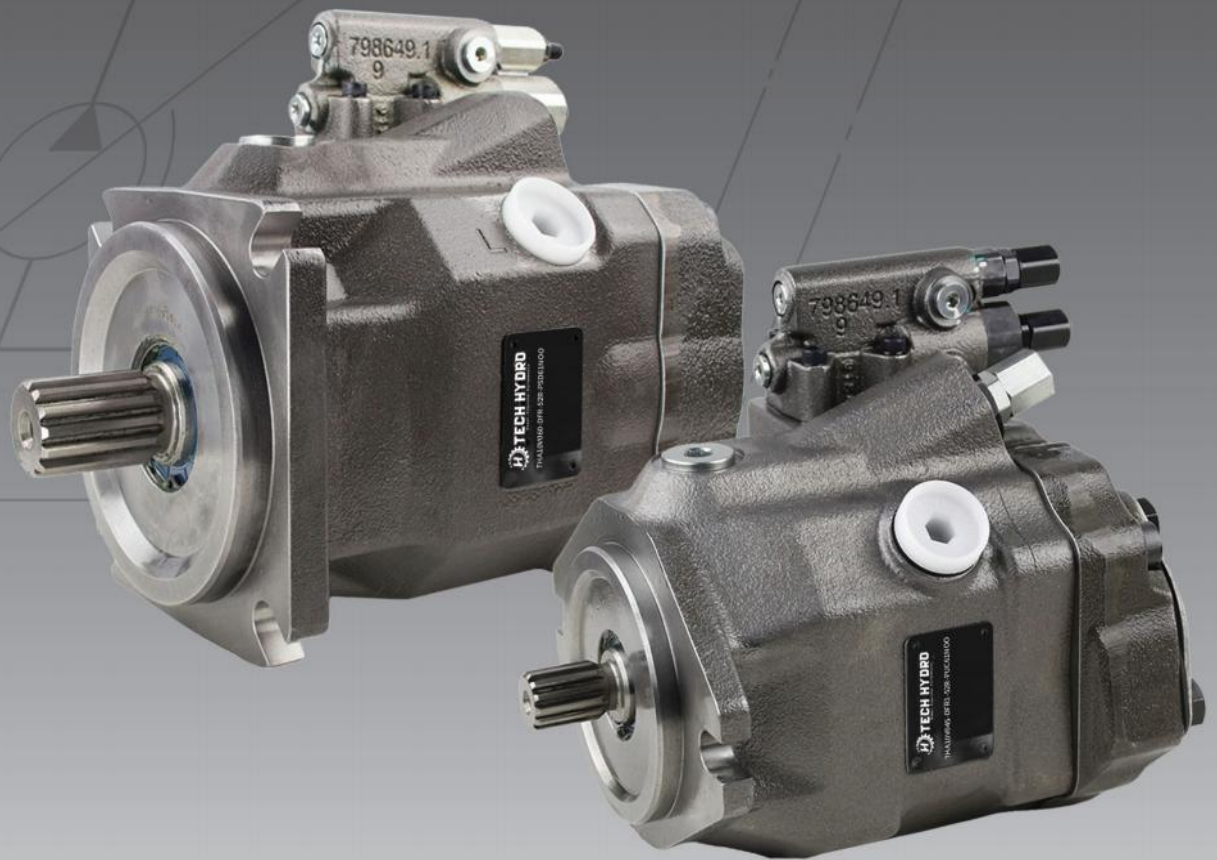


Variable Displacement Axial Piston Pump

THA10VO

Series 52 and 53



Tech Hydro Variable Piston Pump THA10VO Series 52 and 53 Rev. - (25/01/2023)

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THA10V(S)O SERIES 52 DESIGNATION & ORDERING CODE
SERIES 52

01	02	03	04	05	06	07	08	09	10	11	12
THA10V(S)	O			/	52	-					

Axial piston unit		10	28	45	60	85	
01	Swashplate design, variable, nominal pressure 3600 psi (250 bar), maximum pressure 4450 psi (315 bar)	●	-	-	-	-	THA10VS
		-	●	●	●	●	THA10V

Operating mode		
02	Pump, open circuit	O

Size (NG)		10	28	45	60	85
03	Geometric displacement, see table of values on page 11					

Control device		10	28	45	60	85	
04	Pressure controller	●	●	●	●	●	DR
	with flow controller	●	●	●	●	●	DFR
	X-T plugged	●	●	●	●	●	DFR1
	with flushing function	-	●	●	●	●	DRSC
	without flushing function	-	●	●	●	●	DRSC
	with pressure cut-off	●	●	●	●	●	DRG
	hydraulic	●	●	●	●	●	DRG
	electric	-	●	●	●	●	ED71
	negative control	-	●	●	●	●	ED72
	U = 12 V	-	●	●	●	●	ED72
	U = 24 V	-	●	●	●	●	ED72
	electric	-	●	●	●	●	ER71
	positive control	-	●	●	●	●	ER71
	U = 12 V	-	●	●	●	●	ER72
	U = 24 V	-	●	●	●	●	ER72
	Differential pressure control	-	○	○	○	○	EF. ¹⁾
	electric control (negative control)	-	○	○	○	○	EF. ¹⁾

Series		10	28	45	60	85
05	Series 5, index 2	●	●	●	●	●

Direction of rotation		
06	Viewed on drive shaft	clockwise
		counter-clockwise

Sealing material		
07	Buna-N	P
	FKM (fluoroelastomer)	V

Drive shaft		10	28	45	60	85
08	Parallel keyed shaft ISO 3019-1 limited suitability for through drive	●	●	●	●	●
		03/4" 3/16" key	07/8" 1/4" key	01" 1/4" key	01-1/4" 5/16" key	01-1/2" 3/8" key
	Splined shaft	●	●	●	●	●
	Standard shaft	03/4" 11T	07/8" 13T	01" 15T	01-1/4" 14T	01-1/2" 17T
	ISO 3019-1	●	●	●	●	●
	similar to shaft "S" however for higher torque	-	07/8" 13T	01" 15T	01-1/4" 14T	01-1/2" 17T
	reduced diameter, limited suitability for through drive	05/8" 9T	03/4" 11T	07/8" 13T	01" 15T	01-1/4" 14T
	similar to shaft "U", however for higher torque only conditionally suitable for mounting with through drive. For mounting options, see page 77	-	03/4" 11T	07/8" 13T	01" 15T	01-1/4" 14T
08	Tapered with Woodruff key	-	07/8" (1.8) 1/4" key	07/8" (1.8) 1/4" key	01-1/4" (1.8) 5/16" key	-
	Parallel keyed shaft DIN 6885 limited suitability for through drive	●	-	-	-	-

● = Available ○ = On request - = Not available

THA10V(S)O SERIES 52 DESIGNATION & ORDERING CODE

SERIES 52

01	02	03	04		05	06		07	08	09	10	11	12
THA10V(S)	O			/	52		-						

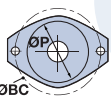
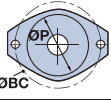
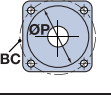
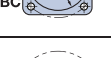
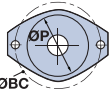
Mounting flange

			10	28	45	60	85	
09	ISO 3019-2 (ISO)	2-hole	●	—	—	—	—	A
	ISO 3019-1 (SAE)	2-hole	●	●	●	●	●	C
		4-hole	—	—	—	●	—	D

Working port

						10	28	45	60	85	
10	SAE flange ports Fastening thread UNC	rear		B S	not for through drive	—	●	●	●	●	61
		laterally opposite		B S	for through drive	—	●	●	●	●	62
	Threaded port UNF	rear		B S	not for through drive	●	●	●	—	—	64
	SAE flange port fastening thread, metric	rear		B S	not for through drive	—	●	●	●	●	11
		at side, opposite		B S	for through drive	—	●	●	●	●	12
		at side, offset 90°		B S	not for through drive, available only for counter-clockwise direction of rotation	—	—	●	—	—	13
	Threaded port, metric	rear		B S	not for through drive	●	—	—	—	—	14

Through drive (for mounting options see page 77)

11	Flange ISO 3019-1 Diameter	Hub for splined shaft ¹⁾ Diameter		10	28	45	60	85	
	without through drive			●	●	●	●	●	N00
	82-2 (A) Pilot Dia. ØP: 3.25" Bolt Circle Dia. ØBC: 4.19"	5/8 in 9T 16/32DP		—	●	●	●	●	K01
		3/4 in 11T 16/32DP		—	●	●	●	●	K52
	101-2 (B) Pilot Dia. ØP: 4.00" Bolt Circle Dia. ØBC: 5.75"	7/8 in 13T 16/32DP		—	●	●	●	●	K68
		1 in 15T 16/32DP		—	—	●	●	●	K04
	127-4 (C) Pilot Dia. ØP: 5.00" Bolt Circle Dia. ØBC: 6.375"	1-1/4 in 14T 12/24DP		—	—	—	●	●	K15
		1-1/2 in 17T 12/24DP		—	—	—	—	●	K16
	127-2 (C) Pilot Dia. ØP: 5.00" Bolt Circle Dia. ØBC: 7.125"	1-1/4 in 14T 12/24DP		—	—	—	—	●	K07
		1-1/2 in 17T 12/24DP		—	—	—	—	●	K24

Series

		10	28	45	60	85	
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 83 and the project planning notes regarding each control device.
- In addition to the type code, please specify the relevant technical data.

1) In accordance with ANSI B92.1a

THA10VO SERIES 53 DESIGNATION & ORDERING CODE

SERIES 53

01	02	03	04		05	06		07	08	09	10	11	12
THA10V	O			/	53		-						

Axial piston unit

18 28 45 63 72 85 100

01	Swashplate design, variable, nominal pressure 3600 psi (250 bar), maximum pressure 4450 psi (315 bar)	•	•	•	•	•	•	•	THA10V
-----------	---	---	---	---	---	---	---	---	---------------

Operating mode

02	Pump, open circuit	O
-----------	--------------------	----------

Size (NG)

03	Geometric displacement, see table of values on page 11	18	28	45	63	72	85	100
-----------	--	----	----	----	----	----	----	-----

Control device

18 28 45 63 72 85 100

04	Pressure controller	hydraulic			•	•	•	•	•	•	•	DR
	with flow controller	hydraulic	X-T open		•	•	•	•	•	•	•	DRF
			X-T plugged	with flushing function	•	•	•	•	•	•	•	DRS
				without flushing function	•	•	•	•	•	•	•	DRSC
	with pressure cut-off	hydraulic	remote controlled		•	•	•	•	•	•	•	DRG
		electric	negative control	U = 12 V	•	•	•	•	•	•	•	ED71
				U = 24 V	•	•	•	•	•	•	•	ED72
		electric	positive control	U = 12 V	•	•	•	•	•	•	•	ER71
				U = 24 V	•	•	•	•	•	•	•	ER72
	Differential pressure control		electric control (negative control)		○	○	○	○	○	•	•	EF.¹⁾
	Power control with pressure cutoff	hydraulic	Beginning of control	from 145 to 510 psi (10 to 35 bar)	•	•	•	•	•	•	•	LA5D
				520 to 1015 psi (36 to 70 bar)	•	•	•	•	•	•	•	LA6D
				1030 to 1520 psi (71 to 105 bar)	•	•	•	•	•	•	•	LA7D
				1535 to 2030 psi (106 to 140 bar)	•	•	•	•	•	•	•	LA8D
				2045 to 3335 psi (141 to 230 bar)	•	•	•	•	•	•	•	LA9D
	remote controlled	hydraulic	Beginning of control	see LA.D	•	•	•	•	•	•	•	LA.DG
	Flow control X-T plugged	hydraulic with flushing function	Beginning of control	see LA.D	•	•	•	•	•	•	•	LA.DS
		hydraulic without flushing function	Beginning of control	see LA.D	•	•	•	•	•	•	•	LA.DC
		Differential pressure control ¹⁾	Beginning of control	see LA.D	○	○	○	○	○	•	•	LA.EF¹⁾
		Electrically overrideable (negative control)	Beginning of control	see LA.D	•	•	•	•	•	•	•	LA.S

• = Available ○ = On request – = Not available

Notice

► Observe the project planning notes regarding each control device.

THA10V0 SERIES 53 DESIGNATION & ORDERING CODE

SERIES 53

01	02	03	04		05	06		07	08	09	10	11	12
THA10V	0			/	53		-						

Control device (continued from previous page)

			18	28	45	63	72	85	100
04	Electro-proportional control positive control								
	with pressure control	$U = 12\text{ V}$		•	•	•	•	•	EP1D
		$U = 24\text{ V}$	•	•	•	•	•	•	EP2D
	with pressure and flow control (load-sensing) X-T open	$U = 12\text{ V}$	•	•	•	•	•	•	EP1DF
		$U = 24\text{ V}$	•	•	•	•	•	•	EP2DF
	with pressure and flow control (load-sensing) X-T plugged	$U = 12\text{ V}$	•	•	•	•	•	•	EP1DS
		$U = 24\text{ V}$	•	•	•	•	•	•	EP2DS
	with electrohydraulic pressure control	$U = 12\text{ V}$	•	•	•	•	•	•	EP1ED
		$U = 24\text{ V}$	•	•	•	•	•	•	EP2ED
	Electro-proportional control positive control								
	with pressure control	$U = 12\text{ V}$	•	•	•	•	•	•	EK1D
		$U = 24\text{ V}$	•	•	•	•	•	•	EK2D
	Pressure and flow control with controller cut-off (load-sensing) X-T open	$U = 12\text{ V}$	•	•	•	•	•	•	EK1DF
		$U = 24\text{ V}$	•	•	•	•	•	•	EK2DF
	Pressure and flow control with controller cut-off (load-sensing) X-T plugged	$U = 12\text{ V}$	•	•	•	•	•	•	EK1DS
		$U = 24\text{ V}$	•	•	•	•	•	•	EK2DS
	Electrohydraulic pressure control with controller cut-off	$U = 12\text{ V}$	•	•	•	•	•	•	EK1ED
		$U = 24\text{ V}$	•	•	•	•	•	•	EK2ED

Series		18	28	45	63	72	85	100
05	Series 5, index 3	•	•	•	•	•	•	53

Direction of rotation

06	Viewed on drive shaft	clockwise	R
		counter-clockwise	L

Sealing material

07	Buna-N	P
	FKM (fluoroelastomer)	V

Drive shaft

08	Parallel keyed shaft ISO 3019-1 limited suitability for through drive		 	03/4" 3/16" key	07/8" 1/4" key	01" 1/4" key	01-1/4" 5/16" key	01-1/4" 5/16" key	01-1/2" 3/8" key	01-1/2" 3/8" key	K
	Splined shaft	Standard shaft	 	03/4" 11T	07/8" 13T	01" 15T	01-1/4" 14T	01-1/4" 14T	01-1/2" 17T	01-1/2" 17T	S
		similar to shaft "S" however for higher torque	 	03/4" 11T	07/8" 13T	01" 15T	01-1/4" 14T	01-1/4" 14T	01-1/2" 17T	01-1/2" 17T	R
	ISO 3019-1	reduced diameter, limited suitability for through drive	 	05/8" 9T	03/4" 11T	07/8" 13T	01" 15T	01" 15T	01-1/4" 14T	01-1/4" 14T	U
		similar to shaft "U", however for higher torque only conditionally suitable for mounting with through drive. For mounting options, see page 77	 	—	—	07/8" 13T	01" 15T	01" 15T	01-1/4" 14T	01-1/4" 14T	W

Mounting flange

			18	28	45	63	72	85	100
09	ISO 3019-1 (SAE)	2-hole	•	•	•	•	•	•	C
		4-hole	—	—	—	•	•	•	D

• = Available ○ = On request — = Not available

THA10VO SERIES 53 DESIGNATION & ORDERING CODE
SERIES 53

01	02	03	04		05	06		07	08	09	10	11	12
THA10V	O			/	53		-						

Working port

						18	28	45	63	72	85	100	
10	SAE flange ports Fastening thread UNC	rear			B S	not for through drive	•	•	•	•	•	•	61
		laterally opposite			B S	for through drive	•	•	•	•	•	•	62
	SAE flange port fastening thread, metric	rear			B S	not for through drive	•	•	•	•	•	•	11
		at side, opposite			B S	for through drive	•	•	•	•	•	•	12
		at side, offset 90°			B S	not for through drive, available only for counter-clockwise direction of rotation	-	-	•	-	-	-	13

Through drive (for mounting options see page 77)

11	Flange ISO 3019-1 Diameter	Hub for splined shaft ¹⁾ Diameter				18	28	45	63	72	85	100	
	without through drive					•	•	•	•	•	•	•	N00
	82-2 (A) Pilot Dia. ØP: 3.25" Bolt Circle Dia. ØBC: 4.19"	5/8 in	9T 16/32DP			•	•	•	•	•	•	•	K01
		3/4 in	11T 16/32DP			•	•	•	•	•	•	•	K52
	101-2 (B) Pilot Dia. ØP: 4.00" Bolt Circle Dia. ØBC: 5.75"	7/8 in	13T 16/32DP			-	•	•	•	•	•	•	K68
		1 in	15T 16/32DP			-	-	•	•	•	•	•	K04
	127-4 (C) Pilot Dia. ØP: 5.00" Bolt Circle Dia. ØBC: 6.375"	1-1/4 in	14T 12/24DP			-	-	-	•	•	•	•	K15
		1-1/2 in	17T 12/24DP			-	-	-	-	-	•	•	K16
	127-2 (C) Pilot Dia. ØP: 5.00" Bolt Circle Dia. ØBC: 7.125"	1-1/4 in	14T 12/24DP			-	-	-	-	-	•	•	K07
		1-1/2 in	17T 12/24DP			-	-	-	-	-	•	•	K24

Series

		18	28	45	63	72	85	100	
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

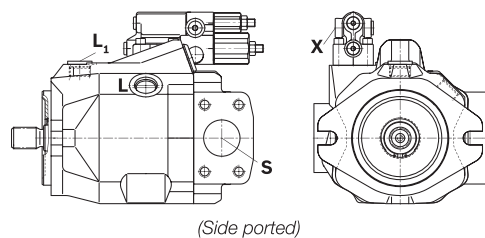
Notice

- Note the project planning notes on page 83.
- In addition to the type code, please specify the relevant technical data when placing your order.

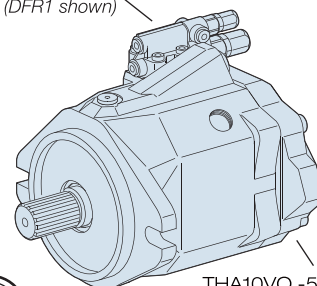
2) In accordance with ANSI B92.1a

STRUCTURAL DRAWING - SERIES 52

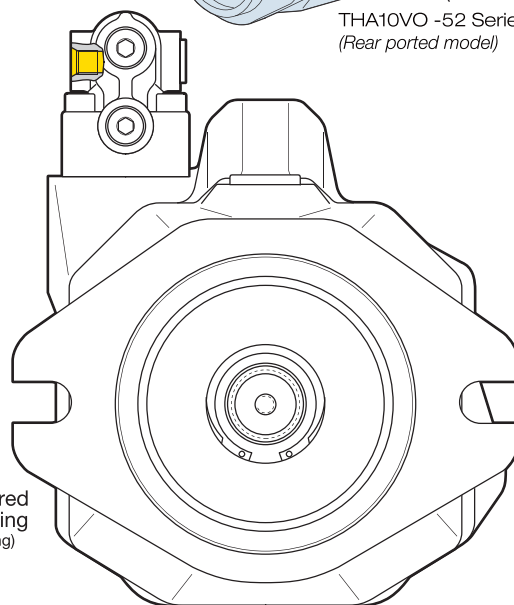
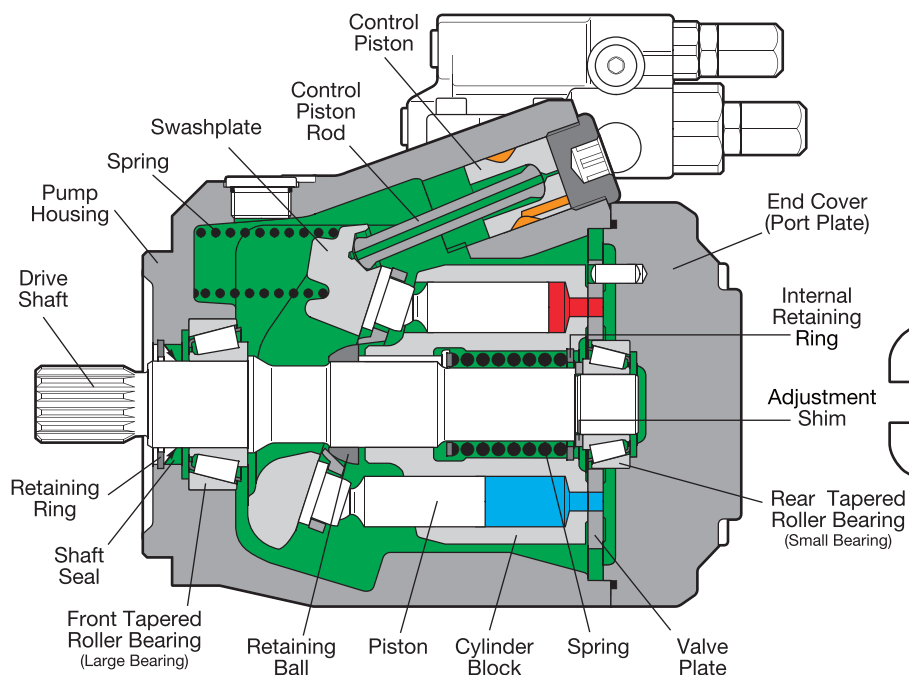
SERIES 52



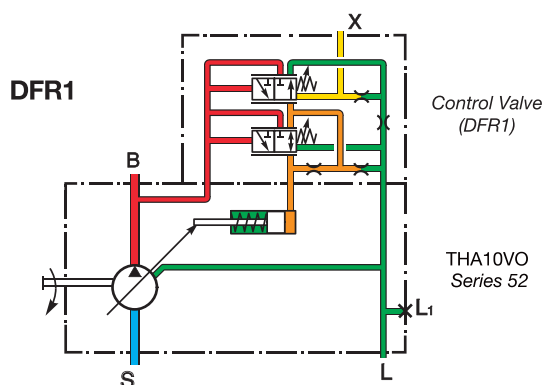
Control Valve
(DFR1 shown)



THA10VO -52 Series
(Rear ported model)

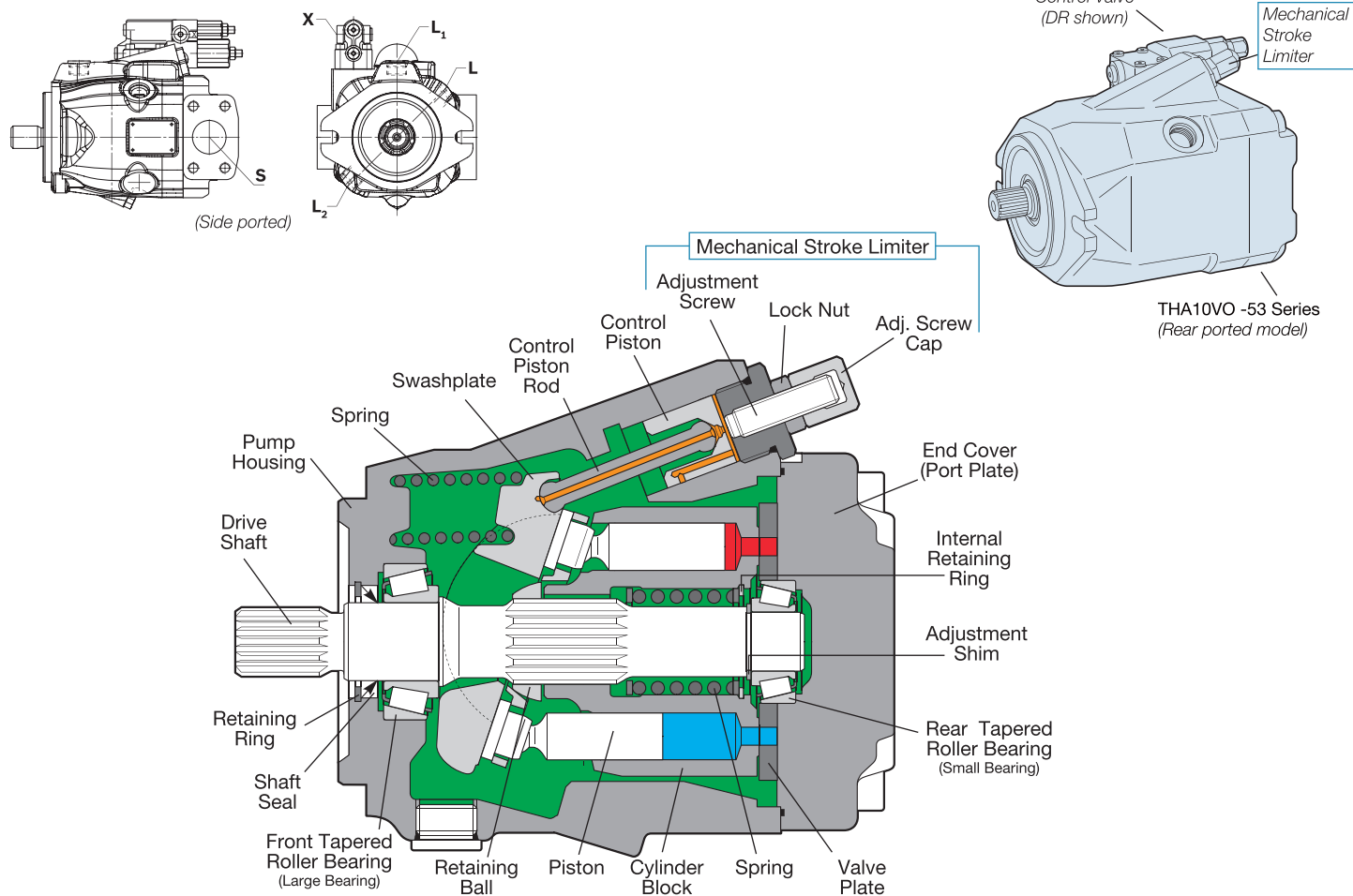


■ Example Shown:
DFR1 Control Valve

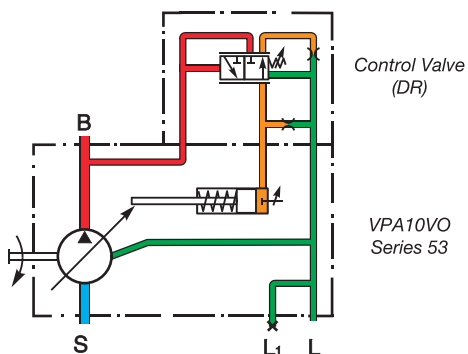


- High Pressure
- Return Line Pressure
- Suction Pressure
- Case Drain Pressure
- Pilot Pressure
- Control Pressure

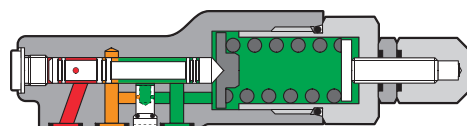
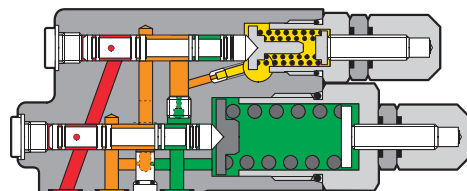
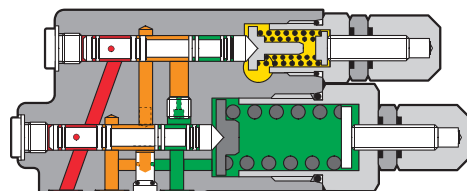
STRUCTURAL DRAWING - SERIES 53

SERIES 53


Example Shown: DR Control Valve



- High Pressure
- Return Line Pressure
- Suction Pressure
- Case Drain Pressure
- Pilot Pressure
- Control Pressure


DR

DFR

DFR1

HYDRAULIC FLUIDS

The THA10V(S)O variable pump is designed for operation with HLP mineral oil according to DIN 51524.

Notes on selection of hydraulic fluid

The hydraulic fluid should be selected such that the operating viscosity in the operating temperature range is within the optimum range (ν_{opt} see selection diagram).

Note

At no point of the component may the temperature be higher than 115°C. The temperature difference specified in the table is to be taken into account when determining the viscosity in the bearing.

Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit. A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406.

At very high hydraulic fluid temperatures (90° C to maximum 115 °C), cleanliness level 19/17/14 according to at least ISO 4406 is necessary.

Please contact us if the above classes cannot be observed.

VISCOSITY AND TEMPERATURE OF HYDRAULIC FLUIDS

	Viscosity	Temperature	Comment
Cold start	$\nu_{max} \leq 1600 \text{ mm}^2/\text{s}$	$\theta_{St} \geq -40 \text{ }^{\circ}\text{C}$	$t \leq 1 \text{ min}$, without load ($p \leq 30 \text{ bar}$), $n \leq 1000 \text{ rpm}$
	Permissible temperature difference	$\Delta T \leq 25 \text{ K}$	between axial piston unit and hydraulic fluid
Warm-up phase	$\nu < 1600 \text{ to } 400 \text{ mm}^2/\text{s}$	$\theta = -40 \text{ }^{\circ}\text{C} \text{ to } -25 \text{ }^{\circ}\text{C}$	Note the detailed information on operation with low temperatures, see data sheet 90300-03-B.
Continuous operation	$\nu = 400 \text{ to } 10 \text{ mm}^2/\text{s}$	$\theta = -25 \text{ }^{\circ}\text{C} \text{ to } +110 \text{ }^{\circ}\text{C}$	This corresponds, for example on the VG 46, to a temperature range of +5 °C to +85 °C (see selection diagram page 7)
			measured at port L Observe the permissible temperature range of the shaft seal ($\Delta T = \text{approx. } 5 \text{ K}$ between the bearing/shaft seal and port L)
	$\nu_{opt} = 36 \text{ to } 16 \text{ mm}^2/\text{s}$		Range of optimum operating viscosity and efficiency
Short-term operation	$\nu_{min} \geq 7 \text{ mm}^2/\text{s}$		$t < 1 \text{ min}$, $p < 0.3 \cdot p_{nom}$

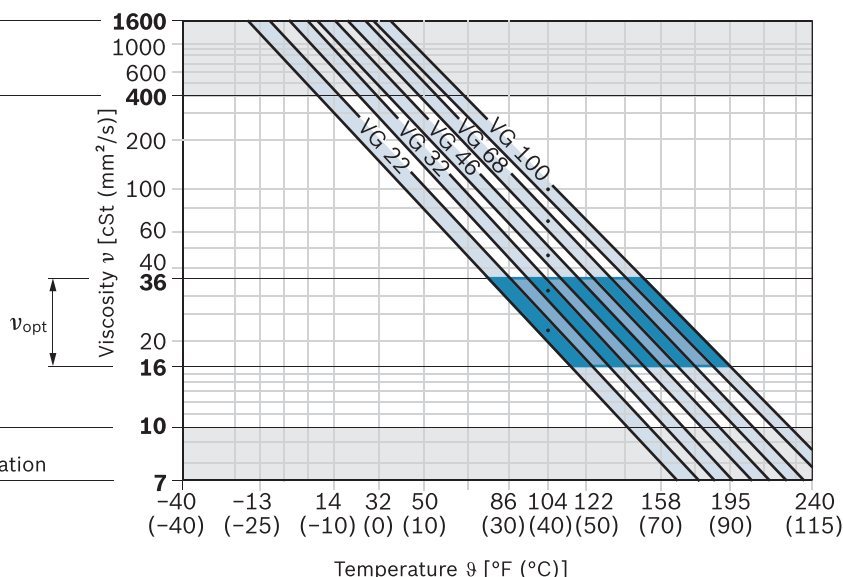
Selection Diagram

Maximum permissible viscosity on cold start

Warm-up phase

Continuous operation

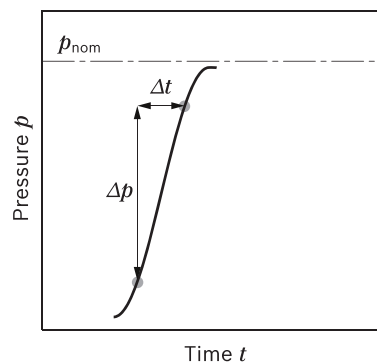
Minimum permissible viscosity for short-term operation



OPERATING PRESSURE RANGE

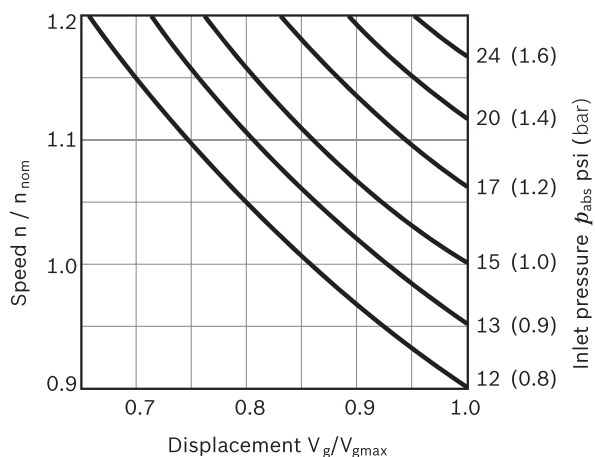
Pressure at working port B		Definition
Nominal pressure p_{nom}	250 bar absolute	The nominal pressure corresponds to the maximum design pressure. The maximum pressure corresponds the maximum working pressure within the single operating period. The sum of the single operating periods must not exceed the total operating period.
Maximum pressure p_{max}	315 bar absolute	
Single operating period	2.5 ms	
Total operating period	300 h	
Minimum pressure $p_{\text{B abs}}$ (high pressure side)	10 bar absolute	Minimum pressure on the high-pressure side (B) which is required in order to prevent damage to the axial piston unit.
Rate of pressure change $R_{\text{A max}}$	16000 bar/s	Maximum permissible rate of pressure rise and reduction during a pressure change over the entire pressure range.
Pressure at suction port S (inlet)		
Minimum pressure Standard $p_{\text{S min}}$	0.8 bar absolute	Minimum pressure at suction port S (inlet) that is required in order to avoid damage to the axial piston unit. The minimum pressure depends on the speed and displacement of the axial piston unit.
Maximum pressure $p_{\text{S max}}$	5 bar absolute	
Case drain pressure at port L ₁ , L ₂		
Maximum pressure $p_{\text{L max}}$	2 bar absolute	Maximum 0.5 bar higher than inlet pressure at port S , but not higher than $p_{\text{L max}}$. A case drain line to the reservoir is required.

Rate of Pressure Change $R_{A max}$

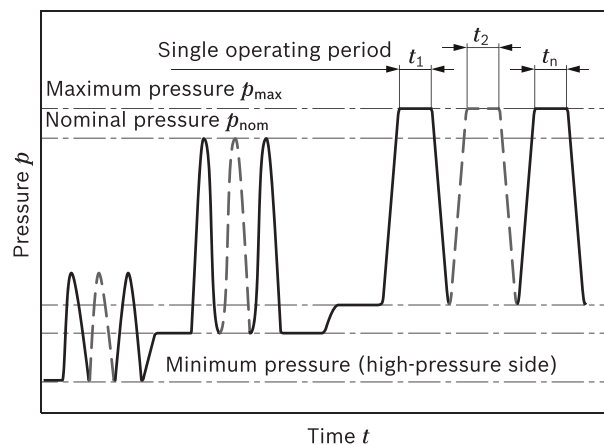


Maximum Permissible Speed (limit speed)

Permissible speed by increasing inlet pressure p_{abs} at suction opening S or at $V_g \leq V_{gmax}$



Pressure Definition



$$\text{Total operating period} = t_1 + t_2 + \dots + t_n$$

Note

Operating pressure range valid when using hydraulic fluids based on mineral oils. Please contact us for values for other hydraulic fluids.

TECHNICAL DATA

Size	NG		10	18	28	45	60	63	72	85	100
Displacement, geometric, per revolution	V_g $_{max}$	in ³ (cm ³)	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 ¹⁾	at $V_{g\ max}$	n_{nom}	rpm	3600	3300	3000	2600 ²⁾	2700	2600	2600	2300
	at $V_g < V_{g\ max}$	n_{max} $_{perm}$	rpm	4320	3960	3600	3120	3140	3140	3140	2500
Flow	at n_{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)	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)
Power	at n_{nom} , $V_{g\ max}$ and Δp = 3600 psi (250 bar)	P	HP (kW)	22 (16)	34 (25)	47 (35)	65 (49)	88 (65)	90 (68)	103 (77)	119 (89)
	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)
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)
	at $V_{g\ max}$ and $\Delta p = 1440$ psi (100 bar)									02 (135)	117 (159)
Rotary stiffness of drive shaft	S									05100 (143000)	105100 (143000)
	R									12773 (152900)	112773 (152900)
	U									5900 (102900)	75900 (102900)
	W									56960 (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)
	C	c	lb-ft/rad (Nm/rad)	– (–)	– (–)	⁴⁾	⁴⁾	⁴⁾	– (–)	– (–)	⁴⁾
Moment of inertia for rotary group	J_{TW}	lbs-ft ² (kgm ²)	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 ³⁾	α	rad/s ²	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 without 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 with 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 $p_{abs} = 15$ psi (1 bar) at the suction port **S**
 - for the optimum viscosity range from $\nu_{opt} = 36$ to 16 cSt (mm²/s)
 - with hydraulic fluid on the basis of mineral oils
- 2) See diagram on page 9 at speed increase up to $n_{max\ perm}$.

