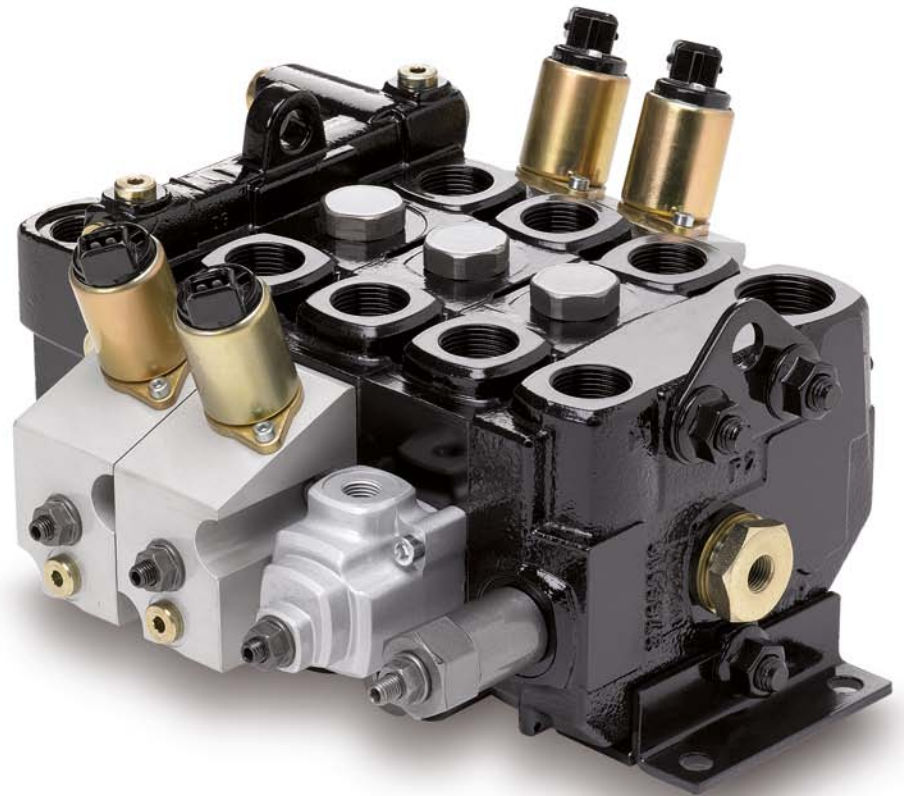




aerospace  
climate control  
electromechanical  
filtration  
fluid & gas handling  
**hydraulics**  
pneumatics  
process control  
sealing & shielding



# F130

## Mobile Directional Control Valve

Proportional, Open or Closed Centre



ENGINEERING YOUR SUCCESS.

## Catalogue layout

This catalogue is designed to give an overview of the F130CF directional valve and to show how it can be customised to meet your needs exactly. Apart from general information and basic technical data therefore, the catalogue contains descriptions of the variety of options available for the different function areas of the valve. After you have studied the options and made your selection, we will tailor your valve to meet your operating and control criteria.

Each function area is given as a subheading, followed by a brief description. When several optional functions are available for the same function area, the subheading is followed by an "item number" in square brackets, e.g. **Main pressure relief valve [16]**. This is followed by a series of coded options, e.g. **PS, PB, Y**, together with a brief description of what each code represents. Alternatively, one or more pressure, flow or voltage options are given.

On pages 10 and 11 are general circuit diagrams showing the basic functions of the F130 valve, together with the item numbers and letter codes used to represent them. Naturally, the same item numbers and letter codes are used in all sub-circuit diagrams that appear elsewhere in the catalogue in conjunction with descriptions of the respective function areas. All sub-circuit diagrams have been extracted from the general circuit diagram. Please note that, unless stated otherwise, all sections and views of the valves have been drawn as seen from the inlet section.

## How to order your valve

Parker has developed a computer program to specify the F130, so that the configuration of your valve can be optimised to give maximum performance in your particular hydraulic system.

Based on the demands on each individual machine function, the computer specifies the configuration of the valve to give optimal performance. It also generates complete documentation for your valve in the form of a detailed specification and hydraulic circuit diagram.

The program also generates a unique product designation that is subsequently stamped into the data plate on your valve. Your

customised valve specifications remain on our database to facilitate rapid identification of your valve in the event of re-ordering or servicing.

## Early consultation with Parker saves time and money

Our experienced application engineers have in-depth knowledge of the different types of hydraulic system and the ways in which they work. They are at your disposal to offer qualified advice on the various combinations of functions and control characteristics you may require, and to advise how to obtain the best possible economy.

By consulting Parker early in the project planning stage, you are assured of a comprehensive hydraulic system that will give your machine the best possible operating and control characteristics, together with outstanding economy.

### 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 <sup>3</sup>	= 0.061024 in <sup>3</sup>
1 m	= 3.2808 feet
1 mm	= 0.03937 in
9/5 °C + 32	= °F

Subject to alteration without prior notice. The graphs and diagrams in this catalogue are typical examples only. While the contents of the catalogue are updated continually, the validity of the information given should always be confirmed. For more detailed information, please contact Parker Hannifin.



## **WARNING – USER RESPONSIBILITY**

**FAILURE OR IMPROPER SELECTION OR IMPROPER USE OF THE PRODUCTS 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 or system options for further investigation by users having technical expertise.

The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalog and in any other materials provided from Parker or its subsidiaries or authorized distributors.

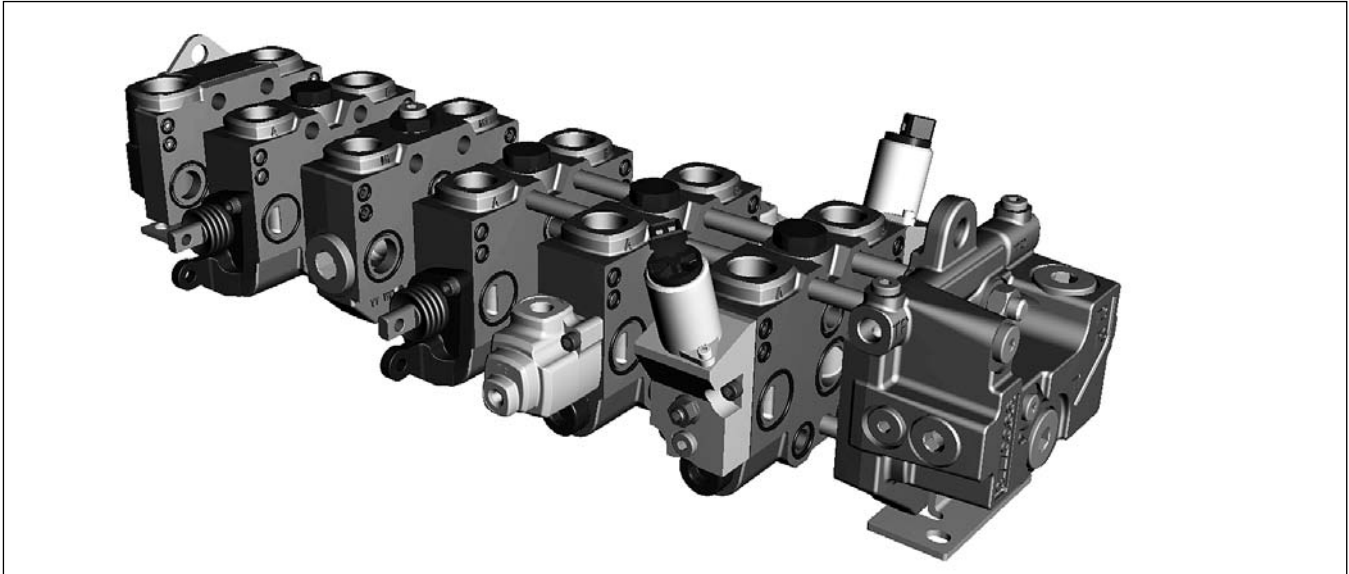
To the extent that Parker or its subsidiaries or authorized distributors provide component or system options based upon data or specifications provided by the user, the user is responsible for determining that such data and specifications are suitable and sufficient for all applications and reasonably foreseeable uses of the components or systems.

## **Offer of Sale**

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

<b>Contents</b>	<b>Page</b>
Valve Description.....	4
System Description.....	5-6
System Connection .....	7
A. Series connection, multi-valve system, F130CF only.....	7
B. Series connection, single-valve system, F130CF only .....	7
C. Parallel connection, multi-valve system.....	7
Technical Data .....	8
Environmental Characteristics.....	9
Hydraulic circuit diagram showing basic functions, standard valve .....	10
Hydraulic circuit diagram showing basic functions (model with integral spool actuators).....	11
Inlet Sections [15].....	12-13
Main pressure relief valve [16].....	14
Pressure setting [17].....	14
Pump unloading [22].....	14
Options in pump-unloading inlet [23].....	14
Tank connection T2 [25].....	15
Pump connection P2 [26] .....	15
Pump connection P1 [27] .....	15
Mid-inlet section [90].....	16
Options, mid-inlet [93].....	17
Main pressure relief valve [94].....	17
Pressure setting [98].....	17
End section [30].....	18
Tank connection T1 [33].....	18
Tank connection T3 [34].....	19
Power-beyond function [36] .....	19
Reducing valve [37] .....	20
Pilot-oil strainer [39].....	20
Separate tank connection for pilot circuit [40].....	20
Spool Sections.....	21-27
Spool actuators [50].....	22
Hand-operated spool actuators with open spool end .....	22
Spool position indication [52].....	22
Remote controlled, proportional spool actuators with open spool end .....	22
Remote controlled ON/OFF spool actuators with open spool end .....	22
Lever bracket [51] .....	23
Remote controlled proportional spool actuators with closed spool end .....	23
Spool function [60].....	25
Spool designation [69].....	25
Options in the spool section .....	25
Options in the pressure gallery [66].....	25
Choice of Spool .....	25
Pressure limiters in service ports [76A/B](Port relief valves).....	26
Port relief valve [76].....	26
Function blocks (manifolds) .....	27
Connectors .....	27
Hand levers.....	27
Dimensional Drawings, Conventional valve.....	28
Dimensional Drawings, Inlet and end sections.....	29
Dimensional Drawings, Spool actuators.....	30

[00] refers to item numbers in customer specification.



The F130 directional valve is of modular construction. Designed for many different applications, it is used in cranes and other types of construction machine, forestry machines, refuse trucks, drill rigs, fork-lift trucks, etc.

The F130 is available in three different versions: the **F130CF** with an open centre for fixed pumps, the **F130CP** with a closed centre for variable displacement pumps and the **F130LS** with a closed centre, coupled with a load sensing signal, to the variable displacement pump.

### Compact system construction

The valve is of modular construction and offers unique possibilities for the integration of application-adapted functions to give compact and total system solutions for a wide range of mobile machines.

### Freedom in machine design

The valve can be of the directly operated type, or can be equipped for electric, pneumatic or hydraulic remote control. A combination of direct and remote control is also possible. These options give the designer great freedom in terms of component location and the choice of pilot media.

### Economy

Thanks to its modular construction, the F130 can be optimised for both simple and complex functions. The possibility of integrating total function solutions gives low overall system costs. The valve can be modified or expanded as necessary to suit the needs of the customer.

### Safety

The valve is of robust construction, with each function unitised. This facilitates both

training and servicing and contributes greatly to safety. Moreover, the valve can be fitted with a special inlet section that enables an emergency STOP function to be incorporated into the valve to meet the demands of the EC Machinery Directive in a uniquely simple way.

### Design

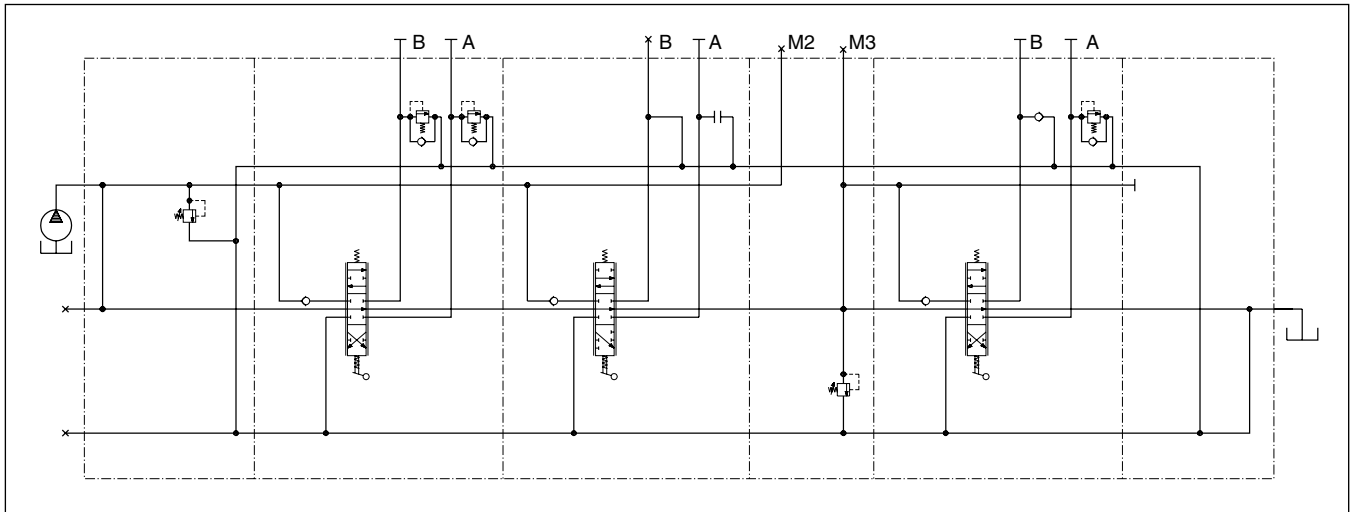
The F130 is stackable and can be supplied in combinations of 1 to 11 spool sections, and in combination with one or more manifolds (function blocks). The valve is designed for system pressures of up to 320 bar and can be equipped with port relief valves in the service ports for a maximum pressure of 350 bar. The F130CF has a flow range of 60 – 110 l/min, depending on how the valve is equipped. The F130CP has a flow range of 60 – 150 l/min. There is a wide range of spools for the valve. This enables control characteristics of the valve to be customized optimally.

### Essential characteristics

- Low lever forces give comfortable operation when the valve is controlled directly.
- Flexible, modular construction makes it easy to modify or expand the valve to meet changing needs.
- Easy to change spools at any time, thanks to good manufacturing precision.
- Can be flanged to both standard and specially customised function manifolds. This enables even more functions to be integrated into a single unit in a compact system, with minimal piping.
- Mid-inlet sections enable compact

system construction, even in systems with several pressure levels.

- Can be equipped for both multi-pump and multi-valve systems, thus increasing its range of applications in many different types of hydraulic system.
- Very wide range of application-adapted spools designed to optimise control characteristics.
- Our proportional remote-controlled valves have pressure compensated spools, which further improves control and simultaneous-operating characteristics.
- Separate check valve in each spool section prevents undesirable sinking of the load.
- Separate port-relief valve in each service port gives individual maximum pressure limitation.
- The port relief valves have excellent pressure characteristics even as secondary pressure relief valves, and respond very quickly to sudden changes in load.
- Low pressure drops keep down energy losses and reduce the generation of heat.
- Machined land edges in the valve housing guarantee good control characteristics.
- Quality materials and high manufacturing precision ensure a superior product with low internal leakage and long service life.
- A wide range of optional functions enables the valve to be customised to meet your needs precisely.
- Open spool ends with rubber bouts increase the service life of both spools and spool seals.



Basic circuit diagram, CFO.

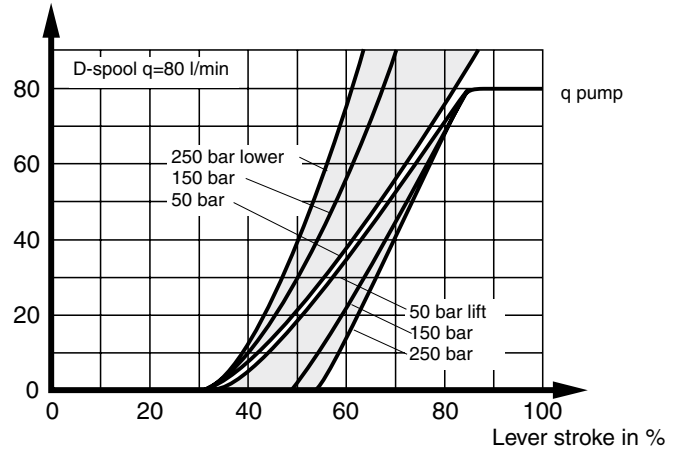
For information about different hydraulic systems, see our system brochure HY02-8009/UK

The F130 is designed with an open centre.

The type diagrams on the right show the control characteristics of the F130CF.

