



# STEERING

**Technical Information**

*LPS Priority Valve*

White is a leading global provider of motor and steering solutions that power the evolution of mobile and industrial applications around the world.



# Contents:

<b>Chapter 1 Introduction .....</b>	<b>4</b>
Features .....	5
Ordering details .....	5
Function, section .....	6
Versions, symbols .....	8
<i>Standard version- Flangeable .....</i>	<i>8</i>
<i>Standard version-line mounting and pump mounting .....</i>	<i>8</i>
<i>Special version- with throttle check valve as PP damper<sup>1</sup> .....</i>	<i>9</i>
<i>Special version- with throttle check valve and CF max. pressure relief valve in PP .....</i>	<i>9</i>
<i>Load signal dynamic .....</i>	<i>10</i>
<i>Key to schematics abbreviations .....</i>	<i>10</i>
Technical data .....	10
Pressure fluid technical data .....	10
<i>Pressure fluids .....</i>	<i>10</i>
<i>Operating viscosity .....</i>	<i>10</i>
<i>Limiting viscosity .....</i>	<i>11</i>
<i>Temperature range (see selection diagram) .....</i>	<i>11</i>
<i>Further on the selection of pressure fluids .....</i>	<i>11</i>
<i>Pressure fluid filtration .....</i>	<i>11</i>
Unit dimensions: Type LPS / A; NG40 and 80 .....	12
Unit dimensions: Type LPS / P; NG40 and 80 .....	14
Unit dimensions: Type LPS / R; NG40, 80, and 120 .....	15
Unit dimensions: Type LPS / R; NG160 .....	17
<b>Figures .....</b>	<b>19</b>
<b>Tables .....</b>	<b>19</b>

# Chapter 1

## Introduction

---

### Topics:

- *Features*
- *Ordering details*
- *Function, section*
- *Version, symbols*
- *Technical data*
- *Pressure fluid technical data*
- *Unit dimensions: type LPS/ A; NG40 and 80*
- *Unit dimensions: type LPS/ P; NG40 and 80*
- *Unit dimensions: type LPS/ R; NG40, 80 and 120*
- *Unit dimensions: Type LPS/ R; NG160*

## 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

Description					Code
Priority valve					LP
Design Standard					=S
Nominal size <sup>1</sup>					
	l/min	A <sup>2</sup>	p <sup>2</sup>	R <sup>2</sup>	
	40	●	●	●	= 40
	80	●	●	●	= 80
	120			●	= 120
	160			●	= 160
Connection type					
	Flangeable on to the steering unit				= A
	Pump mounting				= P
	In-line mounting				= R
Component series					
	10 to 19				=1x
	(10 to 19: unchanged installation and connection dimensions)				
Load sensing					( /)
	Dynamic load signal				=LD
Control pressure differential					
	bar	A <sup>2</sup>	p <sup>2</sup>	R <sup>2</sup>	
	4	●	⊙	⊙	= 4
	7	●	●	●	= 7
	10			●	= 10
	15			⊙	= 15
PP damping orifice <sup>3</sup>					(-)
	0.8 mm				= 4 ●
	1.0 mm				= 6 ●

Table 1 Model code details

Description		Code	
<b>LD dynamic orifice<sup>3</sup></b>			
	0.8 mm	= 4	⓪
	1.0 mm	= 6	●
<b>LD damping orifice<sup>3, 4</sup></b>			
	1.5 mm	= 3	●
<b>Pipe connections P, T, L, R/LD</b>		( / )	
	Pipe tread	= 01	●
	Metric DIN thread	= 02	⓪
	SAE thread	= 12	⓪
Special specifications. Please clarify with our sales organization		*	

Table 1 Model code details

- = Standard option
- ⓪ = Extended option

### Note

<sup>1</sup> Nominal size- max. flow into P-port

<sup>2</sup> Mounting and connection type

<sup>3</sup> When testing the machine, the system can be optimized by changing the orifices.

<sup>4</sup> Please take note! The LD damping orifice has to be larger than the LD dynamic orifice.

## Function, section

- The type LPS priority valves are used in conjunction with steering systems of closed center - 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 the 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).
- 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.