- 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)]

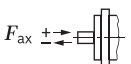
Key

V_g	Displacement per revolution [in ³ (cm ³)]
Δp	Differential pressure [psi (bar)]
n	Rotational speed [rpm]
η_v	Volumetric efficiency
η_{hm}	Hydraulic-mechanical efficiency
η_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. Anfield Industries, Inc. 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.

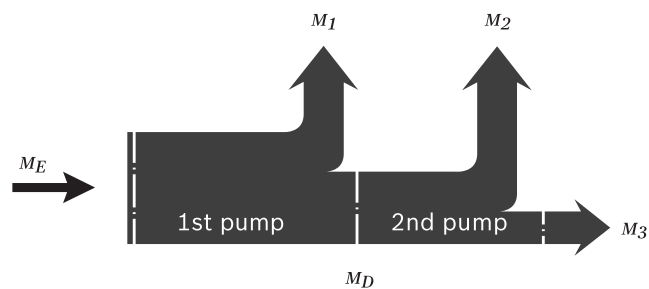
PERMISSIBLE INPUT AND THROUGH DRIVE TORQUES

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 ²⁾										
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

■ Distribution of Torques



Torque at 1st pump	M_1
Torque at 2nd pump	M_2
Torque at 3rd pump	M_3
Input torque	$M_E = M_1 + M_2 + M_3$
	$M_E < M_{E \max}$
Through-drive torque	$M_D = M_2 + M_3$
	$M_D < M_{D \max}$

DR - PRESSURE CONTROLLER

The pressure controller limits the maximum pressure at the pump outlet within the control range of the variable pump. The variable pump only supplies as much hydraulic fluid as is required by the consumers. If the operating pressure exceeds the pressure setting at the pressure valve, the pump will regulate to a smaller displacement to reduce the control differential.

Basic position in depressurized state:

$V_{g \max.}$ (Max. displacement)

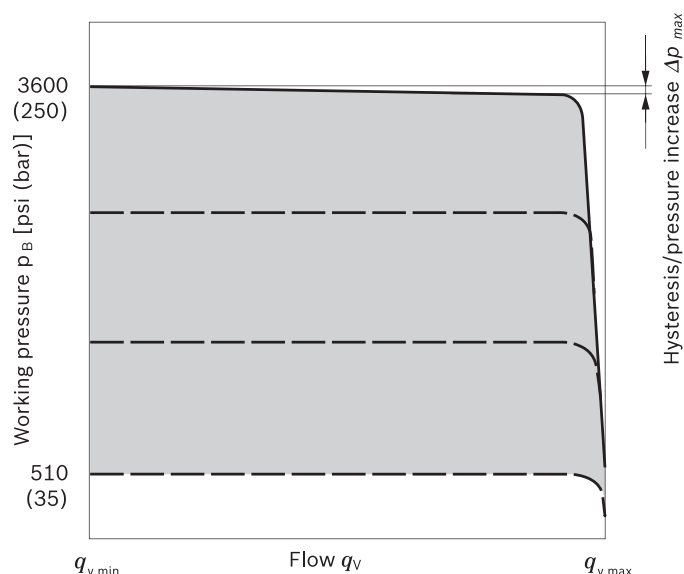
Setting range¹⁾ for pressure control:

510 to 3600 psi (35 to 250 bar).

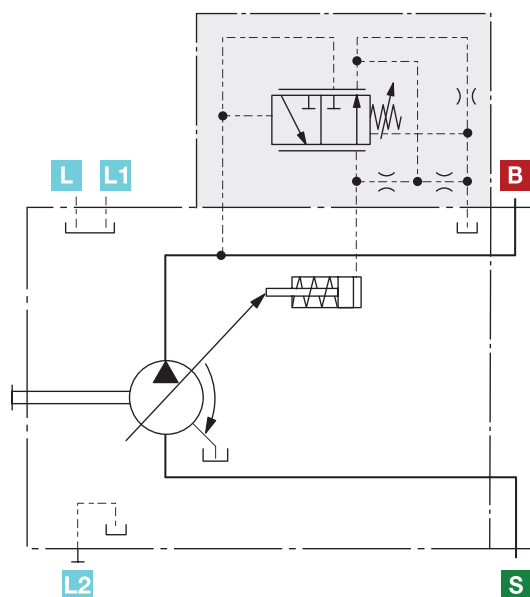
Standard is 3600 psi (250 bar).

Characteristic Curve - DR Controller

at $n=1500$ rpm; $t_{\text{fluid}} = 120^\circ \text{F}$ (50°C)



Circuit Diagram - DR Controller



Ports

B	Pressure port
S	Suction port
L, L1, L2	Case drain ports (L1 plugged)

DR Controller Data

Size		10	18	28	45	60	72	85	100
						63			
Pressure increase	Δp [psi (bar)]	87 (6)	87 (6)	87 (6)	87 (6)	115 (8)	115 (8)	175 (12)	200 (14)
Hysteresis and Repeat accuracy	Δp [psi (bar)]	maximum 45 (3)							
Pilot fluid consumption	gpm (l/min)	maximum approx. 0.8 (3)							

¹⁾ In order to prevent damage to the pump and the system, the permissible setting range must not be exceeded. The range of possible settings at the valve is higher.

DRG - PRESSURE CONTROLLER, REMOTE CONTROLLED

For the remote controlled pressure controller, the LS pressure limitation is performed using a separately arranged pressure relief valve. Therefore, any pressure control value under the pressure set on the pressure controller can be regulated. Pressure controller DR see page 15.

A pressure relief valve is externally piped to port **X** for remote control. This relief valve is not included in the scope of delivery of the DRG control.

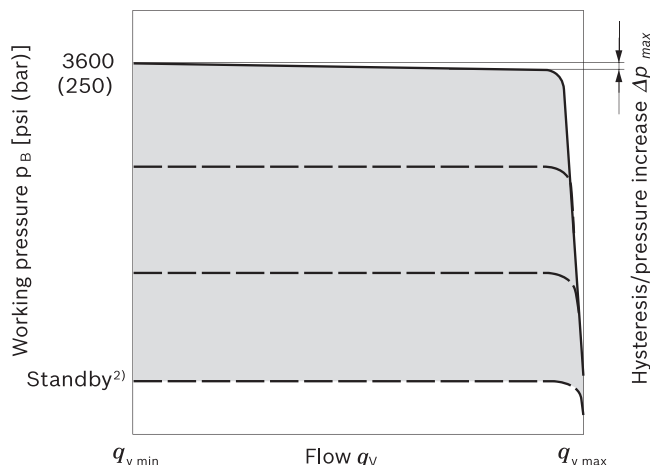
When there is differential pressure Δp at the control valve and with the standard setting on the remote controlled pressure cut-off of 290 psi (20 bar), the amount of control fluid at the port is **X** approx. 0.4 gpm (1.5 l/min). If another setting is required (range from 145 to 320 psi (10 to 22 bar)) please state in plain text. As a separate pressure relief valve **(1)** we recommend:

- a direct operated, hydraulic or electric proportional one, suitable for the control fluid mentioned above. The maximum line length should not exceed 6.6 ft (2 m).
- Basic position in depressurized state: $V_{g \max}$.
- Setting range¹⁾ for pressure control 510 to 3600 psi (35 to 250 bar) **(3)**.
Standard is 3600 psi (250 bar).
- Setting range for differential pressure 145 to 320 psi (10 up to 22 bar) **(2)**.
Standard is 290 psi (20 bar).

Unloading on port **X** to the reservoir results in a zero stroke pressure ("standby") pressure which lies about 15 to 30 psi (1 to 2 bar) higher than the differential pressure Δp , however, other system influences are not taken into account.

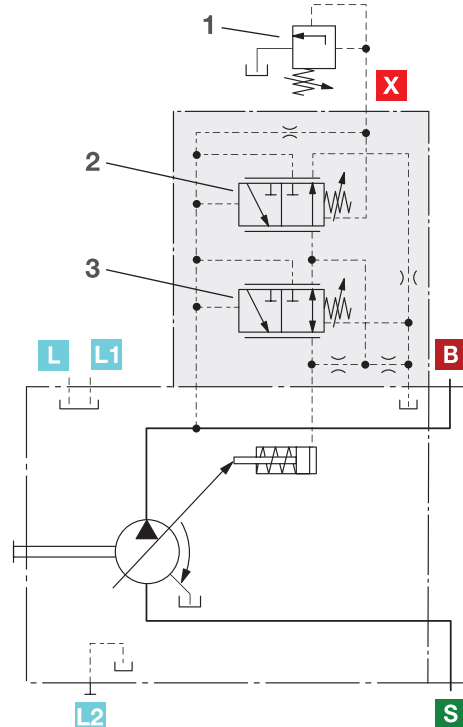
Characteristic Curve - DRG Controller

at $n=1500 \text{ rpm}$; $t_{\text{fluid}} = 120^\circ \text{ F } (50^\circ \text{ C})$



Circuit Diagram - DRG Controller

1. The separate pressure relief valve and the line are customer supplied
2. Remote controlled pressure cut-off (G)
3. Pressure controller (DR)



Ports

B	Pressure port
S	Suction port
L, L1, L2	Case drain ports (L1 plugged)
X	Pilot pressure ports

DRG Controller Data

Size		10	18	28	45	60 63	72	85	100
Pressure increase	Δp [psi (bar)]	87 (6)	87 (6)	87 (6)	87 (6)	115 (8)	115 (8)	175 (12)	200 (14)
Hysteresis and Repeat accuracy	Δp [bar]	maximum 45 (3)							
Pilot fluid consumption	gpm (l/min)	maximum approx. 1.2 (4.5)							

1) In order to prevent damage to the pump and the system, the permissible setting range must not be exceeded. The range of possible settings at the valve is higher.

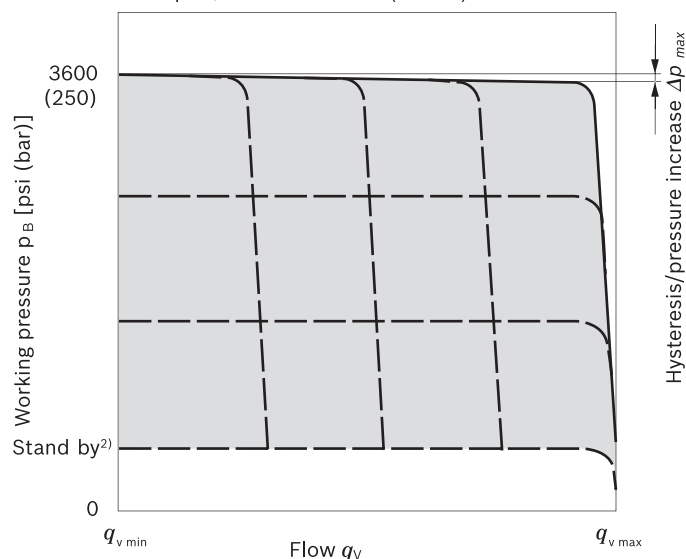
2) Zero stroke pressure from pressure setting Δp on controller **(2)**

DRF (DFR) / DRS (DFR1) / DRSC – PRESSURE AND FLOW CONTROLLER

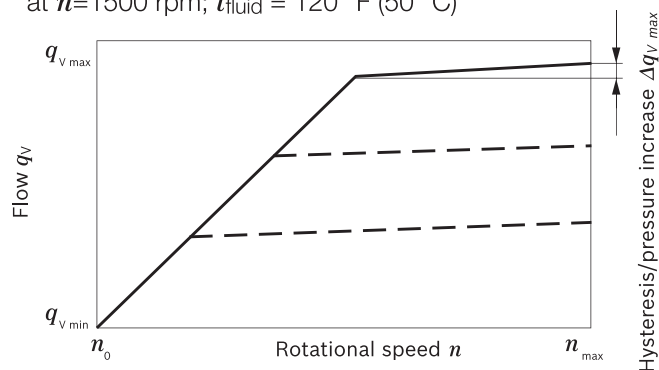
In addition to the pressure controller function (see page 15), an adjustable orifice (e.g. directional valve) is used to adjust the differential pressure upstream and downstream of the orifice. This is used to control the pump flow. The pump flow is equal to the actual hydraulic fluid quantity required by the consumer. With all controller combinations, the V_g reduction has priority.

- Basic position in depressurized state: $V_g \max$.
- Setting range¹⁾ to 3600 psi (250 bar).
- DR pressure controller data see page 15

Characteristic Curve - DRF (DFR) / DRS (DFR1) / DRSC at $n=1500$ rpm; $t_{\text{fluid}} = 120^\circ \text{F}$ (50°C)



Characteristic Curve at Variable Speed at $n=1500$ rpm; $t_{\text{fluid}} = 120^\circ \text{F}$ (50°C)

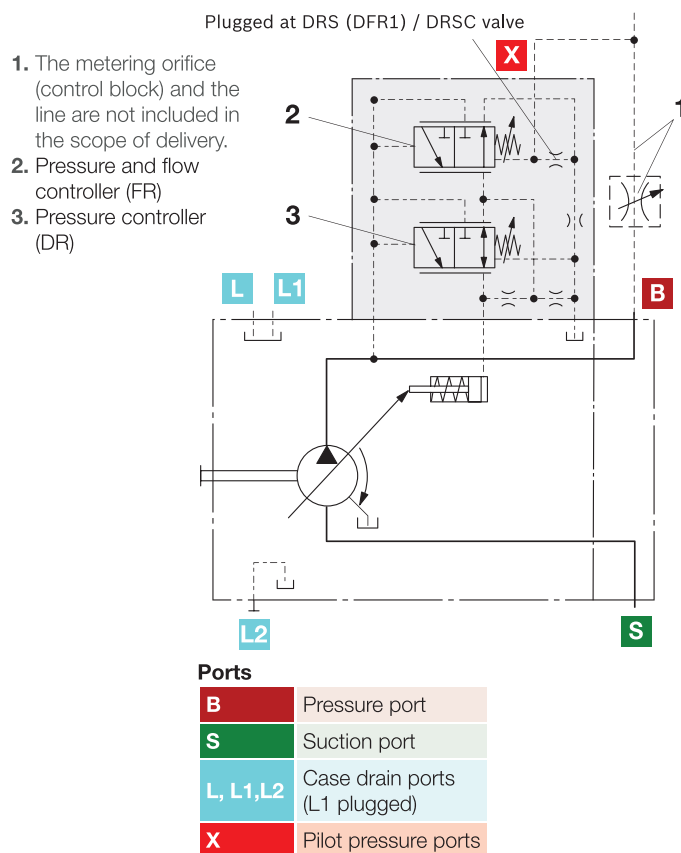


- 1) In order to prevent damage to the pump and the system, the permissible setting range must not be exceeded. The range of possible settings at the valve is higher.
- 2) Zero stroke pressure from pressure setting Δp on controller (2)

Possible connections at port **B**
(not included in the delivery contents)

LS mobile control blocks	Data sheets
M4-12	64276
M4-15	64283
LUDV mobile control blocks	
M6-15	64284
M7-22	64295

Circuit Diagram - DRF (DFR) Controller



Notice

The DRS (DFR1) and DRSC versions have no unloading from **X** to the reservoir.

The LS must thus be unloaded in the system.

Because of the flushing function sufficient unloading of the flow controller in DRS (DFR1) control valve **X**-line must also be provided.

If this unloading of the **X** line cannot be ensured, the DRSC control valve must be used.

For further information, see page 18.

■ Differential pressure p :

- Standard setting: 200 psi (14 bar)
If another setting is required, please state in clear text.
- Setting range: 200 to 320 psi (14 to 22 bar)

Unloading on port **X** to the reservoir results in a zero stroke pressure ("standby") pressure which lies about 15 to 30 psi (1 to 2 bar) higher than the differential pressure Δp , however, other system influences are not taken into account.

■ DRF (DFR) Controller Data

- DR pressure controller data see page 15.
- Maximum flow deviation measured at drive speed
 $n = 1500$ rpm.

Size		10	18	28	45	60 63	72	85	100
Flow deviation	Δq_{vmax} [gpm (l/min)]	0.13 (0.5)	0.24 (0.9)	0.26 (1.0)	0.48 (1.8)	0.66 (2.5)	0.66 (2.5)	0.83 (3.1)	0.83 (3.1)
Hysteresis; Repeat accuracy	Δp [psi (bar)]	maximum 45 (3)							
Pilot fluid consumption	gpm (l/min)	maximum approx. 0.8 to 0.2 (3 to 4.5) (DRF (DFR)) maximum approx. 0.8 (3) (DRS (DFR1) / DRSC)							

LA.. - PRESSURE, FLOW AND POWER CONTROLLER

Pressure controller equipped as DR(G), see pages 15-16.
Equipment of the flow controller like DRS (DFR1), see page 17

ordering please state the power characteristics to be set
ex works in plain text, e.g. 27 HP (20 kW) at 1500 rpm.

In order to achieve a constant drive torque with varying operating pressures, the swivel angle and with it the volume flow from the axial piston pump is varied so that the product of flow and pressure remains constant. Flow control is possible below the power control curve. When

Controller Data

- Pressure controller DR see page 15.
- Pressure and flow controller DRF see page 17.
- See data sheet 92709 for electric override LA.EF
- Pilot fluid consumption max. approx. 1.45 gpm (5.5 l/min).

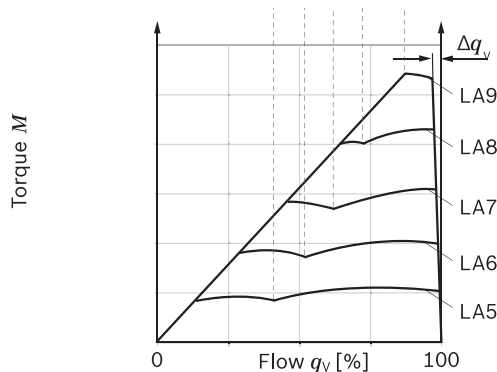
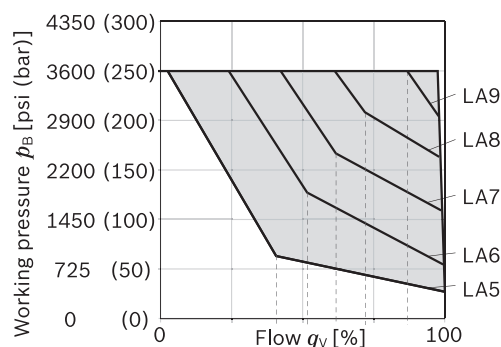
Beginning of control psi (bar)	Torque M [lb-ft (Nm)] for size							Order code
	18	28	45	63	72	85	100	
145 to 510 (10 to 35)	2.80 – 8.92 (3.8 – 12.1)	4.4 – 14 (6 – 19)	7.4 – 22.1 (10 – 30)	11 – 32 (15 – 43)	12.5 – 36.3 (17 – 49.2)	15 – 42 (20 – 57)	18 – 49.5 (24 – 68)	LA5
520 to 1015 (36 to 70)	8.92 – 17.2 (12.2 – 23.3)	14 – 26.5 (19.1 – 36)	22.2 – 43.5 (30.1 – 59)	32 – 61 (43.1 – 83)	36.4 – 69.9 (49.3 – 94.9)	42 – 83 (57.1 – 112)	49.5 – 97.1 (68.1 – 132)	LA6
1030 to 1520 (71 to 105)	17.2 – 24.9 (23.4 – 33.7)	26.6 – 38.4 (36.1 – 52)	43.6 – 62 (59.1 – 84)	61 – 88 (83.1 – 119)	70 – 100.3 (95.0 – 136.0)	83 – 118 (112.1 – 160)	97.1 – 139.4 (132.1 – 189)	LA7
1535 to 2030 (106 to 140)	24.9 – 33.2 (33.8 – 45)	38.4 – 51.6 (52.1 – 70)	62 – 83 (84.1 – 112)	88 – 116 (119.1 – 157)	100.4 – 132.3 (136.1 – 179.4)	118 – 156 (160.1 – 212)	139.4 – 183.6 (189.1 – 249)	LA8
2045 to 3335 (141 – 230)	33.2 – 55.2 (45.1 – 74.8)	51.7 – 86.3 (70.1 – 117)	83 – 139 (112.1 – 189)	116 – 195 (157.1 – 264)	132.4 – 222.5 (179.5 – 301.7)	156 – 263 (212.1 – 357)	183.3 – 309 (249.1 – 419)	LA9

Conversion of the torque values in power [HP (kW)]

$$P = \frac{M}{3.5 (6.4)} \text{ [HP (kW)]} \quad (\text{at } 1500 \text{ rpm}) \quad \text{or} \quad P = \frac{2\pi \times M \times n}{33000 (60000)} \text{ [HP (kW)]} \quad (\text{For rotational speeds see page 11})$$

Characteristic Curve - LA.DS

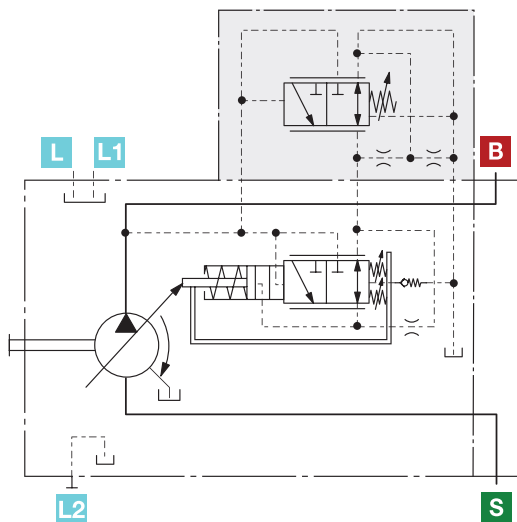
at $n=1500$ rpm; $t_{\text{fluid}} = 120^\circ \text{ F } (50^\circ \text{ C})$



LA.. - PRESSURE, FLOW AND POWER CONTROLLER VARIATIONS

■ Circuit Diagram - LA.D Controller

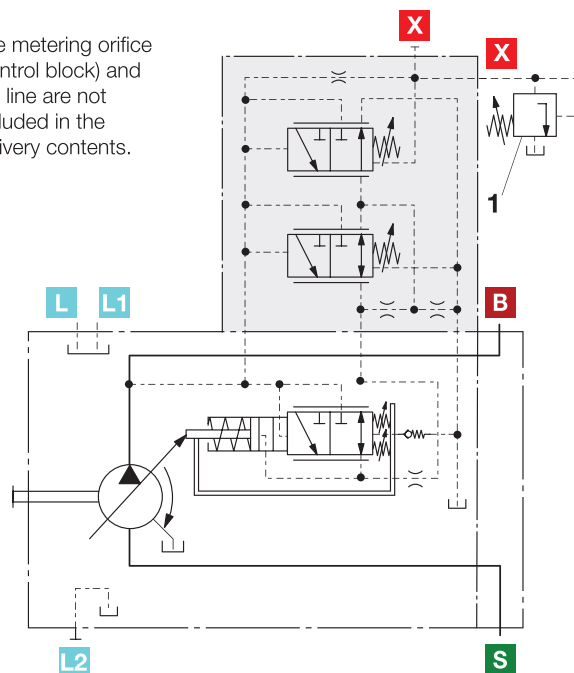
with pressure cut-off



■ Circuit Diagram - LA.DG Controller

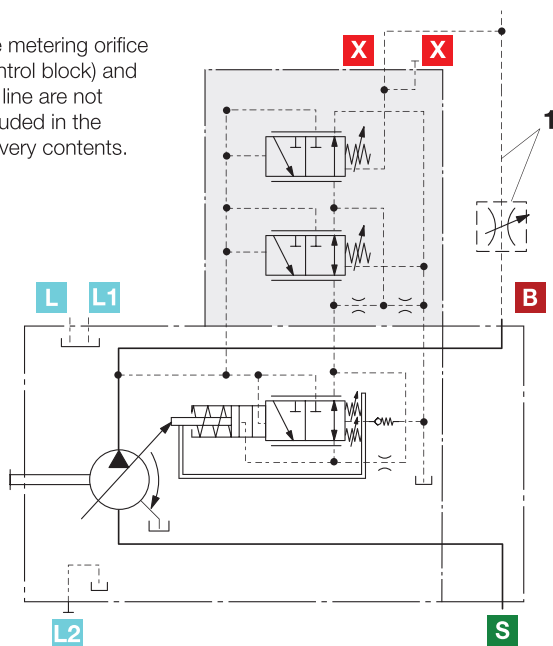
with pressure cut-off, remotely operated

1. The metering orifice (control block) and the line are not included in the delivery contents.



■ Circuit Diagram - LA.DS Controller

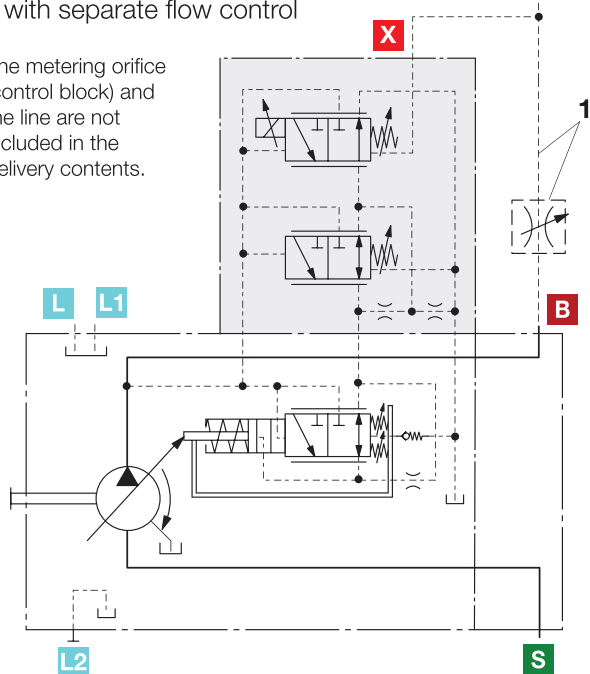
1. The metering orifice (control block) and the line are not included in the delivery contents.



■ Circuit Diagram - LA.S Controller

with separate flow control

1. The metering orifice (control block) and the line are not included in the delivery contents.



Ports

B	Pressure port
S	Suction port
L, L1, L2	Case drain ports (L1 plugged)
X	Pilot pressure ports

ED – ELECTRO-HYDRAULIC PRESSURE CONTROLLER

The ED valve is set to a certain pressure by a specified variable solenoid current.

When changing the consumer (load pressure), this causes an increase or decrease in the pump swivel angle (flow) in order to maintain the electrically set pressure level.

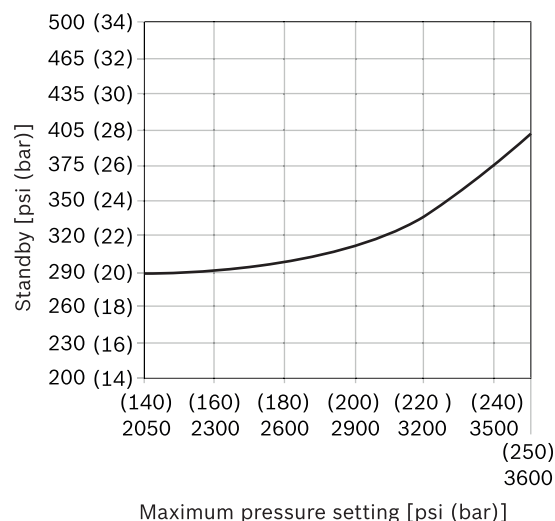
The pump thus only delivers as much hydraulic fluid as the consumers can take. The desired pressure level can be set steplessly by varying the solenoid current.

As the solenoid current signal drops towards zero, the pressure will be limited to $p_{\max}$ by an adjustable hydraulic pressure cut-off (secure fail safe function in case of power failure, e.g. for fan speed control). The swivel time characteristic of the ED control was optimized for the use as a fan drive system.

When ordering, specify the type of application in plain text.

- Pilot fluid consumption: 0.8 to 1.2 gpm (3 to 4.5 l/min).
- For standby standard setting, see the following diagram. Other values on request.

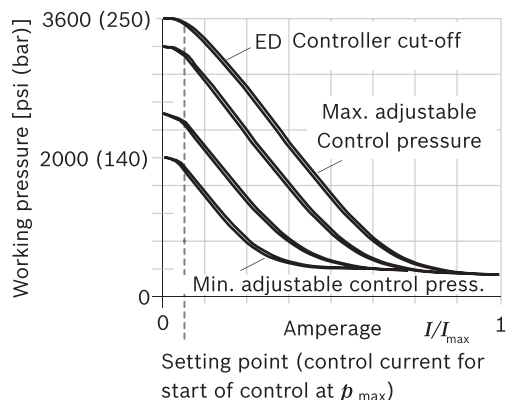
■ Influence of the Pressure Setting on Standby (maximally energization)



■ Static Current-Pressure Characteristic Curve ED

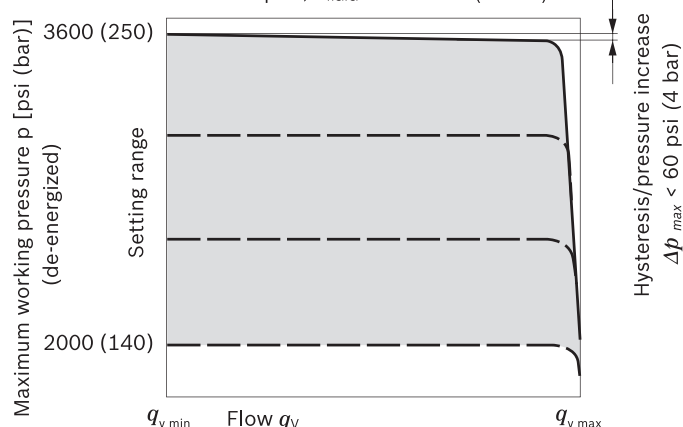
(negative characteristic curve)

- Hysteresis static < 45 psi (3 bar).



■ Flow-Pressure Characteristic Curve ED

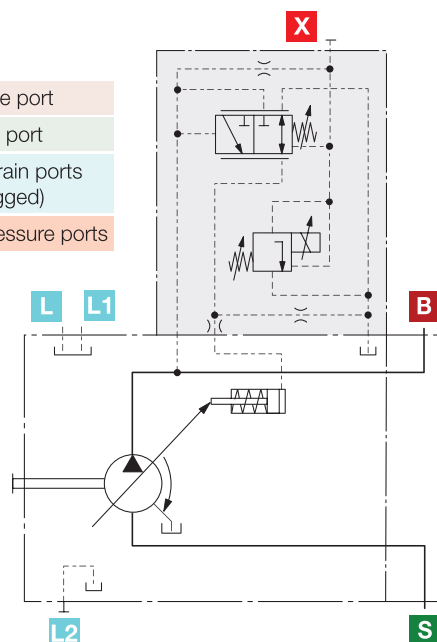
- Valid at $n=1500$ rpm; $t_{\text{fluid}} = 120^{\circ}\text{F}$ (50°F).



■ Circuit Diagram - ED71/ED72 Controller

Ports

B	Pressure port
S	Suction port
L, L1, L2	Case drain ports (L1 plugged)
X	Pilot pressure ports



■ ED Controller Data

Technical data, solenoids	ED71	ED72
Voltage	12 V (±20%)	24 V (±20%)
Control current		
Start of control at $p_{\max}$	100 mA	50 mA
End of control at $p_{\min}$	1200 mA	600 mA
Current limit	1.54 A	0.77 A
Nominal resistance (at 68 °F (20 °C))	5.5 Ω	22.7 Ω
Dither frequency	100 Hz	100 Hz
Recommended amplitude Peak to peak	240 mA	120 mA
Duty cycle	100%	100%
Type of protection: see connector version page 79		
Operating temperature range at valve -4 °F to 239 °F (-20 °C to +115 °C)		

Notice!

With **ED71**, de-energized operating condition (jump from 100 to 0 mA) results in a pressure increase of the maximum pressure of 60 to 75 psi (4 to 5 bar).

With **ED72**, de-energized operating condition (jump from 50 to 0 mA) results in a pressure increase of the maximum pressure of 60 to 75 psi (4 to 5 bar).

ER – ELECTRO-HYDRAULIC PRESSURE CONTROLLER

The ER valve is set to a certain pressure by a specified variable solenoid current.

When changing the consumer (load pressure), this causes an increase or decrease in the pump swivel angle (flow) in order to maintain the electrically set pressure level.

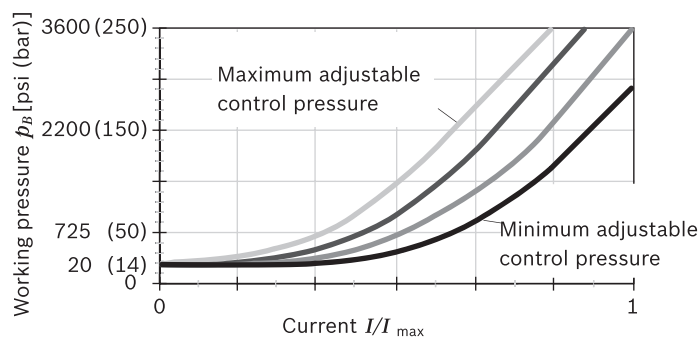
The pump thus only delivers as much hydraulic fluid as the consumers can take. The desired pressure level can be set steplessly by varying the solenoid current.

As the solenoid current signal drops towards zero, the pressure will be limited to $p_{\min}$ (stand by).

Observe project planning notes.

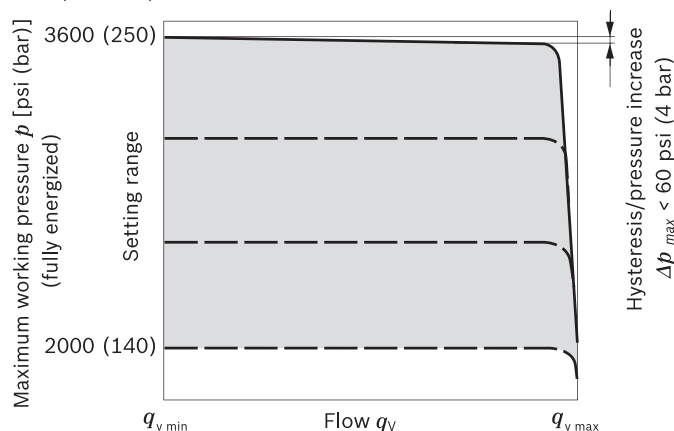
■ Static Current-Pressure Characteristic Curve ER (positive characteristic curve)

- Hysteresis static current-pressure characteristic curve < 45 psi (3 bar).

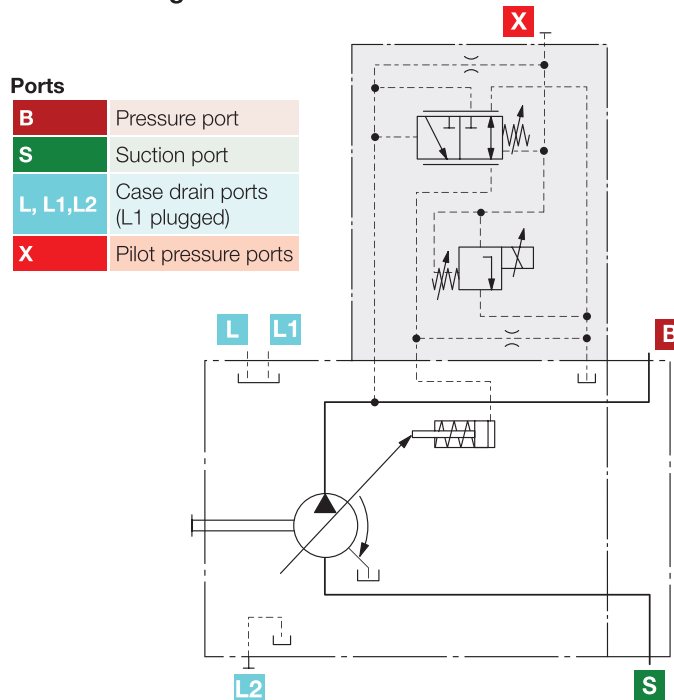


■ Flow-Pressure Characteristic Curve ER

- Valid at $n=1500$ rpm; $t_{\text{fluid}} = 120^\circ \text{ F}$ (50° F).
- Pilot fluid consumption: 0.8 to 1.2 gpm (3 to 4.5 l/min).
- Standby standard 200 psi (14 bar).
Other values on request.
- Influence of pressure setting on standby ± 30 psi (± 2 bar).



■ Circuit Diagram - ED71/ED72 Controller



■ ER Controller Data

Technical data, solenoids	ER71	ER72
Voltage	12 V ($\pm 20\%$)	24 V ($\pm 20\%$)
Control current		
Start of control at $p_{\min}$	100 mA	50 mA
End of control at $p_{\max}$	1200 mA	600 mA
Current limit	1.54 A	0.77 A
Nominal resistance (at 68° F (20° C))	5.5 Ω	22.7 Ω
Dither frequency	100 Hz	100 Hz
Recommended amplitude Peak to peak	240 mA	120 mA
Duty cycle	100%	100%
Type of protection: see connector version page 79		
Operating temperature range at valve	-4 to 239° F (-20 to $+115^\circ \text{ C}$)	

Project planning note!

Excessive current levels ($I > 1200$ mA at 12V or $I > 600$ mA at 24V) to the ER solenoid can result in undesired pressure increases which can lead to pump or system damage. Therefore:

- Use $I_{\max}$ current limiter solenoids.
- An intermediate plate pressure controller can be used to protect the pump in the event of overflow.

An accessory kit with intermediate plate pressure controller can be ordered from Anfield Industries, Inc. under part number R902490825.