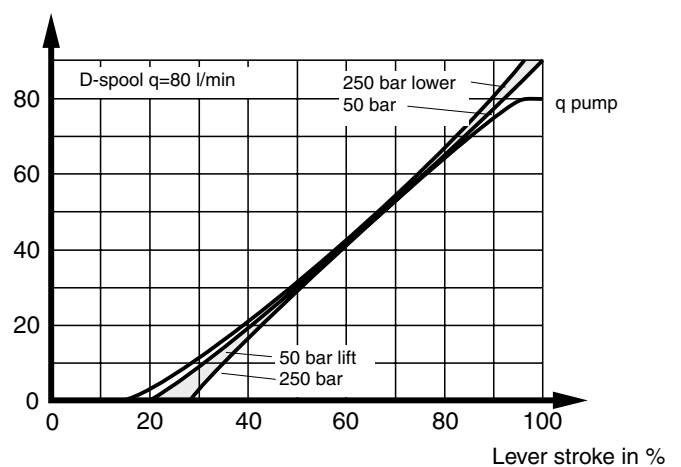
The valve is also suitable for use in systems with variable pumps.

q(l/min) Flow rate in service port

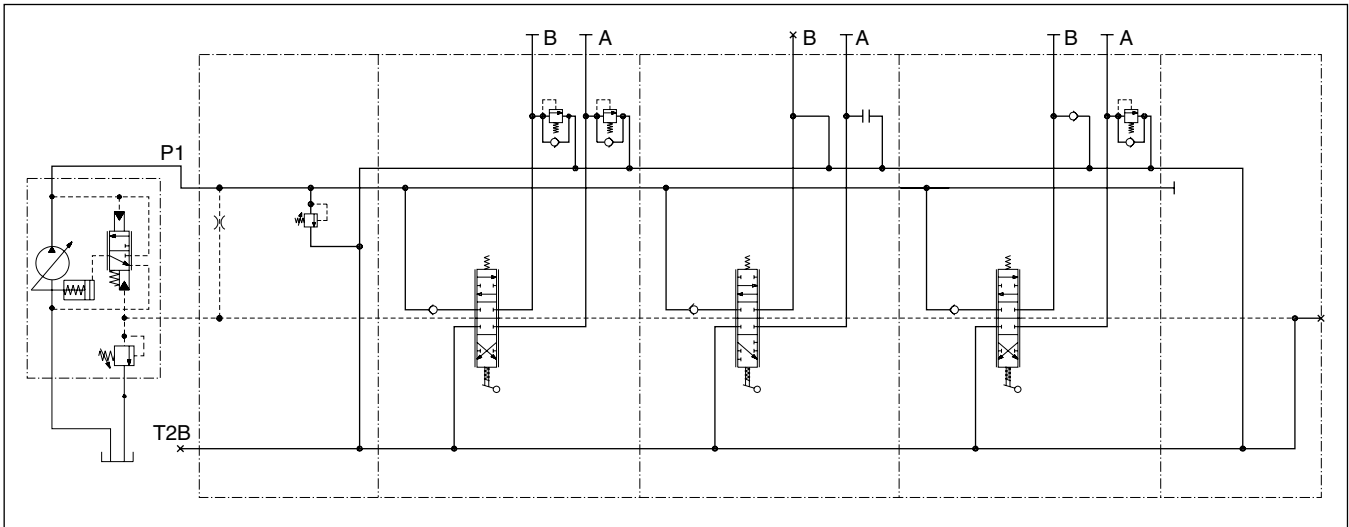


*In the F130CF with hand-operated spools, the speed is influenced by the size of the load, i.e. the heavier the lift load, the longer the lever stroke needed before the load starts to move, and the heavier the sink load, the quicker the lowering sequence.*

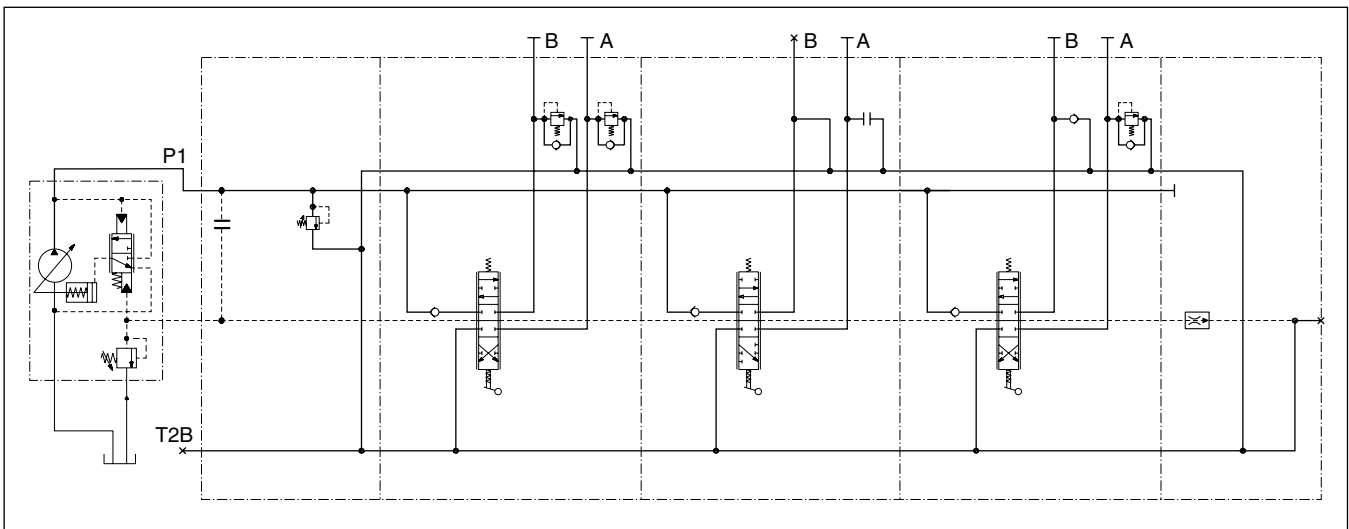
q(l/min) Flow rate in service port



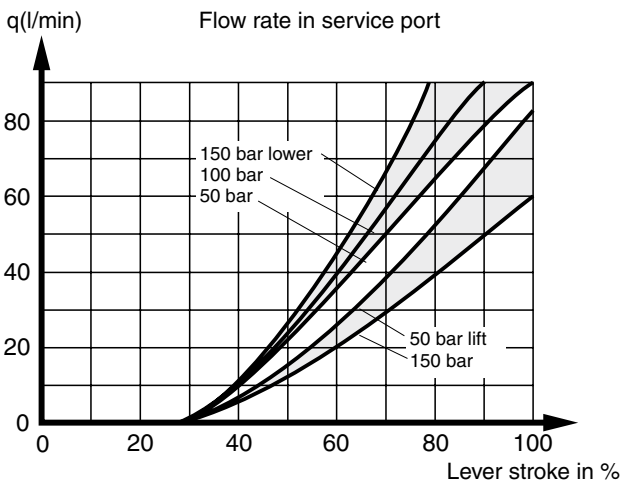
*In the F130CF with PC or EC closed spool-actuators, the spools are pressure compensated. This means that the load has only a slight influence on speed.*



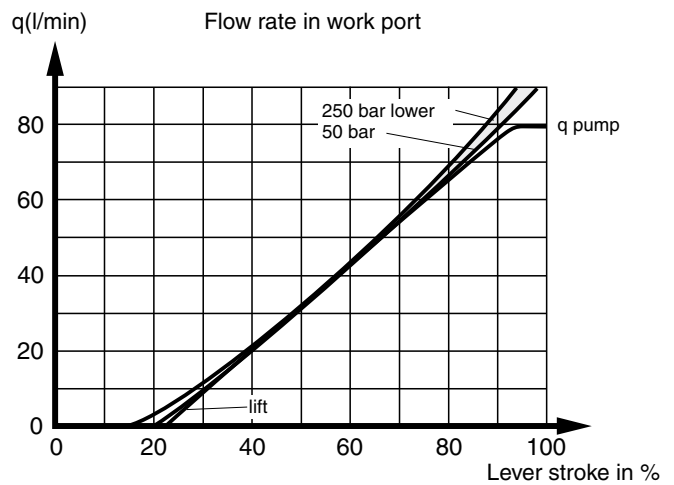
Principle circuit diagram for valve with closed centre.



Principle circuit diagram for valve with load sensing (LS).



In the F130CP with hand-operated spools, all loads start moving at the same point, regardless of the size and direction of the load. The size of the load does, however, affect the slope of the curve to some extent.

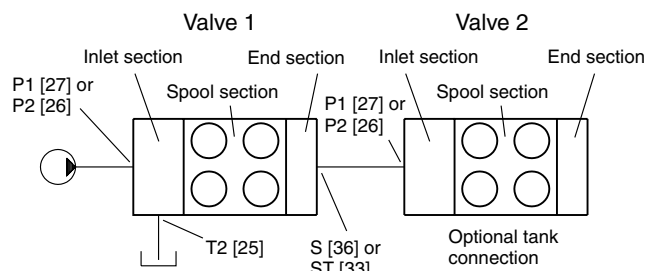


In the F130LS equipped with PC and ECS closed spool-actuators, the spools are pressure compensated, with the result that the load's influence on speed is negligible.

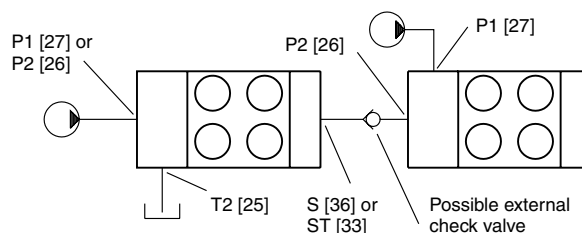
Below are a few examples of how the F130 can be connected up.

**A. Series connection, multi-valve system, F130CF only**

The pump is connected to the first valve. Flow that is not directed to a consumer via the first valve continues to the next valve. The first valve therefore has priority and, in the event of full spool actuation in the first valve, no flow continues to the next valve.

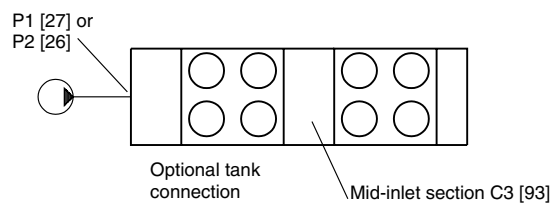


If an additional pump is connected to valve 2, then valve 2 receives the flow from pump 2 plus any residual flow from valve 1.

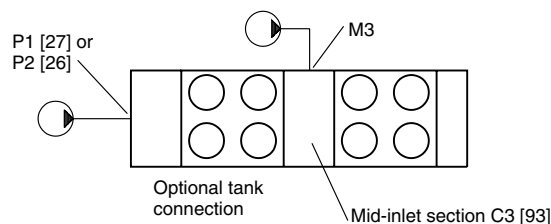


**B. Series connection, single-valve system, F130CF only**

The pump is connected to the inlet section. Flow that is not directed out to consumers connected before the mid-inlet section continues to consumers connected after the mid-inlet section. This means that the first spool sections have priority, i.e. in the event of full spool actuation in a section before the mid-inlet section, no flow continues to the sections after the mid-inlet section.



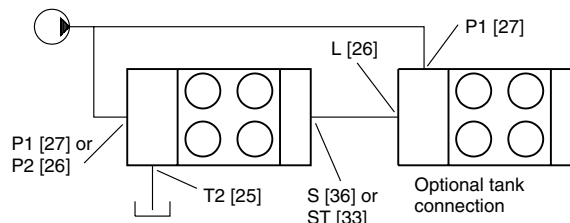
If an additional pump is connected to the mid-inlet section, then subsequent sections will receive the flow from pump 2 plus any flow from pump 1 that has not been used by the sections before the mid-inlet section.



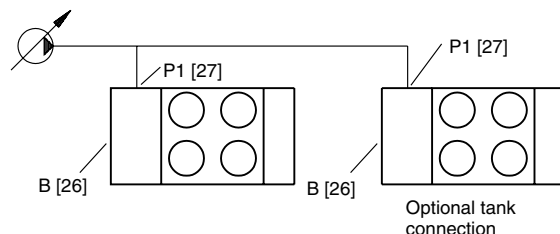
**C. Parallel connection, multi-valve system**

In parallel connection, the same pump is connected to two or more valves. The function is the same as if the pump were connected to a single large valve.

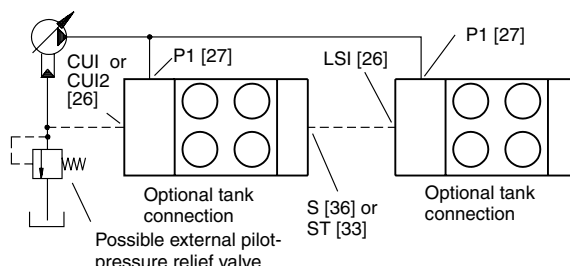
Parallel connection, fixed pump (CFO), F130CF



Parallel connection, variable pump (CP), F130CP



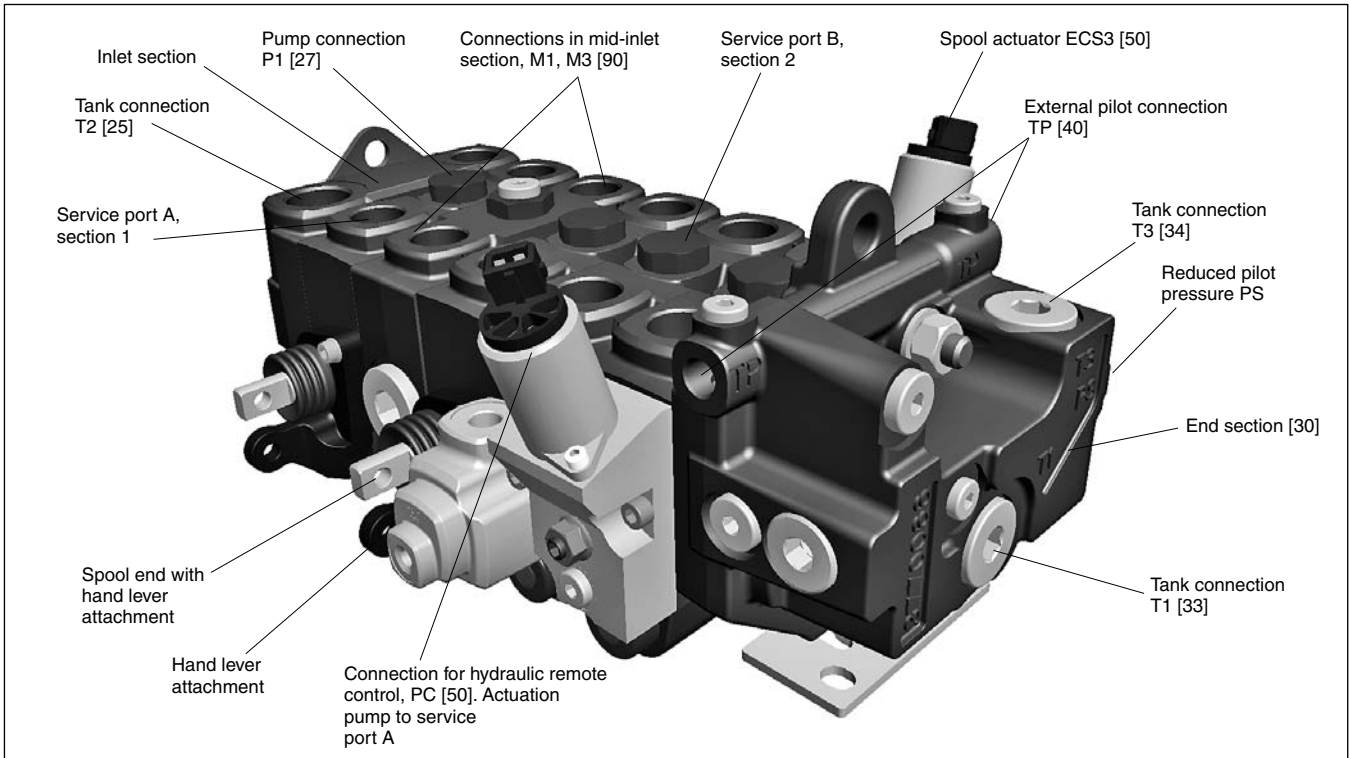
Parallel connection, variable pump (CPU, LS), F130CP



----- = signal line (pilot pressure)

The different functions are described in more detail on pages 12, 15 and 17 – 19.

Item number in [ ] indicates part or functional area of valve.



**Pressure**

Pump port max. 320 bar\* (4640 psi)  
 Service port max. 350 bar\* (5075 psi)  
 Tank port, static max. 20 bar (290 psi)  
 \* Stated pressures are maximum absolute shock pressures at 10 bar tank pressure.

**Recommended flow rates**

F130CF, pump port max. 110 l/min\*\* (29.1 US gpm)  
 F150CP, pump port max. 150 l/min (39.6 US gpm)  
 F150LS, pump port max. 150 l/min (39.6 US gpm)  
 Return from service port max. 175 l/min (46.2 US gpm)  
 \*\* Max. recommended flow rate depends on choice of spool.

**Internal pilot pressure**

Factory-set 35 bar (508 psi)

**Leakage from service port over spool**

From A or B port: max 12 cm<sup>3</sup>/min (0.73 cu.in/min) at pressure 100 bar (1450 psi), temperature 50 °C (122 °F) and viscosity 30 mm<sup>2</sup>/s (cSt).

