



Directional Control Valve L90LS

***Proportional, Load-Sensing and
Pressure Compensated***

*Catalogue HY17-8504/UK
December, 2004*



Catalogue layout

In addition to general information and basic technical data, this catalogue contains descriptions of the many optional functions you can specify for the L90LS, so that we may customize it to control your machine optimally.

Each *function area* of the valve is given as a subheading, followed by a brief description. When different options are available for a function area, the subheading is followed by an *item number* in square brackets, e.g. **Pressure relief valve [16]**. This is followed by a series of *coded options*, e.g. **PA1, PS, Y**, together with a brief description of what each code represents.

Alternatively, one or more pressure, flow or voltage options are given.

On page 7 is a general circuit diagram, which shows the basic function areas of the L90LS, as well as the item numbers that represent them. The same item numbers are of course used in all sub-circuit diagrams elsewhere in the catalogue. Please note that, unless stated otherwise, all sections and views of the valves have been drawn as seen from the inlet section.

Computer-aided valve specification

We have developed a computer program to specify the L90LS on the basis of the criteria for each individual machine function. The program facilitates optimal configuration of the valve for maximum performance in different applications. It also generates documentation in the form of a detailed specification and

hydraulic circuit diagram for your valve, as well as a unique ID number that is stamped into the valve data plate. Your valve specifications are then stored on our database to facilitate rapid identification in the event of service enquiries or re-ordering.

Early consultation with Parker saves time and money

Our experienced engineers have in-depth knowledge of different types of hydraulic system and the ways in which they work. They are at your disposal to offer expert advice on the best system for the desired combination of machine functions,

control characteristics and economic criteria. By consulting Parker early in the project planning stage, you are assured of a comprehensive hydraulic system that gives your machine the best possible operating and control characteristics.

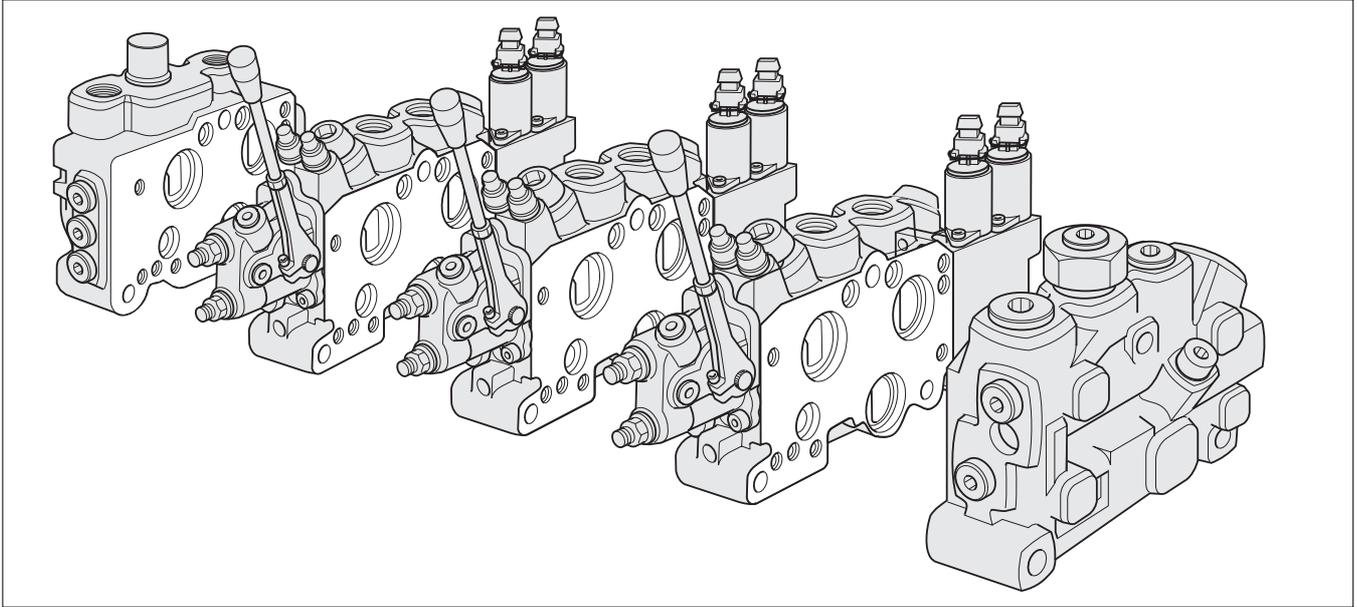
Parker reserves the right to modify products without prior notice. Typical curves and diagrams are used in this catalog. Even though the catalog is revised and updated continuously, there is always the possibility of errors. For more detailed information about the products, please contact Parker.

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

List of contents	Page
General Information	5
Technical Data	6-7
Hydraulic circuits	8-9
Inlet sections [15]	10
Pressure relief valve [16]	12
Pressure setting [17]	12
Differential pressure limiter [18]	12
Load signal system [20]	13
Pump-unloading function [22]	14
Tank connection T1 [25]	14
Pump connection P1 [26]	14
End section [30]	15
LS connection [31]	15
Pump connection P2 [32]	15
Counterpressure valve / tank connection T2 [33]	16
Tank connection T3 [34]	16
Internal-pilot pressure supply [37]	16
Pilot filter [39]	17
Separate tank connection for pilot circuit [40]	17
Spool Section	18
Spool actuator, enclosed variant, type ECH and PC	18
Spool actuator, open variant, type C	18
Basic variants of spool section [47]	18
Spool actuators [50]	20
Directly operated, with open spool-end	20
ON/OFF remote-controlled, with open spool-end	21
Remote-controlled, proportional spool actuators with open spool-end	21
Lever brackets [51]	21
Directly operated with enclosed spool-ends	22
Proportionally remote-controlled, with enclosed spool-ends	22-23
Connector types [56]	23
Lever bracket [51]	24
Pilot restrictor [55 A, B]	24
Choice of spool	25
Spool function [60]	25
Flow requirements [61 A, B]	25
Spool symbols	25
Area ratios [62]	26
Load characteristics [63]	26
Force feedback [64 A, B]	26
Pressure compensator / load-hold check valve [66]	27
Damping of pressure compensator [67]	27
Spool designations [69]	27
Flow settings [72]	28
Feed-reducing valve [75]	28
Setting of feed reduction in the A-/B-port [75A] [75B]	28
Port relief and/or anti-cavitation valves [76 A, B]	29
System functions	30
System signal lines [80]	30
Individual LS connection [81]	30
Two-speed function [82]	31
Internal connection of service port [85]	31
Function manifolds [90-99]	31
Dimensional Drawing, Spool actuators with enclosed spool end	32
Dimensional Drawing, Spool actuators with open spool end	33
Levers for open spool-actuators	34
Direct lever for enclosed spool-actuators	34

[00] refer to position numbers in the customer specification.



The L90LS is a stackable, multi-section, load-sensing, pressure-compensated directional valve for mobile machines such as cranes, skylifts, forklift trucks, platform trucks, excavators and harvesters. It is designed for working pressures of up to 320 bar and a maximum pump flow of 150 l/min. The valve can be given excellent simultaneous-operating characteristics, which enable several machine functions to be operated responsively at the same time, regardless of the sizes of individual loads.

To facilitate precise customization for different applications, the L90LS is of wholly modular construction. Each valve is therefore built to order, so that it incorporates exactly the valve functions and values needed to control the given machine in an optimal way.

Compact, integral system construction

The total modularity of the L90LS gives unique opportunities to integrate a wide range of normally external functions into the valve. Such functions can be common or specific to individual spool-sections, so that widely differing criteria for individual machine functions can be met in just one valve. This enables compact, tailored, logical, pre-tested, service-friendly system solutions to be created for many different types of machine.

In situations where flow demands vary so greatly that two separate directional valves would normally be required, the L90LS can, with the aid of a special adapter plate, be flanged to a larger valve such as the K170LS or K220LS to give a compact, unitized system solution and optimum economy.

Wide range of spool actuators

The spools in the L90LS can be actuated directly by means of levers or remotely by

pneumatic, electro-pneumatic, hydraulic or electro-hydraulic remote control. Some of our remote-controlled spool actuators can be fitted with a supplementary direct lever to give a dual-control and/or emergency facility. The wide range of actuating options gives the machine designer great freedom in terms of control criteria and component location.

Customization and economy

The L90LS can be tailored optimally to control either simple or complex machine-functions and combinations thereof. Its facilities for integrating total, wholly customized solutions for a wide range of applications give low system costs and minimal energy consumption.

Safety and serviceability

The design of the L90LS makes it easy for machine manufacturers to comply with national and international safety regulations, such as those contained in the EC Machinery Directive. Special safety functions for machines such as cranes and skylifts can be integrated into the valve in a logical and simple way. With all system functions contained in a robust, compact, pre-tested unit with minimal external pipework, overall safety and reliability is greatly improved at the same time as servicing and the training of personnel is made much easier.

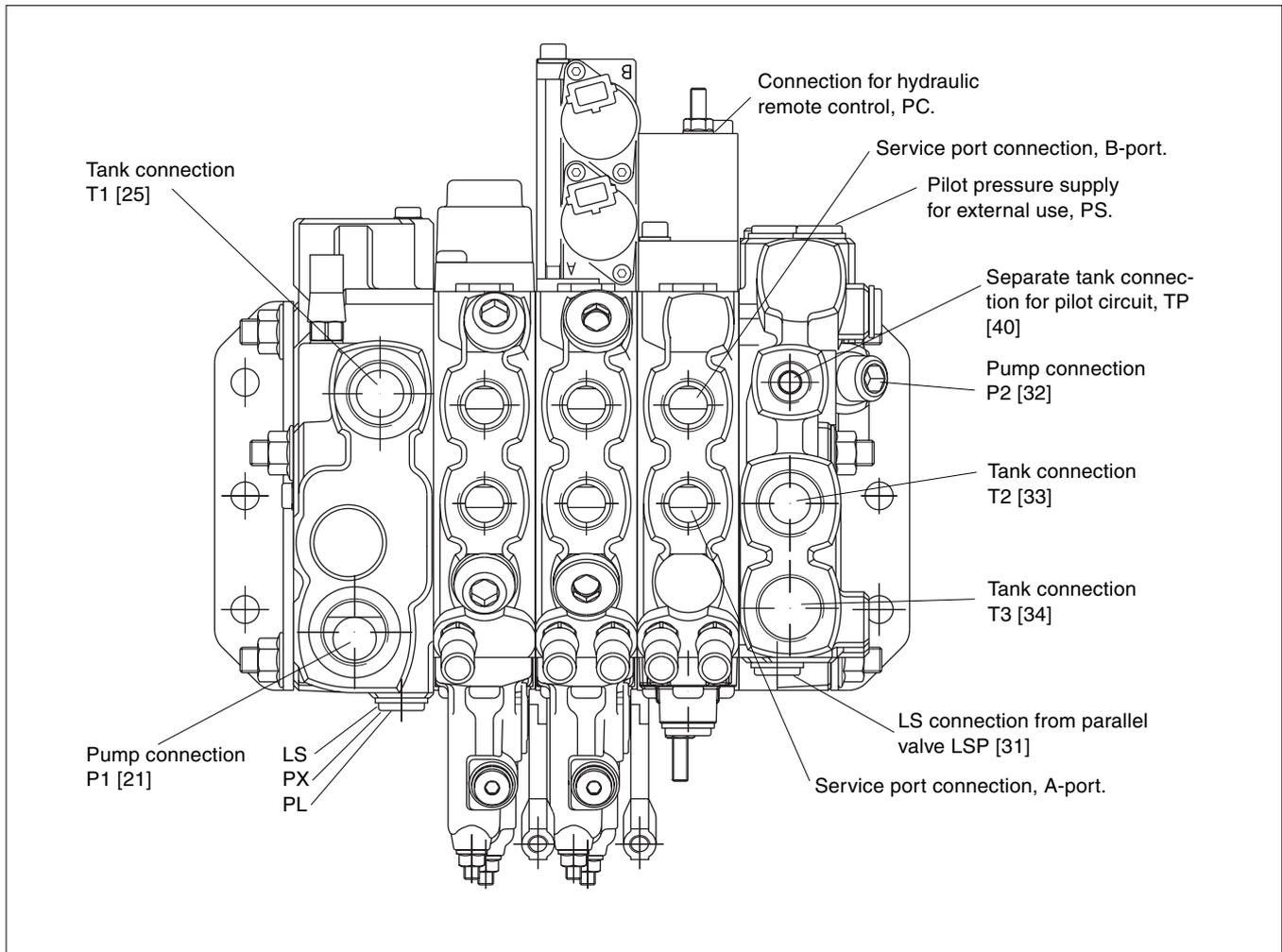
Spool sections and flow rates

The L90LS can be supplied in combinations of 1-12 spool sections or in combination with special function manifolds fitted between spool sections. The maximum recommended flow rate per spool section is 125 l/min, or 90 l/m when equipped with a pressure compensator.

Examples of optional functions

Depending on the application and operating criteria of the machine, a wide range of common, section- or port-specific optional functions can be integrated into the L90LS. Examples include:

- a bypass function in the inlet section for systems fed by fixed pumps
- a pump-unloading function that blocks the pump inlet when activated, thus enabling an emergency-stop function to be incorporated into the system
- section-specific pressure compensation
- section-specific load-hold check functions
- port-specific relief and anti-cavitation functions
- port-specific feed reduction
- port-specific force-feedback functions that enable force-sensing and also provide a hydraulic ramp function
- a load-signal copying function to eliminate micro-sinking
- a built-in pilot-pressure function in the end section
- a counterpressure function that gives exceptionally good make-up characteristics and the possibility of unloading lowering movements
- section-specific two-speed functions that enable switching between performance and precision work in machines such as cranes and skylifts
- automatic stopping functions for selected machine movements in the event of overload or the reaching of other pre-determined limits
- priority for machine functions such as brakes and steering.



Pressures

Pump inlet (psi)	max. 260/320 bar* (3800/4600 psi)
Service ports (psi)	max. 280/350 bar* (4000/5000 psi)
Tank connection (psi)	max. 20 bar (290 psi)

* Stated pressures are absolute shock pressures, valid for grey / nodular iron.

Flow rates, recommended

Pump connection	max. 200 l/min (50 US gpm)
Service port, with pressure compensator	max. 90** l/min (24 US gpm)
Service port, without pressure compensator	max. 125** l/min (33 US gpm)
Return from service port	max. 150 l/min (40 US gpm)

** Depending on spool variant.

Feed reducing valves

Setting range	50 - 330 bar (725-4800 psi)
---------------	-----------------------------

Internal pilot pressure

Fixed setting	22, 35 or 43 bar (320, 508 or 625 psi)
---------------	----------------------------------------

Filtration

Filtration must be arranged so that Target Contamination Class 20/18/14 according to ISO 4406 is not exceeded. For the pilot circuit, Target Contamination Class 18/16/13 according to ISO 4406 must not be exceeded.

Technical Data

Hydraulic fluids

Best performance is obtained using mineral-base oil of high quality and cleanness in the hydraulic system. Hydraulic fluids of type HLP (DIN 51524), oil for automatic gearboxes Type A and engine oil type API CD can be used.

Viscosity, working range 15-380 mm²/s*

Temperature

Oil temperature, working range +20 to 90 °C (68 to 194 °F)**

Technical information in this catalogue is applicable at an oil viscosity of 30 mm²/s and temperature of 50 °C using nitrile rubber seals.

