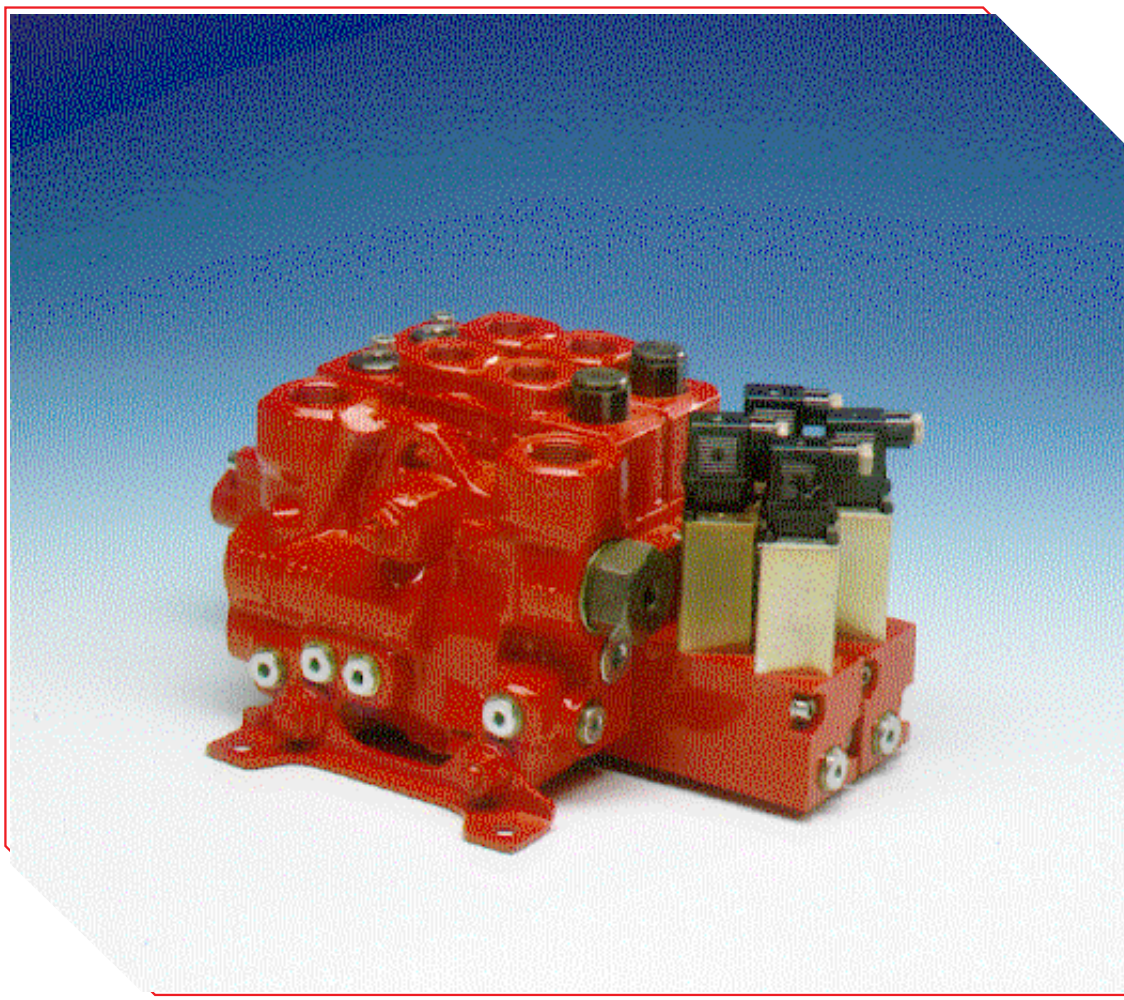
VOAC Hydraulics

Directional Control Valve K170LS

Proportional, load sensing and pressure compensated valve

Catalog 9129 8557-02 (GB)
Catalog 9129 8557-06 (US)
May, 1997



Parker Motion & Control

Ordering information

The K170LS directional control valve can easily be customized with the aid of a special computer program designed by VOAC Hydraulics. This enables you to optimize your valve specification to give peak performance in the intended application and specific hydraulic system.

Once the demands placed on each individual function have been specified, the computer proposes the valve design required to give optimum performance. The computer also produces documentation for your valve, in the form of a detailed specification and hydraulic circuit diagram.

Customers are encouraged to submit their requirements to VOAC Hydraulics as early as possible, preferably at the planning stage. Not only do we have knowledge about the way in which different systems work, we also know which systems will perform best for any given combination of functions and economic demands.

If you wish to specify the valve yourself, this can be done easily with the aid of an ordering form for the K170LS, which contains concentrated information about the standard options.

The information is then input to the VOAC Hydraulics specification program, which generates documentation and a unique, customer-specific identification number for each valve type. The number is then stamped into the I.D. plate of each valve. The specification of your valve remains registered at VOAC Hydraulics, so that identification of the product can be made at any time in the future to facilitate repeat ordering or servicing.

Catalogue layout

This catalogue includes descriptions of the many standard options that can be ordered for each function built into the K170LS valve. VOAC Hydraulics also customizes valves for specific applications - please contact us for further information in this respect.

Each function has a designation in parenthesis e.g. [00], which agrees with the corresponding function item number on the VOAC valve specification forms you may use to specify exactly the valves you require. The data on the specification forms is then used by our computerized specification program to generate the required valve. The system of function numbering is designed to make it easy for you to find performance-related and technical data for the individual functions you wish to have incorporated in your valve.

The item numbers and codes used in all sub-circuit diagrams in this catalogue correspond to the numbers used in the general circuit diagram for the K170LS valve on page 7.

Filtration

Filtration must be arranged so that Target Contamination Class 18/14 according to ISO 4406 is not exceeded. For the pilot system, Target Contamination Class 16/13 according to ISO 4406 is recommended.

VOAC Hydraulics reserves the right to modify products without prior notice.
Typical curves and diagrams are used in this brochure.
Even though the brochure is revised and updated continuously, there is always the possibility of errors. For more detailed information about the products, please contact VOAC Hydraulics.

Conversion factors

1 kg	= 2.2046 lb
1 N	= 0.22481 lbf
1 bar	= 14.504 psi
1 l	= 0.21997 UK gallon
1 l	= 0.26417 US gallon
1 cm^3	= 0.061024 in^3
1 m	= 3.2808 feet
1 mm	= 0.03937 in
9/5 °C + 32 = °F	

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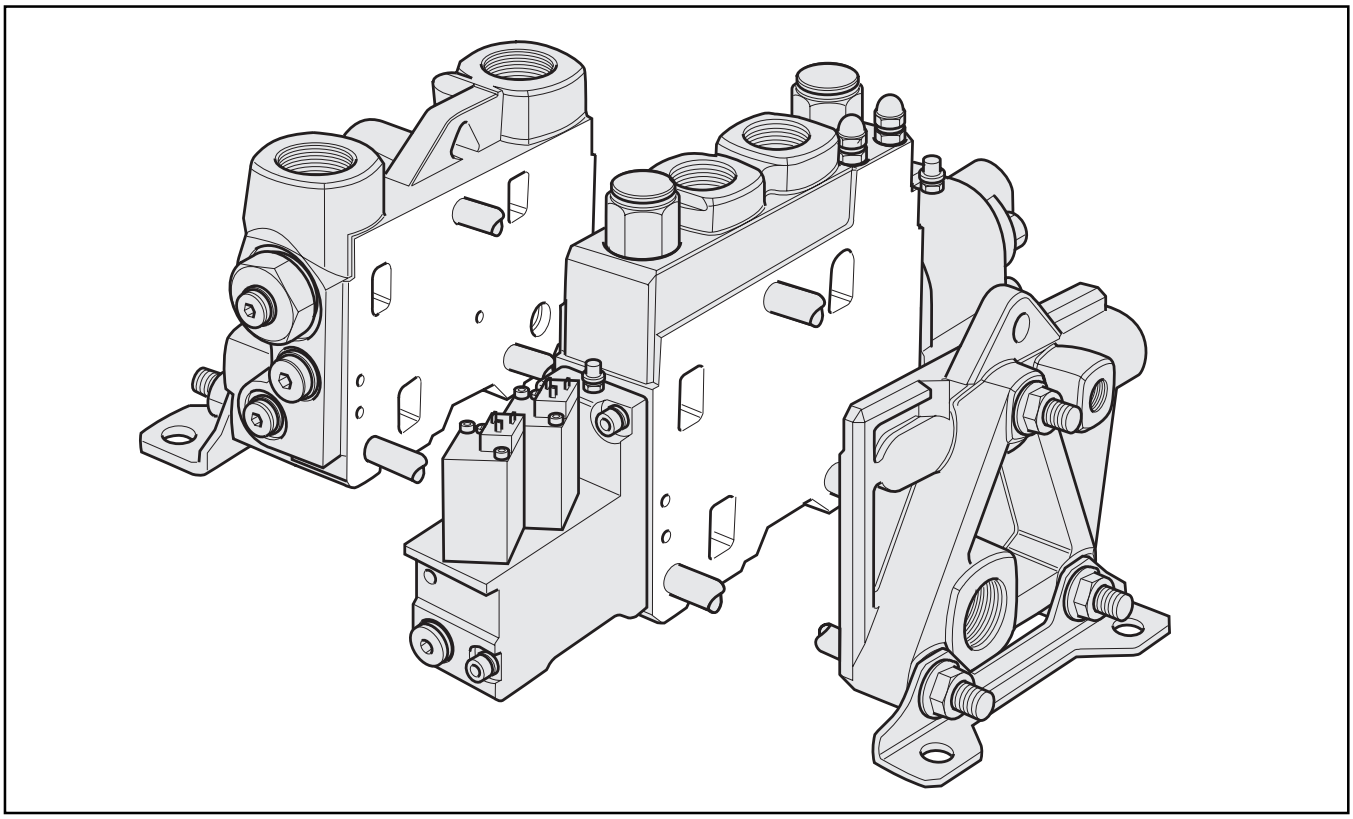
[00] refers to item numbers in the customer specification.



General

The K170LS is a stackable, proportional, load-sensing, pressure-compensated directional control valve, which can also be adapted to give force-sensing control characteristics. It is designed for many different applications, both mobile and industrial, and is widely used in machines such as front-end loaders, backhoe loaders, excavators, cranes, forestry equipment, metal presses and forging hammers.

With its function-adapted spool sections, wide range of additional functions and standard accessories, the K170LS enables the user to optimize the machine and its hydraulic system in the following ways:

Compact system construction

While the K170LS can contain many integrated functions, it requires a minimum of external piping. With the aid of a special adapter plate, it can be mounted directly to the similar, smaller-flow L90LS directional valve, giving great compactness and outstanding operating economy.

Freedom in machine design

The K170LS is designed for proportional hydraulic or electro-hydraulic remote control. This gives great freedom in the location of components, and in the running of pipework, hoses and cables.

Economy

The K170LS can be modified or expanded to suit customer specifications. Function and application adaptation enables energy consumption to be kept to a minimum.

Control characteristics

The control characteristics for both lifting and lowering movements are outstanding, thanks to the unique function adaptation of spools, pressure compensators, feed reducing valves etc. Each function is completely independent of other simultaneously operated functions.

Construction

The K170LS is a stackable valve, and can be delivered in combinations of 1 to 9 spool sections. It is designed for system pressures of up to 320 bar (nodular iron), and can be fitted with motor-port relief valves that open at a maximum pressure of 350 bar. Suitable flow range can be up to 280 l/min (2 x 280 l/min with mid inlet). The recommended flow per section is 170 l/min with a pressure compensator, and 220 l/min without.

As an optional, the K170LS can be given a built-in pilot pressure supply in the inlet section, as well as pressure compensation and feed reduction in the spool sections. The feed reducer is adjustable from 30 to 300 bar. Pressure feed-back (optional) enables a force-sensing function to be incorporated in to the valve. Moreover, fixed or pilot-operated counterpressure valves can be integrated into inlet section to give back-pressure supported load lowering and exceptionally god anti-cavitation characteristics.

System adaptation

The K170LS is a load sensing, pressure-compensated directional valve with unique possibilities for adaptation in respect of both functions and applications to systems with variable LS pumps.

