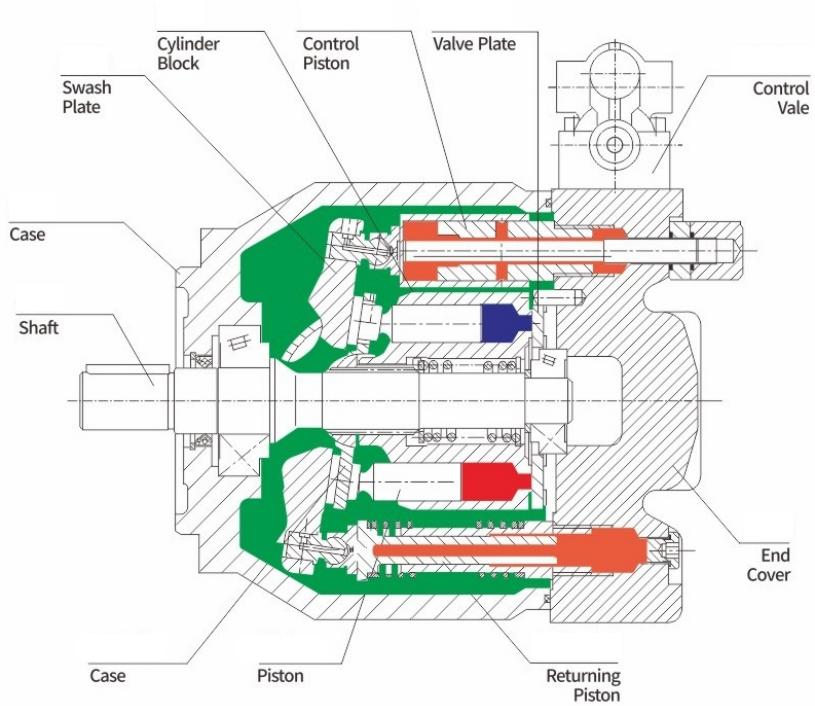
Variable Displacement Piston PumP OS –A10V(S)O/31

Overview

OS –A10V(S)O/31 series variable displacement piston pump swash plate axial plunger variable pump,respectively for industrial use and for mobile machinery design, is designed for open loop hydraulic driven design, adopts a shaft structure, rated working pressure up to 28Mpa.





Features

※The capacity of the pump is in proportion to its rotating speed anddisplacement;the stepless adjustment of the displacement can be materialized by regulating the swivel angle of its swash plate.

※There are many variable control forms, Fast control response;

※Allows for continuous operating pressures up to 28MPa;

※There are two shell discharge ports;

※High power/weight ratio;

※The drive shaft is able to bear the axial and radial load;

※With through–shaft structure,able to form combination pump;

Type Code

OS–		A10VS	O	28	DR	/	31	R	—	V	P	A	12	KB3
	1	2	3	4	5		6	7		8	9	10	11	12

1– Operating Medium

Mineral oil (No Code)	

2–Machinery Classification

Axial piston, swash plate design, variable, used in industry	A10VS
Axial piston, swash plate design, variable, used in industry	A10V

3–Operational Mode

Open circuit	O

4–Size

Nominal displacement mL/r	18	28	45	71	88	100	140	

5–Control Devices

Two point control,directly operated DG	●	●	●	●	●	●	●	DG
Pressure Control DR	●	●	●	●	●	●	●	DR
Remote pressure control DRG	●	●	●	●	●	●	●	DRG
Pressure and flow control DFR	●	●	●	●	●	●	●	DFR
Pressure and flow control DFR1	●	●	●	●	●	●	●	DFR1
Pressure and power control DLR	●	●	●	●	●	●	●	DLR
Pressure and flow and power control DFLR	●	●	●	●	●	●	●	DFLR

6–Series

	31

7–Rotating Direction(View on Shaft End)

Clockwise	R
Counterclockwise	L

8–Seals

Shaftseal FKM	P
VitonFKM	V

Chart shows: ●=Available，○=In preparation，–=Not available

9–Shaft End

	18	28	45	71	88	100	140	
Keyedshaft DIN6885	●	●	●	●	●	●	●	P
Parallelshaft SAE withkey J744(ISO3019–1)	●	●	●	●	●	●	●	K
Splinedshaft ANSIB92.1a, standard shaft Similartoshaft S	3/4″ 3/4″	7/8″ 7/8″	1″ 1″	1 1/4″ 1 1/4″	1 1/4″ 1 1/4″	1/2″ 1 –	3/4″ –	S R
Splinedshaft to SAE J744,reduced diameter not for through drive	3/8″	3/4″	7/8″	1″	1″	1 1/4″	–	U
Splinedshaft SAE	–	–	–	–		1 1/4″	–	W

10–MountingFlange

	18	28	45	71	88	100	140	
ISO 2	●	●	●	●	●	●	–	A
SAE 2	●	●	●	●	●	●	–	C
ISO 4	–	–	–	–	–	–	●	B
SAE 4	–	–	–	–	–	–	●	D

11–Service Line Ports

	18	28	45	71	88	100	140	
Port S and port B at opposite sides,SAE flanged ,metric	●	●	●	●	●	●	●	12
	–	–	–	●	●	–	–	42
Port S and port B at opposite sidesSAE flanged, UNC mounting bolts	●	●	●	●	●	●	●	62
	–	–	–	●	●	–	–	92

12–Through Drive

			18	28	45	71	88	100	140	
Without through drive			●	●	●	●	●	●	●	N00
With through drive, the second pump connection dimension as follows										
Mounting flange	Spline shaft	The second pump								
SAE82,2	U 5/8in9T16/32DP	CR10VS018/31	●	●	●	●	●	●	●	K01
SAE82, 2	S 3/4in11T16/32DP	CR10VS018/31	●	●	●	●	●	●	●	K52
SAE101,2	S 7/8in13T16/32DP	CR10VO28/31		●	●	●	●	●	●	K68
SAE101,2	S 7/8in13T16/32DP	CR		●	●	●	●	●	●	K02
SAE101,2	S 1in15T16/32DP	CR 0VO45/31			●	●	●	●	●	K04
SAE127,2	S 1 1/4in14T12/24DP	CR 0V071/31				●	●	●	●	K07
SAE127,2	S 1 1/2in17T12/24DP	CR 0V0100/31						●	●	K24
SAE152,4	S 1 3/4in13T8/16DP	CR 0VO140/31							●	K17
SO80, 2	S 3/4in11T16/32DP	CR 0VSO18/31	●	●	●	●	●	●	●	KB2
SO100,2	S 7/8in13T16/32DP	CR 0VSO28/31		●	●	●	●	●	●	KB3
ISO100,2	S 1in15T16/32DP	CR 0VSO45/31			●	●	●	●	●	KB4
SO125,2	S 1 1/4in14T12/24DP	CR 0VS071/31				●	●	●	●	KB5
ISO125,2	S 1 1/2in17T12/24DP	CR 0VSO100/31						●	●	KB6
ISO180,4	S 1 3/4in13T8/16DP	CR 0VSO140/31							●	KB7
ISO 80,2	ϕ 18	CR 0VS018/31	●	●	●	●	●	●	●	K51
SAE82,2	ϕ 19.05	CR 0VS018/31	●	●	●	●	●	●	●	K40
SAE100,2	ϕ 22	CR 0VS028/31		●	●	●	●	●	●	K25

			18	28	45	71	88	100	140	
Without through drive			●	●	●	●	●	●	●	N00
With through drive, the second pump connection dimension as follows										
Mounting flange	Spline shaft	The second pump								
SAE101,2	22.225	CR10VS028/31	–	●	●	●	●	●	●	K03
ISO 100,2	25	CR10VSO45/31	–	–	●	●	●	●	●	K26
SAE101,2	25.4	CR10VSO45/31	–	–	●	●	●	●	●	K05
ISO 125,2	32	CR10VS071/31	–	–	–	●	●	●	●	K27
SAE127,2	31.75	CR10VS071/31	–	–	–	●	●	●	●	K08
ISO 125,2	40	CR10VSO100/31	–	–	–	–	–	●	●	K37
SAE127,2	38.1	CR10VS0100/31	–	–	–	–	–	●	●	K38
ISO 180,4	45	CR10VSO140/31	–	–	–	–	–	–	●	K59
SAE152,4	44.45	CR10VSO140/31	–	–	–	–	–	–	●	K21

Description of combination pump: Two pumps can be connedted in series by their head and end, namely integrated to be a combination pump.by the means of through–shaft,and the se cond pump of the series combination is called the subordinate pump.

In case of placing an order, the combination pump model equals to the model of the first pump + the model of the second.

Illustration of combination pump model:OS4VSO45 DR/31R–PPA12KB3+OS10VSO28DR/31R–PSA12N00

Technical Data

■Parameters Table

Size				18	28	45	71	88	100	140
Displacement		V_{gmax}	mL/r	18	28	45	71	88	100	140
Pressure at suction port S (Absolute pressure)	Minimum pressure	$P_{s\,min}$	bar	0.8						
	Minimum pressure	$P_{s\,max}$	bar	10						
Pressure at Outlet port B (Absolute pressure)	Rated pressure	P_N	bar	280						
	Peak pressure	P_{max}	bar	350						
	Minimum pressure		bar	10						
Rate of pressure change		R_A	bar/s	16000						
Drain port L, L_1 pressure (Absolute pressure)		P_L	bar	≤2						
Max. speed	$V_g = V_{g\,max}$	$n_{o\,max}$	r/min	3300	3000	2600	2200	2100	2000	1800
Ps= 1bar	$V_g = V_{g\,max}$		r/min	3900	3600	3100	2600	2500	2400	2100
Max. flow	$n = n_{o\,max}$	$q_{vo\,max}$	L/min	59.4	84	117	156	185	200	252
	n = 1500 r/min		L/min	27	42	68	107	132	150	210

Size				18	28	45	71	88	100	140
Displacement		$V_{g\,max}$	mL/r	18	28	45	71	88	100	140
Maximum power (△p = 280 bar)	n = n_o max	P_{omax}	kW	27.7	39	55	73	86	93	118
	n = 1500 r/min		kW	12.6	20	32	50	62	70	98
Torque ($V_g = V_{g\,max}$)	△ p=280 bar	T_{max}	Nm	80.1	125	200	316	392	445	623
	△ p=100 bar	T	Nm	28.6	45	72	113	140	159	223
Torsional stiffness	Shaft extension P		Nm/rad	13158	25656	41232	80627	80627	132335	188406
	Shaft extension S		Nm/rad	11087	22317	37500	71884	71884	121142	169537
	Shaft extension R		Nm/rad	14850	26360	41025	76545	76545	–	–
	Shaft extension U		Nm/rad	8090	16695	30077	52779	52779	91903	–
	Shaft extension K		Nm/rad	13340	26189	43905	82112	82112	135303	196844
Moment of inertia of the rotating assembly		J	kgm^2	0.00093	0.0017	0.0033	0.0083	0.0083	0.0167	0.0242
Max. angular acceleration			rad/s^2	6800	5500	4000	3300	3300	2700	2700
Volume of case			L	0.4	0.7	1.0	1.6	1.6	2.2	3.0
Weight			kg	12	15	21	33	33	45	60
Drive shaft Allowable load	Max. axial force		N	700	1000	1500	2400	2400	4000	4800
			N	350	1200	1500	1900	1900	2300	2800

1) Once$V_g = V_{g\,max}$, the value is applicable to the inlet pressure at suction port S is P_s = 1bar (absolute pressure),when the inlet pressure P_s increase or decrease the displacement,the speed can be increased,when the inlet pressure $P_{s\,min}$=0.8bar,the speed should be reduced to 90%.$V_g < V_{g\,max}$ value when the speed limit.