Connections

Connection	In section	G-version	UN-version
P1	inlet	G 3/4	1 1/16-12 UN-2B
P2	end and MU	G 1/2	7/8-14 UNF-2B
T1	inlet	G 3/4	1 1/16-12 UN-2B
T2,T3	end and MU	G 3/4	1 1/16-12 UN-2B
TP	end and MU	G 3/8	3/4-16 UNF-2B
A, B	spool	G 1/2	7/8-14 UNF-2B
LS, PL	inlet	G 1/4	9/16-18 UNF-2B
PX	inlet	G 1/4	9/16-18 UNF-2B
PS	end and MU	G 1/4	9/16-18 UNF-2B
PS2	end	G 1/8	7/16-20 UNF-2B
PC	spool	G 1/4	9/16-18 UNF-2B
ACP, ACE, ACEF	spool	G 1/8	1/8-27 NPTF
LSA/B	spool	G 1/8	7/16-20 UNF-2B
LSP	end	G 1/4	9/16-18 UNF-2B
LSP	MU	–	9/16-18 UNF-2B (male)

Weights

Inlet section	5.5 kg	12.1 lb
End section	4.2 kg	9.3 lb

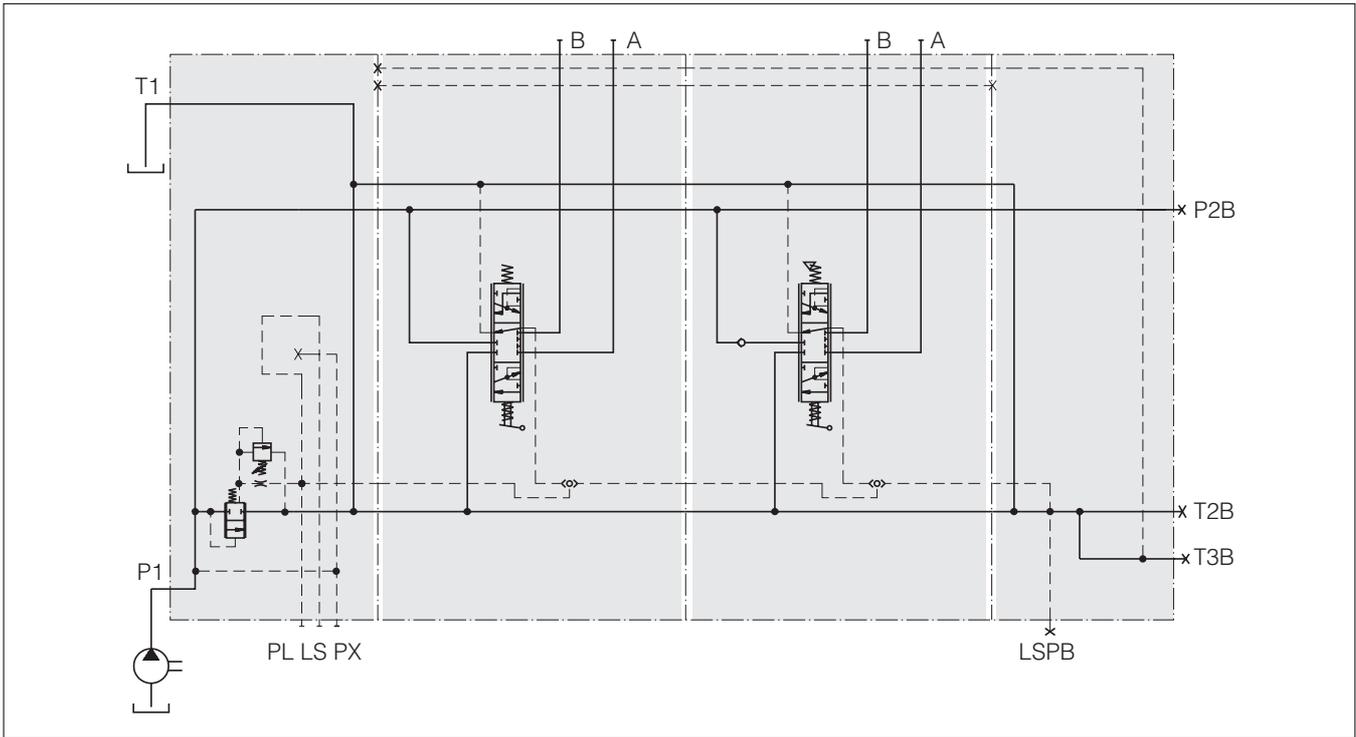
Combined spool-end section, MU compared to spool section below adds 1.2 kg (2.6 lb)

Spool section with spool actuator:

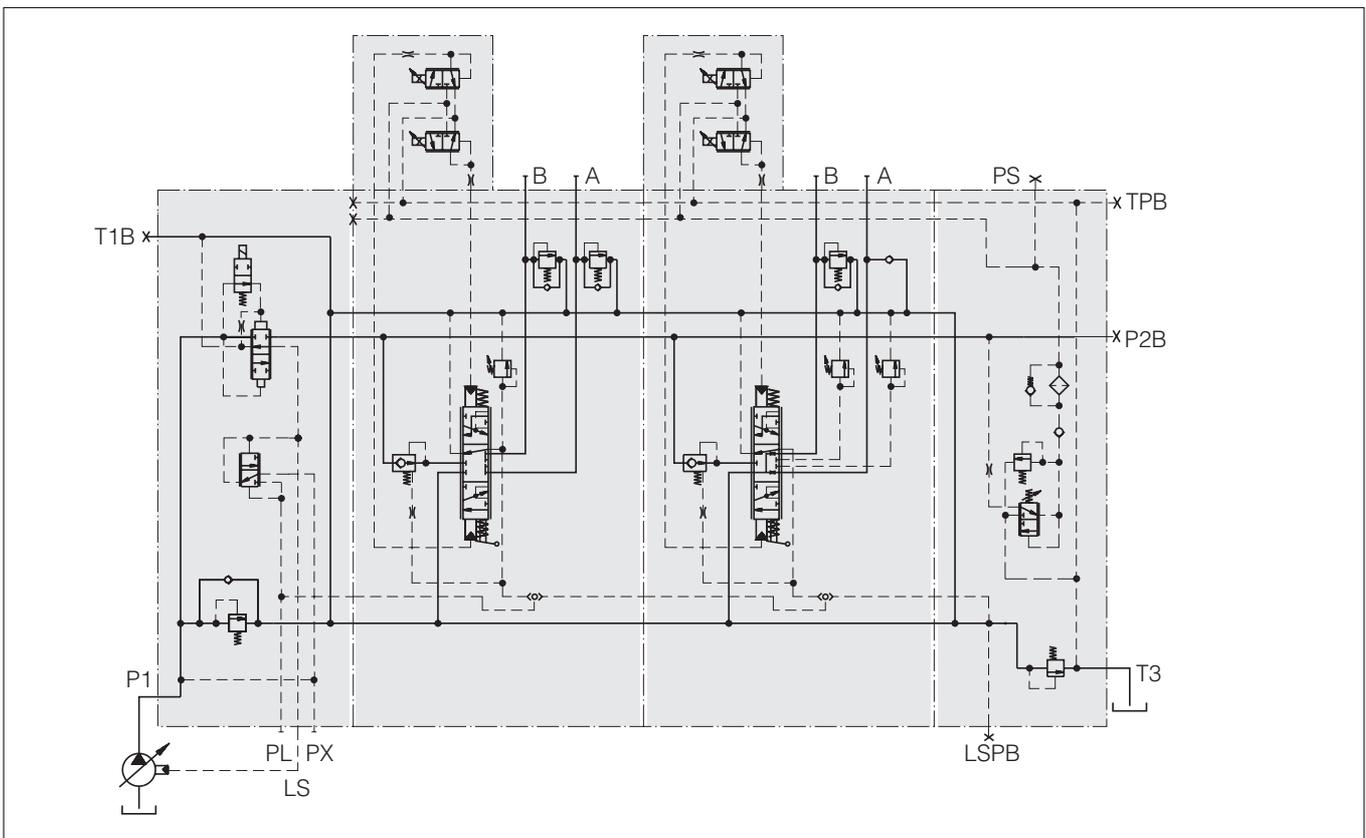
C, B3	4.1 kg	9.0 lb
ACE	5.2 kg	11.5 lb
CH, CHB3, CHX, PC	4.5 kg	9.9 lb
PCH	4.7 kg	10.4 lb
EC, ECS,	5.2 kg	11.5 lb
ECH, ECHL	5.4 kg	11.9 lb

* Performance efficiency will be reduced if outside the ideal values. These extreme conditions must be evaluated by the user to establish suitability of the products performance.

** Product operating limits are broadly within the above range, but satisfactory operation within the specification may not be accomplished. Leakage and response will be affected when used at temperature extremes and it is up to the user to determine acceptability at these levels.

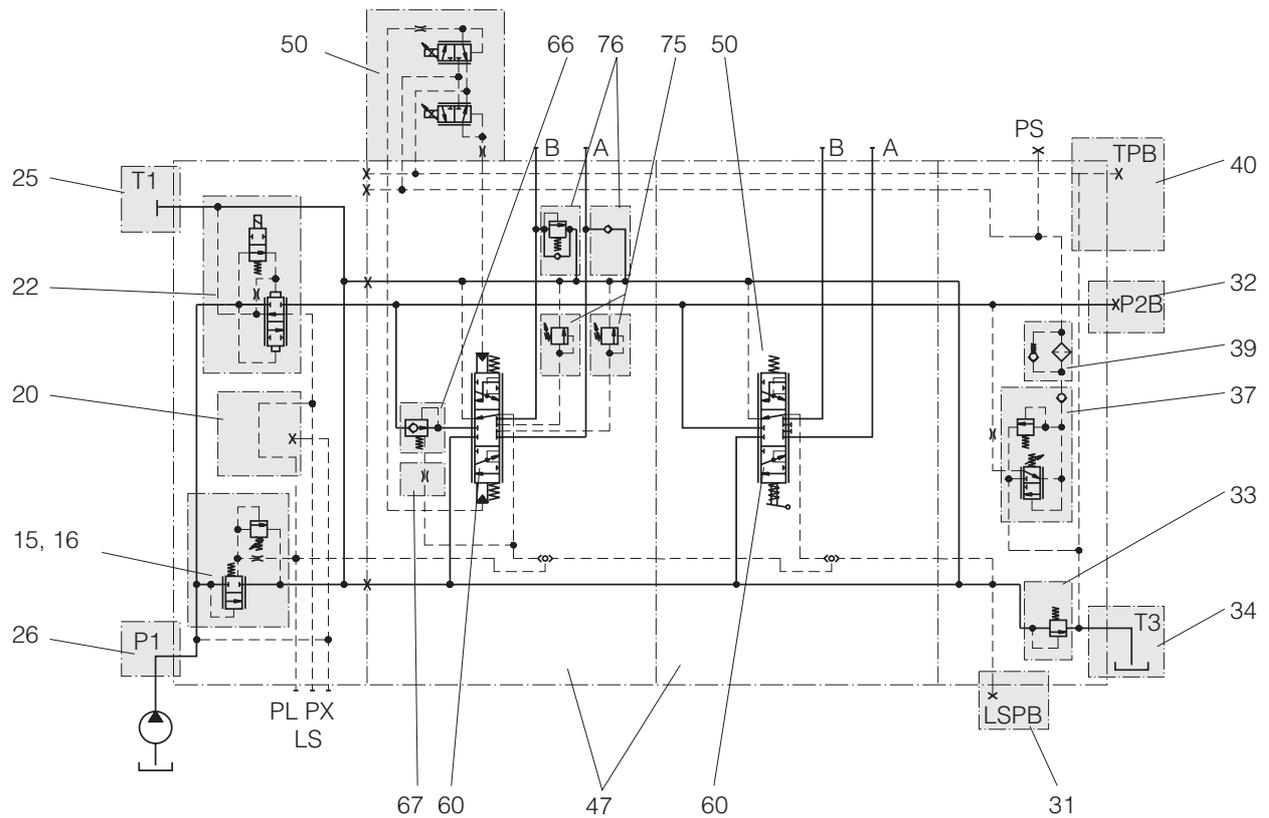


L90LS with levers for direct spool actuation and equipped with bypass for systems fed by pumps with fixed displacement.



L90LS with electro-hydraulic remote-controlled spool actuators and equipped with direct-acting pressure relief valve for systems fed by LS pumps, pump-unloading function, integrated pilot-oil

supply, counterpressure function, section-specific pressure compensators, port-specific feed reducing valves, port-relief and anti-cavitation valves, etc.

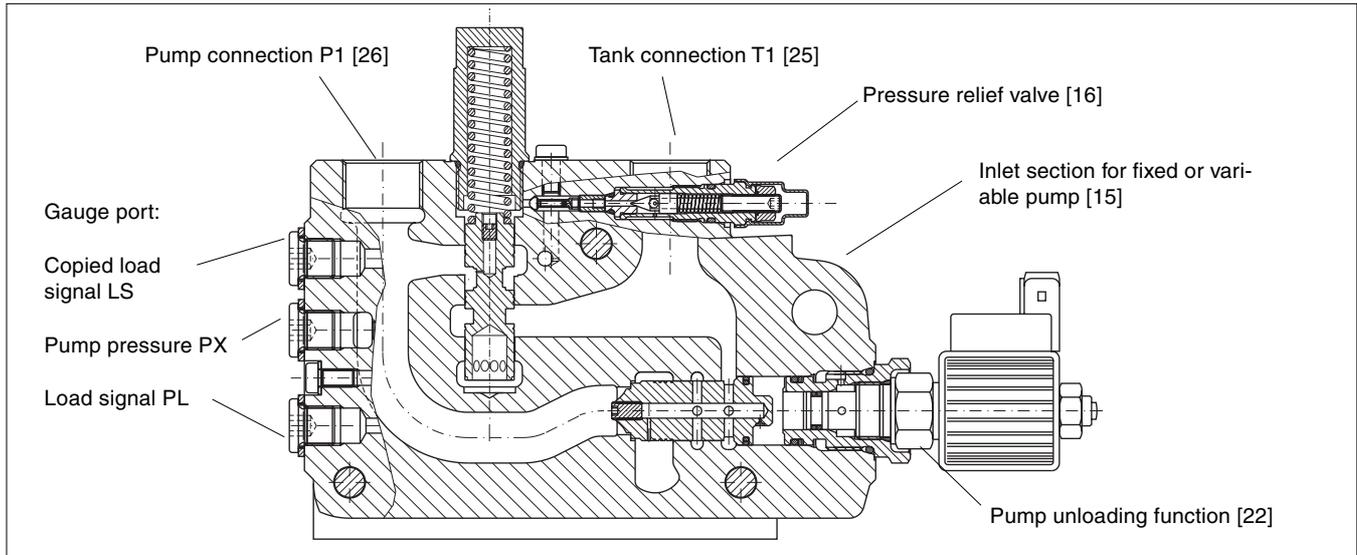


Hydraulic circuit diagram showing basic functions of L90LS

The item numbers in the hydraulic circuit diagram and table below refer to the valve function areas 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 valve-function area [Item number] in catalogue.

Item No.	Code	Description	Item No.	Code	Description
15	CFC	Inlet with bypass for systems with fixed pump.	47	TTT	Section 1 equipped with pressure compensator, separate feed reducers for A- and B-ports, and prepared for port relief valves in both service ports.
16	PS	Pilot-operated main pressure relief valve.	000		Section 2 without pressure compensator, feed reducer or port relief valve.
20	KB	Prepared for load-signal copying.	50	EC	Section 1 equipped with proportional electro-hydraulic remote control.
22	BEN	Electrically activated pump-unloading function that blocks the pump and unloads the load signal.	CH		Section 2 equipped for direct operation with spring centring.
25	T1X	Tank connection to spool section blocked.	60	D	Sections 1 and 2 equipped with spool for double-acting function, with service ports blocked in neutral position.
26	P1	Pump connection in inlet open.	66	K	Pressure compensator with built-in check valve function.
31	LSPB	Load-signal connection for parallel-connected valve plugged.	67	0.8	Restriction of load signal to pressure compensator.
32	P2B	Pump connection Plugged.	75		Pressure setting for feed reducers in A- and B-ports.
33	MF	Counterpressure valve with fixed setting.	76A	N2	Anti-cavitation valve in A-port.
34	T3	Tank connection open.	76B		Pressure setting for combined port-relief and anti-cavitation valve in B-port.
37	R	Pressure reducing valve with separate safety valve for internal pilot pressure supply.			
39	S	Internal coarse filter for pilot circuit.			
40	TPB	Prepared for separate tank connection from pilot circuit.			



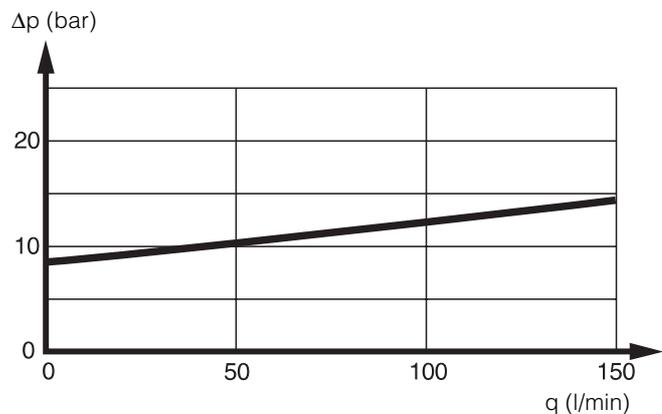
The inlet section comes in several basic variants; one for fixed pumps, two for systems with variable pumps and another - a simple plate - for use when none of the inlet section's integrated functions is required. Inlet sections are equipped with pump and tank connections, a connection for the load signal to LS pumps and gauge ports for measuring the pump and load-signal pressures. In all basic variants, the pump connection P1 [26] and

tank connection T1 [25] are open, while the other connections are plugged. The variant for fixed pumps can be converted easily in the field to work with variable pumps, and vice versa. (CFC « LS1).

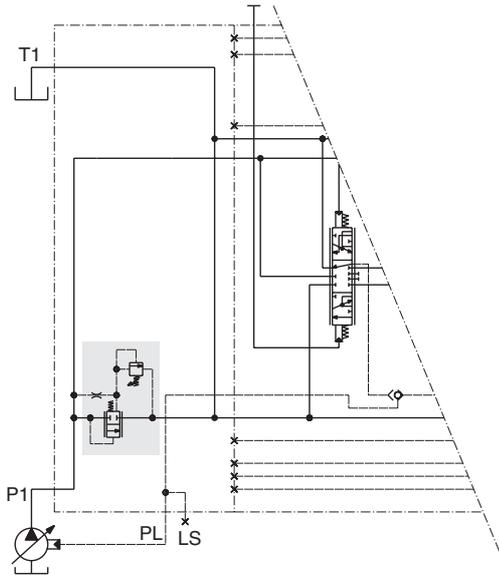
Functions for maximum pressure relief, copying of the load signal and pump unloading (which blocks the hydraulic energy supply to the valve) can be integrated into the inlet section.