**Connections**

All standard connections are available in two versions unless stated otherwise:  
 G version (BSP pipe thread) for flat seal (type Tredo) as per ISO 228/1 and UNF version for O-ring seal as per SAE J1926/1.

**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.

Connection	Located	G version	UNF version
P1, P2	inlet section	G3/4	1-1/16-12 UN-2B
T2	inlet section	G1	1-5/16-12 UN-2B
M1	mid-inlet section	G3/4	1-1/16-12 UN-2B
M3	mid-inlet section	G3/4	1-1/16-12 UN-2B
T1	end section	G3/4	1-1/16-12 UN-2B
TP, PS	end section	G1/4	9/16-18 UNF-2B
T3	end section	G3/4	1-1/16-12 UN-2B
Service ports	spool sections	G3/4	1-1/16-12 UN-2B

For other connections, please see respective sections in catalogue.

**Weight**

The weight varies somewhat with the configuration of the valve. The figures below are therefore approximate.

**Valve housing inclusive of spool, pressure relief valve etc; but exclusive of spool actuators.**

Conventional inlet (I)	4.1 kg (9.1 lb)
Inlet (IU)	6.3 kg (14.0 lb)
Spool section for conventional spool actuator	4.8 kg (10.7 lb)
Spool section for integrated spool actuator (EC)	6.4 kg (14.2 lb)
Spool section for integrated spool actuator (PC)	5.9 kg (13.1 lb)
Mid-inlet section	4.1 kg (9.1 lb)
End section with integrated pilot pressure supply (USP)	4.7 kg (10.4 lb)
Conventional end section (US)	2.4 kg (5.3 lb)



The valve can be mounted in any direction. However, the mounting base should be flat and stable so that the valve is not subjected to strain. If the valve is mounted with the cap of the spool actuator facing downward, then cap A13 should be chosen for spool actuators C and B3 [50].

The O-rings in the valve are mainly made of nitrile rubber, NBR. The O-rings in the joint face between the sections are made of hydrated nitrile rubber, HNBR, because HNBR tolerates heat better than NBR.

**Temperature**

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

**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 mm<sup>2</sup>/s\*\*

**Technical information in this catalogue is applicable at an oil viscosity of 30 mm<sup>2</sup>/s and temperature of 50 °C (122 °F).**

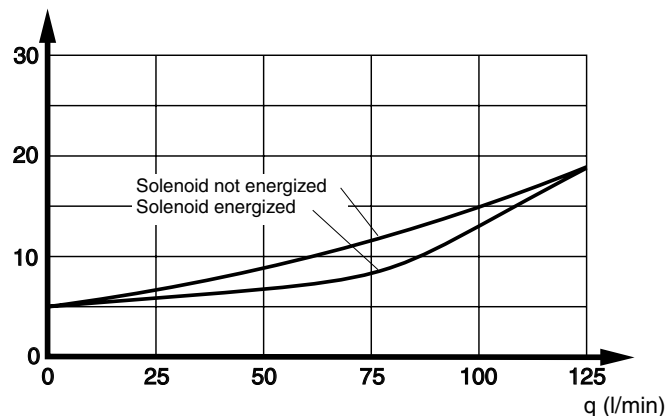
\* Product operating limits are broadly within the above range, but satisfactory operation within the specification may not be accomplished. Leakage and response will be affected when used at temperature extremes and it is up to the user to determine acceptability at these levels.

\*\* 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.

**Pressure drops**

**Pressure drop with pump-unloading inlet**

Δp (bar) Pressure drop P1 to T2, 6-section valve

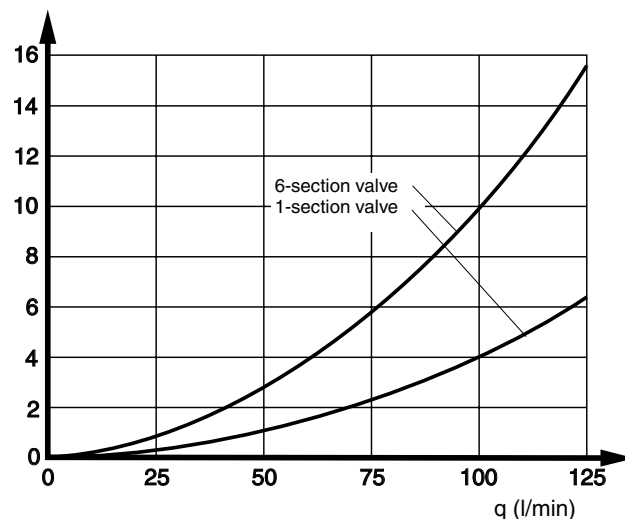


*Pump unloading function.*

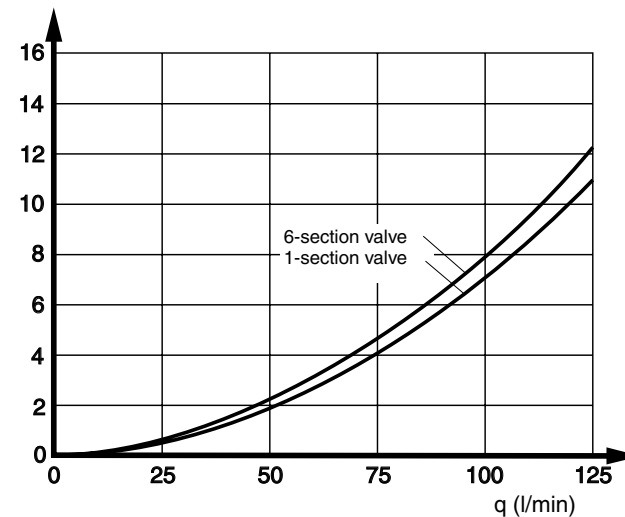
*See description and hydraulic circuit diagram on page 14. With a pump-unloading inlet, the pressure drop does not fall below 5 bar, due to a counter pressure valve that guarantees the function. The pressure-drop curves P1 to T2 include an extra counter pressure of 2 bar at a flow of 100 l/min, due to a pressure drop over the check valve in the inlet. If the check valve is not chosen, the pressure drop is reduced by the corresponding value.*

**Pressure drop with standard inlet, F130CF**

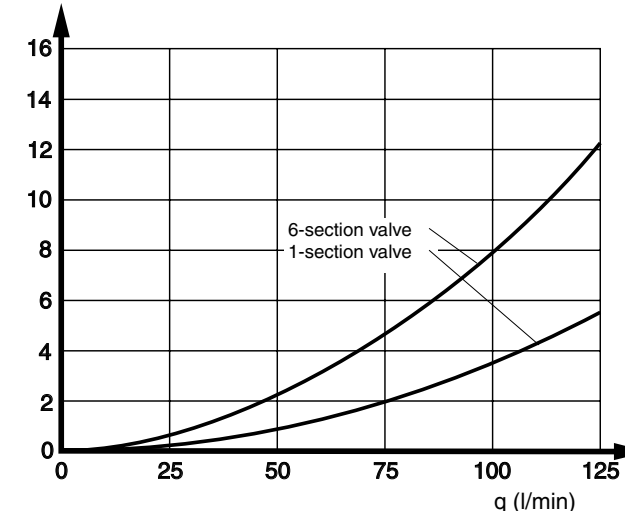
Δp (bar) Pressure drop P1/P2 to T1



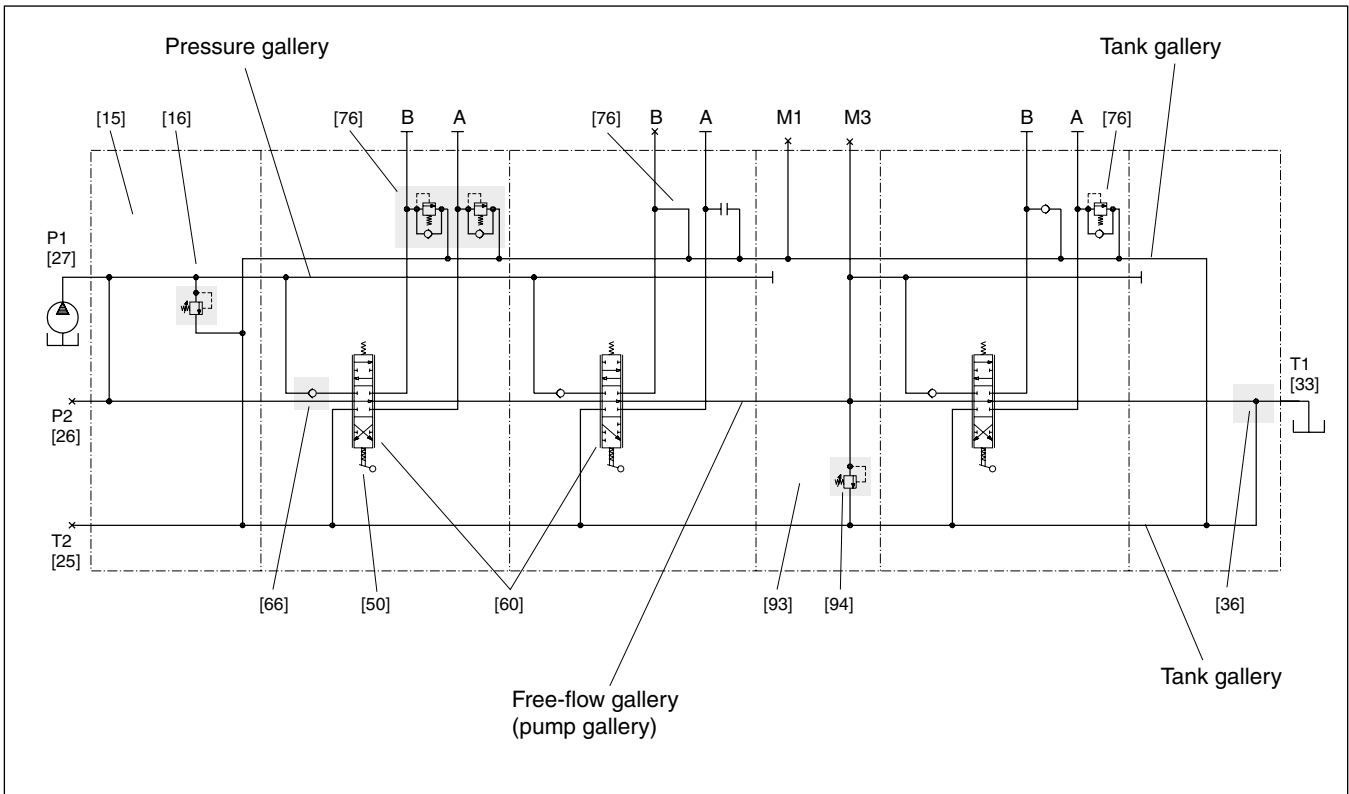
Δp (bar) Pressure drop P1/P2 to service-port A/B



Δp (bar) Pressure drop service-port A/B to T1



**Hydraulic circuit diagram showing basic functions, standard valve**



The circuit diagram above shows the F130CF with three spool sections and a mid-inlet between sections 2 and 3.

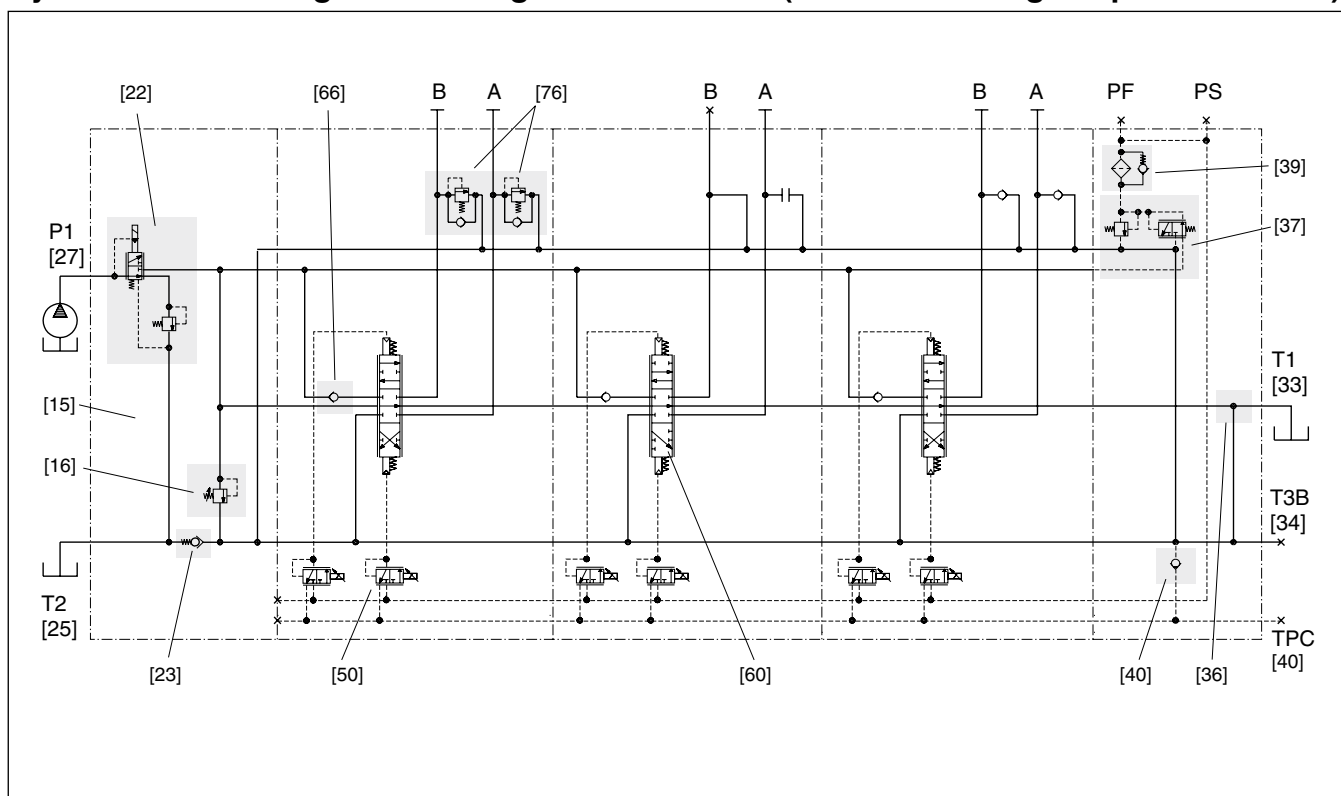
The shaded areas indicate functions or function groups that are described further on in the catalogue.

The item numbers in the hydraulic circuit diagram above and table below refer to function areas for which different options are available. The valve above is equipped as described below.

For details of other options available, and for the F130CP, please refer to the respective function areas [item numbers] given alongside the various sub-headings that begin on page 12.

Item No.	Code	Description	Item No.	Code	Description
15	I	Standard inlet section	66	N	Load-hold check valve in each section to prevent undesirable load sinking.
16	PS	Adjustable main pressure relief valve in inlet.	76	PA	Combined port-relief and anti-cavitation valve in service-ports A and B on section 1, and in service-port A on section 3.
25	T2B	Tank connection in inlet plugged.	Y2		Connection between service-port A and tank gallery blocked in section 2.
26	P2B	Pump connection P2 in inlet plugged.	X2		Connection between service-port B and tank gallery open in section 2 (always the case with EA spool).
27	P1	Pump connection P1 in inlet open.	N2		Anti-cavitation valves fitted in service ports A and B of section 3.
33	T1	Tank connection T1 in end section open.	93	C3	Mid-inlet with series connection to give priority to preceding sections. Intended for single or multi-pump operation.
36	/	Free-flow gallery connected with tank.	94	PS	Adjustable main pressure relief valve in mid-inlet.
50	C	Spring-centred spool actuator on all sections for stepless operation by hand.			
60	D	Spool for double-acting function in sections 1 and 3.			
	EA	Spool for single-acting function working on service port A. Service port B blocked in section 2.			