Valve characteristics

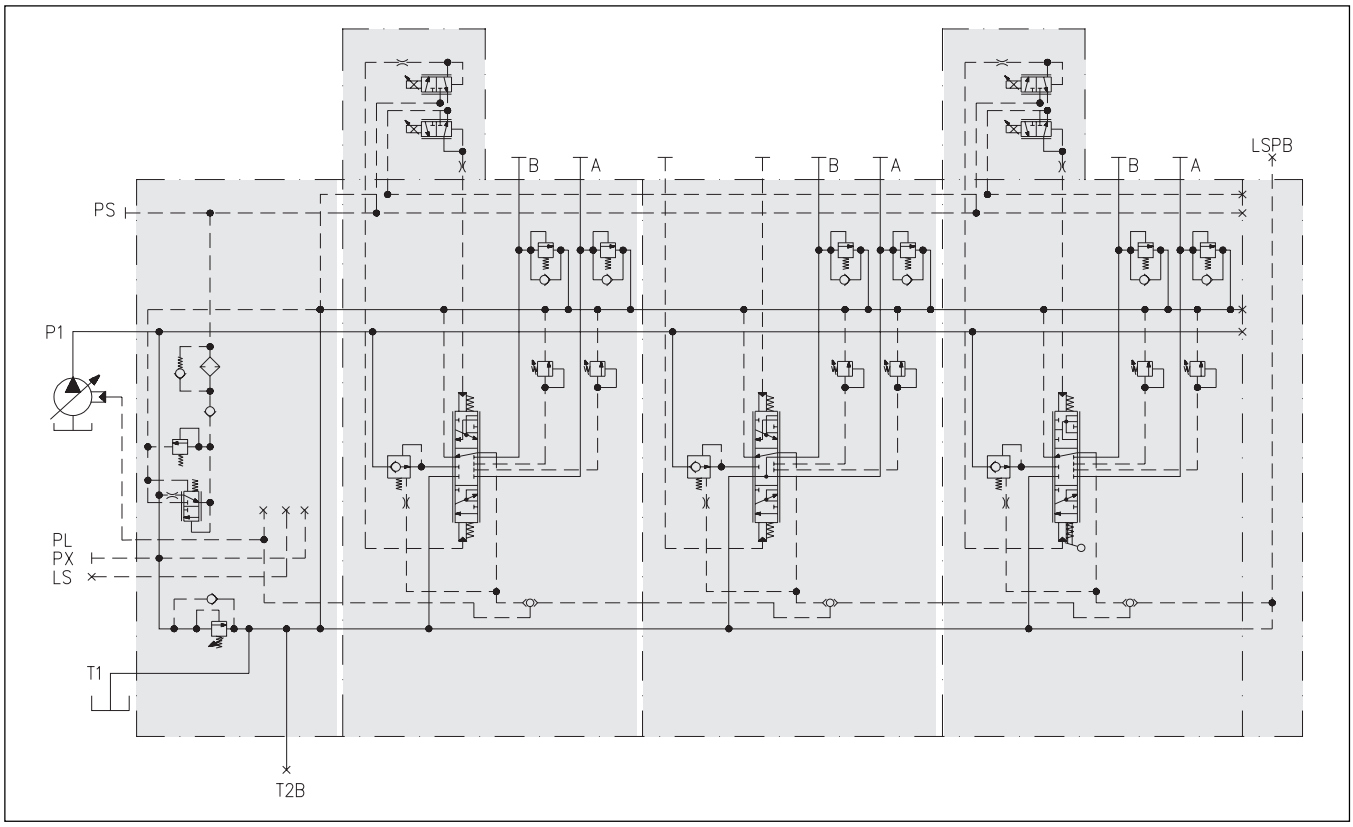
Copied load signal:
The system permits consumption in the load signal line to the pump, without the signal level being affected.

Pressure compensation:
Pressure-compensated spools for lifting and lowering movements. Separate compensator for each spool section for excellent pressure compensation.

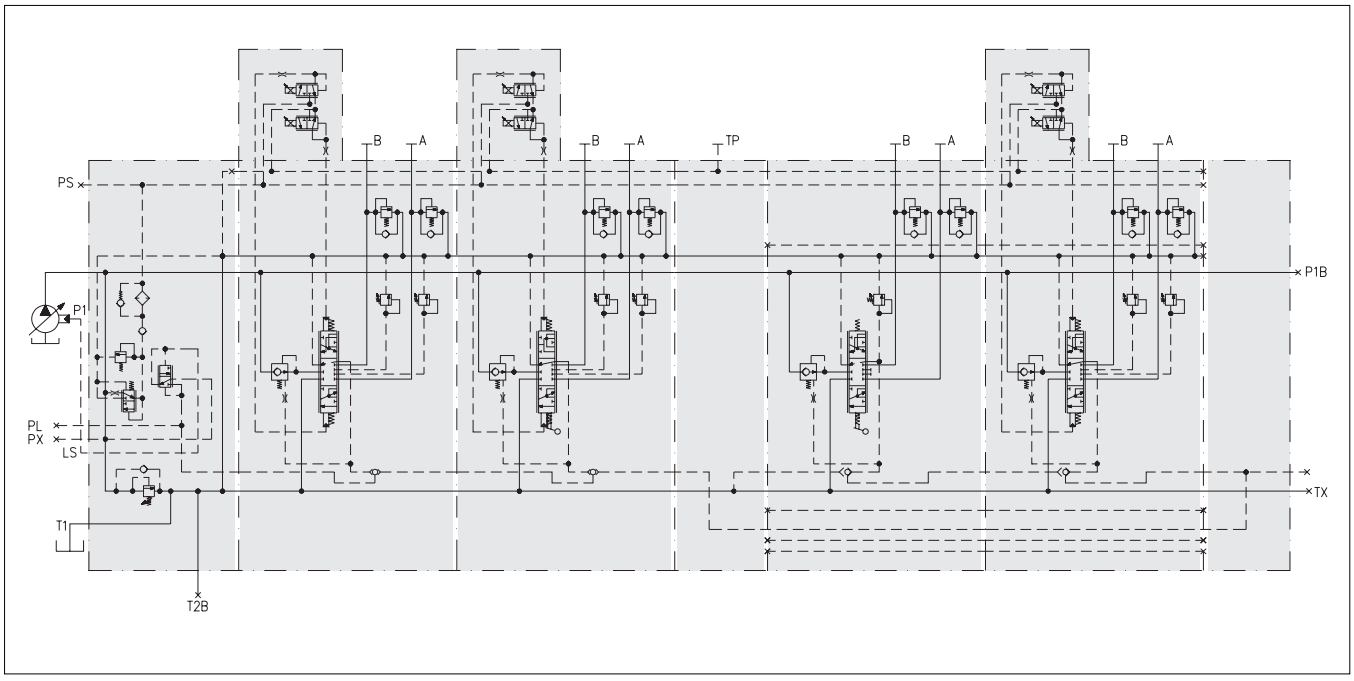
Feed reducers:
Individually adjustable between 30 and 300 bar for each service port. Reduction can also be controlled remotely.

Force control:
Force-sensing control characteristics (made available through the pressure-feedback option) give not only effective force control, but also more gentle transition across at speed changes and greater stability in the hydraulic system.

Counterpressure valve:
Built-in counterpressure valve in two versions (fixed setting or pilot control) for best application-adaptation.

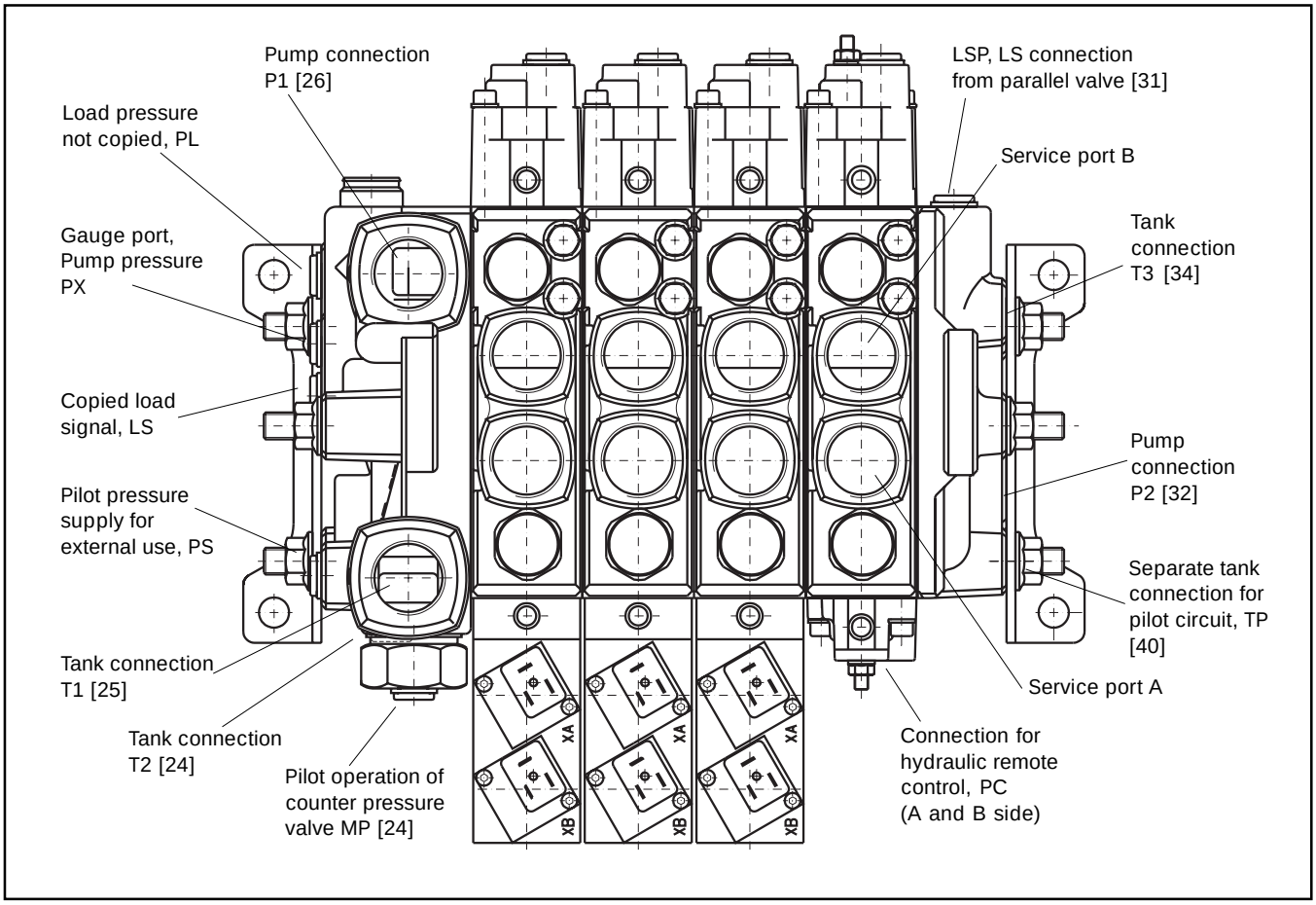


K170LS with built-in hydraulic, electro-hydraulic, or combined manual and electro-hydraulic spool actuator. In this example, the valve is not equipped with a copying function for the load signal (LS).



The K170LS valve connected to a L90LS valve. The L90LS valve is used for functions which requires less flow. This gives price advantages as well as operational advantages. The valve in this example fitted with an internal pilot pressure supply and individual pressure compensator, feed reduction and pressure relief valves.

