

# Axial piston variable pump A10VO Series 52 and 53

## Americas



- ▶ For machines with medium pressure requirements
- ▶ Sizes 10 to 100
- ▶ Nominal pressure 3600 psi (250 bar)
- ▶ Maximum pressure 4550 psi (315 bar)
- ▶ Open circuit

### Features

- ▶ Variable pump with axial piston rotary group in swashplate design for hydrostatic drives in open circuit.
- ▶ Flow is proportional to drive speed and displacement.
- ▶ The flow can be infinitely varied by adjusting the swashplate angle.
- ▶ Stable bearing for long service life
- ▶ High permissible drive speed
- ▶ Favorable power-to-weight ratio – compact dimensions
- ▶ Low noise
- ▶ Excellent suction characteristics
- ▶ Electro-hydraulic pressure control
- ▶ Power control
- ▶ Electro-proportional swivel angle control
- ▶ Short control response times

## Type code series 52

01	02	03	04	05	06	07	08	09	10	11	12
<b>A10V(S)</b>	<b>O</b>			<b>/</b>	<b>52</b>		<b>-</b>	<b>V</b>			

<b>Axial piston unit</b>									<b>10</b>	<b>28</b>	<b>45</b>	<b>60</b>	<b>85</b>	
01	Swashplate design, variable, nominal pressure 3600 psi (250 bar), maximum pressure 4450 psi (315 bar)								●	-	-	-	-	<b>A10VS</b>
									-	●	●	●	●	<b>A10V</b>

<b>Operating mode</b>											
02	Pump, open circuit										<b>O</b>

<b>Size (NG)</b>													
03	Geometric displacement, see table of values on page 10								<b>10</b>	<b>28</b>	<b>45</b>	<b>60</b>	<b>85</b>

<b>Control device</b>															
04	Pressure controller	hydraulic							●	●	●	●	●	<b>DR</b>	
	with flow controller	hydraulic	X-T open						●	●	●	●	●	<b>DFR</b>	
			X-T plugged						●	●	●	●	●	<b>DFR1</b>	
	with pressure cut-off	hydraulic	remote controlled							●	●	●	●	●	<b>DRG</b>
			electric	negative control						-	●	●	●	●	<b>ED71</b>
										-	●	●	●	●	<b>ED72</b>
		electric	positive control							-	●	●	●	●	<b>ER71</b>
									-	●	●	●	●	<b>ER72</b>	
									-	○	○	○	●	<b>EF..<sup>1)</sup></b>	

<b>Series</b>									<b>10</b>	<b>28</b>	<b>45</b>	<b>60</b>	<b>85</b>	
05	Series 5, index 2								●	●	●	●	●	<b>52</b>

<b>Direction of rotation</b>														
06	Viewed on drive shaft	clockwise												<b>R</b>
		counter-clockwise												<b>L</b>

<b>Sealing material</b>											
07	FKM (fluoroelastomer)										<b>V</b>

<b>Drive shaft</b>														
08	Splined shaft ISO 3019-1	Standard shaft								●	●	●	●	<b>S</b>
		similar to shaft "S" however for higher torque								-	●	●	●	<b>R</b>
		reduced diameter, limited suitability for through drive								●	●	●	●	<b>U</b>
		similar to shaft "U", however for higher torque only conditionally suitable for mounting with through drive. For mounting options, see page 73								-	●	●	●	<b>W</b>
	Parallel keyed shaft ISO 3019-1 limited suitability for through drive									●	●	●	●	<b>K</b>
	Tapered with Woodruff key									-	●	●	●	<b>C</b>

<b>Mounting flange</b>														
09	ISO 3019-1 (SAE)	2-hole								●	●	●	●	<b>C</b>
		4-hole								-	-	-	●	<b>D</b>

1) See data sheet 92709 for precise specification

01	02	03	04	05	06	07	08	09	10	11	12
<b>A10V(S)</b>	<b>O</b>		<b>/</b>	<b>52</b>		<b>-</b>	<b>V</b>				