EP – ELECTRO-PROPORTIONAL CONTROLLER

Electro proportional control makes a continuous and reproducible setting of the pump displacement possible directly via the cradle. The control force of the control piston is applied by a proportional solenoid. The control is proportional to the current (for start of control, see table right).

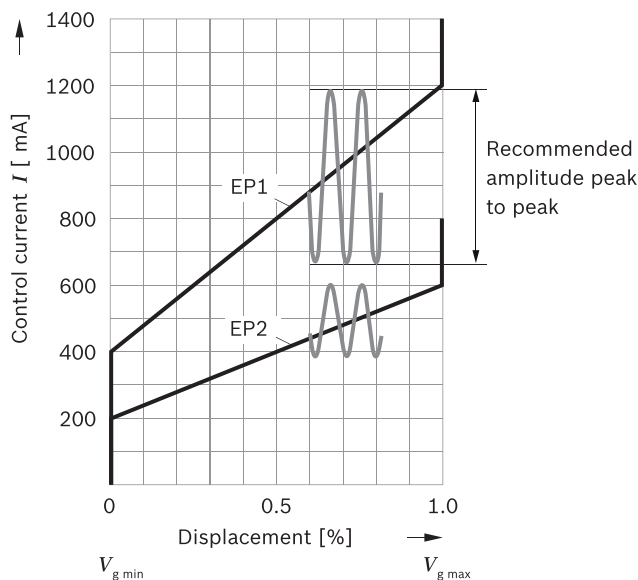
In a depressurized state, the pump is swiveled to its initial position ($V_{g \max}$) by an adjusting spring. If the working pressure exceeds a limit value of approx. 60 psi (4 bar), the pump starts to swivel from $V_{g \max}$ to $V_{g \min}$ without control by the solenoid (control current < start of control). With a minimum swivel angle $V_{g \min}$ and de-energized EP solenoids, a minimum pressure of 145 psi (10 bar) must be maintained. A PWM signal is used to control the solenoid.

EP.D: The pressure control regulates the pump displacement back to $V_{g \min}$ after the pressure command value has been reached.

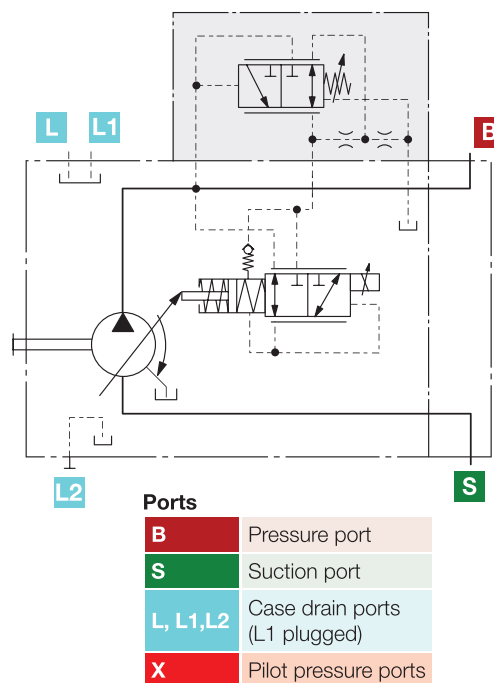
A minimum operating pressure of 200 psi (14 bar) is needed for safe and reproducible control. The required control fluid is taken from the high pressure.

Characteristic Curve EP1/2

- Hysteresis static current-displacement characteristic curve < 5%.



Circuit Diagram - EP.D Controller



EP Controller Data

Technical data, solenoids	EP1	EP2
Voltage	12 V (±20%)	24 V (±20%)
Control current		
Start of control at $V_{g \min}$	400 mA	200 mA
End of control at $V_{g \max}$	1200 mA	600 mA
Dither frequency	100 Hz	100 Hz
Recommended amplitude Peak to peak ¹⁾	240 mA	120 mA
Current limit	1.54 A	0.77 A
Nominal resistance (at 68 °F (20 °C))	5.5 Ω	22.7 Ω
Duty cycle	100%	100%
Type of protection: see connector version page 79		
Operating temperature range at valve -4 °F to 239°F (-20 °C to +115 °C)		

Notice!

We recommend the valve with flushing function for the EP.D control variant. Please contact us.

1) ΔI = 44% of the current difference within the control range, regardless of the mean value of the current

EK – ELECTRO-PROPORTIONAL CONTROLLER WITH CONTROLLER CUT-OFF

Variant EK... is based completely on the variant EP... (see page 24).

In addition to the electro-proportional control function, a controller cut-off is integrated in the electric characteristic curve. The pump then swivels to $V_{g \max}$ if the pilot signal is lost (e.g. cable break) and then works with the DRF settings if necessary (see page 17). The controller cutoff is only intended for short-term use and not for permanent use if the control signal is lost. If the control signal is lost, the pump swivel times are increased by the EK valve.

A PWM signal is used to control the solenoid.

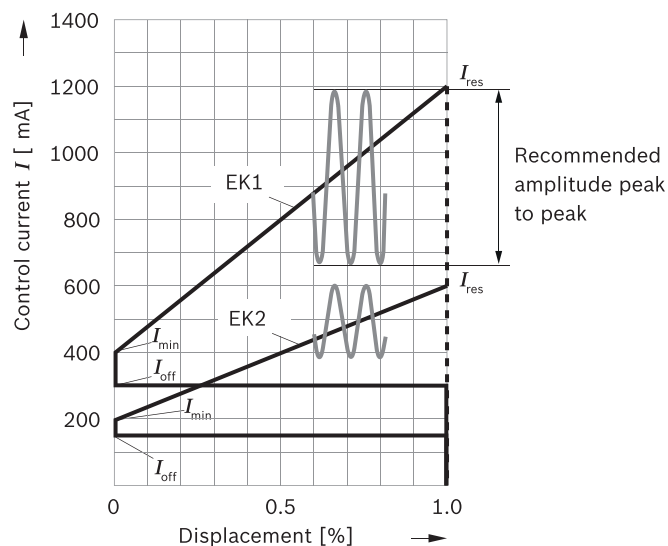
Notice!

A minimum operating pressure of 725 psi (50 bar) is needed for safe and reproducible electro-proportional control with controller cut-off. For lower pressures, a pilot signal of > 500 mA (EK2) or > 1000 mA (EK1) is required in order to avoid undesired controller cut-off. The required control fluid is taken from the high pressure.

In the $V_{g \max}$ the spring force of the return spring is maximum. To overcome the force of this spring, the solenoid must be subjected to excessive current (I_{res}).

Characteristic Curve EK1/2

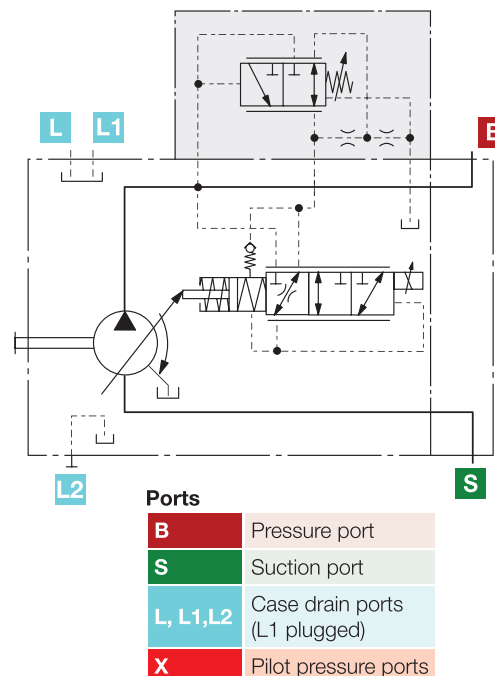
- Hysteresis static current-displacement characteristic curve < 5%.
- For changes in current, ramp times of > 200 ms must be observed.



Notice!

We recommend the valve with flushing function for the EK.D control variant. Please contact us.

Circuit Diagram - EK.D Controller



EK Controller Data

Technical data, solenoids	EK1	EK2
Voltage	12 V (±20%)	24 V (±20%)
Control current		
Start of control at $V_{g \min}$	400 mA	200 mA
End of control at $V_{g \max}$	1200 mA	600 mA
Dither frequency	100 Hz	100 Hz
Recommended amplitude Peak to peak ¹⁾	240 mA	120 mA
Current limit	1.54 A	0.77 A
Nominal resistance (at 68 °F (20 °C))	5.5 Ω	22.7 Ω
Duty cycle	100%	100%
Type of protection: see connector version page 79		
Operating temperature range at valve -4 °F to 239 °F (-20 °C to +115 °C)		
	EK1	EK2
I_{min} [mA]	400	200
I_{max} [mA]	1200	600
I_{off} [mA]	< 300	< 150
I_{res} [mA]	> 1200	> 600

1) ΔI = 44% of the current difference within the control range, regardless of the mean value of the current

EP(K).DF / EP(K).DS / EP(K) – WITH PRESSURE AND FLOW CONTROLLER

The pressure control regulates the pump displacement infinitely varied back to V_g min after the set pressure command value has been reached.

This function is super-imposed on the EP or EK control, i.e. the control-current dependent EP or EK function is executed below the pressure command value.

For the setting range of the pressure flow controller, see pages 15 to 17.

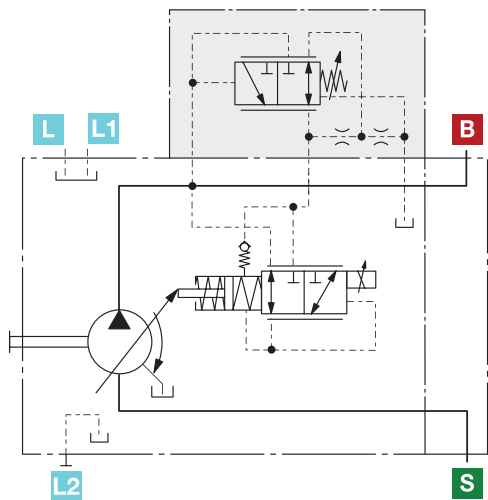
With all controller combinations, the V_g reduction has priority. With flow control, the pump flow can be influenced in addition to pressure control. The pump flow is thus equal to the actual amount of hydraulic fluid required by the consumer. This is achieved using the differential pressure at the consumer (e.g. orifice).

The EP.DS or EK.DS version has no connection between **X** and the reservoir (load-sensing). Please refer to the notes on page 17.

Ports

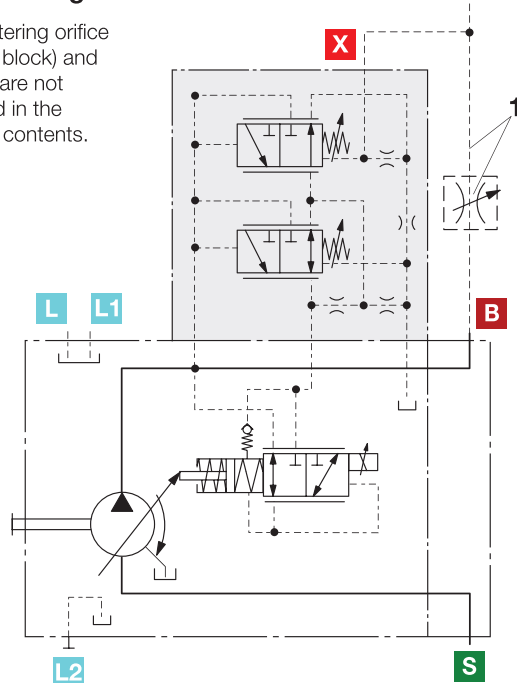
B	Pressure port
S	Suction port
L, L1, L2	Case drain ports (L1 plugged)
X	Pilot pressure ports

■ Circuit Diagram - EP.D Controller



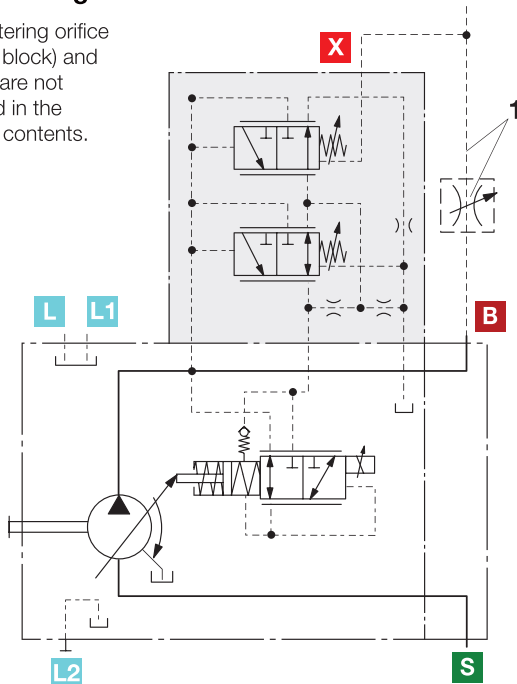
■ Circuit Diagram - EP.DF Controller

1. The metering orifice (control block) and the line are not included in the delivery contents.



■ Circuit Diagram - EP.DS Controller

1. The metering orifice (control block) and the line are not included in the delivery contents.



EP.ED / EK.ED – WITH ELECTRO-HYDRAULIC PRESSURE CONTROLLER

The ED valve is set to a certain pressure by a specified variable solenoid current.

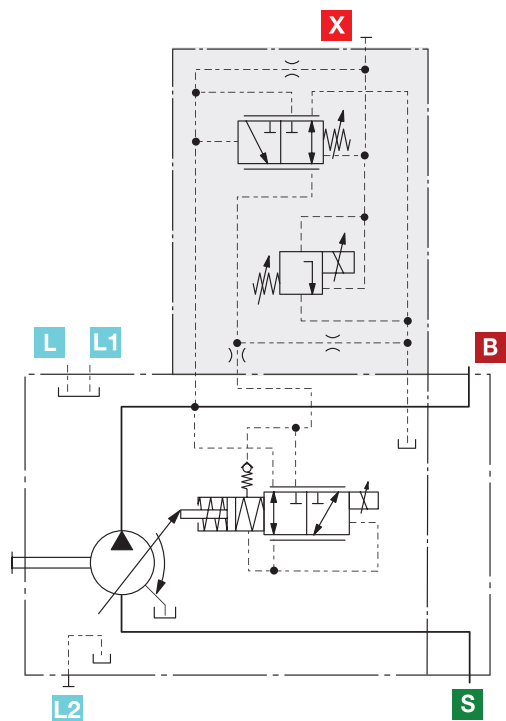
When changing the consumer (load pressure), this causes an increase or decrease in the pump swivel angle (flow) in order to maintain the electrically set pressure level.

The pump thus only delivers as much hydraulic fluid as the consumers can take. The pressure can be set steplessly by the solenoid current.

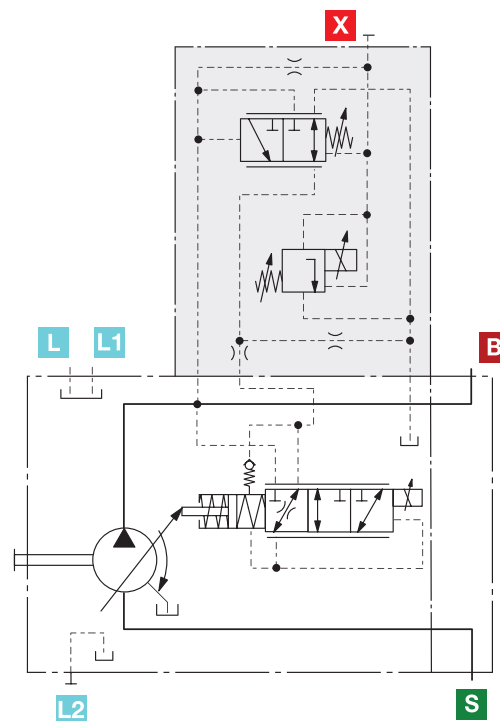
As the solenoid current signal drops towards zero, the pressure will be limited to p_{max} by an adjustable hydraulic pressure cut-off (negative characteristic curve, e.g. for fan speed control). A PWM signal is used to control the solenoid.

For further information and technical data of the solenoids for ED(ER) control please refer to pages 21 to 23.

■ Circuit Diagram - EP.ED Controller



■ Circuit Diagram - EK.ED Controller



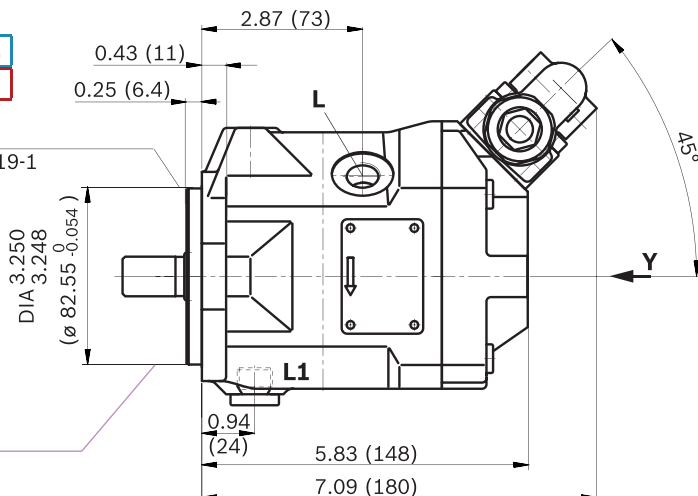
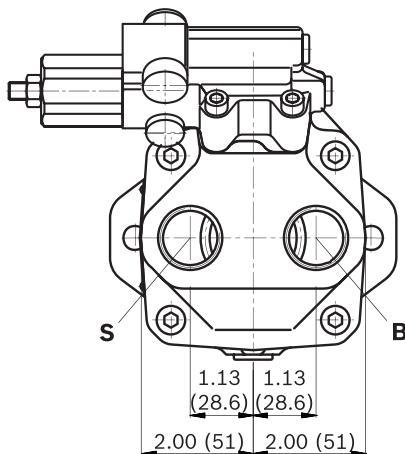
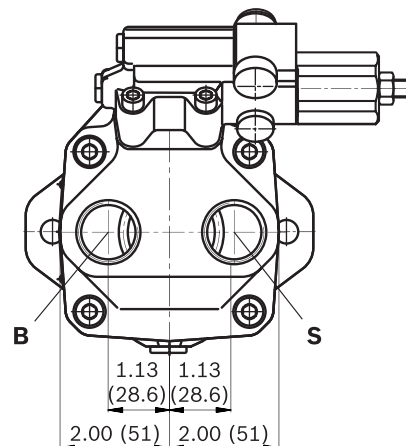
Ports

B	Pressure port
S	Suction port
L, L1, L2	Case drain ports (L1 plugged)
X	Pilot pressure ports

DIMENSIONS SIZE 10
SERIES 52 SIZE 10
DR – Pressure Controller; Mounting Flange C; SAE Version; Series 52
■ Port Plate 64 U

 Threaded Port
 at rear, UNF

SERIES 52
SIZE 10

 Flange
 ISO 3019-1

C Mounting Flange SAE A 2-Bolt
 SAE J744 82-2 (SAE B)
 Pilot Ø 3.25" (82.55 mm)
 Bolt Circle Ø 4.19" (146 mm)

▲ View Y
 Valve mounting
 for clockwise
 rotation

▲ View Y
 Valve mounting
 for counter-clockwise
 rotation

mm [inch]

DIMENSIONS SIZE 10

SERIES **52** SIZE **10**

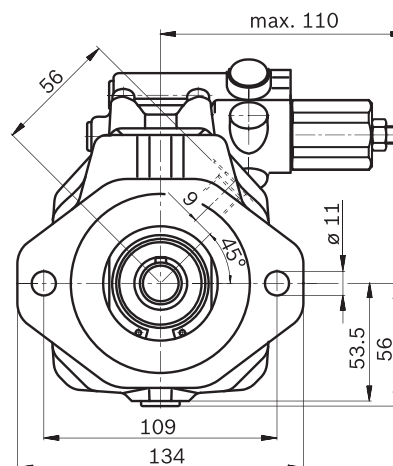
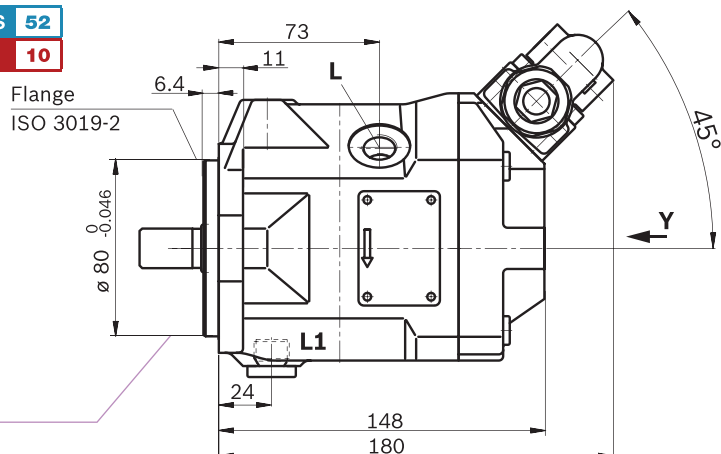
DR – Pressure Controller; Mounting Flange A; ISO Metric Version; Series 52

■ Port Plate 14 M

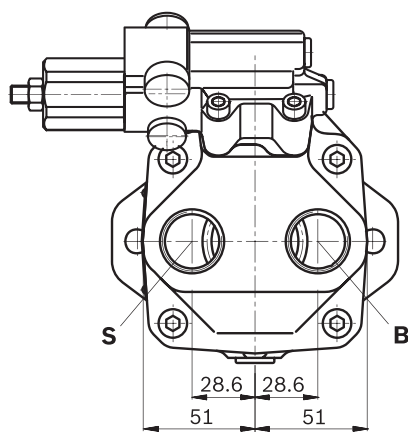
Threaded Port
at rear, Metric



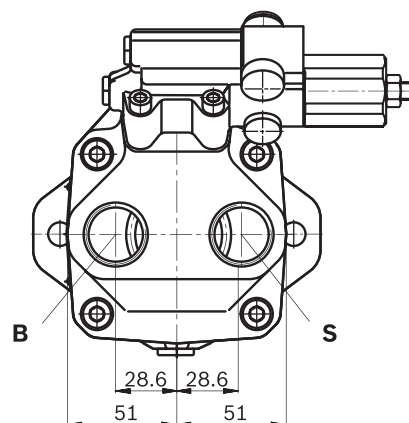
SERIES **52**
SIZE **10**



A Mounting Flange METRIC 2-Bolt
METRIC 80 A2
Pilot Ø 80 mm
Bolt Circle Ø 109 mm



▲ **View Y**
Valve mounting
for clockwise
rotation



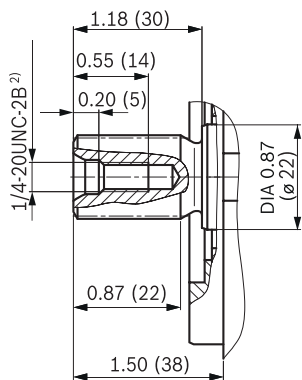
▲ **View Y**
Valve mounting
for counter-clockwise
rotation

mm [inch]

DRIVE SHAFT DIMENSIONS, SIZE 10

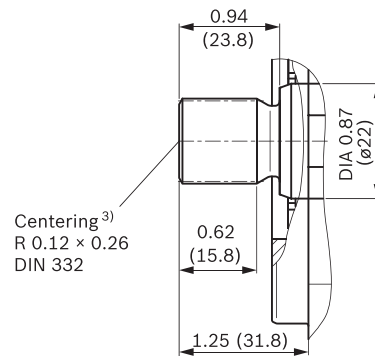
SERIES 52 SIZE 10

S 3/4" Splined Shaft SAE J744

 11T 16/32DP¹⁾

SERIES 52
SIZE 10

in (mm)

U 5/8" Splined Shaft SAE J744

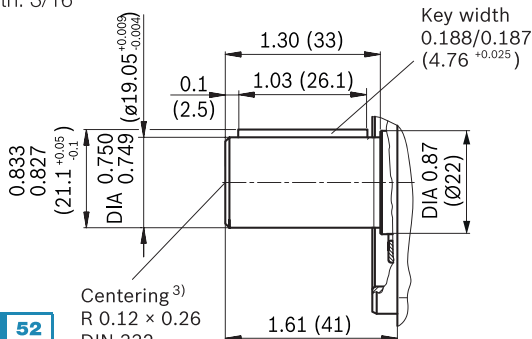
 9T 16/32DP¹⁾

SERIES 52
SIZE 10

in (mm)

K 3/4" Parallel Keyed Shaft

19-1

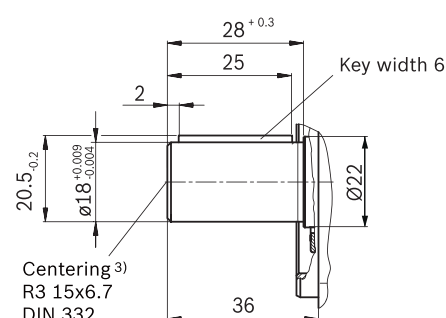
Key width: 3/16"


SERIES 52
SIZE 10

in (mm)

P 18 mm Parallel Keyed Shaft DIN 6885

Key: A6x6x25


SERIES 52
SIZE 10

mm

Port Details for Size 10 Pump with Mounting Flange C - SAE U

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ⁽⁴⁾	State ⁽⁷⁾
B	Working port	ISO 11926	1 1/16-12UNF-2B; 0.79 (20) deep	4550 (315)	O
S	Suction port	ISO 11926	1 1/16-12UNF-2B; 0.79 (20) deep	75 (5)	O
L	Drain port	ISO 11926 ⁽⁵⁾	9/16-18UNF-2B; 0.47 (12) deep	30 (2)	O ⁽⁶⁾
L ₁	Drain port	ISO 11926 ⁽⁵⁾	9/16-18UNF-2B; 0.47 (12) deep	30 (2)	X ⁽⁶⁾
X	Pilot pressure	ISO 11926	7/16-20UNF-2B; 0.45 (11.5) deep	4550 (315)	O

Port Details for Size 10 Pump with Mounting Flange A - Metric M

Ports		Standard	Size	$p_{\max}$ [bar] ⁴⁾	State ⁷⁾
B	Working port	DIN 3852	M27 x 2; 16 deep	315	O
S	Suction port	DIN 3852	M27 x 2; 16 deep	5	O
L	Drain port	DIN 3852 ⁵⁾	M16 x 1.5; 12 deep	2	O ⁶⁾
L ₁	Drain port	DIN 3852 ⁵⁾	M16 x 1.5; 12 deep	2	X ⁶⁾
X	Pilot pressure	DIN 3852	M16 x 1.5; 12 deep	315	O

- 1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Thread according to ASME B1.1
- 3) Coupling axially secured, e.g. with a clamp coupling or radially mounted clamping screw
- 4) Depending on the application, momentary pressure peaks can occur.

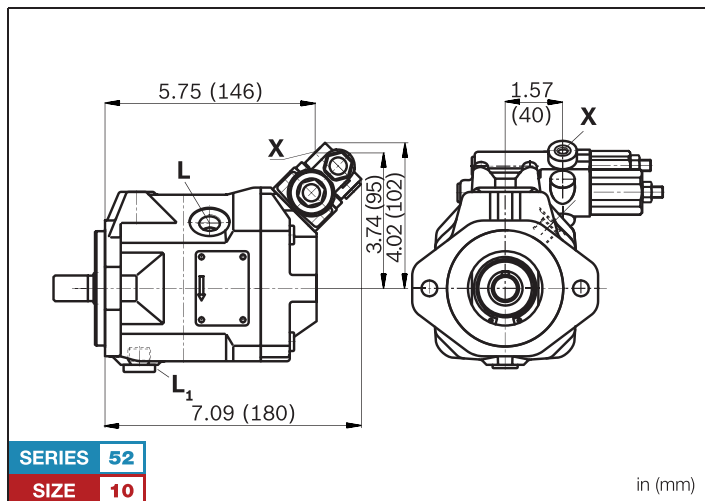
- 5) Keep this in mind when selecting measuring devices and fittings.
- 6) The countersink may be deeper than specified in the standard.
- 7) Depending on the installation position, L or L₁ must be connected (also see installation instructions starting on page 80).
- 8) O = Must be connected (plugged on delivery)
- 9) X = Plugged (in normal operation)

U Imperial M Metric

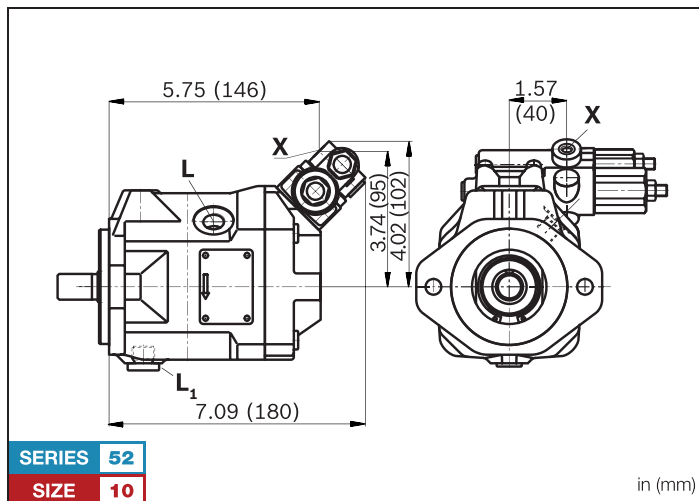
SIZE 10 CONTROLLER DIMENSIONS, SERIES 52

SERIES **52** SIZE **10**

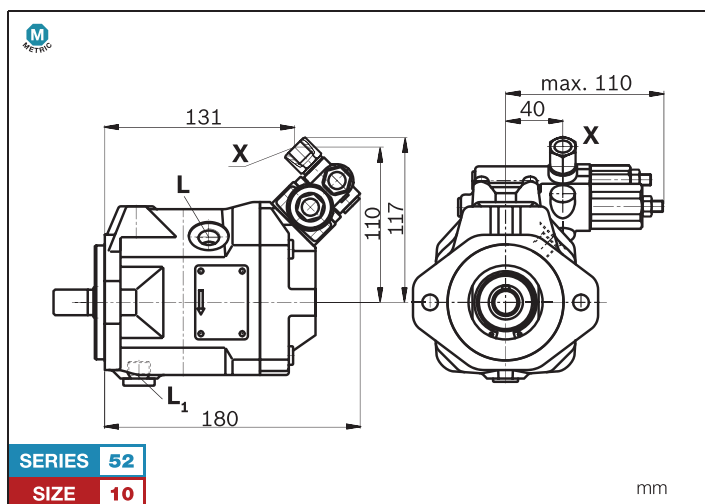
■ DRG – Pressure controller, remotely controlled (SAE)¹⁾



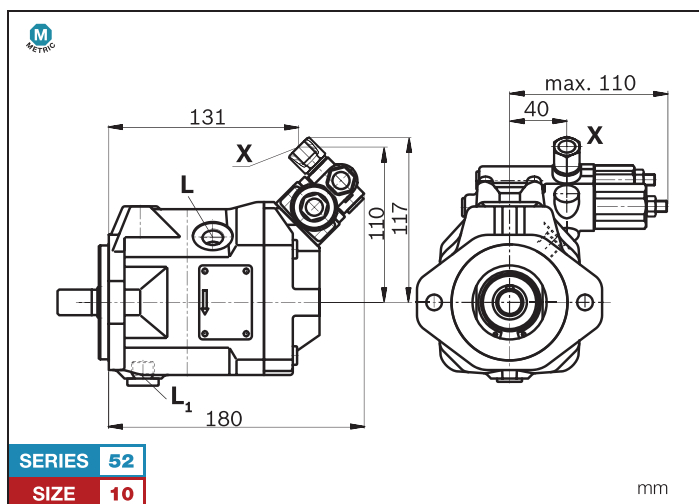
■ DFR/DFR1 – Pressure, flow controller (SAE)¹⁾



■ DRG – Pressure controller, remotely controlled (metric)¹⁾



■ DFR/DFR1 – Pressure, flow controller (metric)¹⁾



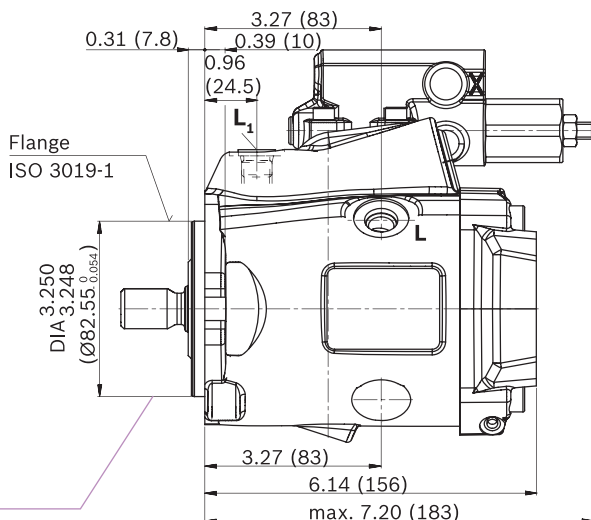
1) Valve mounting for clockwise or counter-clockwise rotation see pages 28 and 29.

DIMENSIONS SIZE 18
SERIES 53 SIZE 18
DR – Hydraulic Pressure controller, Clockwise Rotation, Series 53
■ Port Plate 61 ^U

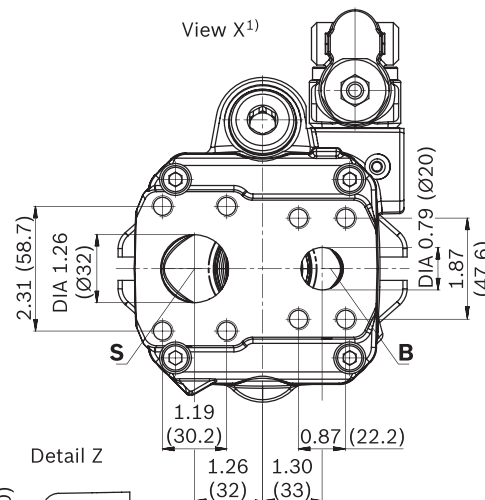
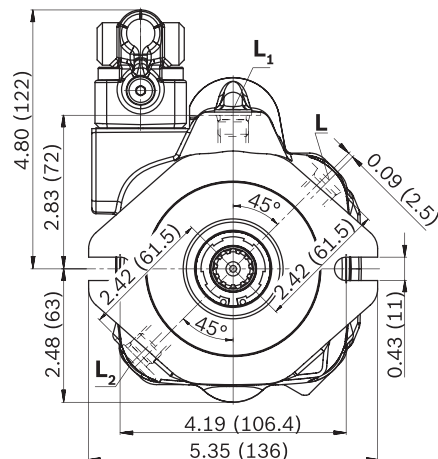
 SAE Flange Ports
 at rear
 UNC thread

■ Port Plate 11 ^M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 53
SIZE 18


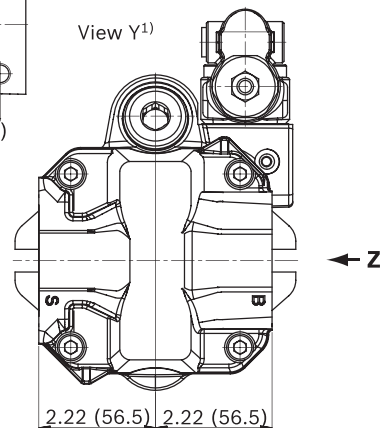
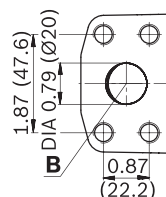
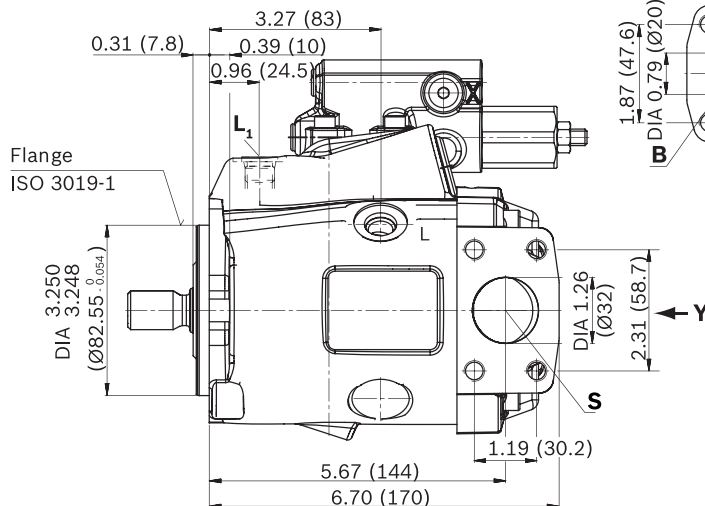
C Mounting Flange SAE A 2-Bolt
 SAE J744 82-2 (SAE B)
 Pilot Ø 3.25" (82.55 mm)
 Bolt Circle Ø 4.19" (146 mm)


■ Port Plate 62 ^U

 SAE Flange Ports
 on sides
 UNC thread

■ Port Plate 12 ^M

 SAE Flange Ports
 on sides
 Metric thread

SERIES 53
SIZE 18


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

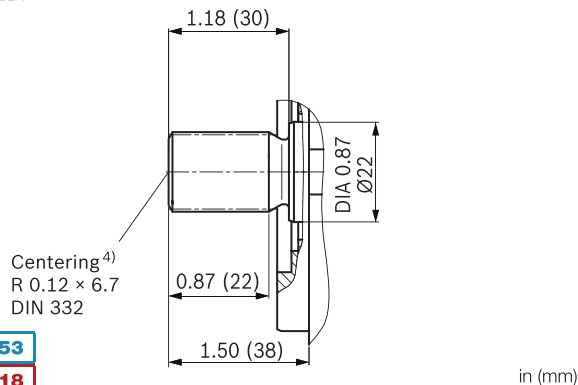
in (mm)

DRIVE SHAFT DIMENSIONS, SIZE 18

SERIES **53** SIZE **18**

S 3/4" Splined Shaft (19-4, ISO 3019-1)

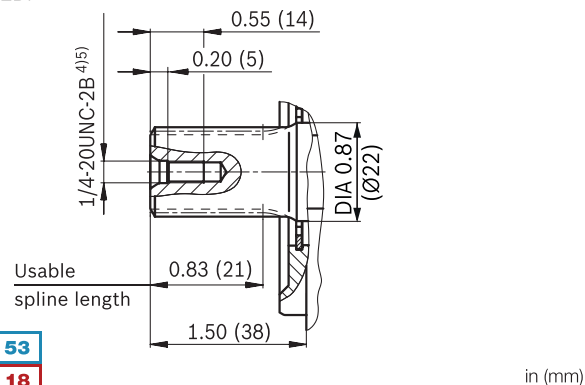
11T 16/32DP¹⁾



SERIES **53**
SIZE **18**

R 3/4" Splined Shaft (similar to ISO 3019-1)

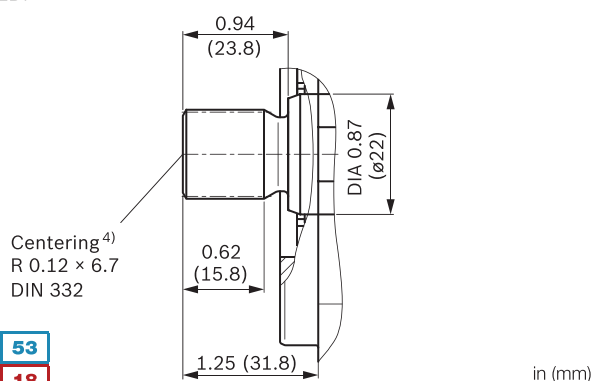
11T 16/32DP^{1) 2)}



SERIES **53**
SIZE **18**

U 5/8" Splined Shaft (16-4, ISO 3019-1)

9T 16/32DP¹⁾

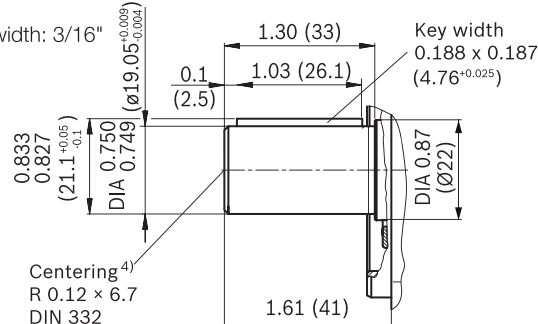


SERIES **53**
SIZE **18**

K 3/4" Parallel Keyed Shaft DIN 6885

19-1

Key width: 3/16"



SERIES **53**
SIZE **18**

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.