Inlet sections [15]

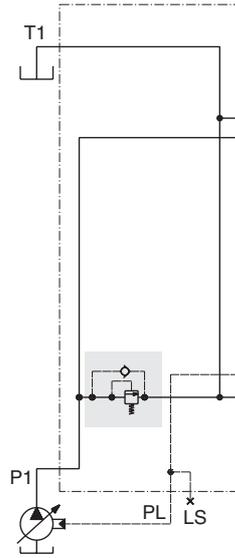
- CFC** Inlet section for systems with fixed pump. The section is equipped with an adjustable, pilot-operated pressure relief valve [16], which protects the pump and inlet side of the valve. A built-in bypass diverts excess oil directly to tank. The bypass pressure level is controlled by the load signal, and is approx. 10 bar above the actual load-signal pressure.
- LS1** Inlet section for systems with LS pump. Equipped with an adjustable, pilot-operated pressure relief valve [16], which protects the pump and inlet side of the valve.
- LS2** Inlet section for systems with LS pump. Equipped with a non-adjustable, direct-acting pressure relief valve [16], which protects the pump and inlet side of the valve. The LS2 variant is normally equipped with a copy function for the load signal, KS [20].
- AS** Inlet section for flow-sharing valve. First valve, nearest pump, in multi valve system. Sending LS-signal to pump.
- AS2** Secondary valve in flow-sharing system, sends LS-signal to first valve.
- IP** Inlet plate without functions. Contains only connections for pump, load signal and a gauge port for measuring tank pressure.
- CA/CL** Combi inlet used as mid-inlet when L90 and K170/K220 are assembled together. This works as 'adapter plate' between valves and replaces inlet sections from both valves. Combi has the same functionality as K-series inlets including flow sharing possibilities (AS). The internal functions are specified in K-series specification.



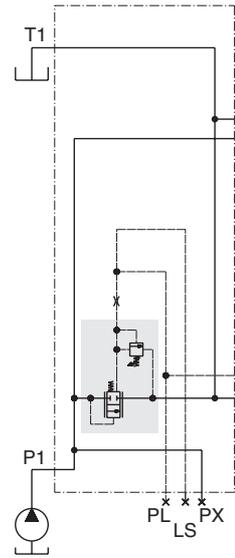
CFC – Idling (no load) pressure drop over bypass. P1 –T1.



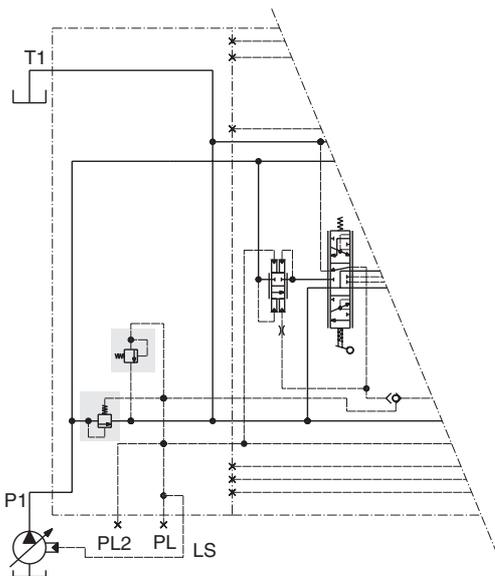
LS1 – Inlet section for systems with LS pump.



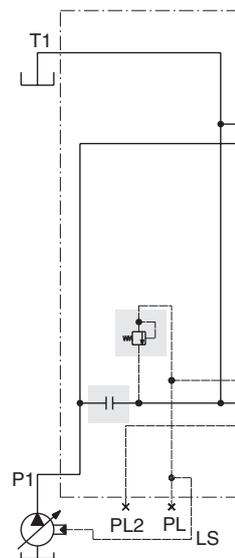
LS2 – Inlet section for systems with LS pump.



CFC – Inlet section for systems with fixed pump.



AS – Inlet section for flow-sharing valve



AS2 – Inlet section for secondary valve in flow-sharing system

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 when there are rapid changes in the load pressure.

- PA1** Direct-acting pressure relief valve, PLC183, with very fast opening sequence and good pressure characteristic. The interchangeable 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 negative pressure in the pump circuit. The valve is intended for the LS2 inlet section [15]. For setting values, please see Pressure setting [17].
- PLM** Main relief valve in AS / AS2 inlet section. Limits the LS-signal pressure that is sent to the LS-pump.
- PS** Pilot-operated pressure relief valve with fast opening sequence and very low pressure override, which effectively prevents overloading of the hydraulic pump and the machine. The valve is adjustable and is delivered factory-set according to the value specified. The valve is intended for the CFC and LS1 inlet sections [15]. Picture, see page 10.
- Y** Plug which can replace the pressure relief valve in the LS2 inlet section [15]. The Y-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 following standard settings are available:

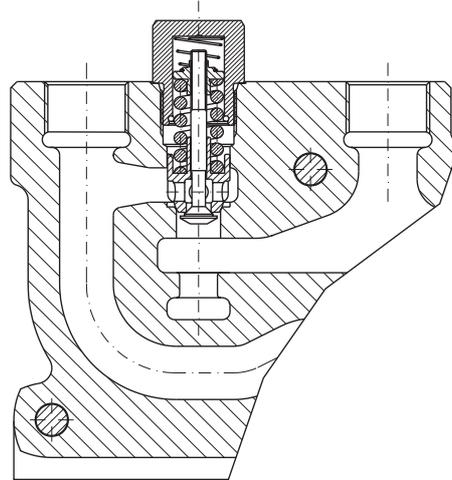
Pressure setting in bar: 63, 80, 100, 125, 140, 160, 175, 190, 210, 230, 240, 250, 260, 280, 300 and 330. Diagram, see page 13.

Pressure setting for PS [16]

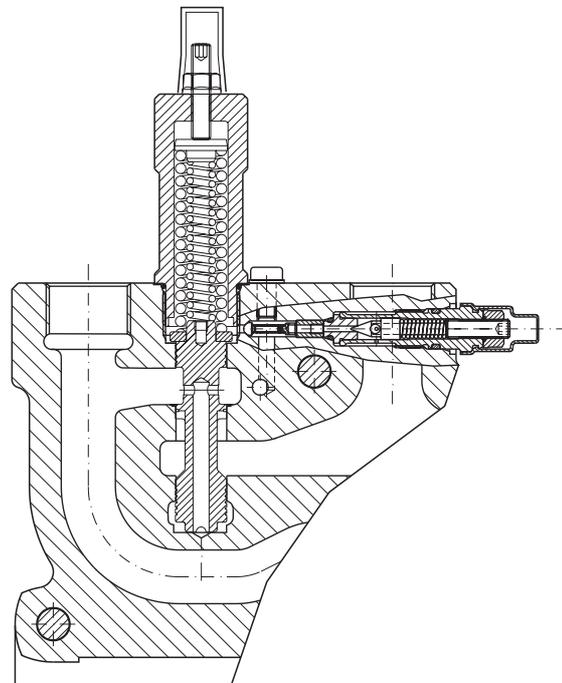
The PS pilot-operated pressure relief valve is adjustable from 50 to 320 bar. The valve can, however, be delivered with a fixed setting according to the value specified. Diagram, see page 13.

Differential pressure limiter [18]

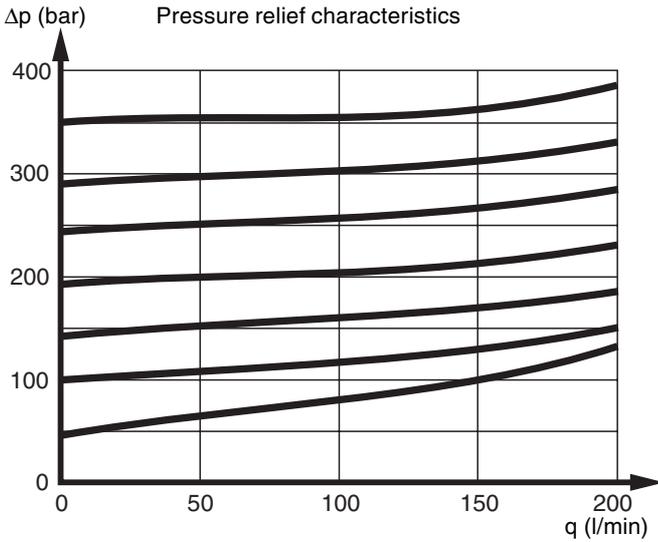
- PLS** Relief function for maximizing Δp in flow-sharing systems (AS) [15]. Must be set higher than the Δp regulator in the pump.



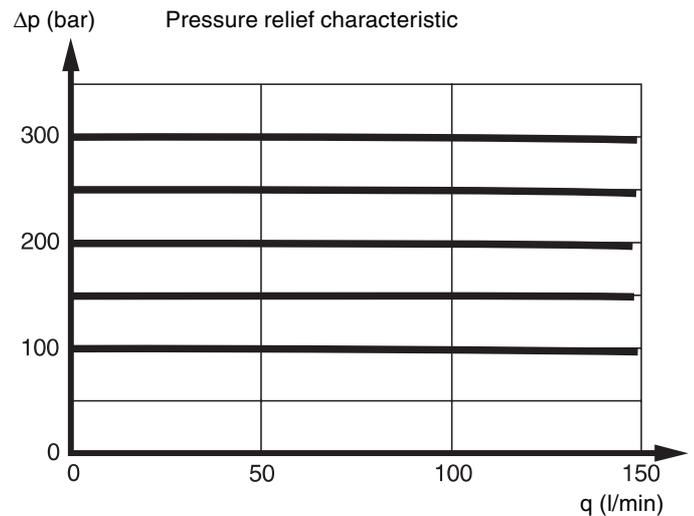
PA1 - Direct-acting pressure relief valve.



PLS - Relief function for maximizing Δp in flow-sharing systems.



PA1 - Direct acting pressure relief valve.



PS - Pilot-operated pressure relief valve.

Load signal system [20]

The load-signal system consists of a series of shuttle valves, one for each spool section in the directional valve. The shuttle valves compare the load signals from all actuated spool sections and transmit the signal with the highest value to the PL connection in the inlet section. If the valve has a load-signal copying function, the signal is transmitted to a copy spool, which makes a copy of the signal and transmits it to the LS port.

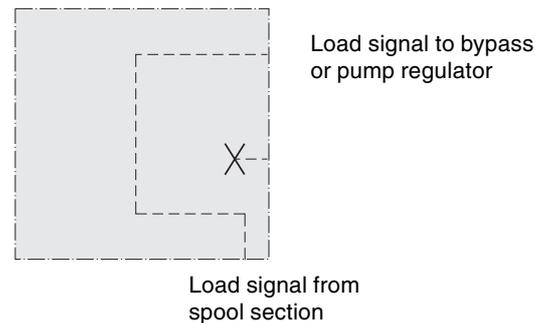
If the load-signal chain is extended to a parallel-connected valve via the LSP port [31], then the highest load signal from the parallel-connected valve is included in the comparisons made by the load-signal chain in the first valve.

In the case of the CFC variant of the L90LS, i.e. the variant fed by a fixed pump, the highest load signal is transmitted to the bypass valve, which regulates the pressure in the pressure gallery to approx. 10 bar above the value of the signal.

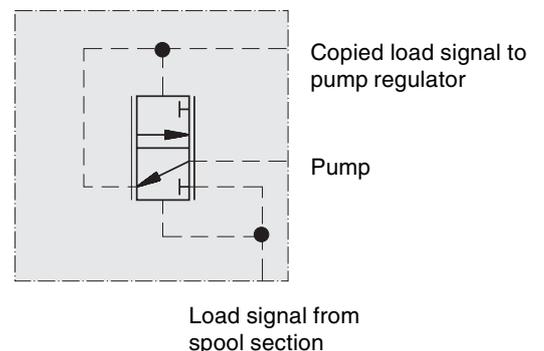
KB Inlet section machined for copy spool but blocked. Gives possibility to install copy spool later. The load signal goes directly to the bypass in CFC systems, or to the PL connection in LS systems.

KS Inlet section with copy spool. The load signal acts on a copy spool, which sends a copied load signal to the LS connection. The copying system permits a certain consumption in the load-signal line to the pumpregulator, without the load signal being influenced. This enables simpler system construction, 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. Moreover, it prevents the tendency for the load to sink slightly at the beginning of the lifting phase. Inlet sections of type LS2 [15] are normally equipped with copy spools.

/ Not machined for copy spool.



KB - Inlet section without copy spool.



KS - Inlet section with copy spool.

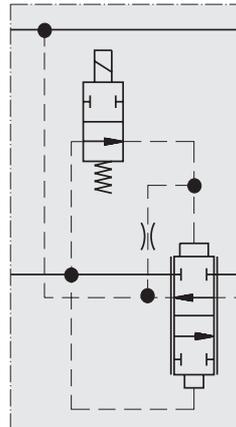
Pump-unloading function [22]

If required, the valve can be equipped with a pump-unloading function in the inlet section. This enables machine manufacturers to equip their machines with an emergency-stop function to comply with the EC Machinery Directive. The function can be controlled either electrically or hydraulically.

(The inlet section is not normally machined to accommodate the pump-unloading function.)

BEN Electrically controlled pump-unloading function. When the current to the electromagnet is broken, the pump is blocked and the load signal drained to tank. In both LS and CFC systems, this means that the pressure gallery is shut off from the pump inlet and the pump is unloaded.

BX Hydraulically controlled pump-unloading function. When an external hydraulic signal with the same pressure as the pump is connected to the BX port, the pump is blocked and the load signal drained to tank. In both LS and CFC systems, this means that the pressure gallery is shut off from the pump inlet and the pump is unloaded.
 Connection: G1/2 or 9/16-18 UNF-2B.



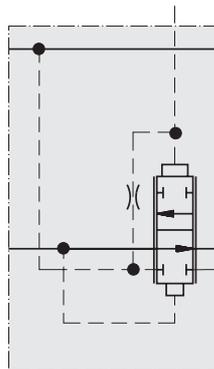
BEN - Electrically controlled pump-unloading function.

Tank connection T1 [25]

T1 Tank connection T1 is open. Normal variant.

T1B Tank connection T1 is blocked.

T1X Used together with CFC [15] and MF counterpressure functions [33] only. Tank connection T1 in the inlet section is separated from the tank galleries in the spool sections. Pump oil that is not used flows via the bypass directly to tank via T1, while returning oil from the actuators flows to tank via the counterpressure valve in the end section and tank connection T3. Circuit, see page 9.



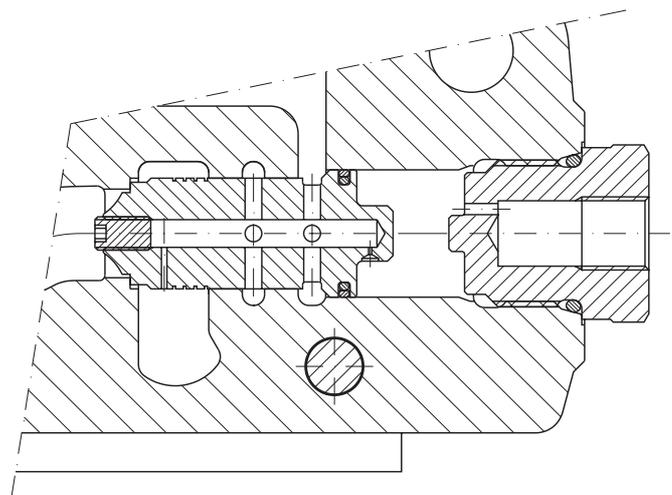
External connection of signal pressure from pump line

BX - Hydraulically controlled pump-unloading function.

