HYDAC INTERNATIONAL

Sectional Directional Control Valve
RS 220

Key valve features

RS 220 is a sectional open center valve designed for max. operating pressures up to 300 bar and max. pump flows up to 80 l/min.

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, scissor-lifts, excavators, telescopic load handlers, skid-loaders, wheel loaders etc.

Technical data

Pressure and flow values*	
Max. operating pressure per port:	
P1, A, B:	300 bar
PP:	25 bar
Without HPCO-Function T1, T3:	20 bar
With HPCO-Function T1, T3:	300 bar
With internal connection of PT to T T2, T4:	 5 bar
With external pilot drain line T2, T4: PT:	 20 bar depressurized to tank
Max. permissible flow on port P1:	80 l/min
Further data	
Spool control force of spool control 901:	
Neutral position:	110 N
Max. spool stroke:	130 N
Permissible contamination level:	20 / 18 / 14 as per ISO 4406 or cleaner
Viscosity range:	10 – 400 mm²/s (cSt) Higher viscosity permitted at start up
Leakage A, B → T at 100 bar, 32 cSt and 40 °C:	≤13 cc/min
Pressure fluid:	Mineral oil and synthetic oil based on mineral oil HL, HLP according to DIN 51524
Fluid temperature range:	-15 °C up to +80 °C

* Higher or other values are possible, depending on application.
For applications with higher requirements than those stated above, please contact us.
MTTFd value on request from HYDAC.

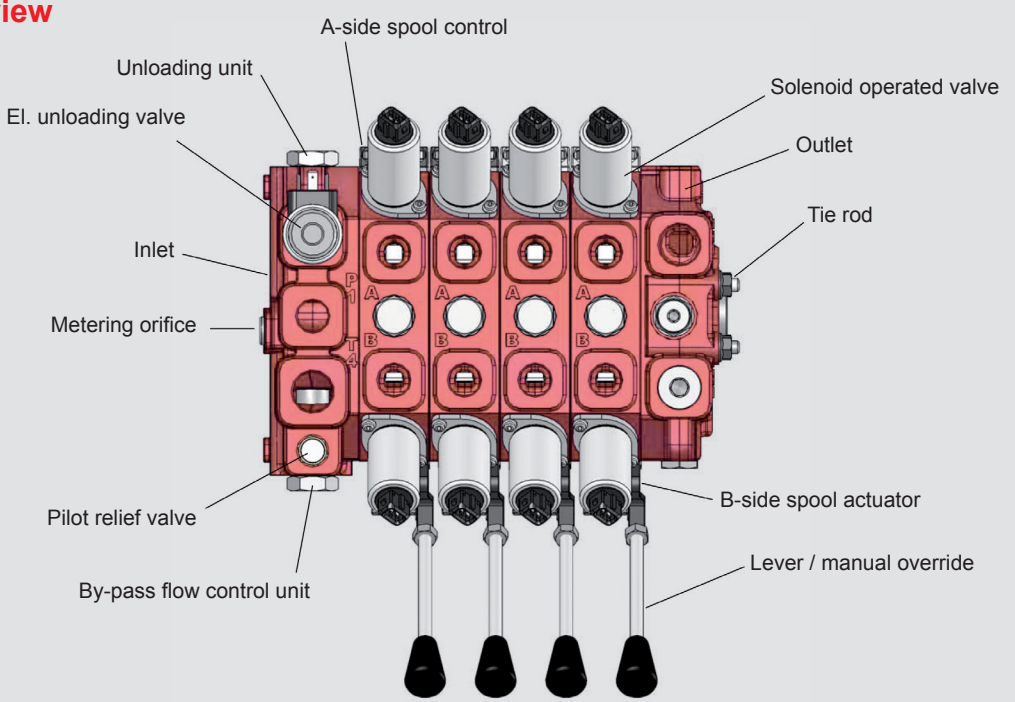
Remote control

The RS 220 is designed with an integrated pilot supply system for easy installation and reliable remote control function.
It is also possible (and in some cases to preferable) 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
- Manual versions easily convertible to remote control

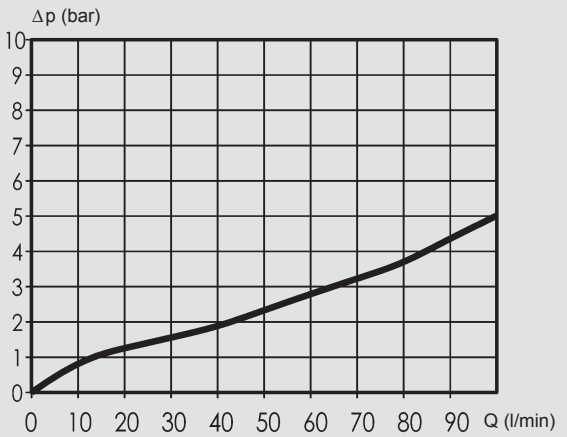
General overview



Pressure drop

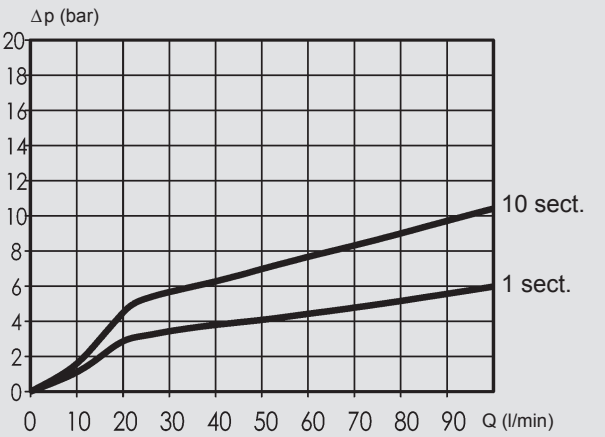
Oil temperature / viscosity for all graphs: +40 °C / 32 cSt

Pressure drop P – T, unloaded valve

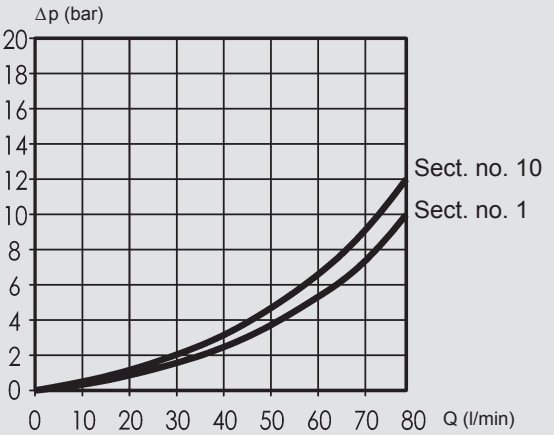


Note: The pressure drops P – T are valid for a valve with a metering orifice PF305 for the center gallery. In the unloaded mode, the valve will have a small flow in the center gallery.