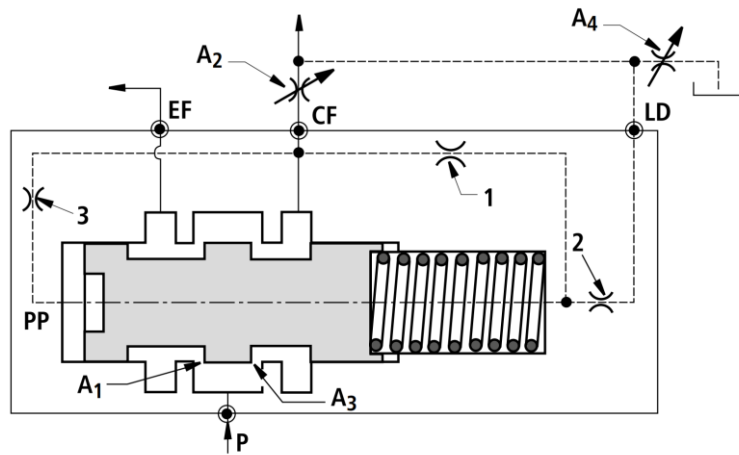


Figure 1 Control piston

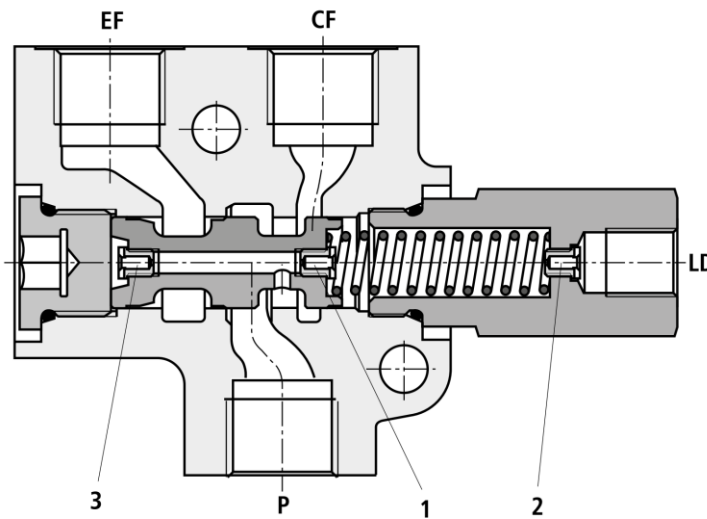


Figure 2 Section LPS – initial position

- 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

## 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 cm<sup>3</sup>/U. The pilot control pressure relief valve for limiting the steering pressure is contained within the steering unit.

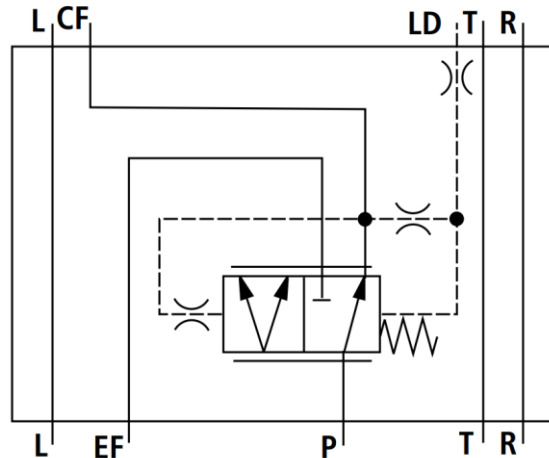


Figure 3 Symbol LPS..A..

### Standard version-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 versions are available.

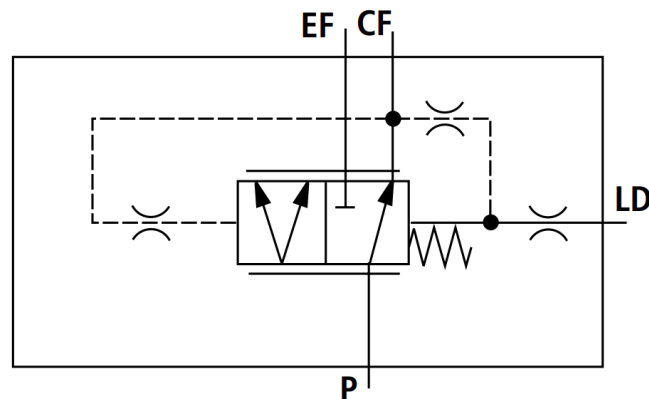


Figure 4 Symbol LPS..R..; LPS..P..