Technical data



Pressure

Valves of grey-iron type

Pump inlet	max 260[1] bar (3800[1] psi)
Service ports	max 280[1] bar (4000[1] psi)
Valves of nodular-iron type	
Pump inlet	max 330[1] bar (4800[1] psi)
Service ports	max 350[1] bar (5000[1] psi)
Pump regulator	Δp min 18[2] bar (260[2] psi)
Compensator K3	Δp min 30[2] bar (435[2] psi)
Return line pressure, static	max 15 bar (220 psi)

1) Pressures given are maximum absolute relief pressures at 10 bar (145 psi) tank pressure
2) Pressure drop pump to valve max 3 bar (44 psi)

Internal pilot pressure

Standard setting	35 bar (500 psi)
Optional setting	45 bar (650 psi)

Feed reducer

Adjustment range	30 to 300 bar (435 to 4350 psi)

Counterpressure valve

Fixed setting	5 bar (70 psi)
Pilot operated, signal pressure	max 30 bar (435 psi)
Pressure ratio, pilot signal : counterpressure	1.2 : 1

Recommended flow rates

Pump connection	max 280[3] l/min (75 USgpm)
Service port with compensator	max 170[4] l/min (45 USgpm)
Service port without compensator	max 220[4] l/min (60 USgpm)
Return from service port	max 280 l/min (75 USgpm)

3) 2 x 280 l/min (2 x 75 USgpm) with mid inlet section
4) Depending on spool version

Weight

Valve with spool actuator type:

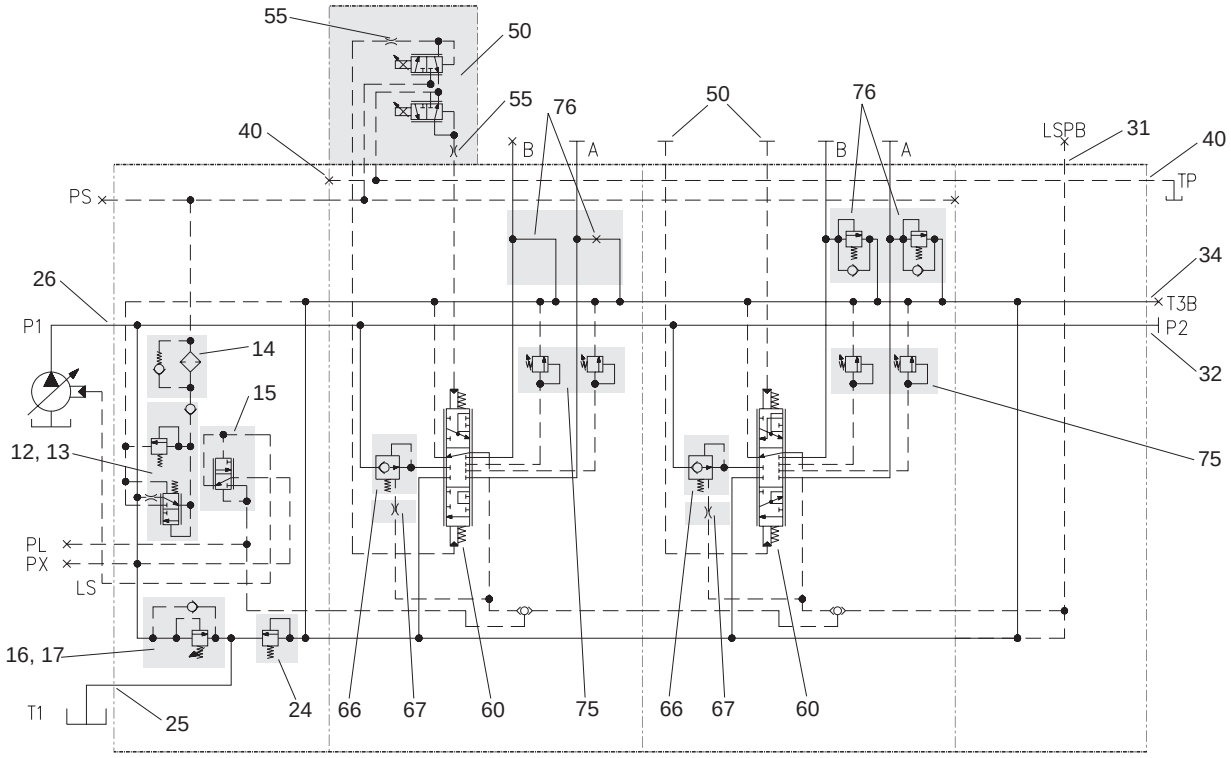
	PC		EC	
No. of sections	Weight in kg	Weight in lb	Weight in kg	Weight in lb
1	21.7	47.8	23.4	51.6
2	30.8	67.9	34.2	75.4
3	39.9	88.0	45.0	99.2
4	49.0	108.0	55.8	123.0
5	58.1	128.1	66.6	146.8
6	67.2	148.1	77.4	170.6
7	76.3	168.2	88.2	194.4
8	85.4	188.3	99.0	218.3
9	94.5	208.3	109.8	242.1

Connections

Threads type G are designed for a flat gasket according to ISO 228/1 (BSP pipe threads)
Type UN are designed for sealing by means of an O-ring according to standard SAE J 1926/1

P1	inlet section	G1 or 1 5/16 - 12 UN-2B
P2	end section	G1 or 1 5/16 - 12 UN-2B
T1, T2	inlet section	G1 or 1 5/16 - 12 UN-2B
A, B	spool section	G3/4 or 1 1/16 - 12 UN-2B
LS, PL	inlet section	G1/4 or 9/16 - 18 UNF-2B
PX, PS	inlet section	G1/4 or 9/16 - 18 UNF-2B
MP	inlet section	G1/4 or 9/16 - 18 UNF-2B
LSP	end section	G3/8 or 9/16 - 18 UNF-2B
T3	end section	G1/4 or 9/16 - 18 UNF-2B
PC	spool section	G1/4 or 9/16 - 18 UNF-2B
TP	end section	G1/4 or 9/16 - 18 UNF-2B

Hydraulic circuit diagram showing basic functions for K170LS



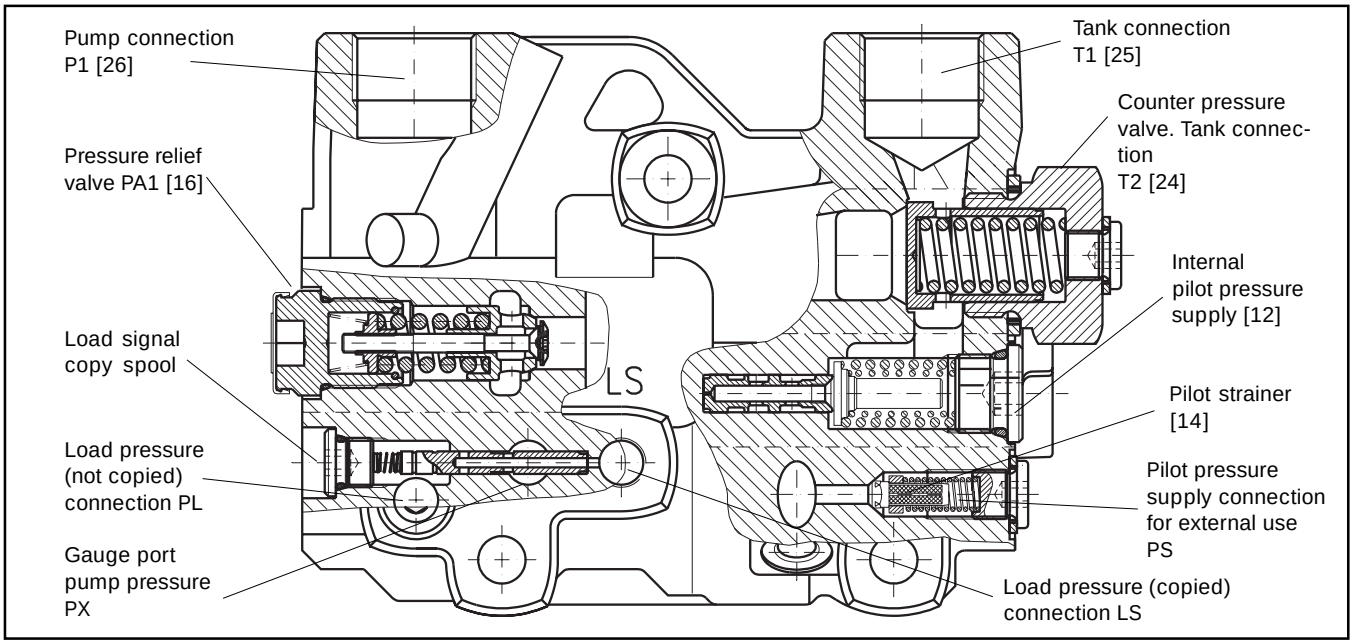
Shaded zones are functions or function groups to be found further on in the text.

The item numbers in the hydraulic circuit diagram and table below refer to the functions or function groups for which different options are available. The valve in the example above is equipped according to the description below. For other equipment alternatives, see under respective function [item number] in the catalogue.

Item	Code	Description
12	R	Pressure reducing valve with separate safety valve for internal pilot pressure supply.
13	35	Reduced pressure set to 35 bar
14	S	Internal coarse filter for pilot circuit.
15	LS	Load-sensing system
16	PA1	Direct operated main pressure relief valve, with fixed setting.
17	280	Pressure setting for main pressure relief valve
24	MF	Fixed counterpressure valve
25	T1	Tank connection open
26	P1	Pump connection open
31	LSPB	Load-signal connection for parallel-connected valve plugged.
32	P2	Pump connection open
34	T3B	Tank connection for warm-up flow plugged
40	TP	Separate tank connection for pilot return

Item	Code	Description
50	EC	Section 1 equipped with proportional electro-hydraulic remote control
	PC	Section 2 equipped with proportional hydraulic remote control
55	0,8	Restrictor in pilot supply line
60	EA	Section 1 equipped with spool for single acting function. Connect to A-port. B-port plugged
	D	Section 2 equipped with spool for double acting function.
66	K1	Pressure compensator with built-in check valve function
67	0,8	Restriction of load signal to compensator.
75	MR	With separate feed reducer on motor ports A and B
76	Y2	Section 1 port A. Service line cavity blocked M-T
	X2	Section 1 port B. Service line cavity open M-T
		Section 2 ports A and B. Combined port relief and anti-cavitation valve

Inlet section [12-29]



The inlet section is equipped with pump (P1) and tank connections (T1, T2), a connection for the load signal to LS pumps (LS), a connection for pilot pressure supply for external use (PS), a gauge point for pump (PX) and load signal pressures (PL). In the basic variant, the pump connection P1 [26] and tank connection T1 [25] are open, while the other connections are plugged.

Functions such as maximum pressure relief, copying of the load signal, pressure reduction for internal pilot-supply, as well as a pilot filter and counterpressure valves can also be integrated into the section.

Internal pilot pressure supply [12]

R Pressure reducer for pilot supply.
Internal pilot pressure supply is a valve function, built into the inlet section, which works as both a pressure reducer and a pressure relief valve in the pilot circuit. For safety reasons, the R-cartridge has also been equipped with a separate safety valve function that prevents the maximum permissible reduced pressure from being exceeded. A check valve prevents pilot oil from leaking back to the pump, and therefore enables the pressure in the pilot supply circuit to be maintained in the event of a temporary fall in pump pressure, e.g. during a rapid lowering movement, to secure pilot supply during pump pressure drop, we recomend to connect an accumulator to the PS port.
Pilot pressure for external use, e.g. for delivery to PCL4 hydraulic remote control valves, can be tapped from the PS connection on the inlet section.

RX Without pressure reducer for pilot supply.

Pilot pressure [13]

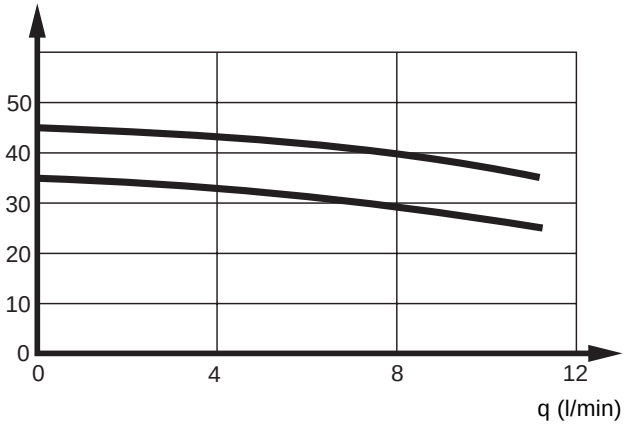
The pilot supply pressure can be set at either 35 or 45 bar.

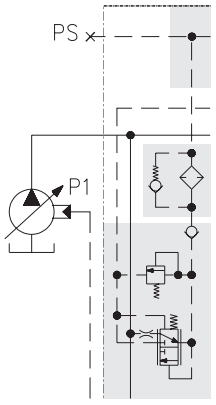
Pilot filter [14]

S Built in strainer for the pilot supply.
Coarse strainer with bypass function in the internal pilot pressure supply. The strainer protects the pilot circuit from dirt, especially during start-up of the system.