Pressure drop P – T (idling)

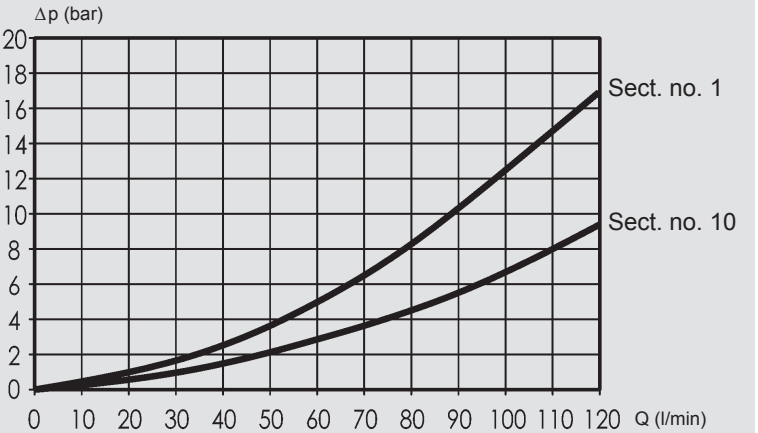


Pressure drop P – A/B



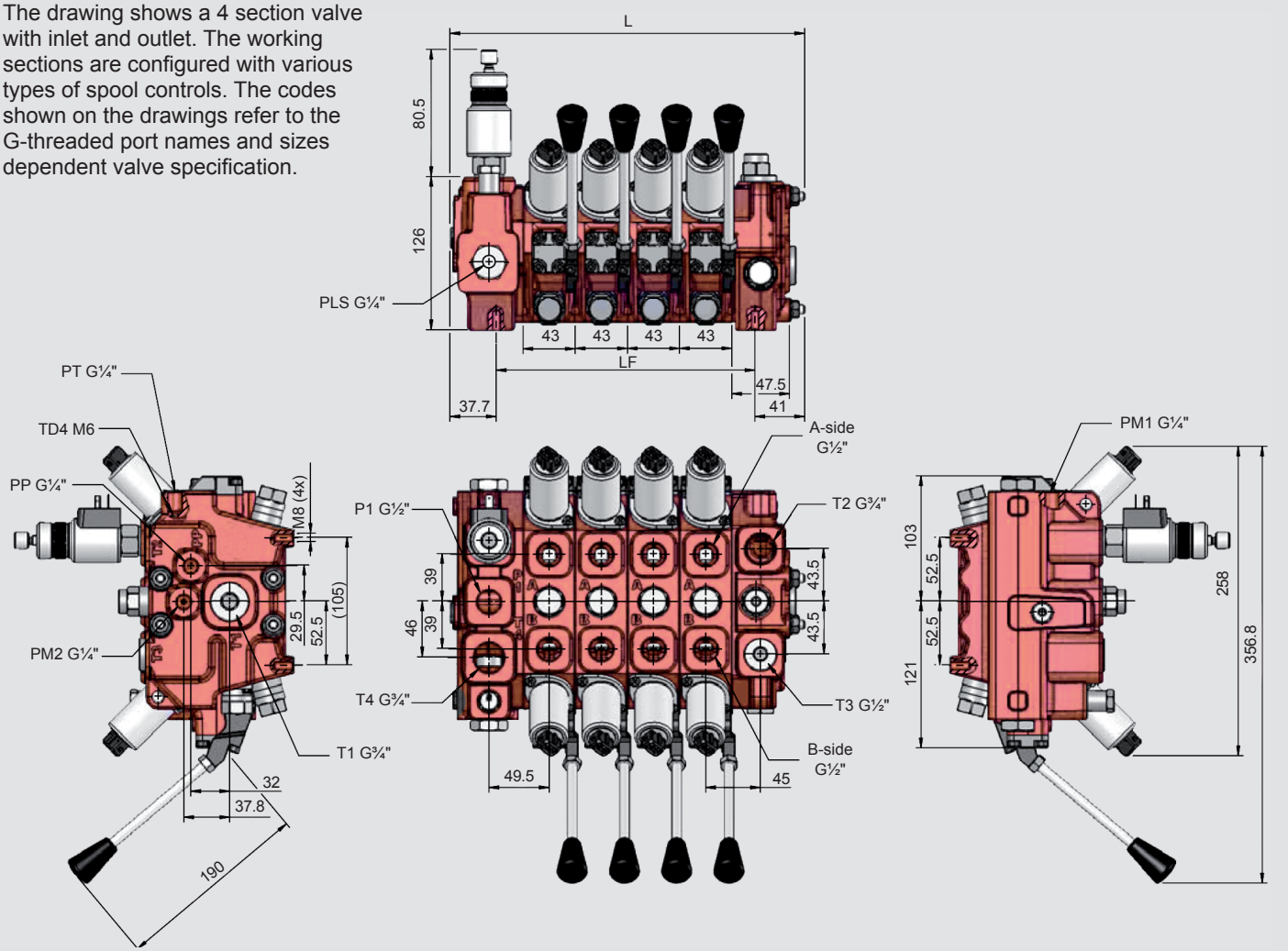
Note: The pressure drop curves P – A/B and A/B – T are valid for sections equipped with spools that are fully open at maximum spooltravel.

Pressure drop A/B – T



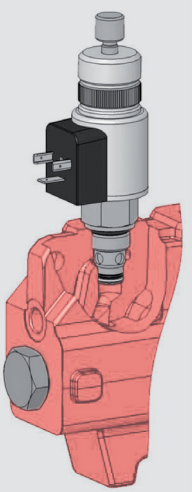
Dimensions and weight

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



Weight	
Inlet section	6.3 kg
Working section	5.0 kg
Outlet section	4.6 kg

No. of working sections	L [mm]	LF [mm]
1	163	84
2	206	127
3	249	170
4	292	213
5	335	256
6	378	299
7	421	342
8	464	385
9	507	428
10	550	471



Electrical unloading

Data	
Rated flow:	40 l/min
Power consumption:	18 W (12 V) 19 W (24 V)
Rated voltage E912:	12 V
Rated voltage E926:	24 V
Max. voltage variation:	+/- 15 %
Duty factor*:	100 %
Connection**:	Connector according to EN 175304-803 (form A)
Protection class:	IP65

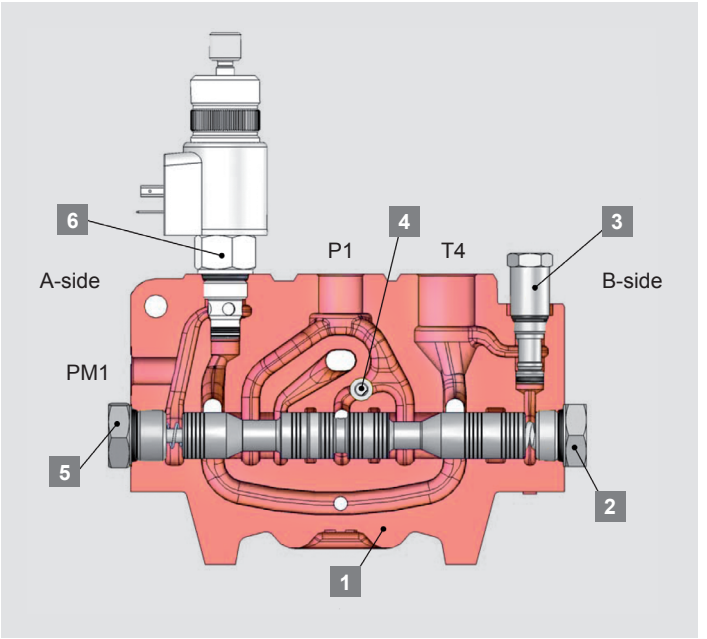
* Sufficient cooling must be provided.

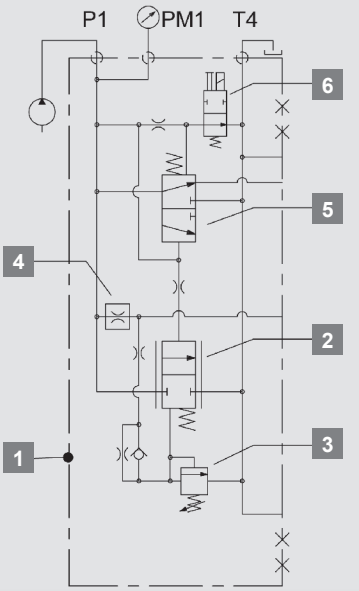
** Other options available on request.