### Special version- with throttle check valve as PP damper<sup>1</sup>

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.

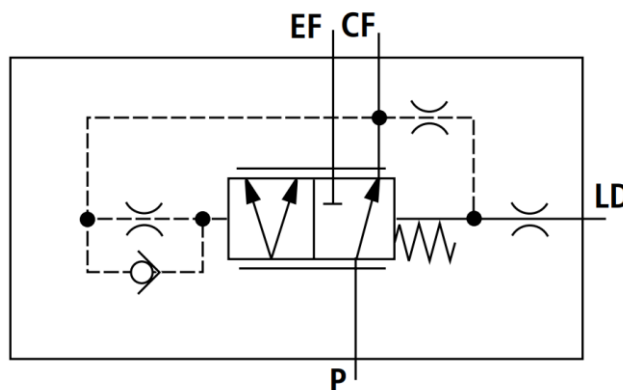


Figure 5 LPS with throttle check valve as PP damper

### 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.

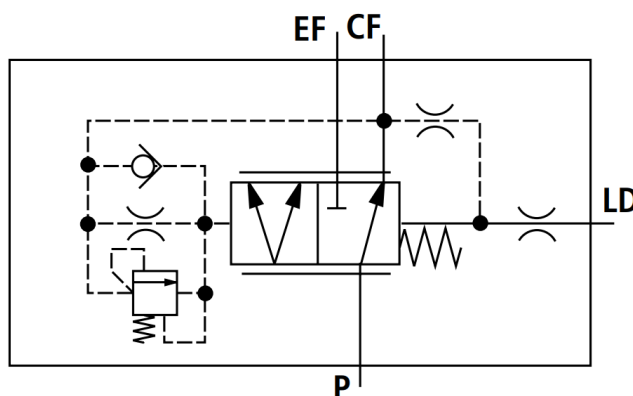


Figure 6 LPS with throttle check valve

#### Note

<sup>1</sup>Only available for LPS 160... in-line mounting

## 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** Work hydraulics
- T** Tank
- LD** Load signal (dynamic)
- R; L** Cylinder

## Technical data

Ambient temperature range		$\vartheta$	°C	-20 to +80
Max. pressure	Port P, EF	$P_{max.}$	bar	250
	Port CF, LD	$P_{max.}$	bar	210
Pressure fluid		<i>See Pressure fluid technical data</i>		
Pressure fluid temperature range		$\vartheta$	°C	-20 to +80
Viscosity range		$\nu$	mm <sup>2</sup> /s	10 to 800
Maximum permissible degree of contamination of the pressure fluid is ISO 4406 (c)				class 19 / 16 / 13 <sup>1</sup>

Table 2 Technical data

### Note

<sup>1</sup>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 16 to 46 mm<sup>2</sup>/s. With reference to the temperature.

## Limiting viscosity

For the limiting conditions the following values apply:

$v_{\min} = 10 \text{ mm}^2/\text{s}$  at a max. permissible temperature of  $\vartheta_{\max} = + 80 \text{ }^\circ\text{C}$

$v_{\max} = 800 \text{ mm}^2/\text{s}$

## Temperature range (see selection diagram)

$\vartheta_{\min} = - 20 \text{ }^\circ\text{C}$

$\vartheta_{\max} = + 80 \text{ }^\circ\text{C}$

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 stabilizes 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 functionality of the steering pump a minimum pressure fluid cleanliness class of 19 / 16/ 13 to ISO 4406 is necessary.*