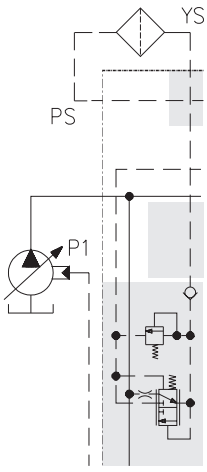
YS Adapter for connection of external filter for pilot pressure oil. Enables the pilot circuit to be supplied with cleaner oil compared with the rest of the system.

Δp (bar) Internal pilot pressure reducer characteristics





Internal pilot-pressure supply R and pilot strainer S



Internal pilot-pressure supply R and adapter YS. (Filter is not supplied with valve)

Load signal system

The load signal system consists of a number of shuttle valves, which compare the load signals from different spool sections and send the highest signal to the connection PL, or to a copying spool in the inlet section.
The system permits a certain consumption in the load signal line to the pump, without the load signal level being affected. This enables simpler system design, with the possibility of installing logic systems in the LS circuit. Thanks to drainage in the pump LS regulator, the system gives better winter operating characteristics with faster response, since the oil in the LS circuit is always warm. In addition to this, the system prevents disruptive micro-sinking of the load in the beginning of the lifting phase.

Inlet section type [15]

The inlet section is available in two variants, one for CP systems and one for systems with LS pumps.

LS Inlet section for systems with LS pump.
The system is equipped with a directly controlled pressure relief valve, PA1[16], which protects the pump and inlet side of the valve. The LS is always equipped with a load-signal copy function.

CP Inlet section for constant pressure systems.
Same as LS but without load-signal copy function, LS.

Pressure relief valve [16]

The inlet section is normally equipped with a pressure relief valve to protect the pump and valve from pressure peaks in the system.

PA1 Direct acting port relief valve, PLC183, with very fast opening sequence and good pressure characteristics. The replaceable PLC cartridge is factory set. The cartridge has a make-up function, which means that oil is able to flow from the tank gallery to the pump gallery in the event of underpressure in the pump circuit. For setting values, please see Pressure settings [17].

Y1 Without relief valve.
Plug which can replace the pressure relief valve. The Y1-plug blocks the connection between the pump and tank completely.

Pressure setting [17]

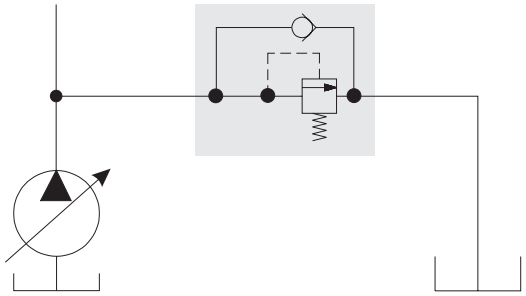
Pressure setting for PA1 [16]

The PA1 direct acting pressure relief valve is delivered with a fixed setting. The standard settings (in bar) available are as follows:
Setting pressure in bar: 50, 63, 80, 100, 125, 140, 160, 175, 190, 210, 230, 240, 250, 260, 280, 300 and 330.

The settings 280, 300 and 330 bar are only applicable to valves of nodular-iron.

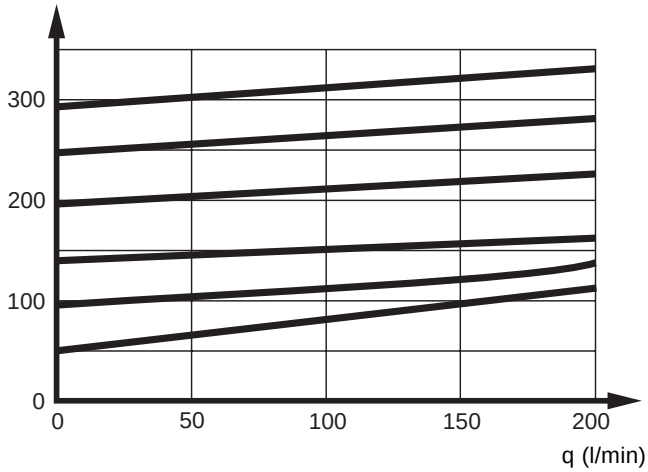
PA1 needs to be set 20 bar above pump pressure.

See also technical data, page 6.

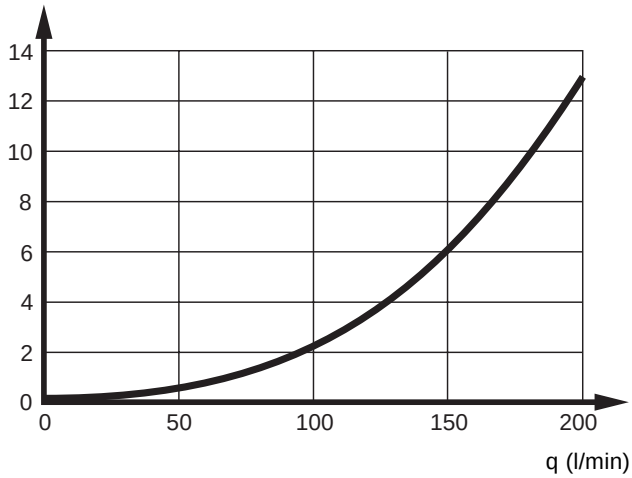


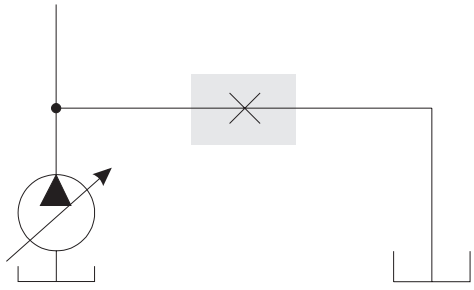
Pressure relief valve PA1

Δp (bar) Pressure relief characteristics



Δp (bar) Anti-cavitation characteristics





Without relief valve Y1

Tank connection T2 [24]

T2B Alternative tank connection T2 plugged. Common variant.

T2 Alternative tank connection T2 open.

Counterpressure valve

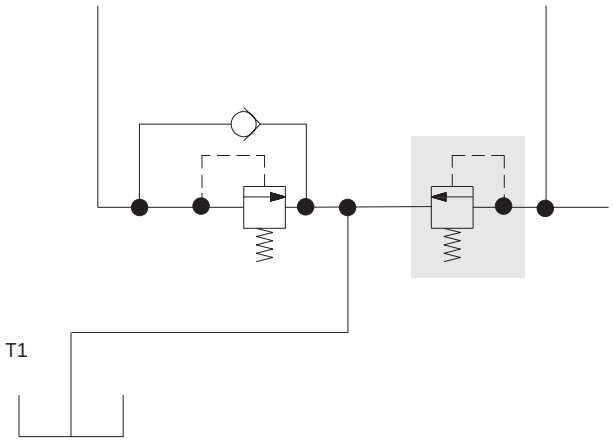
The counterpressure valve, which raises the pressure in the valve's tank gallery, is placed in the inlet section. It is available in two versions: MF with fixed setting and MP with pilot-controlled setting.

By raising the counterpressure, the anti-cavitation characteristics of the K170LS are improved still further. This might, for example, be desirable in situations where make-up flow is directed into the large side of the cylinder during the lowering of loads. Good make-up characteristics eliminate the risk of cavitation and reduce the risk of damage to the cylinder seals. They are also important for functions in which a lowering movement changes to a lifting movement without a time delay.

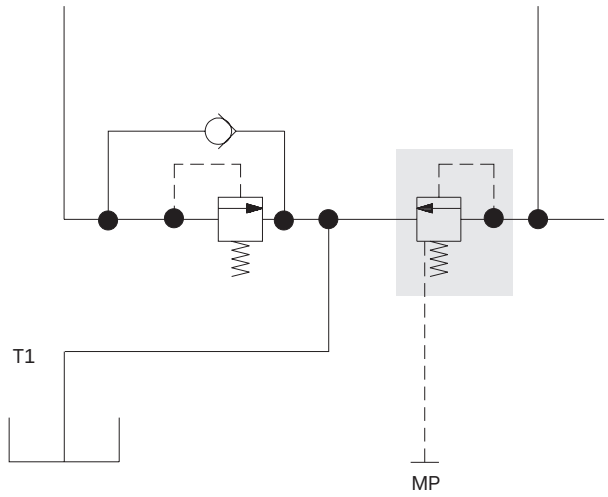
The pilot-operated version gives counterpressure only when it receives a signal. It can be employed in such a way that the signal to the counterpressure valve is connected only to the spool-actuator signal(s) controlling the lowering movement(s) that need extra counterpressure. In this way, unnecessary losses can be avoided. Tank connection T1 [25] must be open.

MF Counterpressure valve factory set to give 5 bar counterpressure at a flow of 20 l/min.

MP Pilot operated counterpressure valve for external control of counterpressure between 0 and 36 bar. Tank connection T1 [25] must be open and tank connection T3 must be plugged (T3B [34]).
The MP pilot operated variant only gives a counterpressure upon receipt of signal. This can be exploited so that the signal to the counterpressure valve is connected only to the spool actuating signal(s) controlling the lowering movement(s) that need an extra counterpressure, thus avoiding unnecessary losses. Max permitted signal pressure is 30 bar. The relationship between pressure and signal is 1.2:1.



Counterpressure valve MF



Pilot operated counterpressure valve MP

Tank connection T1 [25]

T1 Tank connection T1 is open. Common variant.

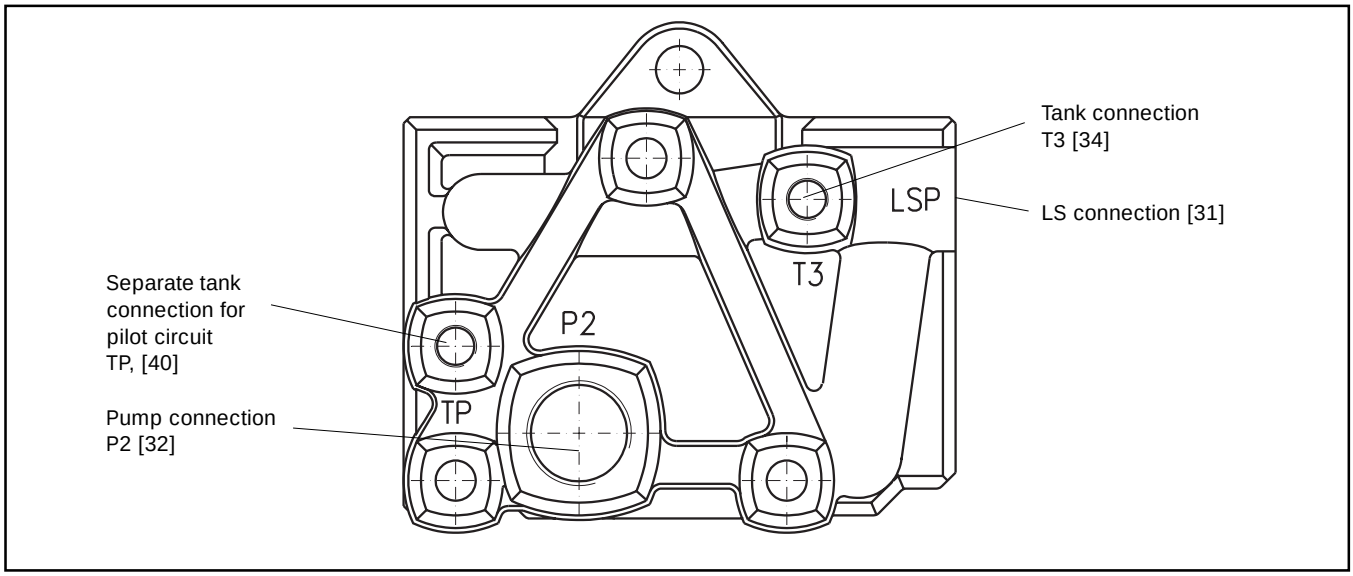
T1B Tank connection T1 is blocked.

Pump connection P1 [26]

P1 Pump connection P1 is open. Common variant.

P1B Pump connection P1 is plugged.

End section [30 - 44]



The end section is available in two variants, one with all connections machined and one without machined connections for pump (P2), tank (T3) and pilot tank (TP).

In the basic variant, the LS connection LSP [31], pump connection P2 [32] and tank connection T3 [34] are plugged.

End section [30]

US Standard end section.