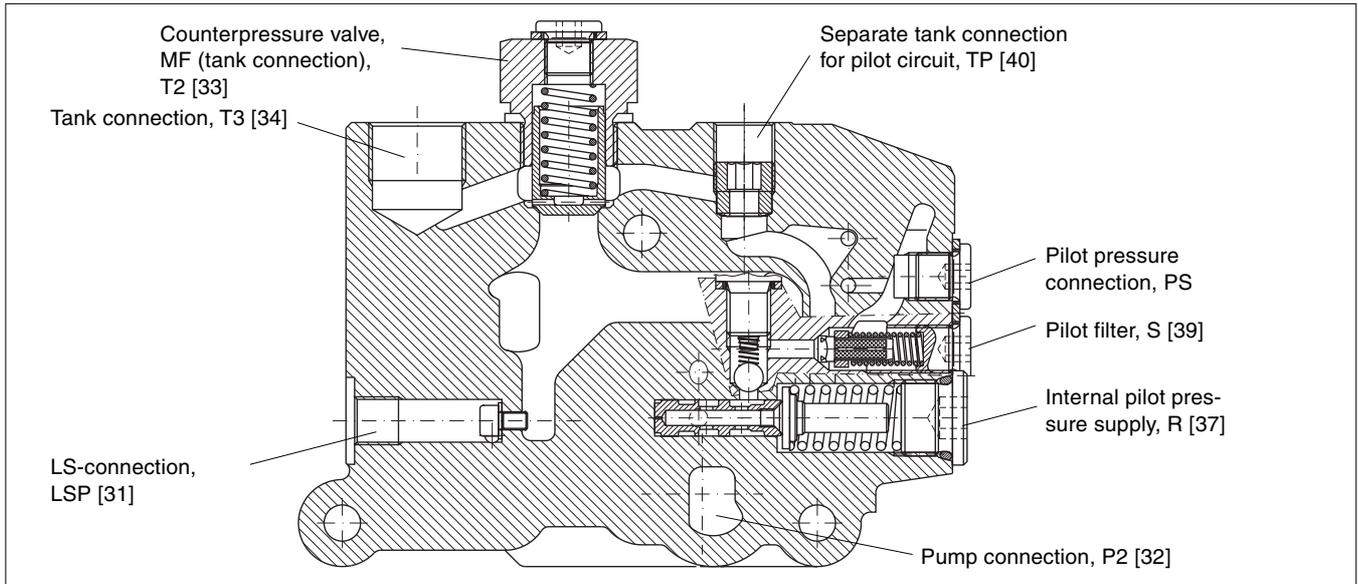
Pump connection P1 [26]

P1 Pump connection P1 is open. Normal variant.

P1B Pump connection P1 is plugged.



BX - Connection of signal pressure.



The end section can be equipped with a number of optional functions to customize it optimally for the given application. It can, for instance, be equipped with a pressure-reducing valve to supply internal pilot-pressure for hydraulic or electro-hydraulic spool actuators, and a fixed counterpressure valve in the T2 port.

In the basic version of the end section, all connections are plugged.

As an alternative to the standard end-section, when internal pilot generation and counter pressure valves are not needed, a combined spool-end section (MU) can be selected. MU, together with the combi-inlet section (CL/CA [15] see page 10), makes a very compact and cost effective solution.

End section [30]

For combination possibilities with series K-valve. See inlet section page 10.

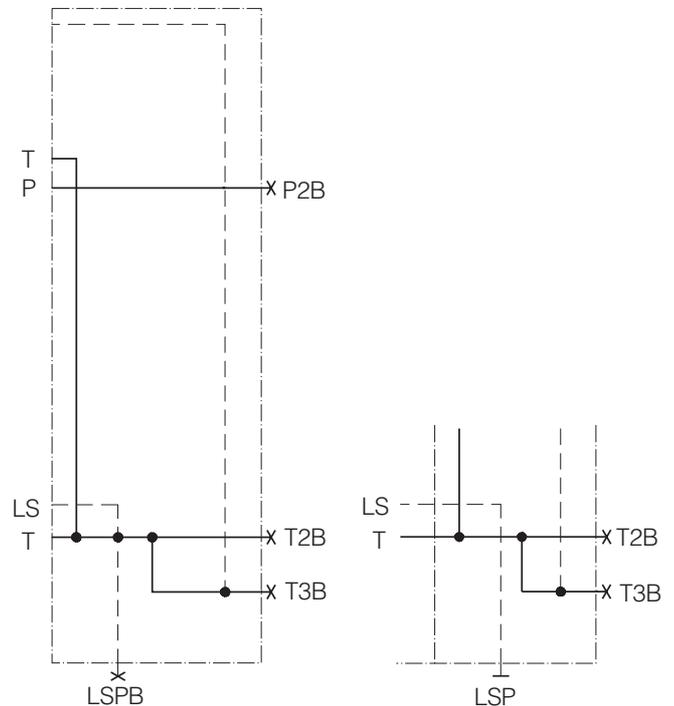
- US** Standard end-section
- MU** Combined spool and end section (one casting), without MF and R options.

LS connection [31]

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

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 machine functions with very high flow demands are operated simultaneously. Under certain provisions, the connection can also be used in situations when feeding from the rear face is the most suitable option in terms of available space. When feeding via P2, the pump-unloading function [22] cannot be used.
- P2B** Alternative pump connection plugged.



LSPB - LSP-port plugged and LS-signal line internally connected to tank.

LSP - Port for connection of LS signal from other valve is open.

Counterpressure valve / tank connection T2 [33]

T2 Alternative tank connection T2 open.

T2B Alternative tank connection T2 plugged.

MF Counterpressure valve factory set to give 5 bar counterpressure. Tank connection T1 must be plugged (T1B) [25] and tank connection T3 [34] must be open.

If the system has a fixed pump, CFC [15], the separate tank line T1X [25] from the bypass can be used to reduce the idling (no load) losses in the system.

Tank connection T3 [34]

T3 Tank connection T3 is open.

T3B Tank connection T3 is plugged.

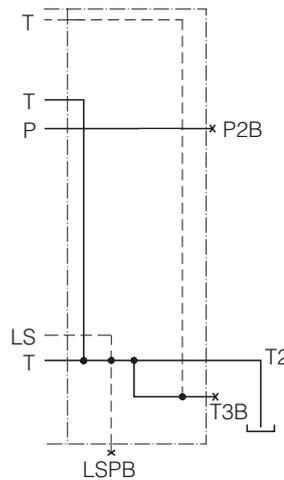
Internal-pilot pressure supply [37]

R Internal pilot-pressure supply is a valve function, built into the end section, which works as both a pressure regulator 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 circuit to be maintained in the event of a temporary fall in pump pressure, e.g. during a rapid lowering movement.

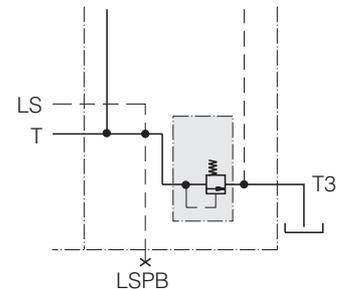
Pilot pressure for external use, e.g. for delivery to PCL4 remote control valves, can be tapped from the PS connection on the B-side of the end section. Pressure setting: 35 bar.

R22 Same as R, but with 22 bar pressure setting.

R43 Same as R, but with 43 bar pressure setting.



T2 – Without counterpressure valve.



MF – Factory-set counterpressure valve.

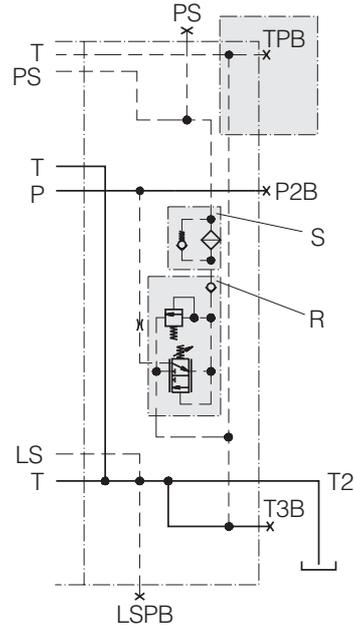
Pilot filter [39]

- S** Coarse filter with bypass function in the internal pilot pressure supply. The filter protects the pilot circuit from dirt, especially during start-up of the system.
- YS** Adapter for connection of external filter for pilot oil. Enables the pilot circuit to be supplied with cleaner oil compared with the rest of the system.

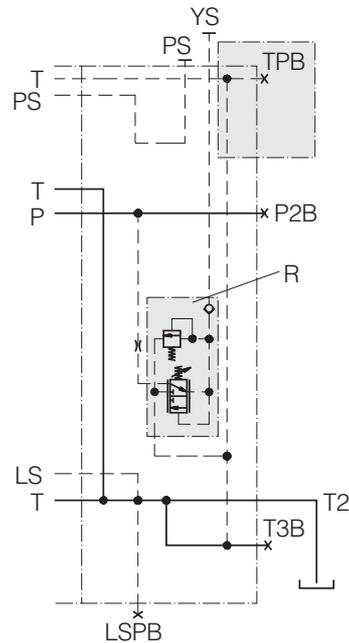
Separate tank connection for pilot circuit [40]

This connection is machined into the end section only when the valve is furnished with internal pilot-pressure supply [37].

- TP** Separate tank connection for the pilot circuit is open. The connection to the main tank gallery of the directional valve is blocked. The function is intended 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.
- TPB** The end section is machined to provide a separate tank connection for the pilot circuit, and plugged. The tank return of the pilot circuit is connected to the tank gallery of the directional valve.
- TPX** Only for MU. Section is machined to provide external connection of pilot tank. There is no internal tank connections in MU. If needed then it must be arranged in the inlet manifold or externally



*R - internal pilot-pressure supply.
S - coarse filter with bypass function.
TPB - end section machined to accommodate separate tank connection for pilot circuit, and plugged.*



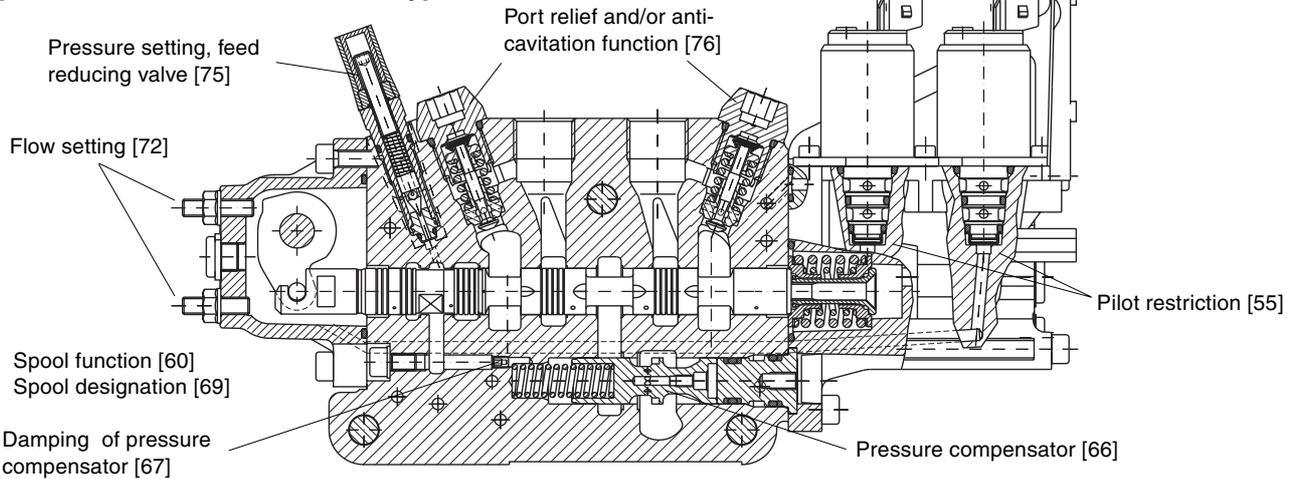
*R - internal pilot-pressure supply.
YS - adapter for connection of external pilot-pressure filter.
TPB - end section machined to accommodate separate tank connection for pilot circuit, and plugged.*

The L90LS is stackable and can be supplied in combinations of 1-12 spool sections. Each section can be equipped individually with a variety of optional functions, as well as different types of spool and spool-actuator. This enables optimum customization to the application and particular machine function in question.

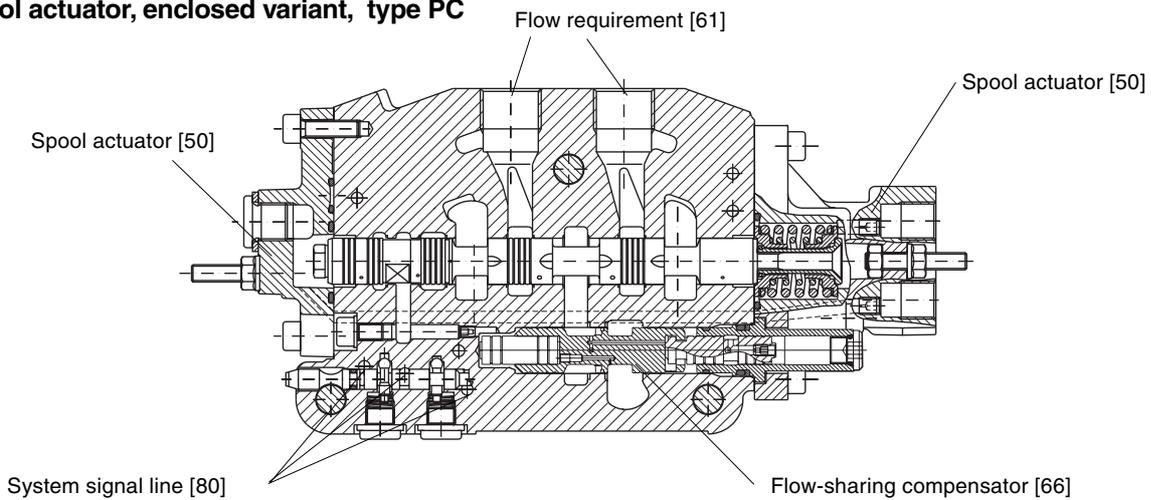
Basic variants of spool section [47]

Spool sections are available in different variants depending on the choice of optional functions:

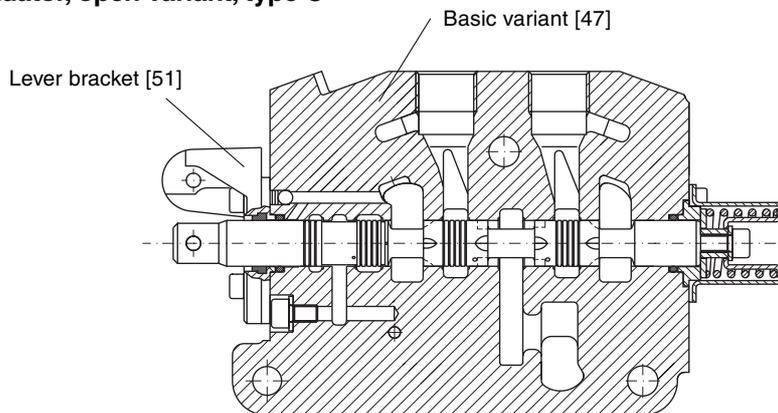
Spool actuator, enclosed variant, type ECH



Spool actuator, enclosed variant, type PC



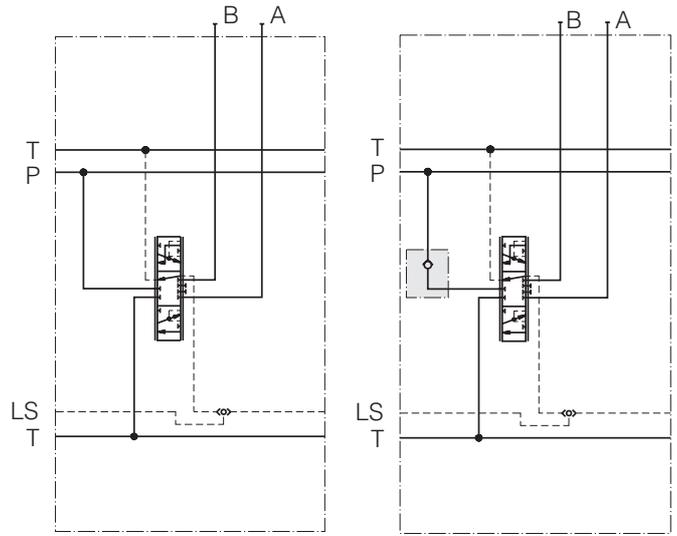
Spool actuator, open variant, type C



- 000** Not machined for pressure compensator, load-hold check valve, feed reducer, port-relief or anti-cavitation valves.
- V00** Section fitted with load-hold check valve, but not machined for port relief valves.
- T00** Section fitted with pressure compensator, but not machined for port relief valves.
- TA0** Section fitted with pressure compensator and feed reduction in A-port, but not machined for port relief valves.
- TC0** Section fitted with pressure compensator and common feed reduction in A- and B-ports, but not machined for port relief valves.
- TT0** Section fitted with pressure compensator and individual feed reduction in A- and B-ports, but not machined for port relief valves.
- **T** All of the section variants above are available in versions that are machined for, and can be fitted with, port relief and/or anti-cavitation valves in service ports A and B. In such cases, the letter T is given in the third position in the product designation, e.g. 00T, V0T, T0T, TAT, TCT and TTT. For further information, see Port relief and/or anti-cavitation valves [76].
- MU** Combined spool and end section. Shorter total valve length.