**Working port**

						10	28	45	60	85		
10	SAE flange ports	rear				not for through drive	-	●	●	●	●	61
	Fastening thread						-	●	●	●	●	62
	UNC	laterally opposite				for through drive	-	●	●	●	●	
	Threaded port	rear				not for through drive	●	●	●	-	-	64
	UNF											

**Through drive** (for mounting options, see page 73)

11	Flange ISO 3019-1	Hub for splined shaft <sup>1)</sup>										
	Diameter	Diameter										
	without through drive						●	●	●	●	●	N00
	82-2 (A)	5/8 in		9T 16/32DP			-	●	●	●	●	K01
		3/4 in		11T 16/32DP			-	●	●	●	●	K52
	101-2 (B)	7/8 in		13T 16/32DP			-	●	●	●	●	K68
		1 in		15T 16/32DP			-	-	●	●	●	K04
	127-4 (C)	1 1/4 in		14T 12/24DP			-	-	-	●	●	K15
		1 1/2 in		17T 12/24DP			-	-	-	-	●	K16
	127-2 (C)	1 1/4 in		14T12/24DP			-	-	-	-	●	K07
		1 1/2 in		17T 12/24DP			-	-	-	-	●	K24

**Connector for solenoids**

12	Without connector (without solenoid, only for hydraulic controls, without signs)						●	●	●	●	●	
	DEUTSCH - molded connector, 2-pin, without suppressor diode (for electric control)						-	●	●	●	●	P

● = Available    ○ = On request    - = Not available

**Notice**

- ▶ Observe the general project planning notes on page 79 and the project planning notes regarding each control device.
- ▶ In addition to the type code, please specify the relevant technical data.