Technical Data

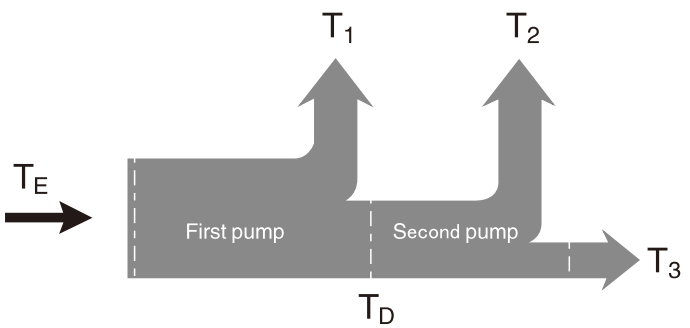
■Permissible input torque and through drive torque

Size				18	28	45	71	88	100	140
Torque (V △P=280 bar)		T_{max}	Nm	80	125	200	316	392	445	623
Max . input torque 1)	Shaft P	T_{Emax}	Nm	88	137	200	439	439	857	1206
		ϕ	mm	18	22	25	32	32	40	45
	Shaft S	T_{Emax}	Nm	124	198	319	626	626	1104	1620
		ϕ	in	3/4	7/8	1	1 1/4	1 1/4	1 1/2	1 3/4

Size				18	28	45	71	88	100	140
Torque ($V_{g\,max}$ △P=280 bar)		T_{max}	Nm	80	125	200	316	392	445	623
Max . input torque[1)]	Shaft R	T_{Emax}	Nm	160	250	400	644	644	–	–
		ϕ	mm	3/4	7/8	1	1 1/4	1 1/4	–	–
	Shaft K	T_{Emax}	Nm	104	145	212	433	433	750	1186
		ϕ	in	3/4	7/8	1	1 1/4	1 1/4	1 1/2	1 3/4
Max . Through drive torque	Shaft S	T_{Dmax}	Nm	108	160	319	492	492	778	1266
	Shaft R	T_{Dmax}	Nm	120	176	365	548	548	–	–
	Shaft K	T_{Emax}	Nm	104	145	212	433	433	750	1186

1) For drive shaft free of radial load

Torque Distribution



■Hydraulic oil

Operating viscosity range

For optimum efficiency and service life, we recommend that the operating viscosity in the range of the following best (at operating temperature)

Optimum operating viscosity v_{opt} =16~36mm^2/s

Limits of viscosity range

Under critical operating conditions the following values apply:

V_{min} =10mm^2/s Short time (t≤1min)

Max. permissible case drain temperature of 90℃

V_{max} =1000mm^2/s Short time (t≤ 1min)

p≤30bar，n≤1000 r/min， θ ≥–25℃

Selection Considerations of hydraulic oil

Inorder to select the correct hydraulic oil. it must be determined at ambient temperature within the tank temperature (open circuit). Select the hydraulic fluid in the working temperature range for optimum viscosity range, it recommended to choose where relevant, the higher viscosity grade.

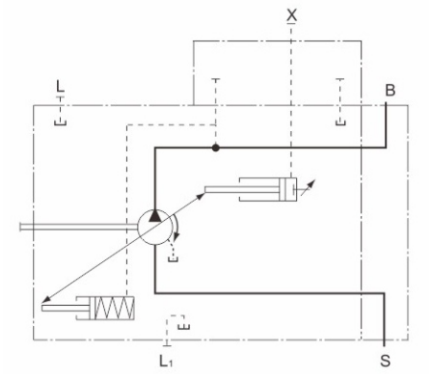
The case drain temperature is influenced by pressure and input speed and is always higher than the tank temperature. However, any part of the piston temperature shall not exceed 90℃.The fluid temperature in the bearing area is generally higher than the average case drain oil temperature high around 5℃

Control Devices

1、DG Direct Control DG

An external switching pressure can be applied to Port X to minimize the swivel angle of the variable pump. Control oil can be supplied directly for the control piston under the necessary minimum pressure of 50 bar. The variable pump can only be shifted between Vg max and Vgmin .

Note: the switching pressure needed at Port X is in direct correlation with the actual working pressure of Pressure Port B.



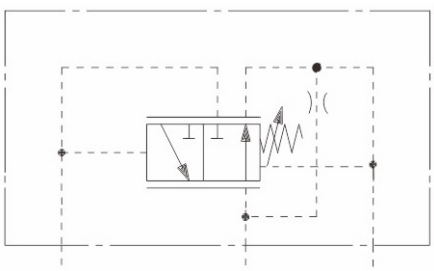
2、Pressure Control DR

The pressure control will keep the outlet pressure constant. Therefore, the variable pump only delivers as much fluidas required by the actuator elements of the hydraulic system. The outlet pressure can be set through stepless adjustmenton the control valve.

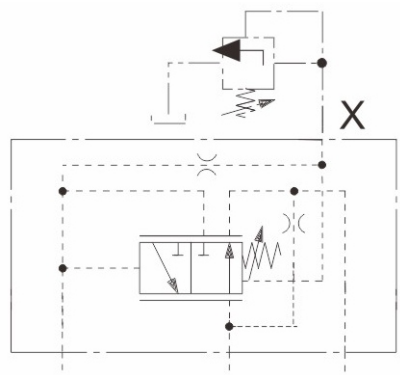
3、Remote Pressure Control DRG

The function and equipment of constant control is slmilar to that of DR. The remote control can be realized by connecting an external relief valve with Port X. Relief valve is not included in the scope of supply for DRG control.

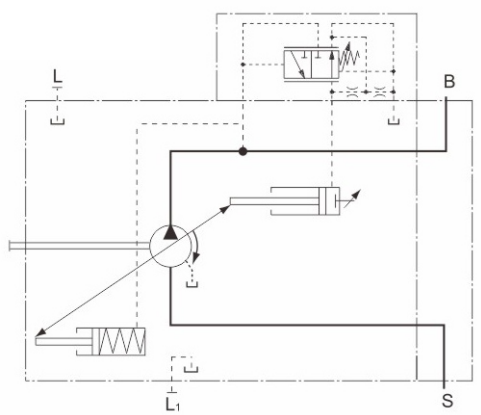
Size 140



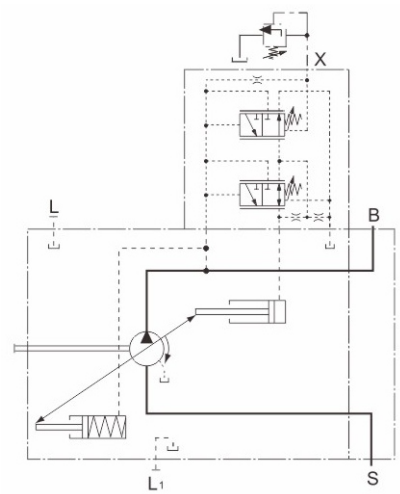
Size 140



Size 18 ~ 100



Size 18 ~ 100



Control Devices

4、Pressure and Flow Control DFR/DFR1

In addition to the pressure control function, the outlet flow of the pump can be adjusted by the differential pressure of the throttle valve installed on the oil supply pipe. The varlable pump delivers the fluid needed by the actuator elements of the hydraulic system and is free from the influence of the changes in actual working pressure. Pressure control takes precedence over flow control.

Relief valve is not included in the scope of supply for DFR/ DFR1 control.

The throttle orifice between Port X of DFR1 control valve and the pump chamber is enclosed.

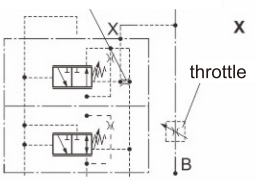
5、Pressure and Flow and Power Control DFLR

In order to gain constant driving torque under the working conditions with changeable working pressure, the output flow can be changed to keep the product of flow and pressure constant, namely to keep the output powerful of the pump constant.

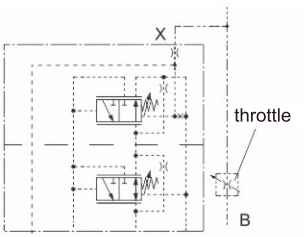
Flow control can only be conducted below the constant power control curve.

Relief valve is not included in the scope of supply for DFLR control.

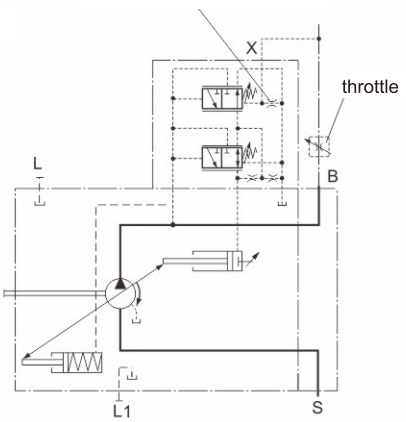
Size 140



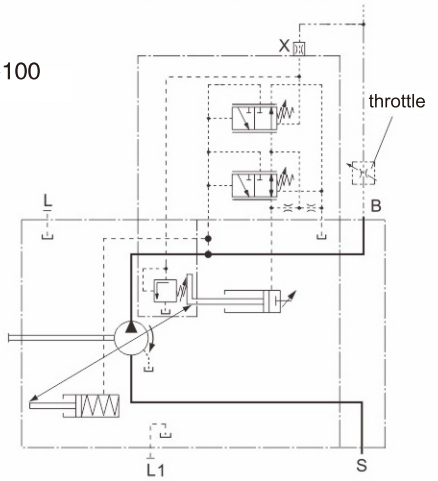
Size 140



Size 18~100



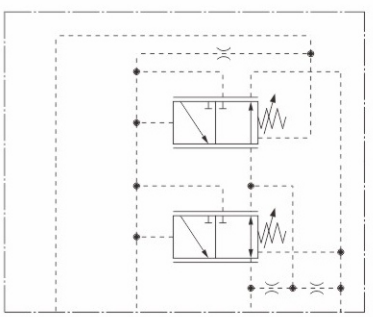
Size 28~100



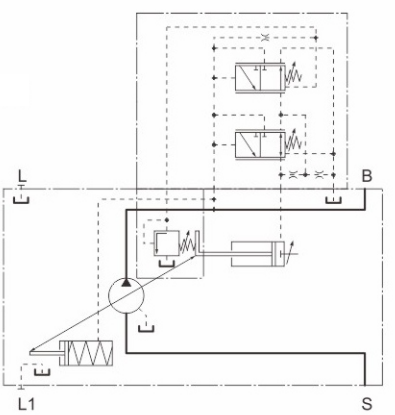
6、Pressure and Power control DLR

The control unit no flow control.

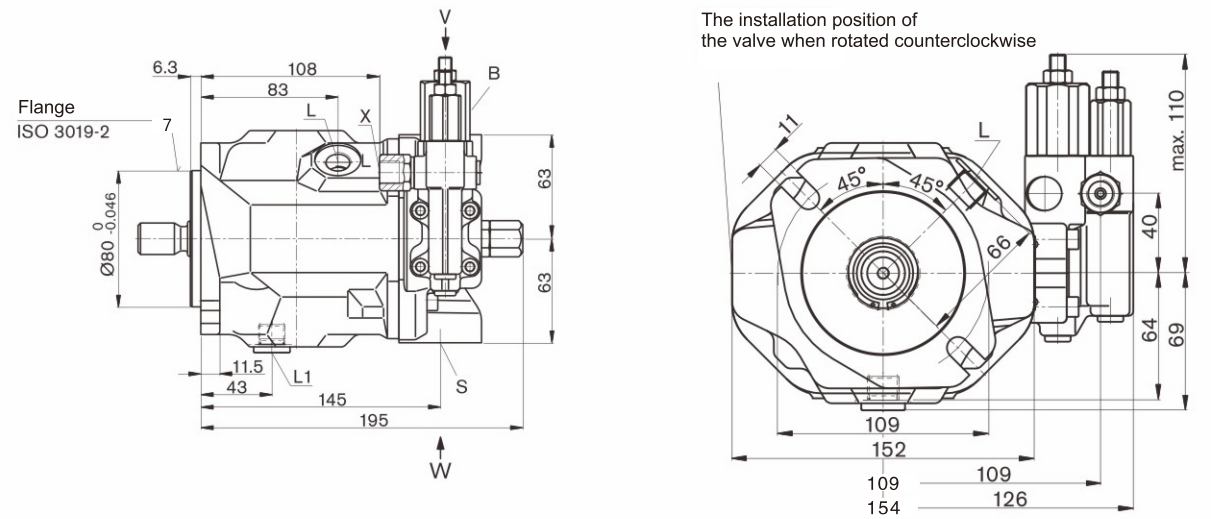
Size 140



Size 28~100

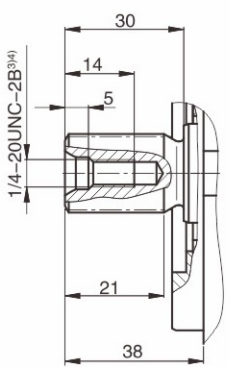


Dimensions size 18 Flange A (Control devices DR, DRG, DFR/DFR1)