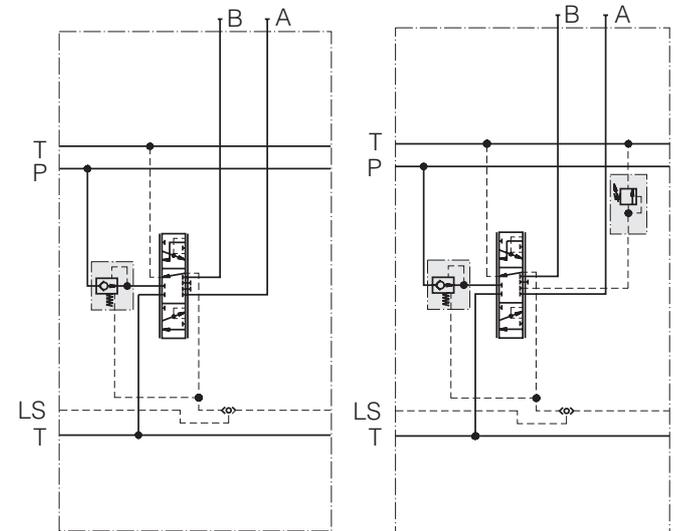
V** and T** have the same machining and can be converted easily from one variant to another at any time. However, the machining for *O*, *A*, *C* and *T* sections is different.

For further information, see also "Pressure compensator / load-hold check valve [66]" and "Feed reducing valve [75]".



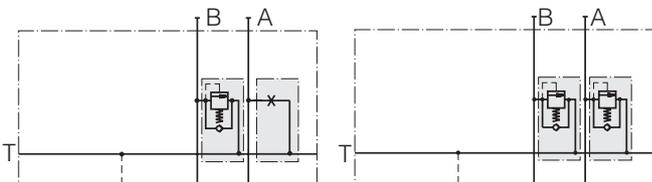
Variant 000

Variant V00

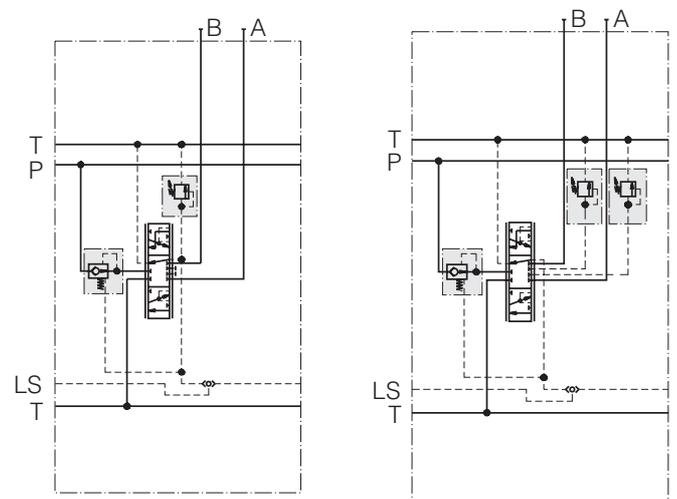


Variant T00

Variant TA0



Variant **T prepared for port-relief and/or anti-cavitation valves in service-ports A and B.
 Above left: section with Y-plug in A-port and combined port-relief and anti-cavitation valve in B-port.
 Above right: section with combined port-relief and anti-cavitation valves in both A and B ports.



Variant TC0

Variant TT0

Spoolactuators

Spool actuators of both the open and enclosed type can be used on the L90LS. Open spool-actuators, in which the spool-end is exposed, are simpler and cheaper. They are intended for use in systems where low capital cost is a priority. They can be operated directly by means of linear levers or mechanical coordinate levers (joysticks), or can be connected to remote controls by means of wires.

With enclosed spool-actuators, the spool-ends are totally enclosed in oil-filled caps. Enclosed spool actuators are intended primarily for hydraulic and electro-hydraulic remote control, but can also be the preferred choice for direct control in aggressive environments.

Many different versions of spool actuator are available. Details can be found on pages 20-23.

Spool actuators [50]

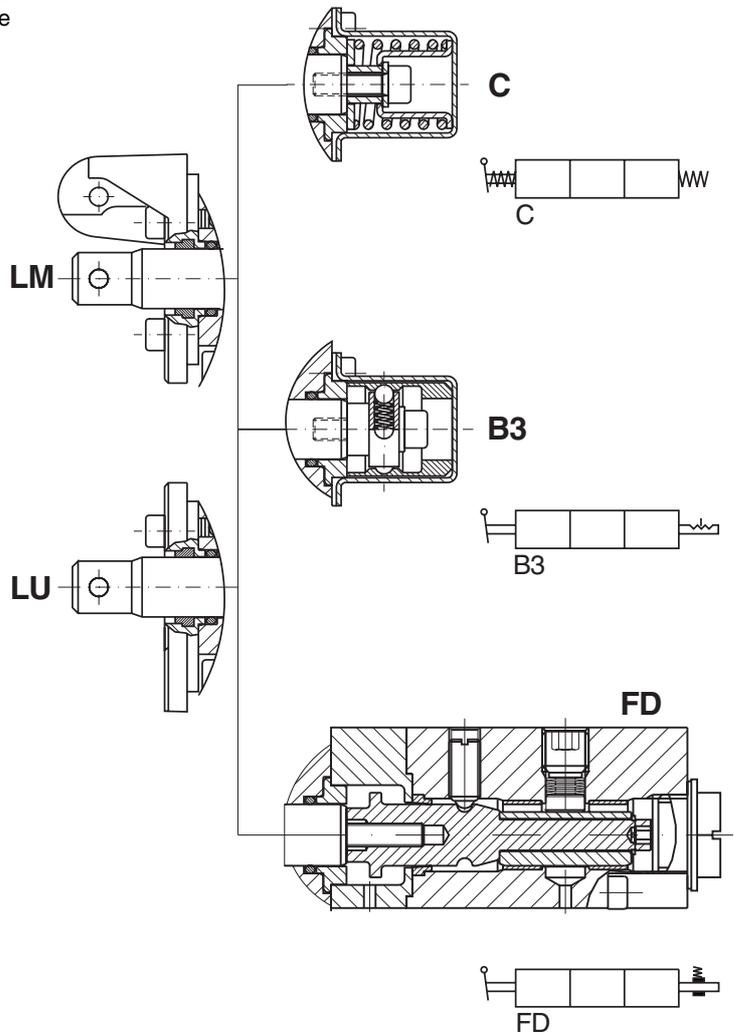
Directly operated, with open spool-end

C Spring-centred spool actuator
Steplessly operable with spring-return to neutral.
Spring force in neutral: 60 N
Spring force when fully actuated: 130 N

B3 Three-position spool actuator
Equipped with 3-position mechanical detent that gives 3 fixed positions: neutral and fully actuated in either direction. Spool remains in selected position and must be moved deliberately from one position to another.

Force needed on spool to overcome detent: approx. 160 N

FD Friction-detented spool actuator
Lever remains at selected stepless position. A force index indicates when the lever is in neutral.



ON/OFF remote-controlled, with open spool-end

ACE **Electro-pneumatic spool actuator, ON/OFF**
 Spring-centred. Can be fitted with supplementary local lever (optional) for direct, stepless actuation of spool.

Control pressure:	min. 4 bar
	max. 10 bar
Spring force in neutral:	95 N
Spring force when spool fully actuated:	160 N
Solenoid:	12 V DC 0.85 A
	24 V DC 0.42 A
Voltage tolerance:	±20%
Connections:	G 1/8 or NPTF 1/8-27

ACEF **Electro-pneumatic spool actuator, ON/OFF**
 Identical to the ACE, except that it has a common pressure gallery for primary air. The primary air can be connected to either the first or the last of the adjacent spool-sections equipped with ACEF actuators.

Connection thread: G 1/8 or NPTF 1/8-27

Remote-controlled, proportional spool actuators with open spool-end

ACP **Pneumatic proportional spool-actuator**
 Can be fitted with supplementary local lever (optional) for direct, stepless actuation of spool. The ACP is best controlled by means of our **VP04** remote-control valve (see separate brochure).

Breakaway pressure*:	2 bar
Final pressure*:	5.5 bar
	max. 10 bar

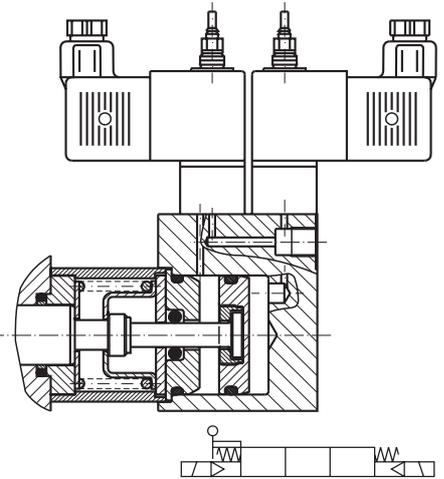
Connection thread: G 1/8 or NPTF 1/8-27

Lever brackets [51]

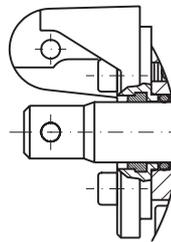
- LM** For spool actuators with open spool-end
- LU** Spool-sealing cover without lever bracket for spool actuators with open spool-end

* The breakaway pressure is the pressure needed for the directional valve to open the connection "pump to service port". The final pressure is the lowest pressure needed to effect full actuation of a spool in the directional valve. This data must be taken into consideration when choosing control units, since the opening pressure of the control unit must be lower than the breakaway pressure of the spool actuator in order to avoid jerky starting and stopping. However, the control unit's final pressure must be higher than the final pressure of the directional valve in order to ensure that the spools can be fully actuated.

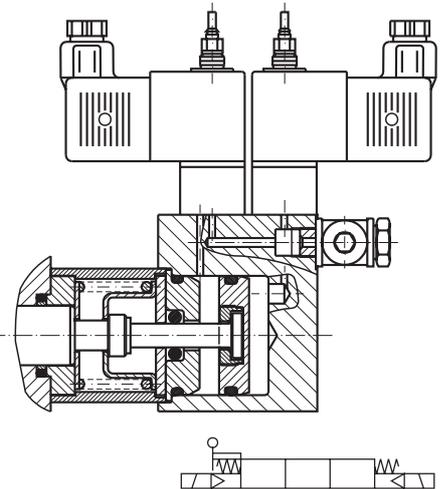
ACE



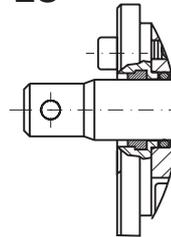
LM



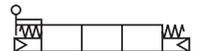
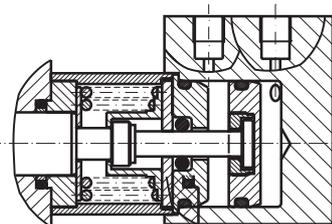
ACEF



LU



ACP



Directly operated with enclosed spool-ends

CH Spring-centred spool actuator
 Has enclosed spool-ends for use in aggressive environments.
 Steplessly operable with spring-return to neutral.
 Spring force in neutral: 70 N
 Spring force with spool fully actuated: 140 N

CHX Spring-centred spool actuator
 Same as CH, but with stronger springs to compensate for friction in external linkage arms etc.
 Spring force in neutral: 85 N
 Spring force with spool fully actuated: 250 N

CHB3 Three-position spool actuator
 Equipped with 3-position mechanical detent that gives 3 fixed positions: neutral and fully actuated in either direction. Spool remains in selected position and must be moved deliberately from one position to another.
 Force needed on spool to overcome detent: approx. 160 N

Proportionally remote-controlled, with enclosed spool-ends

PC Hydraulic spool-actuator

PCH Hydraulic spool-actuator with facility for supplementary local lever for direct control

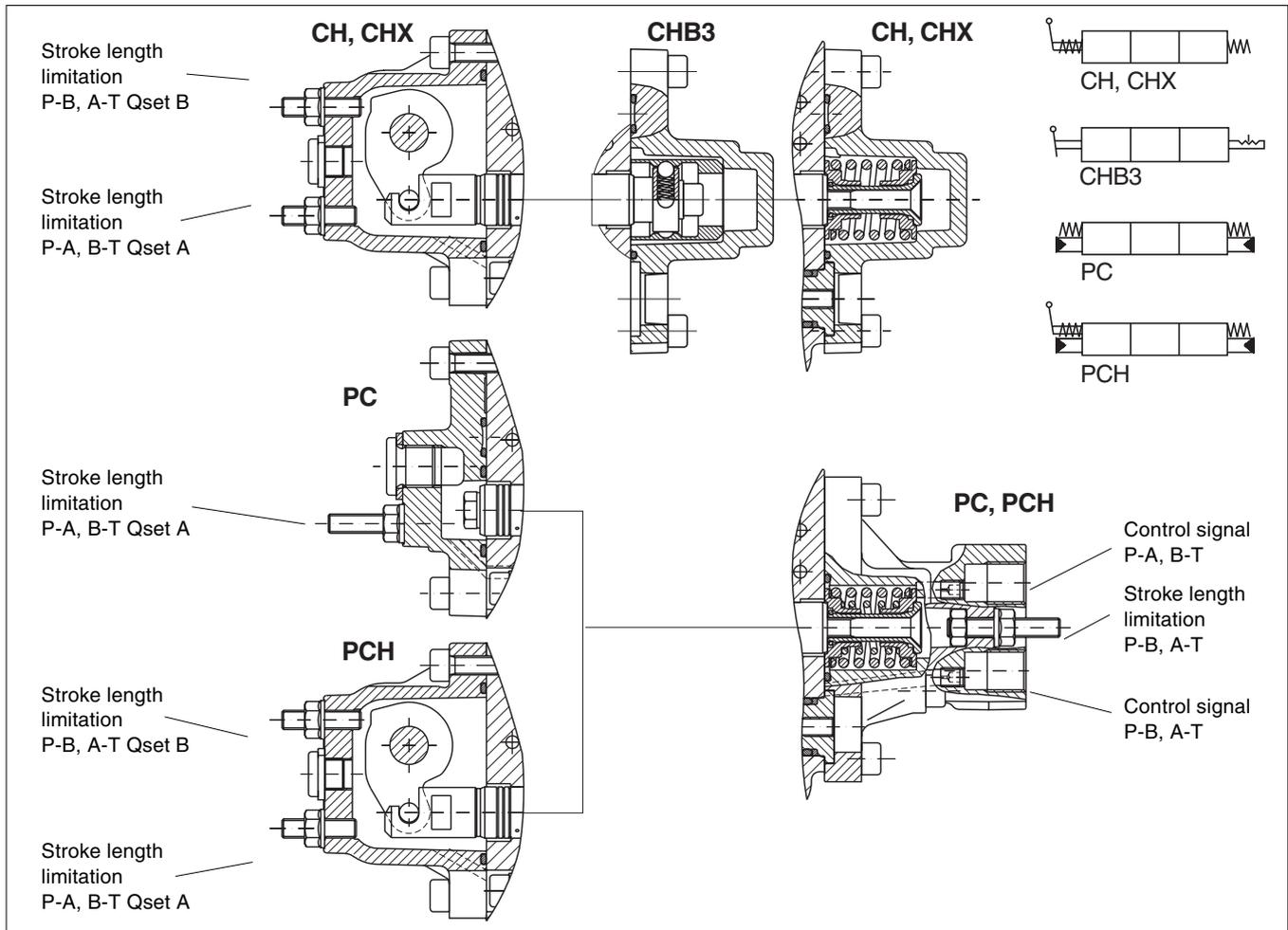
The PC and PCH are proportional, hydraulically controlled spool actuators with spring-centring to neutral. They are intended to be controlled by the **PCL4** remote-control valve. When determining a suitable control pressure for the PCL4, bear in mind that its breakaway pressure should be approx. 1 bar lower than that of the directional valve in order to ensure gentle starting and stopping. The pilot pressure for the PCL4 can be tapped from the internal pilot-pressure supply in the end section of the directional valve, via the PS connection.

Control pressure, breakaway*: 5.5 bar
 Control pressure, final*: 15.0 bar
 Permissible pressure in pilot cap: max. 35 bar

Connections: G ¼ or 9/16-18 UNF

* See page 21.

See also separate catalogue for PCL4.



Proportionally remote-controlled, with enclosed spool-ends

EC/ECS Electro-hydraulic spool actuator

The EC/ECS are proportional, electro-hydraulically controlled spool actuators with spring centering to neutral. They are intended to be controlled remotely by the IQAN or EHC35 control systems. Pilot-pressure oil for the PVC25 converter-valves is led to the spool actuators through internal ducts in the directional valve. This means that only the electric cables from the control system to the converter valve need to be connected externally.

Control current for PVC25, 12 V

Breakaway* min. 550 mA
 Fully actuated max. 980 mA

Control current for PVC25, 24V

Breakaway* min. 260 mA
 Fully actuated max. 510 mA

Measuring connections: G1/4 or 9/16-18 UNF

EC as ECS but with manual over-ride and air-bleed screw.

*
 The breakaway current refers to the current needed for the directional valve to open the connection "pump to service port". The final current is the lowest current needed to effect full actuation of a spool in the directional valve. This data must be taken into consideration when choosing control units, since the opening current of the control unit must be lower than the breakaway current of the spool actuator in order to avoid jerky starting and stopping. However, the control unit's final current must be higher than the final current of the directional valve in order to ensure that the spools can be fully actuated.

ECH Electro-hydraulic spool actuator with facility for supplementary local lever for direct control

The ECH spool actuator can be operated directly and steplessly by a supplementary local lever (optional).

Spring force in neutral 60 N
 Spring force with spool fully actuated 350 N

Other data as for ECS to the left.

ECHL Same as ECH, but with weaker centering spring.