3) Thread according to ASME B1.1
4) Coupling axially secured, e.g. with a clamp coupling or radially mounted clamping screw

PORT DIMENSIONS SIZE 18

SERIES 53 SIZE 18

Port Plate 61, 62 U

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁵⁾
B	Working port (standard pressure series) Fastening thread	ISO 6162-1 ASME B1.1	3/4 in 3/8-16UNC-2B; 0.75 (19) deep	4550 (315)	O
S	Suction port (standard pressure series) Fastening thread	ISO 6162-1 ASME B1.1	1 1/4 in 7/16-14UNC-2B; 0.79 (20) deep	75 (5)	O

Port Plate 11, 12 Metric M

Ports		Standard	Size	$p_{\max}$ [bar] ¹⁾	State ⁵⁾
B	Working port (standard pressure series) Fastening thread	SAE J518 ³⁾ DIN 13	3/4 in M10 × 1.5; 17 deep	315	O
S	Suction port (standard pressure series) Fastening thread	SAE J5187) DIN 13	1 1/4 in M10 × 1.5; 17 deep	5	O
L	Drain port	ISO 11926 ²⁾	3/4-16UNF-2B; 0.47 (12) deep	30 (2)	O ⁴⁾
L₁, L₂	Drain port	ISO 11926 ²⁾	3/4-16UNF-2B; 0.47 (12) deep	30 (2)	X ⁴⁾
X	Pilot pressure	ISO 11926	7/16-20UNF-2A; 0.45 (11.5) deep	4550 (315)	O

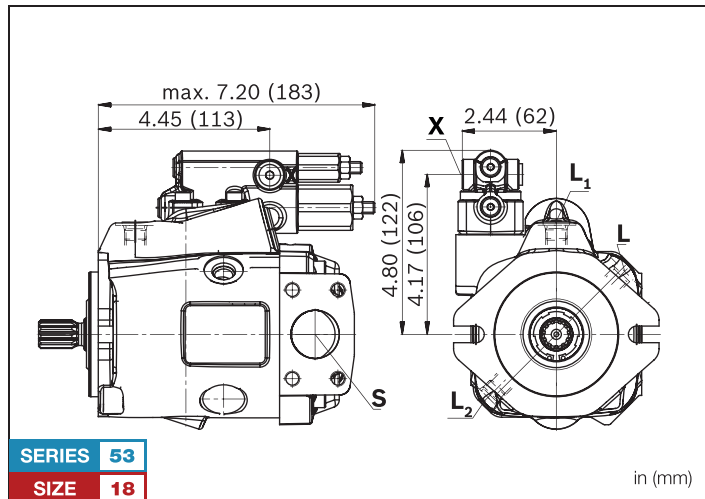
- 1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
 2) The countersink may be deeper than specified in the standard.
 3) Metric fastening thread is a deviation from standard.

- 4) Depending on the installation position, **L**, **L₁** or **L₂** must be connected (also see installation instructions starting on page 80).
 5) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

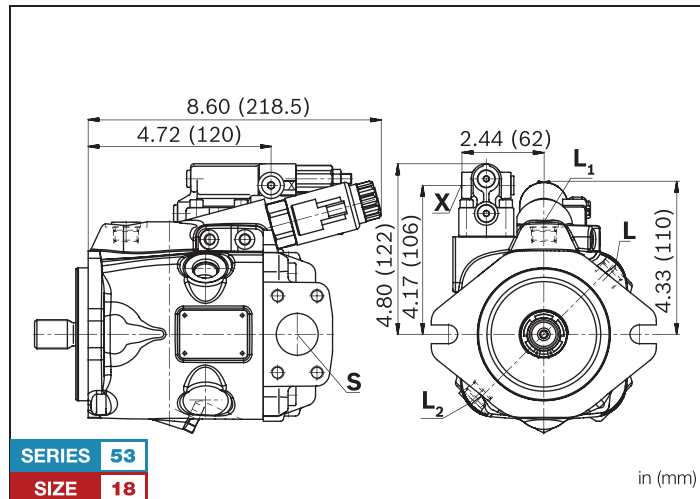
SIZE 18 CONTROLLER DIMENSIONS, SERIES 53

SERIES **53** SIZE **18**

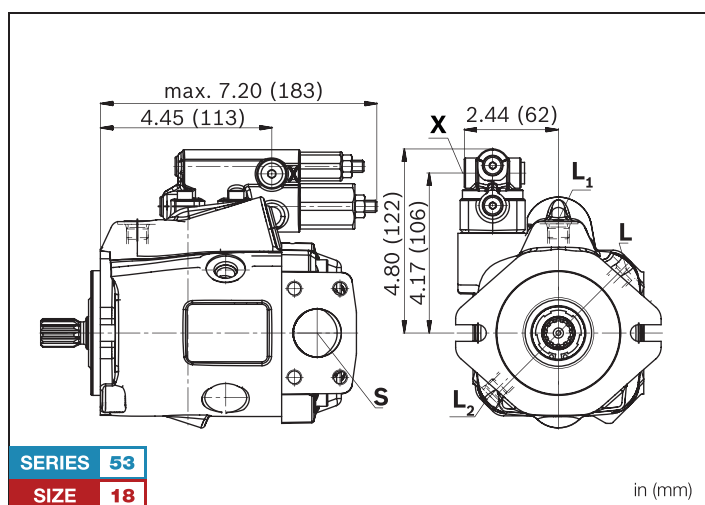
■ DRG – Pressure controller, remotely controlled, series 53



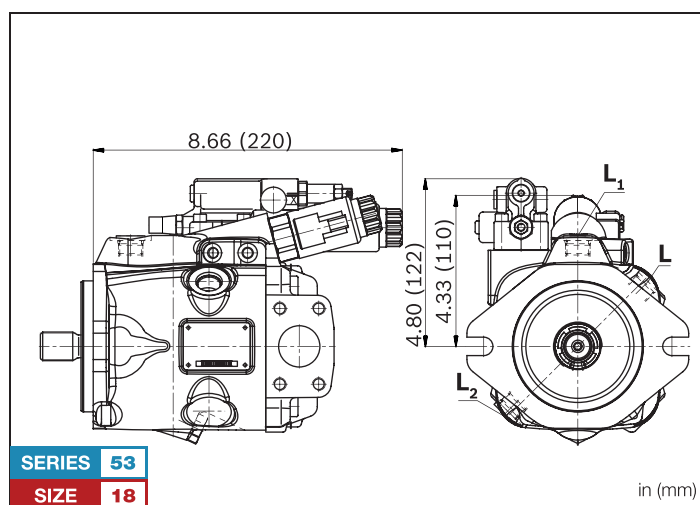
■ EP.D. / EK.D. – Electro-proportional control, series 53



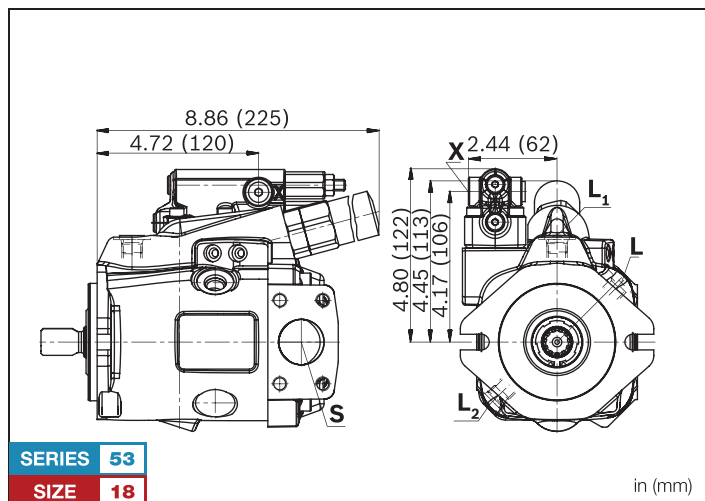
■ DRF/DRS/DRSC – Pressure and flow controller, series 53



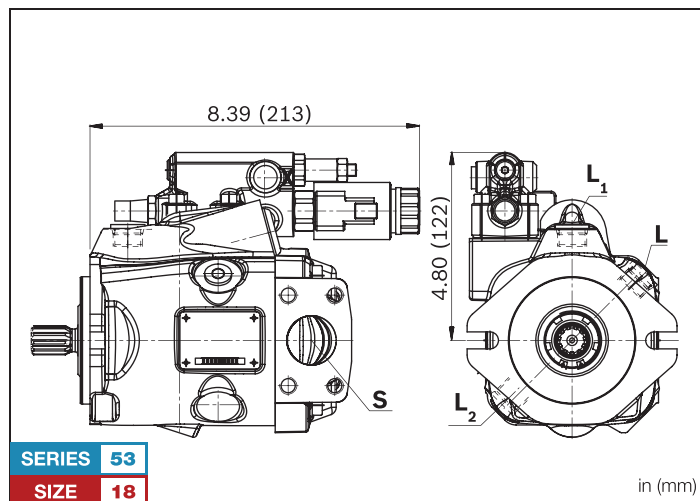
■ EP.ED. / EK.ED. – Electro-prop. control, series 53



■ LA.D. – Pressure, flow and power controller, series 53



■ ED7. / ER7. – Electro-prop. Pressure control, series 53

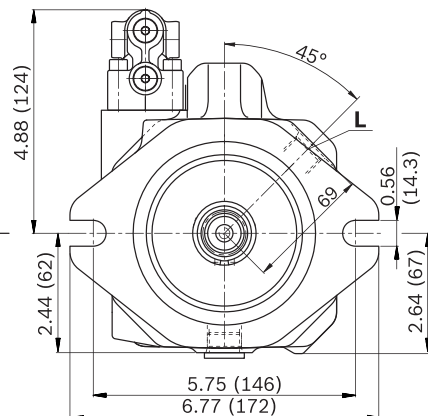
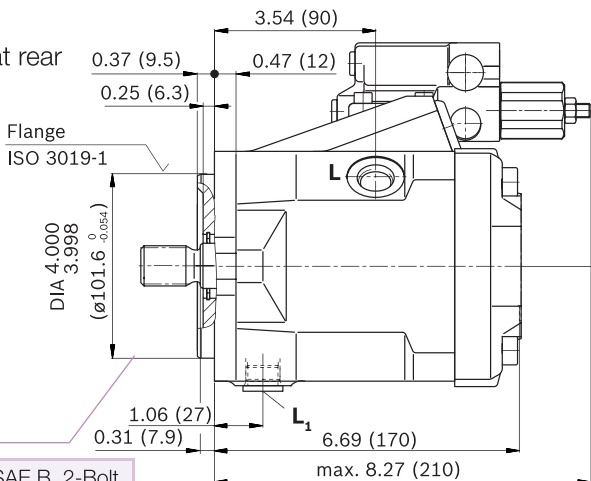


DIMENSIONS SIZE 28
SERIES 52 SIZE 28
DR – Hydraulic Pressure Controller; Clockwise Rotation, Series 52
Port Plate 61 ^U

 SAE Flange Ports at rear
 UNC thread

Port Plate 11 ^M

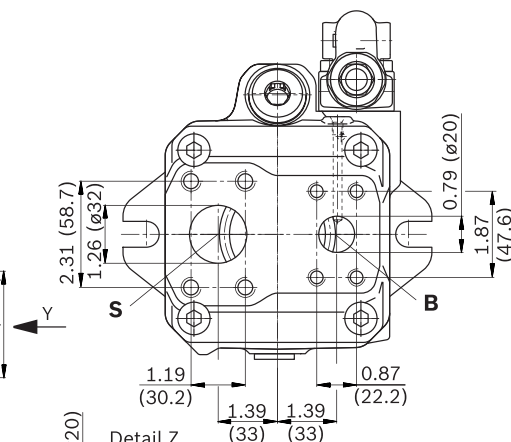
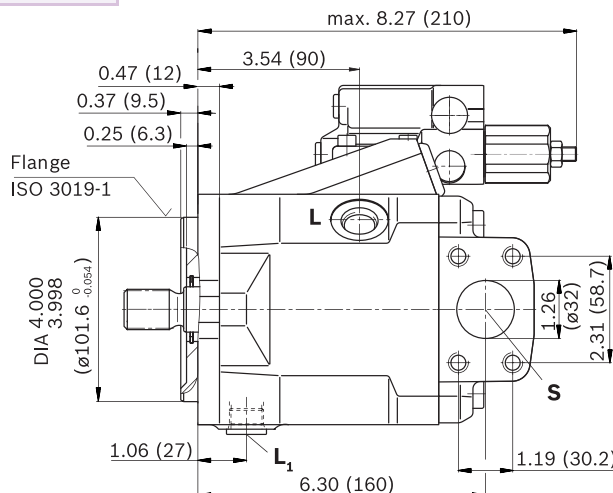
 SAE Flange Ports
 at rear
 Metric thread

SERIES 52
SIZE 28
C Mounting Flange SAE B 2-Bolt
 SAE J744 101-2 (SAE B)
 Pilot Ø 4" (101.6 mm)
 Bolt Circle Ø 5.75" (146 mm)

 View X¹⁾
Port Plate 62 ^U

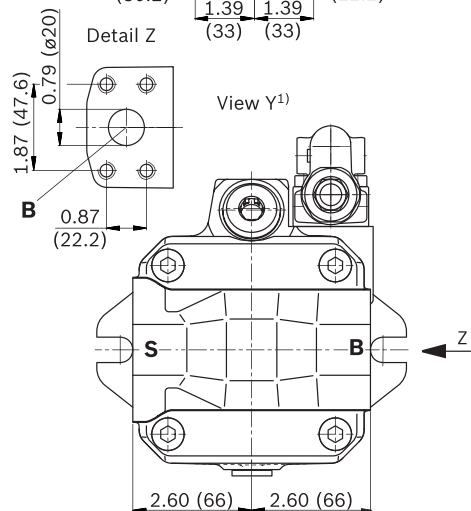
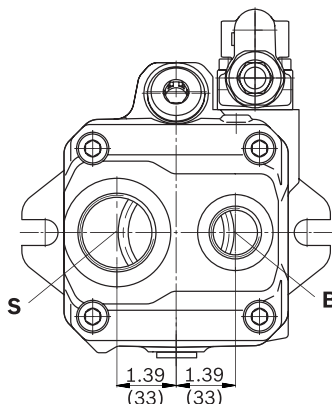
 SAE Flange Ports
 at rear
 UNC thread

Port Plate 12 ^M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 52
SIZE 28

 View Y¹⁾
Port Plate 64 ^U

 Threaded Port
 at rear, UNF

SERIES 52
SIZE 28


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

in (mm)

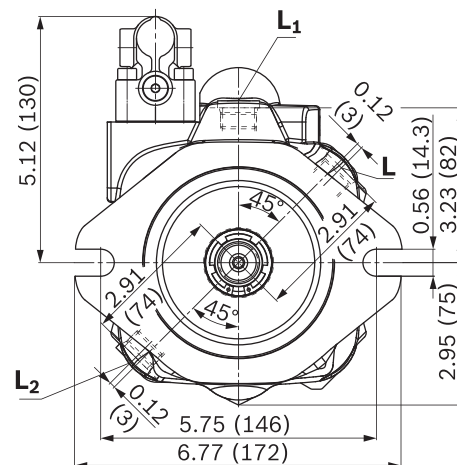
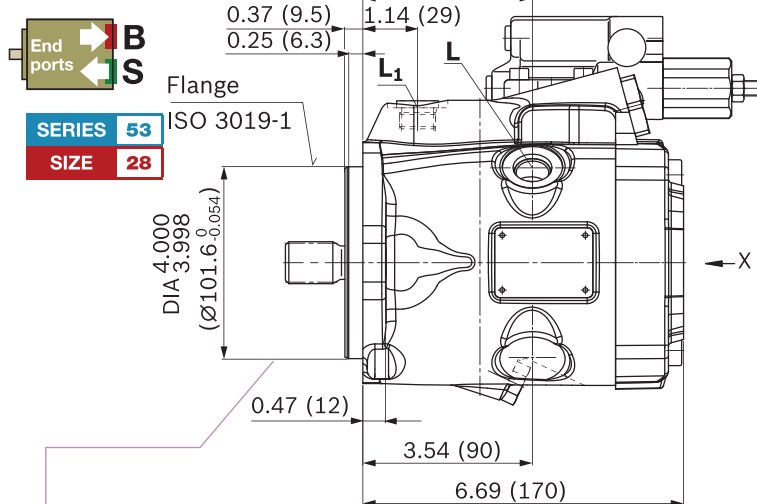
DIMENSIONS SIZE 28

SERIES **53** SIZE **28**

DR – Hydraulic Pressure Controller; Clockwise Rotation, Series 53

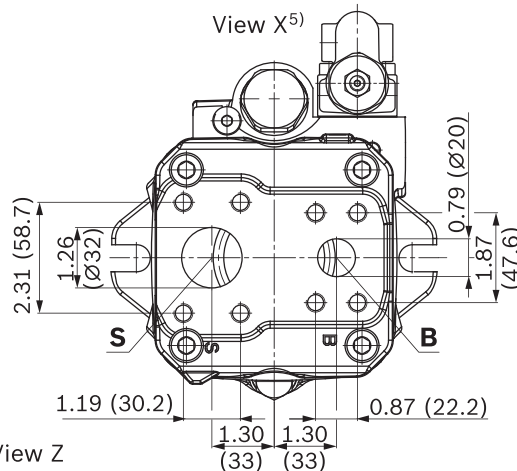
■ Port Plate 61¹⁾ **U**

■ Port Plate 11²⁾ **M**



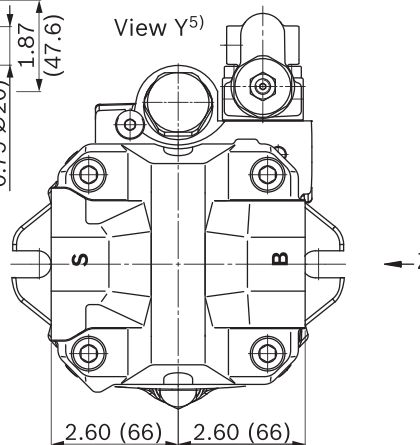
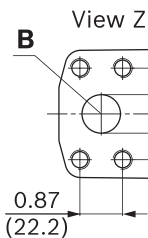
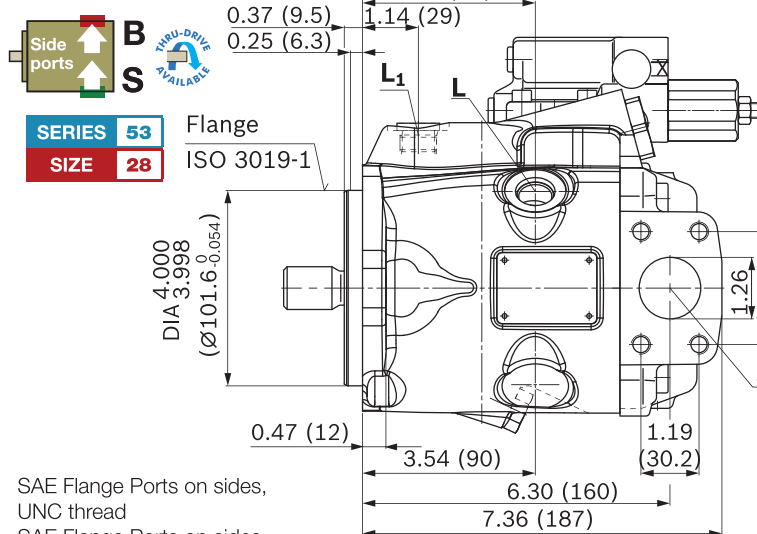
C Mounting Flange SAE B 2-Bolt
SAE J744 101-2 (SAE B)
Pilot Ø 4" (101.6 mm)
Bolt Circle Ø 5.75" (146 mm)

- 1) SAE Flange Ports at rear,
UNC thread
- 2) SAE Flange Ports at rear,
Metric thread



■ Port Plate 62³⁾ **U**

■ Port Plate 12⁴⁾ **M**



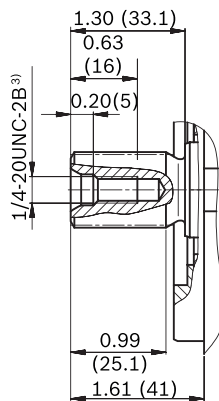
- 3) SAE Flange Ports on sides,
UNC thread
- 4) SAE Flange Ports on sides,
Metric thread

5) Dimensions of working ports turned
through 180° for counter-clockwise rotation in (mm)

DRIVE SHAFT DIMENSIONS, SIZE 28

SERIES	52/53	SIZE	28
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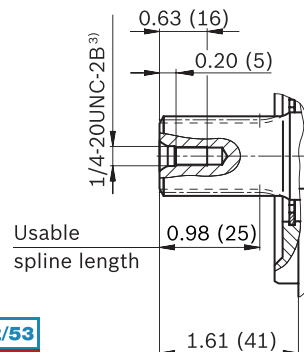
S 7/8" Splined Shaft (22-4, ISO 3019-1)

 13T 16/32DP¹⁾


SERIES	52/53
SIZE	28

in (mm)

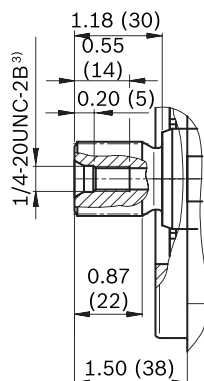
R 7/8" Splined Shaft (similar to ISO 3019-1)

 13T 16/32DP^{1) 2)}


SERIES	52/53
SIZE	28

in (mm)

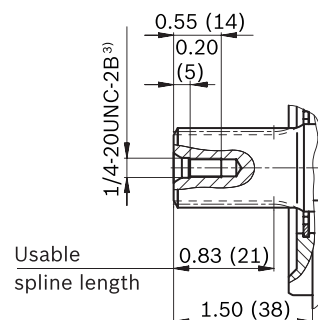
U 3/4" Splined Shaft (19-4, ISO 3019-1)

 11T 16/32DP¹⁾


SERIES	52/53
SIZE	28

in (mm)

W 3/4" Splined Shaft (similar to ISO 3019-1)

 11T 16/32DP^{1) 2)}


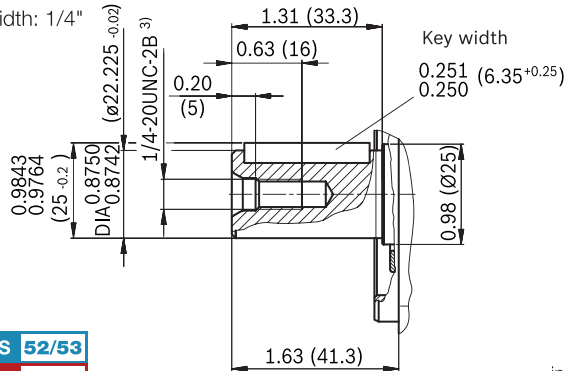
SERIES	52
SIZE	28

in (mm)

K 7/8" Parallel Keyed Shaft (ISO 3019-1)

22-1

Key width: 1/4"

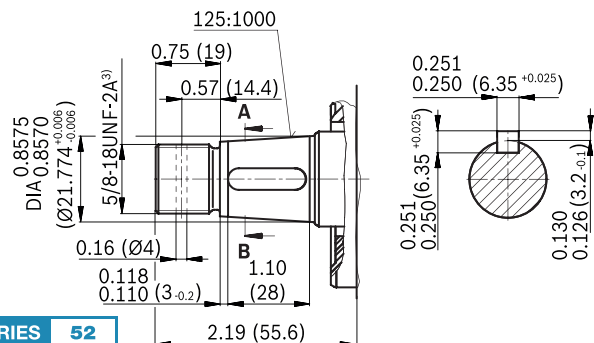


SERIES	52/53
SIZE	28

in (mm)

C 7/8" Tapered (1:8) with woodruff key (ISO 3019-1)

Key width: 1/4"



SERIES	52
SIZE	28

in (mm)

- 1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
- 3) Thread according to ASME B1.1

PORT DIMENSIONS, SIZE 28

SERIES **52/53** SIZE **28**

Port Plate 61, 62 U

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series) Fastening thread	ISO 6162-1 ASME B1.1	3/4 in 3/8-16UNC-2B; 0.75 (19) deep	4550 (315)	O
S	Suction port (standard pressure series) Fastening thread	ISO 6162-1 ASME B1.1	1 1/4 in 7/16-14UNC-2B; 0.79 (20) deep	75 (5)	O

Port Plate 64 U

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port	ISO 11926	1 1/16 12UN-2B; 0.79 (20) deep	4550 (315)	O
S	Suction port	ISO 11926	1 5/8 12UN-2B ; 0.67 (17) deep	75 (5)	O

Port Plate 11, 12 Metric M

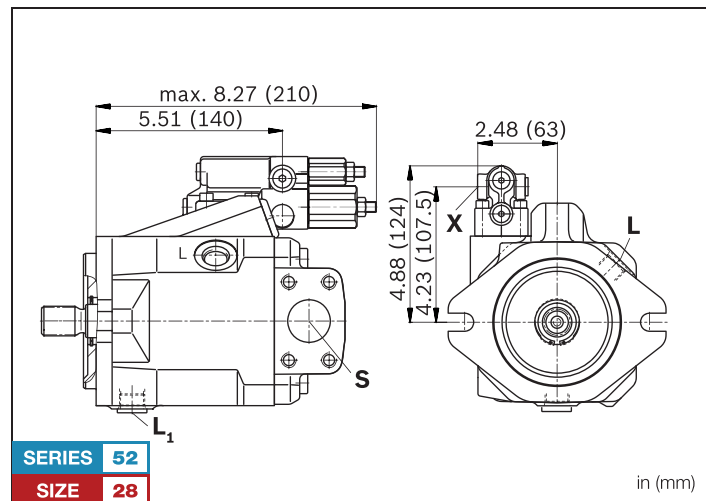
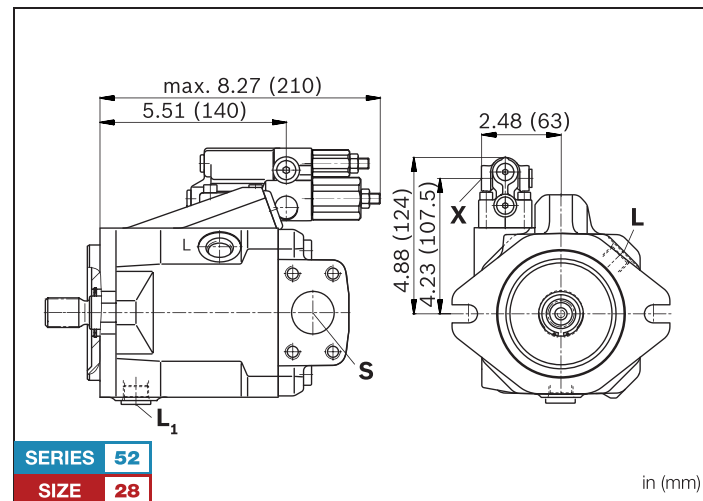
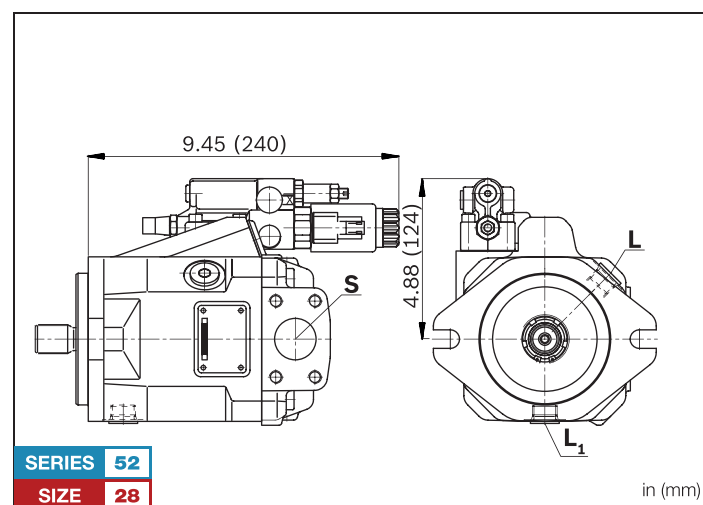
Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series) Fastening thread	SAE J518 ⁵⁾ DIN 13	3/4 in M10 × 1.5; 17 deep	4550 (315)	O
S	Suction port (standard pressure series) Fastening thread	SAE J518 ⁵⁾ DIN 13	1 1/4 in M10 × 1.5; 17 deep	75 (5)	O
L	Drain port	ISO 11926 ²⁾	3/4-16UNF-2B; 0.47 (12) deep	30 (2)	O ³⁾
L₁, L₂⁴⁾	Drain port	ISO 11926 ²⁾	3/4-16UNF-2B; 0.47 (12) deep	30 (2)	X ³⁾
X	Pilot pressure	ISO 11926	7/16-20UNF-2B; 0.45 (11.5) deep	4550 (315)	O

- 1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
 2) The countersink may be deeper than specified in the standard.
 3) Depending on the installation position, **L**, **L₁** or **L₂** must be connected (also see installation instructions starting on page 80).