LS-connection [31]

LSP Port open for connection of LS-signal from other valve. This connection is used to receive the load signal from a parallel connected valve.

LSPB Port for LS signal from other valve plugged. LS signal is internally drained.

Pump connection P2 [32]

P2 Alternative pump connection in rear face. The connection can, for example, be used to feed valves located to the rear, or for double feeding of the valve in applications where many functions with very high flow demands are operated simultaneously. The connection can also be used in situations where feeding from the rear face is the most suitable option in terms of space available.

P2B Alternative pump connection plugged. Common variant.

Tank connection T3 [34]

T3 Tank connection T3 is open.

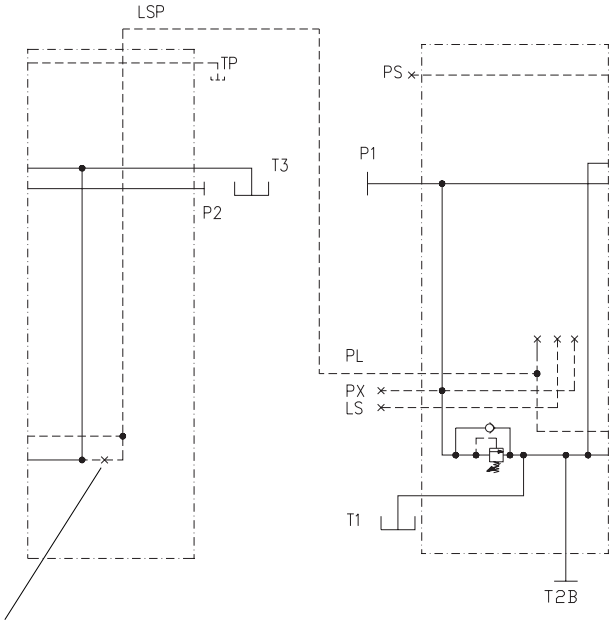
T3B Tank connection T3 is plugged. Common variant.

Separate tank connection for the pilot circuit [40]

TP Separate tank connection for the pilot circuit is open. The connection to the main tank gallery of the directional valve is blocked in the inlet section. The function is recomended for systems in which there is a risk of dynamic pressure fluctuations in the tank line, which cause fluctuations in the pilot circuit when there is a common tank line.

NB! TP connection can not be plugged.

/ Not prepared for separate pilot return.

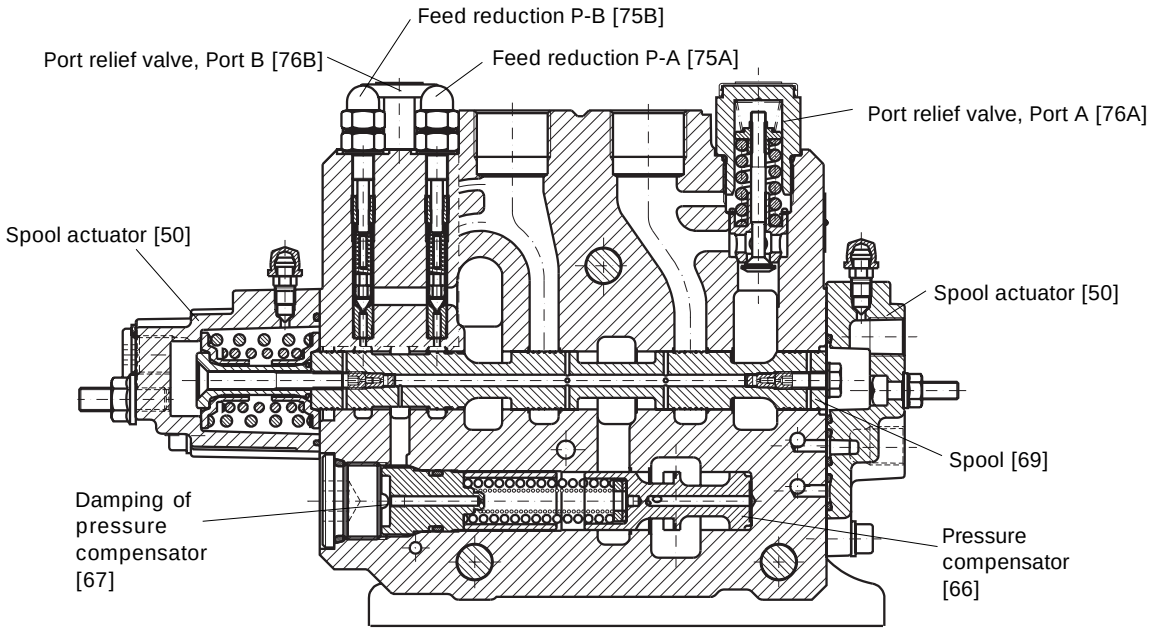


Only with LSP [31]

In the case of parallel connected valves, the PL connection load-sensing signal in the last valve passes to the LSP connection in the first valve.

Spool section [45-89]

Spool section with actuator type PC



The K170LS directional valve is stackable and can be delivered in combinations of 1 to 9 spool sections. Each section can be equipped individually with a large number of optional functions, spools and spool actuators for optimum adaptation to the application and controlled function.

Material design [48]

G Spool section in grey-iron design, (Max 260 bar in pump port and max 280 bar in service port).

S Spool section in nodular-iron design, (Max 330 bar in pump port and max 350 bar in service port).

Spool actuators [50]

PC, PCH - Hydraulic spool actuator

PC Hydraulic spool actuation.

PCH Hydraulic spool actuation with manual operation.

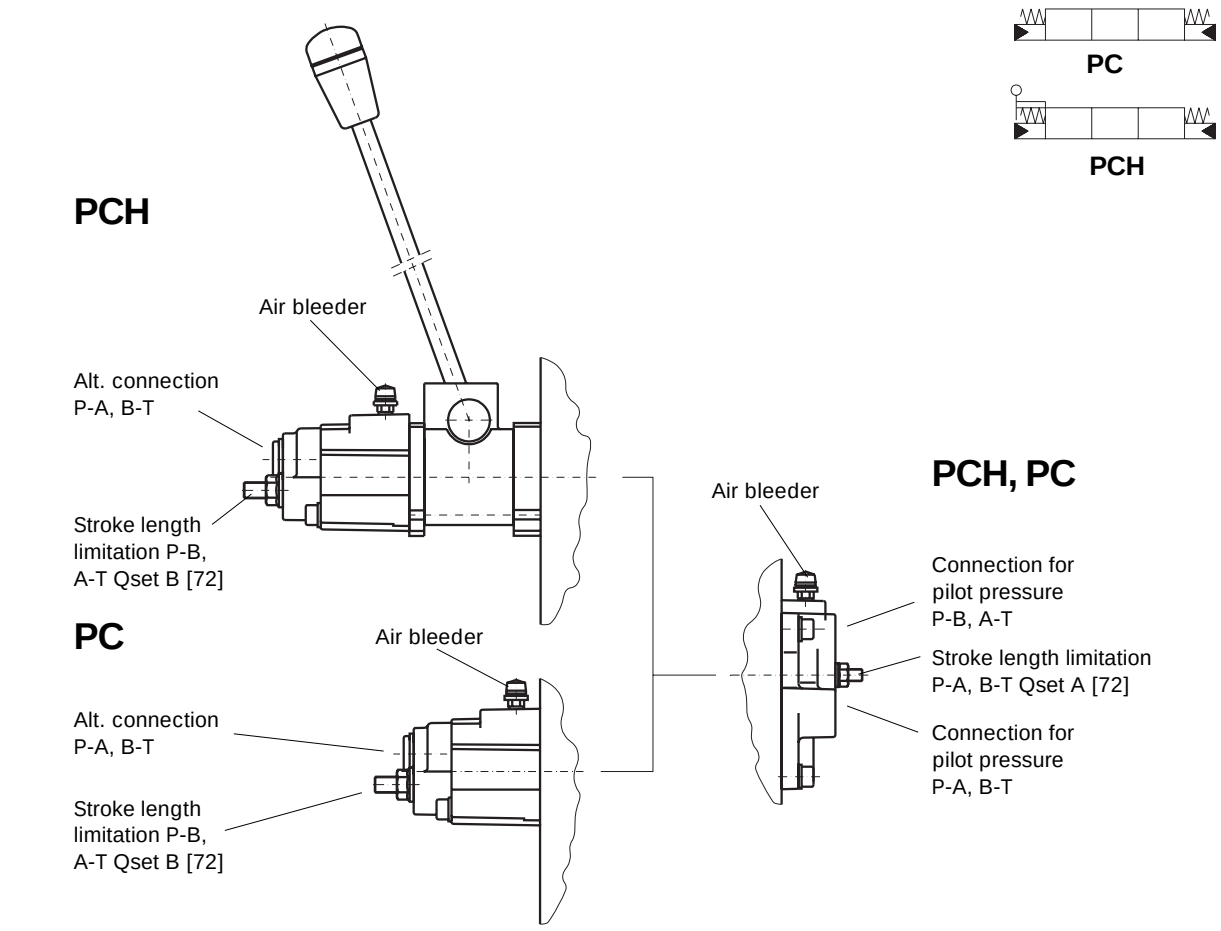
The PC and PCH are proportional, hydraulically controlled spool actuators with spring centring to the neutral position. They are intended to be hydraulicly remote controlled by PCL4.

When choosing a control pressure for the PCL4, its starting pressure should be approx. 1 bar lower than that of the directional valve, in order to ensure gentle starting and stopping. The pilot pressure for the control pressure valve can connected to the PS port for the internal pilot pressure supply in the inlet section of the directional valve.

PC	Control pressure, start	5.6 bar
	Control pressure, final	20.5 bar
PCH	Control pressure, start	5 bar
	Control pressure, final	21 bar
	Permissible pressure in pilot cap	max. 50 bar

Connections: G1/4 or 9/16-18 UNF

PC, PCH Hydraulic spool actuators



Spool actuators [50]

Electro-hydraulic proportional spool actuator

EC Electro-hydraulic spool actuator.

ECH Electro-hydraulic spool actuator with manual operation facility.

The EC and ECH are proportional, electro-hydraulically controlled spool actuators with spring centring to the neutral position. They are intended to be controlled remotely by the IQAN or EHC35 control systems. Please see separate data sheet for further information about VOAC Hydraulics remote control systems. Pilot pressure oil for the converter valves is led to the spool actuators through internal ducts in the valve. This means that only the electric cables from the control system to the valve solenoids need to be connected externally. The VOAC Hydraulics PVC102 is used as the converter valve. Please contact VOAC for further information.

The ECH can also be operated steplessly by means of a hand lever.

Control current for:

PVC102, 12 V - Starting	min. 420 mA
PVC102, 12 V - Fully actuated	max. 900 mA
PVC102, 24 V - Starting	min. 230 mA
PVC102, 24 V - Fully actuated	max. 500 mA

Gauge port: G1/4 or 9/16-18 UNF

Electro-hydraulic on-off spool actuator

EB Electro-hydraulic spool actuator.

EBH Electro-hydraulic spool actuator with manual operation facility.