Suitable for use, e. g. when spool actuator is mainly intended to be operated directly.

Spring force in neutral 85 N
 Spring force with spool fully actuated 250 N

Control current for PVC25, 12 V

Breakaway* min. 550 mA
 Fully actuated max. 820 mA

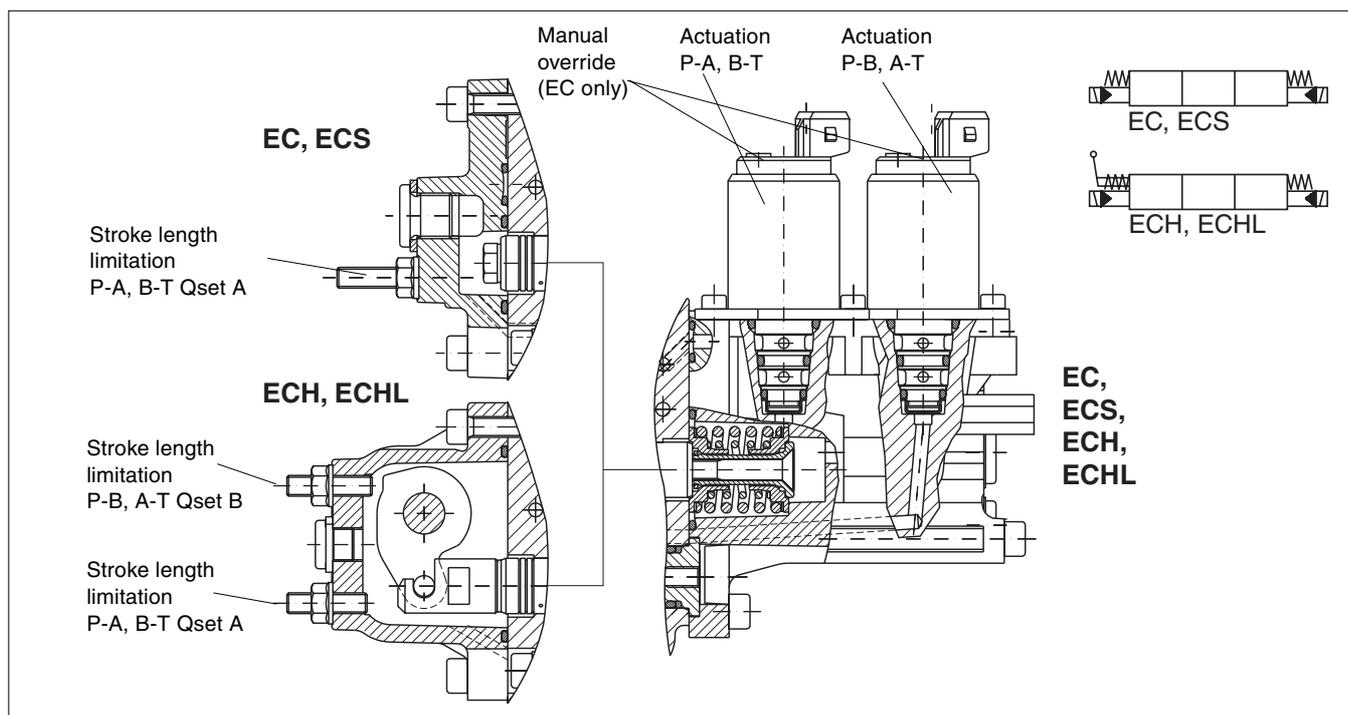
Control current for PVC25, 24V

Breakaway* min. 260 mA
 Fully actuated max. 440 mA

Other data as for ECH above.

Connector types [56]

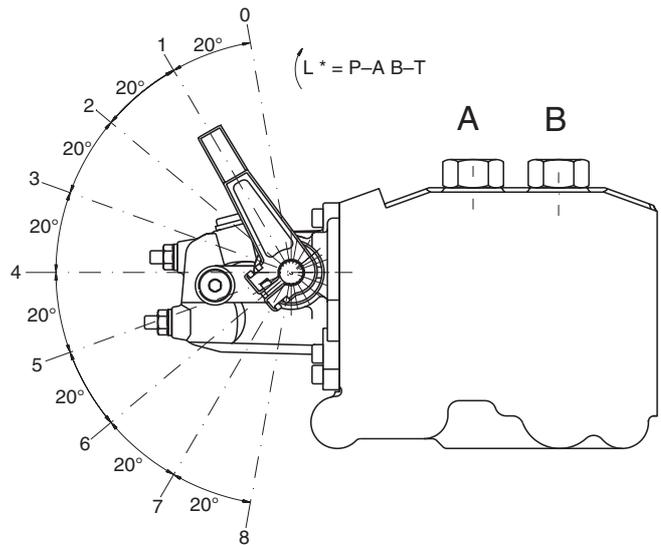
- A** Solenoid with connector for Bosch 1 928 402 404 or AMP Junior-Timer type C, 963040-3.
- D** Solenoid with male type connector type Deutch.



Lever bracket [51]

In addition to the normal lever-attachment angle, L1, the lever bracket is available in 8 other angles, designated L0 to L8 (see figure opposite). In the L4 variant, for instance, the lever is mounted parallel with the spool.

- L1** Standard lever-bracket for directly operated spool actuators with enclosed spool-ends, e.g. CH, and for remote-controlled spool actuators that have facility for supplementary local lever for direct control, e.g. ECH.

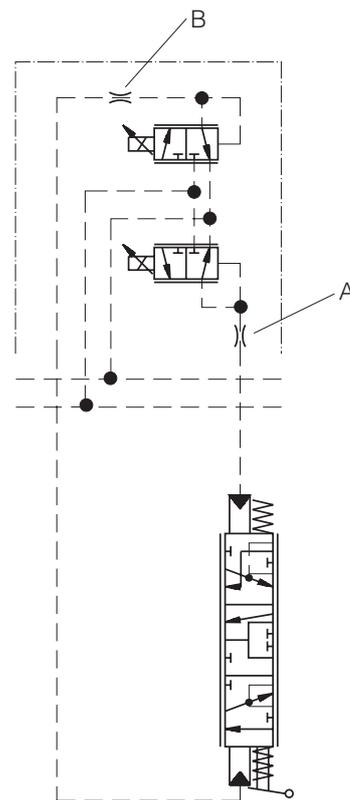


Lever brackets L can be given different attachment angles.

Pilot restrictor [55 A, B]

To give gentle control characteristics, remote-controlled spool actuators with enclosed spool-ends are fitted with pilot restrictors, which can be chosen individually for each service port. The restrictor gives a kind of ramp function.

Restrictors from 0.6 to 1.5 mm available.



Pilot restrictor

Choice of spool

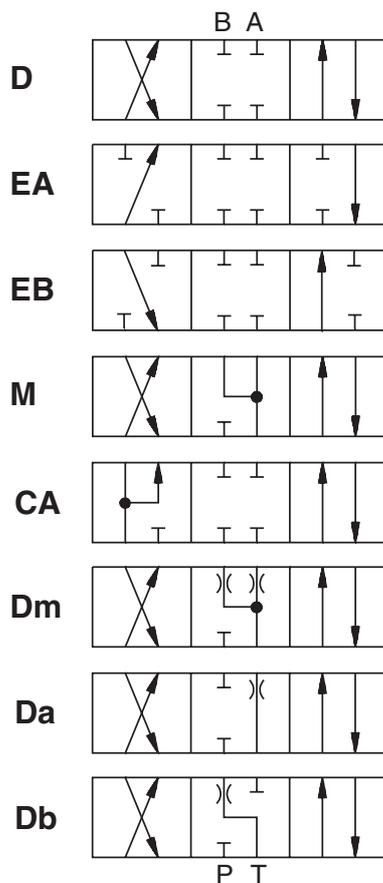
The spool is the most important link between the operator's actuation of a control lever and the behaviour of the corresponding machine function. The designs of our spools are therefore customized to meet the operating criteria of each individual machine function as accurately as possible. Spools are designed with the aid of a computerized specification system, which takes all factors into account.

Spool function [60]

There are many spool variants: D, EA, EB, M, CA, Dm, Da and Db, which are customized for different flows, load conditions and actuator area ratios. The spools are also available with different degrees of force feedback from the A- and/or B-side.

- D** Double-acting spool for, e.g. double-acting cylinder. Blocked in the neutral position.
- EA** Single-acting spool for, e.g. single-acting cylinder. Blocked in the neutral position. Service port B blocked.
- EB** Single-acting spool for, e.g. single-acting cylinder. Blocked in the neutral position. Service port A blocked.
- M** Double-acting spool for, e.g. hydraulic motor. Float position function in neutral position.
- CA** Regenerative spool for rapid feeding of cylinder via the A-port. The large side of the cylinder is connected to the A-port.
- Dm** Double-acting spool with drainage A to T and B to T, which prevents pressure build-up in the neutral position. The spool is used as a double-acting spool in combination with, e.g. an overcentre valve.
- Da** Double-acting spool with drainage A to T, which prevents pressure build-up in the A-port in the neutral position. The spool is used as a double-acting spool in combination with, e.g. an overcentre valve.
- Db** Double-acting spool with drainage B to T, which prevents pressure build-up in the B-port in the neutral position. The spool is used as a double spool in combination with, e.g. an over-centre valve.

Spool symbols



Flow requirements [61 A, B]

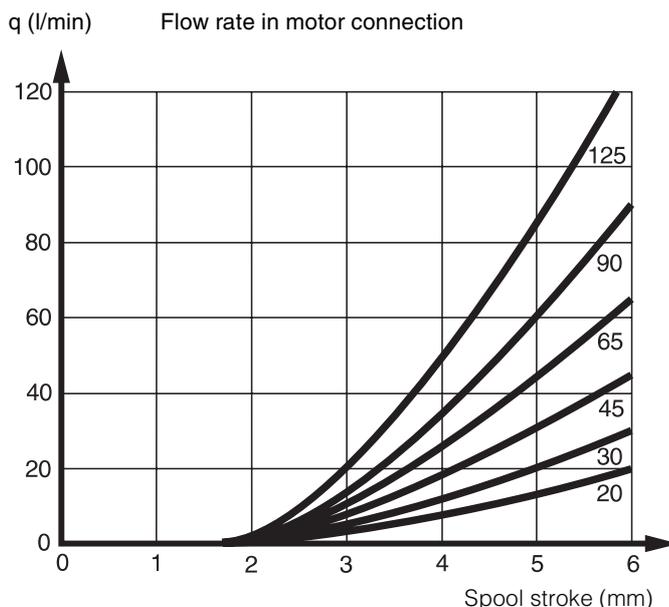
There is a wide range of computer-optimized spool designs for the L90LS with nominal flows of up to 90 l/min per spool-section when the sections are equipped with individual pressure-compensators.

Without individual pressure-compensators, flows up to 125 l/min per spool section are obtainable, depending on the adjusted differential between the load-signal pressure and the pump pressure.

On the basis of the desired flows to the A and B ports entered in the ordering documentation, our computerized valve-specification system selects a spool to give at least the specified flow, at the same time taking all other parameters into account.

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

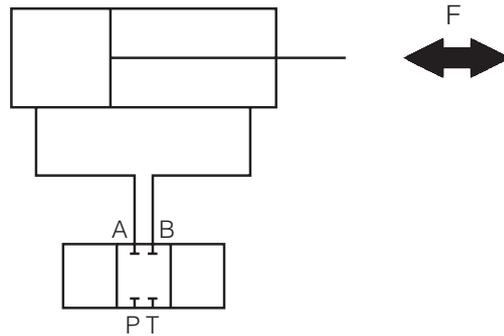
See "Flow settings [72]" for details on factory-set maximum flows.



Typical curves showing flow as a function of spool stroke.

Area ratios [62]

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

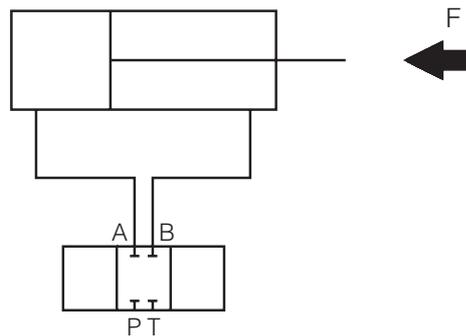


LAB - Lift load can change between the A- and B-port.

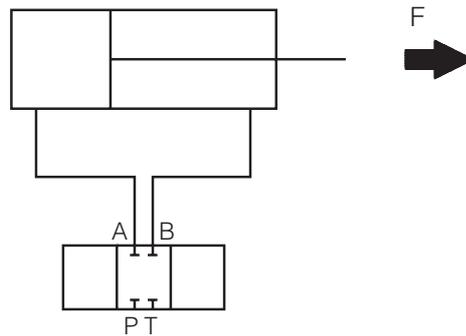
Load characteristics [63]

The characteristics of the lift load can be specified according to five typical cases. This information is entered so that the spool can be customized optimally for the intended application.

- LAB** Lift load can alternate 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 - Lift load normally on A-port only.



LB - Lift load normally on B-port only.

Force feedback [64 A, B]

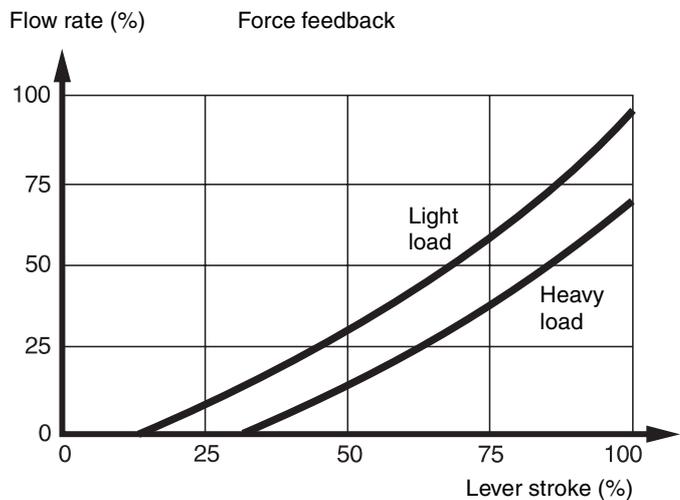
The L90LS can be furnished with a force-feedback function to give operators of the LS system the same positive sense of force-control obtained with constant-flow (CFO) systems. This makes it easier for the operator to avoid damaging the machine in applications such as digging, since he is able to sense increasing resistance or outright obstacles to the movement of a machine function.

Force feedback also gives a kind of ramp function that results in more gentle transition between rapid changes in the speed of a machine movement. This in turn has a stabilizing effect on the hydraulic system and results in smoother operation of the machine. Both characteristics are important, especially for functions like slewing movements. In addition to increasing the efficiency of the machine, they also minimize wear.

The A and B ports individually can be given any one of three different levels of force feedback. The higher the level, the greater the reduction in speed for a given lever stroke as resistance rises. This means that the operator must move the lever further if he wishes to maintain the same speed of movement with rising resistance.

- /** No force feedback
- FN** Normal level of force feedback
- FH** High level of force feedback
- FL** Low level of force feedback

The force feedback function is not available for directly operated valves.



Spool Section

Pressure compensator / load-hold check valve [66]

When there are demands for very good simultaneous-operating characteristics or intensive, multi-section operability and responsiveness, individual spool-sections in the L90LS can be equipped with integral pressure-compensators. Sections so equipped are not then influenced by other simultaneously-operated machine functions, regardless of the variations in loads, provided there is sufficient pump capacity.

Responding to the instantaneous value of the load signal, the pressure compensator regulates continuously the flow through the spool to maintain a constant pressure-differential between the pump and service-port sides of the spool. This results in a constant flow to the consumer for a given lever stroke, regardless of the load pressure or any activity in other spool sections.

The standard variant of the pressure compensator is designated K. Three other variants, designated KL, KH and KX, which give 85, 120 and 150 % of the standard flow respectively, are also available. They are intended to enable further customization of the spool section to suit the flow requirements of the actuator.

All Parker pressure compensators are fast and responsive, and come with an integrated load-hold check-valve function. If necessary, spool sections with pressure compensators can also be equipped with feed-reducing valves in the service ports to regulate the delivery pressure to the consumer to the desired level.

(V** and T** spool-sections [47] have the same machining and can be converted easily to accommodate feed-reducing and port-relief valves.)

/ Section not machined for pressure compensator or load-hold check valve.

K Standard pressure compensator.

KL Compensator that gives 85% of specified spool's nominal flow.

KH Compensator that gives 120% of specified spool's nominal flow.

KX Compensator that gives 150% of specified spool's nominal flow.

KAS Compensator for flow-sharing systems. (consult Parker product specialist)

KAP Compensator for flow-sharing systems. (consult Parker product specialist)

N Section equipped with load-hold check valve.

X Section machined for pressure compensator or load-hold check valve, and plugged.

Damping of pressure compensator [67]

The LS restrictor affects the response of the pressure compensator, and is normally chosen at 0.8 mm.

/ No LS restrictor for compensator.