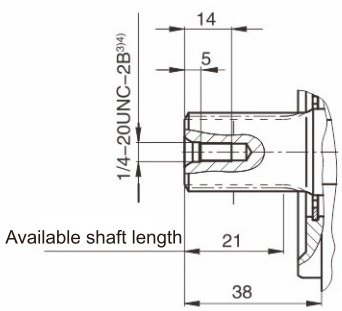


Shaft

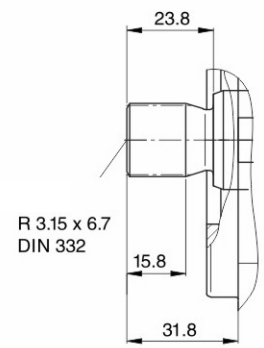
S Available spline length, 3/4 in 11T 16/32DP[1] (SAE J744)



R Available spline length, 3/4 in 11T 16/32DP[1)2)] (SAE J744)



U Available spline length, 5/8 in 9T 16/32DP[1)2)] (SAE J744)

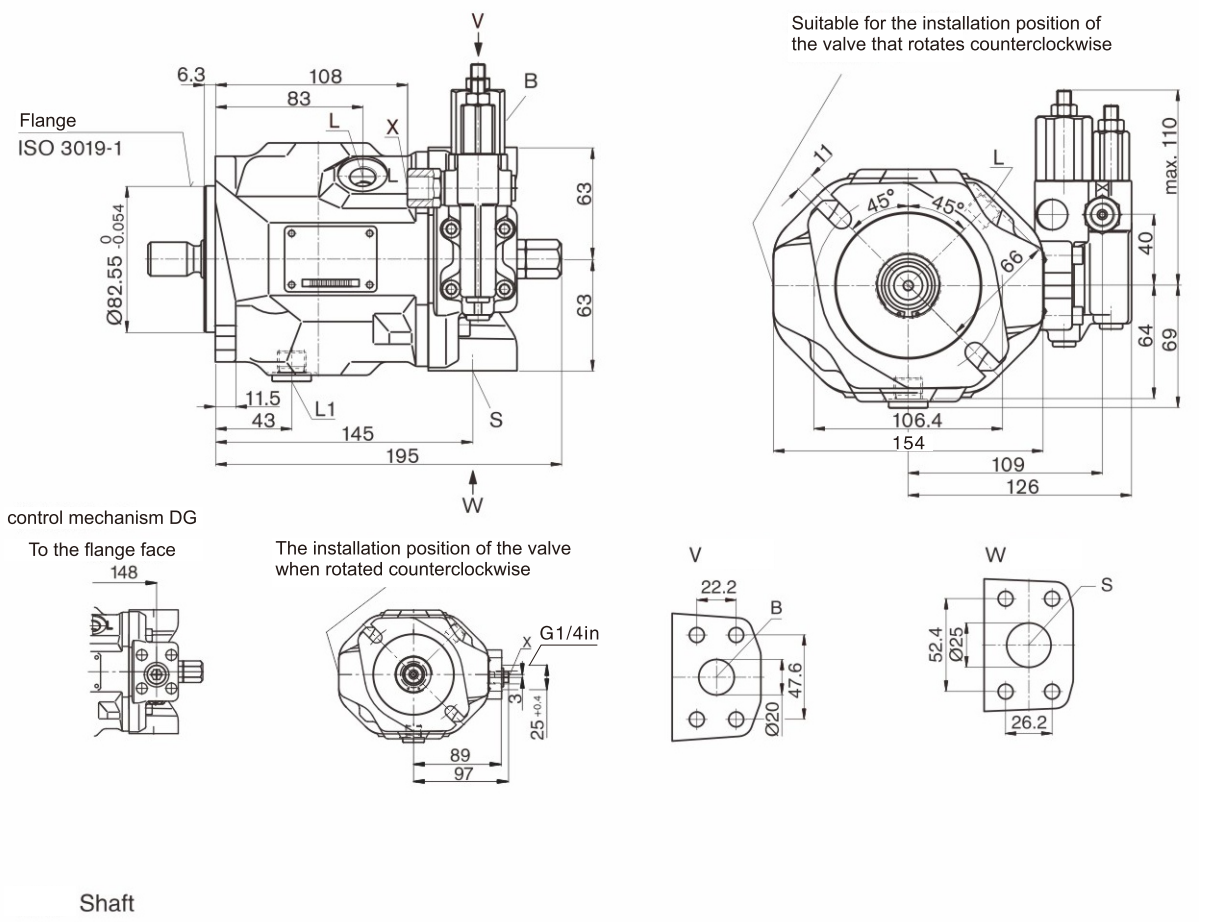


Ports

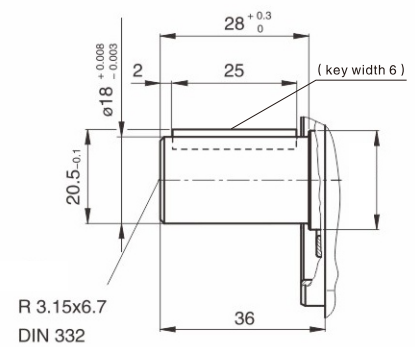
B	Outlet port	Flange SAE J518 3/4in (Standardseries) Fixing thread M10 17
S	Suction port	Flange SAE J518 1in (Standard series) Fixing thread M10 17
L	Drain port	M16 x 1.5 12
L1	Drain port	M16 x 1.5 12
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12 For DG Control

Dependent on the installation position,port L or port L1 must be connected.

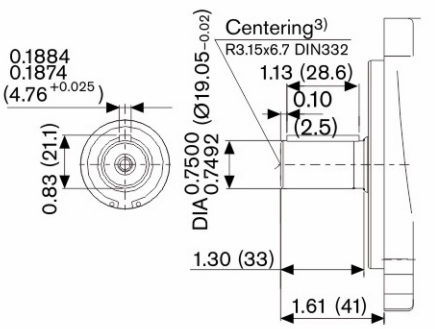
Dimensions size 18 Flange C (Control devices DR, DRG, DFR/DFR1)



P Plain key shaft DIN6885, A6 × 6 × 25



K Plain key shaft, Parallel with key
ISO 3019–1 22–1

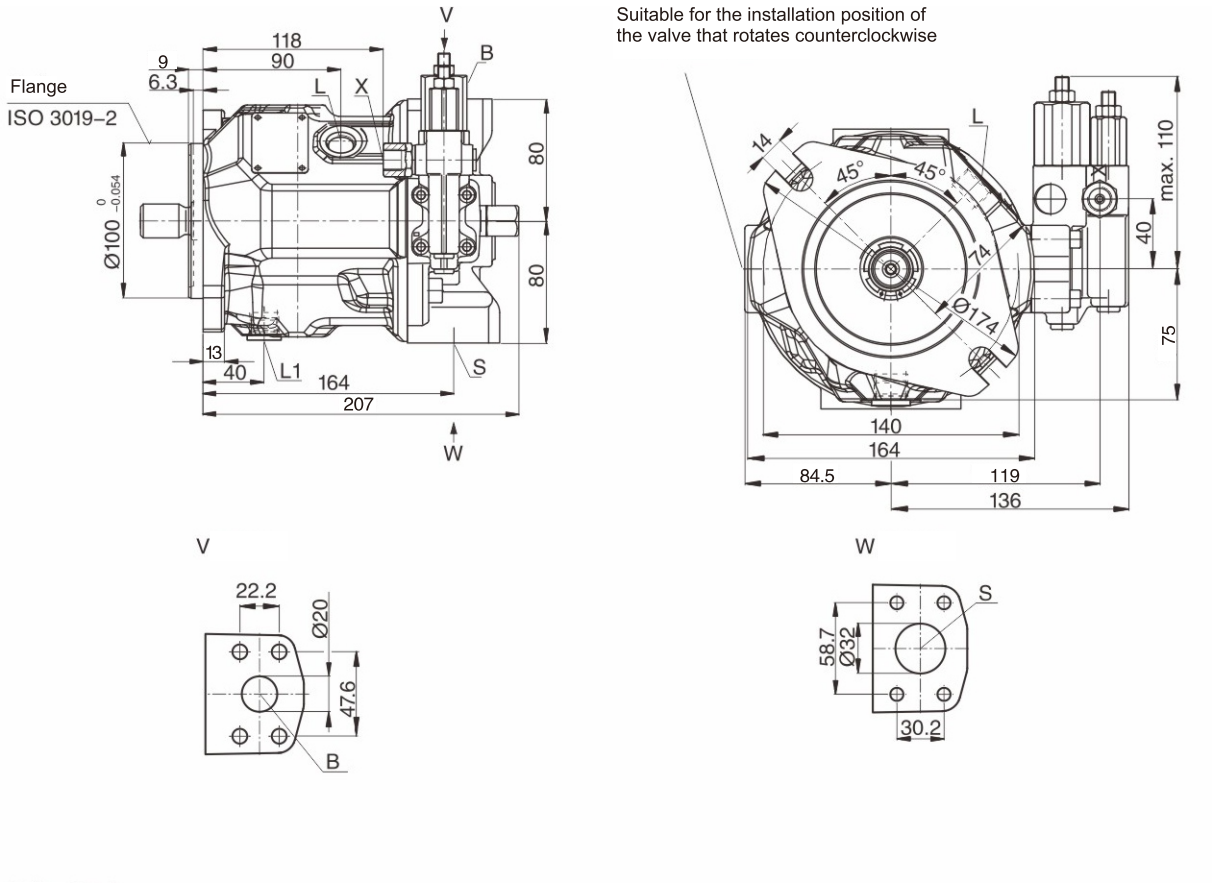


Oil Ports

B	Outlet port	Flange SAE J518 3/4in (Standardseries) Fixing thread 3/8–16UNC;20 deep
S	Suction port	Flange SAE J518 1in (Standard series) Fixing thread 3/8–16UNC;20 deep
L	Drain port	M16 x 1.5 12
L1	Drain port	9/16–18UNF–2B 12
X	□Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12 For DG Control

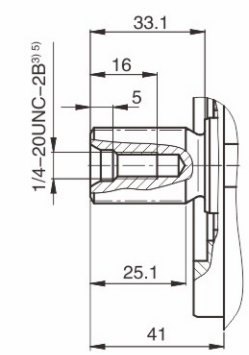
Dependent on the installation position,port L or port L1 must be connected.

Dimensions size 28 Flange A (Control devices DR, DRG, DFR/DFR1)

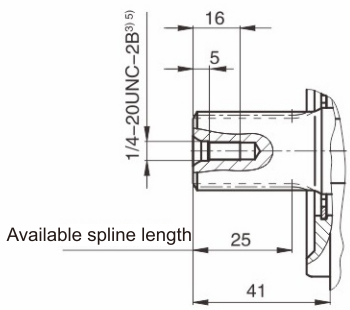


Shaft

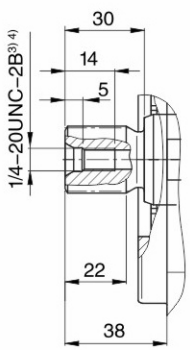
S spline shaft , 7/8 in 13T 16/32DP[1)]
(SAE J744)



R spline shaft , 7/8 in 13T 16/32DP[1)2)]
(SAE J744)



U spline shaft , 3/4 in 11T 16/32DP[1)]
(SAE J744)



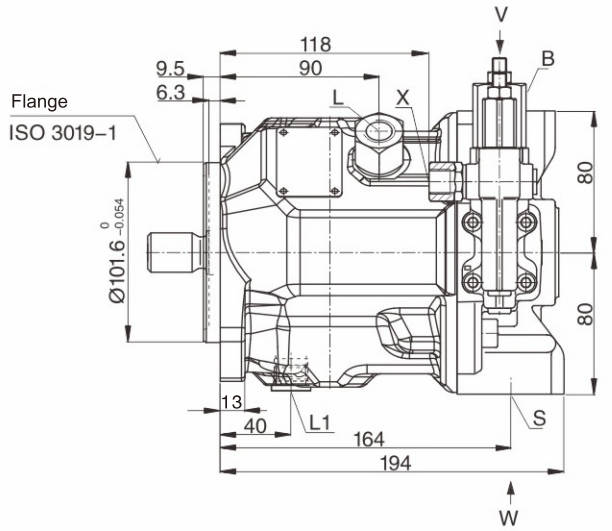
Ports

B	Outlet port	Flange SAE J518 3/4in (Standardseries) Fixing thread M10 17
S	Suction port	Flange SAE J518 1 1/4in (Standard series) Fixing thread M10 17
L	Drain port	M18 x 1.5 12
L1	Drain port	M18 x 1.5 12
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12For DG Control

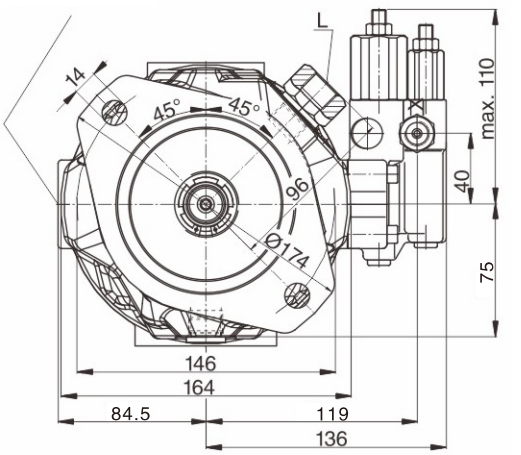
Dependent on the installation position,port L or port L1 must be connected.