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

Inlet section I01G

With flow control and electrical unloading function





1	Inlet section	I01G
2	By-pass flow control unit	FK301
3	Pilot relief valve	TB12
4	Metering orifice for center gallery	PF305
5	Unloading unit	FU301
6	Solenoid operated valve	E926

Main relief function

The by-pass flow control valve FK301 2 in combination with the relief valve TB12 3 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: 35 – 300 bar (3.5 – 30.0 MPa)
- Setting range step: 5 bar

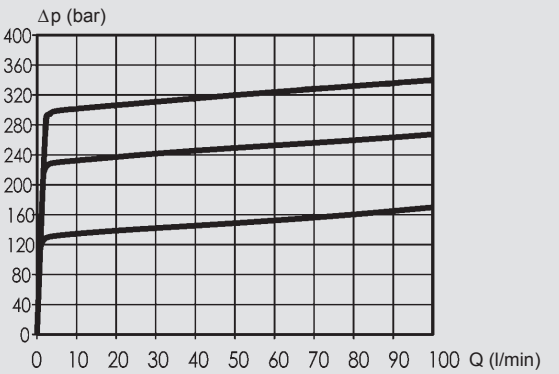
The I01G 1 with its integral Q-function provides by-pass of pump flow to tank when idling, thereby reducing pressure drop and heat generation. The flow control function of the inlet also regulates the flow to the user corresponding to the travel of a partially selected spool. This, in addition to reduced flow forces and a control response largely unaffected by varying pump flows, contributes to the excellent operating characteristics achievable with RS 220.

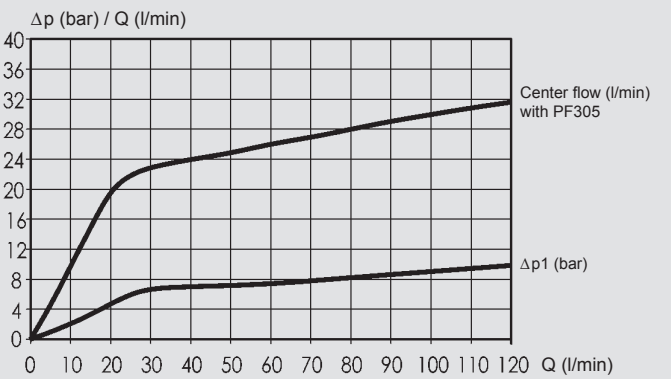
The solenoid selected relief valve shuts off the oil supply to the valve sections.

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 gallery is set by an exchangeable metering orifice.

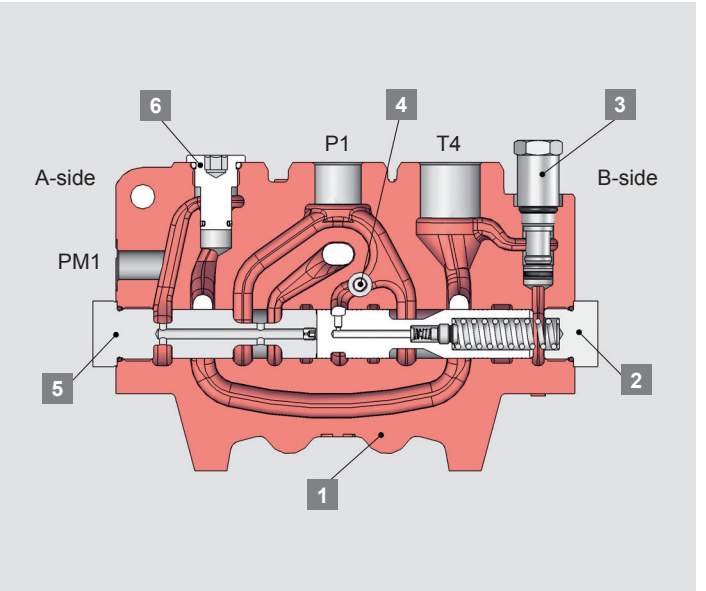
The opening of the by-pass flow control spool is cushioned by a special check valve integrated in the spool.



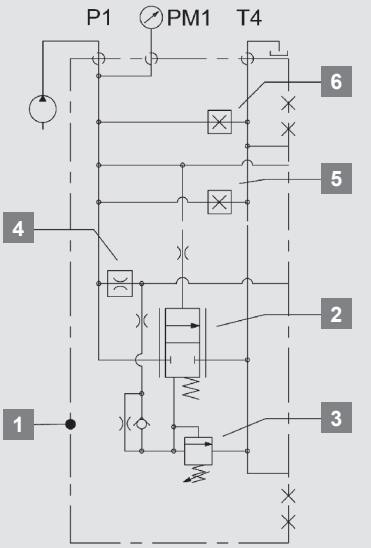


Inlet section I01G

With flow control and without unloading function



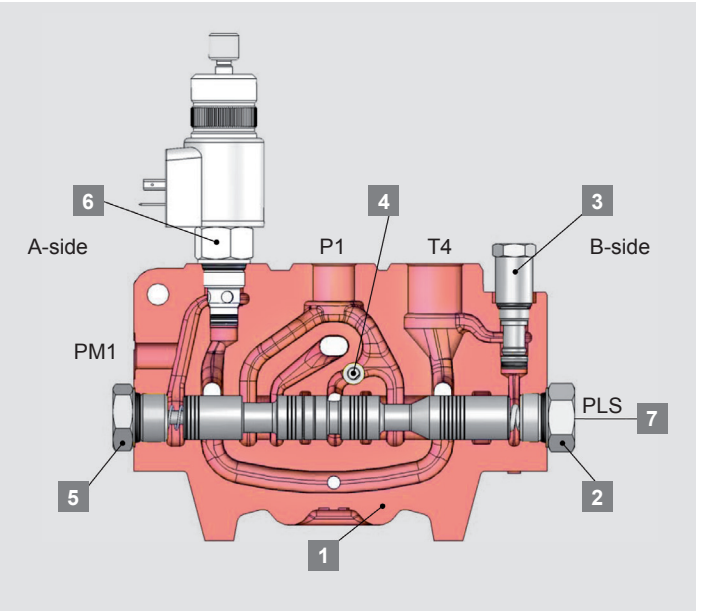
The inlet section can also be supplied without the unloading function. The unloading spool and the solenoid operated valve in that case are replaced by blanking plugs.



1	Inlet section	I01G
2	By-pass flow control unit	FK301
3	Pilot relief valve	TB12
4	Metering orifice for center gallery	PF305
5	Plug replacing unloading unit	PU300
6	Plug replacing electrical unloading valve	PE20

Inlet section I01G

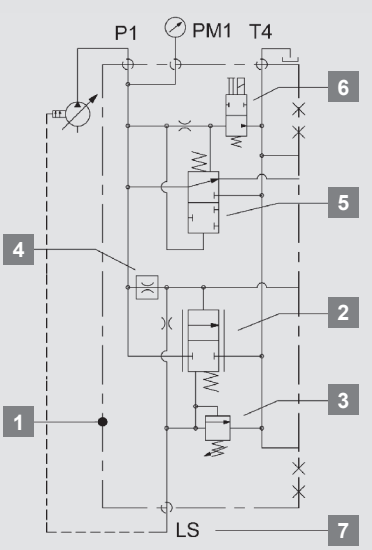
For systems with variable displacement pumps



The inlet section I01G 1 can also be used in valves in systems with variable displacement pumps. The pump must be of the LS-regulated type. 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 gallery. The regulated flow is set by the combination of metering orifice and actual stand-by pressure from the pump.