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

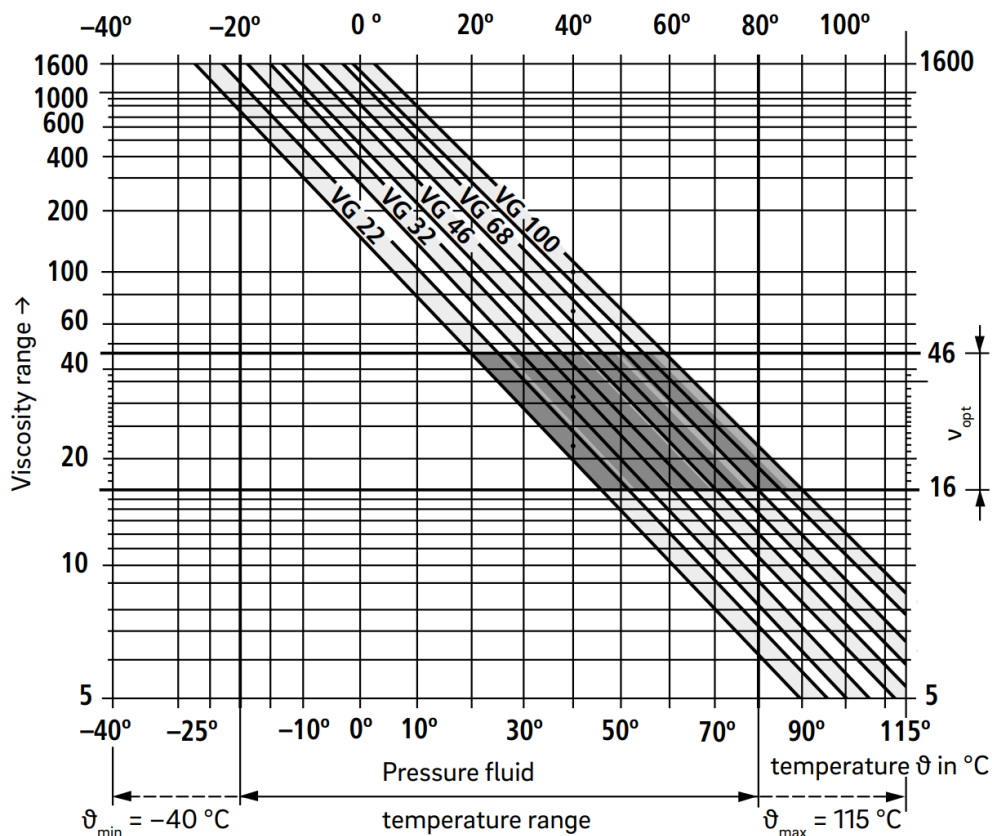


Figure 7 Selection diagram

### Unit dimensions: Type LPS / A; NG40 and 80

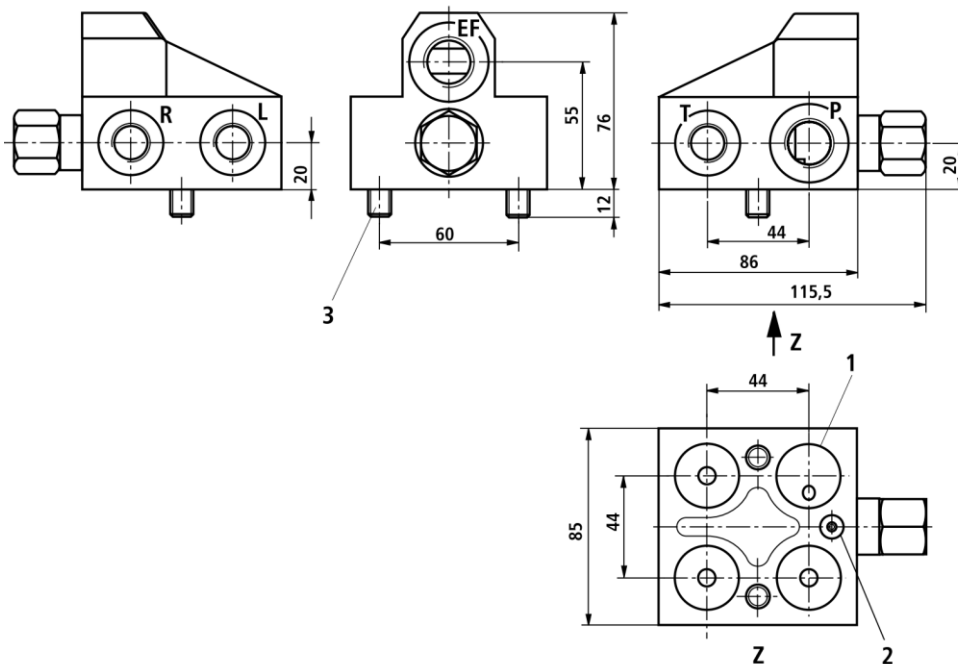


Figure 8 Unit dimensions in mm

WHITE can accept no responsibility for possible errors in catalogues, brochures, and other printed material. WHITE reserves the right to alter its products without notice. This also applies to products already on order provided that such alterations can be made without subsequent changes being necessary in specifications already agreed.