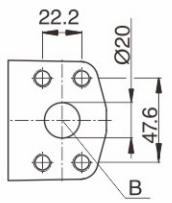
Dimensions size 28 Flange C (Control devices DR, DRG, DFR/DFR1)

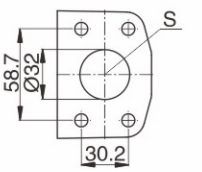
Port 12(control mechanism DG、DFLR、DLR) Port 11 (Control devices DG, DFLR, DLR)



The installation position of the valve when rotated counterclockwise

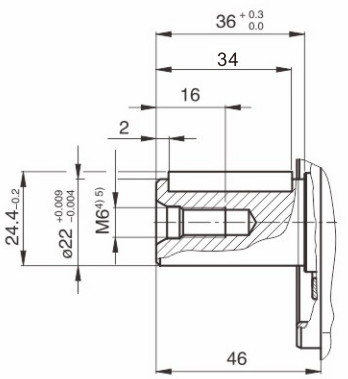




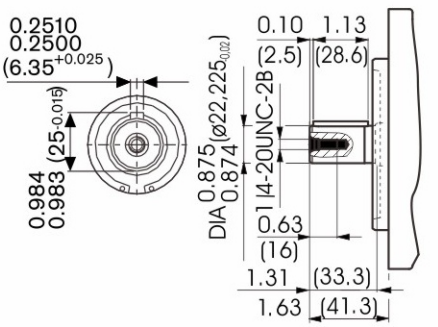


Shaft

P Plain key shaft DIN6885，A6 × 6 × 32



K Plain key shaft，Parallel with key ISO 3019–1 22–1



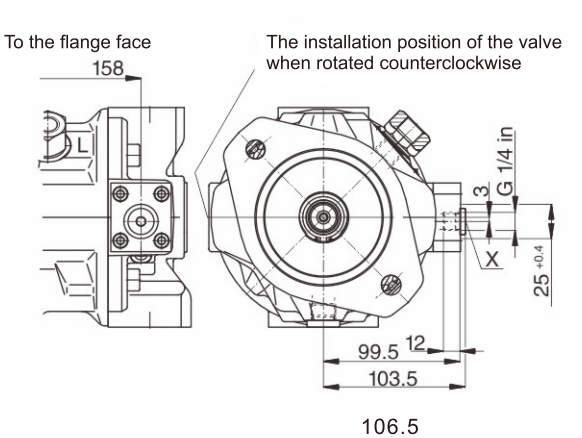
Ports

B	Outlet port	Flange SAE J518 3/4in (Standardseries) Fixing thread 3/8–16UNC;20 deep
S	Suction port	Flange SAE J518 1 1/4in (Standard series) Fixing thread 7/16–14UNC;24 deep
L	Drain port	M18 x 1.5 12
L1	Drain port	3/4–16UNF–2B 14
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12 For DG Control

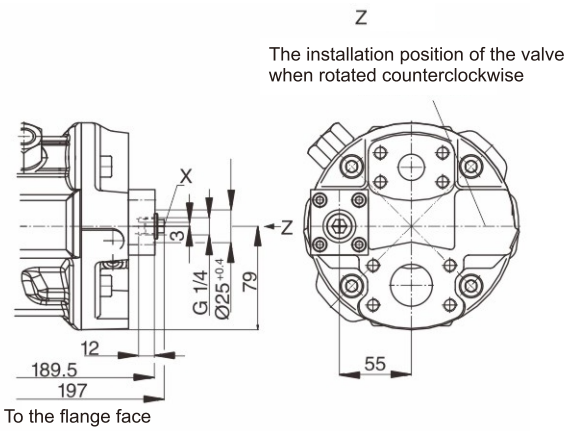
Dependent on the installation position,port L or port L1 must be connected.

Dimensions size 28

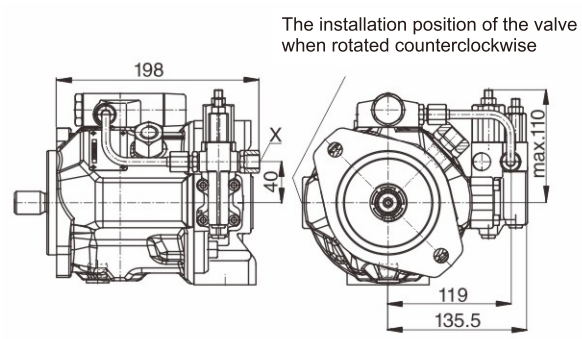
Control devices DG port 12



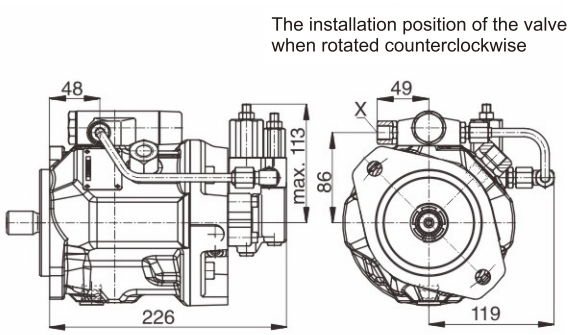
Control devices DG port 11



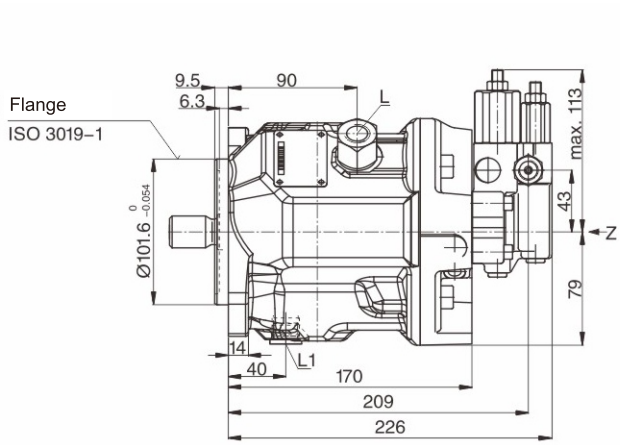
Control devices DFLR, DLR port 12

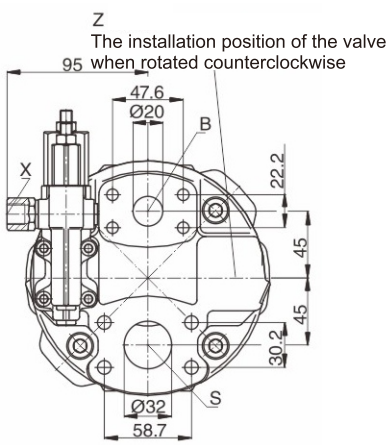


Control devices DFLR, DLR port 11

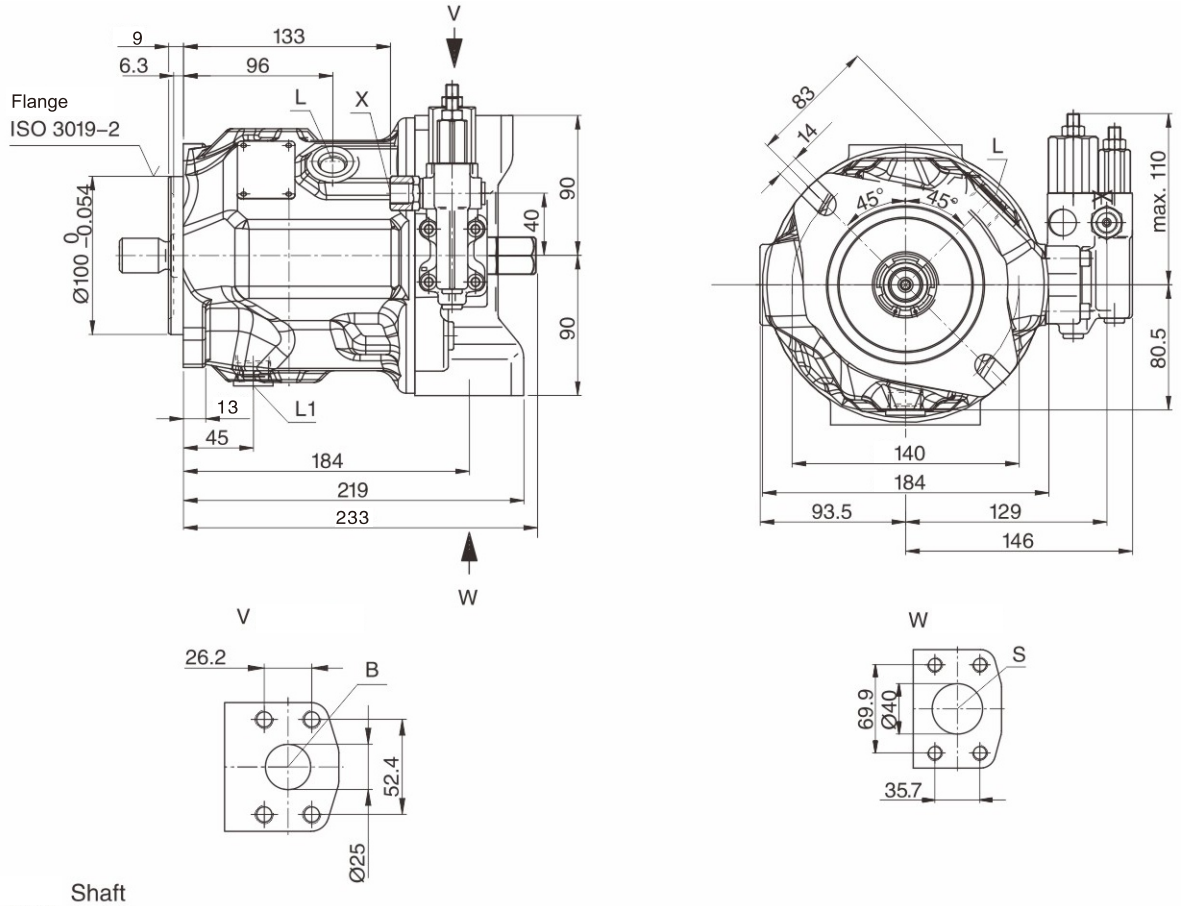


port 11 （Control devices DG,DFLR, DLR ）

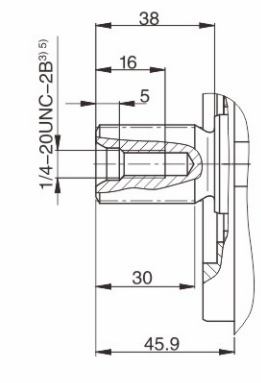




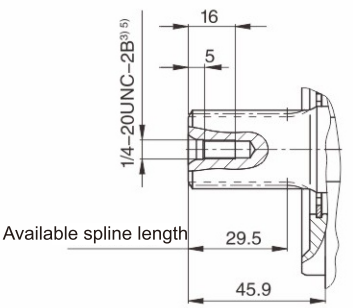
Dimensions size 45 Flange A (Control devices DR, DRG, DFR/DFR1)



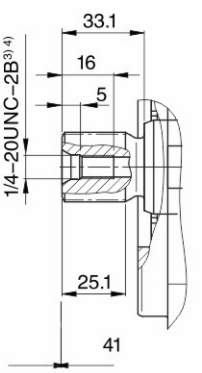
S spline shaft , 1 in 15T 16/32DP[1)]
(SAE J744)



R spline shaft , 1 in 15T 16/32DP[1)2)]
(SAE J744)