<sup>1)</sup> In accordance with ANSI B92.1a

## Technical data

Size		NG	10	18	28	45	60	63	72	85	100
Displacement, geometric, per revolution		$V_g$ in <sup>3</sup> (cm <sup>3</sup> )	0.64 (10.5)	1.10 (18)	1.75 (28)	2.75 (45)	3.66 (60)	3.84 (63)	4.39 (72)	5.18 (85)	6.10 (100)
Maximum rotational speed <sup>1)</sup>	at $V_{g \max}$	$n_{\text{nom}}$ rpm	3600	3300	3000	2600 <sup>2)</sup>	2700	2600	2600	2500	2300
	at $V_g < V_{g \max}$	$n_{\text{max perm}}$ rpm	4320	3960	3600	3120	3140	3140	3140	3000	2500
Flow	at $n_{\text{nom}}$ and $V_{g \max}$	$q_v$ gpm (l/min)	9.7 (37)	15.6 (59)	22 (84)	31 (117)	42 (162)	43 (163)	49.4 (187)	55 (212)	60 (230)
	at $n_E = 1500$ rpm	$q_{vE}$ gpm (l/min)	4 (15)	7.1 (27)	1.1 (42)	18 (68)	24 (90)	25.1 (95)	28.5 (108)	34 (128)	39 (150)
Power	at $n_{\text{nom}}$ , $V_{g \max}$ and $\Delta p = 3600$ psi (250 bar)	$P$ HP (kW)	22 (16)	34 (25)	47 (35)	65 (49)	88 (65)	90 (68)	103 (77)	119 (89)	130 (96)
	at $n_E = 1500$ rpm	$P_E$ HP (kW)	9.4 (7)	15 (11)	24 (18)	38 (28)	50 (37)	52 (39)	60 (45)	71 (53)	84 (62)
Torque	at $V_{g \max}$ and $\Delta p = 3600$ psi (250 bar)	$M$ lb-ft (Nm)	31 (42)	52 (71)	82 (111)	132 (179)	175 (238)	184 (250)	211 (286)	247 (338)	293 (398)
	at $V_{g \max}$ and $\Delta p = 1440$ psi (100 bar)	$M$ lb-ft (Nm)	13 (17)	21 (29)	33 (45)	53 (72)	70 (95)	74 (100)	84 (114)	102 (135)	117 (159)
Rotary stiffness of drive shaft	S	$c$ lb-ft/rad (Nm/rad)	6760 (9200)	8082 (11000)	16400 (22300)	27560 (37500)	48100 (65500)	48100 (65500)	48100 (65500)	105100 (143000)	105100 (143000)
	R	$c$ lb-ft/rad (Nm/rad)	– (–)	10870 (14800)	19400 (26300)	30240 (41000)	51200 (69400)	51200 (69400)	51200 (69400)	112773 (152900)	112773 (152900)
	U	$c$ lb-ft/rad (Nm/rad)	5020 (6800)	5870 (8000)	12317 (16700)	22130 (30000)	36290 (49200)	36290 (49200)	36290 (49200)	75900 (102900)	75900 (102900)
	W	$c$ lb-ft/rad (Nm/rad)	– (–)	– (–)	14678 (19900)	25370 (34400)	39830 (54000)	39830 (54000)	39830 (54000)	86960 (117900)	86960 (117900)
	K	$c$ lb-ft/rad (Nm/rad)	7965 (10800)	9810 (13300)	19770 (26800)	32380 (43900)	54506 (73900)	54506 (73900)	54506 (73900)	120518 (163400)	120518 (163400)
	C	$c$ lb-ft/rad (Nm/rad)	– (–)	– (–)	– <sup>4)</sup>	– <sup>4)</sup>	– <sup>4)</sup>	–	–	– <sup>4)</sup>	– (–)
Moment of inertia for rotary group		$J_{TW}$ lbs-ft <sup>2</sup> (kgm <sup>2</sup> )	0.0142 (0.0006)	0.2207 (0.0009)	0.0403 (0.0017)	0.0783 (0.003)	0.1329 (0.0056)	0.1329 (0.0056)	0.1329 (0.0056)	0.2848 (0.012)	0.2848 (0.012)
Maximum angular acceleration <sup>3)</sup>		$\alpha$ rad/s <sup>2</sup>	8000	6800	5500	4000	3300	3300	3300	2700	2700
Case volume		$V$ gal (L)	0.05 (0.2)	0.06 (0.25)	0.08 (0.3)	0.13 (0.5)	0.21 (0.8)	0.21 (0.8)	0.21 (0.8)	0.26 (1)	0.26 (1)
Weight <b>without</b> through drive (approx.)		$m$ lbs (kg)	17 (8)	25 (11.5)	33 (15)	40 (18)	48.5 (22)	48.5 (22)	48.5 (22)	79 (36)	79 (36)
Weight <b>with</b> through drive (approx.)		lbs (kg)	– (–)	28.6 (13)	40 (18)	53 (24)	62 (28)	62 (28)	62 (28)	99 (45)	99 (45)

1) The values are applicable:  
 – At an abs. pressure  $p_{\text{abs}} = 15$  psi (1 bar) at the suction port **S**  
 – for the optimum viscosity range from  $\nu_{\text{opt}} = 36$  to 16 cSt (mm<sup>2</sup>/s)  
 – with hydraulic fluid on the basis of mineral oils

2) See diagram on page 9 at speed increase up to  $n_{\text{max perm}}$ .

3) The data are valid for values between the minimum required and maximum permissible rotational speed. It applies for external stimuli (e.g. diesel engine 2 to 8 times rotary frequency, cardan shaft twice the rotary frequency). The limit value is only valid for a single pump. The load capacity of the connection parts must be considered.

4) On Request

Determining the operating characteristics		
Flow	$q_v = \frac{V_g \times n \times \eta_v}{231 (1000)}$	[gpm (l/min)]
Torque	$M = \frac{V_g \times \Delta p}{24 (20) \times \pi \times \eta_{mh}}$	[lb-ft (Nm)]
Power	$P = \frac{2 \pi \times M \times n}{33000 (60000)} = \frac{q_v \times \Delta p}{1714 (600) \times \eta_t}$	[HP (kW)]


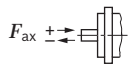
#### Key

$V_g$	Displacement per revolution [in <sup>3</sup> (cm <sup>3</sup> )]
$\Delta p$	Differential pressure [psi (bar)]
$n$	Rotational speed [rpm]
$\eta_v$	Volumetric efficiency
$\eta_{hm}$	Hydraulic-mechanical efficiency
$\eta_t$	Total efficiency ( $\eta_t = \eta_v \times \eta_{hm}$ )

#### Notice

- ▶ Theoretical values, without efficiency and tolerances; values rounded
- ▶ Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Bosch Rexroth recommends checking the load by means of experiment or calculation / simulation and comparison with the permissible values.