- 4) Only for series 53
 5) Metric fastening thread is a deviation from standard.
 6) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

SIZE 28 CONTROLLER DIMENSIONS, SERIES 52

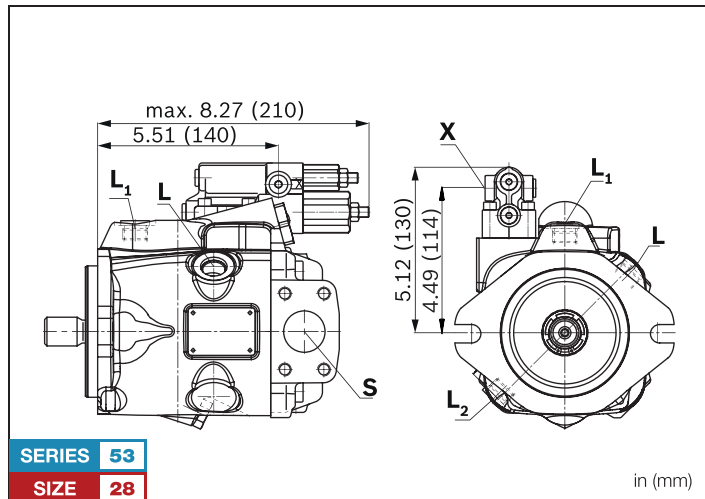
SERIES	52	SIZE	28
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DRG – Pressure controller, remotely controlled, series 52

DFR/DFR1 – Pressure and flow controller, series 52

ED7. / ER7. – Electro-prop. Pressure control, series 52


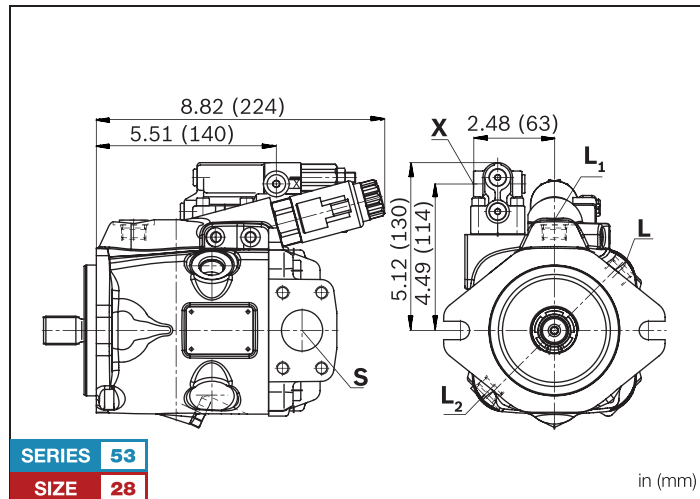
SIZE 28 CONTROLLER DIMENSIONS, SERIES 53

SERIES **53** SIZE **28**

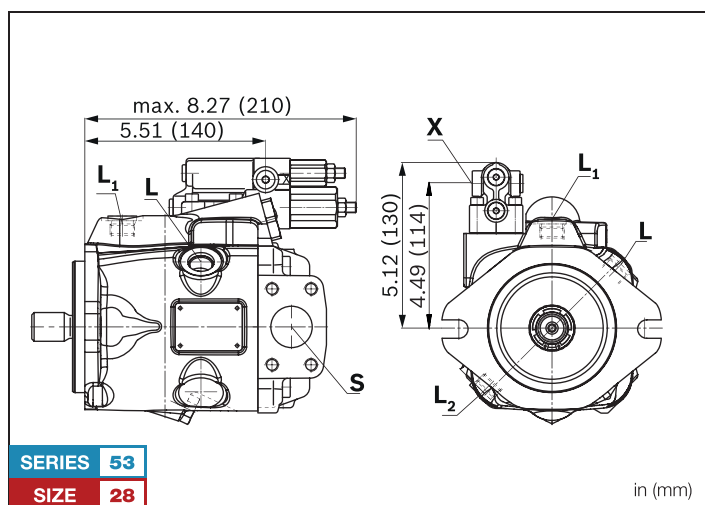
■ DRG – Pressure controller, remotely controlled, series 53



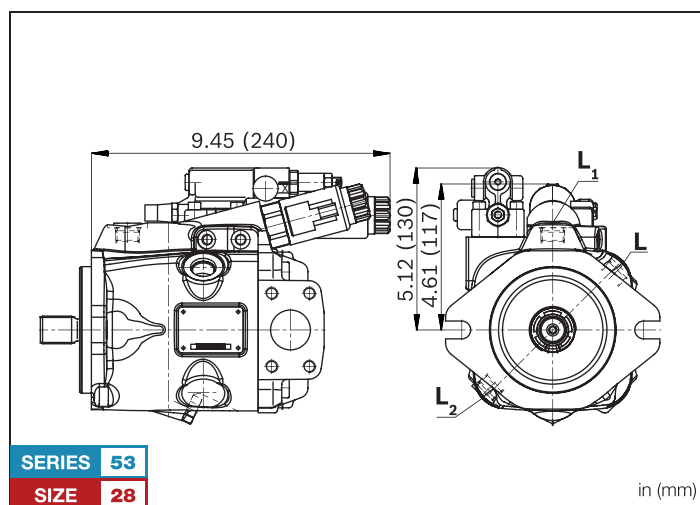
■ EP.D. / EK.D. – Electro-proportional control, series 53



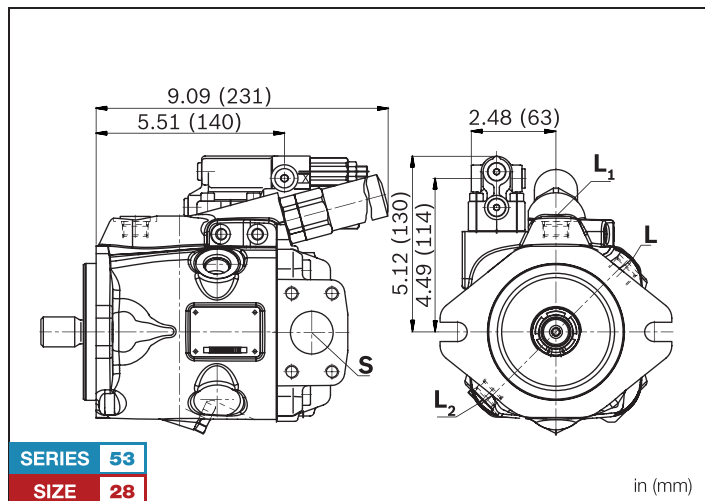
■ DRF/DRS/DRSC – Pressure and flow controller, series 53



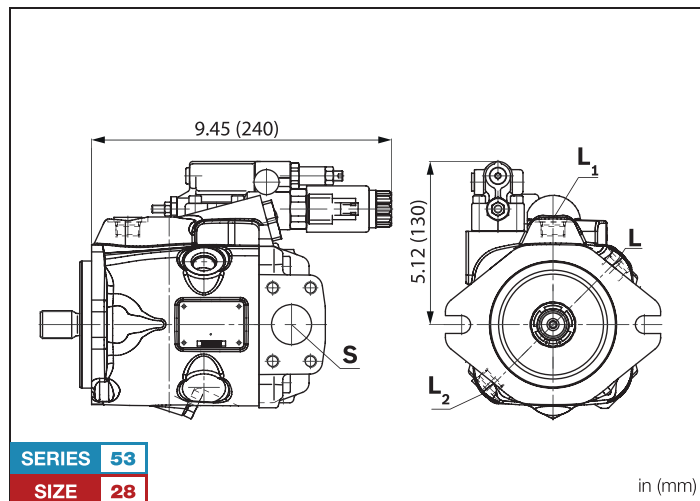
■ EP.ED. / EK.ED. – Electro-proportional control, series 53



■ LA.D. – Pressure, flow and power controller, series 53



■ ED7. / ER7. – Electro-prop. Pressure control, series 53

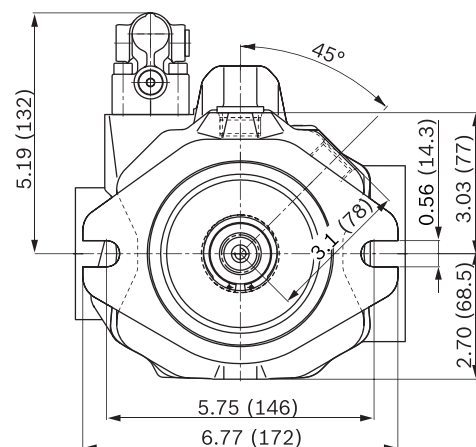
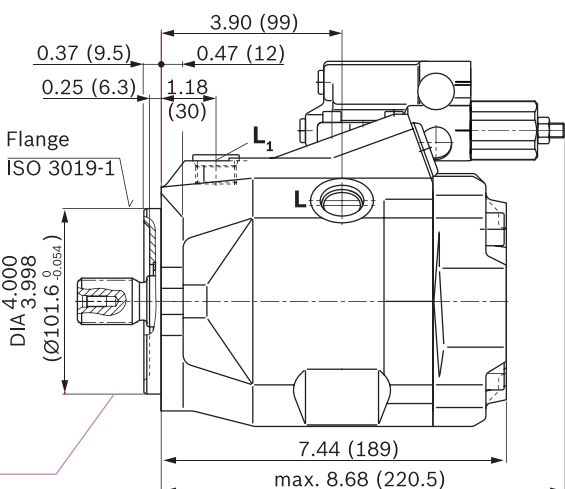


DIMENSIONS SIZE 45
SERIES 52 SIZE 45
DR – Hydraulic Pressure Controller; Clockwise Rotation, Series 52
Port Plate 61 U

 SAE Flange Ports
 at rear
 UNC thread

Port Plate 11 M

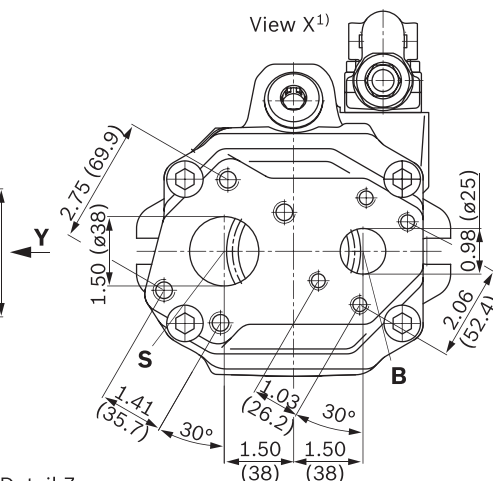
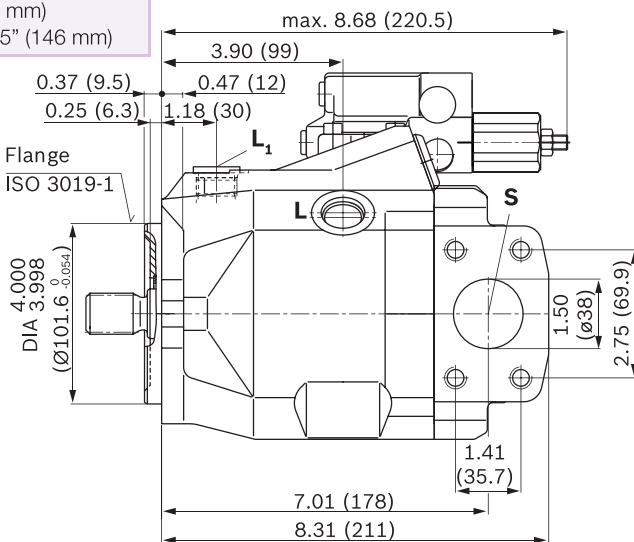
 SAE Flange Ports
 at rear
 Metric thread

SERIES 52
SIZE 45
C Mounting Flange SAE B 2-Bolt
 SAE J744 101-2 (SAE B)
 Pilot Ø 4" (101.6 mm)
 Bolt Circle Ø 5.75" (146 mm)

Port Plate 62 U

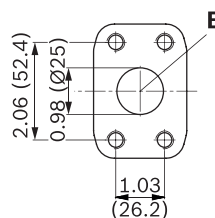
 SAE Flange Ports
 at rear
 UNC thread

Port Plate 12 M

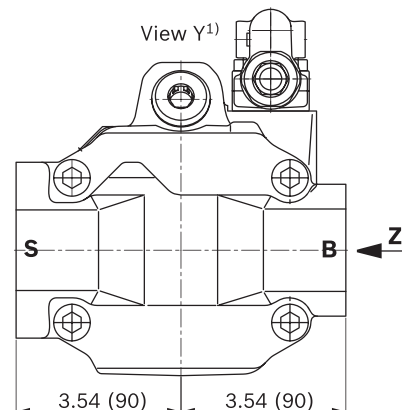
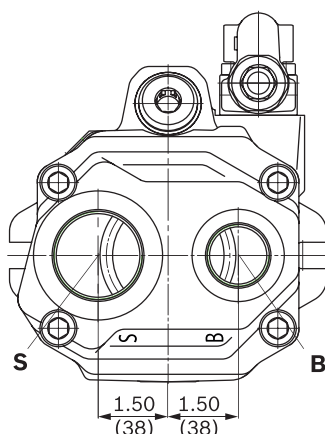
 SAE Flange Ports
 at rear
 Metric thread

SERIES 52
SIZE 28


Detail Z


Port Plate 64 U

 Threaded Port
 at rear, UNF

SERIES 52
SIZE 45


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

in (mm)

DIMENSIONS SIZE 45

SERIES **53** SIZE **45**

DR – Hydraulic Pressure Controller; Clockwise Rotation, Series 53

Port Plate 61 **U**

SAE Flange Ports
at rear
UNC thread

Port Plate 11 **M**

SAE Flange Ports
at rear
Metric thread



SERIES **53**
SIZE **45**

C Mounting Flange SAE B 2-Bolt
SAE J744 101-2 (SAE B)
Pilot Ø 4" (101.6 mm)
Bolt Circle Ø 5.75" (146 mm)

Port Plate 62 **U**

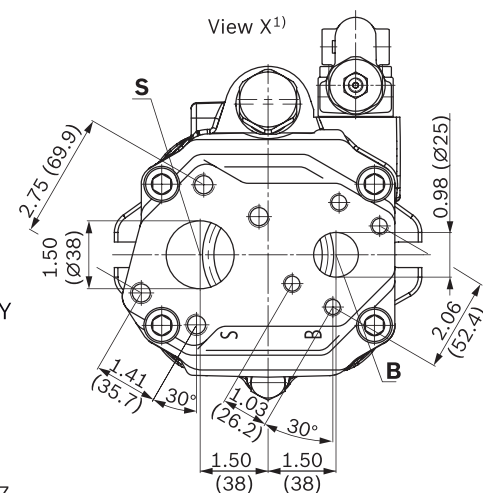
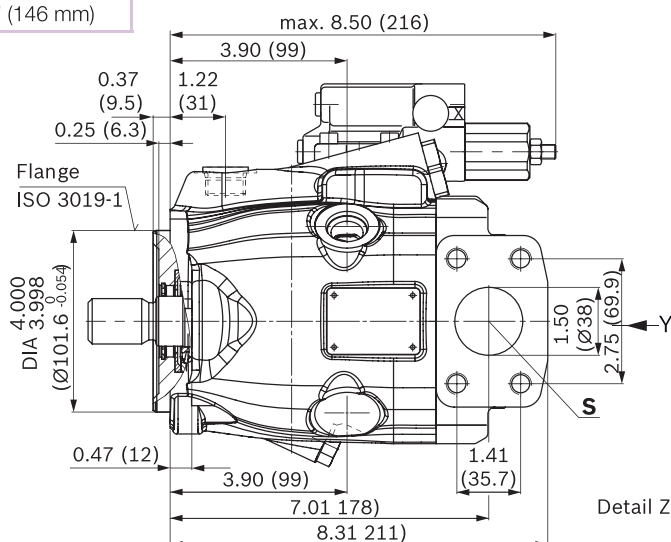
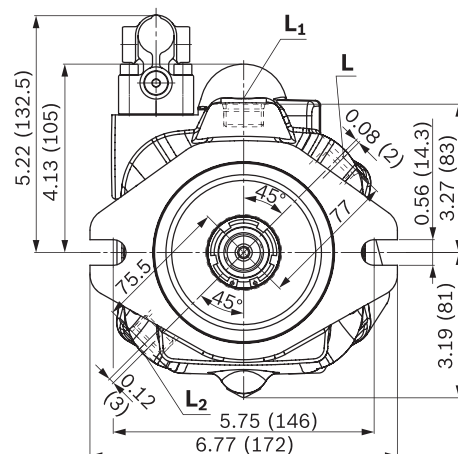
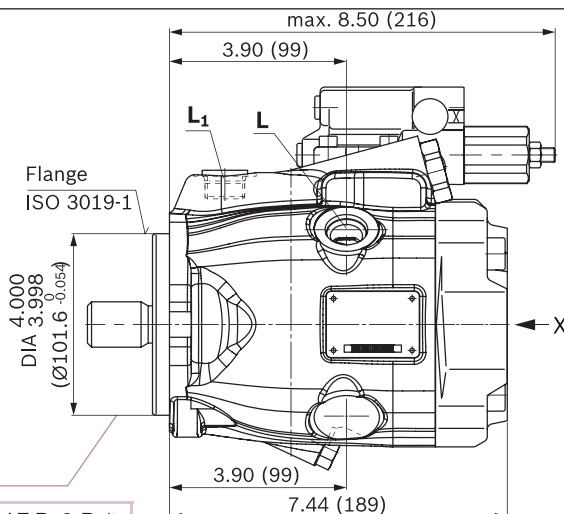
SAE Flange Ports
at rear
UNC thread

Port Plate 12 **M**

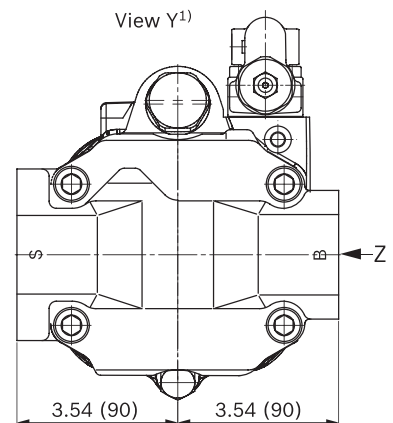
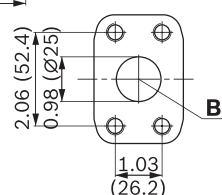
SAE Flange Ports
at rear
Metric thread



SERIES **53**
SIZE **28**



Detail Z



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

in (mm)

U Imperial **M** Metric

DIMENSIONS SIZE 45

 SERIES **52/53**

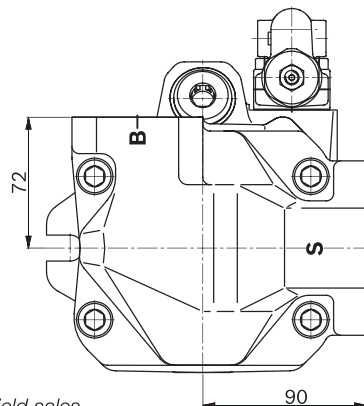
 SIZE **45**

DR – Hydraulic Pressure Controller; Clockwise Rotation, Series 52 and 53

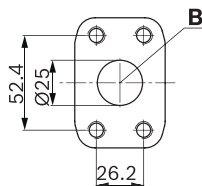
■ Port Plate 13* ^M

SAE Flange Ports
 at side, offset 90°
 Metric thread
 Counter-clockwise
 rotation²⁾


 SERIES **52/53**

 SIZE **45**


Detail Z



* Check availability with Anfield sales.

- 1) Dimensions of working ports turned through 180° for counter-clockwise rotation
- 2) For dimensions of working ports S and B for port plate 13, please refer to port plate 12, footnote 2).

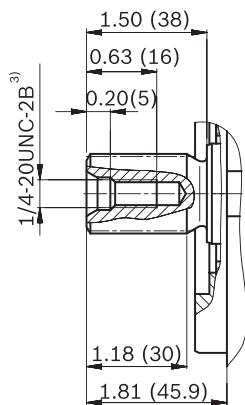
mm

DRIVE SHAFT DIMENSIONS, SIZE 45

SERIES 52/53 SIZE 45

S 1" Splined Shaft (25-4, ISO 3019-1)

15T 16/32DP¹⁾

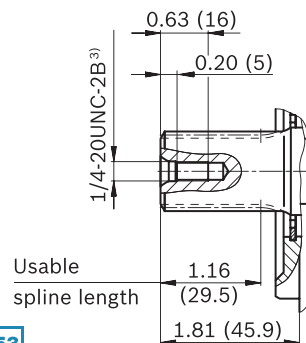


SERIES 52/53
SIZE 45

in (mm)

R 1" Splined Shaft (similar to ISO 3019-1)

15T 16/32DP^{1) 2)}

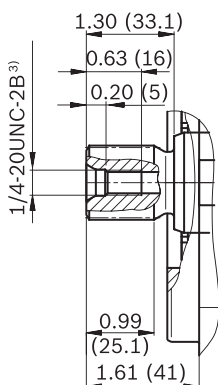


SERIES 52/53
SIZE 45

in (mm)

U 7/8" Splined Shaft (22-4, ISO 3019-1)

13T 16/32DP¹⁾

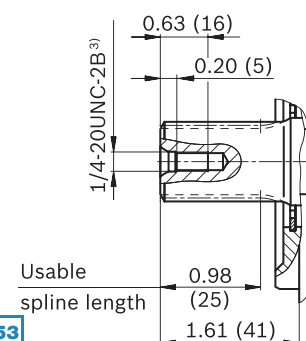


SERIES 52/53
SIZE 45

in (mm)

W 7/8" Splined Shaft (similar to ISO 3019-1)

13T 16/32DP^{1) 2)}



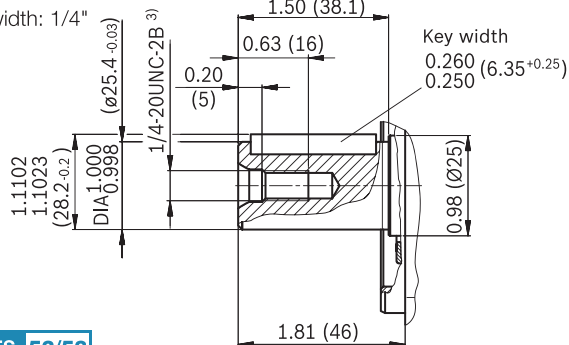
SERIES 52/53
SIZE 45

in (mm)

K 7/8" Parallel Keyed Shaft (ISO 3019-1)

25-1

Key width: 1/4"

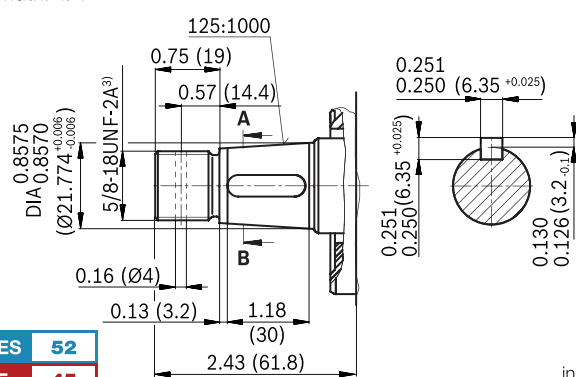


SERIES 52/53
SIZE 45

in (mm)

C 7/8" Tapered (1:8) with woodruff key (ISO 3019-1)

Key width: 1/4"



SERIES 52
SIZE 45

in (mm)

- 1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
- 3) Thread according to ASME B1.1

PORT DIMENSIONS, SIZE 45

SERIES 52/53 **SIZE** 45

Port Plate 61, 62 U

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	ISO 6162-1	1 in	4550 (315)	O
	Fastening thread	ASME B1.1	3/8-16UNC-2B; 0.71 (18) deep		
S	Suction port (standard pressure series)	ISO 6162-1	1 1/2 in	75 (5)	O
	Fastening thread	ASME B1.1	1/2-13UNC-2B; 0.87 (22) deep		

Port Plate 64 U

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	4550 (315)	O
S	Suction port	ISO 11926	1 7/8-12UN-2B; 0.79 (20) deep	75 (5)	O

Port Plate 11, 12, 13 Metric M

Ports		Standard	Size	$p_{\max}$ [bar] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	SAE J518 ⁵⁾	1 in	315	O
	Fastening thread	DIN 13	M10 × 1.5; 17 deep		
S	Suction port (standard pressure series)	SAE J518 ⁵⁾	1 1/2 in	5	O
	Fastening thread	DIN 13	M12 × 1.75; 20 deep		
L	Drain port	ISO 11926 ²⁾	7/8-14UNF-2B; 0.51 (13) deep	30 (2)	O ³⁾
L₁, L₂ ⁴⁾	Drain port	ISO 11926 ²⁾	7/8-14UNF-2B; 0.51 (13) deep	30 (2)	X ³⁾
X	Pilot pressure	ISO 11926	7/16-20UNF-2A; 0.45 (11.5) deep	4550 (315)	O

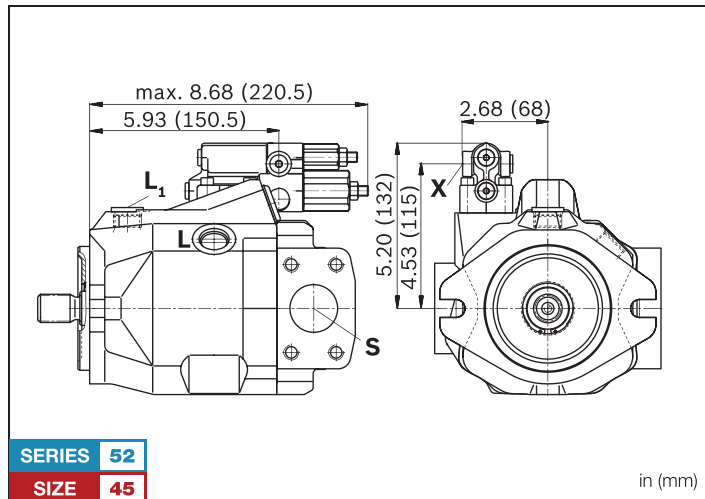
1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
 2) The countersink may be deeper than specified in the standard.
 3) Depending on the installation position, **L**, **L₁** or **L₂** must be connected (also see installation instructions starting on page 80).

4) Only for series 53
 5) Metric fastening thread is a deviation from standard.
 6) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

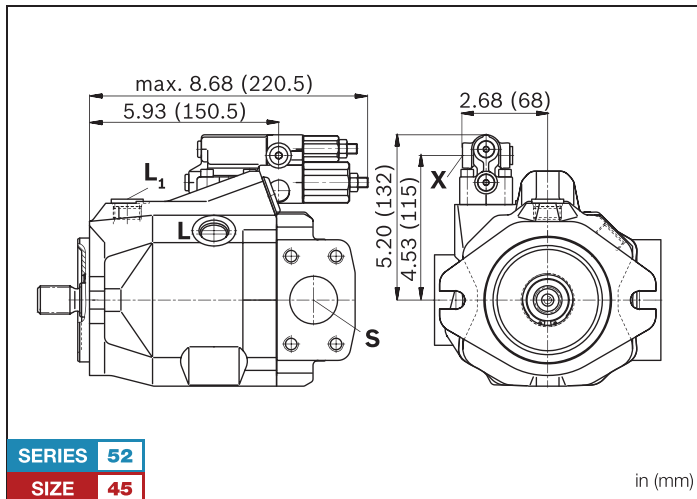
SIZE 45 CONTROLLER DIMENSIONS, SERIES 52

SERIES **52** SIZE **45**

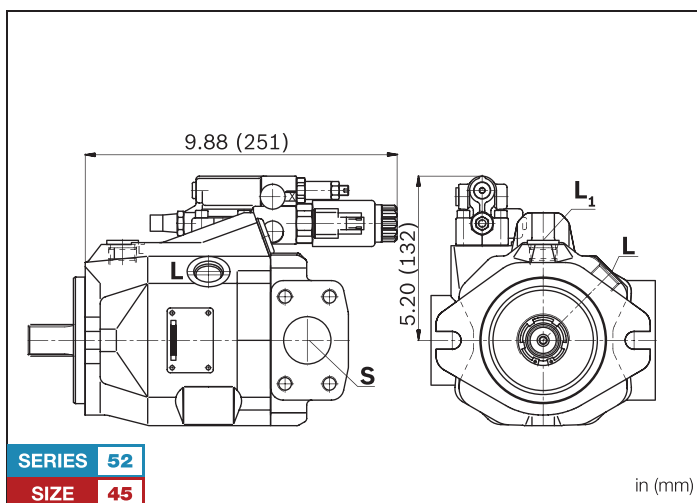
■ DRG – Pressure controller, remotely controlled, series 52

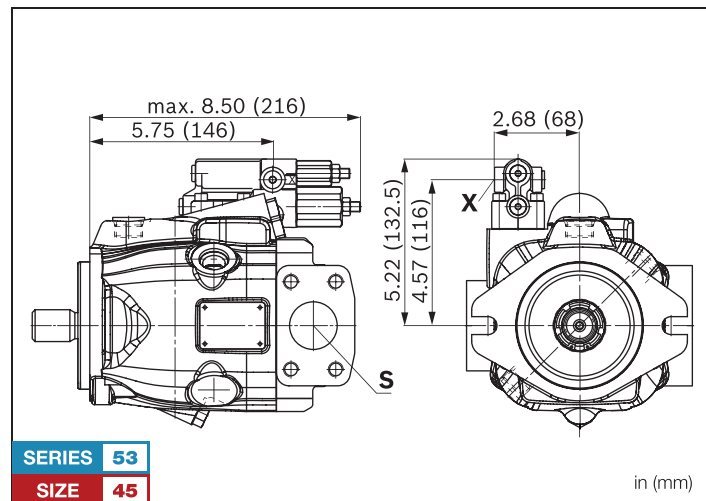
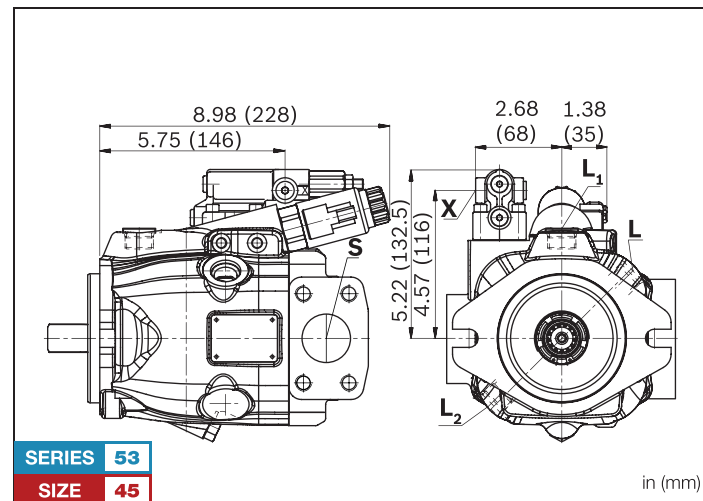
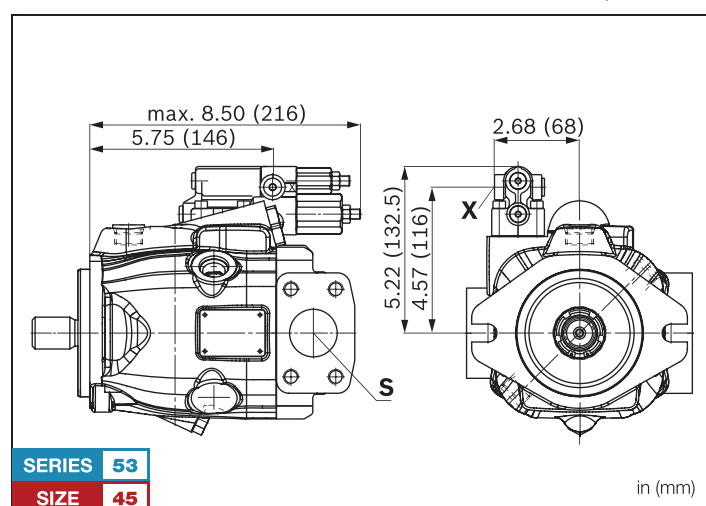
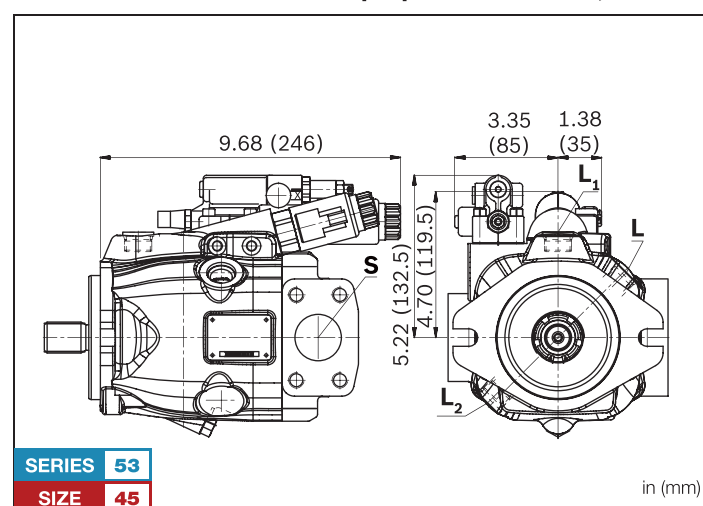
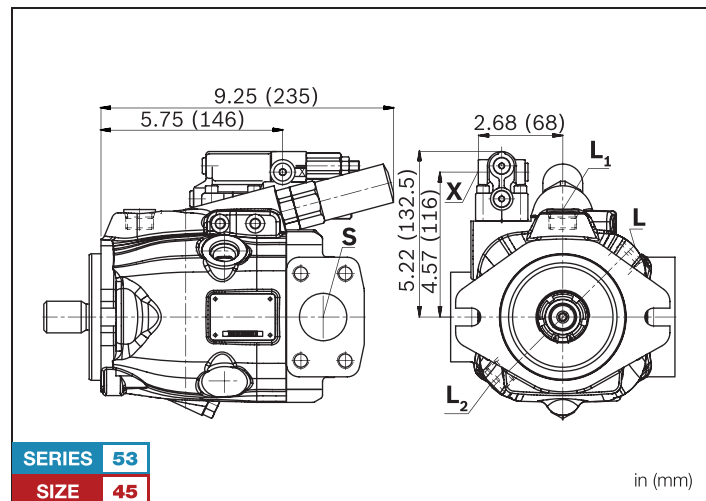
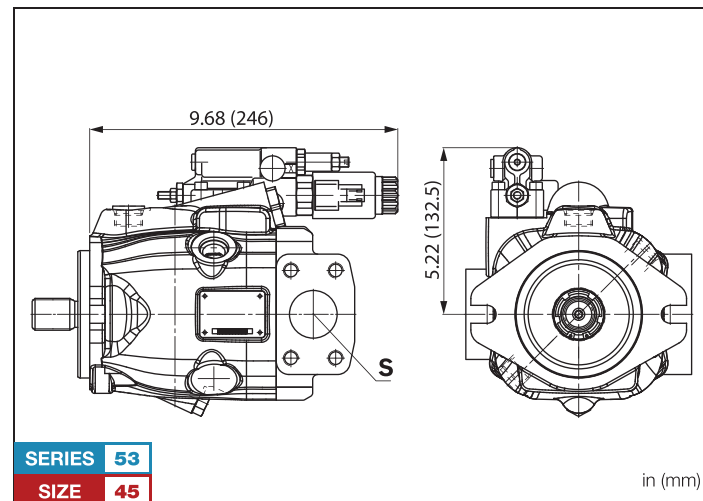


■ DFR/DFR1/DRSC – Pressure and flow controller, series 52



■ ED7. / ER7. – Electro-prop. Pressure control, series 52



SIZE 45 CONTROLLER DIMENSIONS, SERIES 53
SERIES 53 SIZE 45
■ DRG – Pressure controller, remotely controlled, series 53

■ EP.D. / EK.D. – Electro-proportional control, series 53

■ DRF/DRS/DRSC – Pressure and flow controller, series 53

■ EP.ED. / EK.ED. – Electro-proportional control, series 53

■ LA.D. – Pressure, flow and power controller, series 53

■ ED7. / ER7. – Electro-prop. Pressure control, series 53


DIMENSIONS SIZE 60

SERIES **52** SIZE **60**

DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange C Series 52

■ Port Plate 61 U

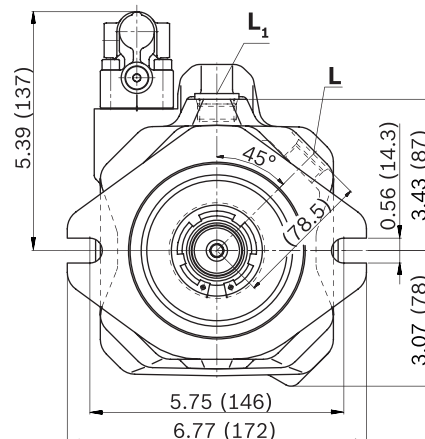
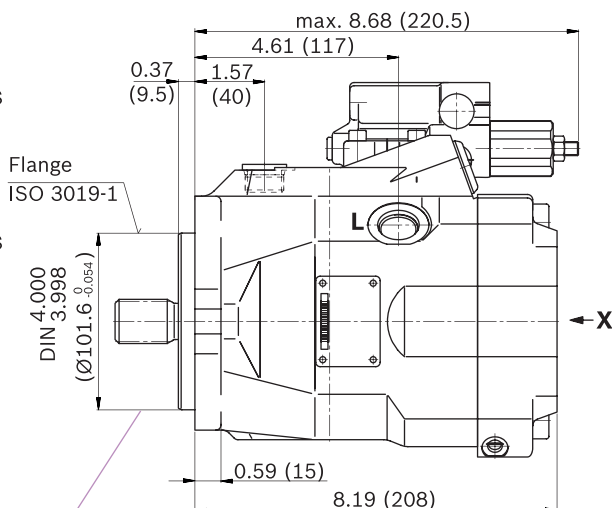
SAE Flange Ports
at rear
UNC thread

■ Port Plate 11 M

SAE Flange Ports
at rear
Metric thread

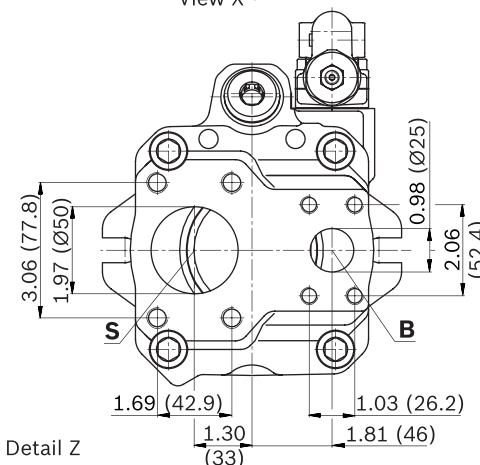


SERIES **52**
SIZE **60**



C Mounting Flange SAE B 2-Bolt
SAE J744 101-2 (SAE B)
Pilot Ø 4" (101.6 mm)
Bolt Circle Ø 5.75" (146 mm)

View X¹⁾



Detail Z

■ Port Plate 62 U

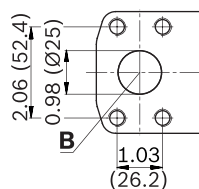
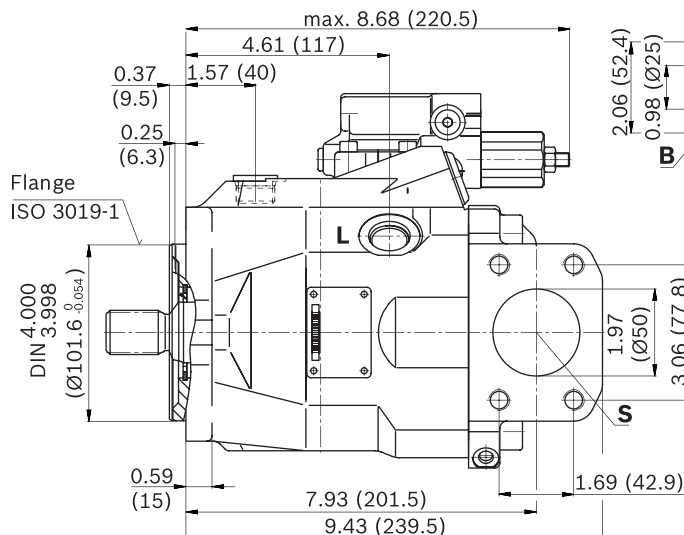
SAE Flange Ports
at rear
UNC thread

■ Port Plate 12 M

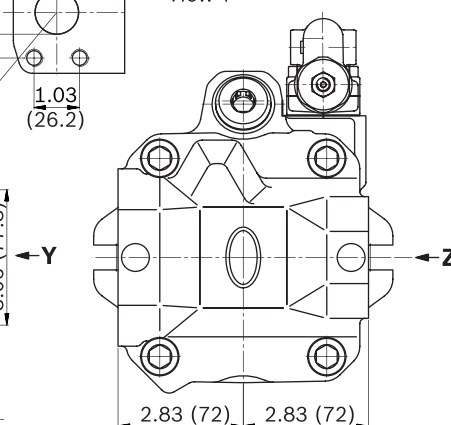
SAE Flange Ports
at rear
Metric thread



SERIES **52**
SIZE **60**



View Y¹⁾



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

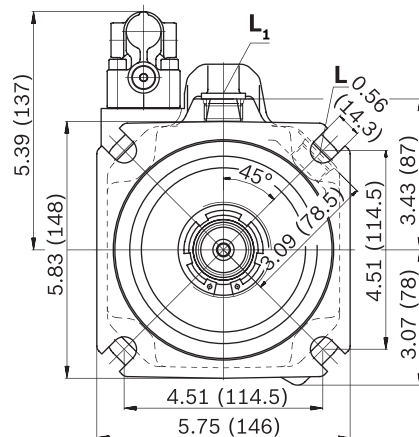
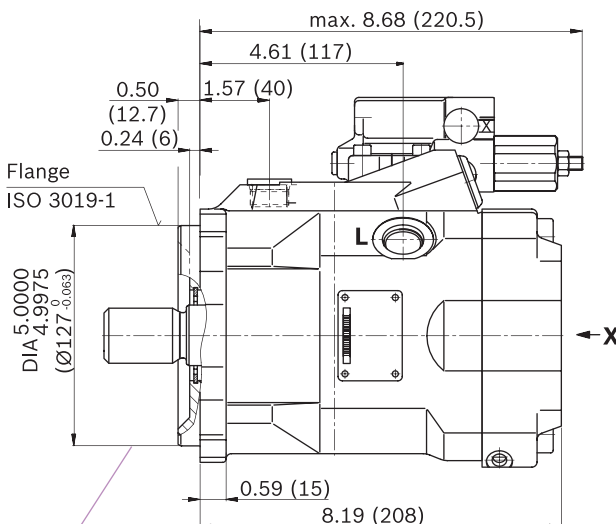
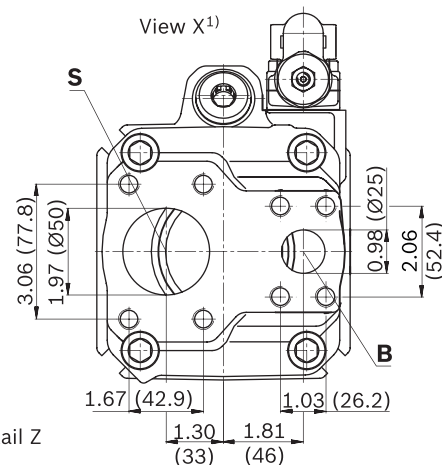
in (mm)