**Hydraulic circuit diagram showing basic functions (model with integral spool actuators)**



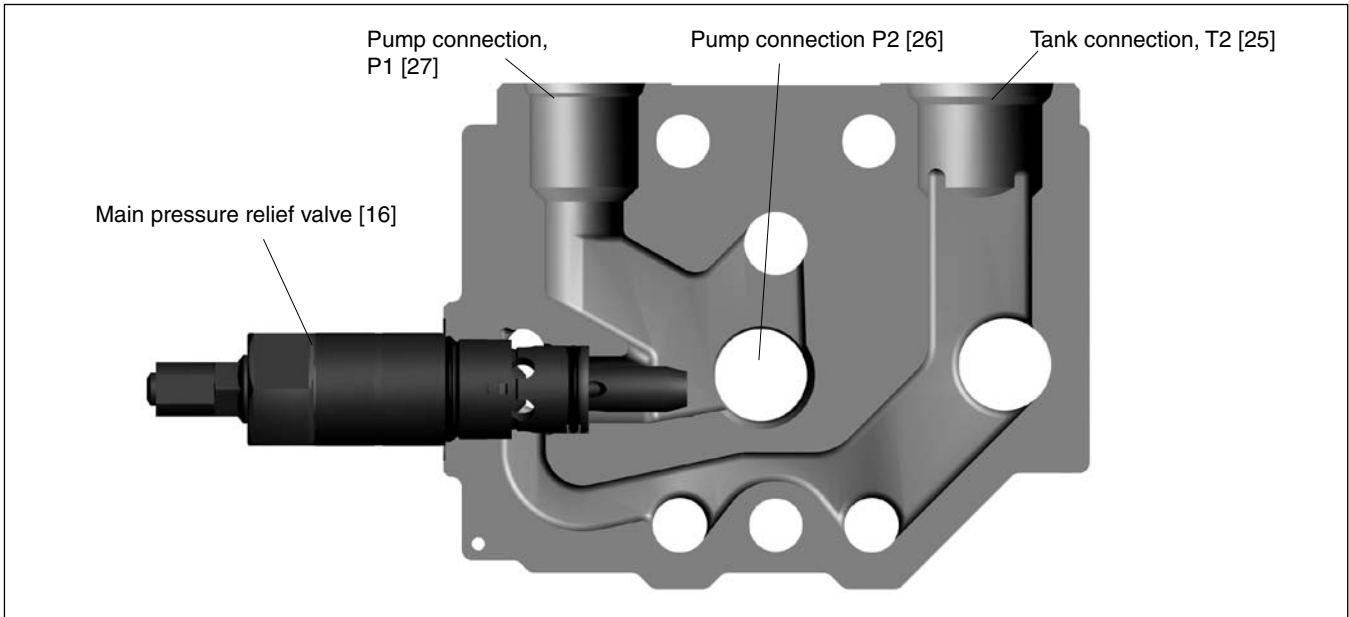
The circuit diagram above shows the F130 with three electro-hydraulically controlled spool sections and an integral pilot-oil

supply. The shaded areas indicate functions or function groups that are described further on in the catalogue.

The item numbers in the hydraulic circuit diagram above and table below refer to function areas for which different options are available. The valve above is equipped as described below.

For details of other options available, and for the F130CP, please refer to the respective function areas [item numbers] given alongside the various sub-headings that begin overleaf.

Item No.	Code	Description	Item No.	Code	Description
15	IU	Inlet with integrated bypass and pump-unloading function	60	D	Spool for double-acting function in sections 1 and 3.
16	PS	Adjustable main pressure relief valve in inlet.	EA	EA	Spool for single-acting function working on service port A. Service port B blocked in section 2.
22	BEN	Electric pump-unloading function.	66	N	Load-hold check valve in each section to prevent undesirable load sinking.
23	N3	Check valve to prevent oil leakage.	76	PA	Combined port-relief and anti-cavitation valve in service ports A and B of section 1 and service port A of section 3.
25	T2	Tank connection in inlet open.	Y2	Y2	Connection between service-port A and tank gallery blocked in section 2.
27	P1	Pump connection P1 in inlet open.	X2	X2	Connection between service-port B and tank gallery open in section 2 (always the case with EA spool).
33	T1	Tank port T1 in end section open.	N2	N2	Anti-cavitation valve mounted in service-ports A and B on section 3.
34	T3B	Tank port T3 in end section plugged.			
36	/	Free-flow gallery connected with tank.			
37	R35	Reducing valve for pilot-oil supply.			
39	S	Internal pilot-oil filter.			
40	TPC	Pilot-oil tank with check valve.			
50	ECS3	Spool actuator for electric remote control.			



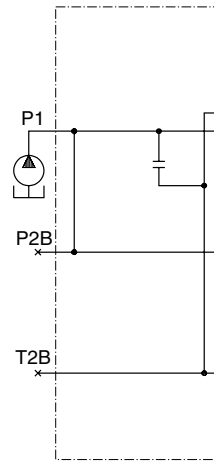
*Standard inlet section*

The inlet section is available in two basic versions: the conventional version and a version with pump unloading.

The conventional inlet section has two pump connections, P1 and P2, and a tank connection, T2. The direct-acting main pressure relief valve is also located in the inlet section.

The F130 with closed centre (F130CP, F130LS) is created by combining inlet section I with L or CUI at item [26]. The difference between the F130CP and the F130CF is that the free-flow gallery (open centre) in the CP version is used to break a hydraulic signal, instead of to convey unused pump flow to tank.

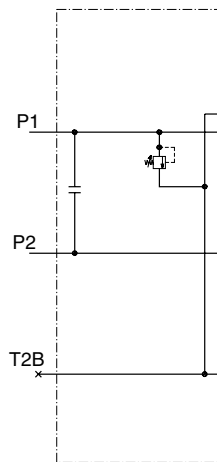
However, in the F130LS, the free-flow gallery is used to collect and pass load signals to the variable pump. The load signal indicates the pressure requirement for the motor port needing the highest pressure.



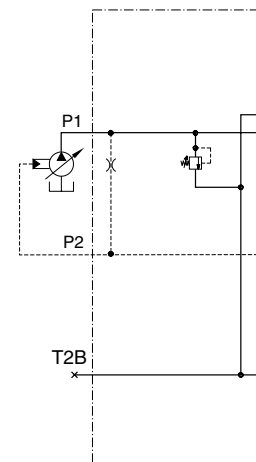
*Standard inlet I without main pressure relief valve (F130CF).*

**Inlet section type [15]**

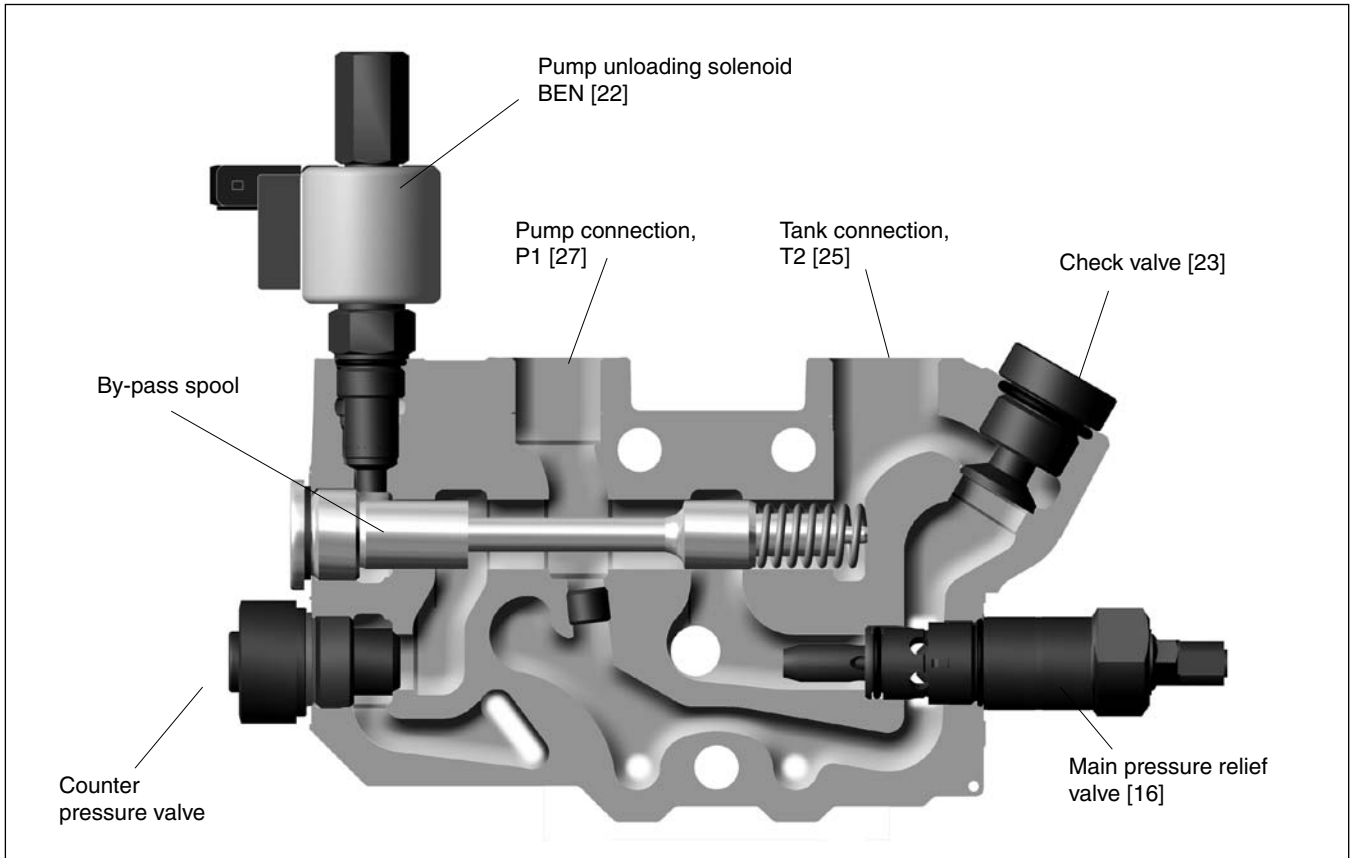
- I** Standard inlet.
- IU** Inlet with integrated pump-unloading function (F130CF).



*Standard inlet I with L-function and main pressure-relief function PS (F130CF).*

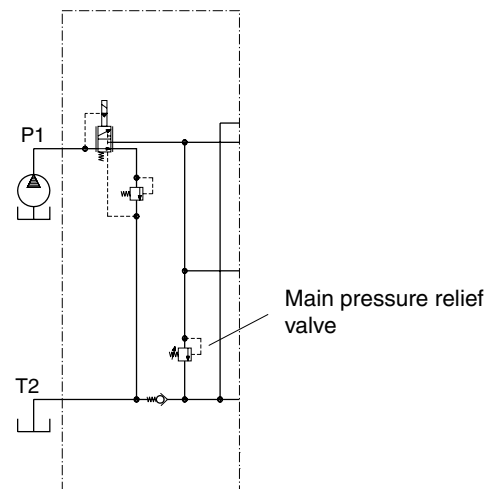


*Standard inlet I with CUI-function and main pressure-relief function PS (F130CP).*



*Inlet section for valve with integrated pump-unloading function.*

The inlet section IU for the F130CF contains a pump-unloading function. This, together with some kind of overcentre valve, enables the machine constructor to equip the machine with an emergency-STOP function.



*Inlet section with pump unloading and main pressure relief valve.*

**Main pressure relief valve [16]**

The pressure relief valve is direct acting and steplessly adjustable. To give the best characteristic, the working range is divided into 7 different ranges: 80-125 bar, 126-140 bar, 141-160 bar, 161-210 bar, 211-250 bar, 251-280 bar and 281-320 bar. The pressure can be increased to approximately 30 bar above the maximum value of the adjustment range in order to enable the machine to be tested at pressures higher than the intended maximum working pressure. The Parker PLD130 cartridge valve, which has a very good characteristic, is used as the pressure relief valve. Alternatively, a plug can be specified to block the connection pump-to-tank when the main pressure relief valve is located elsewhere in the system.

- PS** Adjustable main pressure relief valve. Supplied factory-set.
- PB** Adjustable main pressure relief valve. Supplied factory-set and sealed.
- Y** Without pressure relief valve.

**Pressure setting [17]**

Max. 250 bar for grey-iron version of valve.  
 Max. 320 bar for nodular-iron version of valve.

**Pump unloading [22]**

According to the EC Machinery Directive, machines must be equipped with one or more emergency STOP functions to enable actual or impending danger to be averted.

*"The emergency STOP function must stop the dangerous process as quickly as possible without creating additional hazards and the energy supply to the function must be cut off."*

The pump-unloading inlet meets these criteria by diverting incoming oil from the pump directly to the tank line, at the same time blocking the pump line into the valve. This means that no energy is transmitted to the functions. It should be noted, however, that movements driven by dead weight will continue if there are no overcentre valves.

N.B. The pump-unloading function is part of the machine's safety system.

The pump-unloading function can also be used to save energy when the valve is not being used. By engaging the pump-unloading function when the valve is not being used, the pump-to-tank pressure drop is reduced, see characteristics on page 9.

The solenoid BEN [22] that controls the pump-unloading function is available in 12 and 24 V versions. The solenoid is equipped with a manual actuator. For connector details, please see page 27.

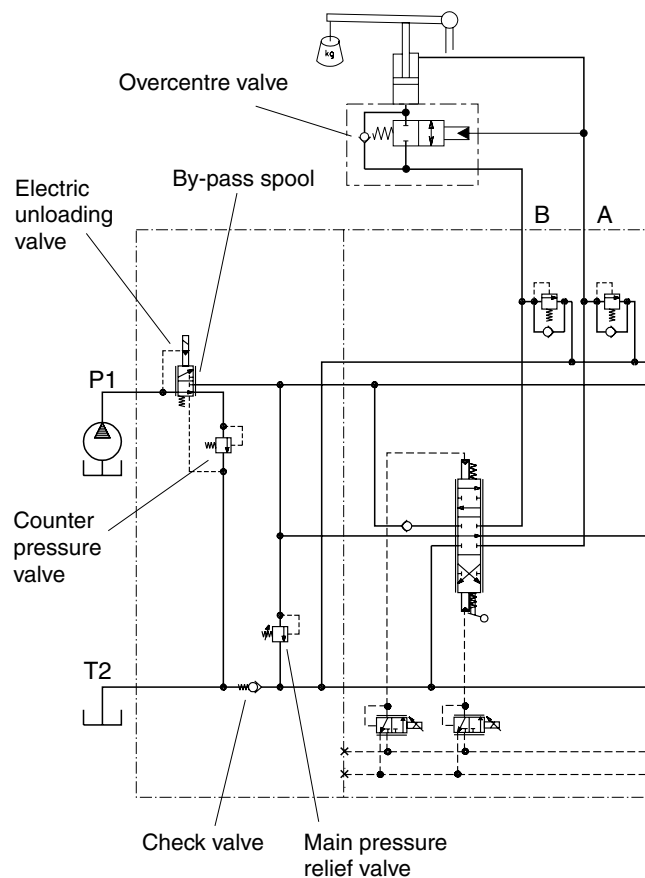
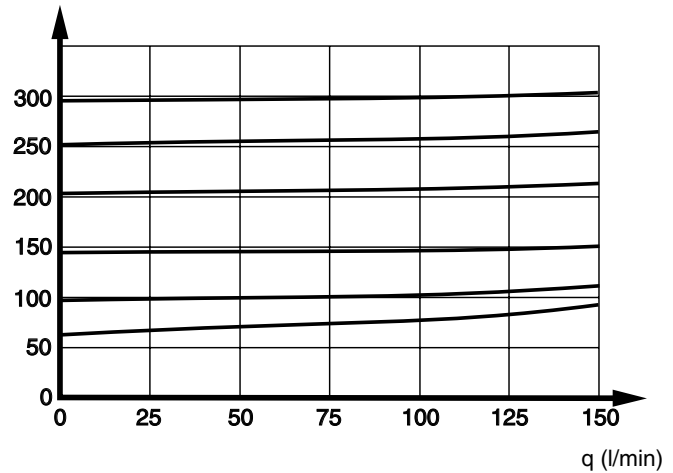
- /** Inlet not equipped with pump unloading.
- BEN** Inlet equipped with electrically controlled pump unloading.

**Options in pump-unloading inlet [23]**

From an environmental and economic point of view, it is advantageous to close the tank gallery as well, so that no oil runs out via the anti-cavitation valve in the event of a hose rupture, for instance. To prevent this from happening, the pump-unloading inlet can be equipped with a check valve in the tank gallery.

- X3** Pump-unloading inlet without check valve.
- N3** Pump-unloading inlet with check valve in tank gallery.

$\Delta p$  (bar) Pressure relief characteristic, PS/PB



Circuit diagram for pump unloading

### **Tank connection T2 [25]**

- T2** Tank connection T2 open.
- T2B** Tank connection T2 plugged (normal version).