**Permissible radial and axial forces on the drive shaft**

Size	NG	10	18	28	45	60/63	72	85	100	
Radial force maximum at a/2	 $\pm F_{q \max}$	lbf (N)	56 (250)	78 (350)	270 (1200)	337 (1500)	382 (1700)	337 (1500)	450 (2000)	450 (2000)
Axial force maximum	 $+ F_{ax \max}$	lbf (N)	90 (400)	157 (700)	225 (1000)	337 (1500)	450 (2000)	337 (1500)	675 (3000)	675 (3000)

**Notice**

► The values given are maximum values and do not apply to continuous operation. All loads of the drive shaft reduce the bearing service life.

**Permissible input and through-drive torques**

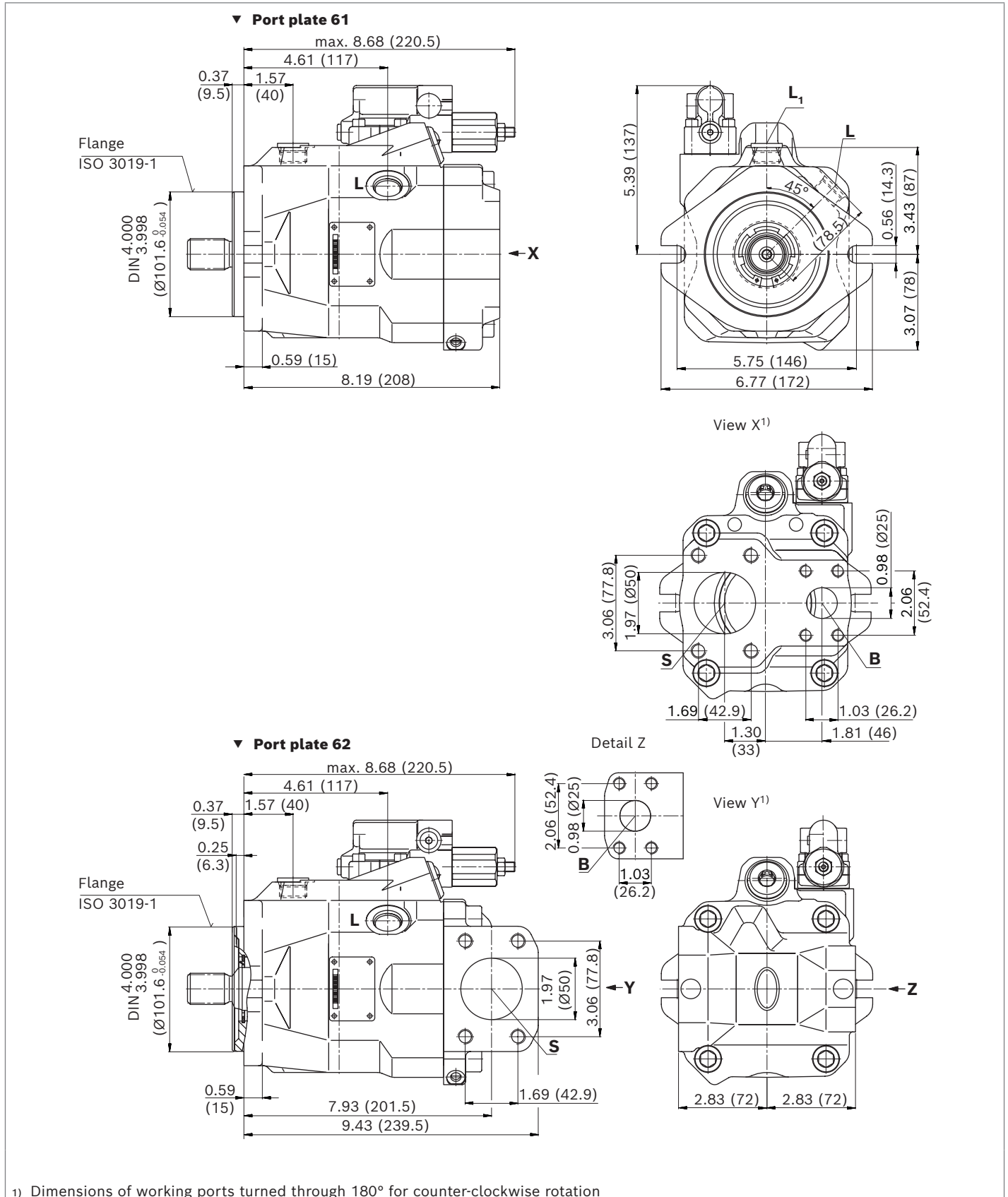
Size			10	18	28	45	60/63	72	85	100
Torque at $V_{g \max}$ and $\Delta p = 3600 \text{ psi (250 bar)}^1$	$M_{max}$	lbft (Nm)	31 (42)	52 (71)	82 (111)	132 (179)	184 (250)	211 (286)	247 (338)	293 (398)
Input torque at drive shaft, maximum <sup>2)</sup>										
S	$M_{E \max}$	lb-ft (Nm)	93 (126)	91 (124)	146 (198)	235 (319)	464 (630)	464 (630)	853 (1157)	853 (1157)
	DIA	inch	3/4	3/4	7/8	1	1 1/4	1 1/4	1 1/2	1 1/2
R	$M_{E \max}$	lb-ft (Nm)	– (–)	118 (160)	184 (250)	295 (400)	479 (650)	479 (650)	895 (1215)	895 (1215)