DIMENSIONS SIZE 60
SERIES 52 SIZE 60
DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange D Series 52
Port Plate 61 U

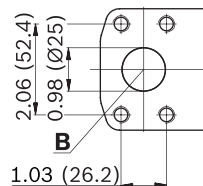
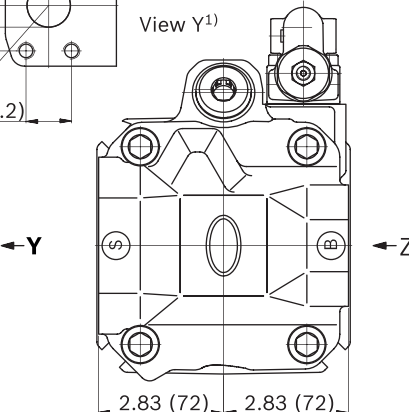
 SAE Flange Ports
 at rear
 UNC thread

Port Plate 11 M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 52
SIZE 60
D Mounting Flange SAE C 4-Bolt
 SAE J744 127-4 (SAE C)
 Pilot Ø 5" (127 mm)
 Bolt Circle Ø 6.375" (161.9 mm)

 View X¹⁾


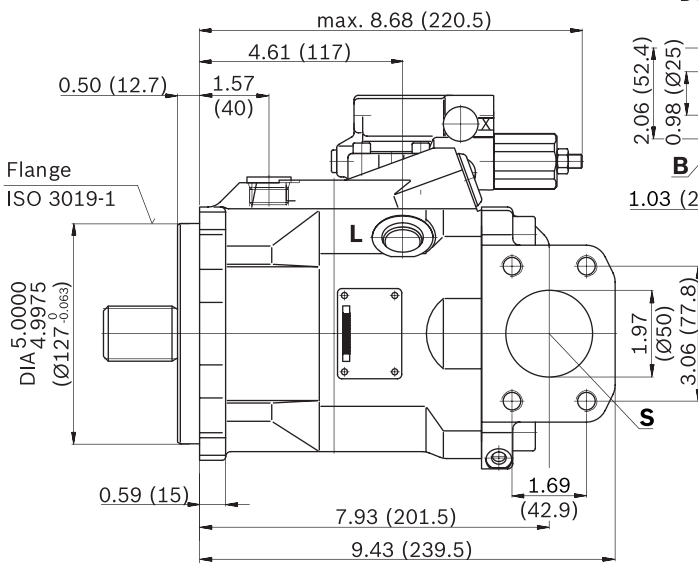
Detail Z


 View Y¹⁾

Port Plate 62 U

 SAE Flange Ports
 at rear
 UNC thread

Port Plate 12 M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 52
SIZE 60


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

in (mm)

DIMENSIONS SIZE 63

SERIES **53** SIZE **63**

DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange C Series 53

■ Port Plate 61 **U**

SAE Flange Ports
at rear
UNC thread

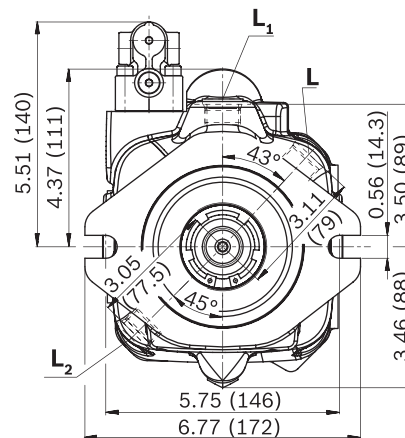
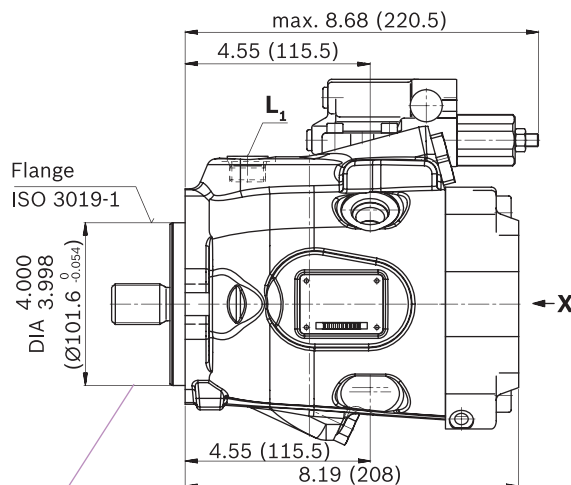
■ Port Plate 11 **M**

SAE Flange Ports
at rear
Metric thread

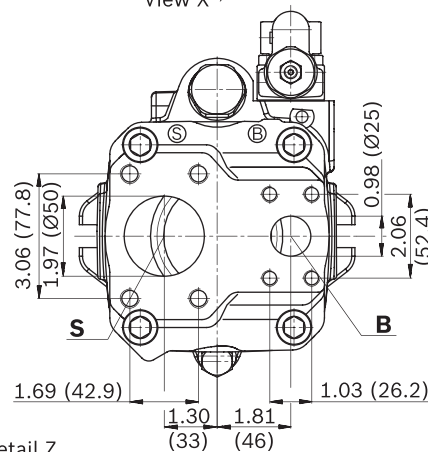


SERIES **53**
SIZE **63**

C Mounting Flange SAE B 2-Bolt
SAE J744 101-2 (SAE B)
Pilot Ø 4" (101.6 mm)
Bolt Circle Ø 5.75" (146 mm)



View X¹⁾



Detail Z

■ Port Plate 62 **U**

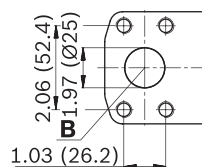
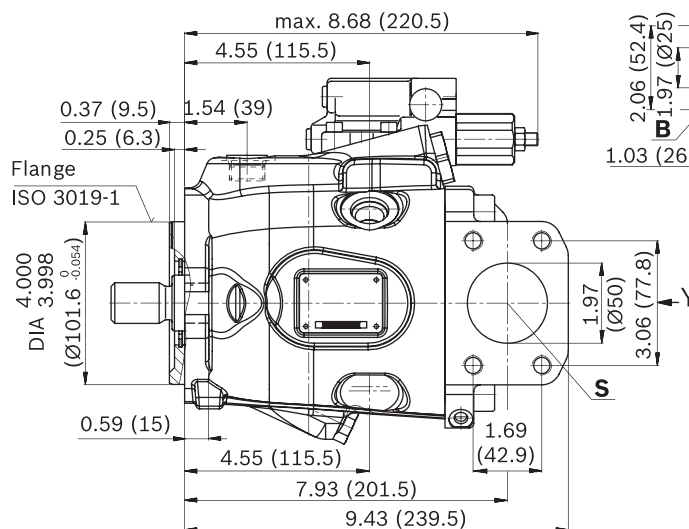
SAE Flange Ports
at rear
UNC thread

■ Port Plate 12 **M**

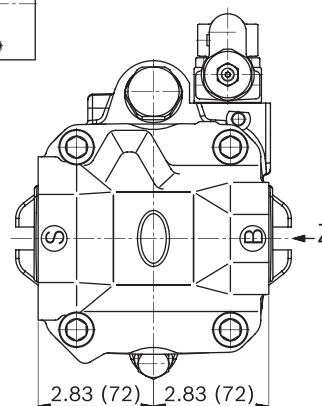
SAE Flange Ports
at rear
Metric thread



SERIES **53**
SIZE **63**



View Y¹⁾



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

in (mm)

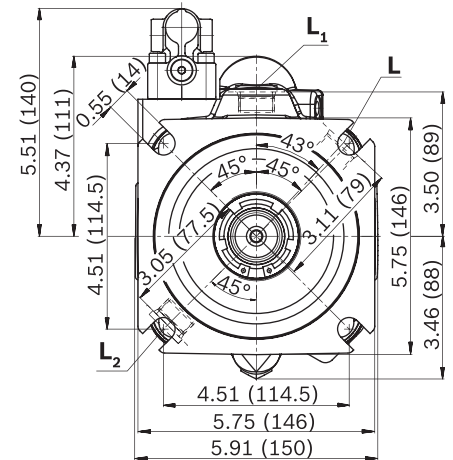
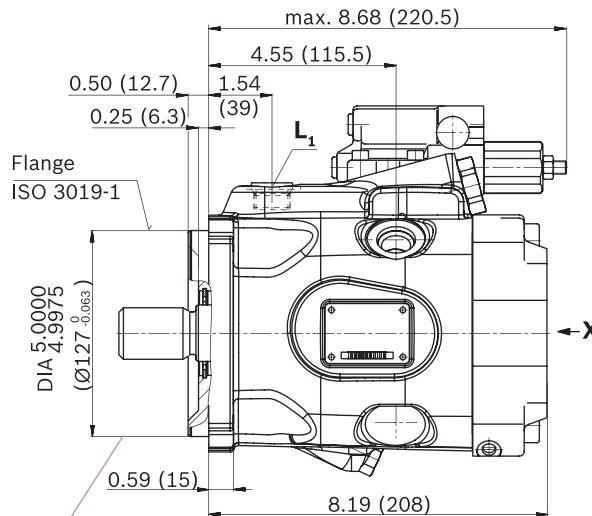
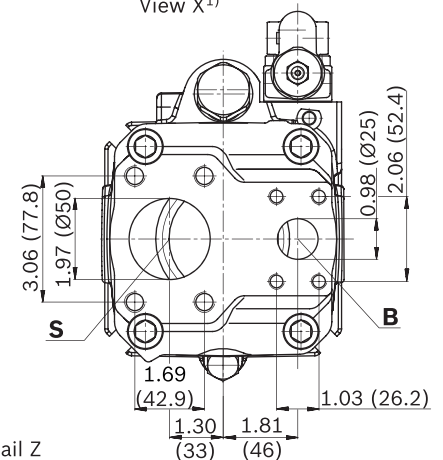
DIMENSIONS SIZE 63
SERIES 53 SIZE 63
DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange D Series 53

- **Port Plate 61** **U**
SAE Flange Ports
at rear
UNC thread

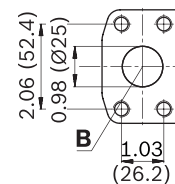
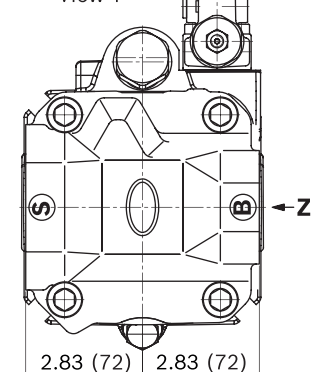
- **Port Plate 11** **M**
SAE Flange Ports
at rear
Metric thread


SERIES 53
SIZE 63

- D** Mounting Flange SAE C 4-Bolt
SAE J744 127-4 (SAE C)
Pilot Ø 5" (127 mm)
Bolt Circle Ø 6.375" (161.9 mm)

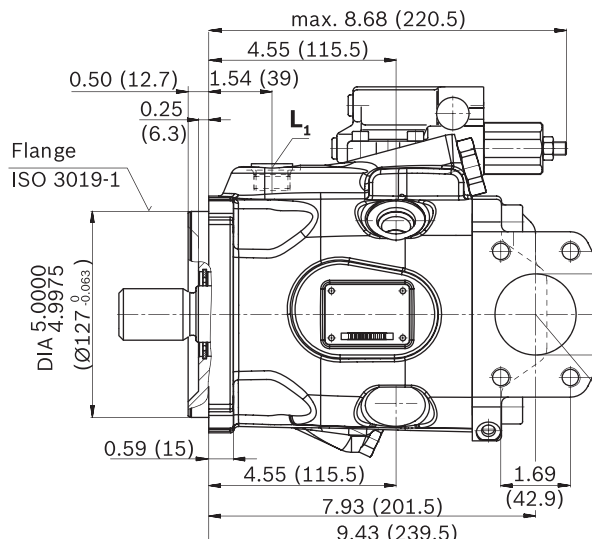

 View X¹⁾


Detail Z


 View Y¹⁾


- **Port Plate 62**
SAE Flange Ports
at rear
UNC thread

- **Port Plate 12**
SAE Flange Ports
at rear
Metric thread


SERIES 53
SIZE 63


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

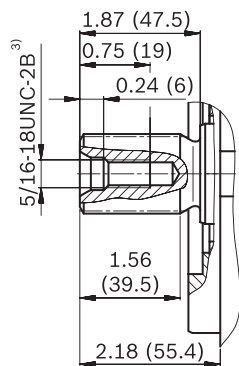
in (mm)

DRIVE SHAFT DIMENSIONS, SIZE 60/63

SERIES **52/53** SIZE **60/63**

S 1-1/4" Splined Shaft (32-4, ISO 3019-1)

14T 12/24DP¹⁾

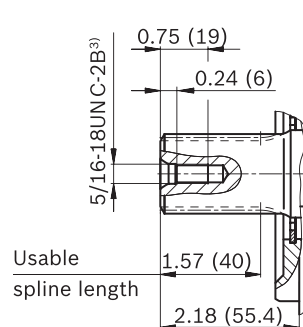


SERIES **52/53**
SIZE **60/63**

in (mm)

R 1-1/4" Splined Shaft (similar to ISO 3019-1)

14T 12/24DP^{1) 2)}

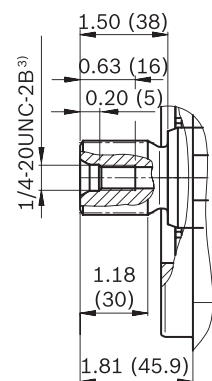


SERIES **52/53**
SIZE **60/63**

in (mm)

U 1" Splined Shaft (25-4, ISO 3019-1)

15T 16/32DP¹⁾

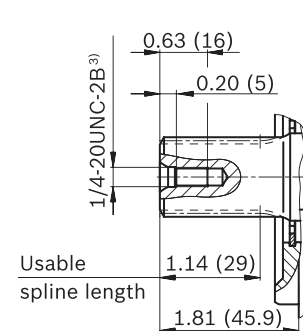


SERIES **52/53**
SIZE **60/63**

in (mm)

W 1" Splined Shaft (similar to ISO 3019-1)

15T 16/32DP^{1) 2)}



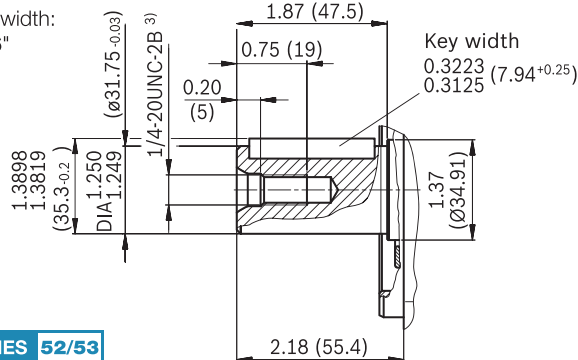
SERIES **52/53**
SIZE **60/63**

in (mm)

K 1-1/4" Parallel Keyed Shaft (ISO 3019-1)

32-1

Key width:
5/16"

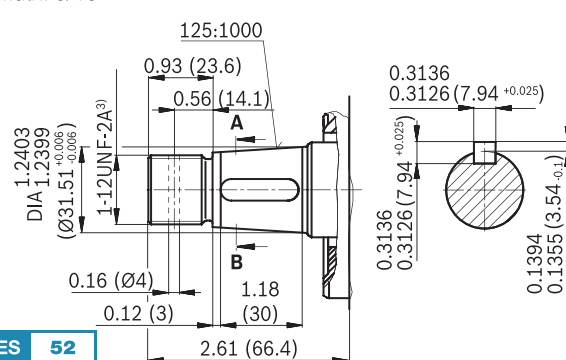


SERIES **52/53**
SIZE **60/63**

in (mm)

C 1-1/4" Tapered (1:8) with woodruff key (ISO 3019-1)

Key width: 5/16"



SERIES **52**
SIZE **60**

in (mm)

- 1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
- 3) Thread according to ASME B1.1

PORT DIMENSIONS SIZE 60/63

SERIES 52/53 **SIZE** 60/63

■ Port Plate 61, 62 **U**

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	ISO 6162-1	1 in	4550 (315)	O
	Fastening thread	ASME B1.1	3/8-16UNC-2B; 0.71 (18) deep		
S	Suction port (standard pressure series)	ISO 6162-1	2 in	75 (5)	O
	Fastening thread	ASME B1.1	1/2-13UNC-2B; 0.87 (22) deep		

■ Port Plate 11, 12 Metric **M**

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	SAE J518 ⁵⁾	1 in	315	O
	Fastening thread	DIN 13	M10 × 1.5; 17 deep		
S	Suction port (standard pressure series)	SAE J518 ⁵⁾	2 in	5	O
	Fastening thread	DIN 13	M12 × 1.75; 20 deep		
L	Drain port	ISO 11926 ²⁾	7/8-14UNF-2B; 0.51 (13) deep	30 (2)	O ³⁾
L₁, L₂ ⁴⁾	Drain port	ISO 11926 ²⁾	7/8-14UNF-2B; 0.51 (13) deep	30 (2)	X ³⁾
X	Pilot pressure	ISO 11926	7/16-20UNF-2A; 0.45 (11.5) deep	4550 (315)	O

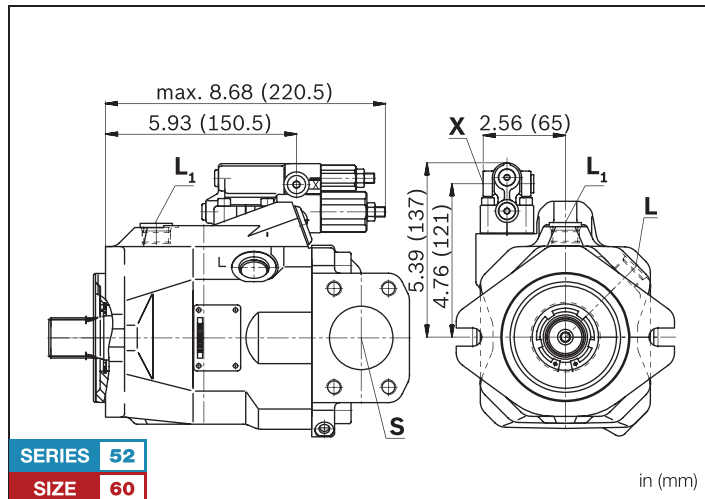
- 1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
- 2) The countersink may be deeper than specified in the standard.
- 3) Depending on the installation position, L, L1 or L2 must be connected (also see installation instructions starting on page 80).

- 4) Only series 53.
- 5) Metric fastening thread is a deviation from standard.
- 6) O = Must be connected (plugged on delivery)
X = Plugged (in normal operation)

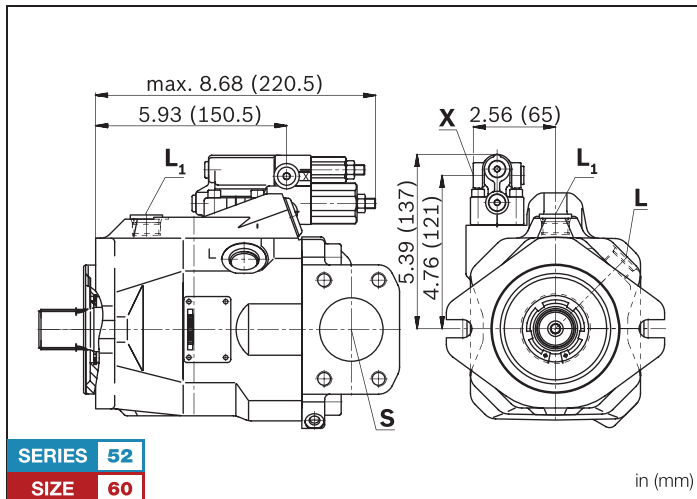
SIZE 60 CONTROLLER DIMENSIONS, SERIES 52

SERIES **52** SIZE **60**

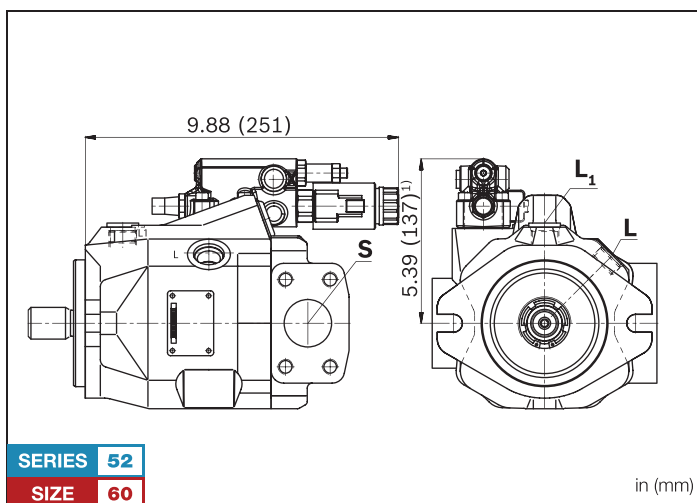
■ DRG – Pressure controller, remotely controlled, series 52

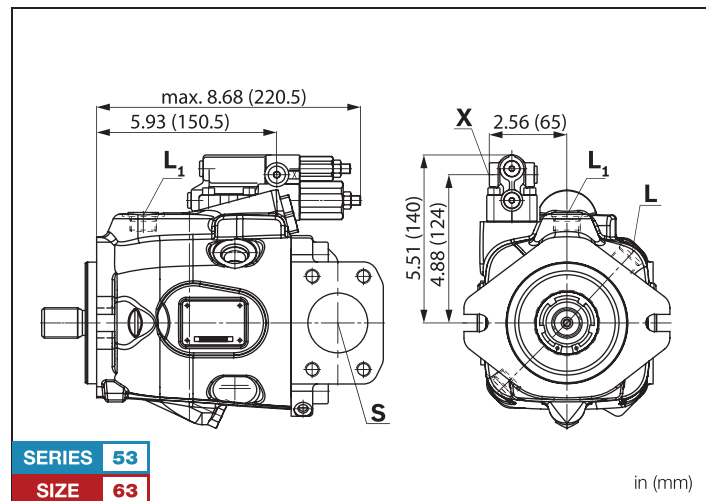
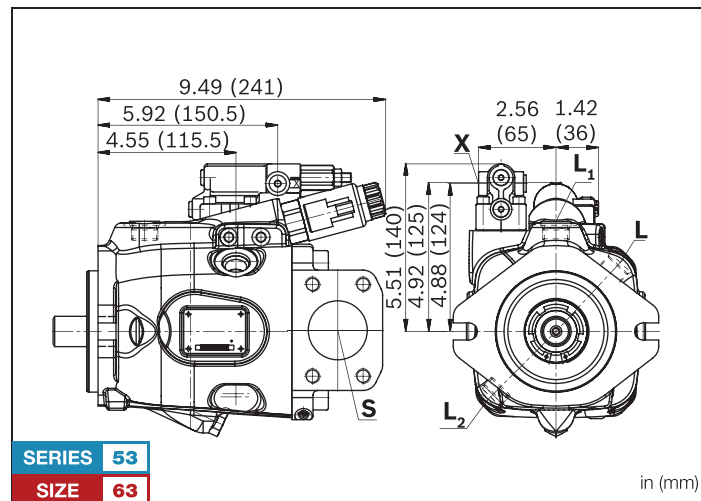
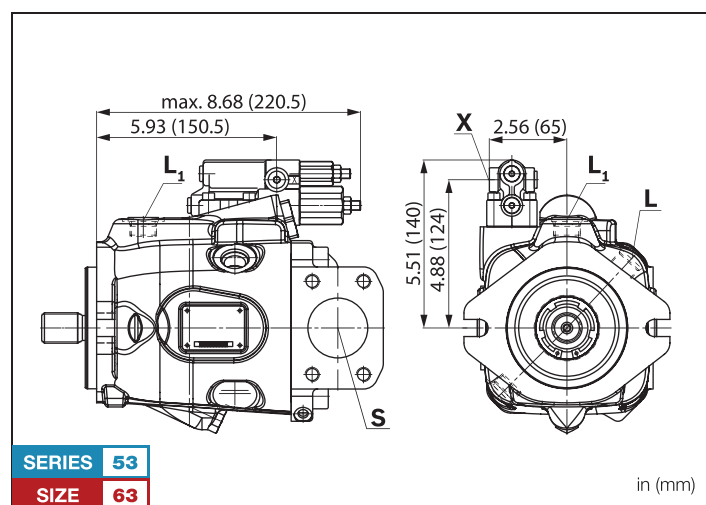
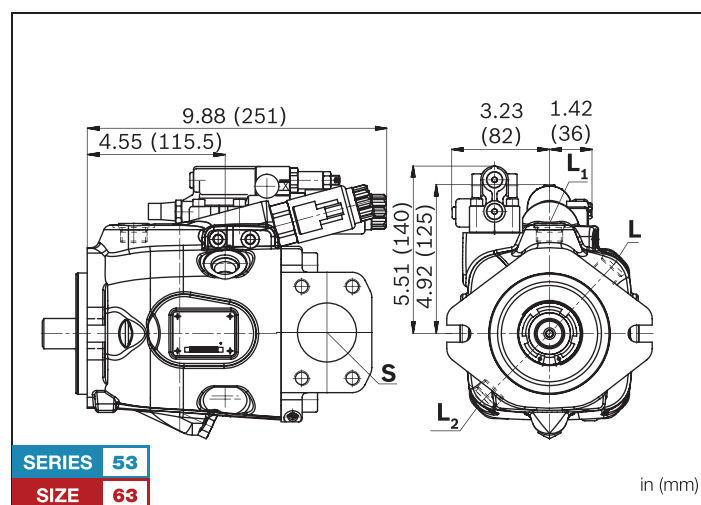
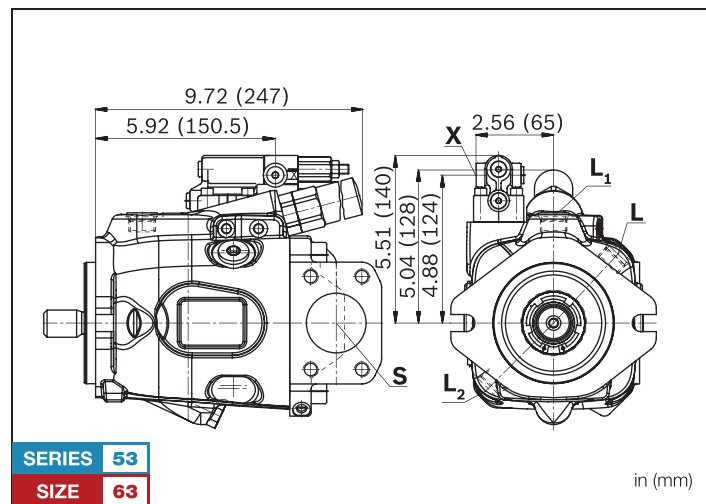
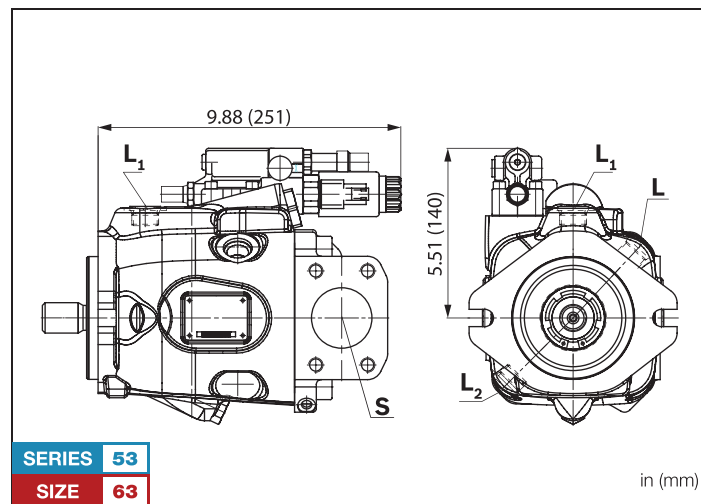


■ DFR/DFR1/DRSC – Pressure and flow controller, series 52



■ ED7. / ER7. – Electro-prop. Pressure control, series 52



SIZE 63 CONTROLLER DIMENSIONS, SERIES 53
SERIES 53 SIZE 63
DRG – Pressure controller, remotely controlled, series 53

EP.D. / EK.D. – Electro-proportional control, series 53

DRF/DRS/DRSC – Pressure and flow controller, series 53

EP.ED. / EK.ED. – Electro-proportional control, series 53

LA.D. – Pressure, flow and power controller, series 53

ED7. / ER7. – Electro-prop. Pressure control, series 53


DIMENSIONS SIZE 72

SERIES **53** SIZE **72**

DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange C Series 53

■ Port Plate 61 U

SAE Flange Ports
at rear
UNC thread

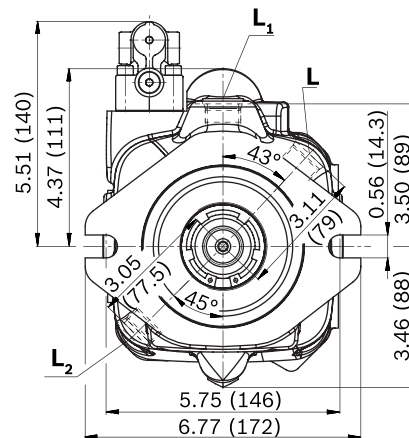
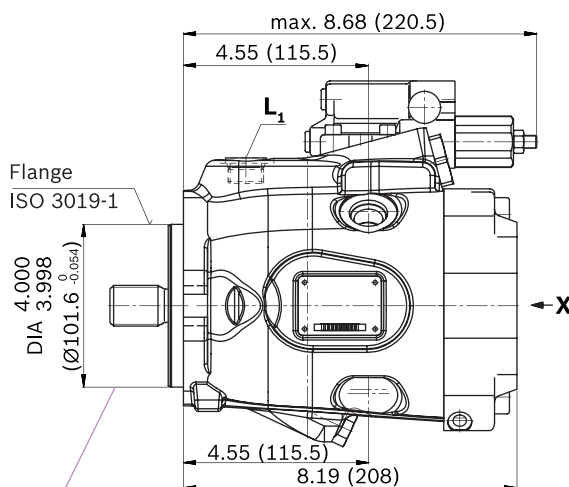
■ Port Plate 11 M

SAE Flange Ports
at rear
Metric thread

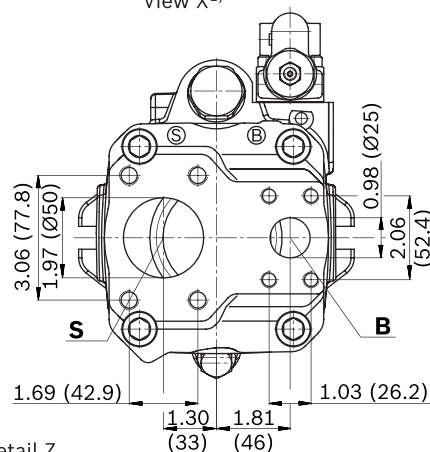


SERIES **53**
SIZE **72**

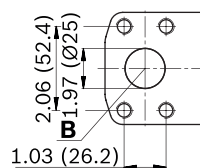
C Mounting Flange SAE B 2-Bolt
SAE J744 101-2 (SAE B)
Pilot Ø 4" (101.6 mm)
Bolt Circle Ø 5.75" (146 mm)



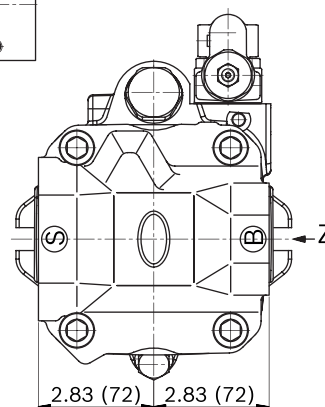
View X¹⁾



Detail Z



View Y¹⁾



■ Port Plate 62 U

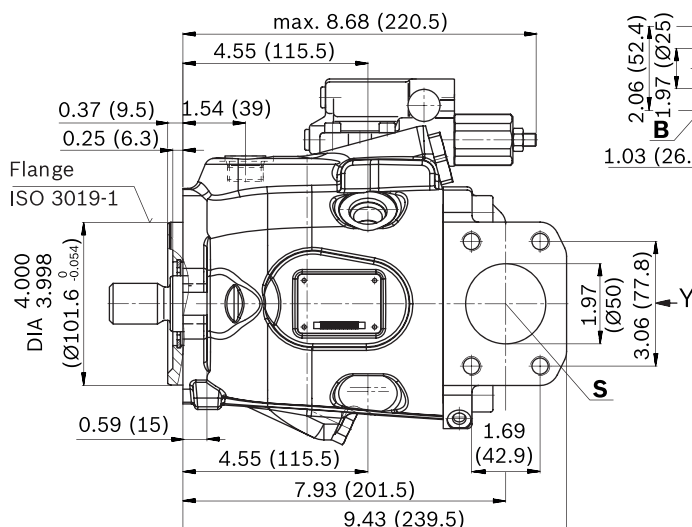
SAE Flange Ports
at rear
UNC thread

■ Port Plate 12 M

SAE Flange Ports
at rear
Metric thread



SERIES **53**
SIZE **72**



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

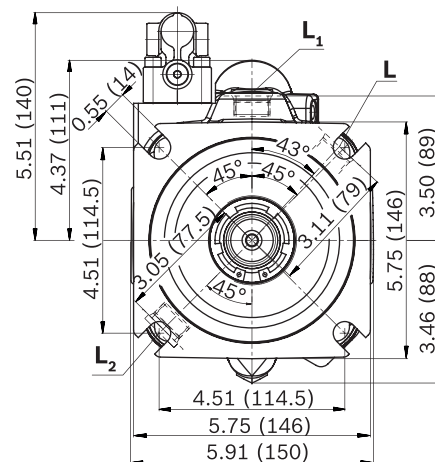
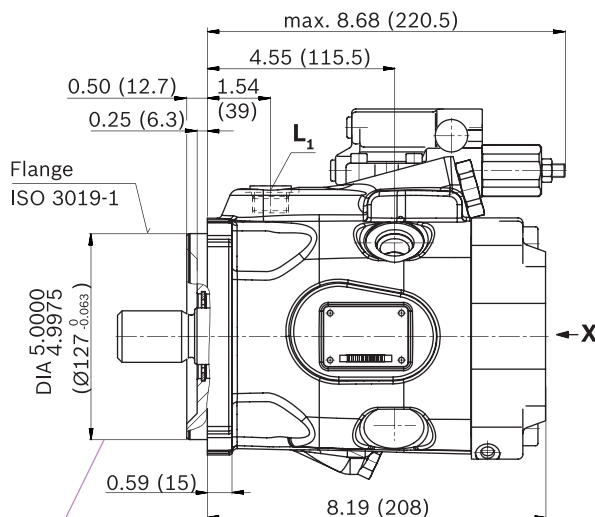
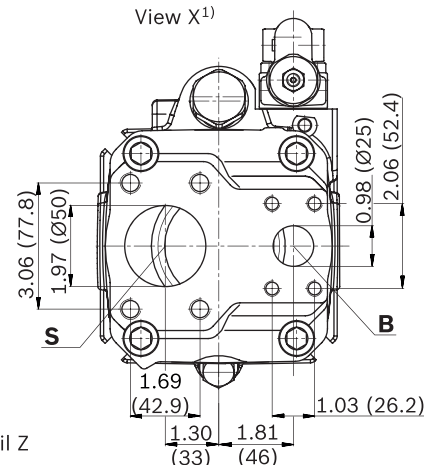
in (mm)

DIMENSIONS SIZE 72
SERIES 53 SIZE 72
DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange D Series 53
Port Plate 61 U

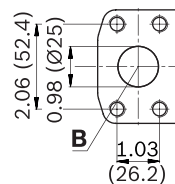
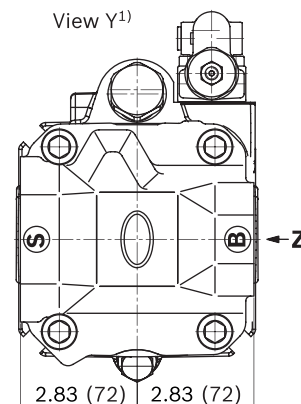
 SAE Flange Ports
 at rear
 UNC thread

Port Plate 11 M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 53
SIZE 72
D Mounting Flange SAE C 4-Bolt
 SAE J744 127-4 (SAE C)
 Pilot Ø 5" (127 mm)
 Bolt Circle Ø 6.375" (161.9 mm)