Preferably, the max. system pressure is set in the pump but as an extra safeguard 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 that the metering orifice is specific to the pump.

Use PF302 4 if the stand-by pressure is 14 bar, PF303 if it is 20 bar and PF304 if it is 24 bar. Generally the stand-by pressure is

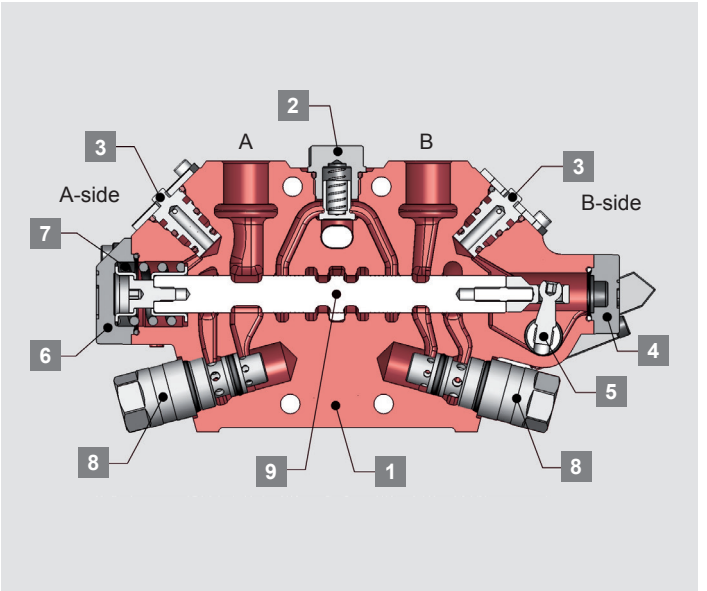


1	Inlet section	I01G
2	Primary relief valve	FK310
3	Pilot relief valve	TB12
4	Metering orifice for center gallery	PF302, 303, 304
5	Shut-off unit	FU302
6	Solenoid operated valve	E926
7	LS-port	

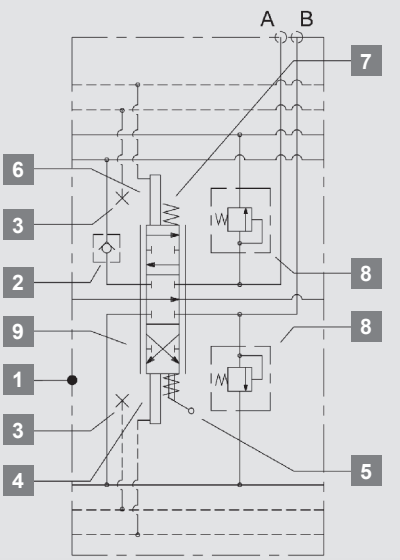
significantly higher than the pressure drop over the metering orifice in an open center system. This means that the metering orifice in a system with variable pump has to be smaller. The solenoid selected relief valve shuts off the oil supply to the valve sections. Together with a load holding valve this provides emergency shut off of the oil supply.

Working section S01G

Manually operated



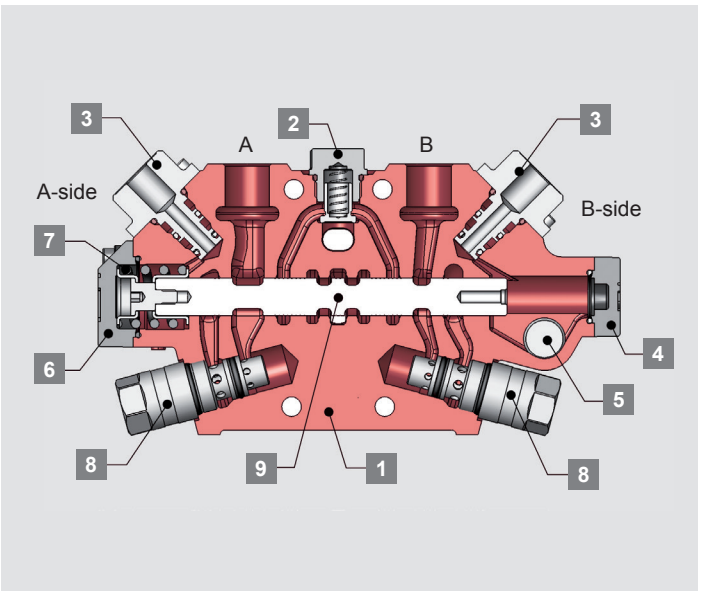
The working section S01G 1 is shown equipped as manually operated. Existing cavities for solenoid valves are fitted with blanking plugs (PE11) 3 which connect (drain) the spool ends to the tank. This is necessary because there are no spool seals to separate the return line galleries from the spool ends. This feature provides very good protection for spool ends (ideal for marine use) and minimizes the risk of external leakage.



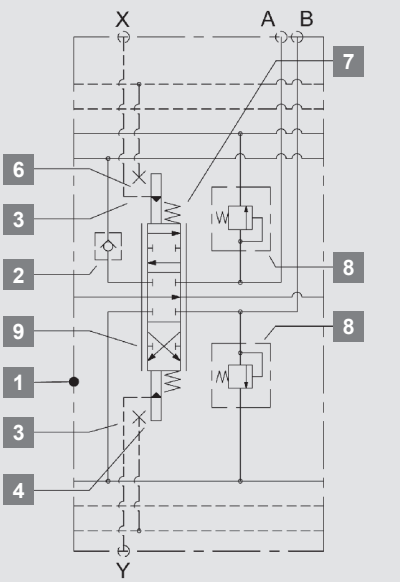
1	Working section	S01G
2	Load check valve	MB22
3	Plug	PE11
4	Spool control, B-side	B01
5	Lever mechanism	LMA
6	Spool control, A-side	9
7	Centering spring for manual control	MS
8	Service port valve	TBD160
9	Spool	

Working section S01G

Hydraulically operated



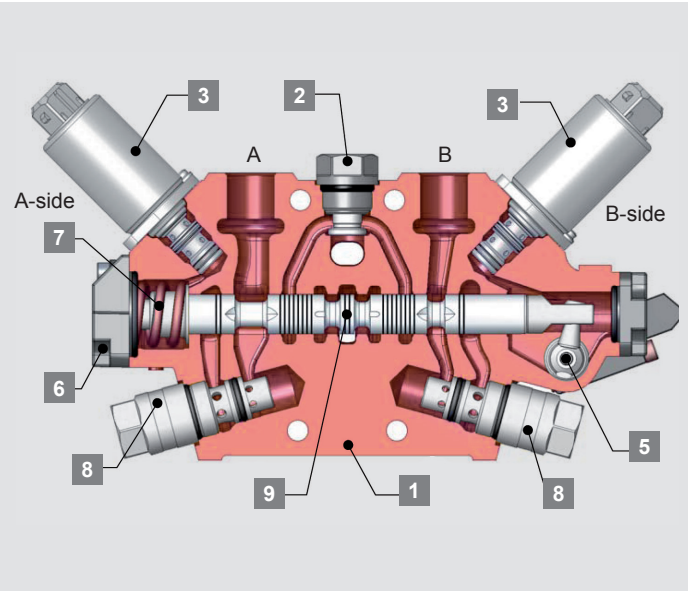
The working section S01G 1 is shown equipped as hydraulically operated and without manual override. Adapters (HG10) 3 are fitted into the solenoid valve cavities. They connect the pressure from a hydraulic control valve to the spool ends.

