Technical Information
Priority valve LPS

Contents

Chapter 1

Priority valve LPS

Topics:

Features

- The LPS priority valve is used in conjunction with steering units using load sensing.
- The priority valves guarantee the priority supply of steering circuits – before all other implement hydraulics – with pressure fluid as defined in legal regulations or standards.
- The steering circuit is supplied with priority independently of pressure. Pressure fluid that is not required for steering is returned to tank or is made available to other implement hydraulics. For supplying the steering system and other implement hydraulics, e. g. working hydraulics, only one pump is required.
- With the aid of priority valves it is possible, in conjunction with variable displacement pumps, to create energy saving hydraulic systems.
- In conjunction with other valves priority valves can also be used as sequencing valve, flow divider or pressure relief valve.

Ordering details

Part number	**Description**				**Code**
LP	Priority valve				
S	**Design** Standard				= S
	Nominal size[1]				
		l/min	**A**[2]	**P**[2]	**R**[2]
		40	●	●	●
		80	●	●	●
		120			●
		160			●
	Connection type				
		Flangeable on to the steering unit			= A
		Pump mounting			= P
		In-line mounting			= R
1x (/)	**Component series**				
		10 to 19			= 1x
		(10 to 19: unchanged installation and connection dimensions)			
	Load Sensing				
		Dynamic load signal			= LD

[1] Nominal size - max. flow into the P-port
[2] Mounting and connecting type

Part number	Description				Code
	Control pressure differential				
		bar	**A**[2]	**P**[2]	**R**[2]
		4	●	◑	◑
		7	●	●	●
		10			●
		15			◑
(-)	**PP damping orifice**[3]				
		0.8 mm			4 = ●
		1.0 mm			6 = ●
	LD dynamic orifice[3]				
		0.8 mm			4 = ◑
		1.0 mm			6 = ●
	LD damping orifice[3, 4] 1.5 mm				3 = ●
	Pipe connections P, T, L, R/LD				
		Pipe thread			● = 01
		Metric DIN thread			◑ = 02
		SAE thread			◑ = 12
*	*Special specifications. Please clarify with our sales organization.*				

Function, section

- The type LPS priority valves are used in conjunction with steering systems of closed centre - load sensing design. They distribute the pump flow between the steering and implement hydraulics, whereby the steering supply has priority (see the sectional view in its initial position).
- In conjunction with variable displacement pumps it is possible to create energy-saving hydraulic systems.
- The priority valve works in the same way as a 3-way flow control valve. The controlled flow (CF) is made available to the steering and the remaining flow (EF) is passed to the implement hydraulics.
- The metering orifice A2 and A4 in this system are not in the flow control valve, but in the steering unit. A2 is closed in the neutral position of the steering (no steering action) and is opened depending on the required flow. The load signal is sensed behind A2 (metering-in orifice).
- In the neutral position of the steering system the load signal line is connected to tank, i. e. A4 is open.
- As with a 3-way flow control valve the priority valve – by controlling the flow at the control orifice A1 – controls the pressure differential at the metering-in orifice A2 and thereby achieves a balance between the forces acting on the control spool. The required pressure-independent supply to the steering is thereby guaranteed (see the principle shown in the control position).

[3] When testing the machine, the system can be optimized by changing the orifices.
[4] Please take note! The LD damping orifice has to be larger than the LD dynamic orifice.

- The type LPS priority valve works independently of the steering pressure and of the implement hydraulics pressure. This is achieved via a second control orifice A3. It moves into its working position when the pressure in the implement hydraulics is higher than the steering pressure.

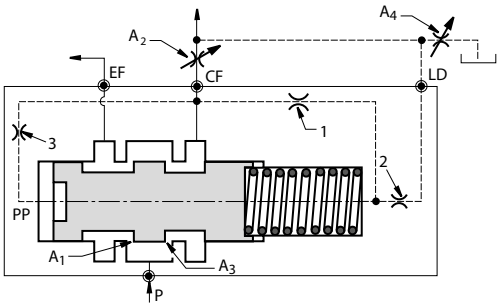
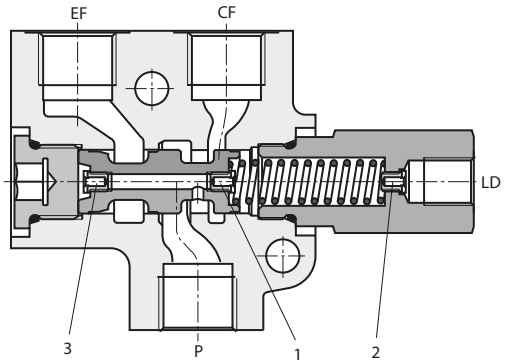