U spline shaft , 7/8 in 13T 16/32DP[1)]
SAE J744



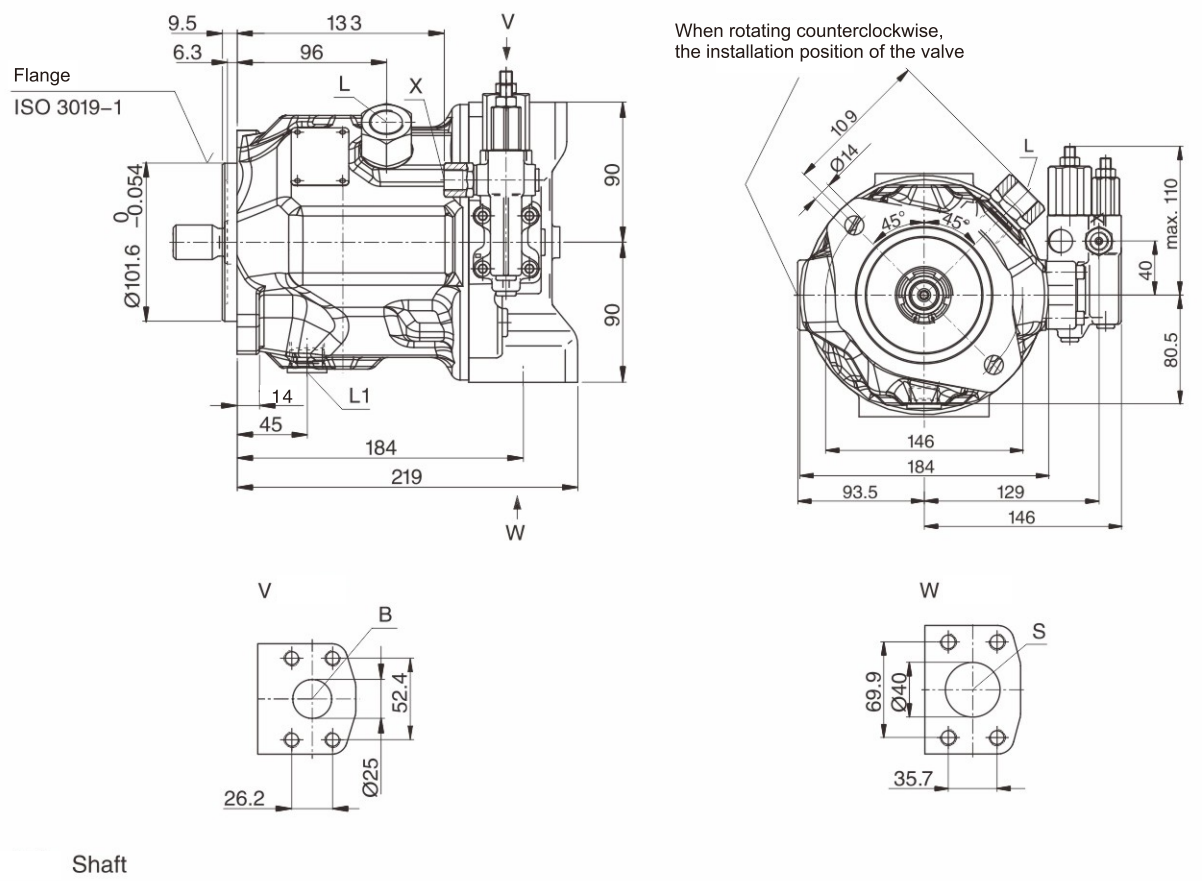
Ports

B	Outlet port	Flange SAE J518 1in (Standardseries)Fixing thread M10 17
S	Suction port	Flange SAE J518 1 1/4–1 1/2in (Standard series) Fixing thread M12 20
L	Drain port	M22 x 1.5 14
L1	Drain port	M22 x 1.5 14
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12 For DG Control

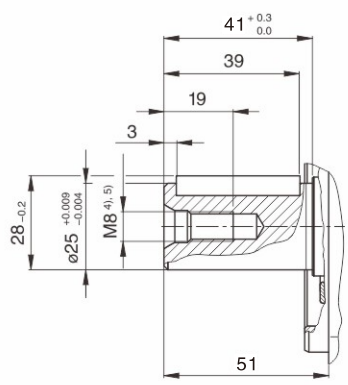
Dependent on the installation position,port L or port L1 must be connected.

Dimensions size 45 Flange C (Control devices DR, DRG, DFR/DFR1)

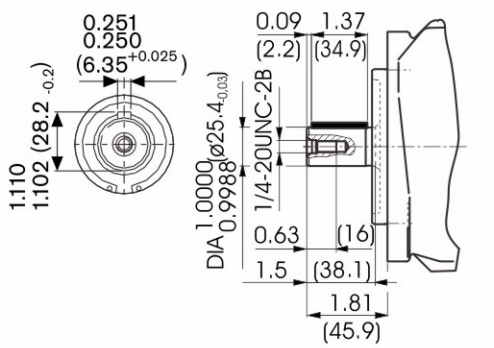
Port 12 (Control devices DG, DFLR, DLR)



P Plain key shaft DIN6885, A8 × 7 × 36



K Plain key shaft, Parallel with key ISO 3019–1 25–1



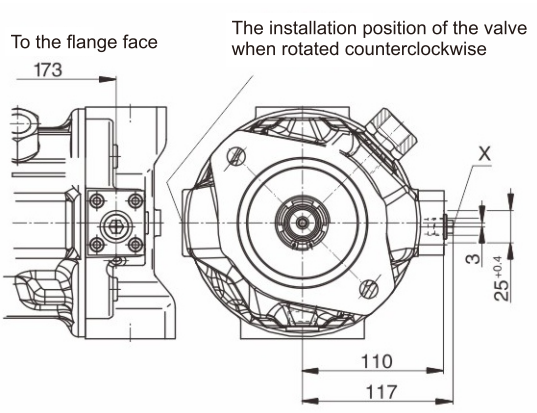
Ports

B	Outlet port	Flange SAE J518 1in (Standardseries) Fixing thread 3/8–16UNC;18 deep
S	Suction port	Flange SAE J518 1 1/2in (Standard series) Fixing thread 1/2–13UNC;22 deep
L	Drain port	M22 x 1.5 14
L1	Drain port	7/8–14unf–2B 16
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12 For DG Control

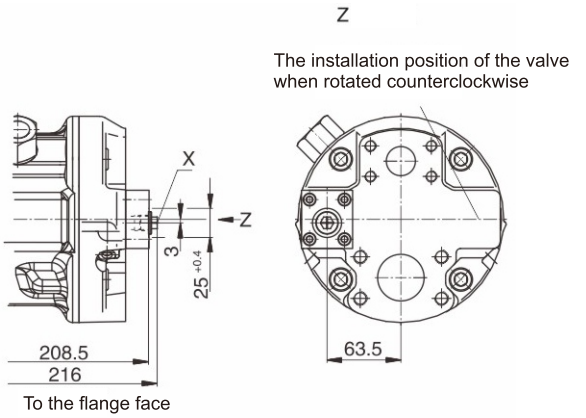
Dependent on the installation position,port L or port L1 must be connected.

Dimensions

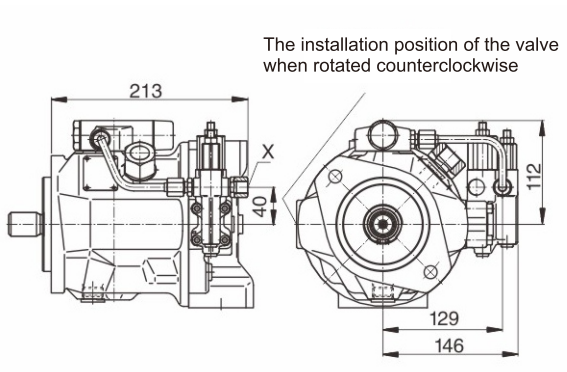
Control device DG port 12



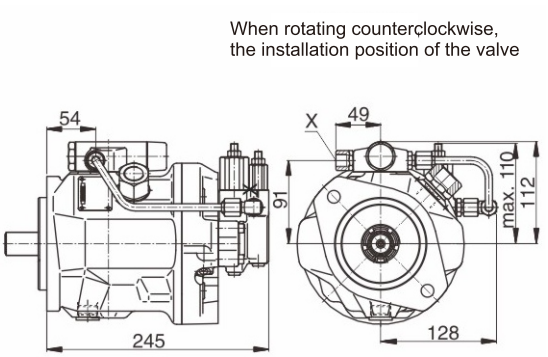
Control device DG port 11



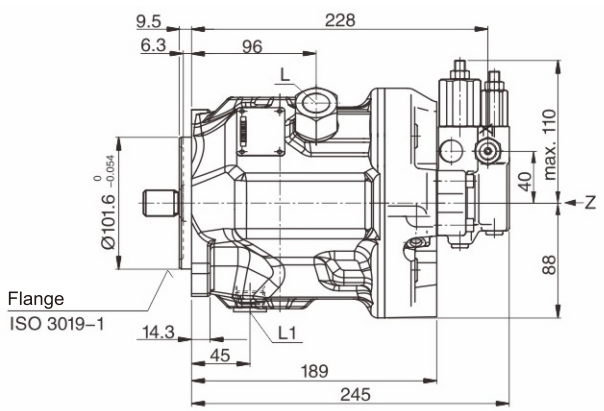
Control device DFLR, DLR port 12

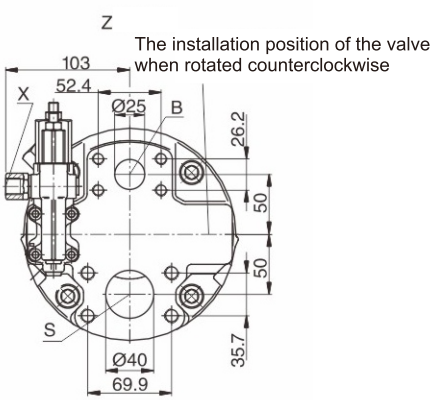


Control device DFLR, DLR port 11

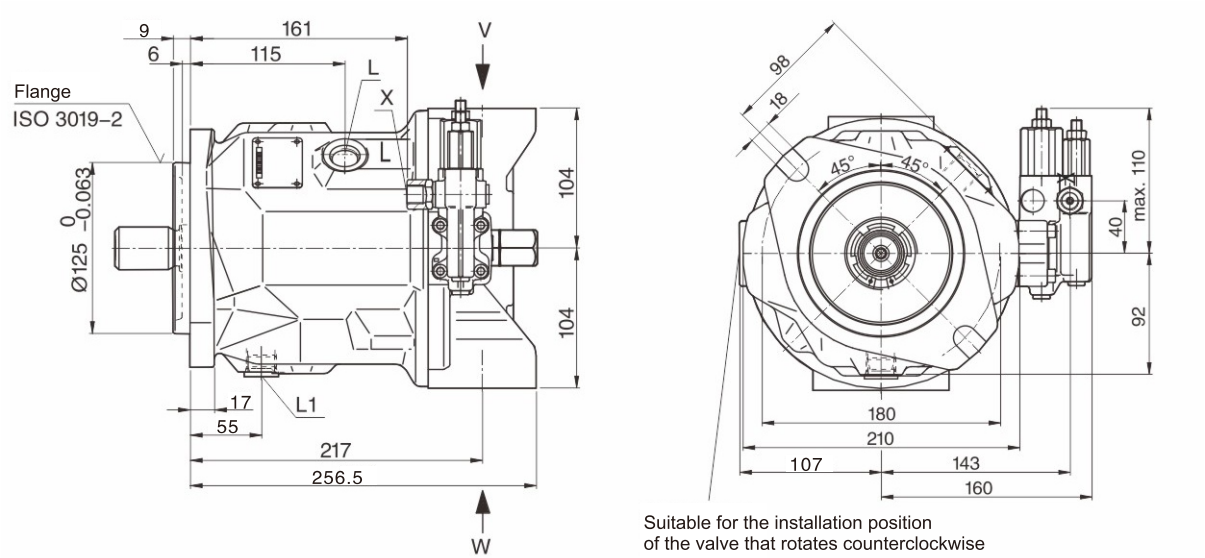


port 11（Control devices DG,DFLR, DLR）





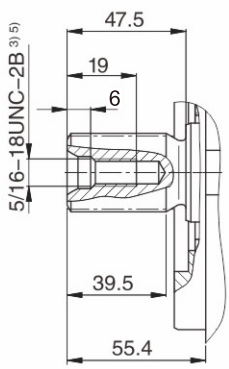
Dimensions size 71 Flange A (Control devices DR, DRG, DFR/DFR1)