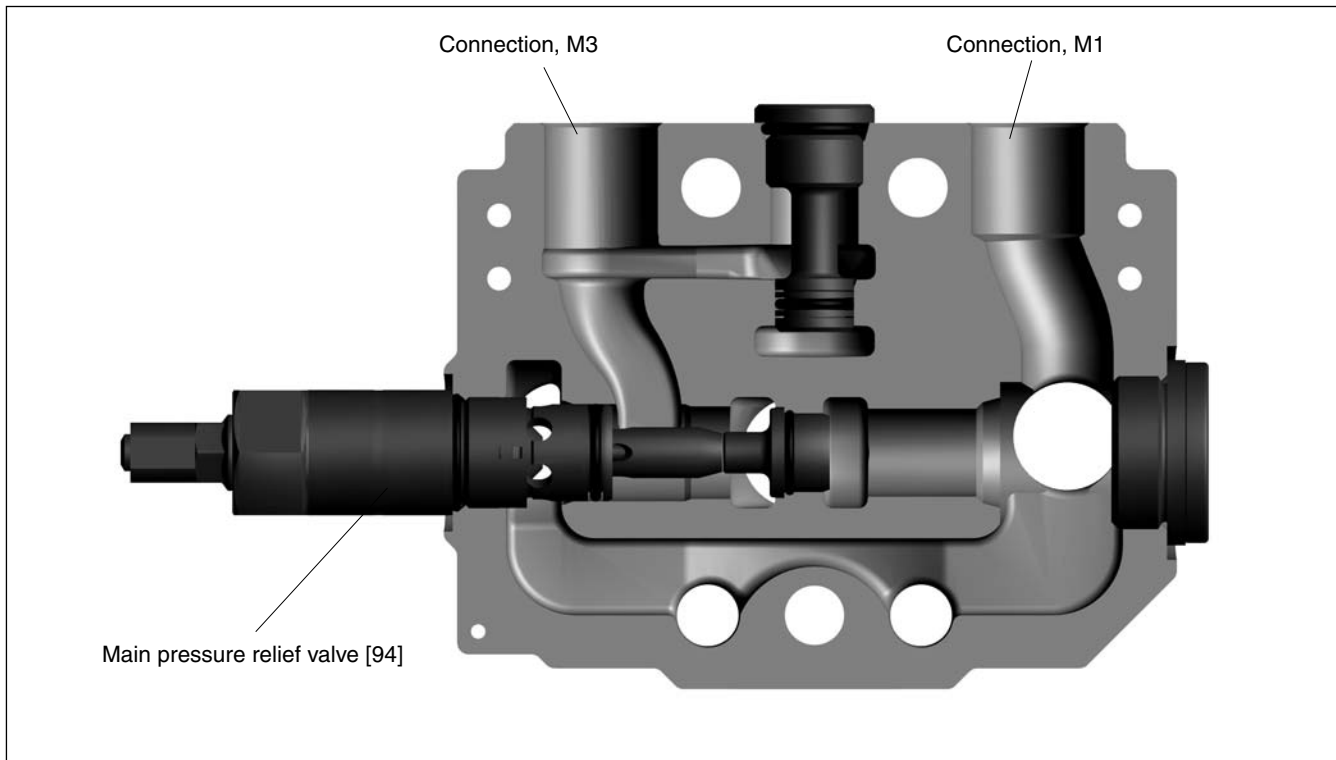
### **Pump connection P2 [26]**

Only available on inlet type I [15]. See page 7 for more information about parallel connection.

- P2** Pump connection P2 open.
- P2B** Pump connection P2 plugged. Normal version.
- L** Parallel-connection used in F130CF when actual valve is connected downstream to another valve. The function separates the free-flow gallery from the pump gallery. (See page 12 for circuit diagram).
- CUI** Unloading-signal restrictor for variable pump. Via the CUI restrictor ( $\varnothing$  0.8 mm), the pump pressure enters the gallery that is used as the free-flow gallery on the F130CF. The inlet section I [15] is connected with the pump regulator via the P1 connection. When all spools are in neutral, the flow coming from the pump gallery passes via the CUI restrictor to the tank connection in the valve's end section. The pressure that influences the pump regulator does not arise. As soon as a spool is shifted out of neutral the connection from the CUI restrictor to tank is broken and the pump pressure is again directed to the pump regulator, via the P1 connection.
- CUI2** Unloading-signal restrictor with same function as CUI, but with  $\varnothing$ 1.5 mm restrictor.
- LSI** Connection nipple that breaks the connection between the free-flow gallery (open centre) and the pressure gallery. Used in CPU system, for instance, if pump-unloading signal is created in another valve. This option must be selected in the specification for F130LS.
- B** Plug that breaks the connection between the free-flow gallery (open centre) and the pressure gallery. Used in F130CP when unloading signal is not wanted. Port P2 blocked.

### **Pump connection P1 [27]**

- P1** Pump connection P1 open. (normal version).
- P1B** Pump connection P1 plugged.



**Mid-inlet section [90]**

There are two connections in the mid-inlet section. They can be connected in different ways, depending on the choice of options.

The main pressure relief valve (see page 17) can/or should be fitted in the mid-inlet, depending on the way in which the system is constructed. See connection alternatives overleaf.

Several mid-inlets can be placed in one and the same valve to give optimum system construction.

**The mid-inlet section can only be selected for the F130CF**



**Options, mid-inlet [93]**

If mid-inlet is used in a solenoid valve, the pilot oil must be supplied from an external source.

- C2** Mid-inlet without function. Used if you plan to convert mid-inlet to C3 or C5 later on.
- C3** Mid-inlet with series connection that gives priority to upstream sections. Intended for single or multi-pump operation. Flow not used in sections upstream of the mid-inlet is added to the incoming flow in the mid-inlet.
- C5** Mid-inlet without flow summation. Intended for multi-pump operation. Valve with C5 mid-inlet functions as two separate valves with a common tank connection. If an extra tank line is connected to port M1, the pump-to-tank pressure drop will be reduced.

**Main pressure relief valve [94]**

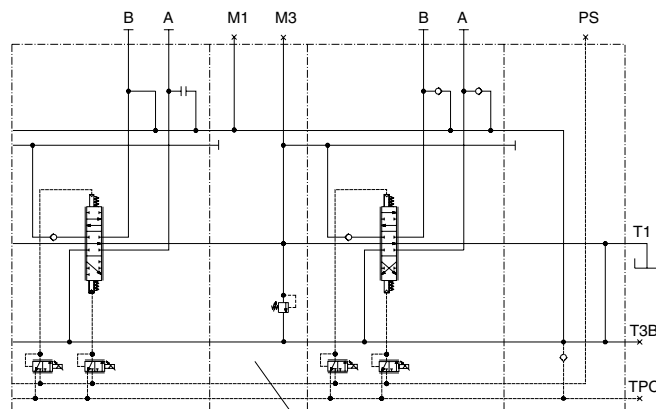
The mid-inlet can be fitted with the same main pressure relief valve as is fitted in the standard inlet. For further information and technical data, please see Inlet section [16] on page 14.

In systems in which several different pressure levels are required, main pressure relief valves can be fitted to give different pressure levels before and after the mid-inlet.

- PS** Adjustable main pressure relief valve. Delivered with opening pressure pre-set as per specification.
- PB** Adjustable main pressure relief valve. Delivered pre-set and factory-sealed.
- Y** Without pressure relief valve.

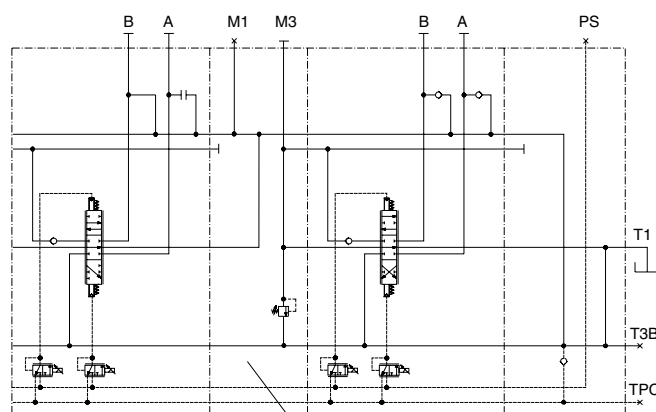
**Pressure setting [98]**

- Max. 250 bar for grey-iron version of valve.
- Max. 320 bar for nodular-iron version of valve.



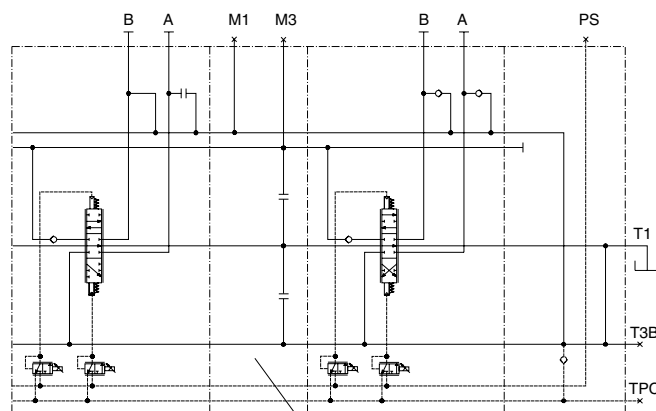
Mid-inlet section

*Mid-inlet, C3. Used in multi-pump systems and when upstream sections are to have priority over flow delivered by the pump connected to the inlet section [15]*



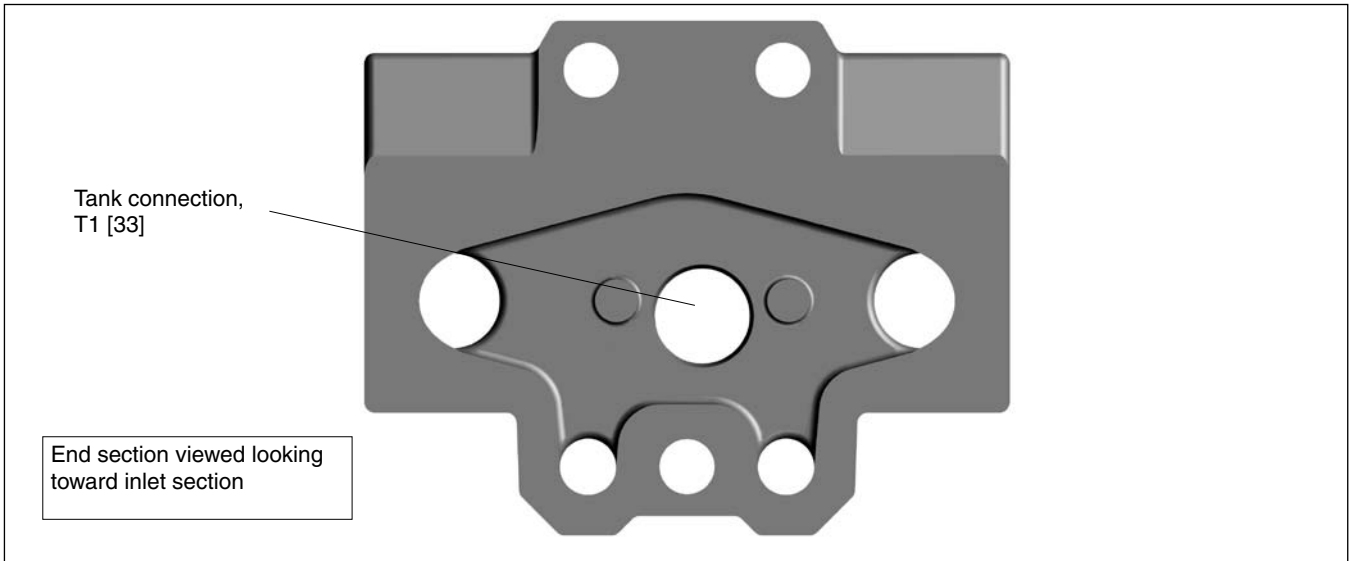
Mid-inlet section

*Mid-inlet, C5. Used in multi-pump systems. Valve functions as two separate valves, but with common tank gallery.*



Mid-inlet section

*Mid-inlet C2 Used when you want to rebuild the mid-inlet to a C3 or C5 later on.*



*End section for standard valve*

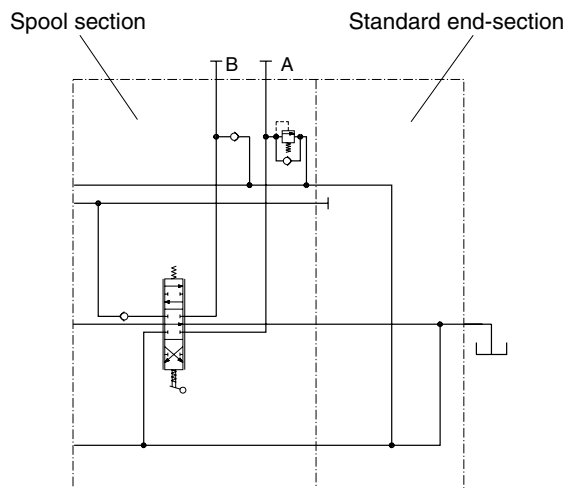
The end section is available in two different versions: the conventional version and a version with an integrated pilot-pressure supply. The conventional end-section is also available, together with a spool section, as a unit called a 'spool section with outlet'. The conventional end-sections are equipped with a tank connection, T1. The end section for valves with integrated spool-actuators includes a reducing valve for the pilot-pressure supply, and one more tank connection, T3. A power-beyond function can be fitted in the T3 connection for serial feeding of subsequent valves (see page 7).

**Type of end section [30]**

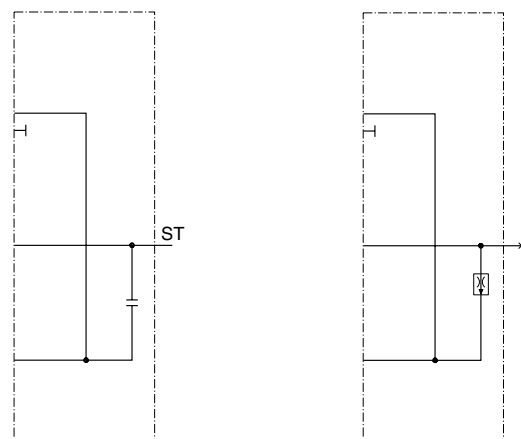
- US** Standard end-section.
- USP** End section with pilot-pressure generation.

**Tank connection T1 [33]**

- T1** Tank connection T1 open (normal version).
- T1B** Tank connection T1 plugged.
- PT** Counter pressure valve that raises pressure in free-flow gallery to ensure that the minimum requisite pilot-pressure is maintained (USP only).
- ST** Power-beyond nipple for conventional end-section. Used to block the connection between the free-flow gallery (open centre) and tank, at the same time as the flow in the free-flow gallery is directed to a subsequent valve through the power-beyond nipple. The tank connection T2 in the inlet must be open. Compare with S at item [36].
- LD** This is a tank connection with a drain cartridge fitted. This must be used in the F130LS.

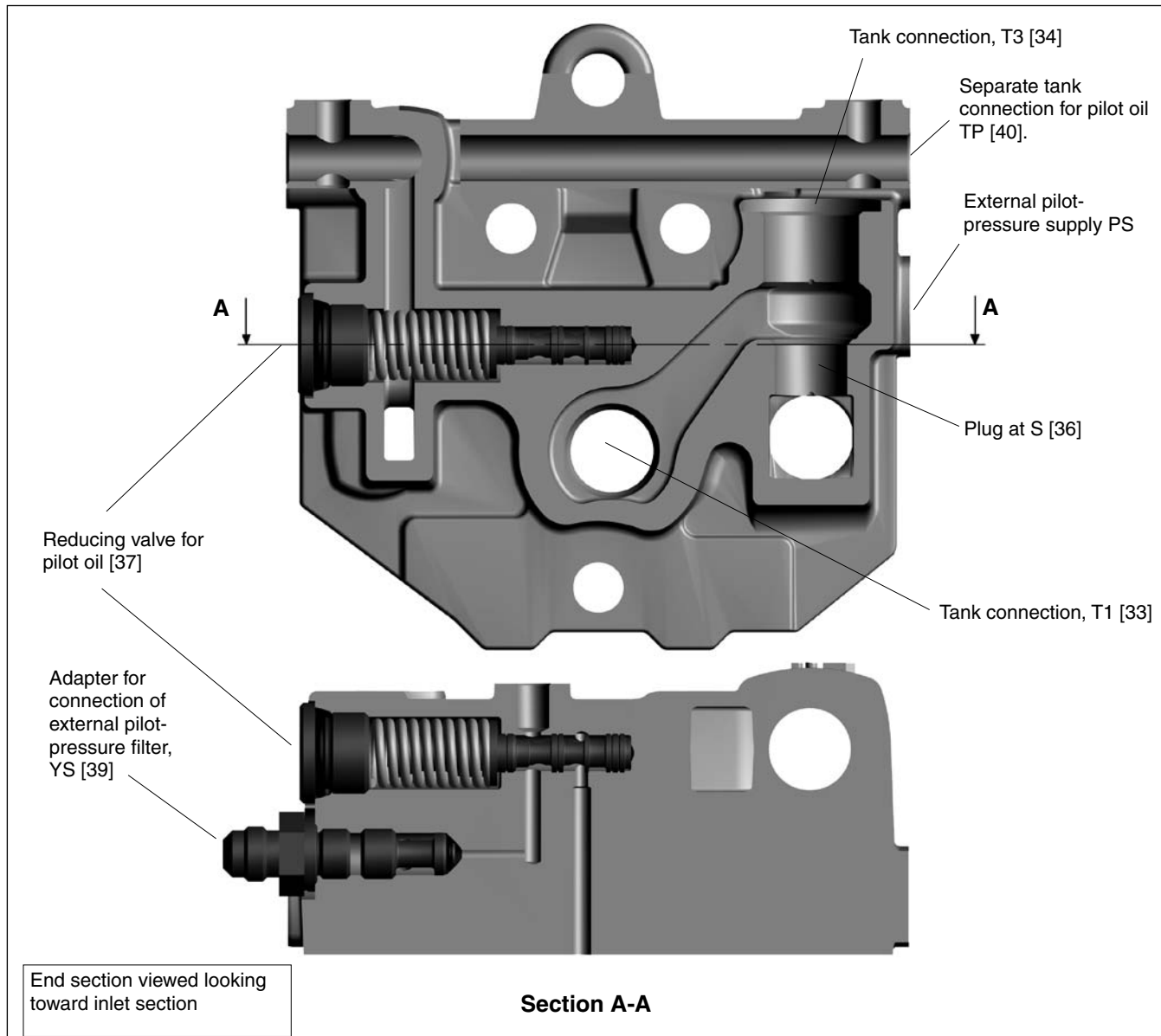


*Tank connection T1 open. Free-flow gallery connected with tank gallery in the end section.*



*Tank connection T1 open. Free-flow gallery not connected with tank (series connected). ST at item [33].*

*Free-flow gallery connected with tank through LD at item [33]. F130LS. only.*



*End section with integral pilot-oil supply*

**Tank connection T3 [34]**

Only on end section USP [30]

**T3** Tank connection T3 open.

**T3B** Tank connection T3 plugged (normal version).

**Power-beyond function [36]**

Only on end section USP [30]

**/** Without series connection.

**S** Power-beyond function used to block connection between free-flow gallery and tank. Flow in free-flow gallery fed to subsequent valve through either T1 or T3 connection. Tank connection T2 in the inlet must be open.