Figure 1: Control position



P	Pump
CF	Steering (control flow)
EF	Work hydraulics (excess flow)
A1	Control orifice
A2	Metering orifice (in steering unit)
A3	Control orifice
A4	Tank unloading
1	LD dynamic orifice
2	LD damping orifice
3	PP damping orifice

Figure 2: Initial position

Versions, symbols

Standard version
flangeable

The LPS..A.. priority valve is directly flanged onto the steering unit. Both components result in a compact unit. No piping is required between the priority valve and the steering unit. This design is available with the nominal flows of 40 and 80 l / min. It is suitable for steering units up to 200 cm3/U. The pilot control pressure relief valve for limiting the steering pressure is contained within the steering unit.

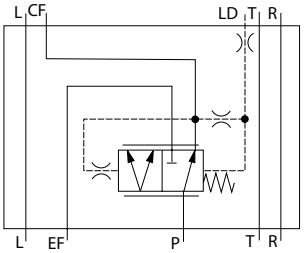


Figure 3: Symbol LPS .. A ..

Standard version

in-line mounting and pump mounting

The LPS..R.. priority valve is a version suitable for in-line mounting. These priority valves are available with the nominal flows of 40, 80, 120 and 160 l / min. When using the type LPS..R.. care has to be taken that the pressure relief valve, for the load signal line, is integrated into the steering unit. If a LPS..R.. is used in conjunction with a steering unit without a pressure relief valve, then the load signal lines have to be externally protected.

The LPS..P.. version is designed to be directly mounted onto a gear pump. 40 and 80 l / min version are available.

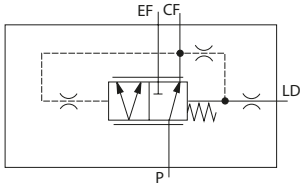


Figure 4: Symbol: LPS .. R ..; LPS .. P ..

Special version

with throttle check valve as PP damper[1]

The priority valve with an additional check valve for bypassing the PP dampening orifice in the direction of opening is provided only for use in conjunction with variable displacement pumps and was specifically developed for this purpose.

This special version provides fast closing of control orifice A1 and suppresses a pressure drop in CF for power-assisted steering in the case of a sudden pressure drop in work hydraulics EF.

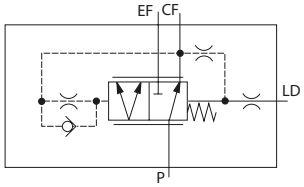


Figure 5: With throttle check valve as PP damper

Special version

with throttle check valve and CF max. pressure relief valve in PP

In addition to the special version with check valve in PP, with this version a pressure relief valve is integrated in PP. This pressure relief valve opens, when the pressure in the CF line is by approx. 30 bar higher than the pressure on the PP side.

Control orifice A1 opens abruptly, and any pressure peaks occurring in the P or CF line are reduced.

[1] Only available for LPS 160... in-line mounting

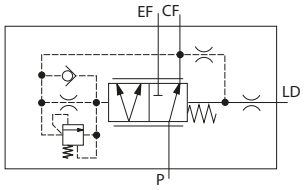


Figure 6: With throttle check valve and pressure relief valve in PP

Load signal dynamic

Via the LD dynamic orifice a continuous small flow is passed into the load signal lines from the CF pressure connection. It is therefore guaranteed that the load signal lines are always full. This leads to the priority valve having short reaction times. The dynamic orifice also takes over the unloading the CF connection when the steering does not accept any oil flow and the implement hydraulics are being operated with high pressure.

Key to schematics abbreviations

P	Pump
CF	Steering
EF	Implement hydraulics
T	Tank
LD	Load signal (dynamic)
R; L	Cylinder

Technical data

Table 1: General

Ambient temperature range	ϑ	°C	-20 to +80

Table 2: Hydraulic

Max. pressure	Port P, EF	$P_{max.}$	bar	250
	Port CF, LD	$P_{max.}$	bar	210
Pressure fluid		See *Pressure fluid technical data* on page 11		
Pressure fluid temperature range		ϑ	°C	-20 to +80
Viscosity range		ν	mm^2/s	10 to 800
Maximum permissible degree of contamination of the pressure fluid is ISO 4406 (c)				class 19 / 16 / 13[1]

[1] The cleanliness classes specified for components must be adhered to in hydraulic systems. Effective filtration prevents malfunction and, at the same time, prolongs the service life of components.