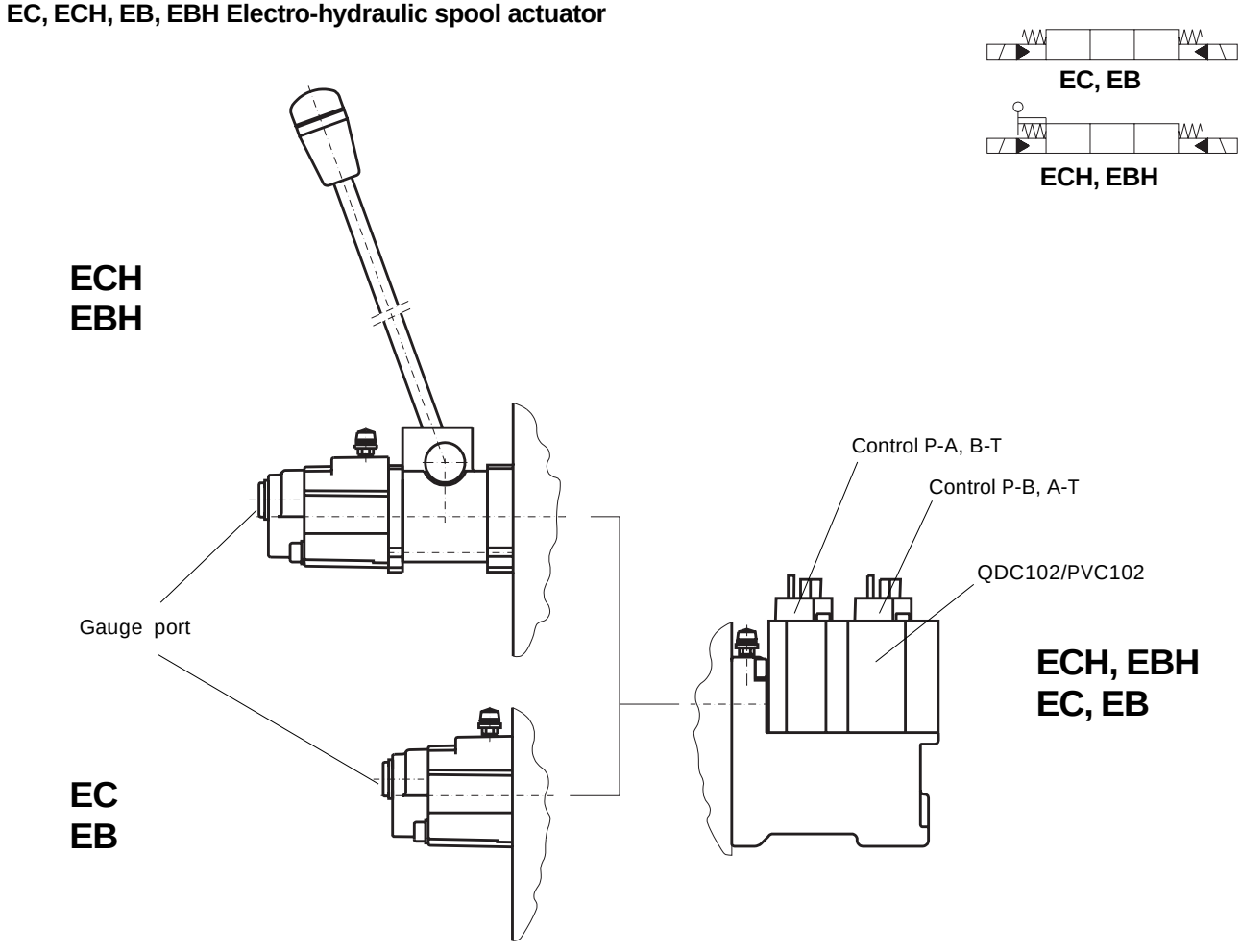
The EB and EBH are electro-hydraulically controlled on-off spool actuators with spring centering to the neutral position. They are intended to be controlled remotely by means of on-off signals. Pilot pressure oil for the converter valves is led to the spool actuators through internal ducts in the valve. This means that only the electric cables from the control system to the valve solenoids need to be connected externally. The VOAC Hydraulics QDC102 is used as the converter valve. Please contact VOAC for further information.

The EBH can be operated steplessly by means of a hand lever.

Control current for QDC102, 12 V	1300 mA
Control current for QDC102, 24 V	650 mA

Gauge port: G1/4 or 9/16-18 UNF

EC, ECH, EB, EBH Electro-hydraulic spool actuator



Pilot restrictor [55 A,B]

To give gentle remote control, the EC, ECH, EB, EBH, PC and PCH spool actuators are fitted with pilot restrictors, which can be chosen individually for each service port. The restrictor gives a kind of ramp function.

For the EC, ECH, EB and EBH, the following options are available:

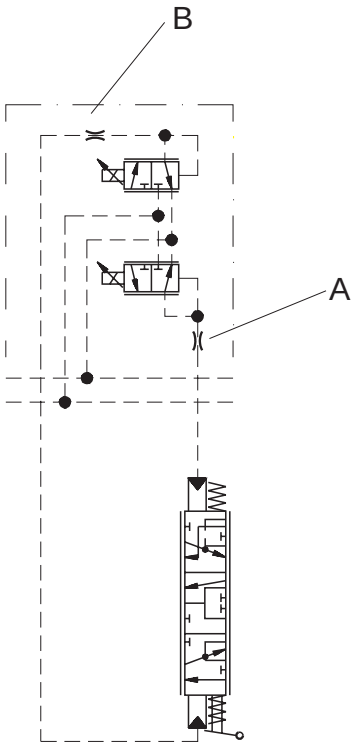
/	Without pilot restrictor
0.45	0.45 mm pilot restrictor
0.6	0.6 mm pilot restrictor
0.7	0.7 mm pilot restrictor
0.8	0.8 mm pilot restrictor (Normal)
0.9	0.9 mm pilot restrictor
1.0	1.0 mm pilot restrictor
1.1	1.1 mm pilot restrictor
1.2	1.2 mm pilot restrictor
1.3	1.3 mm pilot restrictor
1.4	1.4 mm pilot restrictor
1.5	1.5 mm pilot restrictor
1.6	1.6 mm pilot restrictor

For PC, PCH the following options are available:

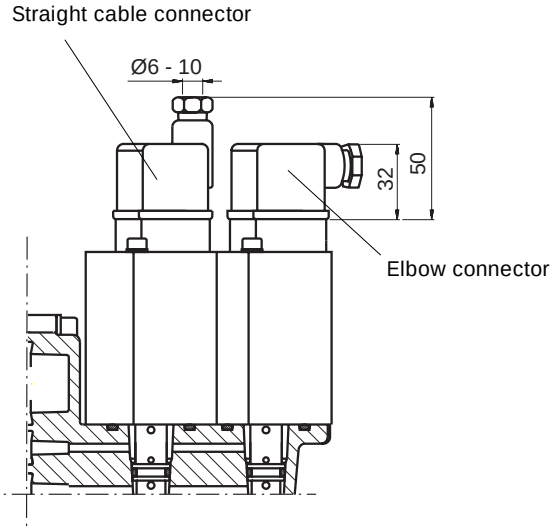
/	Without pilot restrictor (Normal)
0.6	0.6 mm pilot restrictor
0.8	0.8 mm pilot restrictor
0.9	0.9 mm pilot restrictor
1.0	1.0 mm pilot restrictor
1.1	1.1 mm pilot restrictor
1.2	1.2 mm pilot restrictor
1.3	1.3 mm pilot restrictor
1.4	1.4 mm pilot restrictor
1.5	1.5 mm pilot restrictor
1.6	1.6 mm pilot restrictor

Cable connector [56]

/	Without connector
0	Connector straight
90	Connector 90 degree elbow



Pilot restrictor for EC, ECH, EB and EBH spool actuators



The PVC102 and QDC102 converter valves can be delivered with cable connectors if specified by the customer. If electric cables with fitted connectiors are required, these too are available from VOAC, but must be ordered separately.

Spool selection [60-74]

Spool options

The spool is the most important link between the operator's activation of a lever unit and the movement of the controlled function. For this reason, VOAC makes a wide range of standard spools to meet many different function-specific demands. Spool selection is effected with the aid of a computerized specification program, using a series of different parameters to determine the optimum spool for the job.

Spool function [60]

There are many spool variants which are adapted for different flows, load conditions and actuator area ratios. The spools are also available with different degrees of pressure feedback from the A- and/or B-side.

D Double-acting spool for, e.g. double-acting cylinders. Blocked in the neutral position.

Dm Double-acting spool with drainage of service ports A and B to tank, which prevents pressure build up in the neutral position. The spool is used as a double spool in combination with a double over-centre valve.

Da Double-acting spool with drainage of service port A to tank, which prevents pressure build up in service port A in the neutral position.

Db Double-acting spool with drainage of service port B to tank, which prevents pressure build up in service port B in the neutral position.

EA Single-action spool for, e.g. single-acting cylinder. Blocked in neutral position. Service port B blocked.

EA3 Single-acting spool for, e.g. single-acting cylinders. Blocked in neutral position. Service port B blocked during lifting function. Lowering function at both service ports A and B.

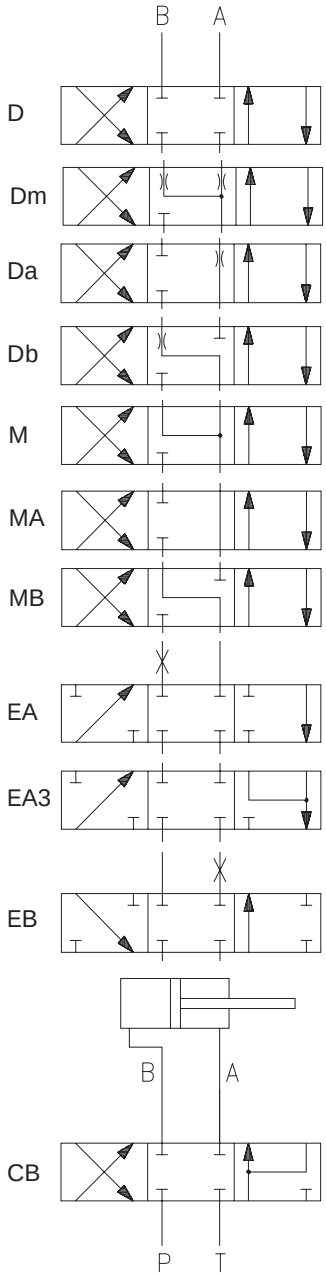
EB Single-acting spool for, e.g. single-acting cylinders. Blocked in neutral position. Service port A blocked.

M Double-acting spool for, e.g. hydraulic motors. Floating function in neutral position.

MA Double-acting spool for, e.g. hydraulic motors. Floating function in neutral position. Service port A to Tank.

MB Double-acting spool for, e.g. hydraulic motors. Floating function in neutral position. Service port B to Tank.

CB Regenerative spool for rapid feeding of cylinder via service port A. The large side of the cylinder is connected to service port B.



Flow requirement [61 A,B]

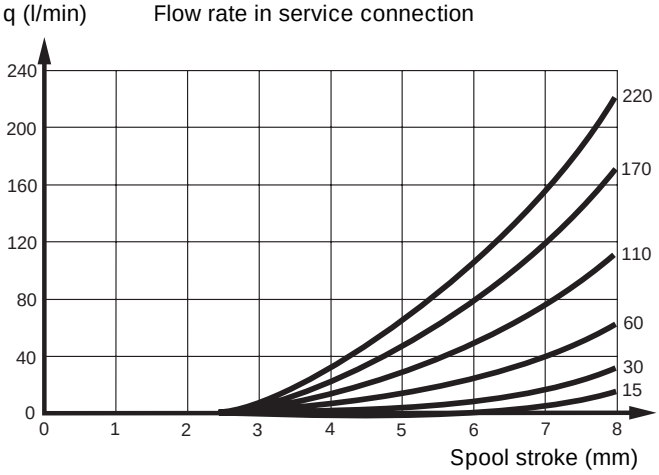
The K170LS directional valve has a range of optimized spool designs for nominal flows up to 170 l/min when the section is equipped with an individual pressure compensator, K1 [66]. See "Pressure compensator and/or load-hold check valve [66]" for flow with other compensators.

Without an individual pressure compensator, flows up to 220 l/min are obtainable, depending on the pre-set regulating difference in the LS pump.

The desired flow to the A- and B-port is entered in the ordering documentation. VOAC's computerized specification system then selects spools to give at least the flow required, also taking other parameters into account.

The maximum flow is then set by limiting the spool stroke by means of adjustment screws on the spool actuator or, in the case of electro-hydraulic remote control, by setting the maximum current.

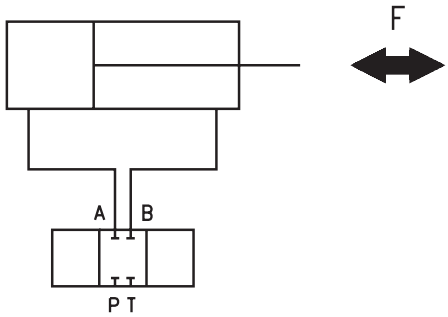
See "Flow settings" [72] for details on factory setting of maximum flow.



Typical curves showing flow as a function of spool stroke

Area relationship [62]

The area relationship for a section is calculated by dividing the cylinder area that is connected to the B-port by the area that is connected to the A-port. When the larger side of the cylinder is connected to the A-port, the relationship is less than 1. The area relationship for a motor is 1.



LAB - Load can change between the A- and B-port.