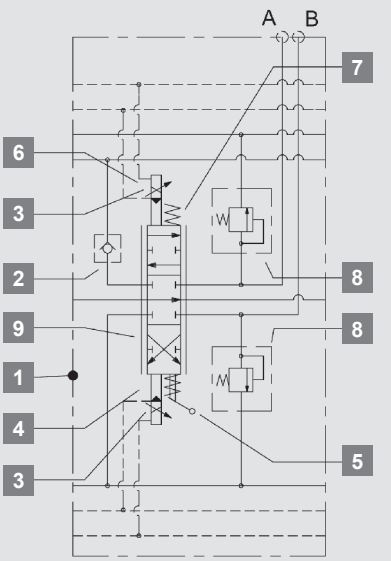


1	Working section	S01G
2	Load check valve	MB22
3	Adapter for hydraulic remote control	HG10
4	Spool control, B-side	B01
5	Plug, replacing lever mechanism	PM02
6	Spool control, A-side	9
7	Centering spring for proportional control	PS
8	Service port valve	TBD160
9	Spool	

Working section S01G

Electro-hydraulically operated





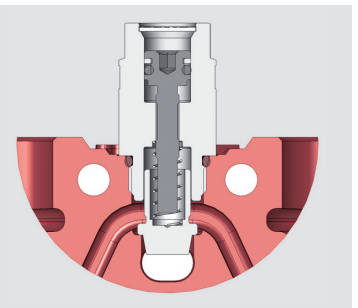
The working section S01G 1 is shown equipped to be electro-hydraulically operated and with manual override. The mechanism for the manual override is an option and can be replaced by a blanking plug.

Valve sections can be varied to suit different types of control.

The centering springs are specified separately.

1	Working section	S01G
2	Load check valve	MB22
3	Solenoid operated valve for proportional control	ER64
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	TBD160
9	Spool	

Load check valve



Load check valve MF22

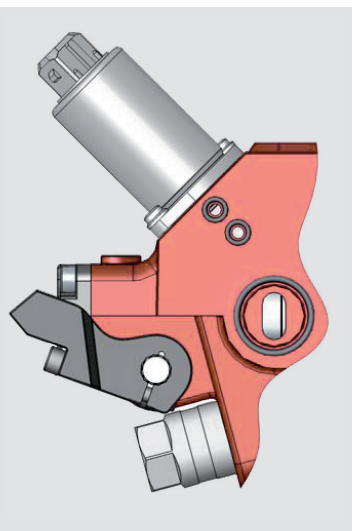
The main function of the load check valve is to prevent backwards movement of the load when the load pressure is higher than the pump pressure during operation.

MB22
Load check valve.

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

MP22
Plug without load check valve. This option is designed, for example, when the function is equipped with pilot operated load holding valves.

Solenoid valve ER62/64 for electro-hydraulic proportional (EHP) control



Note: If used an "on-off" valve it is recommended to limit the current e.g. with 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 cycle	100 %
Connection	AMP Junior-Power-Timer
Recommended PWM frequency	100 Hz
Protection class	IP 65
Ambient temperature	-30 °C up to +80 °C

ER62

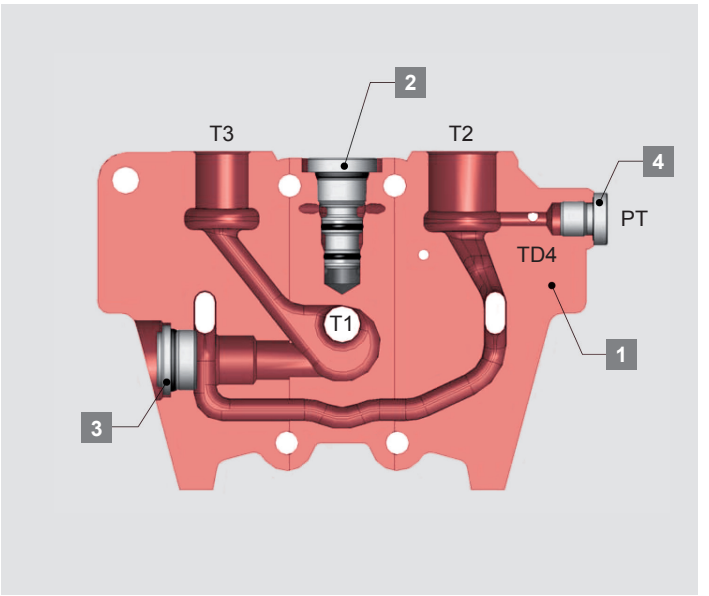
Rated voltage	12 V DC
Starting current	500 mA
Max. current	1,200 mA
Coil resistance @ +20 °C	4.72 Ohm

ER64

Rated voltage	24 V DC
Starting current	250 mA
Max. current	600 mA
Coil resistance @ +20 °C	20.8 Ohm

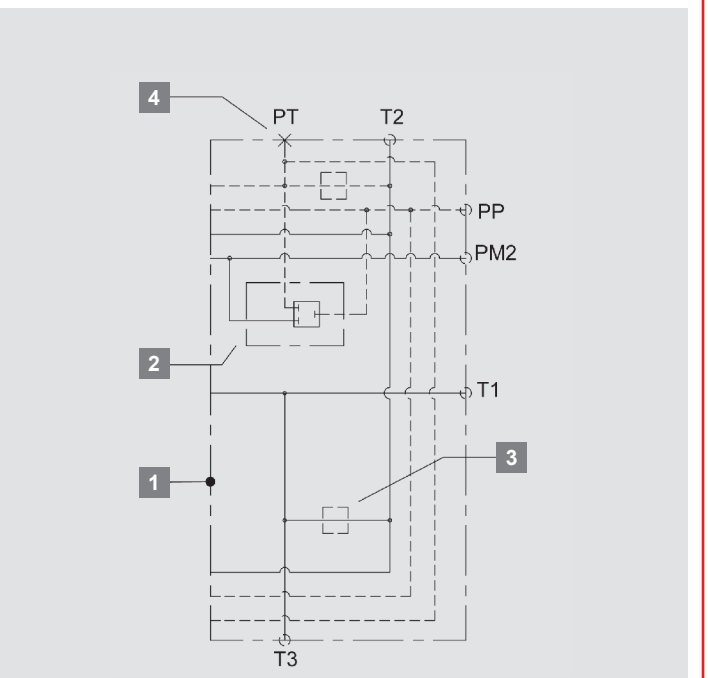
Outlet section U01G

Without internal pilot oil supply function



The outlet section U01G 1 is shown equipped for hydraulically or manually operated sections.

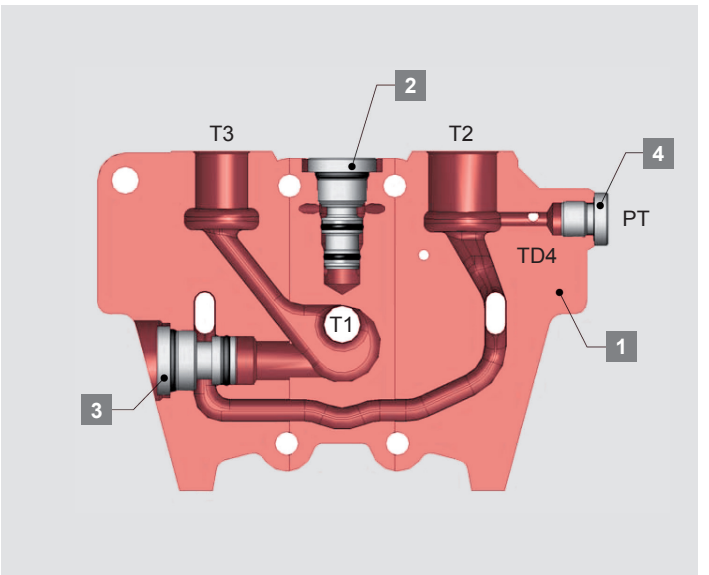
The cavity for the pressure reducing valve is plugged, P63 2.