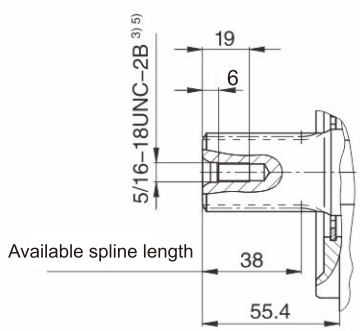


Shaft

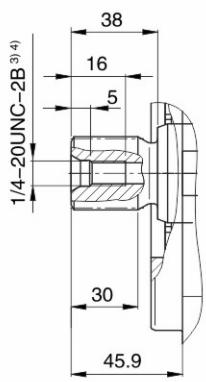
S spline shaft , 1 1/4 in 14T 12/24DP[1] (SAE J744)



R spline shaft , 1 1/4 in 14T 12/24DP[1,2] (SAE J744)



U spline shaft , 1 in 15T 16/32DP[1] (SAE J744)



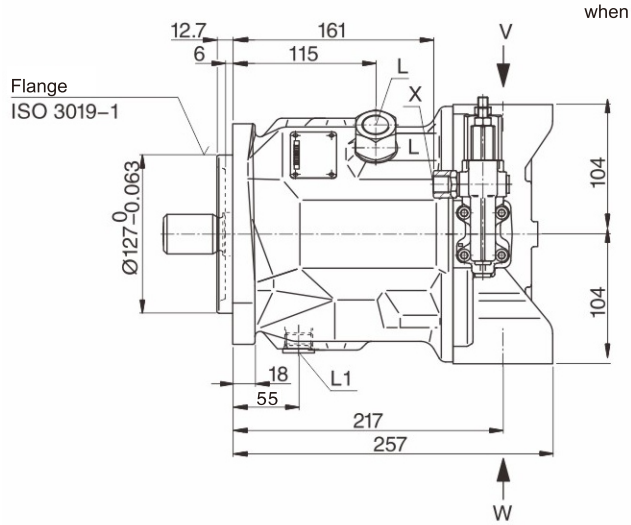
Ports

B	Outlet port	Flange SAE J518 1in (Standardseries) Fixing thread M10 17
S	Suction port	Flange SAE J518 2in (Standard series) Fixing thread M12 20
L	Drain port	M22 x 1.5 14
L1	Drain port	M22 x 1.5 14
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 deep 12 for DG control

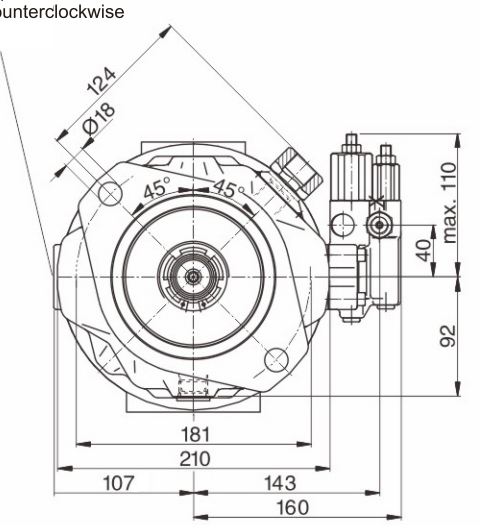
Dependent on the installation position,port L or port L1 must be connected.

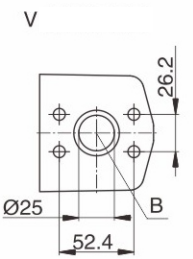
Dimensions size 71 Flange C (Control devices DR, DRG, DFR/DFR1)

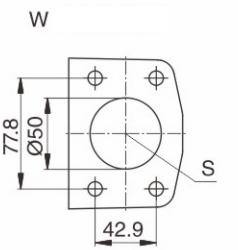
port 42（Control devices DG,DFLR, DLR）



The installation position of the valve when rotated counterclockwise

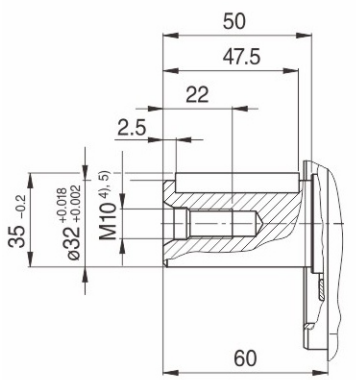




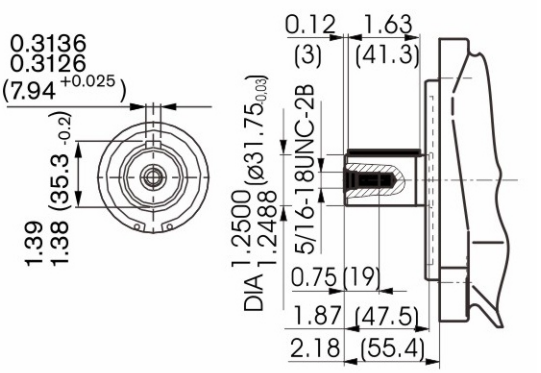


Shaft

P Plain key shaft DIN6885，A10 × 8 × 45



K Plain key shaft，Parallel with key ISO3019–1 32–1



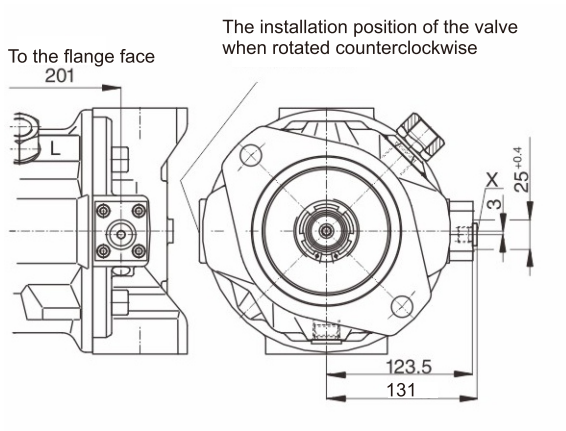
Ports

B	Outlet port	Flange SAE J518 1in (Standardseries) Fixing thread 3/8–16UNC;18 deep
S	Suction port	Flange SAE J518 2in (Standard series) Fixing thread 1/2–13UNC;22 deep
L	Drain port	M22 x 1.5 14
L1	Drain port	7/8–14UNF–2B 16
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12For DG Control

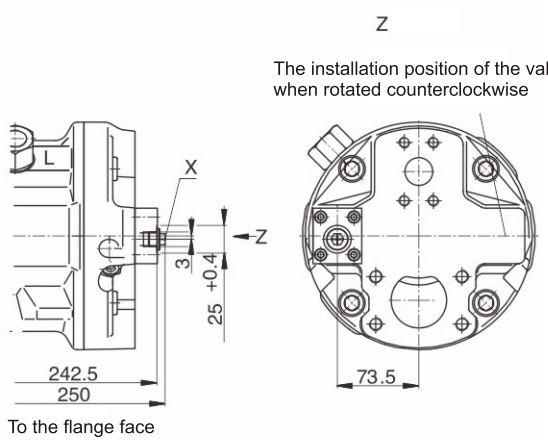
Dependent on the installation position,port L or port L1 must be connected.

Dimensions size 71

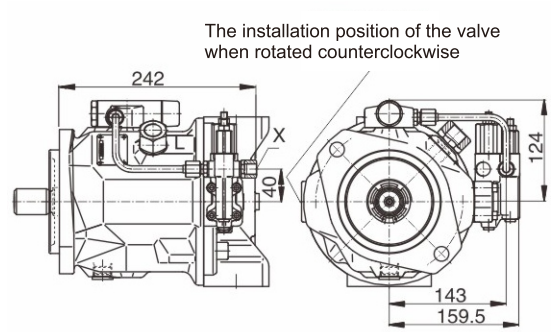
Control device DG port 42



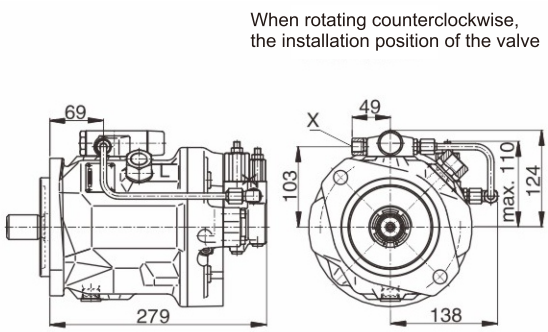
Control device DG port 41



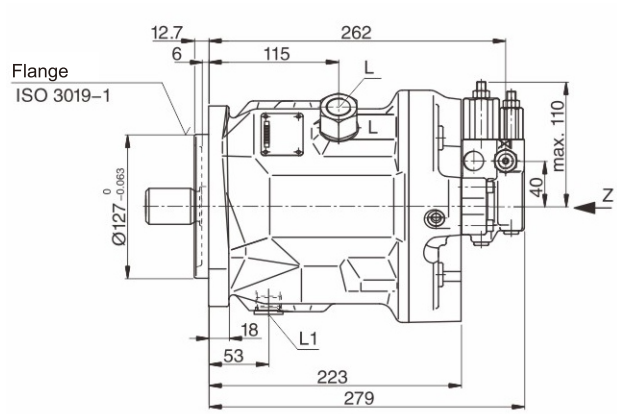
Control device DFLR, DLR port 42

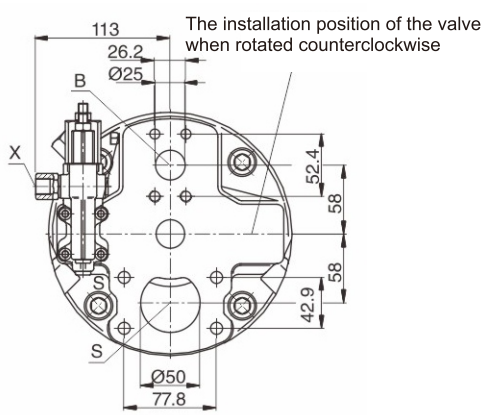


Control device DFLR, DLR port 41

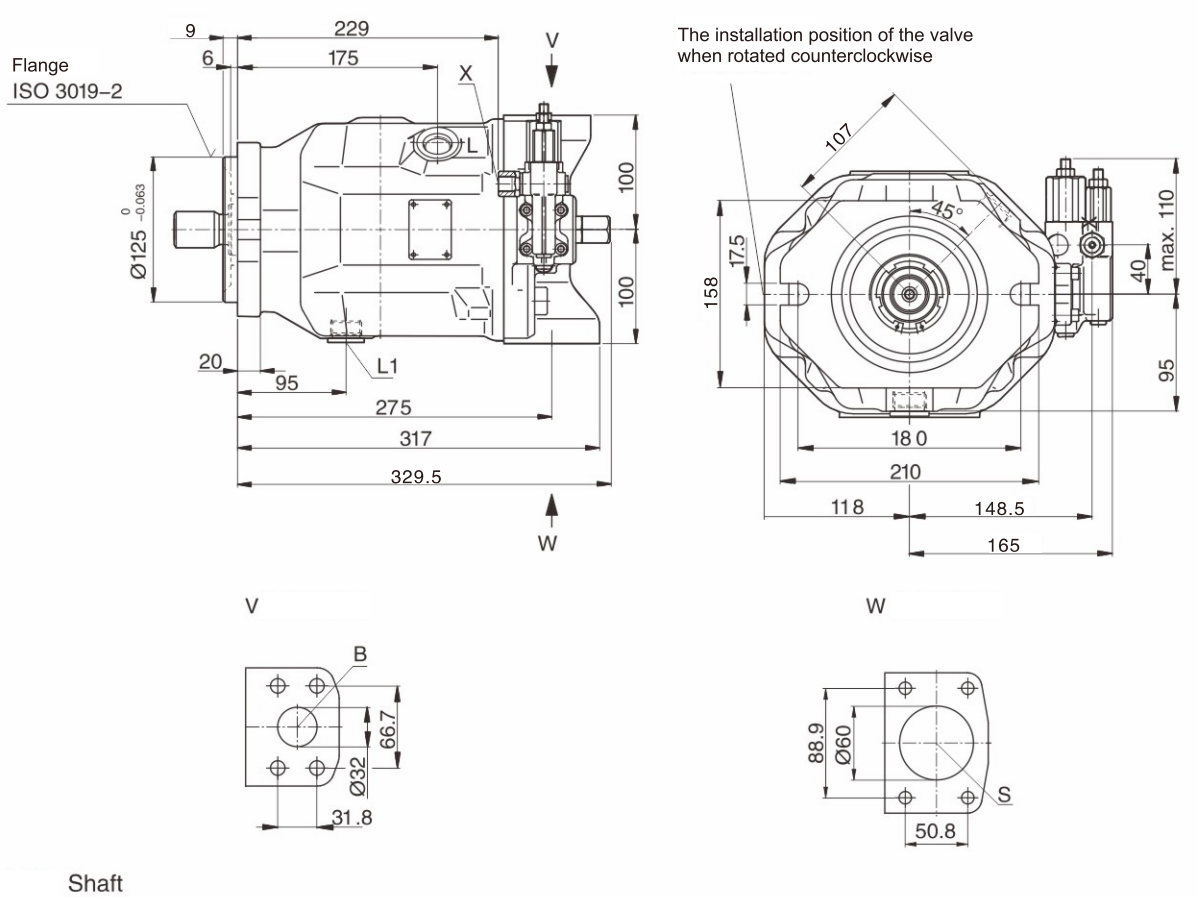


port 11（Control devices DG,DFLR, DLR）

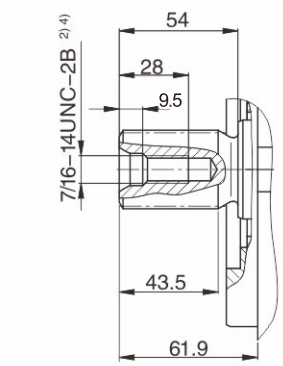




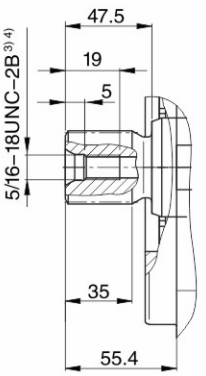
Dimensions size 100 Flange A (Control devices DR, DRG, DFR/DFR1)