**Reducing valve [37]**

Internal pilot-pressure supply is a valve function built into the end section, which acts as both a reducing valve and a pressure relief valve in the pilot circuit. For safety reasons, it is furnished with a separate safety valve function that prevents the maximum permissible pressure from being exceeded.

A pilot pressure for external use, e.g. for the PCL4 remote-control valve, can be tapped via the PS connection.

/ Without reducing valve

**R35** Reducing valve set at 35 bar.

**Pilot-oil strainer [39]**

**S** Coarse filter with by-pass function in the internal pilot-pressure supply. Filter protects pilot circuit from dirt, especially during start-up of system.

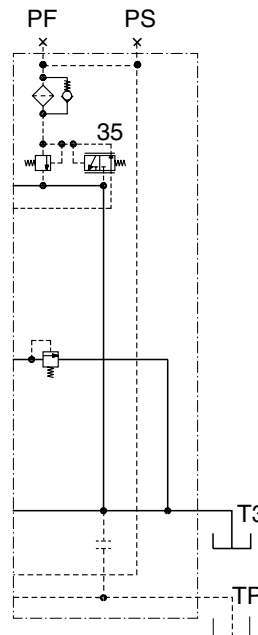
**YS** Adaptor for connection of external pilot-pressure filter. Enables pilot circuit to be supplied with cleaner oil compared with the rest of the system.

**Separate tank connection for pilot circuit [40]**

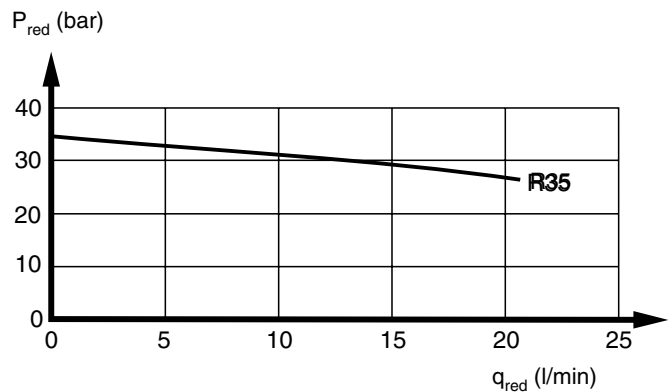
**TP** Separate tank connection for pilot circuit is open. The connection to the main tank gallery in the directional valve is blocked. This function is suitable for systems in which there is a risk of dynamic pressure variations in the tank line causing variations in the pilot circuit when there is a common tank line (recommended).

**TPB** End section machined for separate tank connection for pilot circuit, and plugged. Tank return of pilot circuit connected with tank gallery of directional valve.

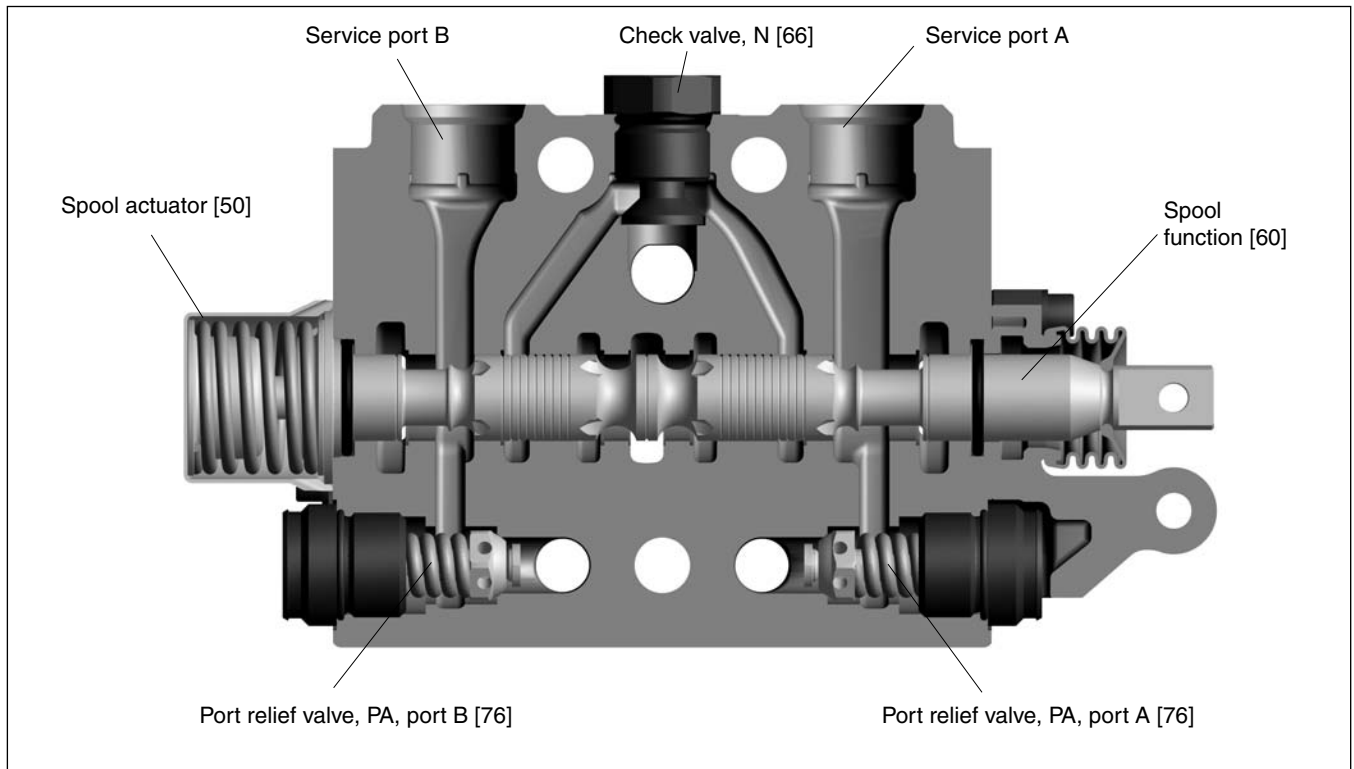
**TPC** The pilot circuit's tank gallery is connected to the main tank gallery via a check valve. The check valve is used to prevent that a pressure peak reaches the spool actuators.



*Tank connection T3 open. Free-flow gallery connected with tank via counter pressure function, PT [33].*



P<sub>red</sub> = reduced pressure  
 q<sub>red</sub> = take-off flow from reducing valve



*Conventional spool section.*

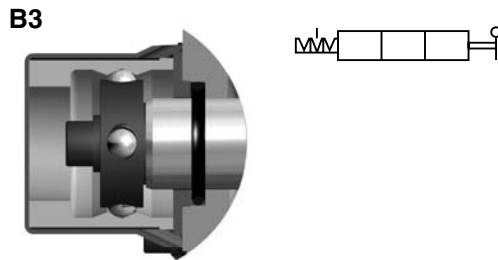
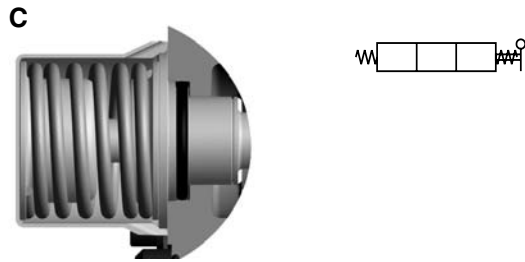
The F130 is stackable and can be supplied in combinations of 1 to 11 spool sections. For each spool section, there is a wide range of spools and spool actuators to choose from. This enables optimum adaptation to the application and controlled function in question. The spool sections have machined control-edges for precise regulation. For best economy, there are spool sections for one or two spools. The spool sections are connected in parallel internally.

**Spool actuators [50]**

A large number of spool actuators is available for F130. They are divided into three different groups: hand-operated, ON/OFF remote controlled and proportionally remote controlled.

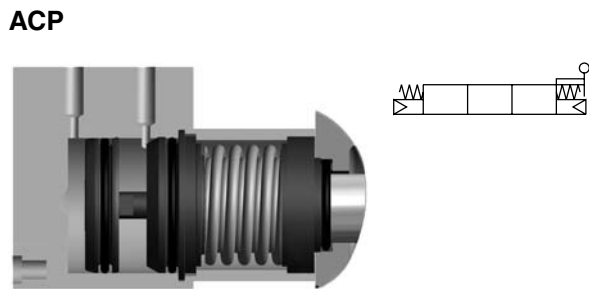
**Hand-operated spool actuators with open spool end**

- C** Spring-centred spool actuator. Actuator for stepless control with spring centring to neutral position.
- B3** Three-position spool actuator. B3 is a spool actuator with mechanical three-position detent. It has three fixed positions: fully actuated at both end positions, and the neutral position.



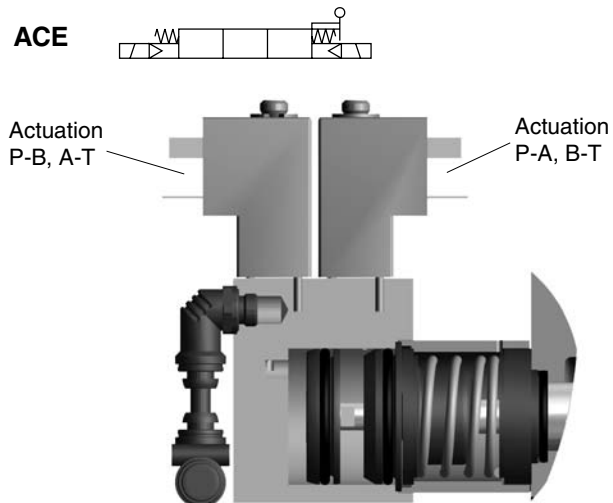
**Remote controlled, proportional spool actuators with open spool end and hand operating facility**

- ACP** Pneumatic proportional spool actuator.  
 The ACP is a pneumatically controlled, proportional spool actuator with spring centring and the possibility of stepless control by means of a hand lever. The ACP is best controlled by the Parker **VP04** remote control valve (see separate brochure).  
 Breakaway pressure\*\*: 2.5 bar  
 Final pressure\*\*: 7 bar (max. 10 bar)  
 Connection thread: G 1/8 or NPTF 1/8-27



**Remote controlled ON/OFF spool actuators with open spool end and possibility of manual control**

- ACE** An electro-pneumatic ON/OFF control with spring centring and the possibility of stepless operation by means of a lever.  
 Primary air: 4 – 10 bar  
 Control current: 12 VDC min. 0.85 A  
 24 VDC min. 0.42 A  
 Voltage tolerance: ± 20%  
 The spool actuator has a common pressure gallery for primary air. The primary air can be connected to either the first or the last valve section directly by means of a plug-in connector for Ø6 mm air hose.  
 The connector must be ordered separately, see page 27.



**Lever bracket [51]**

Lever bracket for open spool actuator is available in two different versions, LM and LJ. Lever bracket LM can't be loaded with forces sideways, from e.g. a mechanical joystick. In these cases LJ should be used. The Parker standard hand levers (see page 27) can only be used with LM. Lever itself not included. Must be ordered separately (see page 27).

The standard protection for the spool is a bellows. In some environments, condensation may form in the bellows, possibly causing corrosion. In this case, we recommend using a lever bracket without a bellows.

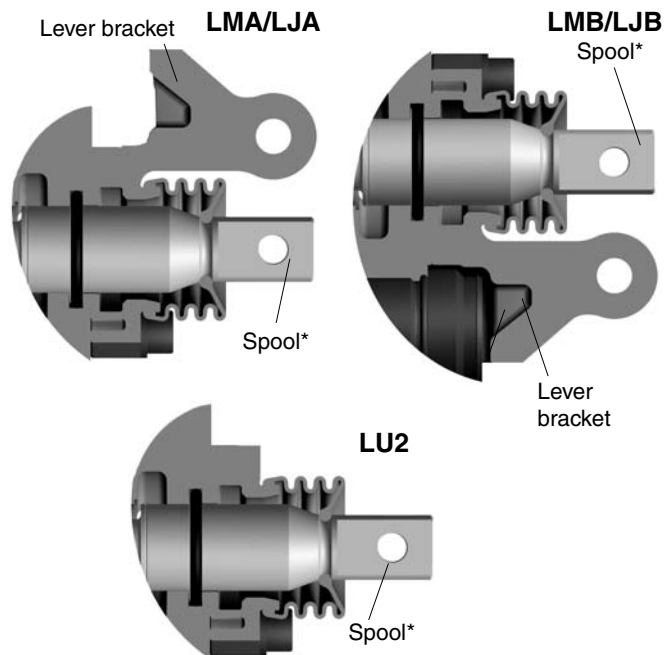
**LMA/  
 LJA** Lever bracket for open spool actuator.

**LMB/  
 LJB** Lever bracket for open spool actuator.

**LU2** No lever bracket – open spool end.

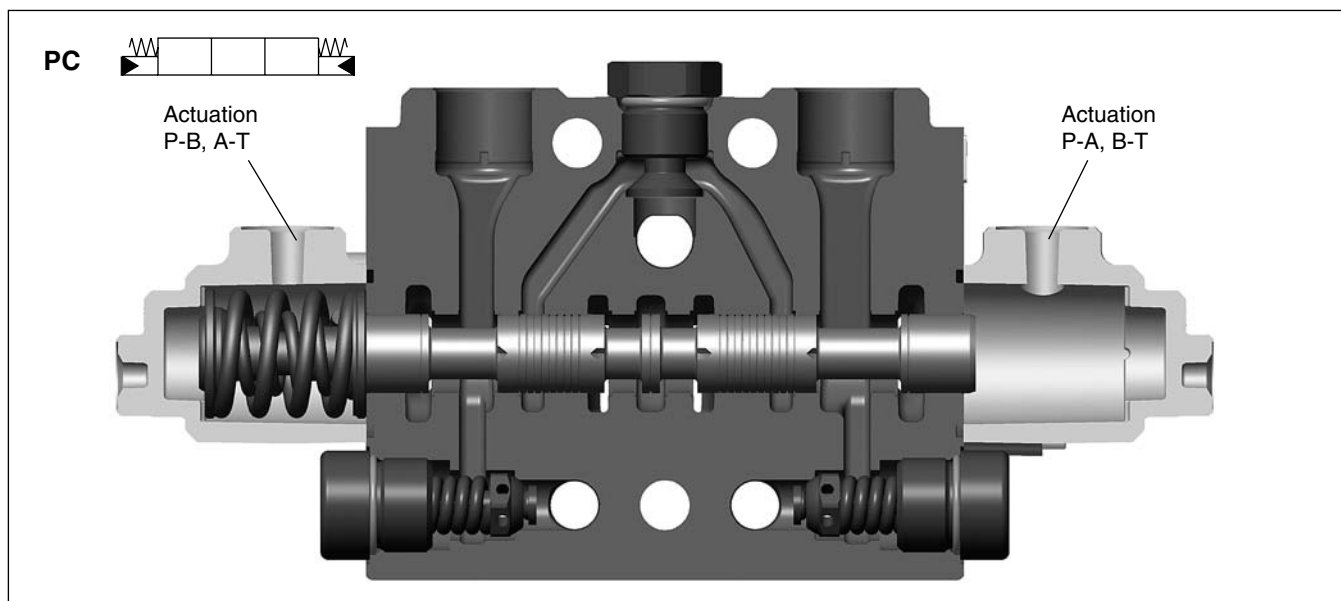
**LU** As LU2 without bellows. The spool is protected by a scraper ring.

**A92** Lever bracket of aluminum, excluding bellows. The spool is protected by a scraper ring. [59]. Especially recommended when the valve is mounted with the spool end and lever bracket facing up.



\* Spool in (←) gives actuation P-A, B-T.  
 Spool out (→) gives actuation P-B, A-T.