1	Outlet section	U01G
2	Plug	P63
3	Plug	PK400
4	Plug	PG02

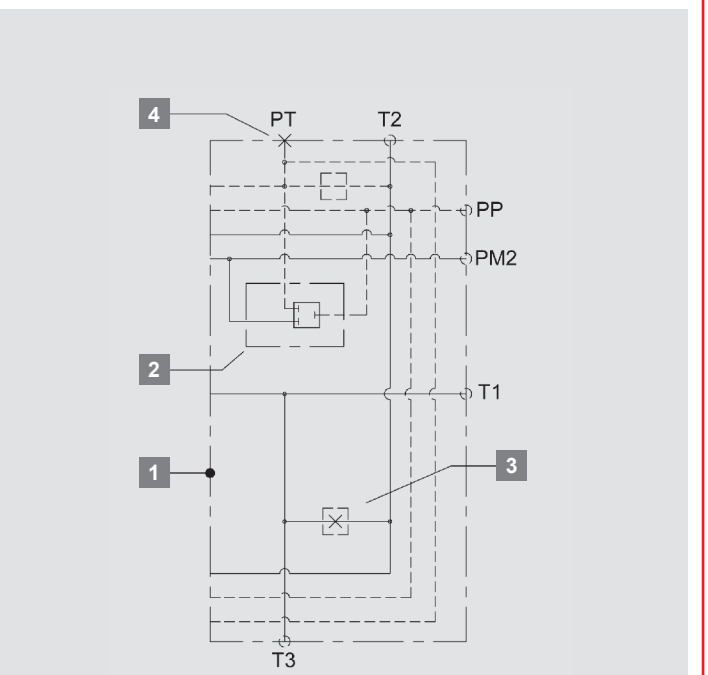
Outlet section U01G

With high pressure carry-over function



The outlet section U01G 1 is shown equipped for hydraulically or manually operated sections and for high pressure carry-over function. Note that the carry-over flow is regulated into the center gallery i. e. the flow determined by the metering orifice of the inlet section. With PF305 this is 25 l/min. The blanking plug P400 3 is fitted. High pressure carry-over ports can be either T1 or T3. The cavity for the pressure reducing valve is plugged with blanking plug P63 2. Only T2 can be used as tank connection.

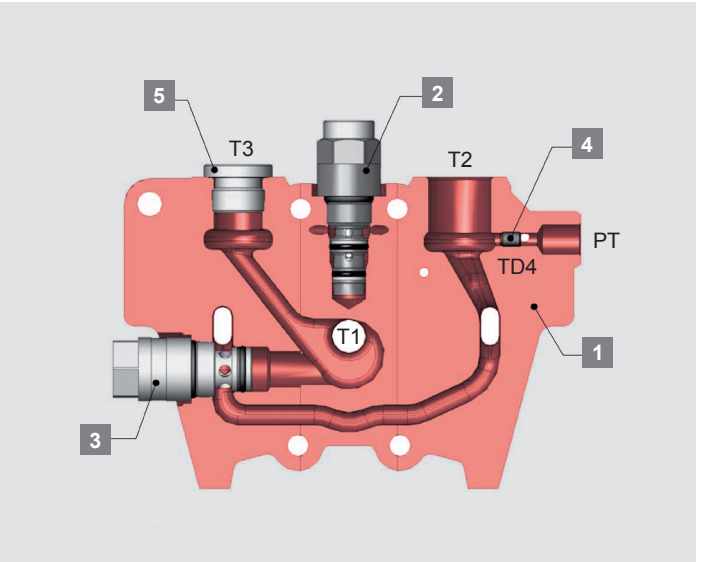
If in this case the plug P400 is replaced by the relief cartridge TBD160, it functions as relief valve for downstream services.



1	Outlet section	U01G
2	Plug	P63
3	Plug	P400
4	Plug	PG02

Outlet section U01G

With internal pilot oil supply function

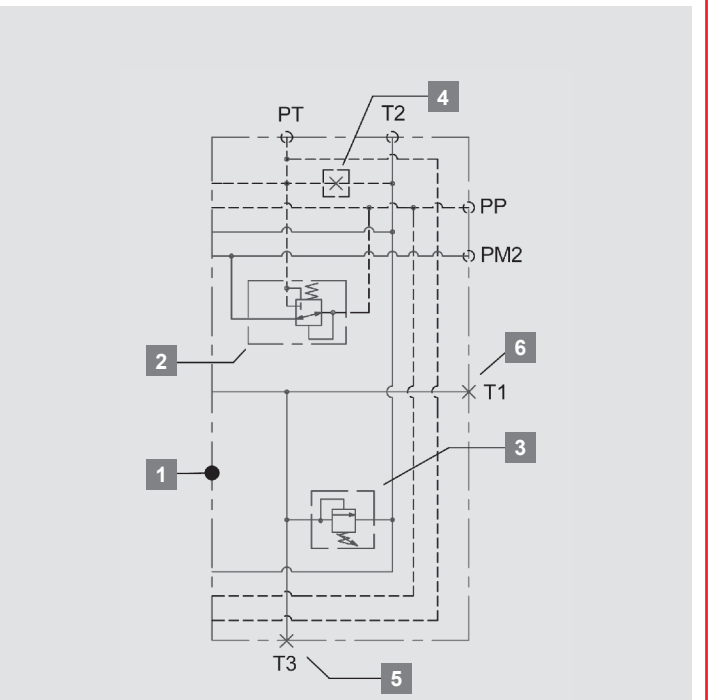


The outlet section U01G 1 is shown equipped for use in an electro-hydraulically operated valve. The outlet is configured for pilot supply to the valve sections.

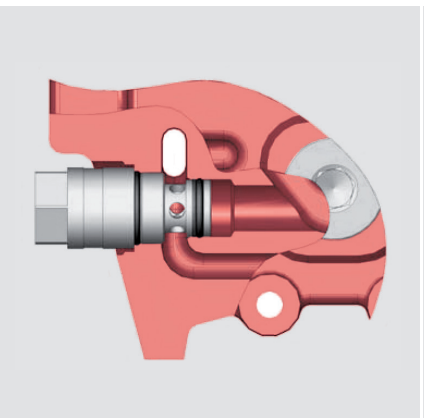
An initial pressure is determined by a pilot pressure valve in the center gallery. Ports T1 and T3 must be plugged.

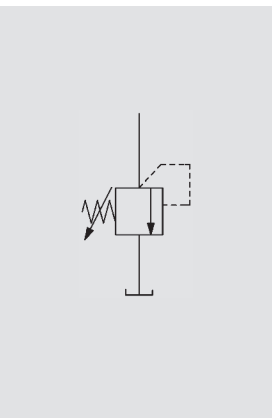
The pilot pressure is limited by a pressure reducing valve connected to the parallel gallery. Due to the fact that the unloading unit in the inlet shuts off the flow supply to the parallel gallery an emergency stop will also shut off the oil supply to the pilot circuit.