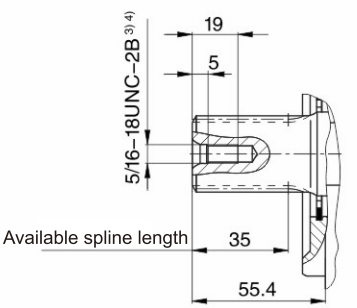
S spline shaft, 1 1/2 in 17T 12/24DP[1)] (SAE J744)



U spline shaft, 1 1/4 in 14T 12/24DP[1)] (SAE J744)



W spline shaft, 1 1/4 in 14T 12/24DP[1)2)] (SAE J744)



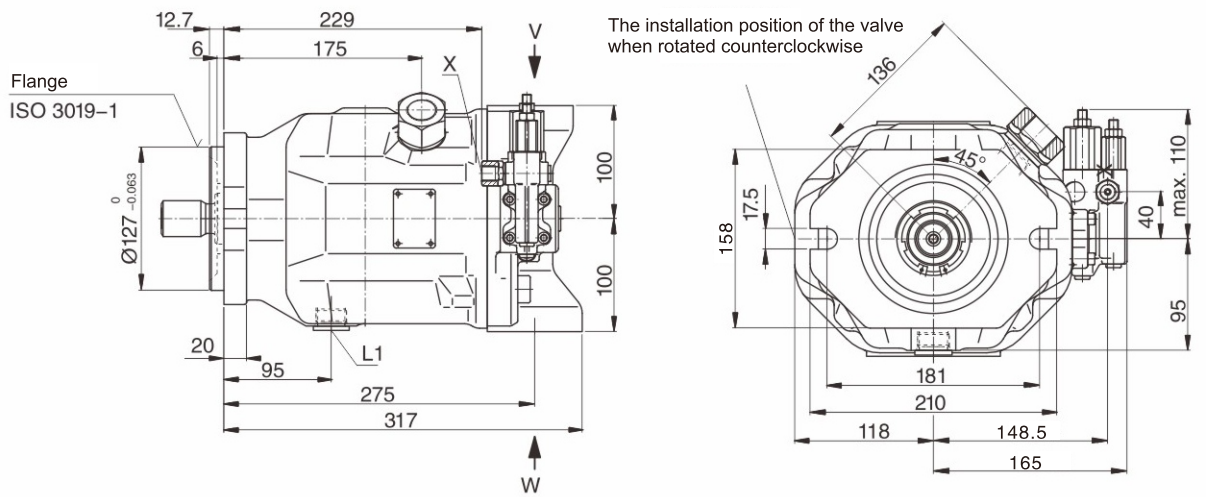
Ports

B	Outlet port	Flange SAE J518 1 1/4in (High–pressure series) Fixing thread M14 19
S	Suction port	Flange SAE J518 2 1/2in (Standard series) Fixing thread M12 17
L	Drain port	M27 x 2 16
L1	Drain port	M27 x 2 16
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12 For DG Control

Dependent on the installation position,port L or port L1 must be connected.

Dimensions size 100 Flange C (Control devices DR, DRG, DFR/DFR1)

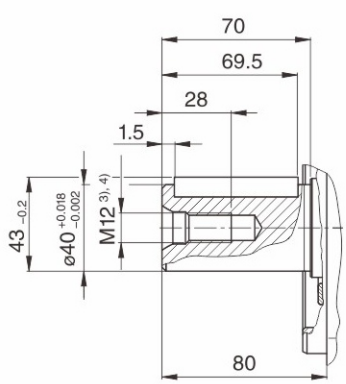
Port 12 (Control devices DG, DFLR, DLR)



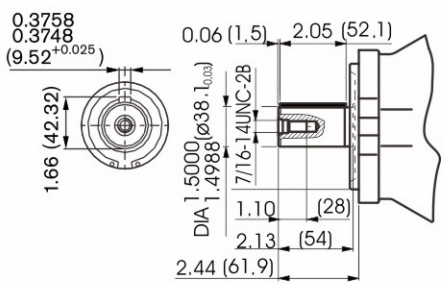


Shaft

P Plain key shaft DIN6885, A12 × 8 × 68



K Plain key shaft, Parallel with key ISO 3019–1 38–1



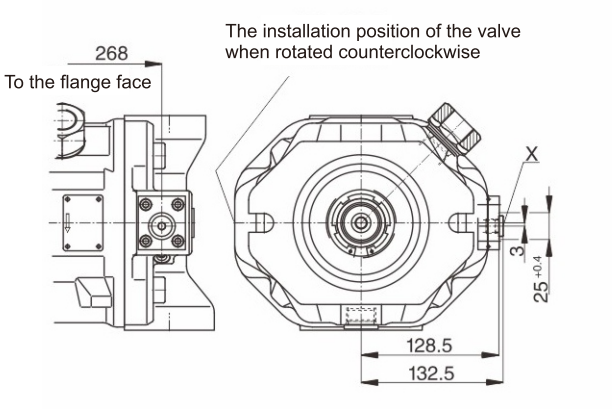
Ports

B	Outlet port	Flange SAE J518 1 1/4in (High–pressure series) Fixing thread 1/2–13UNC;19 deep
S	Suction port	Flange SAE J518 2 1/2in (Standard series) Fixing thread 1/2–13UNC;27 deep
L	Drain port	M27 x 1.5 14
L1	Drain port	1/16–12unf–2B 18
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12 For DG Control

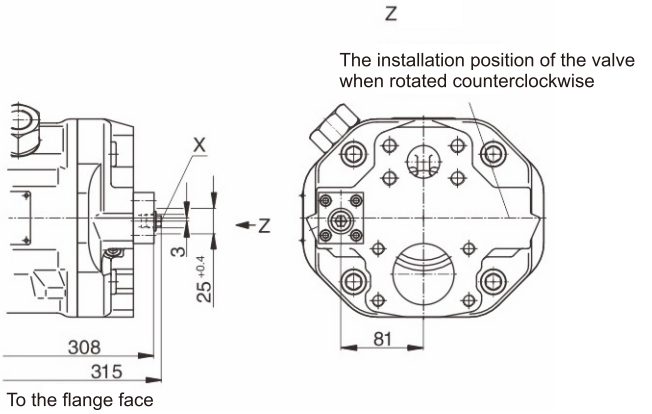
Dependent on the installation position,port L or port L1 must be connected.

Dimensions size 100

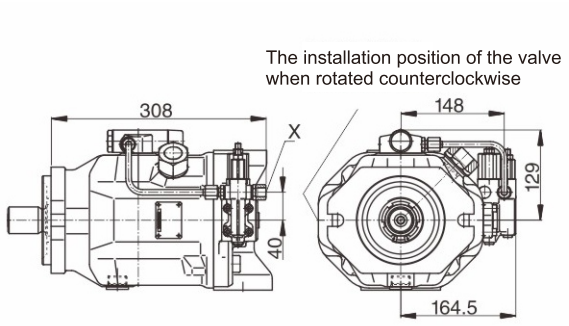
Control device DG port 12



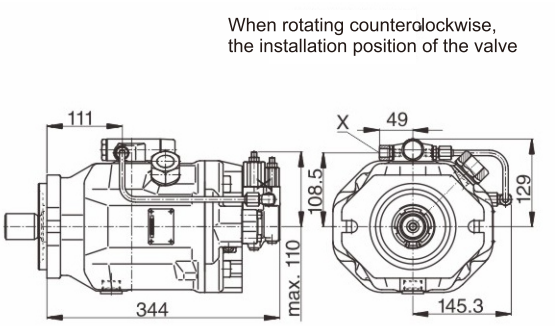
Control device DG port 11



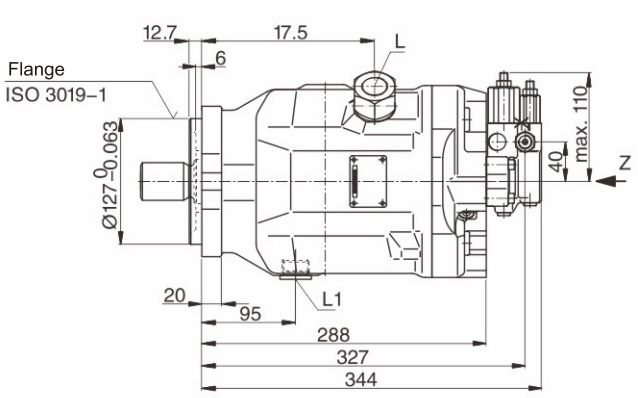
Control device DFLR, DLR port 12

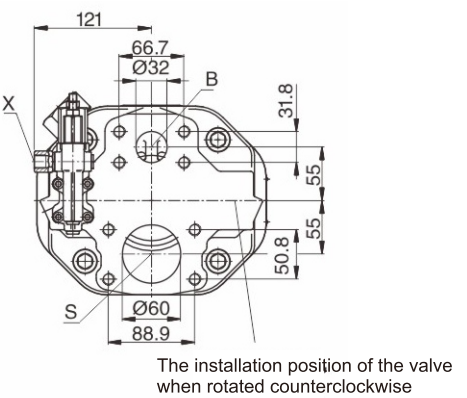


Control device DFLR, DLR port 11

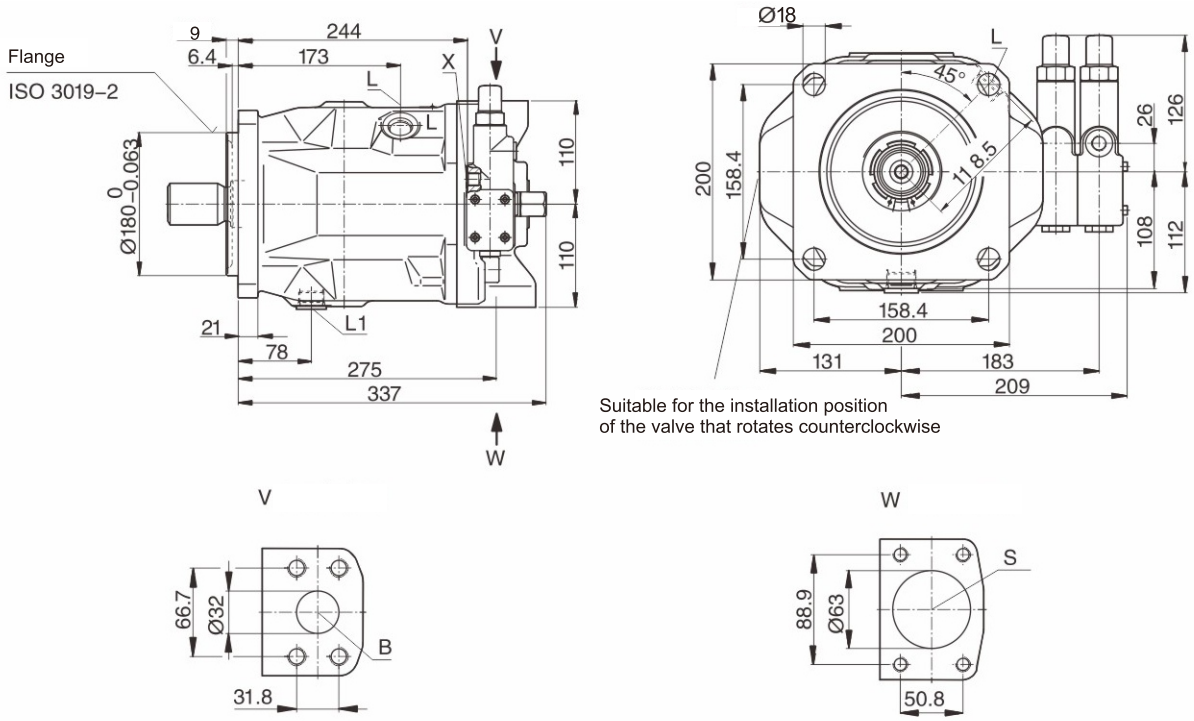


port 11（Control devices DG,DFLR, DLR）





Dimensions size 140 Flange B (Control devices DR, DRG, DFR/DFR1)