All trademarks in this material are the property of the respective companies. WHITE and the WHITE logotype are trademarks of WHITE Drive Motors & Steering LLC and WHITE Drive Motors and Steering Sp. z o.o..

All rights reserved.

- P** Pump
- T** Tank
- EF** Implement hydraulics
- R; L** Cylinder
- 1** 4 x O-ring 24x2<sup>1</sup>
- 2** O-ring 6x2<sup>1</sup>
- 3** valve fixation screws M10x40<sup>1</sup>  
DIN 912-10.9; MA = 60<sup>+5</sup>Nm

**Note:**

<sup>1</sup> Included in the scope of supply

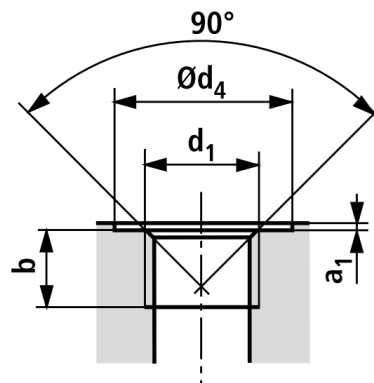


Figure 9 Thread version 01 and 02 (Inch, metric)

Size	Port	Version	d <sub>1</sub>	Ød <sub>4</sub> <sup>+0.4</sup>	b <sub>min.</sub>	a <sub>1</sub> ±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

Table 3 Thread type

## Unit dimensions: Type LPS / P; NG40 and 80

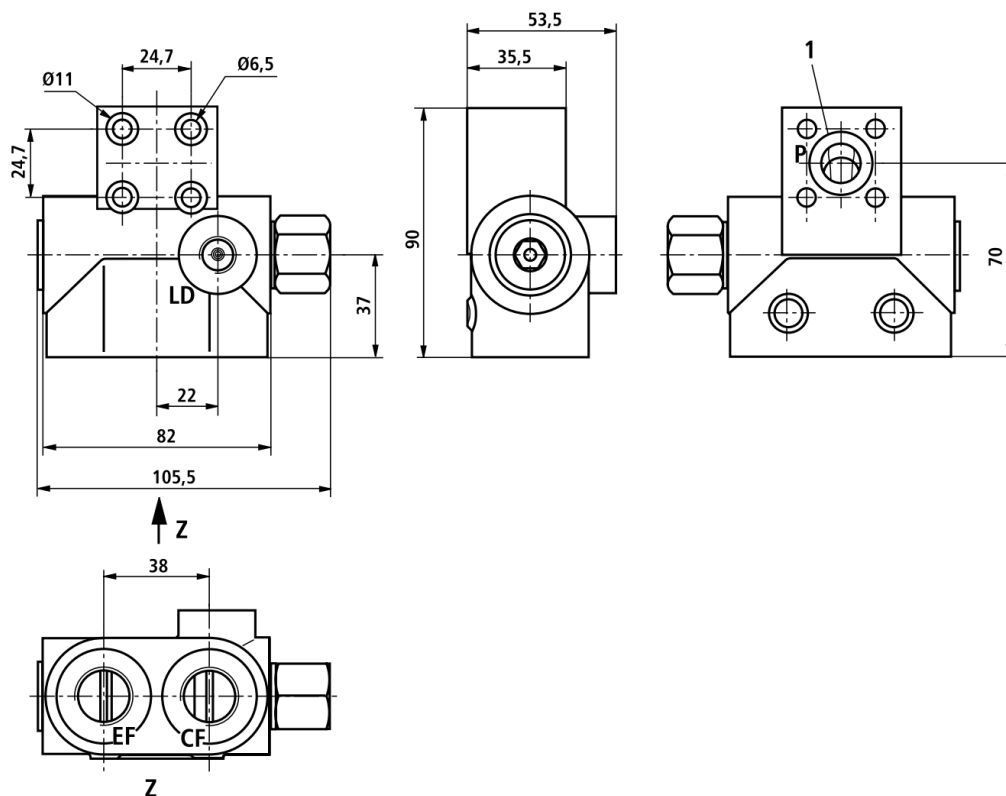


Figure 10 Unit dimensions in mm

- P** Pump
- CF** Steering
- EF** Work hydraulics
- LD** Load signal
- 1** O-ring 20x2x5<sup>2</sup>