	DIA	inch	–	3/4	7/8	1	1 1/4	1 1/4	1 1/2	1 1/2
U	$M_{E \max}$	lb-ft (Nm)	44 (60)	43 (59)	77 (105)	139 (188)	226 (306)	226 (306)	463 (628)	463 (628)
	DIA	inch	5/8	5/8	3/4	7/8	1	1	1 1/4	1 1/4
W	$M_{E \max}$	lb-ft (Nm)	– (–)	– (–)	103 (140)	162 (220)	292 (396)	282 (383)	479 (650)	479 (650)
	DIA	inch	–	–	3/4	7/8	1	1	1 1/4	1 1/4
K	$M_{E \max}$	lb-ft (Nm)	78 (106)	76 (104)	107 (145)	156 (212)	325 (441)	325 (441)	553 (750)	553 (750)
	DIA	inch	3/4	3/4	7/8	1.000	1 1/4	1 1/4	1 1/2	1 1/2
C	$M_{E \max}$	lb-ft (Nm)	– (–)	– (–)	107 (145)	156 (212)	325 (441)	– (–)	553 (750)	– (–)
Maximum through-drive torque										
S	$M_{D \max}$	lb-ft (Nm)	– (–)	80 (108)	118 (160)	235 (319)	357 (484)	357 (484)	515 (698)	515 (698)
R	$M_{D \max}$	lb-ft (Nm)	– (–)	89 (120)	130 (176)	270 (365)	357 (484)	357 (484)	515 (698)	515 (698)
U	$M_{D \max}$	lb-ft (Nm)	– (–)	43 (59)	77 (105)	139 (188)	226 (306)	226 (306)	463 (628)	463 (628)
W	$M_{D \max}$	lb-ft (Nm)	– (–)	– (–)	103 (140)	162 (220)	292 (396)	282 (383)	479 (650)	479 (650)
K	$M_{D \max}$	lb-ft (Nm)	– (–)	76 (104)	107 (145)	156 (212)	325 (441)	325 (441)	– (–)	553 (750)

