standard</p>
Spool 1					
Spool 2					
Spool 3					
Spool 4					
Spool 8					

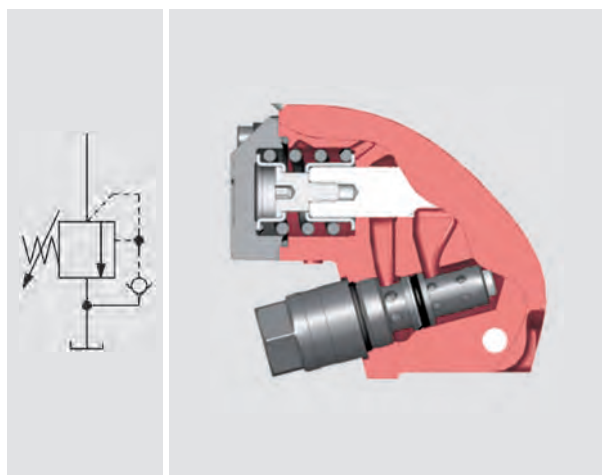
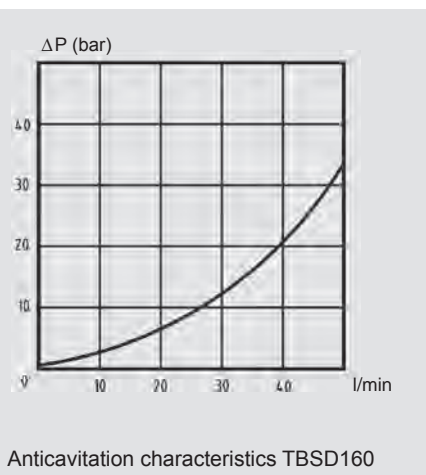
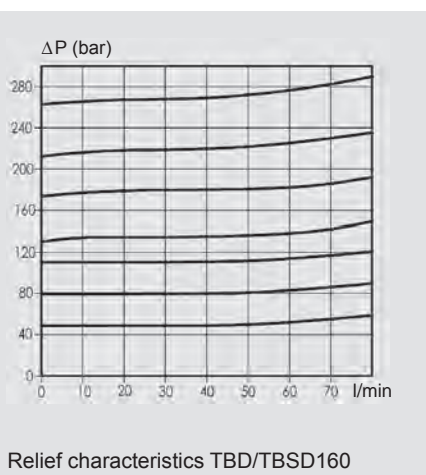
## Service port valves

### Port relief and anticavitation valve TBSD160

The TBD160 is a differential area, direct acting relief valve, for the secondary circuit. It is adjustable and sealable.

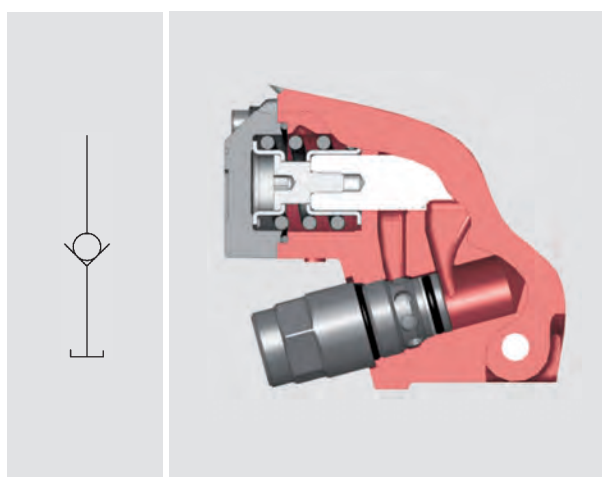
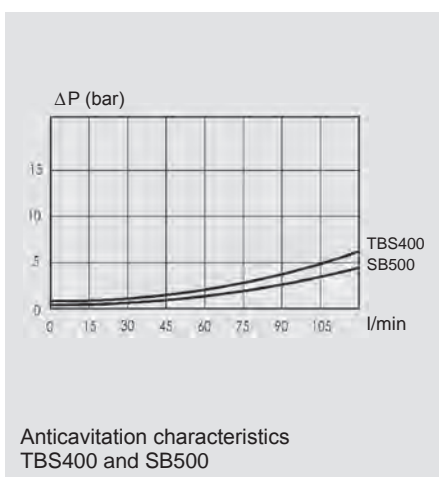
Setting ranges for TBSD160:

- 500-4550 psi (35-300 bar)
- Setting range step: 100 psi (7 bar)

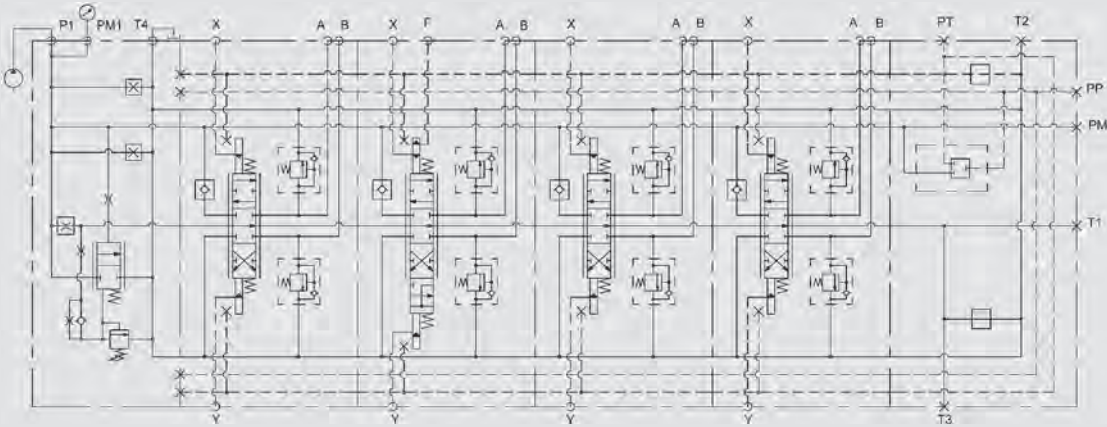


### Anticavitation valve SB500

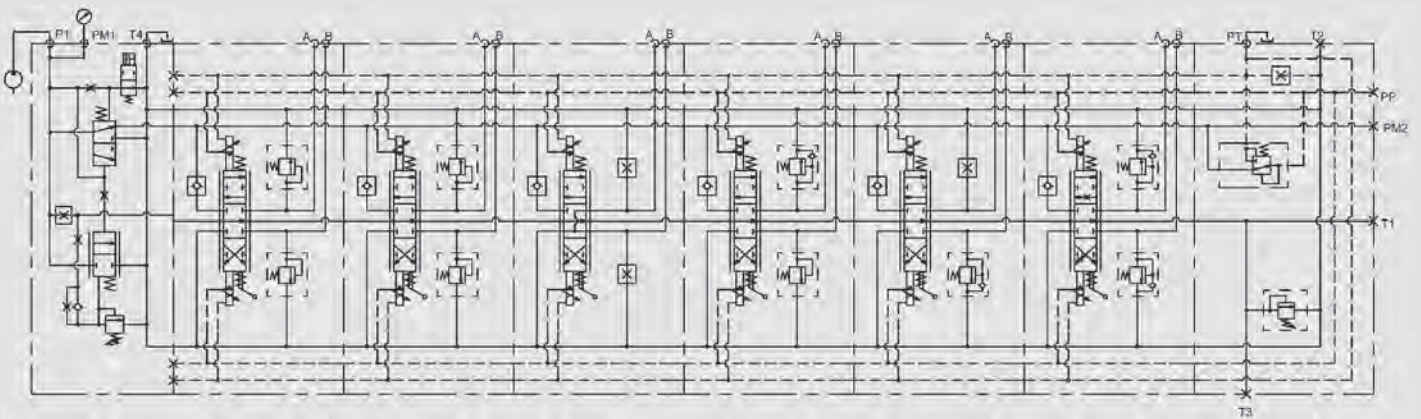
The anticavitation valve service to ensure that, in the event of a lower pressure in the cylinder port than in the tank, oil can be drawn from the system oil tank to the consumer.



## Typical hydraulic circuit diagrams



Hydraulic remote controlled valve.  
2<sup>nd</sup> section with 4-position spool.  
Single circuit.  
Inlet with flow control but without unloading.



Electro hydraulic remote controlled valve with internal pilot supply.  
Single circuit. Inlet with flow control and unloading.





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### Note

The information in this brochure relates to the operating conditions and applications described.

For applications or operating conditions not described, please contact the relevant technical department.

Subject to technical modifications.