**Note:**

<sup>2</sup>Included in the scope of supply

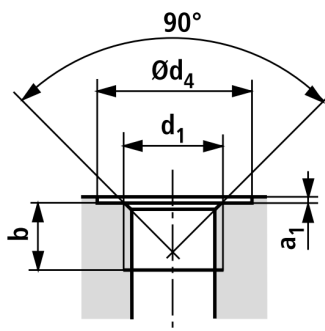


Figure 11 Thread version 01 (Inch)

Size	Port	Version	$d_1$	$\varnothing d_4^{+0.04}$	$b_{min.}$	$a_1 \pm 0.5$
40, 80	P, EF	01	G 1/2	34	14	1
	LD	01	G 1/4	-	12	-

Table 4 Thread type

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

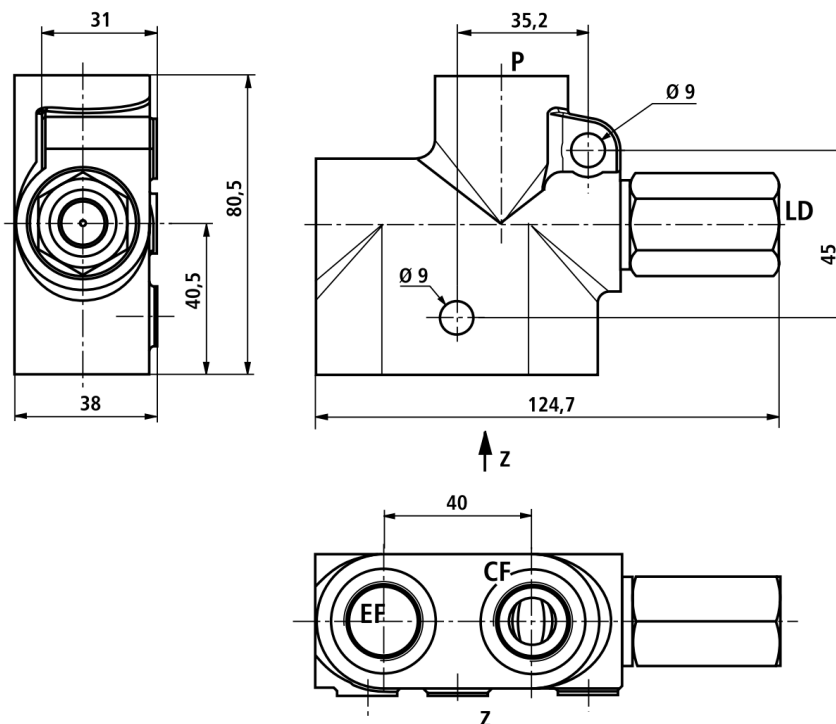


Figure 12 Unit dimensions in mm

- P** Pump
- CF** Steering
- EF** Work hydraulics
- LD** Load signal

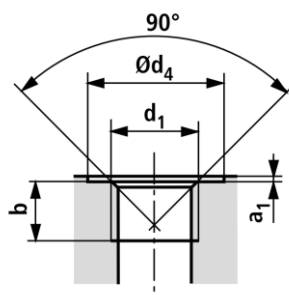


Figure 13 Thread version 01 and 02 (Inch, metric)

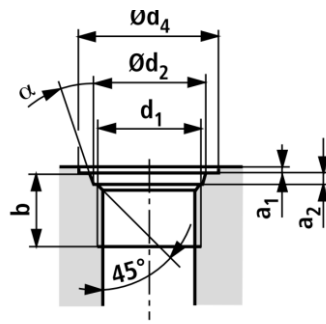


Figure 14 Thread version 12 (UNF)

Size	Port	Version	$d_1$	$\varnothing d_2^{+0.13}$	$\varnothing d_4^{+0.4}$	$b_{\min.}$	$a_1$	$a_2 \pm 0.4$	$\alpha \pm 0.5$	
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°
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°