Load characteristics [63]

The character of the load can be selected according to five typical cases. This information is entered so that the spool can be given the best possible adaptation to the intended application.

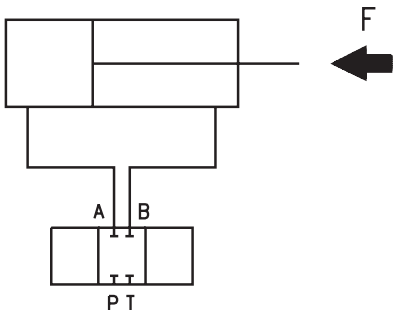
LAB Lift load can change between A-port and B-port.

LA Lift load normally on A-port only.

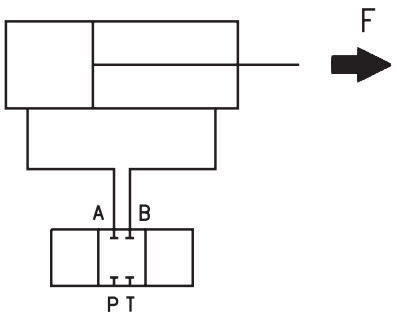
LB Lift load normally on B-port only.

LN No or low lift load on A- and B-ports.

S Slewing function.



LA - Load normally on A- port only.



LB - Load normally on B- port only.

Pressure feedback [64 A,B]

The K170LS is available with a pressure-feedback option, which enables the positive sense of force control from CFO systems to be transmitted to LS systems, thus enabling force-control characteristics to be incorporated in individual valve sections. With force control, the operator is better able to sense the increase in machine load when a hard obstacle is met, e.g. in digging operations.

Pressure feed-back also gives a kind of ramp function, which results in more gentle transitions during speed changes. This in turn has a stabilizing effect on the hydraulic system, and the machine operating characteristics become smoother. Both these characteristics are important, especially for slewing functions and similar movements. With pressure feedback, machine wear is reduced and efficiency increases.

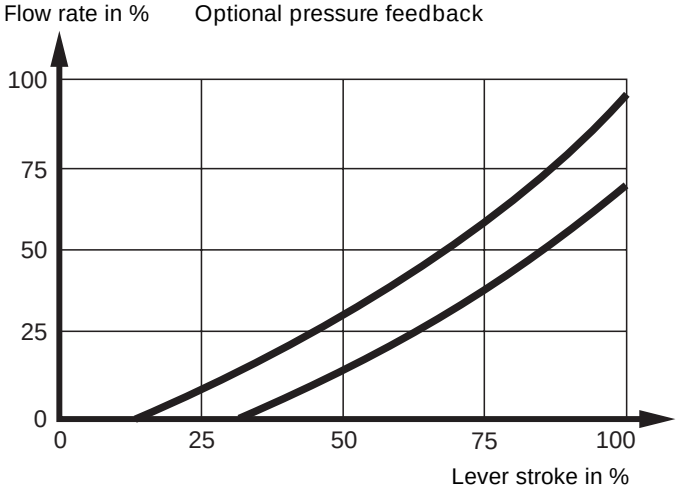
The section can be equipped with pressure feedback for the A- and B-ports individually. The degree of pressure feedback can be chosen from three levels. The higher the level of pressure feedback, the greater the reduction in the function's speed upon increasing resistance for the same lever stroke. It follows from this that the lever must be moved further in order for the speed to remain the same when the load is increasing.

/ No pressure feedback

FN Normal level of pressure feedback

FH High level of pressure feedback

FL Low level of pressure feedback



Pressure feedback

Pressure compensator and/or load-hold check valve [66]

Pressure compensators

The primary purpose of pressure compensation is to maintain a constant flow rate to a function, regardless of pressure variations in the system. The facility is of special value in lifting functions.

Excellent simultaneous operation characteristics
In cases where several machine functions are operated simultaneously, the spool sections in the K170LS can be equipped with individual, integrated pressure compensators. Subject to available pump capacity, sections so equipped will deliver the pre-determined constant flow regardless of other simultaneously operated functions, and regardless of variations in load or feed pressure. VOAC integrated pressure compensators have a very quick response time and incorporate built-in load-hold check valves.

Increased or reduced function speed where required
To meet demands for exact speed in certain functions, VOAC integrated pressure compensators comes in a number of fixed variants that give flow rates from nominal to +55% through the selfsame spool (see K1 to KN1 below). To accommodate changing operating conditions, a variant that can be adjusted on site to give ±20% of nominal flow is also available (see KS below).

K1 Fixed pressure compensator with load-hold check valve. The spool gives nominal flow.

K2 Fixed pressure compensator with load-hold check valve. The spool gives 20% more than nominal flow.

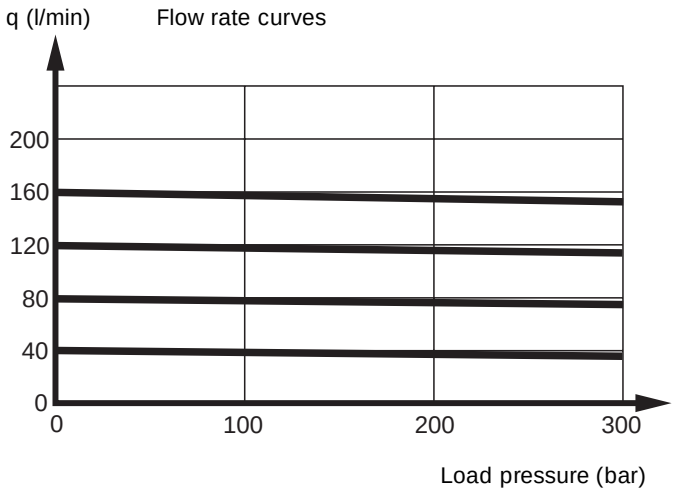
K3 Fixed pressure compensator with load-hold check valve. The spool gives 55% more than nominal flow. N.B. Pump must deliver a pressure of at least Δp=30 bar. (30 bar above load signal reported to pump regulator.)

KN1 Fixed pressure compensator with extra fast load-hold check valve. The spool gives 15% more than nominal flow.

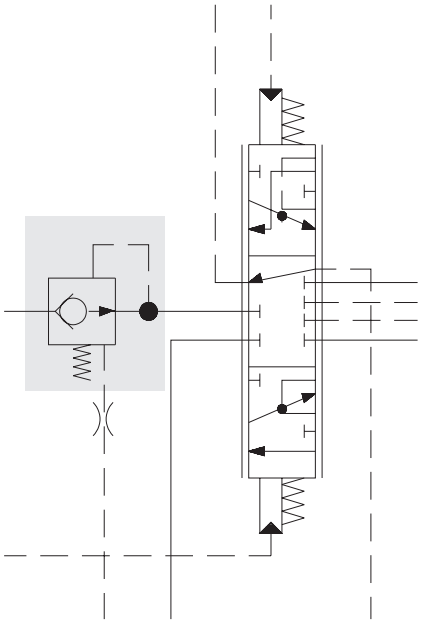
KS Adjustable pressure compensator with load-hold check valve. The spool gives ±20% of nominal flow.

N1 Load-hold check valve.

X1 Prepared for compensator and load-hold check valve.



Load independent flow with pressure compensator



Pressure compensator for constant flow in service port (KN1).

Damping of pressure compensator [67]

The load-signal restrictor affects the response of the pressure compensator.

0.6	Alternative LS restrictor for comp.	∅0.6 mm
0.8	Recommended LS restrictor for comp.	∅0.8 mm
1.0	Alternative LS restrictor for comp.	∅1.0 mm

Spool designation [69]

The task of spool selection can be submitted to VOAC's computerized specification program, which adapts the spool to match the specific demands of each function, thus optimizing the spool.

The information given at positions 61, 62 and 63 therefore makes up part of the basis for the choice of spool.

Flow settings [72]

With PC and PCH spool actuators, flow limitation over the spool to motor ports A and B can be effected by means of mechanical limitation of the spool stroke length.

Qset When the spool section is equipped with a PC or PCH spool actuator, it can be delivered with a factory-set maximum flow rate. Setting is carried out according to the stated flow requirements to the A-and B-ports [61 A, B].

Qset A When the spool section is equipped with a PC or PCH spool actuator, it can be delivered with a factory-set maximum flow rate. Setting is carried out according to the stated flow requirements to the A-ports [61 A].

Qset B When the spool section is equipped with a PC or PCH spool actuator, it can be delivered with a factory-set maximum flow rate. Setting is carried out according to the stated flow requirements to the B-ports [61B].

When setting the flow rates for sections without pressure compensators in systems with LS pumps, the flow setting is made with a Δp of 18 bar between the pump pressure in PX and the load signal in PL, at full flow take-up.

For details on setting the flow for PC spool actuators, see page 13.

Feed reduction valves [75]

Any section in the K170LS valve can be equipped with individual feed reducing valves for the service ports A and B. These are used for those functions in the system which require a lower maximum pressure than the normal operating pressure of the system. The reducing valve is infinitely adjustable between 30 and 300 bar. It serves to reduce the pump pressure so that the feed pressure in the section in which it is fitted does not exceed the pre-set value.

The use of feed reducing valves enables the pressure to be limited without using any more than a pilot flow (<2 l/min).

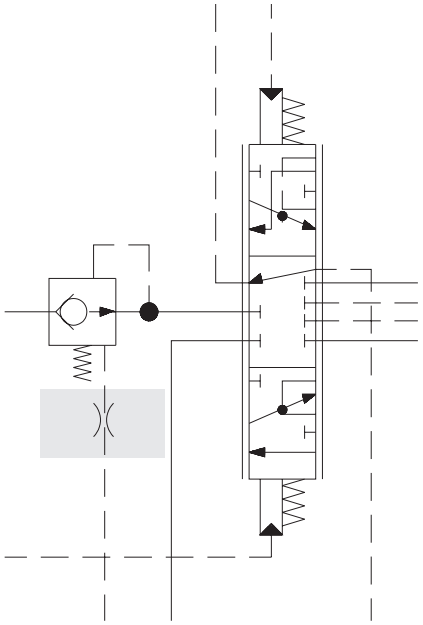
In the case of feed reduction, the section must be fitted with a pressure compensator. Since the feed reducing valve is a two-way valve, pressure shocks that arise after the feed reducing valve must be limited with the aid of a port relief valve. The pressure setting on the port relief valve [76 A,B] can be set as low as 10 bar above reducer setting.

Setting of feed reduction in the A-port [75A]

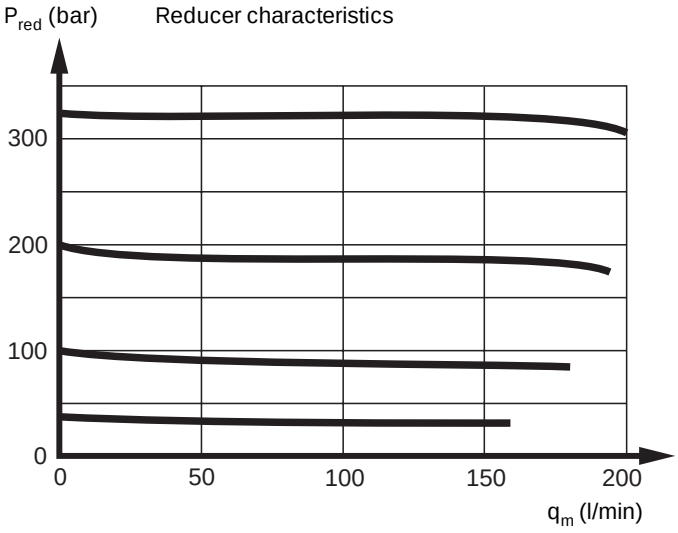
Setting values for the A-port are from 30 to 300 bar.

Setting of feed reduction in the B-port [75B]

Setting values for the B-port are from 30 to 300 bar.



Restrictor for damping of pressure compensator.



P_{red} = Reduced pressure
q_m = Flow at service port

Port relief and/or anti-cavitation valves [76 A,B]

A specially designed cartridge valve is used as a port relief and anti-cavitation valve, PA, in the service ports. Its function is to protect the valve and consumer from pressure peaks and excessive pressure in the system. The very rapid opening sequence and good pressure characteristics make the cartridge valve an excellent port relief valve. The anti-cavitation valve causes oil to flow from the tank gallery to the service port side in the event of underpressure in the service ports.