Pressure fluid technical data

Pressure fluids

Before carrying out any engineering please refer to the extensive information regarding pressure fluid selection and application conditions in standards or manufacturer instructions. For pressure fluids that require FKM or other seals please contact your sales contact.

Operating viscosity

We recommend that the operating viscosity (at operating temperature) for efficiency and service life, is selected within the optimum range of

v_{opt} = optimum operating viscosity range 16 to 46 mm^2/s

with reference to the temperature.

Limiting viscosity

For the limiting conditions the following values apply:

- v_{min} = 10 mm^2/s at a max. permissible temperature of ϑ_{max} = + 80 °C
- v_{max} = 800 mm^2/s

Temperature range (see selection diagram)

- ϑ_{min} = – 20 °C
- ϑ_{max} = + 80 °C

If there is the possibility of there being a temperature difference of more than 20 °C between the steering unit and the pressure fluid, then either a LD or LDA version or an open center version for warming the steering unit should be fitted.

Further on the selection of pressure fluids

A prerequisite to being able to select the correct pressure fluid is knowing the operating temperature and the ambient temperature. The pressure fluid should be so selected that the operating viscosity at the working temperature lies within the optimum range (see selection diagram). We recommend that the next higher viscosity class is selected.

Example:

For an ambient temperature of X °C the tank temperature stabilises at 60 °C. To achieve the optimum viscosity, this relates to the viscosity classes of VG 46 or VG 68; → VG 68 should be selected.

Pressure fluid filtration

The finer the filtration the higher the cleanliness class of the pressure fluid is achieved and so the higher the service life of the entire hydraulic system.

Note: To ensure the functionability of the steering pump a minimum pressure fluid cleanliness class of 19 / 16 / 13 to ISO 4406 is necessary (see *Technical data*).

Caution: Operating the unit with contaminated hydraulic fluid may lead to the steering system failing.

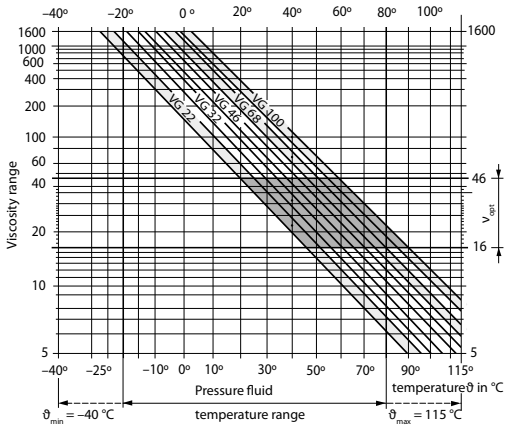
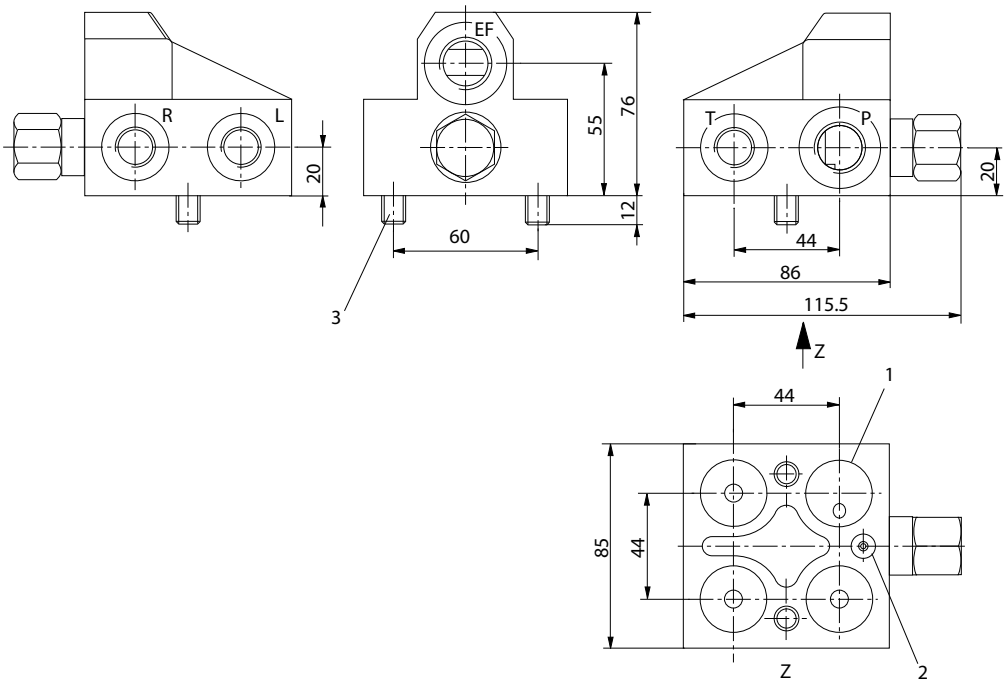