Table 5 Thread type



## Unit dimensions: Type LPS / R; NG160

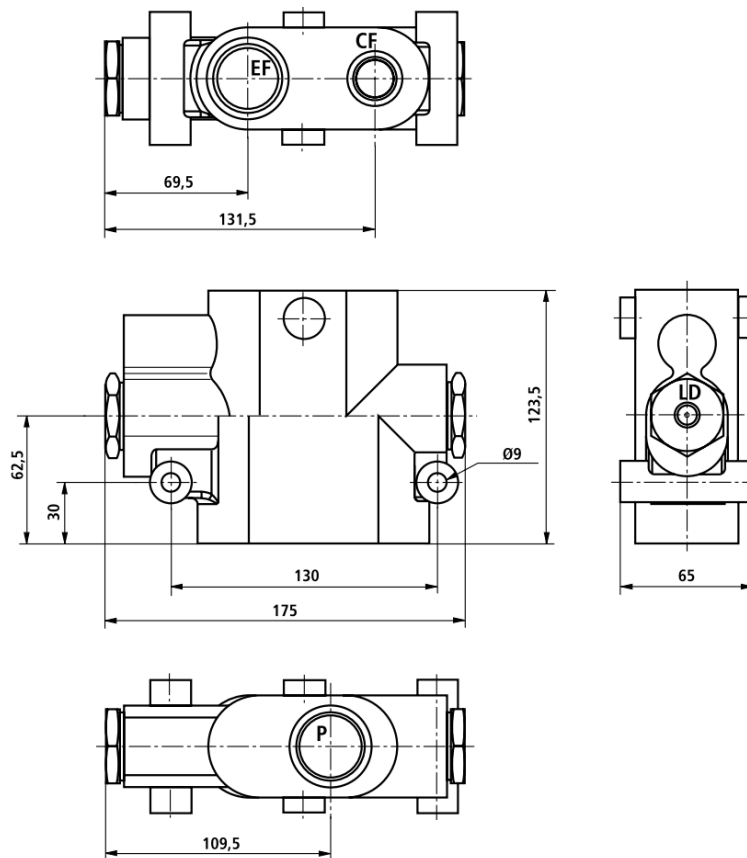


Figure 15 Unit dimensions in mm

- P** Pump
- CF** Steering
- EF** Work hydraulics
- LD** Load signal

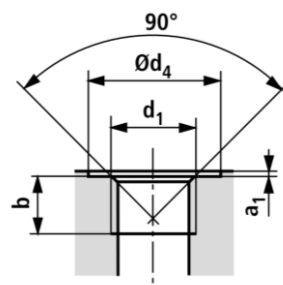


Figure 16 Thread version 01 and 02 (Inch, metric)

Size	Port	Version	d <sub>1</sub>	∅d <sub>4</sub> <sup>+0.4</sup>	b <sub>min</sub>	a <sub>1</sub> ±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	-

Table 6 Thread type

## Figures

---

Figure 1 Control piston .....	7
Figure 2 Section LPS – initial position .....	7
Figure 3 Symbol LPS..A. ....	8
Figure 4 Symbol LPS..R.; LPS..P. ....	8
Figure 5 LPS with throttle check valve as PP damper .....	9
Figure 6 LPS with throttle check valve .....	9
Figure 7 Selection diagram .....	12
Figure 8 Unit dimensions in mm.....	12
Figure 9 Thread version 01 and 02 (Inch, metric).....	13
Figure 10 Unit dimensions in mm.....	14
Figure 11 Thread version 01 (Inch).....	14
Figure 12 Unit dimensions in mm.....	15
Figure 13 Thread version 01 and 02 (Inch, metric).....	15
Figure 14 Thread version 12 (UNF).....	16
Figure 15 Unit dimensions in mm.....	17
Figure 16 Thread version 01 and 02 (Inch, metric).....	17

## Tables

---

Table 1 Model code details.....	5
Table 2 Technical data.....	10
Table 3 Thread type .....	13
Table 4 Thread type .....	15
Table 5 Thread type .....	16
Table 6 Thread type .....	18



White Drive Motors & Steering, LLC  
110 Bill Bryan Blvd, Hopkinsville, Kentucky, 42240

White Drive Motors and Steering sp. z o.o.  
ul. Logistyczna 1, Bielany Wrocławskie, 55-040 Kobierzyce

[whitedriveproducts.com](http://whitedriveproducts.com)