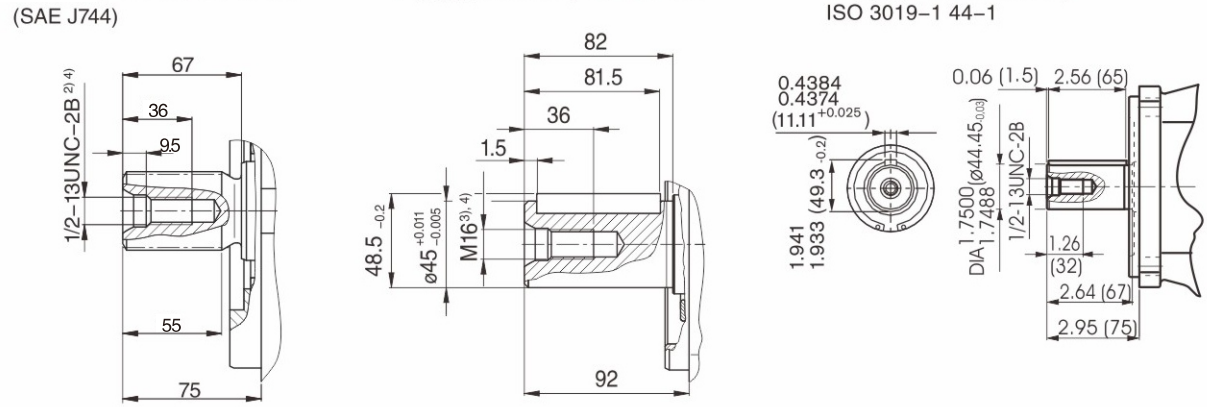


Shaft

S spline shaft , 1 3/4 in 13T 8/16DP[1] (SAE J744)

P Plain key shaft DIN6885, A14 × 9 × 80

K Plain key shaft Parallel with key ISO 3019–1 44–1



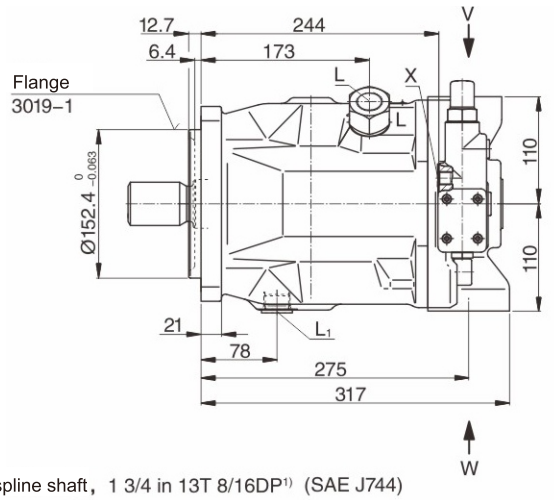
Ports

B	Outlet port	Flange SAE J518 1 1/4in (High–pressure series) Fixing thread M14 19
S	Suction port	Flange SAE J518 2 1/2in (Standard series) Fixing thread M12 17
L	Drain port	M27 x 2 16
L1	Drain port	M27 x 2 16
X	Control pressure	M14 x 1.5 12
X1	Control pressure	G1/4 12 For DG Control

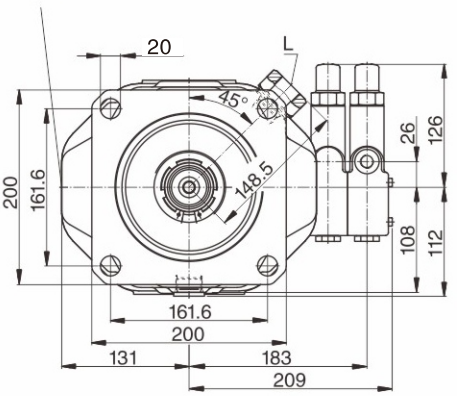
Dependent on the installation position,port L or port L1 must be connected.

Dimensions size 140 Flange D (Control devices DR, DRG, DFR/DFR1)

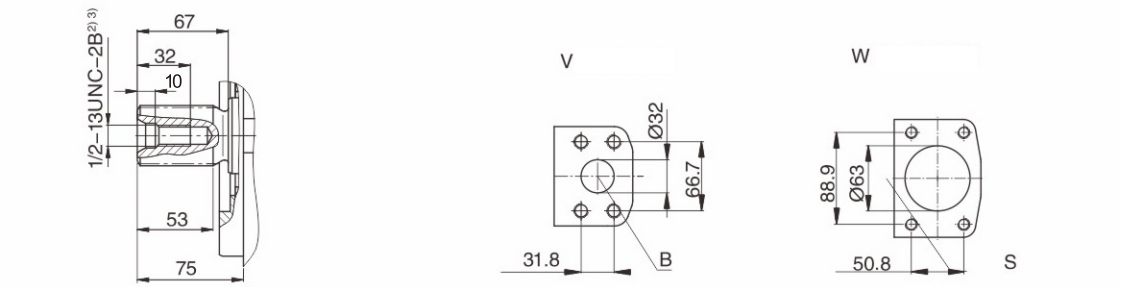
port 12 (Control devices DG,DR,DFLR, DLR)



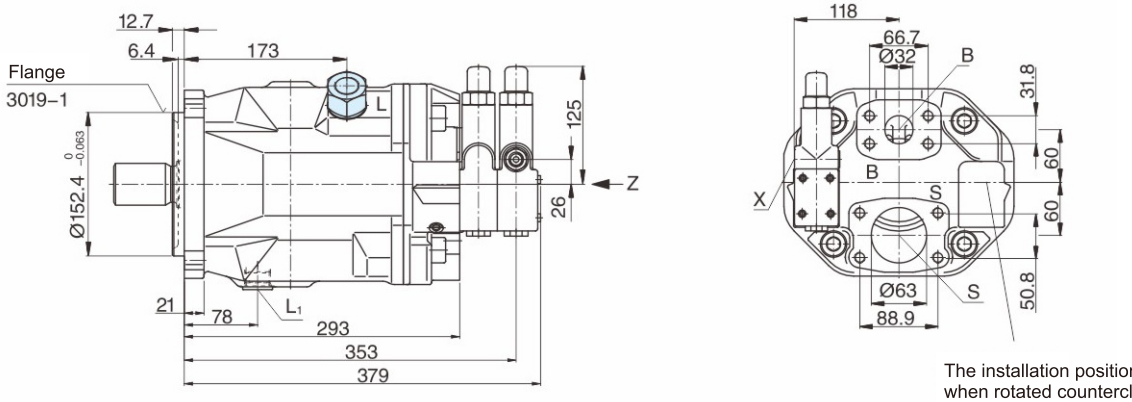
The installation position of the valve when rotated counterclockwise



S spline shaft, 1 3/4 in 13T 8/16DP[1] (SAE J744)



port 11 (Control devices DG,DR,DFLR, DLR)



The installation position of the valve when rotated counterclockwise

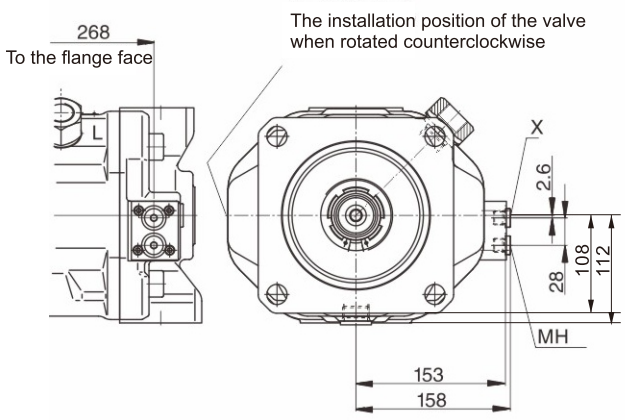
Ports

B	Outlet port	Flange SAE J518 1 1/4in (High–pressure series)Fixing thread 1/2–13UNC;24 deep
S	Suction port	Flange SAE J518 2 1/2in (Standard series) Fixing thread 1/2–13UNC;24 deep
L	Drain port	M27 x 2 16
L1	Drain port	1 1/16–12UNF–2B 18
X	Control pressure	M14 x 1.5 12
X1	Control pressure	M14 x 1.5 12 For DG Control

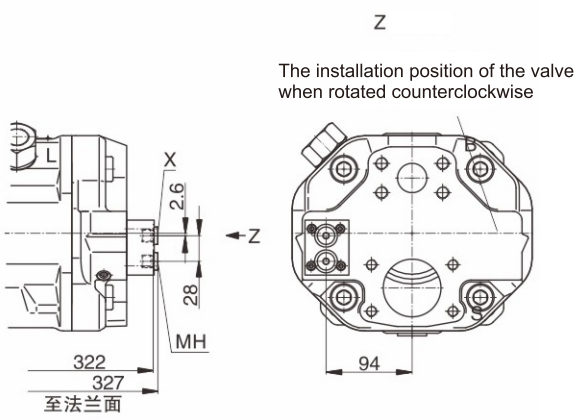
Dependent on the installation position,port L or port L1 must be connected.

Dimensions size 140

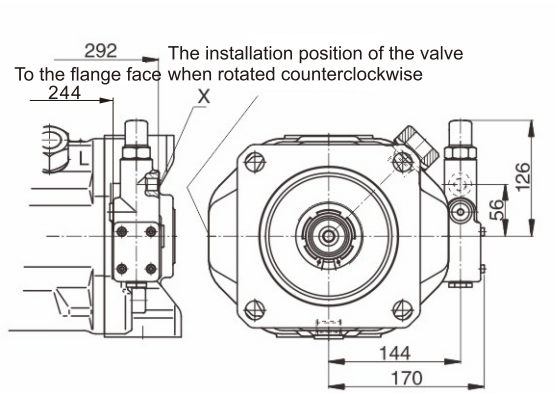
Control device DG port 12



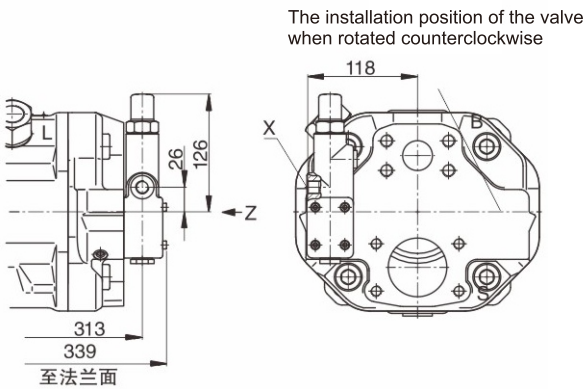
Control device DG port 11



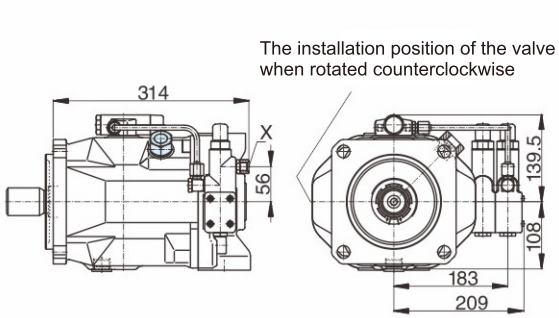
Control device DR, DRG port 12



Control device DR, DRG port 11



Control device DFLR, DLR port 12



Control device DFLR, DLR port 11