**Remote controlled proportional spool actuators  
 with closed spool end**

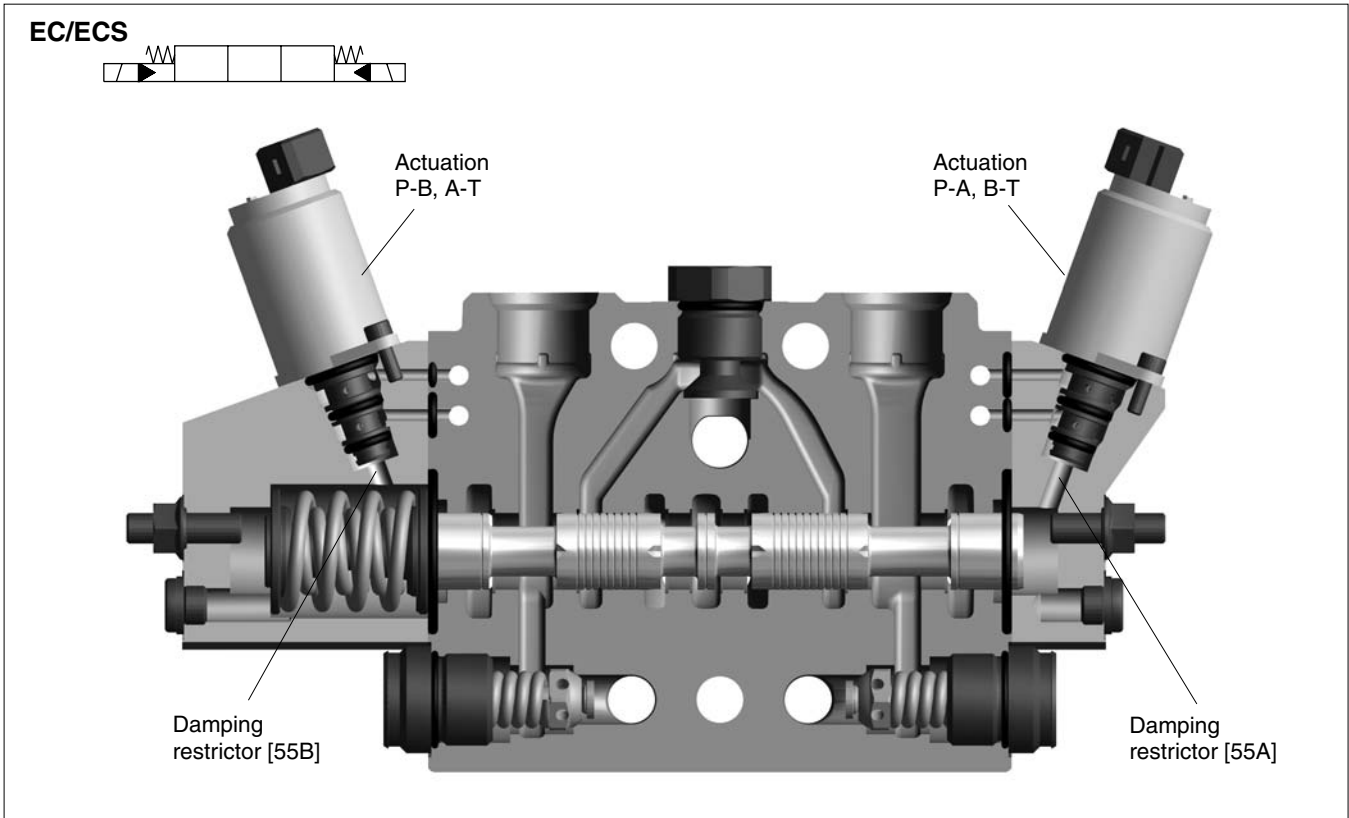


**PC30** Hydraulic proportional spool actuator  
**PC40** The PC30 and PC40 are hydraulically and proportionally controlled spool actuators with spring centring. The PC30 is used on the F130CF with pump flows up to 80 l/min. The PC40 is used on the F130CF with pump flows above 80 l/min, and also on the F130CP. Ideally, the PC30 and PC40 should be remote-controlled by the Parker **PCL4** remote control valve (see separate brochure).

	<b>PC30</b>	<b>PC40</b>
Breakaway pressure**	6 bar	7 bar
Final pressure**	16 bar	24 bar
	(max 35 bar)	(max 35 bar)

\*\* The breakaway pressure refers to 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. The foregoing 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. This is important for the F130CF because, if the spool is not actuated fully, the free-flow gallery will not close, with the result that a certain amount of flow will go directly to tank.

Connection thread: G 1/4 or 9/16-UNF-2B



**ECS3** Electro-hydraulic proportional spool actuator  
**ECS4** The ECS3 and ECS4 are electro-hydraulic, proportionally controlled spool actuators with spring centring. The ECS3 is used on the F130CF with pump flows up to 80 l/min. The ECS4 is used on the F130CF with pump flows above 80 l/min, and also on the F130CP. The Parker **PVC25** cartridge valve is used as a pilot valve.

Ideally, the ECS3 and ECS4 should be remote-controlled by the Parker **IQAN** electronic remote control system (see separate brochure). The connector of AMP type must be ordered separately (see page 27). PVC25 is also available with Deutsch connector type.

	12 V	24 V
<b>ECS3</b> Breakaway current:*	max 540 mA	max 280 mA
Final current:*	min 1100 mA	min 550 mA
<b>ECS4</b> Breakaway current:*	max 580 mA	max 300 mA
Final current:*	min 1450 mA	min 730 mA
<b>ECS3</b> Solenoid (PVC25)	max 1450 mA, 100% ED	max 730 mA, 100% ED
<b>ECS4</b>		
Coil resistance at +20 °C:	5,4 Ω	21,7 Ω
Inductance:	27,7 mH	7,0 mH
Tank pressure:	max 15 bar	max 15 bar

**EC3** The EC3 and EC4 spool actuators have the same data as the ECS3 and ECS4. The difference is that the solenoid valve in the EC3 and EC4 is also equipped with manual-override and air bleeding functions.  
**EC4**

\* 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. This is important for the F130CF because, if the spool is not actuated fully, the free-flow gallery will not close, with the result that a certain amount of flow will go directly to tank.

The stated values are guidelines only. To obtain optimum operating characteristics, the breakaway and final currents should be adjusted individually.

**Connector Type [56]**

The connector of the solenoid is of type:

- A** AMP Junior-Timer type C.
- D** Deutsch type DT04-2P. Mates with DT06-2S Plugs.

The connector must be ordered separately.



The spool is the most important link between the actions of the operator and the movement of the controlled function. Parker therefore goes to great lengths to optimise spools for different flows, load conditions, functions and applications. Since this is a process of continuous development work, new spools are being introduced all the time. For this reason, the many different spools available are not detailed in this catalogue. Parker's computerised specification program will generate proposals for suitable spools for the application and functions of the hydraulic system in your machine.

**Spool function [60]**

Spools are divided into different groups, depending on their basic function.

- D** Double-acting spool. Blocked in the neutral position.
- EA** Single-acting spool. Blocked in the neutral position and service port B blocked.
- EB** Single-acting spool. Blocked in the neutral position and service port A blocked.
- M** Double-acting spool. Service ports connected to tank (float position) in neutral.
- CA** Regenerative spool for rapid feeding of a cylinder, or for flow saving. The large side of the cylinder is always connected to service port A.

Certain spools have been equipped with drainage from service port to tank when the spool is in neutral. Drainage (approx. 2 mm<sup>2</sup>) serves to prevent pressure build-up in the service port. Such drainage is used primarily in combination with different types of external overcentre valve. The spool designation is affected as follows: A lower-case letter is suffixed to the usual spool designation indicating function, e.g. the D-spool becomes a Da-spool to indicate drainage from service-port A to tank.

- a** Drainage of service-port A to tank
- b** Drainage of service-port B to tank
- m** Drainage of service ports A and B to tank

**Spool designation [69]**

Each spool version is imprinted with an alphabetical code to facilitate identification during tuning or servicing in the field.

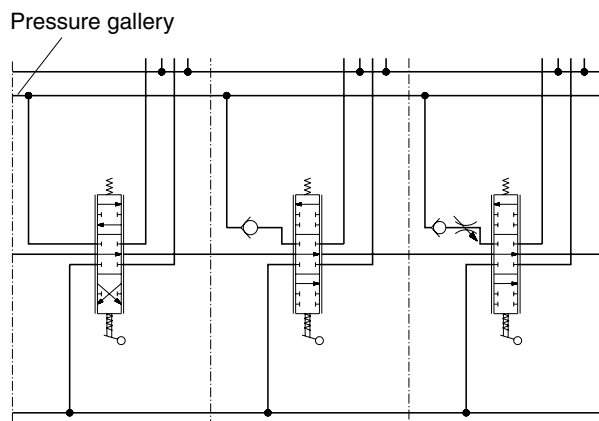
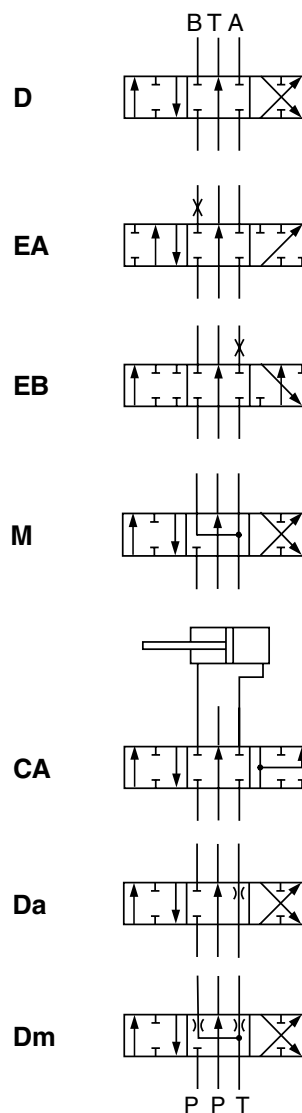
Please note that LS spools have a different coding system. All LS spool have "ls" after the spool codes leading letter e.g. a double acting spool, normal code D, would become Dls and for a single acting spool, normal code EA, would become EAls. For spool selection including drainage, the drainage letter is placed at the end of the code e.g. for a single acting spool with drainage from work port A, the code would be EAlsa.

**Options in the spool section**

**Options in the pressure gallery [66]**

The spool section's pressure gallery can be fitted with different accessories to give the best system construction.

- X** Without load-hold check valve.
- N** Load-hold check valve to prevent undesirable sinking of a heavy load while a light load is operated. Normal version.
- MS** Load-hold check valve equipped with adjustment screw for restricting flow to consumer.



*Pressure gallery open (X) in first section, fitted with check valve (N) in second section and fitted with check valve and adjustment screw (MS) in third section.*

**Pressure limiters in service ports [76A/B]  
 (Port relief valves)**

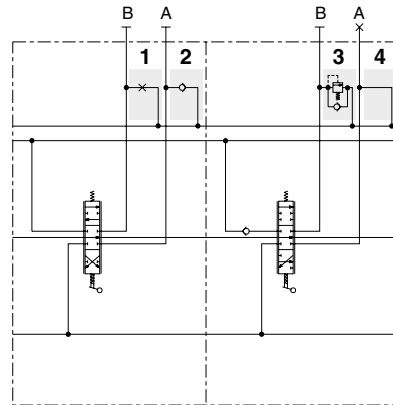
The service ports can be equipped with individual port-relief and/or anti-cavitation valves.

Parkers **PLC082** cartridge valves are used as port relief valves. They are renowned for their long service life, tightness, fast opening sequence and good characteristics over the entire flow range.

**Port relief valve [76]**

- X2** Service port connected permanently with valve's tank gallery.
- Y2** Connection between service port and tank gallery blocked.
- N2** Anti-cavitation valve fitted. The anti-cavitation valve serves to ensure that, in the event of a lower pressure in the service port than in the tank, oil can be sucked from the system oil tank to the consumer. To improve the anti-cavitation function, the oil tank can be pressurised. Note that the counter pressure valve PT [33] does not influence the pressure in the anti-cavitation valve's tank line.
- PA** PLC082 combined port-relief and anti-cavitation valve fitted. Valve is factory-set at the specified pressure. Optional pressure settings: 50, 63, 80, 100, 125, 140, 160, 175, 190, 210, 230, 240, 250, 260, 280, 290, 300, 320 and 350 bar.

Since the cavities for X2, Y2, N2 and PA have the same machining, it is easy to change the function of an existing valve.



In the diagram above:

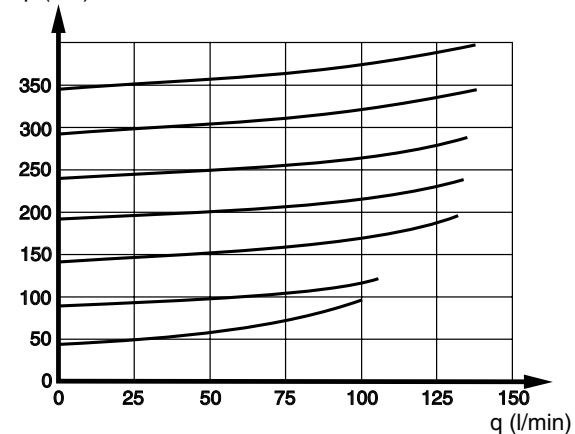
Section 1, service port B, is fitted with a Y2-plug (1) to block the connection to tank.

Section 1, service port A, is fitted with an anti-cavitation valve N2 (2).

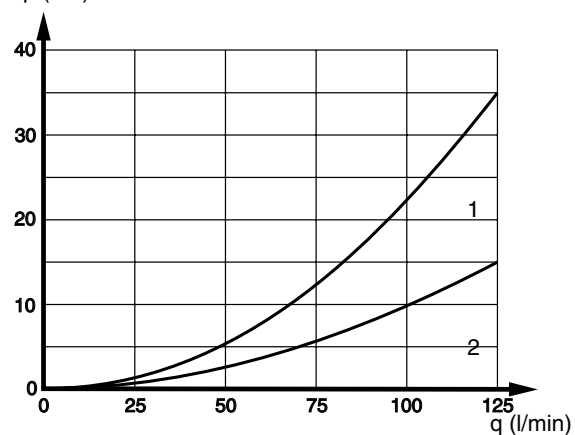
Section 2, service port B, is equipped with a combined port-relief and anti-cavitation valve (3) to limit the pressure and prevent cavitation.

Section 2, service port A, is connected to tank - X2 variant - in the case of EB spools (4).

$\Delta p$  (bar) Port-relief characteristic



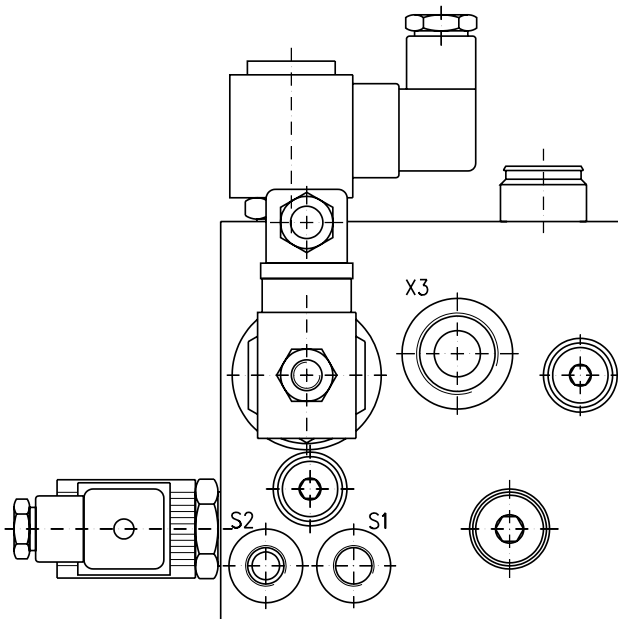
$\Delta p$  (bar) Anti-cavitation characteristic



The curve shows the pressure drop between the tank connection and service port when port relief valve (PA) or anti-cavitation valve (N) without port-relief function is used as an anti-cavitation valve.

**Function blocks (manifolds)**

F130 valves can be equipped with manifold-type function blocks that enable total system solutions to be integral into the valve.



**Connectors, levers**

Connectors, levers, etc. are available as accessories. They must be ordered separately.

See our Mobile Valves Accessories catalogue (HY17-8558/UK).