 View X¹⁾


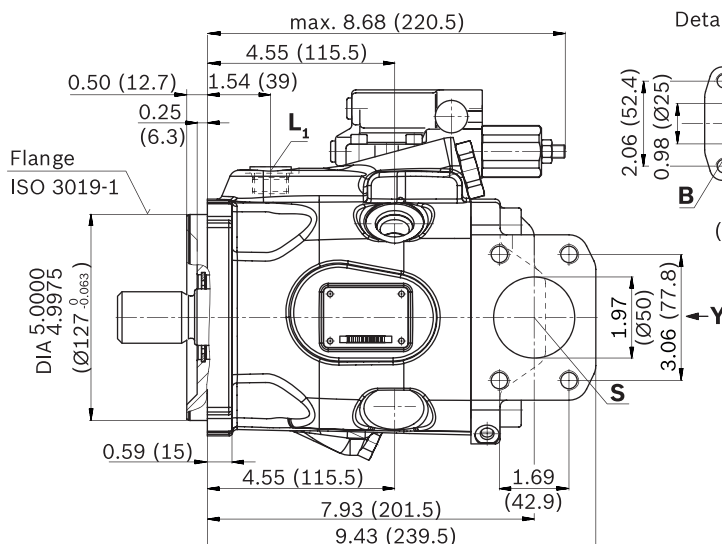
Detail Z


 View Y¹⁾

Port Plate 62 U

 SAE Flange Ports
 at rear
 UNC thread

Port Plate 12 M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 53
SIZE 72


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

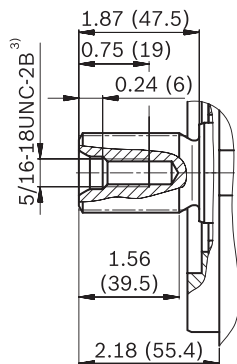
in (mm)

DRIVE SHAFT DIMENSIONS, SIZE 72

SERIES **53** SIZE **72**

S 1-1/4" Splined Shaft (32-4, ISO 3019-1)

14T 12/24DP¹⁾

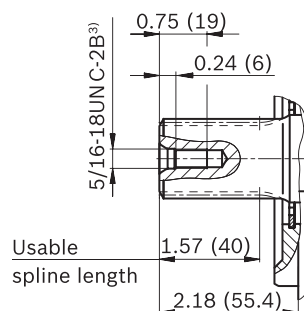


SERIES **53**
SIZE **72**

in (mm)

R 1-1/4" Splined Shaft (similar to ISO 3019-1)

14T 12/24DP^{1) 2)}

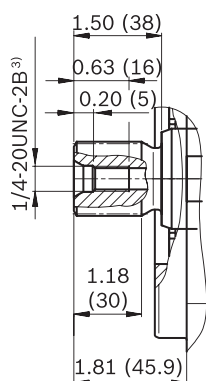


SERIES **53**
SIZE **72**

in (mm)

U 1" Splined Shaft (25-4, ISO 3019-1)

15T 16/32DP¹⁾

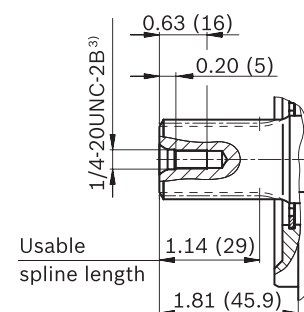


SERIES **53**
SIZE **72**

in (mm)

W 1" Splined Shaft (similar to ISO 3019-1)

15T 16/32DP^{1) 2)}



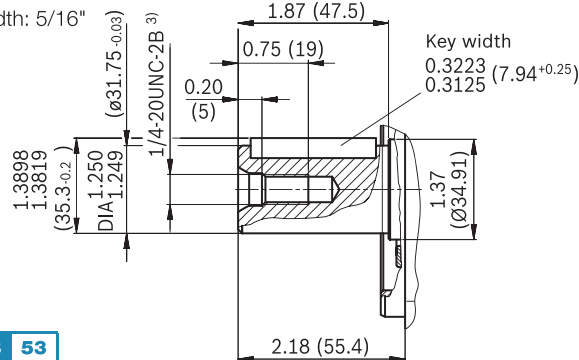
SERIES **53**
SIZE **72**

in (mm)

K 1-1/4" Parallel Keyed Shaft (ISO 3019-1)

32-1

Key width: 5/16"



SERIES **53**
SIZE **72**

in (mm)

- 1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
- 3) Thread according to ASME B1.1

PORT DIMENSIONS SIZE 72

SERIES 53 SIZE 72

Port Plate 61, 62 **U**

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	ISO 6162-1	1 in	4550 (315)	O
	Fastening thread	ASME B1.1	3/8-16UNC-2B; 0.71 (18) deep		
S	Suction port (standard pressure series)	ISO 6162-1	2 in	75 (5)	O
	Fastening thread	ASME B1.1	1/2-13UNC-2B; 0.87 (22) deep		

Port Plate 11, 12 Metric **M**

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	SAE J518 ⁵⁾	1 in	315	O
	Fastening thread	DIN 13	M10 × 1.5; 17 deep		
S	Suction port (standard pressure series)	SAE J518 ⁵⁾	2 in	5	O
	Fastening thread	DIN 13	M12 × 1.75; 20 deep		
L	Drain port	ISO 11926 ²⁾	7/8-14UNF-2B; 0.51 (13) deep	30 (2)	O ³⁾
L₁, L₂⁴⁾	Drain port	ISO 11926 ²⁾	7/8-14UNF-2B; 0.51 (13) deep	30 (2)	X ³⁾
X	Pilot pressure	ISO 11926	7/16-20UNF-2A; 0.45 (11.5) deep	4550 (315)	O

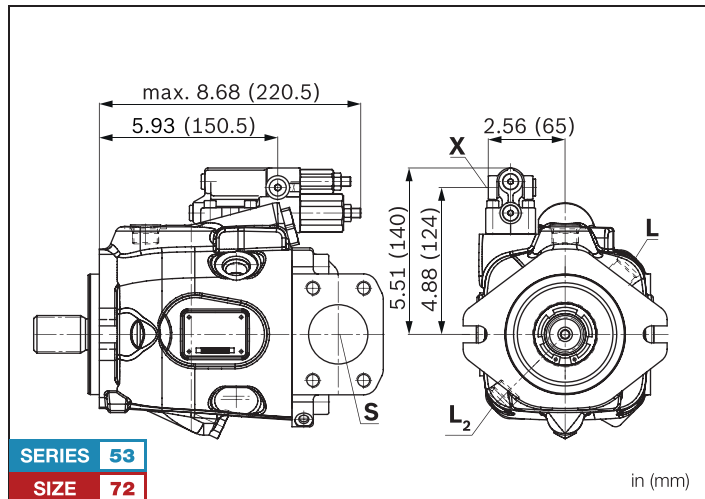
1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
 2) The countersink may be deeper than specified in the standard.
 3) Depending on the installation position, L, L1 or L2 must be connected (also see installation instructions starting on page 80).

4) Only series 53.
 5) Metric fastening thread is a deviation from standard.
 6) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

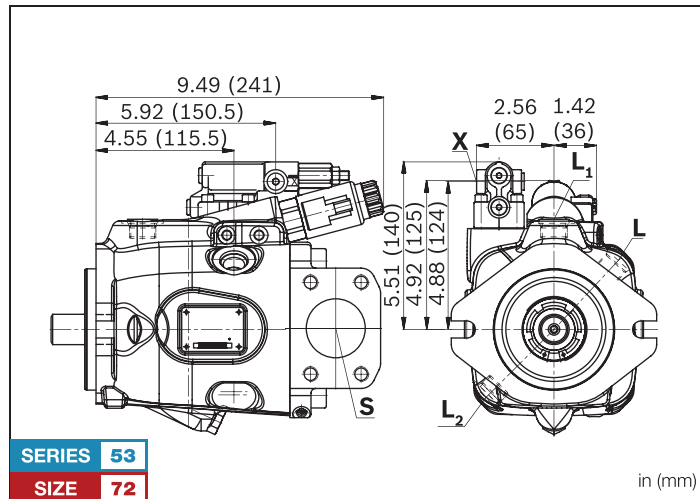
SIZE 72 CONTROLLER DIMENSIONS, SERIES 53

SERIES **53** SIZE **72**

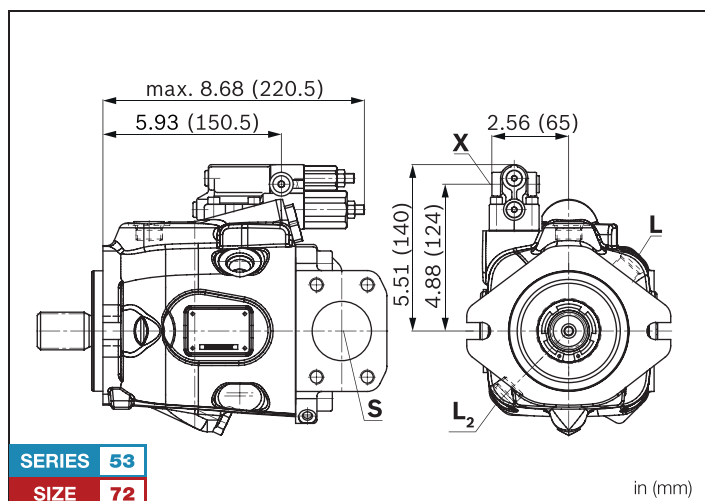
■ DRG – Pressure controller, remotely controlled, series 53



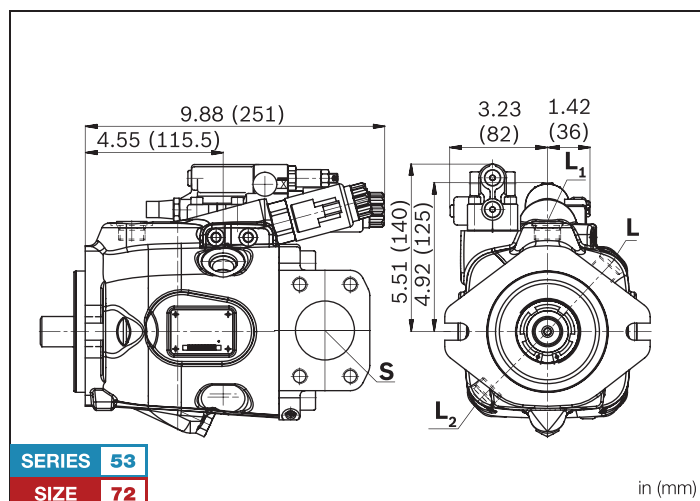
■ EP.D. / EK.D. – Electro-proportional control, series 53



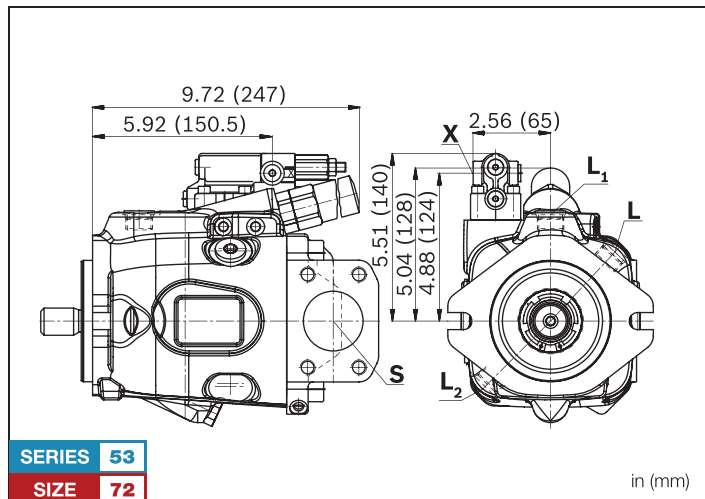
■ DRF/DRS/DRSC – Pressure and flow controller, series 53



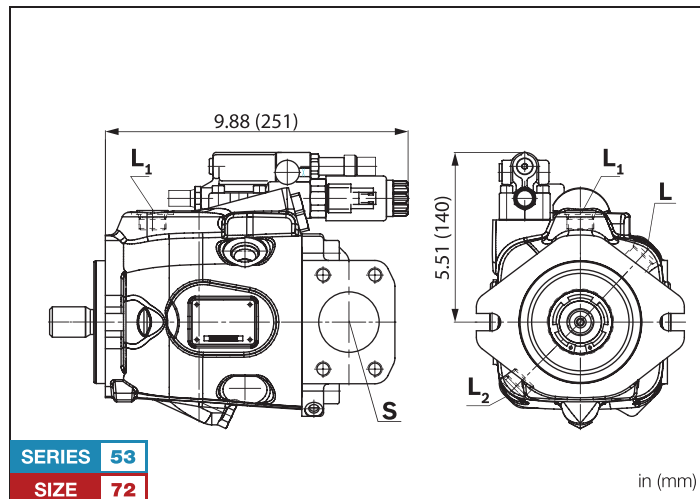
■ EP.ED. / EK.ED. – Electro-proportional control, series 53



■ LA.D. – Pressure, flow and power controller, series 53



■ ED7. / ER7. – Electro-prop. Pressure control, series 53

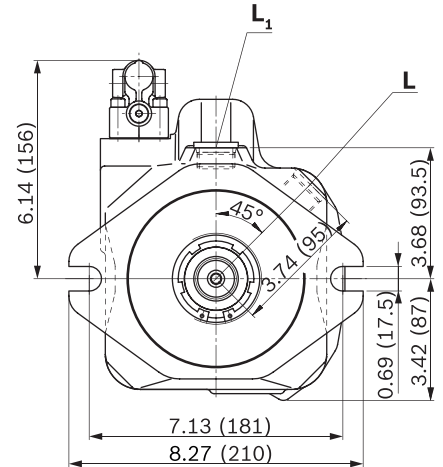
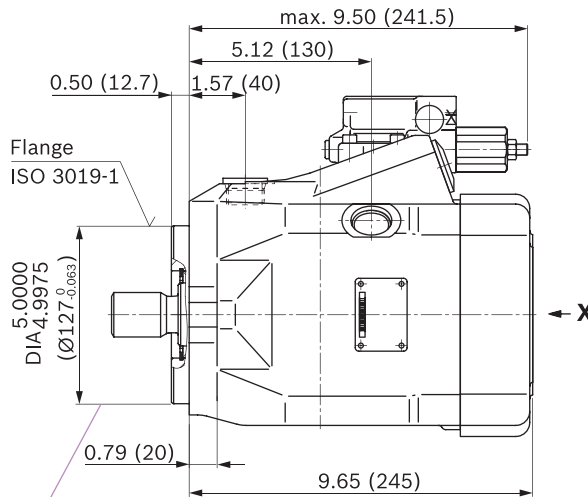
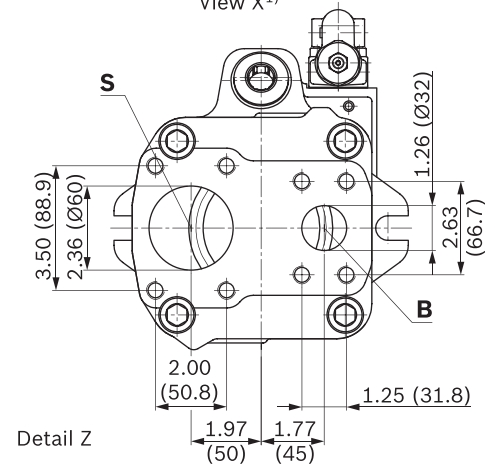


DIMENSIONS SIZE 85
SERIES 52 SIZE 85
DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange C Series 52
Port Plate 61 U

 SAE Flange Ports
 at rear
 UNC thread

Port Plate 11 M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 52
SIZE 85
C Mounting Flange SAE C 2-Bolt
 SAE J744 127-2 (SAE C)
 Pilot Ø 5" (127 mm)
 Bolt Circle Ø 7.125" (181 mm)

 View X¹


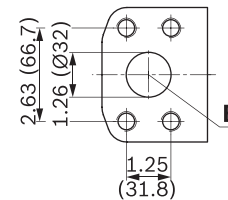
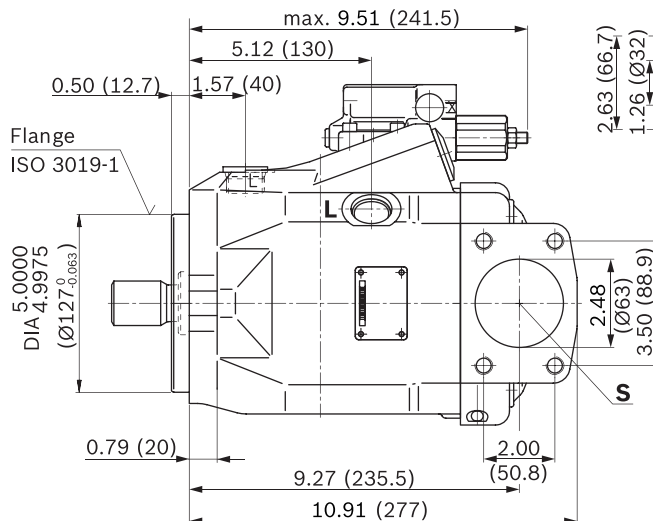
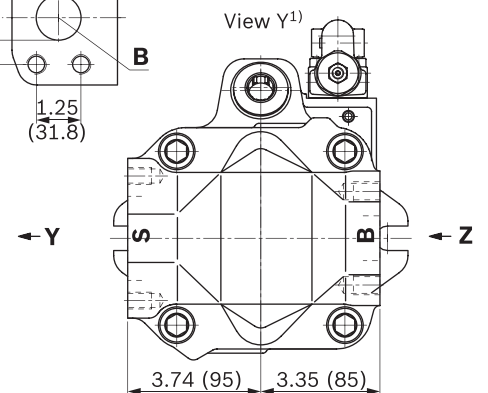
Detail Z

Port Plate 62 U

 SAE Flange Ports
 at rear
 UNC thread

Port Plate 12 M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 52
SIZE 85

 View Y¹


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

in (mm)

DIMENSIONS SIZE 85

SERIES **53** SIZE **85**

DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange C & D Series 53

■ Port Plate 61 **U**

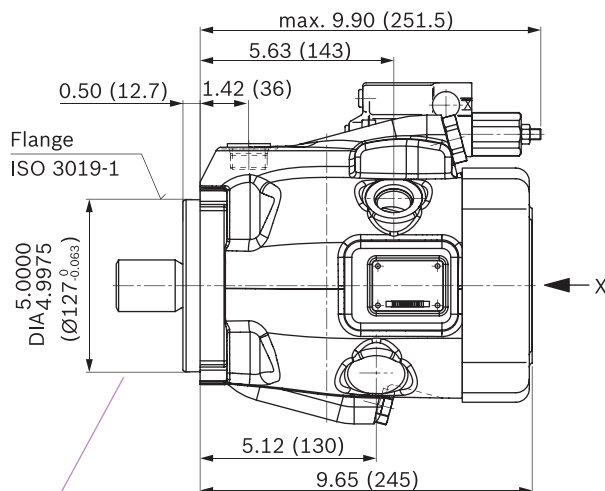
SAE Flange Ports
at rear
UNC thread

■ Port Plate 11 **M**

SAE Flange Ports
at rear
Metric thread

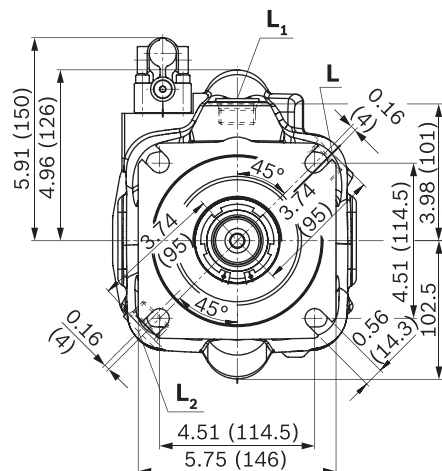


SERIES **53**
SIZE **85**

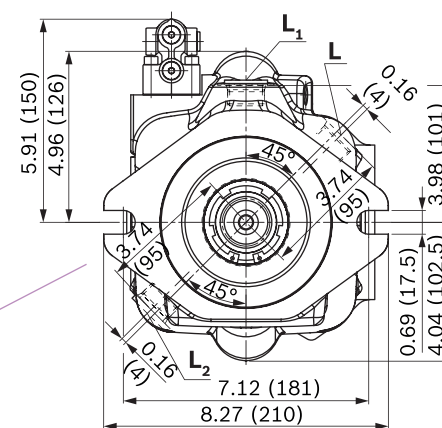


D Mounting Flange SAE C 4-Bolt
SAE J744 127-4 (SAE C)
Pilot Ø 5" (127 mm)
Bolt Circle Ø 6.375" (161.9 mm)

■ Mounting Flange D

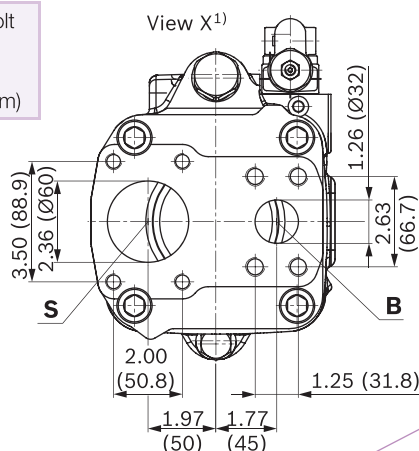


■ Mounting Flange C

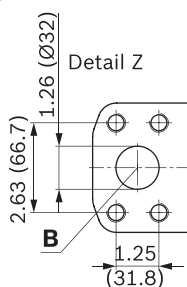


C Mounting Flange SAE C 2-Bolt
SAE J744 127-2 (SAE C)
Pilot Ø 5" (127 mm)
Bolt Circle Ø 7.125" (181 mm)

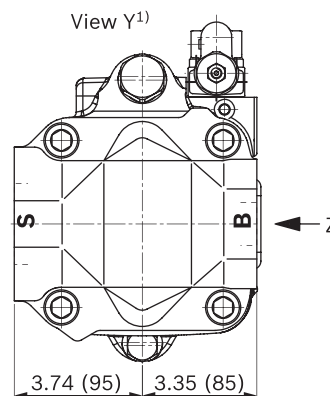
View X¹⁾



Detail Z



View Y¹⁾



■ Port Plate 62 **U**

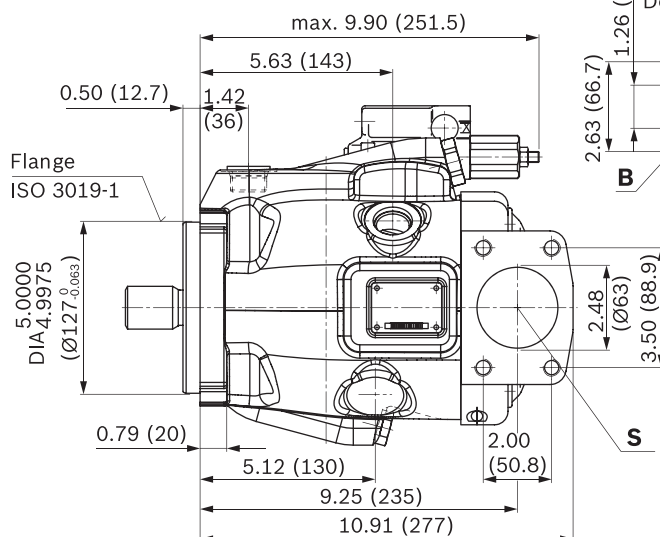
SAE Flange Ports
at rear
UNC thread

■ Port Plate 12 **M**

SAE Flange Ports
at rear
Metric thread



SERIES **53**
SIZE **85**



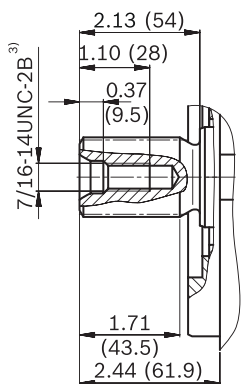
1) Dimensions of working ports turned through 180° for counter-clockwise rotation

in (mm)

DRIVE SHAFT DIMENSIONS, SIZE 85

SERIES	52/53	SIZE	85
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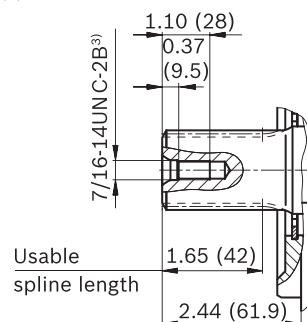
S 1-1/2" Splined Shaft (38-4, ISO 3019-1)

 17T 12/24DP¹⁾


SERIES	52/53
SIZE	85

in (mm)

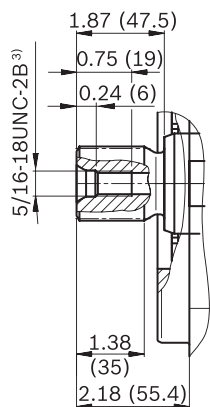
R 1-1/2" Splined Shaft (similar to ISO 3019-1)

 17T 12/24DP^{1) 2)}


SERIES	52/53
SIZE	85

in (mm)

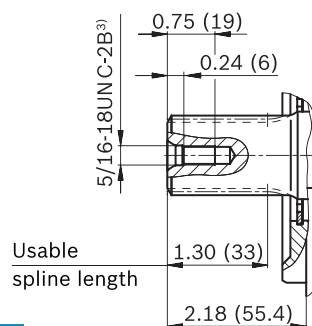
U 1-1/4" Splined Shaft (32-4, ISO 3019-1)

 14T 12/24DP¹⁾


SERIES	52/53
SIZE	85

in (mm)

W 1-1/4" Splined Shaft (similar to ISO 3019-1)

 14T 12/24DP^{1) 2)}


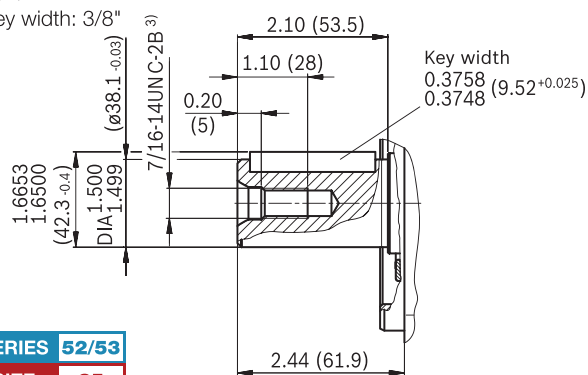
SERIES	52/53
SIZE	85

in (mm)

K 1-1/2" Parallel Keyed Shaft (ISO 3019-1)

38-1

Key width: 3/8"



SERIES	52/53
SIZE	85

in (mm)

- 1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
- 3) Thread according to ASME B1.1

PORT DIMENSIONS SIZE 85

SERIES **52/53** SIZE **85**

Port Plate 61, 62 **U**

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	ISO 6162-1	1 1/4 in	4550 (315)	O
	Fastening thread	ASME B1.1	1/2-13UNC-2B; 0.75 (19) deep		
S	Suction port (standard pressure series)	ISO 6162-1	2 1/2 in	75 (5)	O
	Fastening thread	ASME B1.1	1/2-13UNC-2B; 1.07 (27) deep		

Port Plate 11, 12 Metric **M**

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	SAE J518 ⁵⁾	1 1/4 in	315	O
	Fastening thread	DIN 13	M14 × 2; 19 deep		
S	Suction port (standard pressure series)	SAE J518 ⁵⁾	2 1/2 in	5	O
	Fastening thread	DIN 13	M12 × 1.75; 17 deep		
L	Drain port	ISO 11926 ²⁾	1 1/16-12UNF-2B; 0.59 (15) deep	30 (2)	O ³⁾
L₁, L₂⁴⁾	Drain port	ISO 11926 ²⁾	1 1/16-12UNF-2B; 0.59 (15) deep	30 (2)	X ³⁾
X	Pilot pressure	ISO 11926	7/16-20UNF-2A; 0.45 (11.5) deep	4550 (315)	O

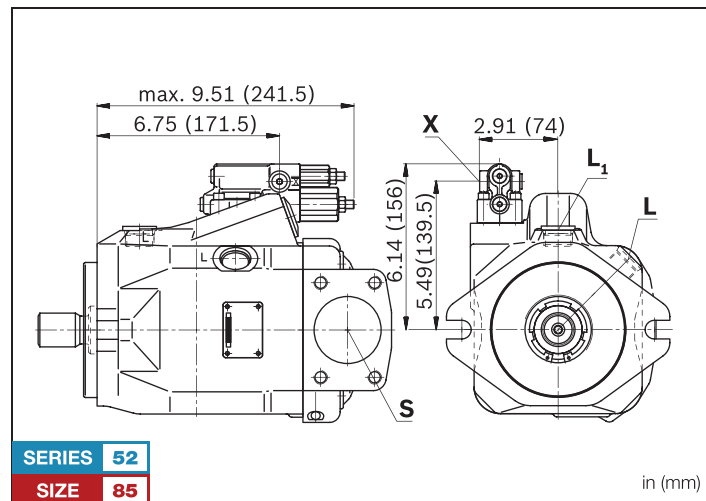
- 1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
 2) The countersink may be deeper than specified in the standard.
 3) Depending on the installation position, L, L1 or L2 must be connected (also see installation instructions starting on page 80).

- 4) Only series 53.
 5) Metric fastening thread is a deviation from standard.
 6) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

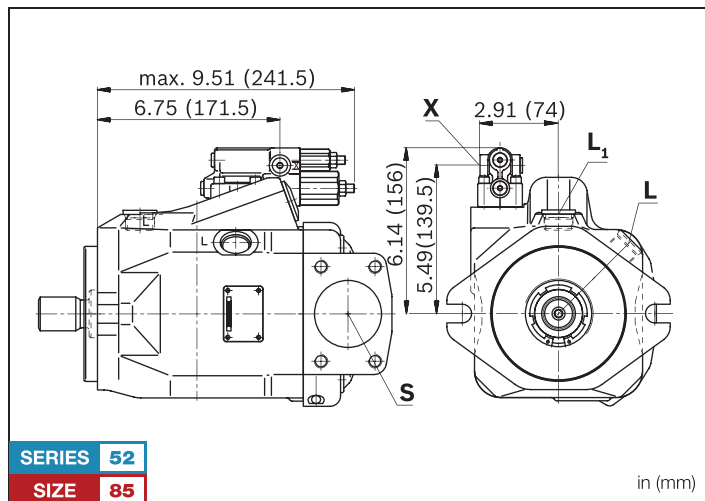
SIZE 85 CONTROLLER DIMENSIONS, SERIES 52

SERIES	52	SIZE	85
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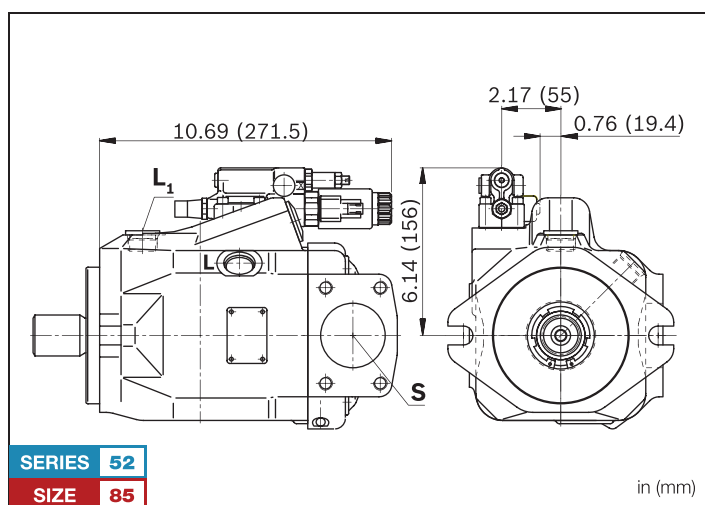
■ DRG – Pressure controller, remotely controlled, series 52



■ DFR/DFR1/DRSC – Pressure and flow controller, series 52



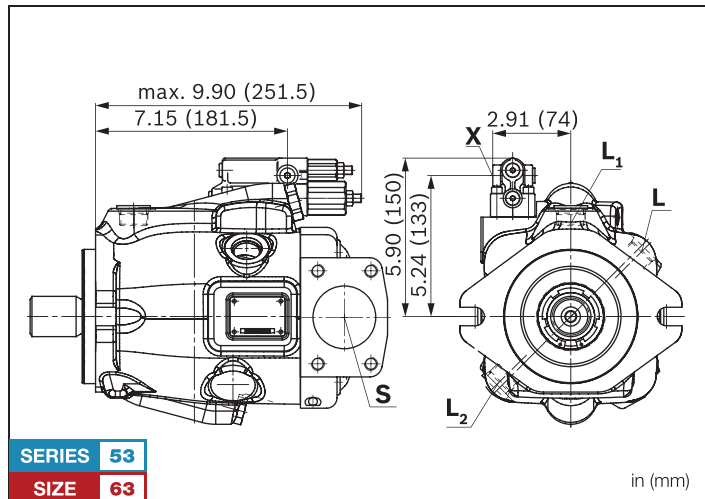
■ ED7. / ER7. – Electro-prop. Pressure control, series 52



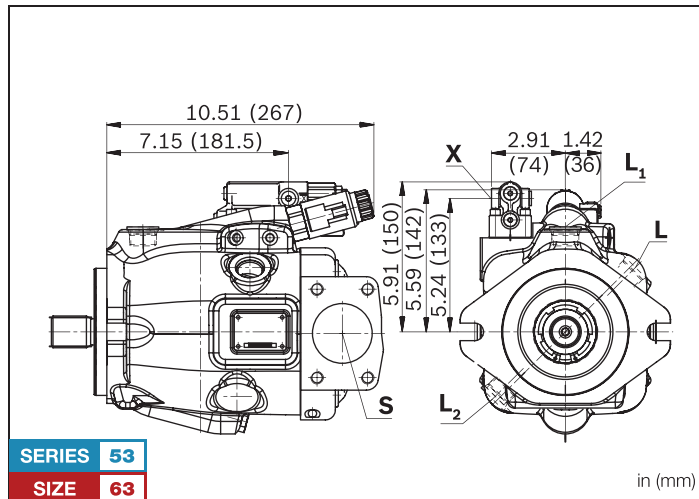
SIZE 85 CONTROLLER DIMENSIONS, SERIES 53

SERIES **53** SIZE **85**

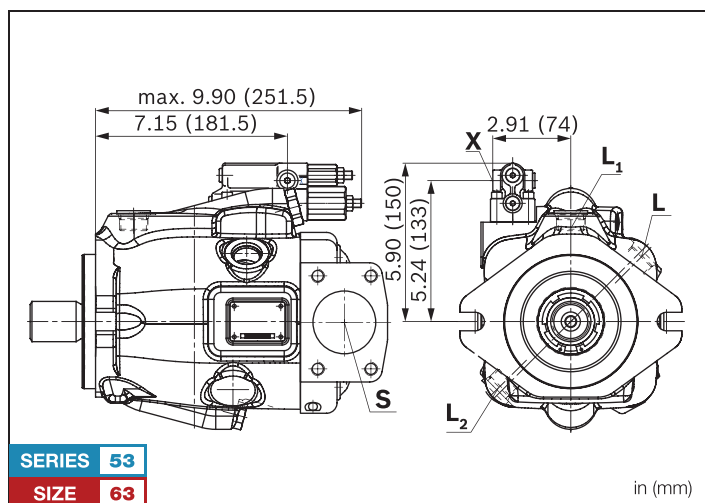
■ DRG – Pressure controller, remotely controlled, series 53



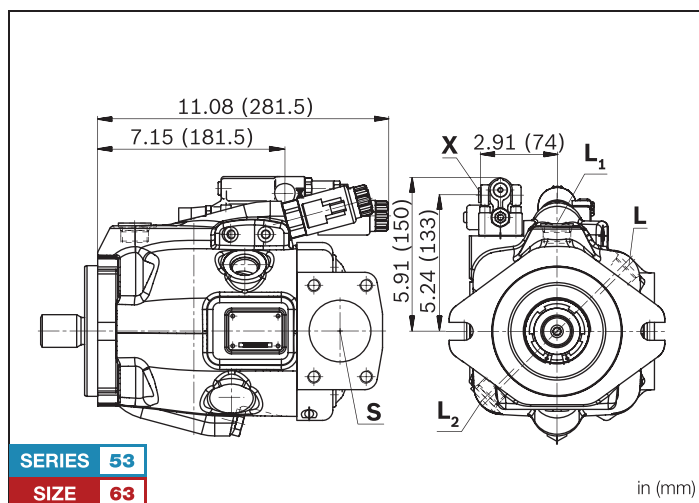
■ EP.D. / EK.D. – Electro-proportional control, series 53



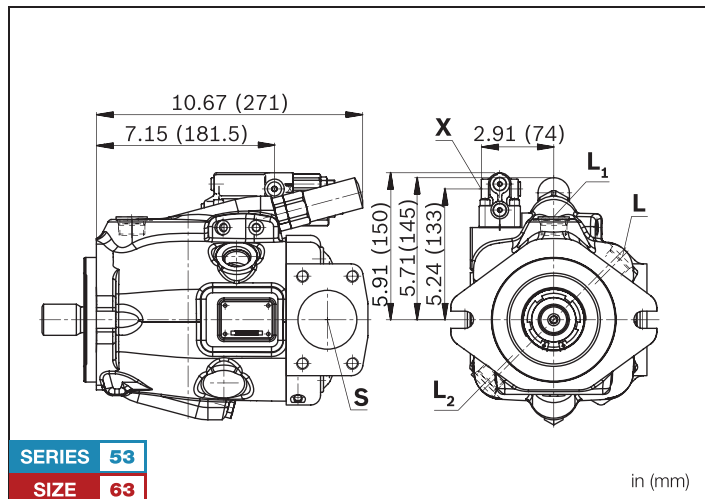
■ DRF/DRS/DRSC – Pressure and flow controller, series 53