Separate anti-cavitation valve in service ports

As an alternative to the port relief valve, the service ports can be fitted with anti-cavitation valves, N2 cartridges. These enable oil to flow from the tank gallery to the service port side in the event of underpressure.
The connection between tank and service port can also be blocked using an Y2-plug.

Anti cavitation characteristics

The curve shows the pressure drop between tank connection and service port when the PA or N2 cartridge is used as an anti-cavitation valve.

X2 Service port A or B open to tank.

Y2 Service port A and/or B to tank blocked with plug.

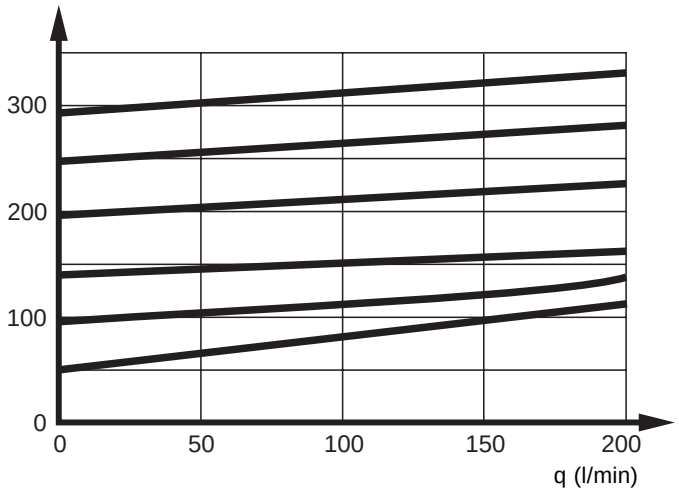
N2 Service port A and/or B side of section equipped with anti-cavitation valve.

50-350 Standard pressure settings for port relief valves (PA) in bar:
50, 63, 80, 100, 125, 140, 160, 175, 190, 210, 230, 240, 250, 260, 280, 300*, 330* and 350*.

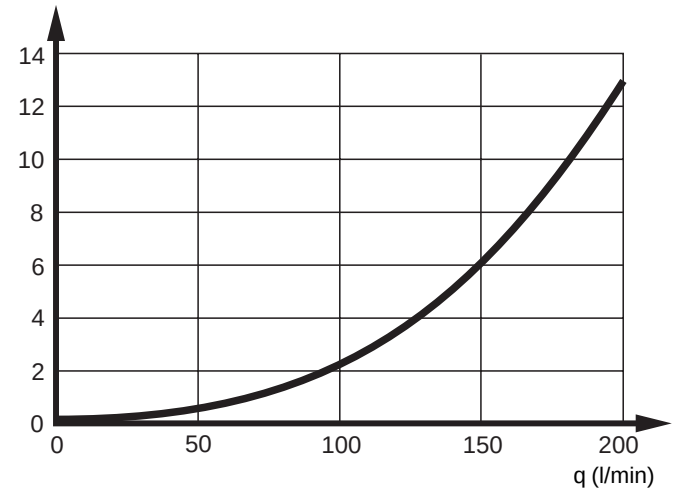
* Applies only to valves of nodular-iron design.
See also technical data, page 6.

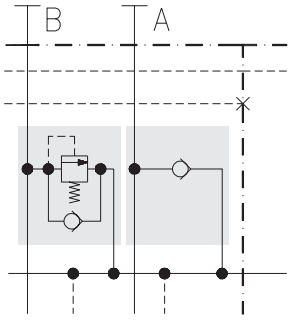
The pressure setting on the port relief valve can be set as low as 10 bar above reducer setting. [75 A,B].

Δp (bar) Pressure relief characteristics

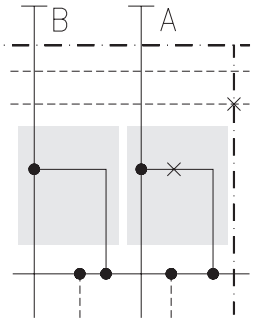


Δp (bar) Anti-cavitation characteristics with PA or N2





Port B is equipped with a combined port relief valve and anti-cavitation valve. (PA) Port A is equipped with an anti-cavitation valve (N2).



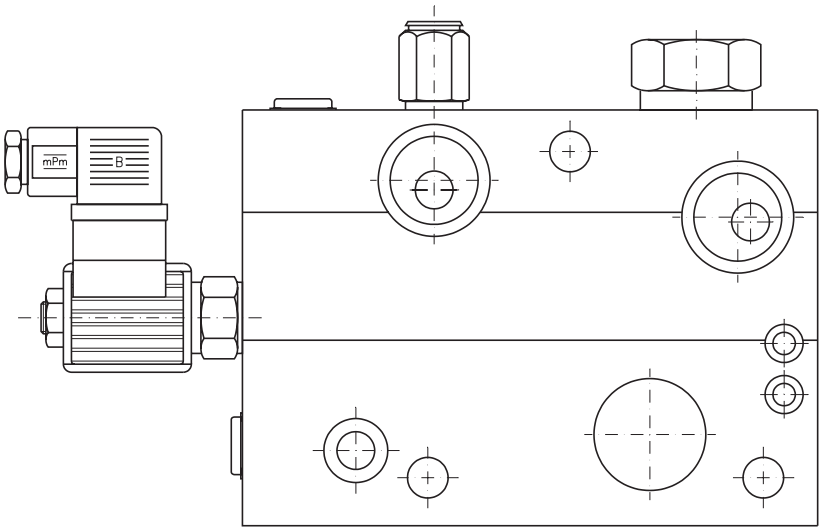
Port B is open to tank (X2) and port A has no tank connection (Y2).

Function block [90-99]

The K170LS can be equipped with function blocks (manifolds) that enables complete system solutions to be integrated into the valve.

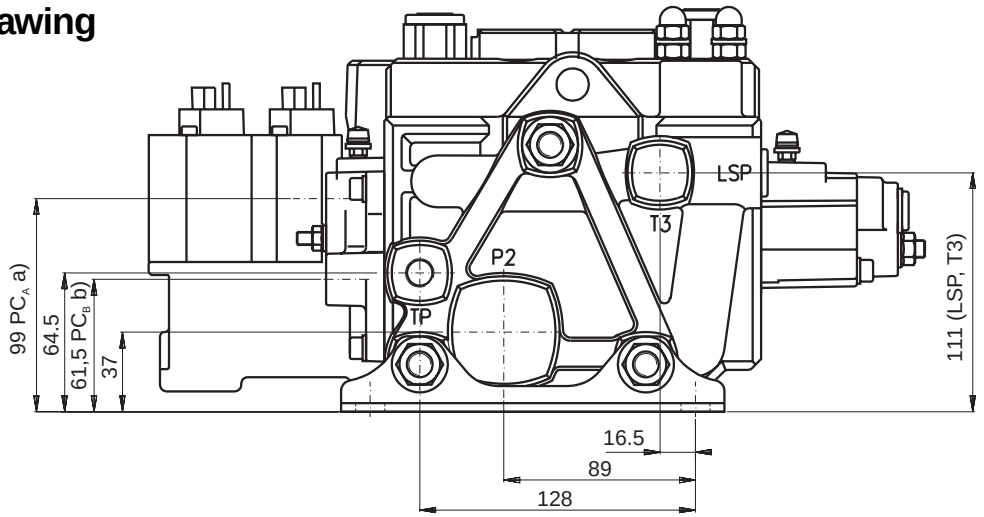
Please contact VOAC Hydraulics for more details on integrated system solutions. In addition to standard blocks, VOAC's custom-builds function blocks to meet special system demands.

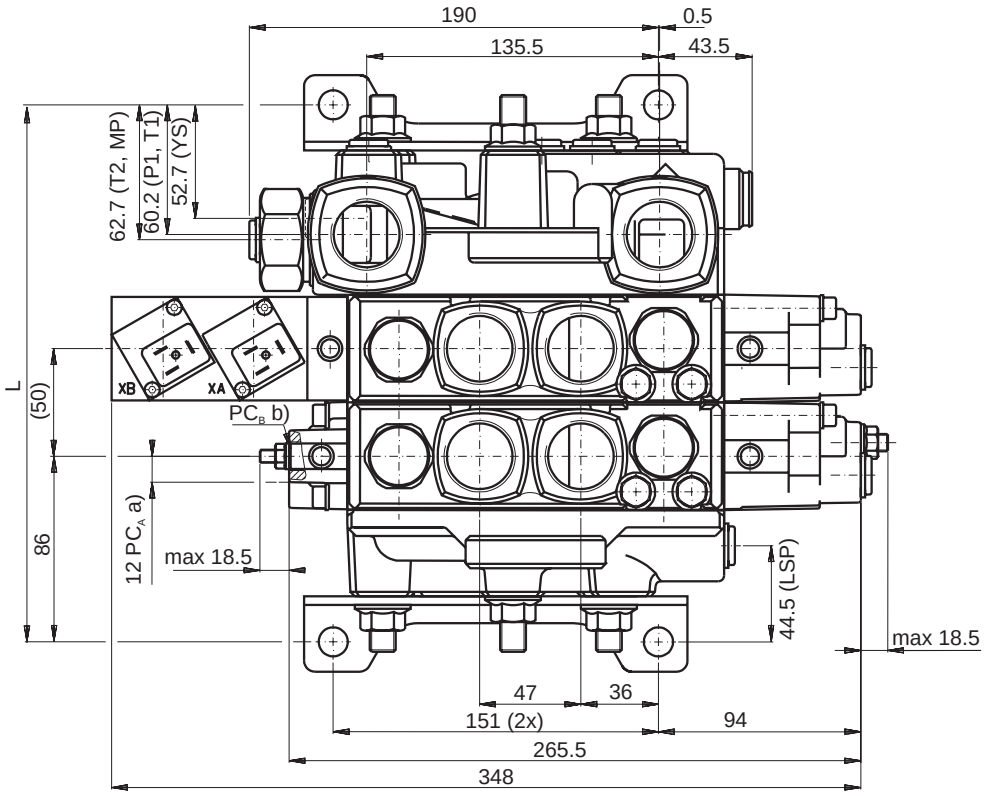
Below is an example of a specially designed function block for a specific customer.



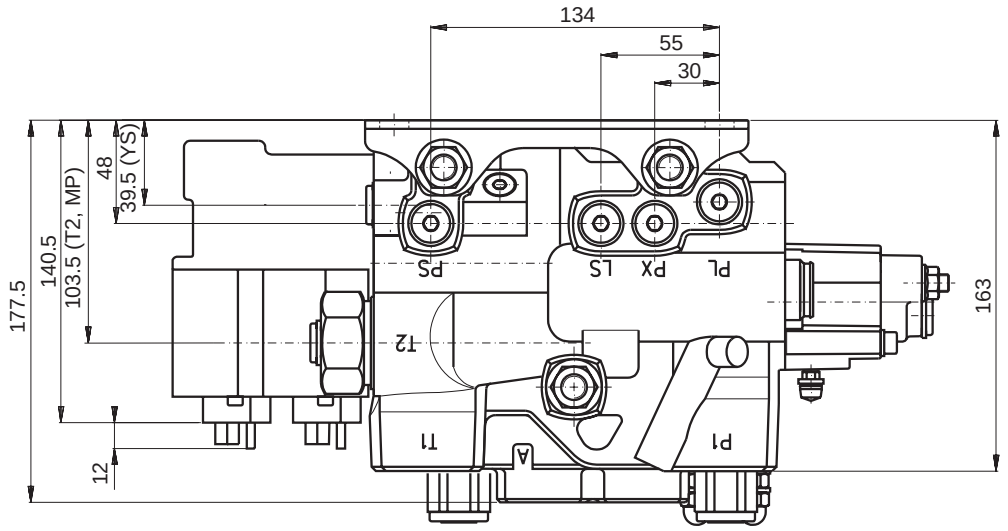
This block, like most of our function blocks, is built up using standard cartridge valves. Only the block itself is unique.

Dimensional drawing





No. of Sections	L mm	L inch
1	200	7.87
2	250	9.84
3	300	11.81
4	350	13.78
5	400	15.75
6	450	17.72
7	500	19.69
8	550	21.65
9	600	23.62



a) Pilot-pressure connection PC$_A$ activates service port A
b) Pilot-pressure connection PC$_B$ activates service port B

For further information, please contact:

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Catalog 9129 8557-02
Ed. 01 (GB)
Catalog 9129 8557-06
Ed. 01 (US)