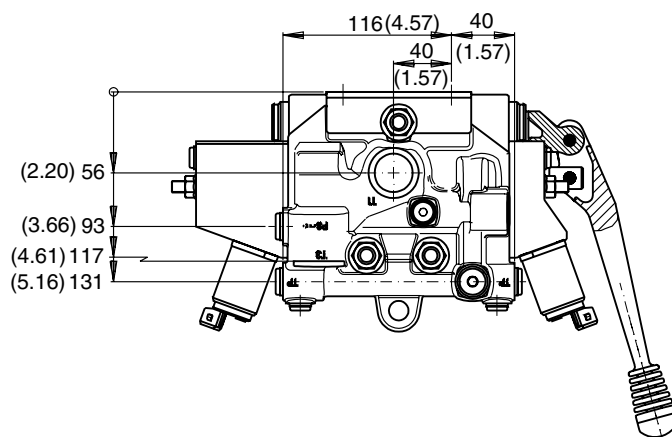
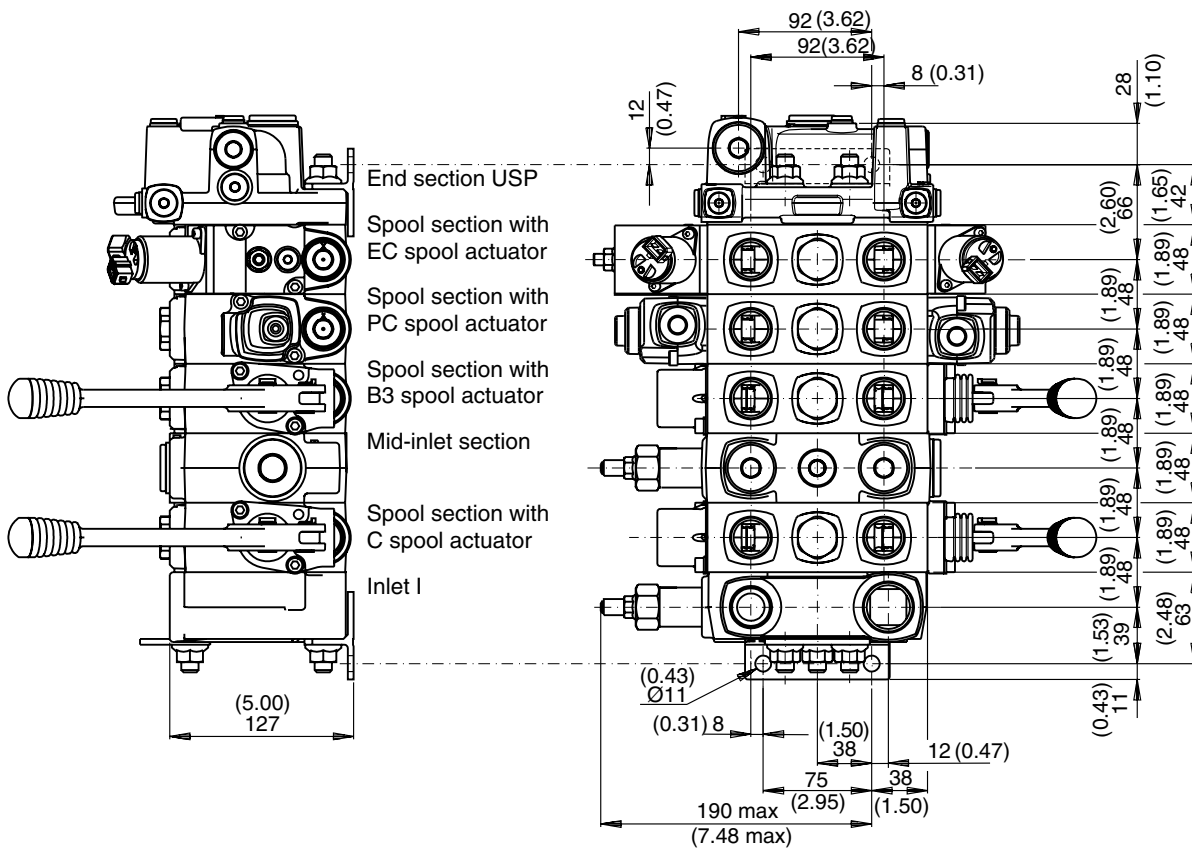
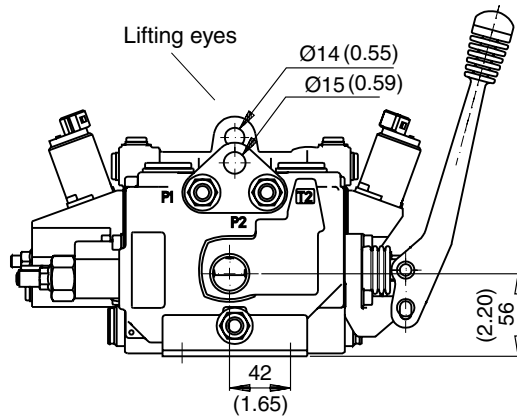
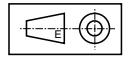
Please contact your Parker representative for more information about integral system solutions. In addition to standard function blocks, special function blocks can be designed by our experienced product and system designers to meet your needs exactly.

The function block above was specially adapted for a customer. Like most of our function blocks, it was constructed with the aid of cartridge valves. Only the housing itself is a unique component.

**Conventional valve**

For connection dimensions,  
 please see page 8.

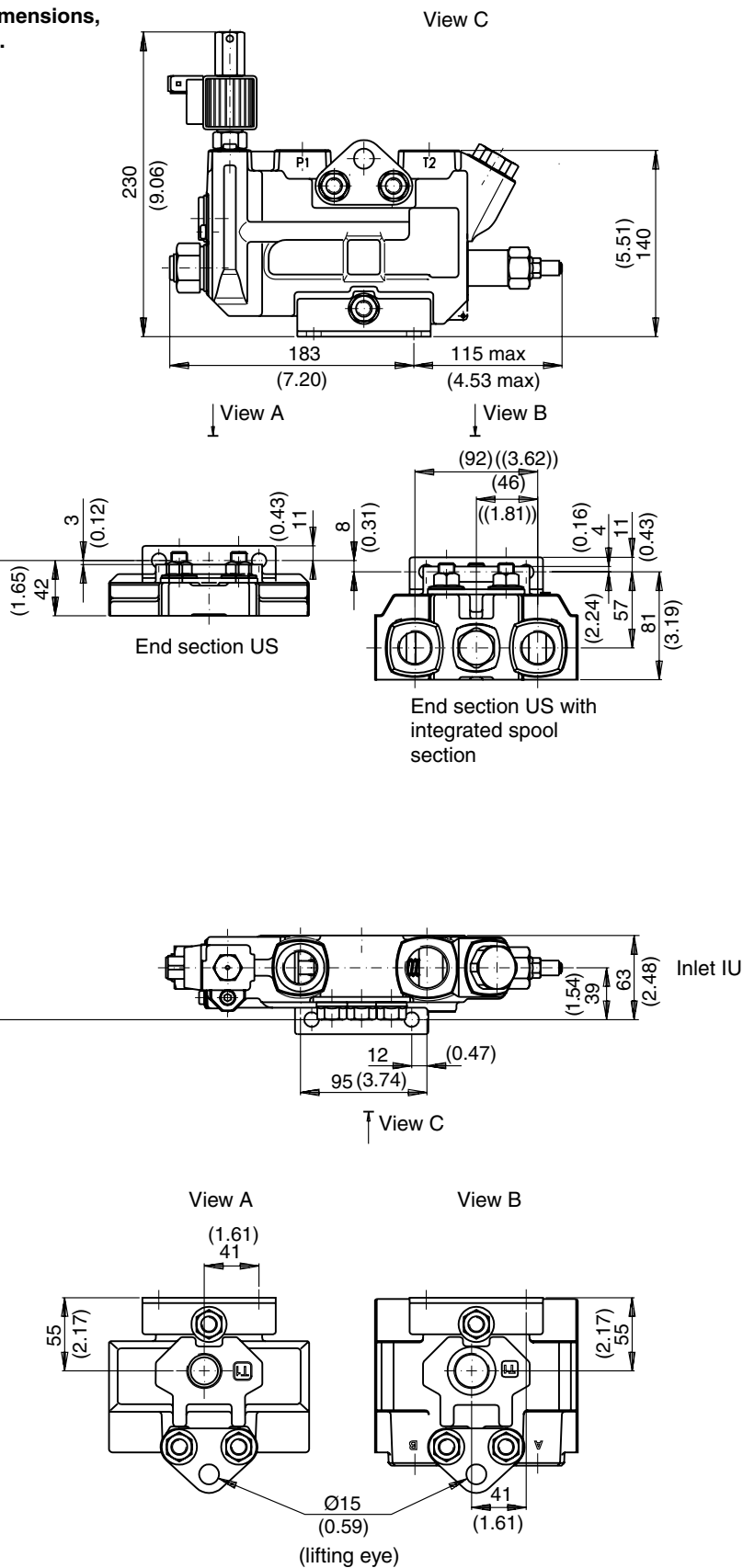
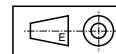
(inch)



**Inlet and end sections**

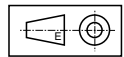
For connection dimensions,  
 please see page 8.

(inch)

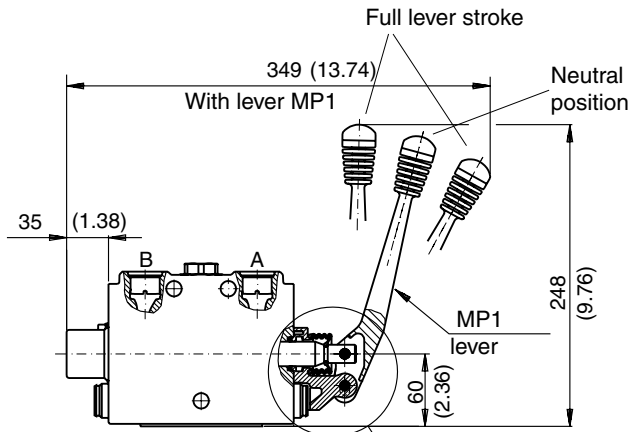


**Spool actuators**

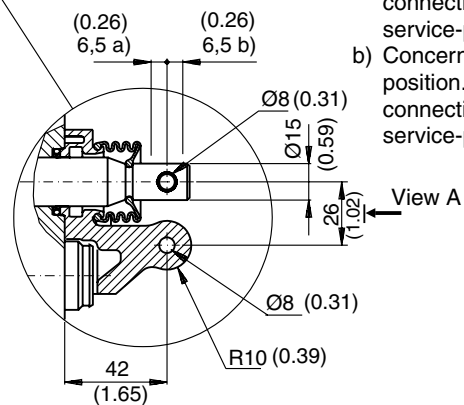
(inch)



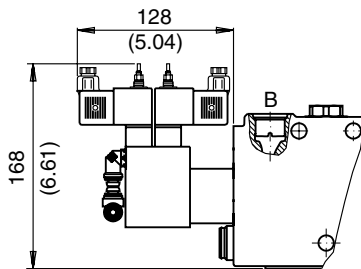
**C, B3**



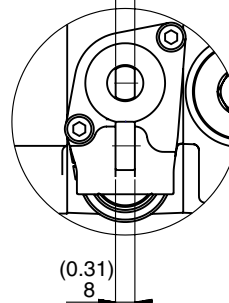
- a) Concerns spool position. Opens connection pump to service-port A.
- b) Concerns spool position. Opens connection pump to service-port B.



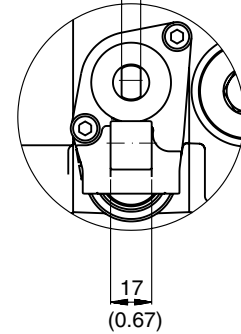
**ACE**



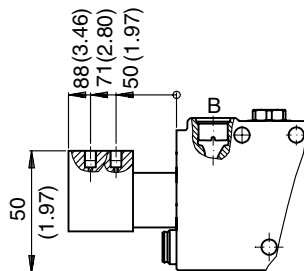
View A LM  
 8 (0.31)



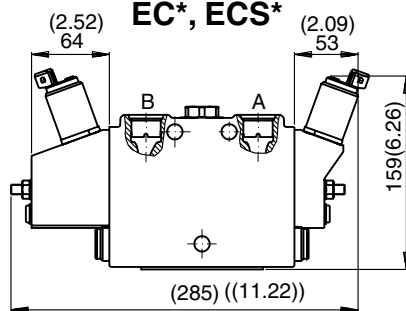
View A LJ  
 8 (0.31)



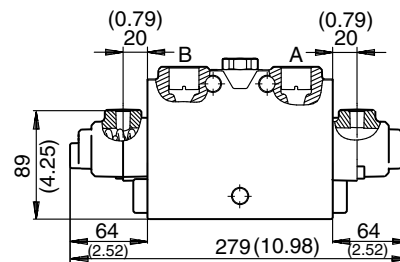
**ACP**



**EC\*, ECS\***



**PC30, PC40**





# Parker Worldwide

## Europe, Middle East, Africa

**AE – United Arab Emirates,**  
Dubai

Tel: +971 4 8127100  
parker.me@parker.com

**AT – Austria,** Wiener Neustadt

Tel: +43 (0)2622 23501-0  
parker.austria@parker.com

**AT – Eastern Europe,** Wiener  
Neustadt

Tel: +43 (0)2622 23501 900  
parker.easteurope@parker.com

**AZ – Azerbaijan,** Baku

Tel: +994 50 2233 458  
parker.azerbaijan@parker.com

**BE/LU – Belgium,** Nivelles

Tel: +32 (0)67 280 900  
parker.belgium@parker.com

**BY – Belarus,** Minsk

Tel: +375 17 209 9399  
parker.belarus@parker.com

**CH – Switzerland,** Etoy

Tel: +41 (0)21 821 87 00  
parker.switzerland@parker.com

**CZ – Czech Republic,** Klecany

Tel: +420 284 083 111  
parker.czechrepublic@parker.com

**DE – Germany,** Kaarst

Tel: +49 (0)2131 4016 0  
parker.germany@parker.com

**DK – Denmark,** Ballerup

Tel: +45 43 56 04 00  
parker.denmark@parker.com

**ES – Spain,** Madrid

Tel: +34 902 330 001  
parker.spain@parker.com

**FI – Finland,** Vantaa

Tel: +358 (0)20 753 2500  
parker.finland@parker.com

**FR – France,** Contamine s/Arve

Tel: +33 (0)4 50 25 80 25  
parker.france@parker.com

**GR – Greece,** Athens

Tel: +30 210 933 6450  
parker.greece@parker.com

**HU – Hungary,** Budapest

Tel: +36 1 220 4155  
parker.hungary@parker.com

**IE – Ireland,** Dublin

Tel: +353 (0)1 466 6370  
parker.ireland@parker.com

**IT – Italy,** Corsico (MI)

Tel: +39 02 45 19 21  
parker.italy@parker.com

**KZ – Kazakhstan,** Almaty

Tel: +7 7272 505 800  
parker.easteurope@parker.com

**NL – The Netherlands,** Oldenzaal

Tel: +31 (0)541 585 000  
parker.nl@parker.com

**NO – Norway,** Asker

Tel: +47 66 75 34 00  
parker.norway@parker.com

**PL – Poland,** Warsaw

Tel: +48 (0)22 573 24 00  
parker.poland@parker.com

**PT – Portugal,** Leca da Palmeira

Tel: +351 22 999 7360  
parker.portugal@parker.com

**RO – Romania,** Bucharest

Tel: +40 21 252 1382  
parker.romania@parker.com

**RU – Russia,** Moscow

Tel: +7 495 645-2156  
parker.russia@parker.com

**SE – Sweden,** Spånga

Tel: +46 (0)8 59 79 50 00  
parker.sweden@parker.com

**SK – Slovakia,** Banská Bystrica

Tel: +421 484 162 252  
parker.slovakia@parker.com

**SL – Slovenia,** Novo Mesto

Tel: +386 7 337 6650  
parker.slovenia@parker.com

**TR – Turkey,** Istanbul

Tel: +90 216 4997081  
parker.turkey@parker.com

**UA – Ukraine,** Kiev

Tel: +380 44 494 2731  
parker.ukraine@parker.com

**UK – United Kingdom,** Warwick

Tel: +44 (0)1926 317 878  
parker.uk@parker.com

**ZA – South Africa,** Kempton Park

Tel: +27 (0)11 961 0700  
parker.southafrica@parker.com

## North America

**CA – Canada,** Milton, Ontario

Tel: +1 905 693 3000

**US – USA,** Cleveland

(industrial)  
Tel: +1 216 896 3000

**US – USA,** Elk Grove Village

(mobile)  
Tel: +1 847 258 6200

## Asia Pacific

**AU – Australia,** Castle Hill

Tel: +61 (0)2-9634 7777

**CN – China,** Shanghai

Tel: +86 21 2899 5000

**HK – Hong Kong**

Tel: +852 2428 8008

**IN – India,** Mumbai

Tel: +91 22 6513 7081-85

**JP – Japan,** Fujisawa

Tel: +81 (0)4 6635 3050

**KR – South Korea,** Seoul

Tel: +82 2 559 0400

**MY – Malaysia,** Shah Alam

Tel: +60 3 7849 0800

**NZ – New Zealand,** Mt Wellington

Tel: +64 9 574 1744

**SG – Singapore**

Tel: +65 6887 6300

**TH – Thailand,** Bangkok

Tel: +662 717 8140

**TW – Taiwan,** Taipei

Tel: +886 2 2298 8987

## South America

**AR – Argentina,** Buenos Aires

Tel: +54 3327 44 4129

**BR – Brazil,** Cachoeirinha RS

Tel: +55 51 3470 9144

**CL – Chile,** Santiago

Tel: +56 2 623 1216

**MX – Mexico,** Apodaca

Tel: +52 81 8156 6000

Ed. 2011-07-07

### EMEA Product Information Centre

Free phone: 00 800 27 27 5374

(from AT, BE, CH, CZ, DE, DK, EE, ES, FI, FR, IE, IL,  
IS, IT, LU, MT, NL, NO, PL, PT, RU, SE, SK, UK, ZA)

### US Product Information Centre

Toll-free number: 1-800-27 27 537

www.parker.com