Figure 7: Selection diagram

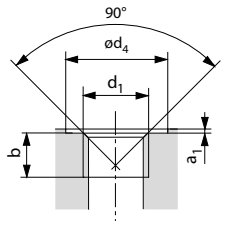
Unit dimensions: Type LPS / A; NG40 and 80



P	Pump
T	Tank
EF	Implement hydraulics
R; L	Cylinder
1	4 x O-ring 24x2[1]
2	O-ring 6x2[1]
3	valve fixation screws M10x40[1] DIN 912-10.9; MA = 60^{+5}Nm

Figure 8: (dimensions in mm)

[1] Included in the scope of supply



01 DIN 3852-2 Form X

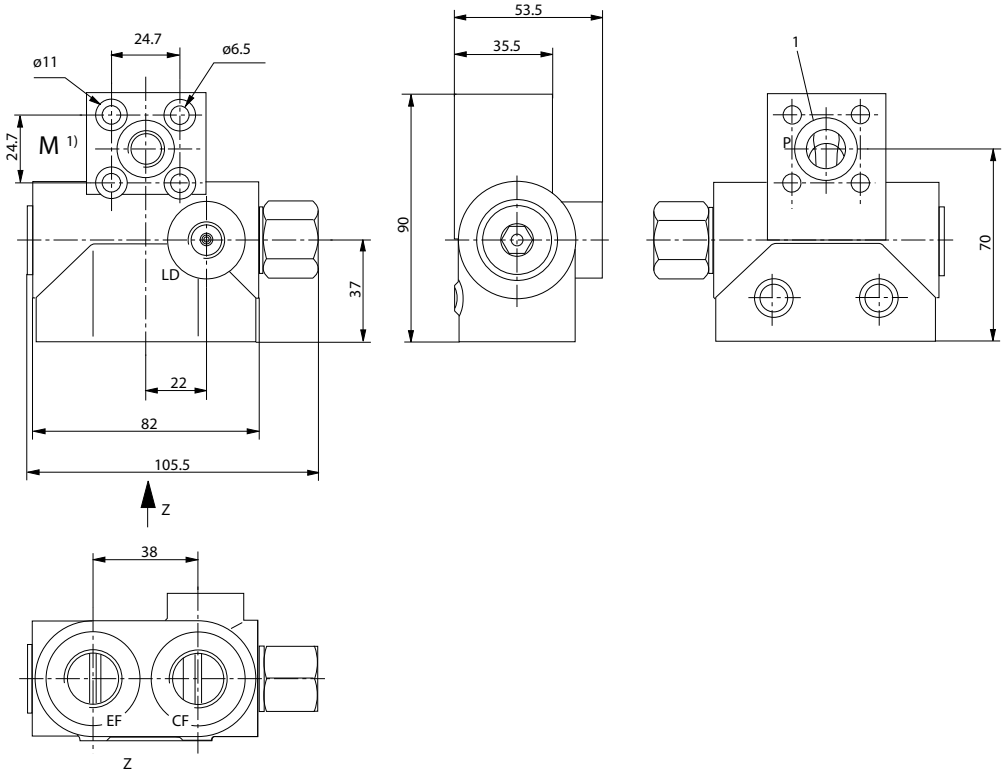
02 DIN 3852-1 Form X

Figure 9: Thread version 01 and 02 (inch, metric)

Table 3: Thread type

Size	Port	Version	d_1	$ød4^{+0.4}$	$b_{min.}$	$a_1^{\pm 0.5}$
40, 80	P, EF	01	G 1/2	34	14	1
		02	M22 x 1.5	28	16	1
	T, L, R	01	G 3/8	28	12	1
		02	M18 x 1.5	24	12	1