1) Efficiency not considered

2) For drive shafts with no radial force

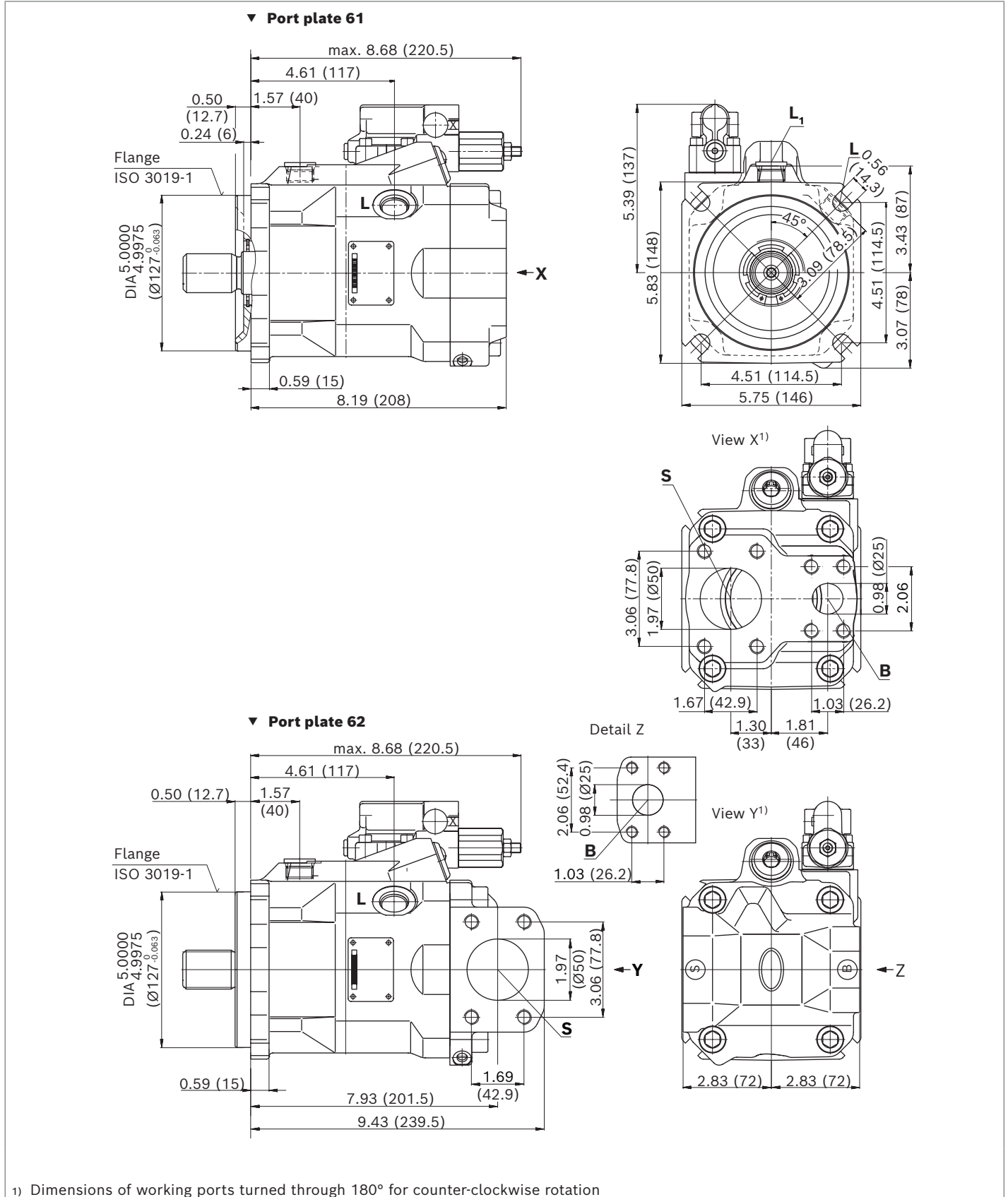
**Dimensions, size 60**

**DR – Hydraulic pressure controller; Clockwise rotation, mounting flange C series 52**



**Dimensions, size 60**

**DR – Hydraulic pressure controller; Clockwise rotation, mounting flange D series 52**



1) Dimensions of working ports turned through 180° for counter-clockwise rotation