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



1	Outlet section	U01G
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	PG04
6	Plug in T1	PG06

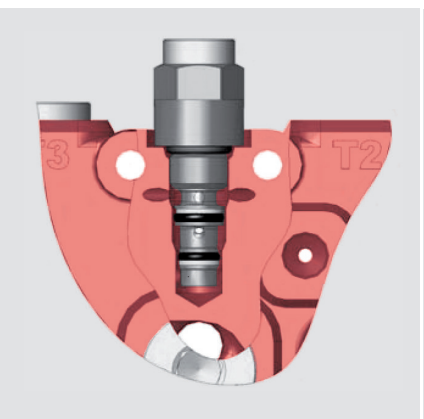


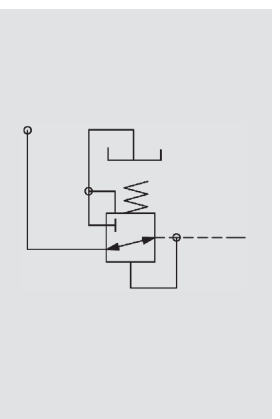


Pilot pressure valve TMB210/2

The cartridge type pilot pressure valve TMB210/2, normally set at minimum 14 bar, is used in the outlet section to ensure 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 check valve.

TMB210/2 is adjustable and sealable.





Pressure reducing valve TRA63

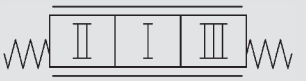
The cartridge type pressure reducing valve TRA63 is used in the outlet to provide pilot oil supply for remote control.

TRA63 is factory pre-set set at 24 bar which consequently is the maximum available pressure level in the pilot system.

Spool controls A-side

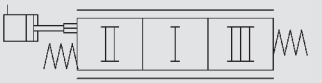
Spool control 9

Spring centering



Spool control LA

External hydraulic kick-out
from spool position III to I



Spool controls

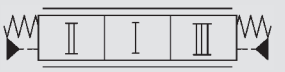
Electro-hydraulic control is achieved by using spool controls in combination with solenoid valves ER62/64 both on A-side and B-side.

The control will be proportional
with the PS spring

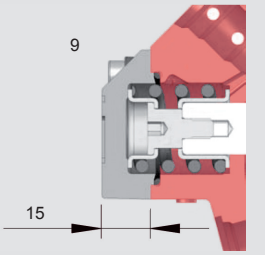
The control will be on-off
in combination with the MS spring

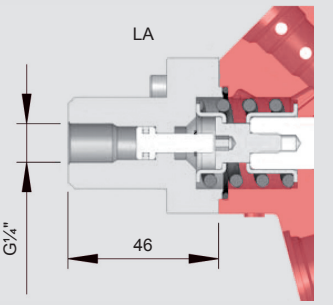
Hydraulic control is achieved by using spool controls in combination with adapters HG10 both on A-side and B-side.

The control will be proportional
in combination with the PS spring



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



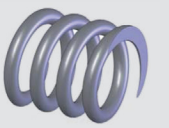


Spring – spool control

Type of centering spring must be specified in the valve configuration

MS spring for manual operation,
Forces 110 – 130 N

PS spring for proportional remote control,
Forces 120 – 320 N



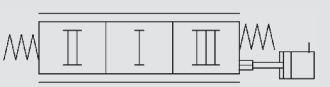
Spool actuator B-Side

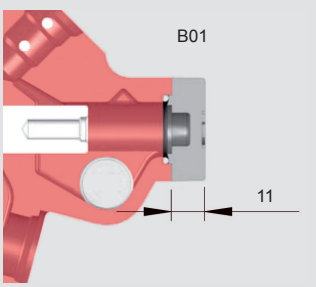
Spool actuator B01

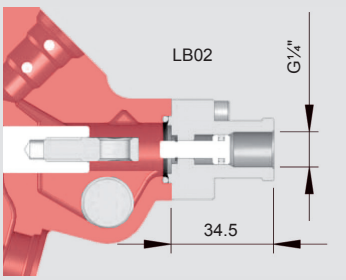
Cap

Spool actuator LB01

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

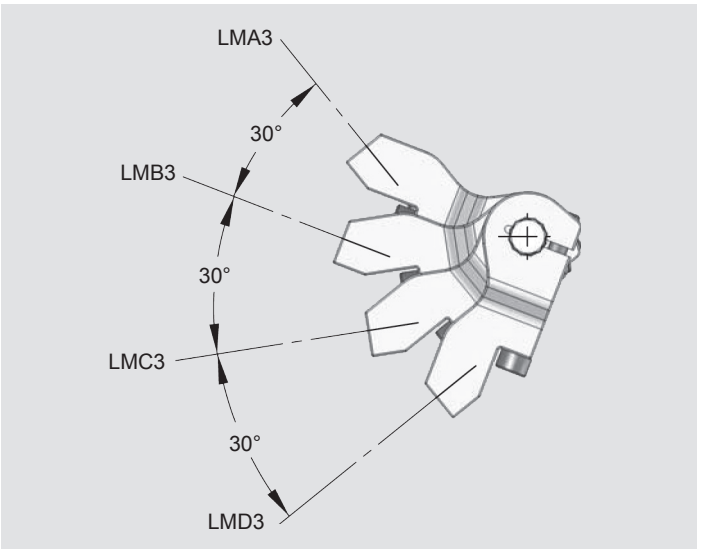






Note: Lever mechanism / cavity plugs as shown in pictures above are independent items to be configured separately.

Lever mechanism on B-side

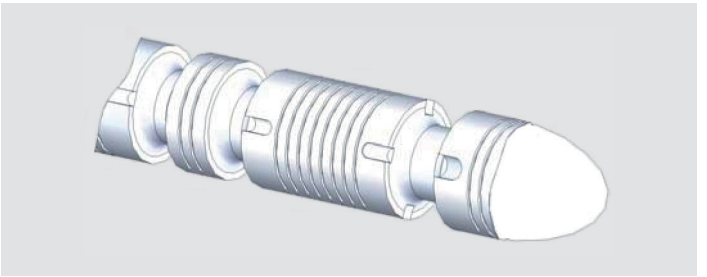


LMA3...LMD3
Mechanism with lever holder but without lever.
The lever MS190 must be ordered as a separate item.
The third letter in the code gives the angle for the assembly of the lever holder.

LM2
Lever mechanism without lever holder, lock nut and handle.

PM02
Plug replacing lever mechanism.

Spools – main design parameters



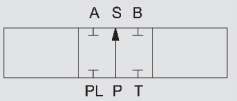
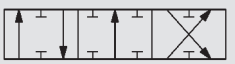
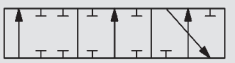
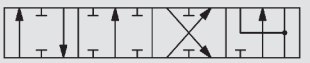
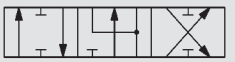
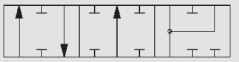
The RS 220 spools are available in a variety of flows and styles to accommodate most design requirements.
The spool matrix configurator below will help and guide you to select the correct spool for your application.
The development of new spools is a continuous process and not all available spools are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

For further details on spools please contact HYDAC.

Spool code

1	6	K	A	A

Type: **Symbol**

	
	
Spool 1	
Spool 2	
Spool 3	
Spool 4	
Spool 8	

Type of application:

A	Spool general use
K	Crane optimized
L	Loader optimized

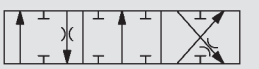
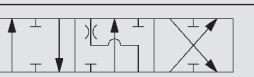
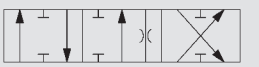
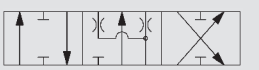
Pump flow, Q-inlet:

6	30 – 50 l/min
8	50 – 75 l/min

Detailed requirements:

A	Standard
	Example:
–	Restricted flow
–	Asymmetric
–	Spool end

Function:

A	Standard
S	 Slewing spool
X	 A-port drained to tank in neutral position
Y	 B-port drained to tank in neutral position
Z	 A/B-ports drained to tank in neutral position

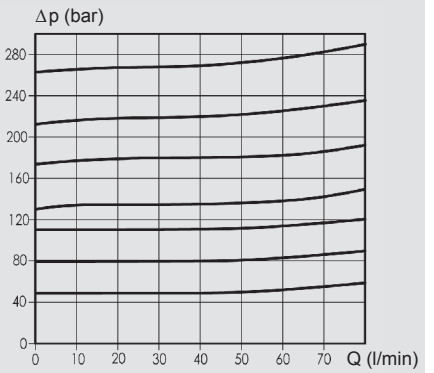
Service port valves

Port relief valve TBD160

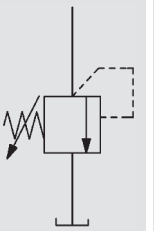
The TBD160 is a differential area, direct acting relief valve, for the secondary circuit.
It is adjustable and sealable.