Unit dimensions: Type LPS / P; NG40 and 80



P Pump

CF Steering

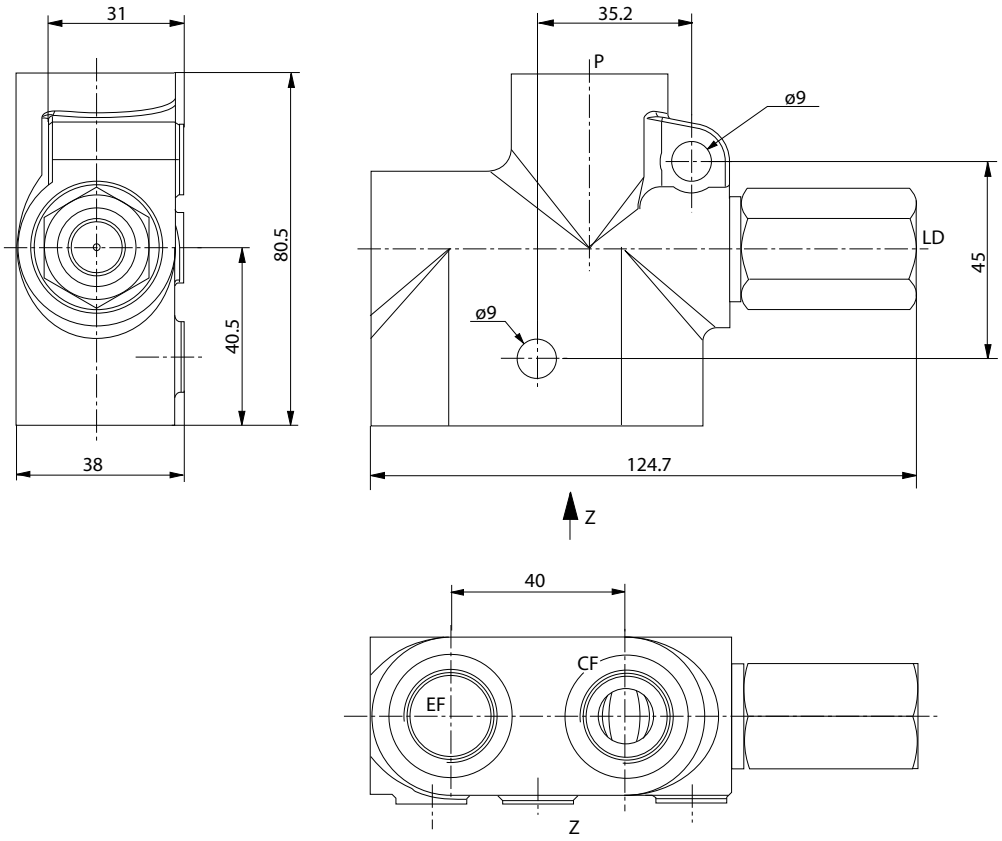
EF	Work hydraulics
LD	Load signal
1	O-ring 20x2, 5[2]

Figure 10: Dimensions in mm

Table 4: Thread version

Size	Port	Version	d_1	$\varnothing d4^{+.04}$	$b_{min.}$	$a_1^{\pm 0.5}$
40, 80	P, EF	01	G 1/2	34	14	1
	LD	01	G 1/4	-	12	-