0.6 Alternative LS restrictor for compensator.

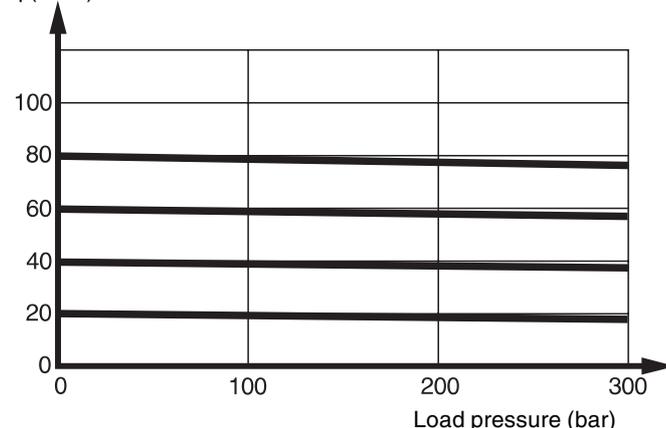
0.8 Recommended LS restrictor for compensator.

1.0 Alternative LS restrictor for compensator.

Spool designations [69]

To facilitate optimal customization to meet the criteria of each individual machine function, the choice of spools is made with the aid of our computerized specification program. The information entered at items 60-66 forms part of the basis for the choice of spool.

q (l/min) Flow rate curves



Load-independent flow with pressure compensator.

Flow settings [72]

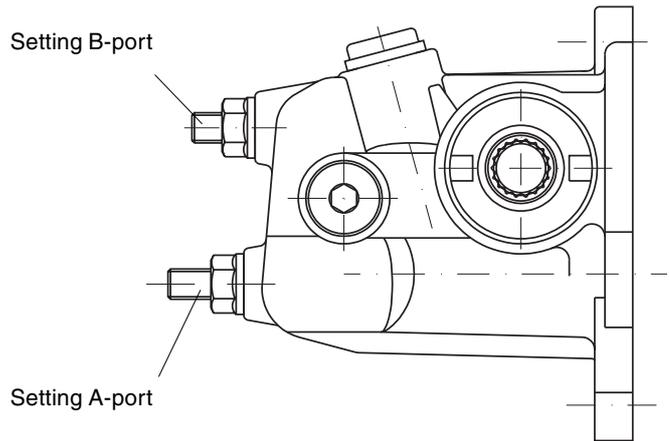
The strokes of spools controlled by enclosed spool-actuators can be arrested to limit the maximum flow to service ports A and B.

Qset The valve is supplied with factory-set maximum flows to the spool section. The settings agree with the specified flow-requirements to the A and B ports [61 A, B].

QsetA The valve is supplied with factory-set maximum flow to the spool section. The setting agrees with the specified flow-requirement to the A port [61 A].

QsetB The valve is supplied with factory-set maximum flow to the spool section. The setting agrees with the specified flow-requirement to the B port [61 B].

When setting the flow rates for spool sections not equipped with pressure compensators in systems fed by LS pumps, the settings are made with a Δp of 15 bar between the pump pressure at the PX port and the load signal at the PL port at full flow take-off. (For flow setting with PC spool-actuators, please see page 22.)



Limiting the maximum flow over the spool by means of mechanical stroke-length limitation of the spool stroke.

Feed-reducing valve [75]

The L90LS with sections designated *A*, *C* or *T* at item [47] is equipped with feed-reducing valves.

Sections designated *A* have feed reduction in the A-port; those designated *C* have common feed reduction for the A-and B-ports; those designated *T* have individually adjustable feed reduction for the A-port and B-port.

Feed reduction is used for system functions that require a lower maximum pressure compared with the normal working pressure of the system. The feed-reducing valve, which is steplessly adjustable from 50 to 320 bar, reduces the delivery pressure in the service port to the pre-set level.

Through the use of feed-reducing valves, the delivery pressure can be limited without consuming any more than a pilot flow (<2 l/min).

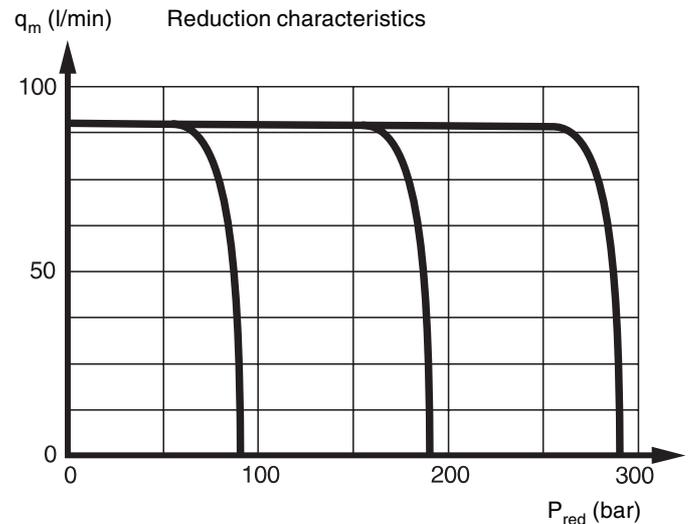
For feed reduction to be installed, the section must be equipped with a pressure compensator. Since the feed-reducing valve is a 2-way valve, pressure shocks that arise after the feed-reducing valve must be limited with the aid of a port relief valve. The pressure setting on the port relief valve should be as close as possible to the setting on the feed-reducing valve, although at least 10 bar higher.

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

Setting values for the A-port are from 50 to 300 bar.

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

Setting values for the B-port are from 50 to 300 bar.

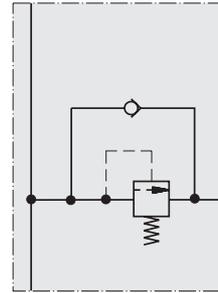


P_{red} = reduced pressure
 q_m = flow rate in service port

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

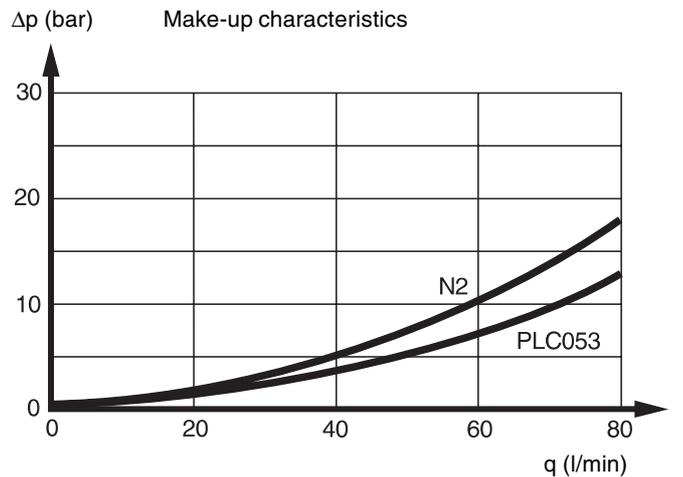
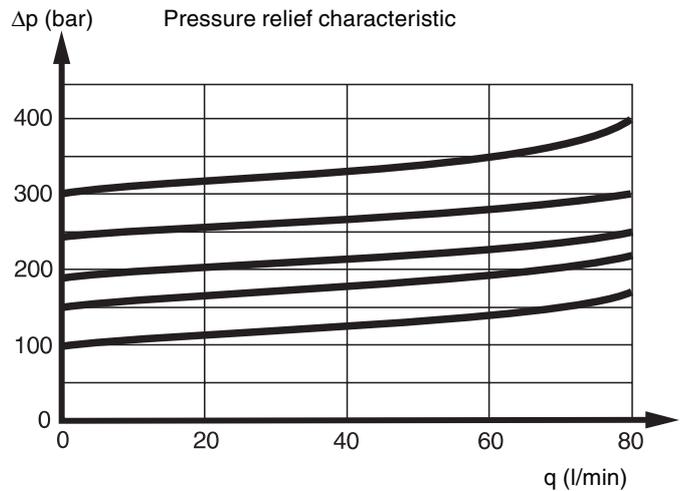
In spool sections designated **T [47], the PLC053 can be used as a combined port-relief and anti-cavitation valve in the service ports to protect the valve and consumer from high system pressure and pressure surges.

The PLC053 is a direct-acting pressure relief valve with a very fast opening sequence and good pressure characteristic. The interchangeable PLC cartridge is factory set. The make-up function enables oil to flow from the tank gallery to the service-port side in the event of negative pressure in the service ports, in order to prevent cavitation.



Circuit diagram for PLC053 pressure relief valve.

- I** Section not machined for port relief valves.
- X2** Section machined for port relief valve. Service port open to tank.
- Y2** Section machined for port relief valve. Connection A/B to tank blocked with plug.
- N2** A/B side of section equipped with anti-cavitation valve.
- 50-350** Standard pressure settings (in bar) for port relief valves in A- or B-ports:
 50, 63, 80, 100, 125, 140, 160, 175, 190, 210, 230, 250, 260, 280, 300, 320 and 350.



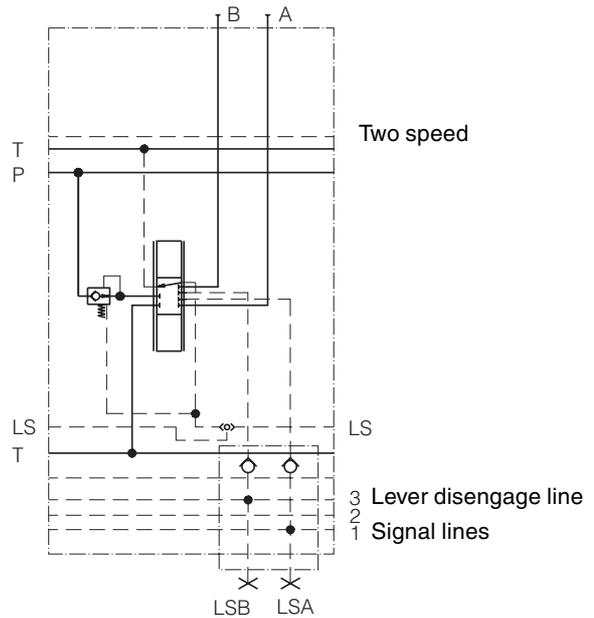
System functions

The L90LS can be equipped with integrated functions to create complete system solutions. The load signal from any service port or spool section can be connected with signal ducts and utilized to stop or limit the pressure to individual machine functions.

In cranes, this auxiliary controlling concept is implemented with the aid of the M11 function manifold [90]. Another example of how the load-signal ducts can be exploited is in the control of thrust pressure to rock drills, according to the instantaneous rotational torque (rotation-pressure controlled thrust).

System signal lines [80]

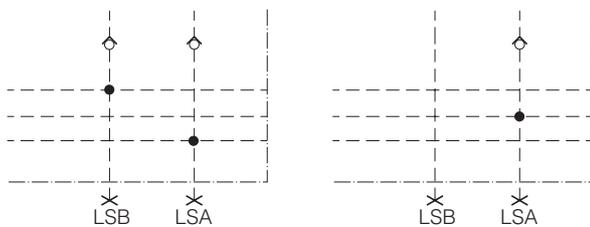
SF Valve section equipped with 3 signal lines that can be connected internally to individual load signals [81], as well as signal line for activation of two-speed function [82].



Individual LS connection [81]

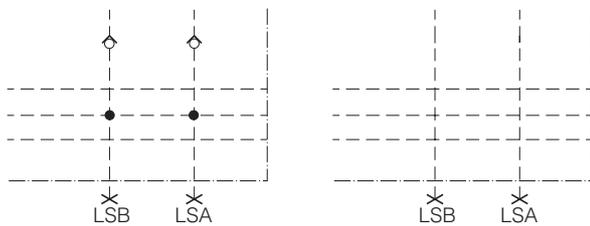
- / No LS connection to signal lines. No possibility of external connection either.
- A1B** Load signal from port A connected to duct 1.
- A1B2** Load signal from port A connected to duct 1. Load signal from port B connected to duct 2.
- A1B3** Load signal from port A connected to duct 1. Load signal from port B connected to duct 3.
- A2B** Load signal from port A connected to duct 2.
- A2B2** Load signal from both ports A and B connected to duct 2.
- A2B3** Load signal from port A connected to duct 2. Load signal from port B connected to duct 3.
- AB** No connection between load signal and signal ducts.
- AB2** Load signal from port B connected to duct 2.
- AB3** Load signal from port B connected to duct 3.

SF – System signal line



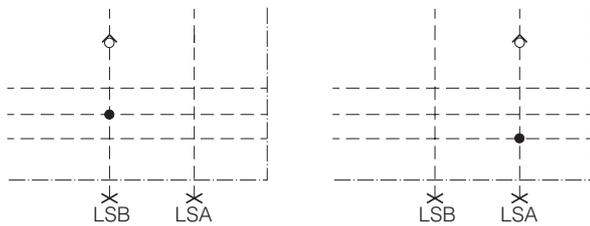
A1B3

A2B



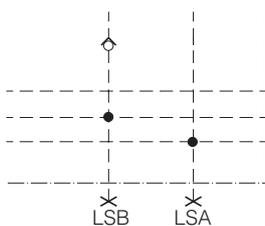
A2B2

AB

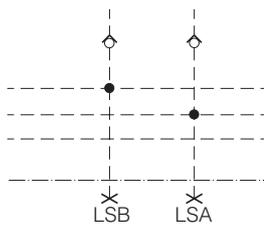


AB2

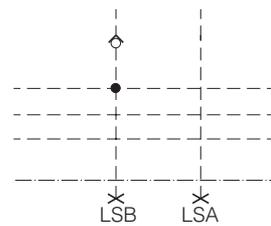
A1B



A1B2



A2B3



AB3

Two-speed function [82]

Any number of spool sections in the L90LS can be furnished with a two-speed function to enable switching between performance and precision work with machines such as cranes and skylifts.

The two-speed function is activated with the aid of the M11 function manifold [90]. Activation reduces the flow to the consumer as indicated below:

- QR2** Flow to consumer reduced to 20% of normal flow.
- QR3** Flow to consumer reduced to 30% of normal flow.
- QR4** Flow to consumer reduced to 40% of normal flow.
- QR5** Flow to consumer reduced to 50% of normal flow.

N.B.

When a spool section is equipped with a two-speed function, the pressure compensator in the section does not have a load-hold check valve function. For this reason, overcentre valves might required for the controlled actuator.

Internal connection of service port [85]

Thanks to the internal service-port connections, system solutions employing function manifolds that require the service port to be used by the manifold can be integrated without the need for external piping.

- M** Gives internal service-port connection downstream of the spool section.
- A013** Gives internal service-port connection both downstream and upstream of the spool section.

Function manifolds [90-99]

The L90LS can be equipped with function manifolds that enable complete system solutions to be integrated into the valve.

Standard function manifolds are available for overload protection, two-speed function, float position, priority for steering and brakes, etc. In addition to the standard units, we custom-build function manifolds to meet special system criteria. Please contact Parker for further information.