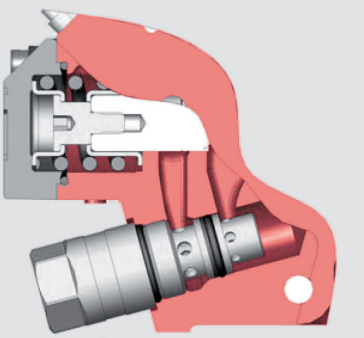
Setting ranges
for TBD/TBSD160:

- 35 – 300 bar
  (3.5 – 30.0 MPa)
- Setting range step: 5 bar



Relief characteristics TBD/TBSD160

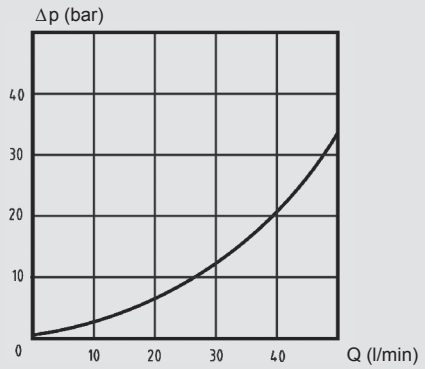




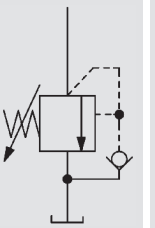
Port relief and anticavitation valve TBSD160

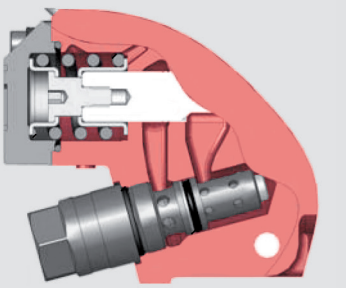
See TBD160 for functional principle.

TBSD160 is adjustable and sealable.



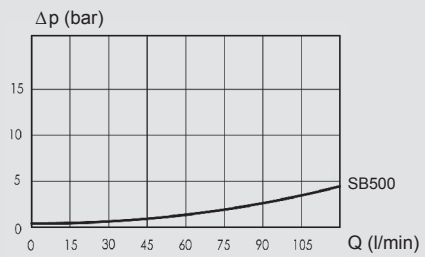
Anticavitation characteristics TBSD160



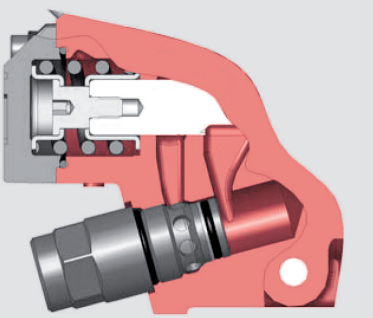


Anticavitation valve SB500

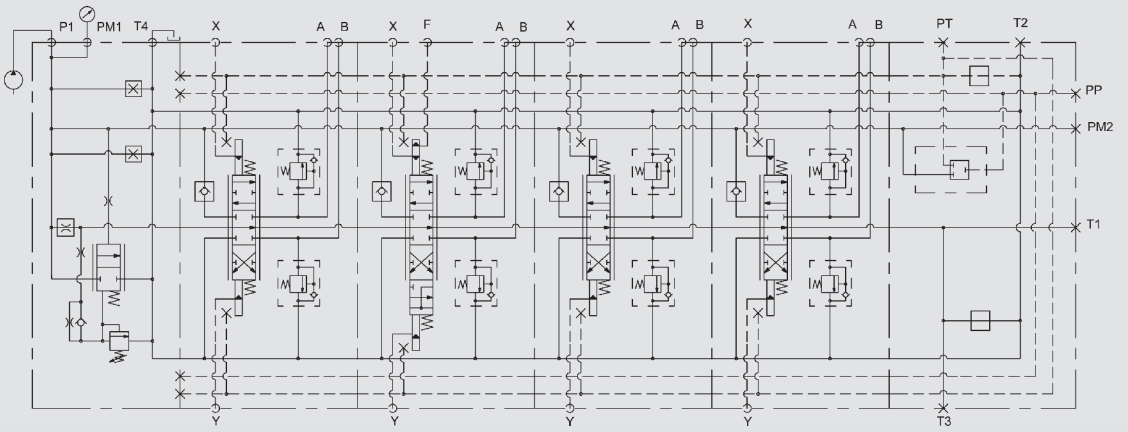
The anticavitation valve ensures that, in the event of a lower pressure in the cylinder port than in the tank, oil can be drawn from the system oil reservoir, as required.



Anticavitation characteristic SB500

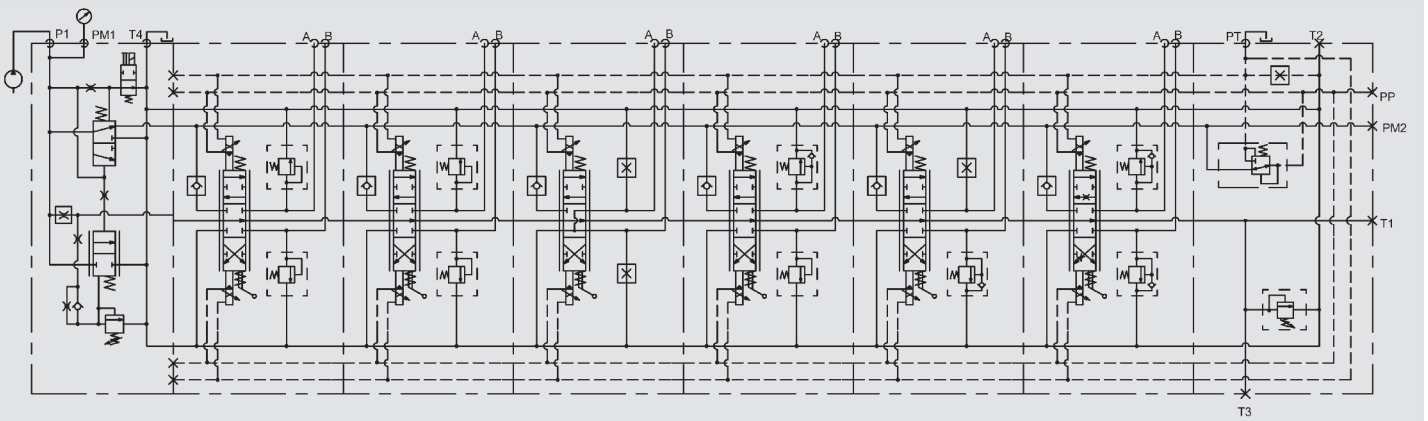


Typical hydraulic diagrams



Hydraulic remote controlled valve.
2nd section with 4-position spool.
Single circuit.

Inlet section with flow control but without unloading function.



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

Notes

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.

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