Unit dimensions: Type LPS / R; NG40, 80, and 120



P	Pump
CF	Steering
EF	Work hydraulics
LD	Load signal

Figure 11: Dimensions in mm

[2] Included in the scope of the supply

Ports: type LPS R; NG40, 80, and 120

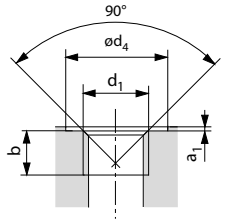


Figure 12: Imperial, metric thread

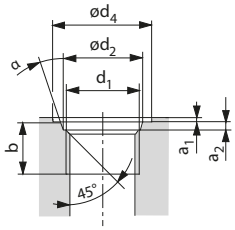
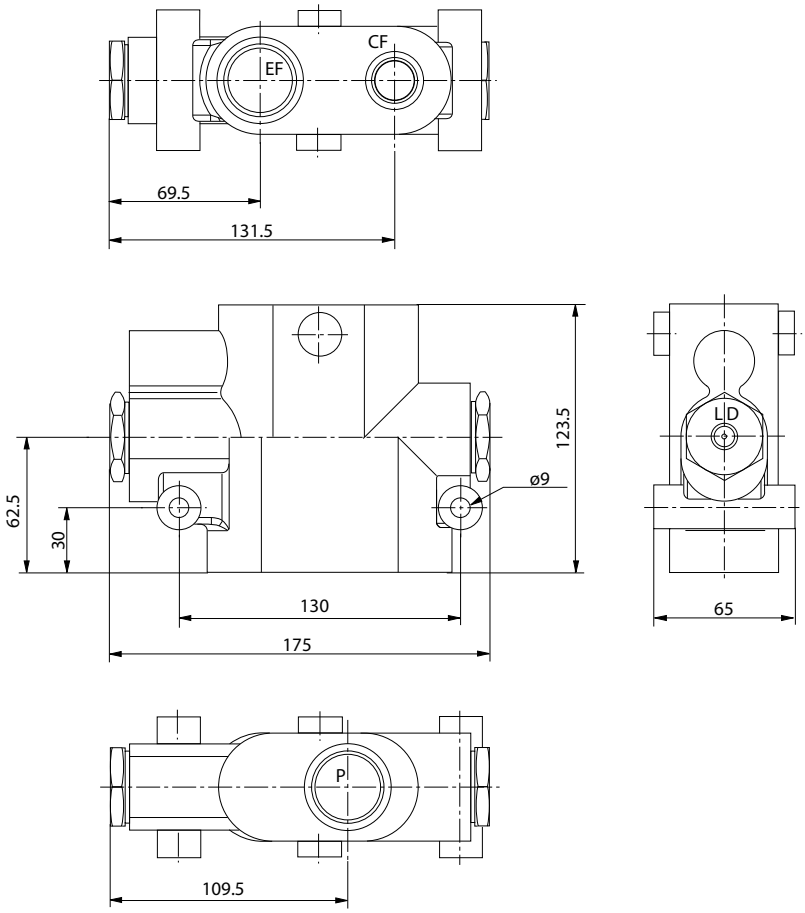


Figure 13: UNF, metric thread

Size	Port	Version	d_1	$Ød_2^{+0.13}$	$Ød_4^{+0.4}$	$b_{min.}$	a_1	$a_2^{\pm 0.4}$	$\alpha^{\pm 0.5}$
40, 80	P, EF	01	G 1/2	-	27	14	0.3	-	-
		02	M22 x 1.5	-	28	14		-	-
		12	7/8-14 UNF	23.9	34	17.5		2.5	15°
	CF	01	G 1/2	-	27	14	0.3	-	-
		02	M22 x 1.5	-	28	14		-	-
		12	3/4-16 UNF	20.6	30	15		2.5	15°
	LD	01	G 1/4	-	-	12	-	-	-
		02	M12 x 1.5	-	-	12		-	-
		12	7/16-20 UNF	12.5	-	13.5		2.4	12°

Size	Port	Version	d_1	$Ød_2^{+0.13}$	$Ød_4^{+0.4}$	$b_{min.}$	a_1	$a_2^{\pm 0.4}$	$\alpha^{\pm 0.5}$
120	P, EF	01	G 3/4	-	33	16	0.3	-	-
		02	M27 x 2	-	33	16		-	-
		12	11/16-12 UNF	29.2	33	19		3.3	15°
	CF	01	G 1/2	-	27	14	0.3	-	-
		02	M18 x 1.5	-	24	12		-	-
		12	3/4-16 UNF	20.6	30	15		2.5	15°
	LD	01	G 1/4	-	-	12	-	-	-
		02	M12 x 1.5	-	-	12		-	-
		12	7/16-20 UNF	12.4	-	13.5		2.4	12°

Unit dimensions: Type LPS / R; NG160



P Pump

CF	Steering
EF	WOrk hydraulics
LD	Load signal

Figure 14: Dimensions in mm

Ports: type LPS / R; NG160

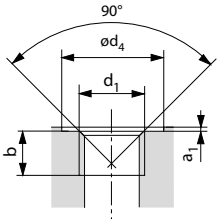


Figure 15: Thread version 01 and 02 (Inch, metric)

Size	Port	Version	d_1	$Ød4^{+0.4}$	b_{min}	$a_1^{\pm 0.5}$
160	P, EF	01	G1	40	18	1
		02	M33 x 2	41	20	1
	CF	01	G 1/2	27	14	1
		02	M22 x 1.5	28	16	1
	LD	01	G 1/4	-	12	-
		02	M12 x 1.5	-	12	-