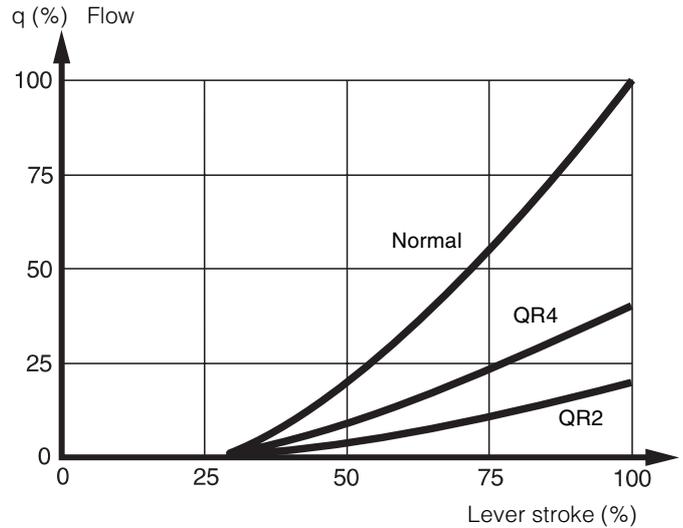
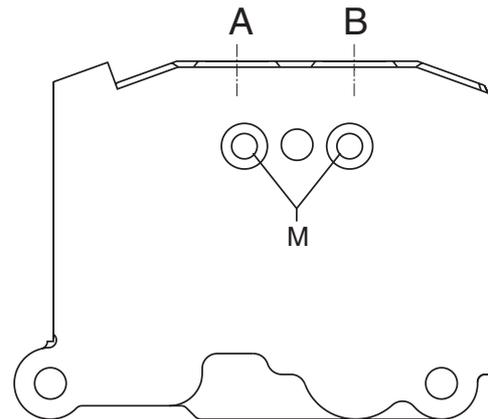


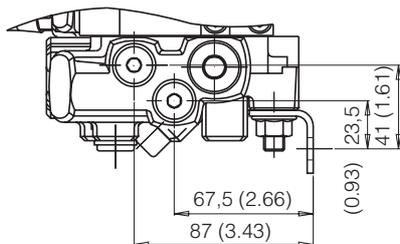
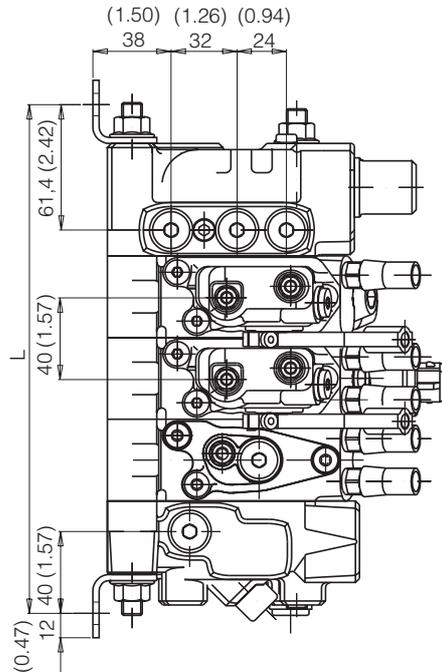
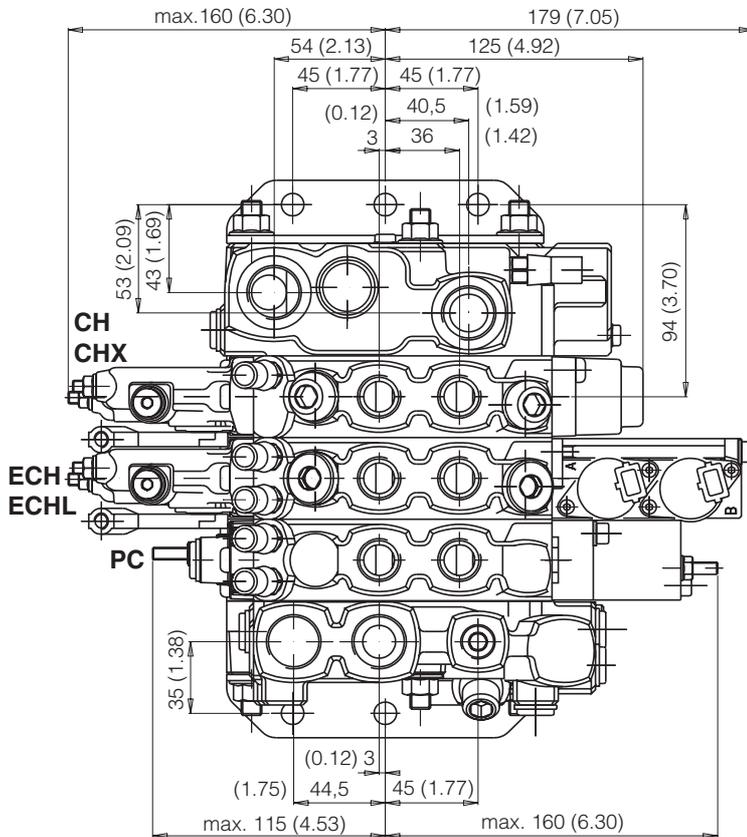
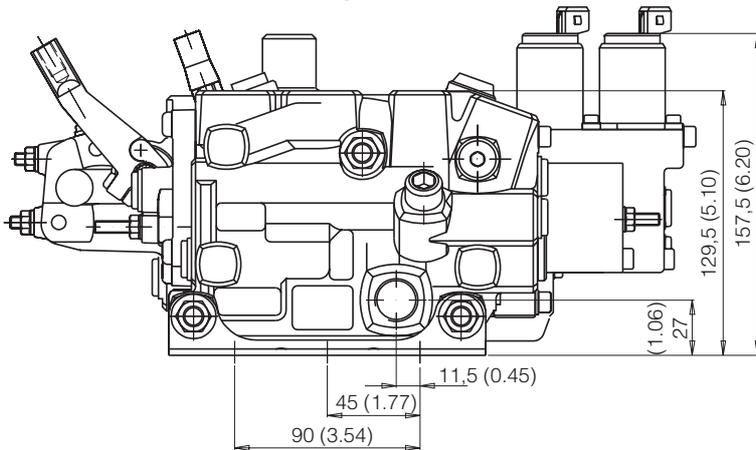
Diagram shows curves for:
 Normal flow.
 Flow with QR4 activated.
 Flow with QR2 activated.



Sectional manifold with internal connection of service ports to downstream function manifold.

Spool actuators with enclosed spool end

(inch)



No. of sections	L mm	L inch
1	169	6.65
2	209	8.23
3	249	9.80
4	289	11.38
5	329	12.95
6	369	14.53
7	409	16.10
8	449	17.68
9	489	19.25
10	529	20.83
11	569	22.40
12	609	23.98

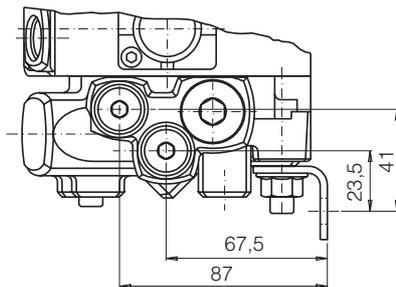
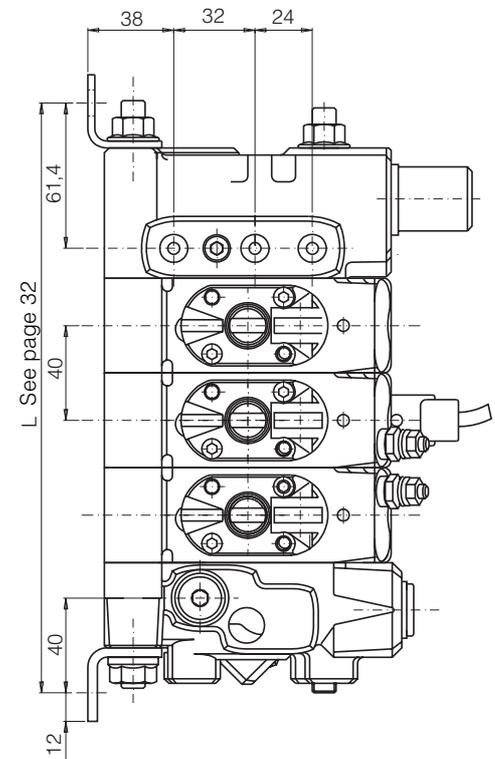
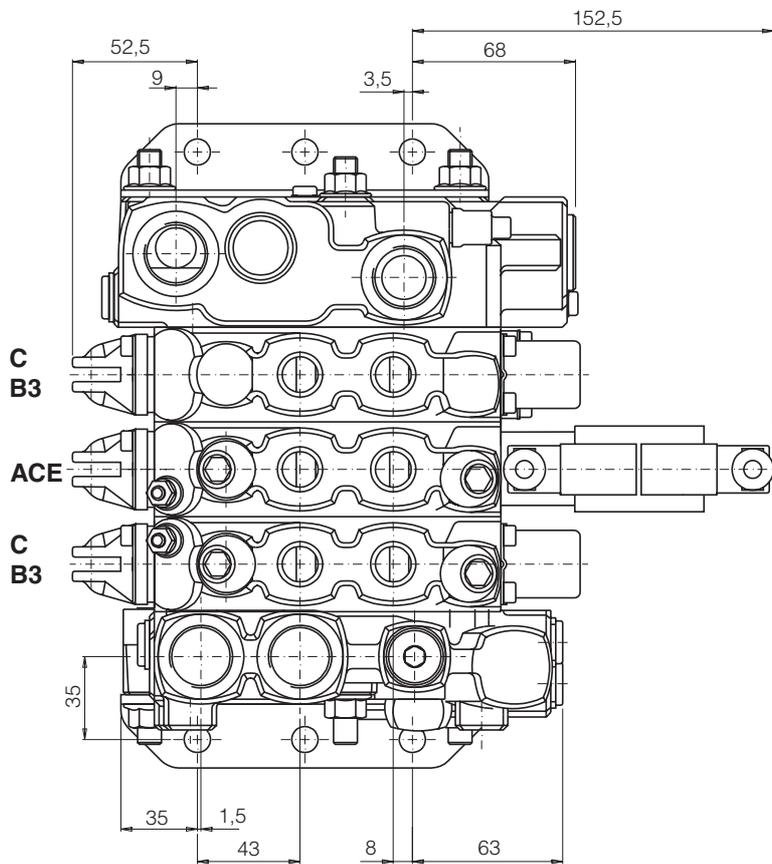
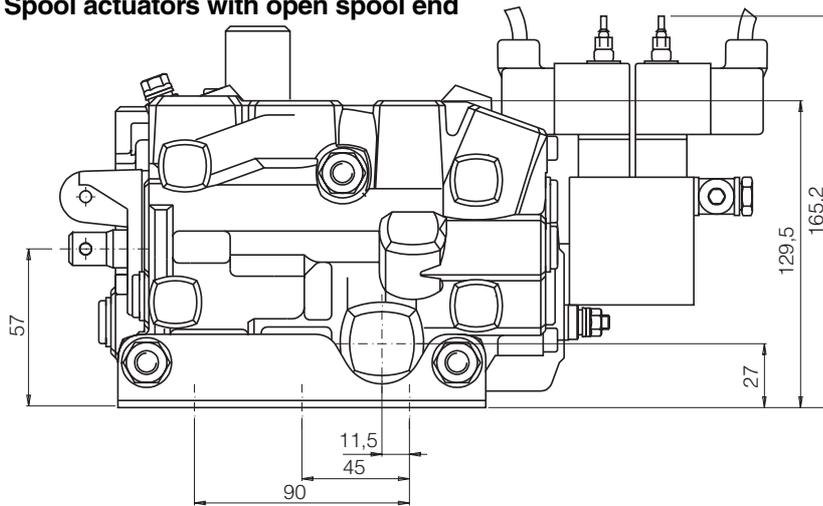
With MU-section L is reduced with 23 mm (0.9 inch)

With IP-section L is reduced with 25 mm (1 inch)

Connection threads, see page 7.

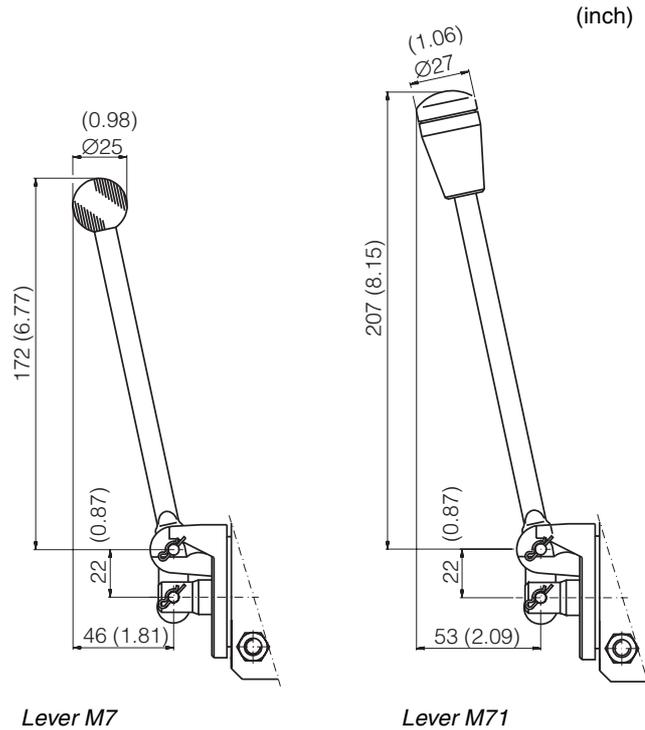
Spool actuators with open spool end

(inch)



Levers for open spool-actuators

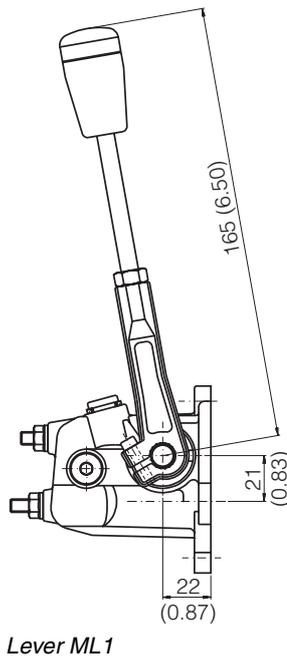
Levers M7 and M71 are made of steel with an anti-rust surface treatment, and fitted with a knob of black plastic. The knob on the M71 lever has a top window for the insertion of a symbol. The lever kits are delivered complete with pin sets for mounting to the valve.



Direct lever for enclosed spool-actuators

Lever for directly operated spool-actuators with enclosed spool-end, and for remote controlled spool-actuators that have a facility for a supplementary local lever for direct control.

The ML1 lever is made of steel and has an anti-rust surface treatment. The lever knob is of black plastic and has a top window for the insertion of a symbol. The lever kit consists of a knob, the lever shaft and a lock nut.



Ordering number Designation

9122 1780-08	M7
9122 1780-11	M71
8234 9390-01	ML1

**WARNING**

FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS AND/OR SYSTEMS DESCRIBED HEREIN OR RELATED ITEMS CAN CAUSE DEATH, PERSONAL INJURY AND PROPERTY DAMAGE.

This document and other information from Parker Hannifin Corporation, its subsidiaries and authorized distributors provide product and/or system options for further investigation by users having technical expertise. It is important that you analyze all aspects of your application, including consequences of any failure, and review the information concerning the product or system in the current product catalogue. Due to the variety of operating conditions and applications for these products or systems, the user, through its own analysis and testing, is solely responsible for making the final selection of the products and systems and assuring that all performance, safety and warning requirements of the application are met.

The products described herein, including without limitation, product features, specifications, designs, availability and pricing, are subject to change by Parker Hannifin Corporation and its subsidiaries at any time without notice.

Offer of Sale

Please contact your Parker representation for a detailed "Offer of Sale".

Hydraulics Group Sales Offices

Europe

Austria

Wiener Neustadt
Tel: +43 (0)2622 23501
Fax: +43 (0)2622 66212

Belgium

Nivelles
Tel: +32 (0)67 280 900
Fax: +32 (0)67 280 999

Czech Republic

Klecany
Tel: +420 284 083 111
Fax: +420 284 083 112

Denmark

Ballerup
Tel: +45 4356 0400
Fax: +45 4373 8431

Finland

Vantaa
Tel: +358 (0)9 4767 31
Fax: +358 (0)9 4767 3200

France

Contamine-sur-Arve
Tel: +33 (0)450 25 80 25
Fax: +33 (0)450 03 67 37

Germany

Kaarst
Tel: +49 (0)2131 4016 0
Fax: +49 (0)2131 4016 9199

Hungary

Budapest
Tel: +36 (06)1 220 4155
Fax: +36 (06)1 422 1525

Ireland

Dublin
Tel: +353 (0)1 293 9999
Fax: +353 (0)1 293 9900

Italy

Corsico (MI)
Tel: +39 02 45 19 21
Fax: +39 02 4 47 93 40

The Netherlands

Oldenzaal
Tel: +31 (0)541 585000
Fax: +31 (0)541 585459

Norway

Ski
Tel: +47 64 91 10 00
Fax: +47 64 91 10 90

Poland

Warsaw
Tel: +48 (0)22 863 49 42
Fax: +48 (0)22 863 49 44

Portugal

Leca da Palmeira
Tel: +351 22 9997 360
Fax: +351 22 9961 527

Slovakia

Ref. Czech Republic

Spain

Madrid
Tel: +34 91 675 73 00
Fax: +34 91 675 77 11

Sweden

Spånga
Tel: +46 (0)8 597 950 00
Fax: +46 (0)8 597 951 10

Turkey

Merter/Istanbul
Tel.: +90 212 482 91 06 or 07
Fax: +90 212 482 91 10

United Kingdom

Warwick
Tel: +44 (0)1926 317 878
Fax: +44 (0)1926 317 855

International

Australia

Castle Hill
Tel: +61 (0)2-9634 7777
Fax: +61 (0)2-9899 6184

Canada

Milton, Ontario
Tel: +1 905-693-3000
Fax: +1 905-876-0788

China

Beijing
Tel: +86 10 6561 0520
Fax: +86 10 6561 0526

Asia Pacific Group

Hong Kong, Kowloon
Tel: +852 2428 8008
Fax: +852 2425 6896

India

Mumbai
Tel: +91 22 7907081
Fax: +91 22 7907080

Japan

Tokyo
Tel: +(81) 3 6408 3900
Fax: +(81) 3 5449 7201

Latin America Group

Brazil
Tel: +55 12 3954-5100
Fax: +55 12 3954-5266

South Africa

Kempton Park
Tel: +27 (0)11-961 0700
Fax: +27 (0)11-392 7213

USA

Cleveland (industrial)
Tel: +1 216-896-3000
Fax: +1 216-896-4031
Lincolnshire (mobile)
Tel: +1 847-821-1500
Fax: +1 847-821-7600

Parker Hannifin is the world's premier supplier of motion and control systems and solutions, with sales and manufacturing facilities throughout the world. For product information and details of your nearest Parker sales office, visit us at www.parker.com or call free on 00800 2727 5374.



Catalogue HY17-8504/UK
PDF 12/04

© Copyright 2004
Parker Hannifin Corporation
All rights reserved.