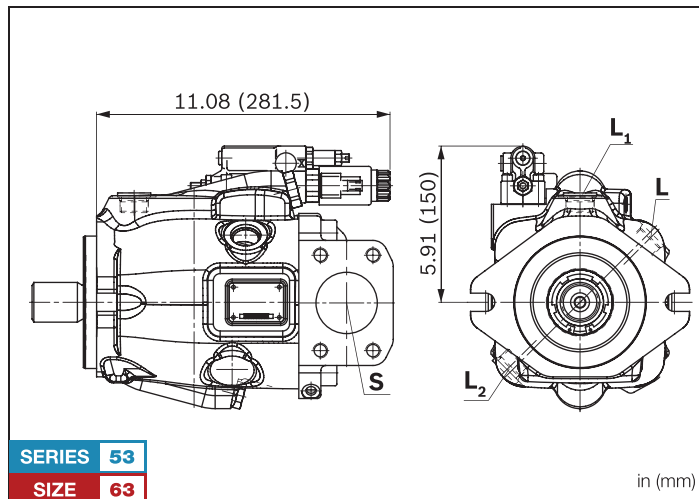
■ EP.ED. / EK.ED. – Electro-proportional control, series 53



■ LA.D. – Pressure, flow and power controller, series 53



■ ED7. / ER7. – Electro-prop. Pressure control, series 53

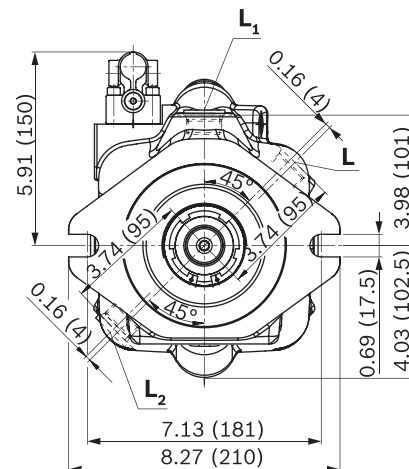
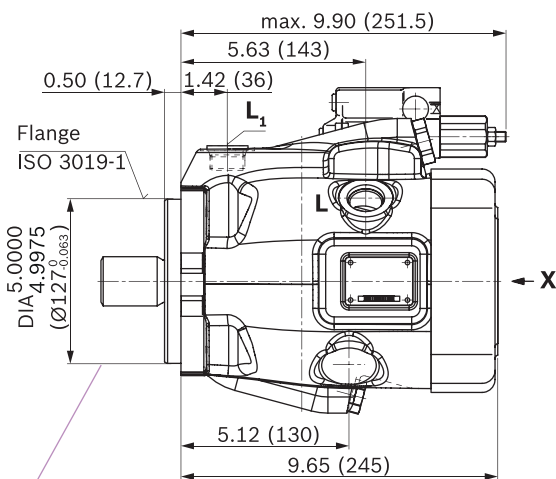
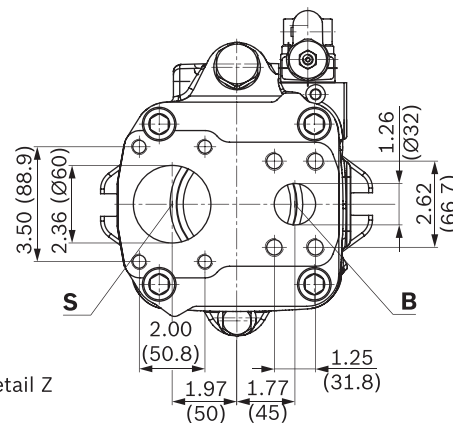


DIMENSIONS SIZE 100
SERIES 53 SIZE 100
DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange C Series 53
Port Plate 61 U

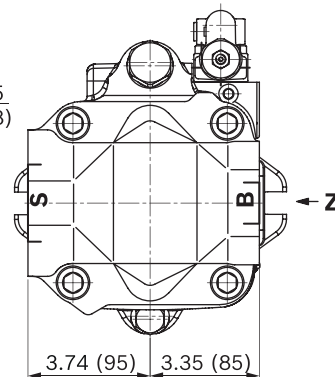
 SAE Flange Ports
 at rear
 UNC thread

Port Plate 11 M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 53
SIZE 100
C Mounting Flange SAE C 2-Bolt
 SAE J744 127-2 (SAE C)
 Pilot Ø 5" (127 mm)
 Bolt Circle Ø 7.125" (181 mm)

 View X¹


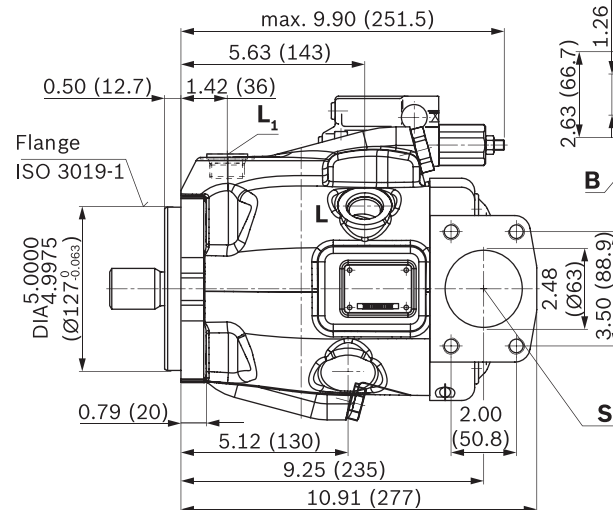
Detail Z

 View Y¹

Port Plate 62 U

 SAE Flange Ports
 at rear
 UNC thread

Port Plate 12 M

 SAE Flange Ports
 at rear
 Metric thread

SERIES 53
SIZE 100


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

in (mm)

DIMENSIONS SIZE 100

SERIES **53** SIZE **100**

DR – Hydraulic Pressure Controller; Clockwise rotation, Mounting Flange D Series 53

■ Port Plate 61 U

SAE Flange Ports
at rear
UNC thread

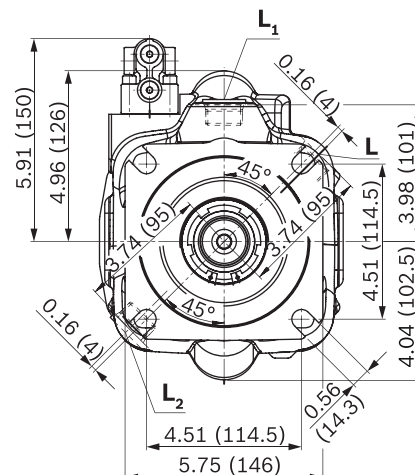
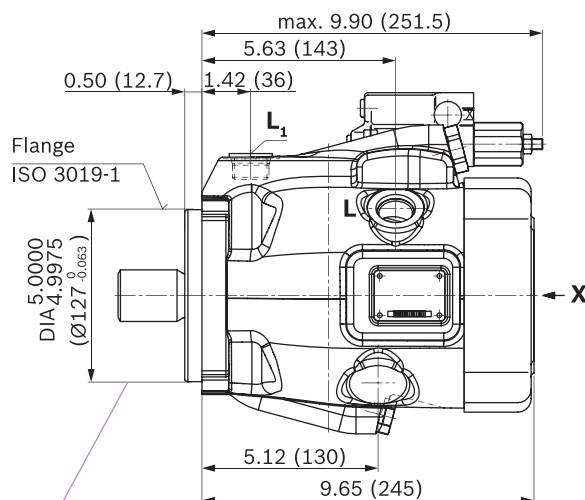
■ Port Plate 11 M

SAE Flange Ports
at rear
Metric thread

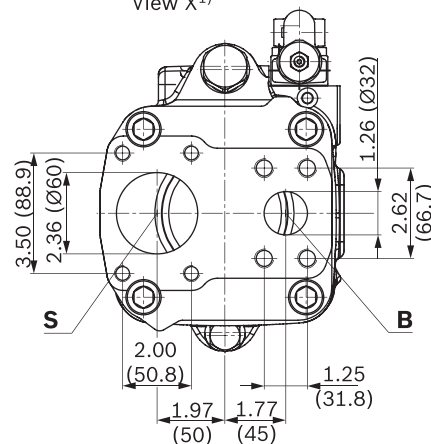


SERIES **53**
SIZE **100**

D Mounting Flange SAE C 4-Bolt
SAE J744 127-4 (SAE C)
Pilot Ø 5" (127 mm)
Bolt Circle Ø 6.375" (161.9 mm)



View X¹



Detail Z

■ Port Plate 62 U

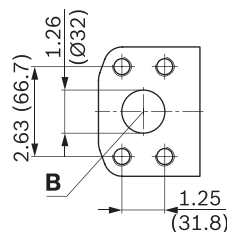
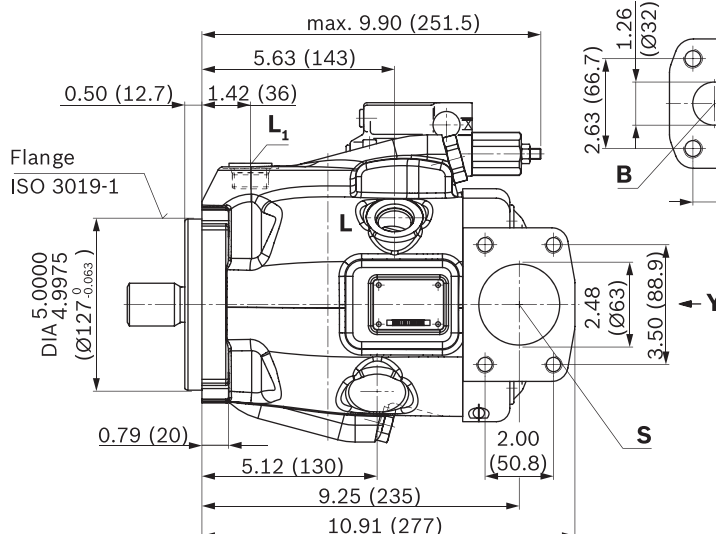
SAE Flange Ports
at rear
UNC thread

■ Port Plate 12 M

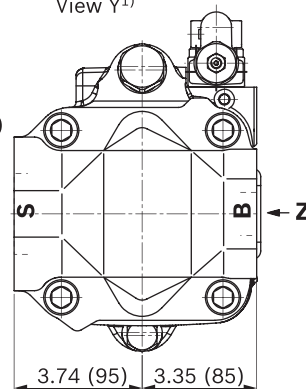
SAE Flange Ports
at rear
Metric thread



SERIES **53**
SIZE **100**



View Y¹



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

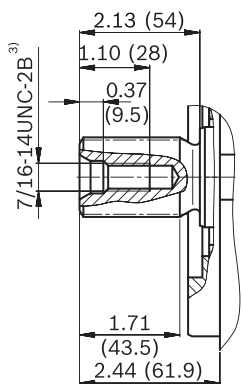
in (mm)

U Imperial M Metric

DRIVE SHAFT DIMENSIONS, SIZE 100

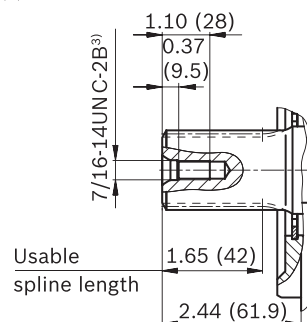
SERIES 53 SIZE 100

S 1-1/2" Splined Shaft (38-4, ISO 3019-1)

 17T 12/24DP¹⁾

SERIES 53
SIZE 100

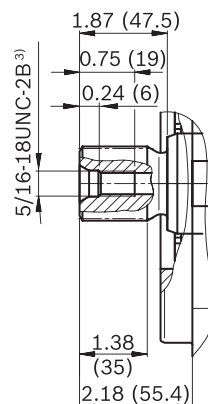
in (mm)

R 1-1/2" Splined Shaft (similar to ISO 3019-1)

 17T 12/24DP^{1) 2)}

SERIES 53
SIZE 100

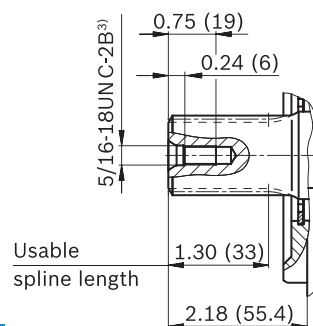
in (mm)

U 1-1/4" Splined Shaft (32-4, ISO 3019-1)

 14T 12/24DP¹⁾

SERIES 53
SIZE 100

in (mm)

W 1-1/4" Splined Shaft (similar to ISO 3019-1)

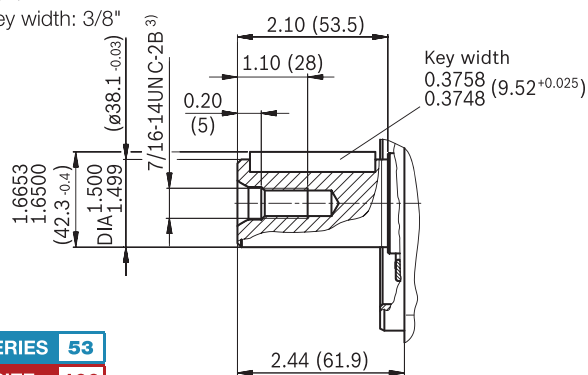
 14T 12/24DP^{1) 2)}

SERIES 53
SIZE 100

in (mm)

K 1-1/2" Parallel Keyed Shaft (ISO 3019-1)

38-1

Key width: 3/8"


SERIES 53
SIZE 100

in (mm)

- 1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Splines according to ANSI B92.1a, spline runout is a deviation from standard ISO 3019-1.
- 3) Thread according to ASME B1.1

PORT DIMENSIONS SIZE 100

SERIES **53** SIZE **100**

Port Plate 61, 62 **U**

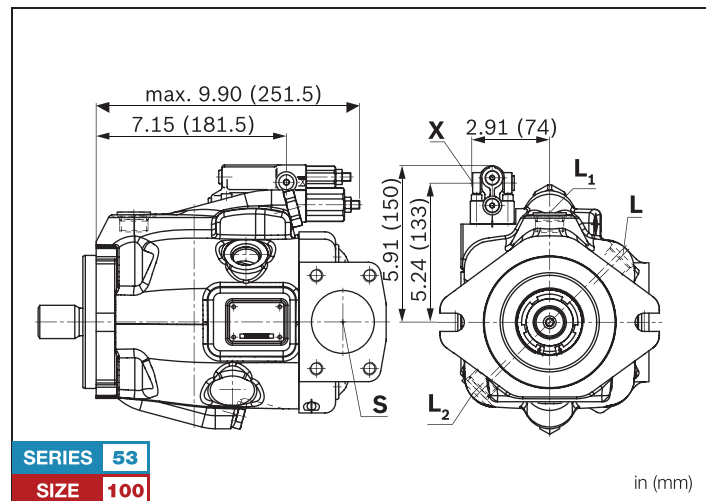
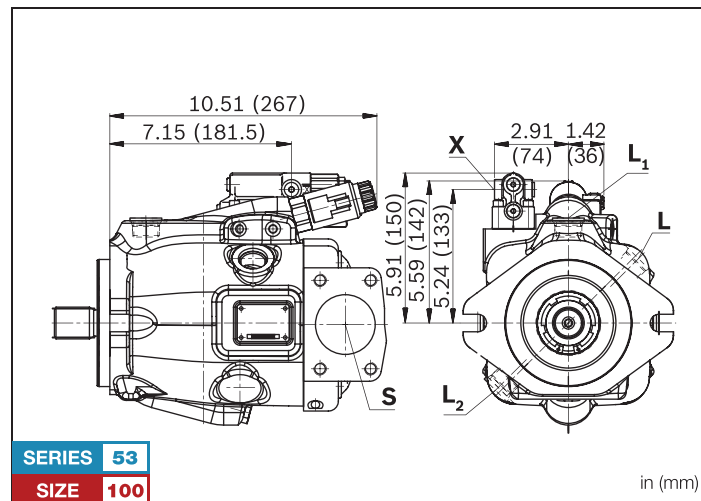
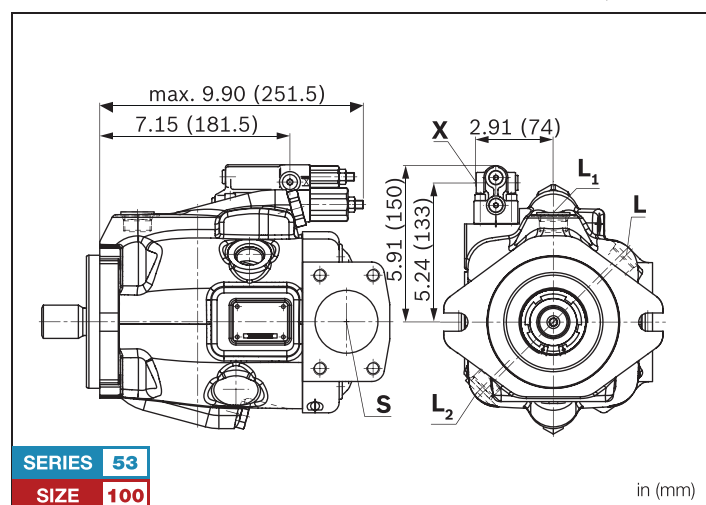
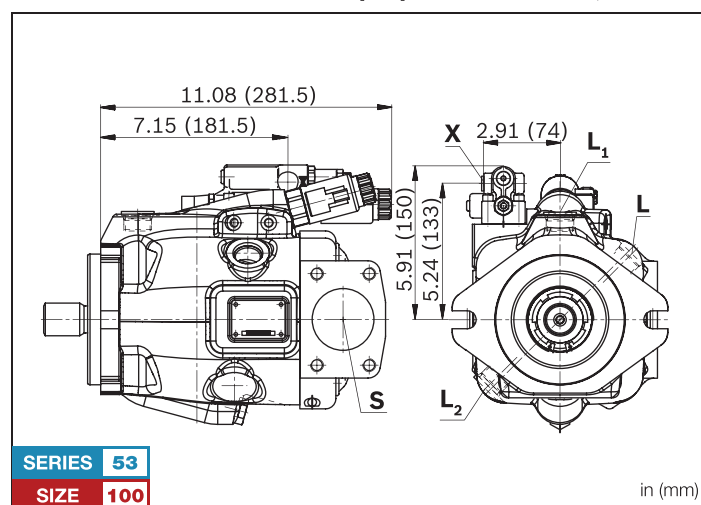
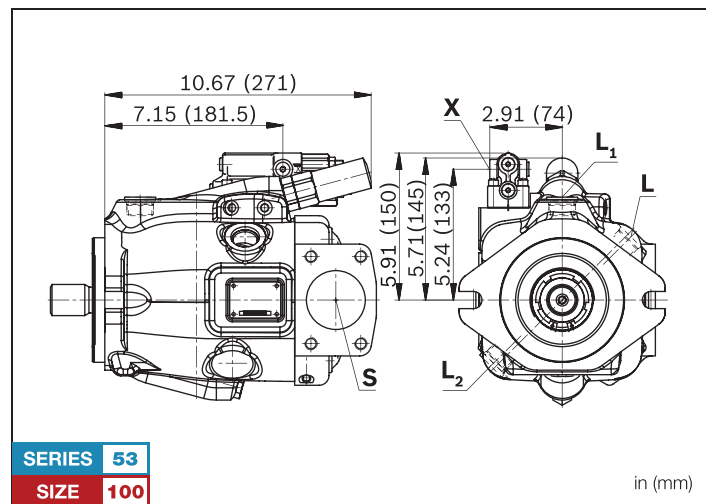
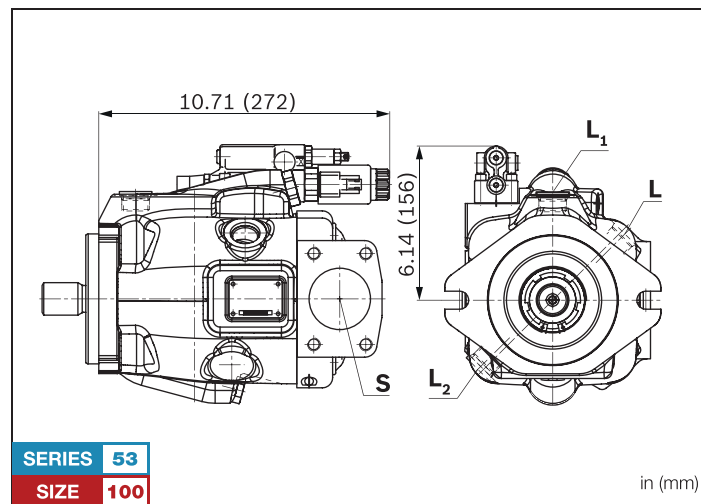
Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	ISO 6162-1	1 1/4 in	4550 (315)	O
	Fastening thread	ASME B1.1	1/2-13UNC-2B; 0.75 (19) deep		
S	Suction port (standard pressure series)	ISO 6162-1	2 1/2 in	75 (5)	O
	Fastening thread	ASME B1.1	1/2-13UNC-2B; 1.07 (27) deep		

Port Plate 11, 12 Metric **M**

Ports		Standard	Size	$p_{\max}$ [psi (bar)] ¹⁾	State ⁶⁾
B	Working port (standard pressure series)	SAE J518 ⁵⁾	1 1/4 in	315	O
	Fastening thread	DIN 13	M14 × 2; 19 deep		
S	Suction port (standard pressure series)	SAE J518 ⁵⁾	2 1/2 in	5	O
	Fastening thread	DIN 13	M12 × 1.75; 17 deep		
L	Drain port	ISO 11926 ²⁾	1 1/16-12UNF-2B; 0.59 (15) deep	30 (2)	O ³⁾
L₁, L₂⁴⁾	Drain port	ISO 11926 ²⁾	1 1/16-12UNF-2B; 0.59 (15) deep	30 (2)	X ³⁾
X	Pilot pressure	ISO 11926	7/16-20UNF-2A; 0.45 (11.5) deep	4550 (315)	O

- 1) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
 2) The countersink may be deeper than specified in the standard.
 3) Depending on the installation position, L, L1 or L2 must be connected (also see installation instructions starting on page 80).

- 4) Only series 53.
 5) Metric fastening thread is a deviation from standard.
 6) O = Must be connected (plugged on delivery)
 X = Plugged (in normal operation)

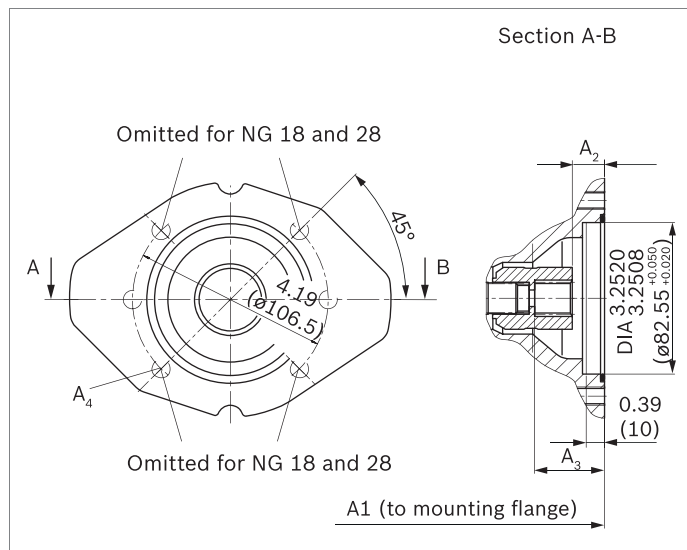
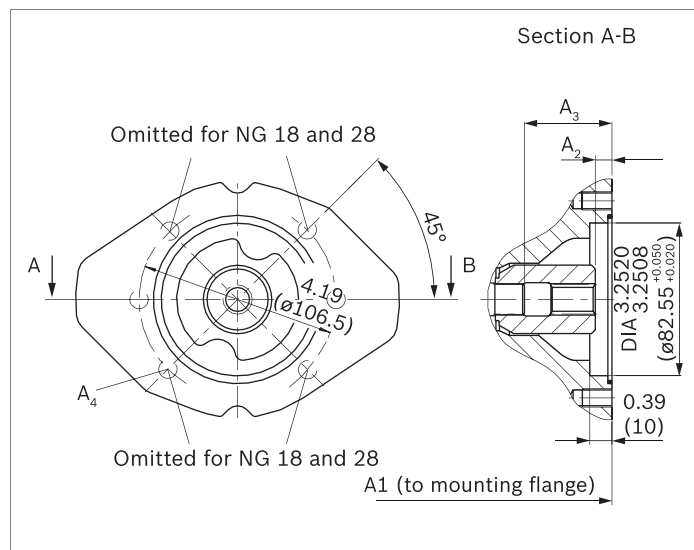
SIZE 100 CONTROLLER DIMENSIONS, SERIES 53
SERIES 53 SIZE 100
DRG – Pressure controller, remotely controlled, series 53

EP.D. / EK.D. – Electro-proportional control, series 53

DRF/DRS/DRSC – Pressure and flow controller, series 53

EP.ED. / EK.ED. – Electro-proportional control, series 53

LA.D. – Pressure, flow and power controller, series 53

ED7. / ER7. – Electro-prop. Pressure control, series 53


DIMENSIONS, THROUGH DRIVE - K01 AND K52

Flange ISO 3019-1 (SAE)		Hub for splined shaft ¹⁾		Availability across sizes							Code
Diameter	Mounting ²⁾	Diameter		18	28	45	60/63	72	85	100	
82-2 (A)	⌀, ∞	5/8 in	9T 16/32DP	•	•	•	•	•	•	•	K01
		3/4 in	11T 16/32DP	•	•	•	•	•	•	•	K52

• = Available ◦ = On request

82-2



K01 (SAE J744 16-4 (A))	NG	A1	A2 ⁴⁾	A3 ⁴⁾	A4 ³⁾
	18	7.17 (182)	0.37 (9.3)	1.67 (42.5)	M10 × 1.5; 0.57 (14.5) deep
	28	8.03 (204)	0.36 (9.2)	1.43 (36.2)	M10 × 1.5; 0.63 (16) deep
	45	9.02 (229)	0.39 (10)	2.07 (52.7)	M10 × 1.5; 0.63 (16) deep
	60/ 63	10.04 (255)	0.34 (8.7)	2.29 (58.2)	M10 × 1.5; 0.63 (16) deep
	72	10.04 (255)	0.34 (8.7)	2.29 (58.2)	M10 × 1.5; 0.63 (16) deep
	85	11.89 (302)	0.49 (12.5)	2.65 (67.2)	M10 × 1.5; 0.79 (20) deep
	100	11.89 (302)	0.49 (12.5)	2.65 (67.2)	M10 × 1.5; 0.79 (20) deep

K52 (SAE J744 19-4 (A-B))	NG	A1	A2 ⁽⁴⁾	A3 ⁽⁴⁾	A4 ⁽³⁾
	18	7.17 (182)	0.71 (18.3)	1.54 (39.3)	M10 × 1.5; 0.57 (14.5) deep
	28	8.03 (204)	0.72 (18.4)	1.55 (39.4)	M10 × 1.5; 0.63 (16) deep
	45	9.02 (229)	0.72 (18.4)	1.55 (39.4)	M10 × 1.5; 0.63 (16) deep
	60/ 63	10.04 (255)	0.72 (18.4)	1.55 (39.4)	M10 × 1.5; 0.63 (16) deep
	72	10.04 (255)	0.72 (18.4)	1.55 (39.4)	M10 × 1.5; 0.63 (16) deep
	85	11.89 (302)	0.85 (21.5)	1.67 (42.5)	M10 × 1.5; 0.79 (20) deep
	100	11.89 (302)	0.85 (21.5)	1.67 (42.5)	M10 × 1.5; 0.79 (20) deep

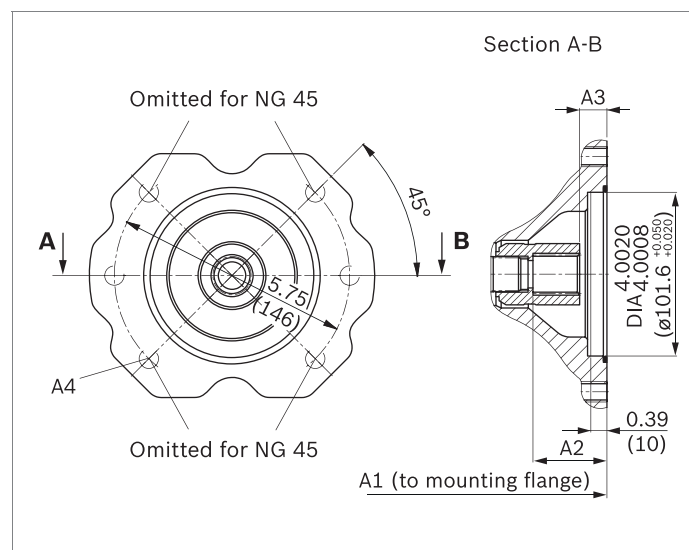
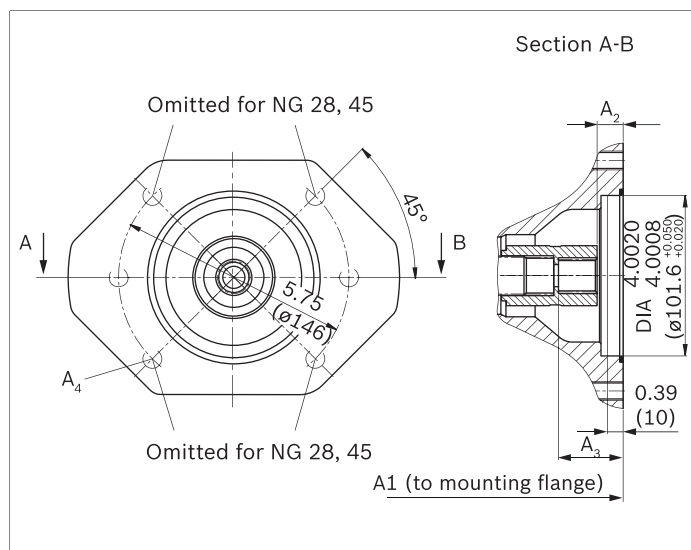
- 1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Mounting holes pattern viewed on through drive with control at top
- 3) Thread according to DIN 13.
- 4) Minimum dimensions

DIMENSIONS, THROUGH DRIVE - K68 AND K04

Flange ISO 3019-1 (SAE)		Hub for splined shaft ¹⁾		Availability across sizes							Code
Diameter	Mounting ²⁾	Diameter		18	28	45	60/63	72	85	100	
101-2 (B)	⌀, ∞	7/8 in	13T 16/32DP	-	●	●	●	●	●	●	K68
		1 in	15T 16/32DP	-	-	●	●	●	●	●	K04

● = Available ○ = On request

101-2



K68 (SAE J744 22-4 (B))	NG	A1	A2 ⁴⁾	A3 ⁴⁾	A4 ³⁾
	28	8.03 (204)	0.68 (17.4)	1.67 (42.4)	M12 × 1.75; 0.71 (18) deep
	45	9.02 (229)	0.68 (17.4)	1.67 (42.4)	M12 × 1.75; 0.71 (18) deep
	60/ 63	10.04 (255)	0.68 (17.4)	1.67 (42.4)	M12 × 1.75; 0.71 (18) deep
	72	10.04 (255)	0.68 (17.4)	1.67 (42.4)	M12 × 1.75; 0.71 (18) deep
	85	11.89 (302)	0.81 (20.5)	1.79 (45.5)	M12 × 1.75; 0.79 (20) deep
	100	11.89 (302)	0.81 (20.5)	1.79 (45.5)	M12 × 1.75; 0.79 (20) deep

K04 (SAE J744 25-4 (B-B))	NG	A1	A2 ⁴⁾	A3 ⁴⁾	A4 ³⁾
	45	9.02 (229)	0.70 (17.9)	1.87 (47.4)	M12 × 1.75; 0.71 (18) deep
	60/ 63	10.04 (255)	0.70 (17.9)	1.87 (47.4)	M12 × 1.75; 0.71 (18) deep
	72	10.04 (255)	0.70 (17.9)	1.87 (47.4)	M12 × 1.75; 0.71 (18) deep
	85	11.89 (302)	0.81 (20.7)	1.98 (50.2)	M12 × 1.75; 0.79 (20) deep
	100	11.89 (302)	0.81 (20.7)	1.98 (50.2)	M12 × 1.75; 0.79 (20) deep

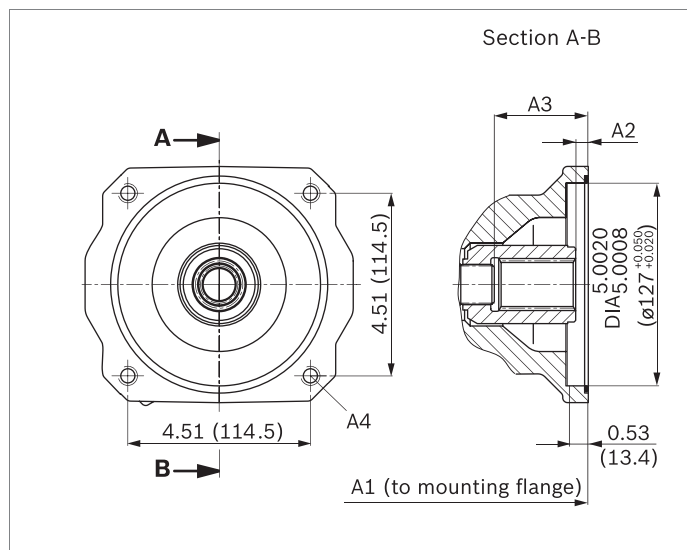
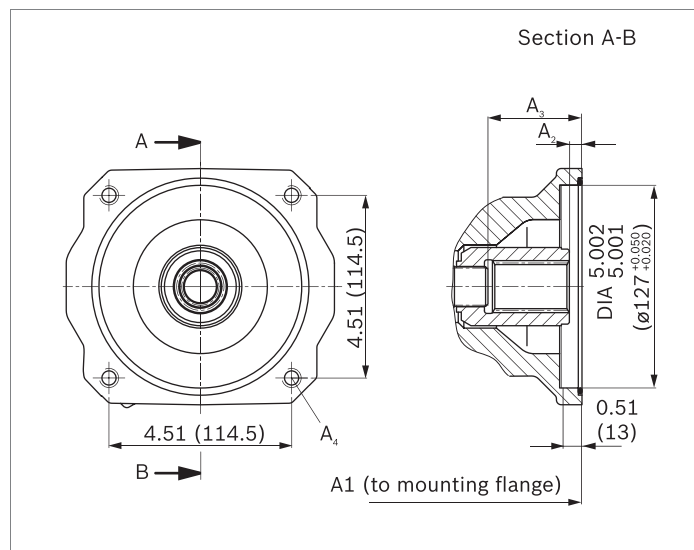
- 1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Mounting holes pattern viewed on through drive with control at top
- 3) Thread according to DIN 13.
- 4) Minimum dimensions

DIMENSIONS, THROUGH DRIVE - K15 AND K16

Flange ISO 3019-1 (SAE)		Hub for splined shaft ¹⁾		Availability across sizes						Code	
Diameter	Mounting ²⁾	Diameter		18	28	45	60/63	72	85	100	
127-4 (C)		1 1/4 in	14T 12/24DP	-	-	-	●	●	●	●	K15
		1 1/2 in	17T 12/24DP	-	-	-	-	-	●	●	K16

• = Available ○ = On request

■ 127-4



K15 (SAE J744 32-4 (C))	NG	A1	A2 ⁴⁾	A3 ⁴⁾	A4 ³⁾
	60/ 63	10.04 (255)	0.70 (17.9)	0.20 (5.9)	M12 × 1.75; 0.63 (16) deep
	72	10.04 (255)	0.70 (17.9)	0.20 (5.9)	M12 × 1.75; 0.63 (16) deep
	85	11.87 (301.5)	0.87 (22)	2.36 (60)	M12 × 1.75; through
	100	11.87 (301.5)	0.87 (22)	2.36 (60)	M12 × 1.75; through

K16 (SAE J744 32-4 (C))	NG	A1	A2 ⁴⁾	A3 ⁴⁾	A4 ³⁾
	85	11.87 (301.5)	0.50 (12.8)	2.65 (67.2)	M12 × 1.75; through
	100	11.87 (301.5)	0.50 (12.8)	2.65 (67.2)	M12 × 1.75; through

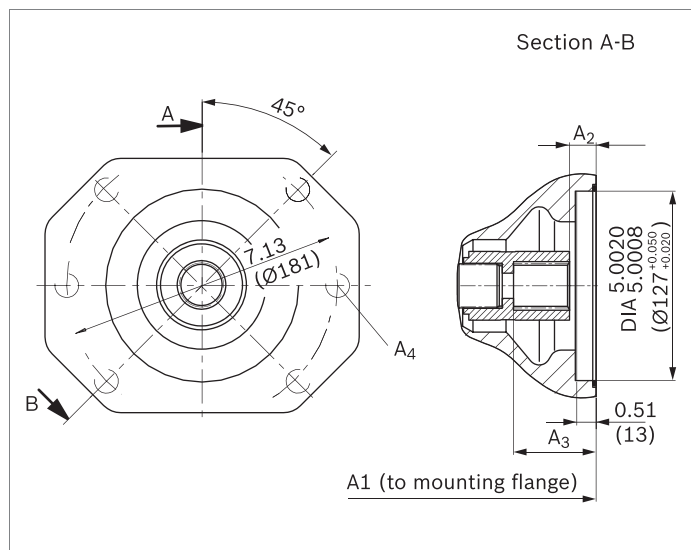
- 1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Mounting holes pattern viewed on through drive with control at top
- 3) Thread according to DIN 13.
- 4) Minimum dimensions

DIMENSIONS, THROUGH DRIVE - K07 AND K24

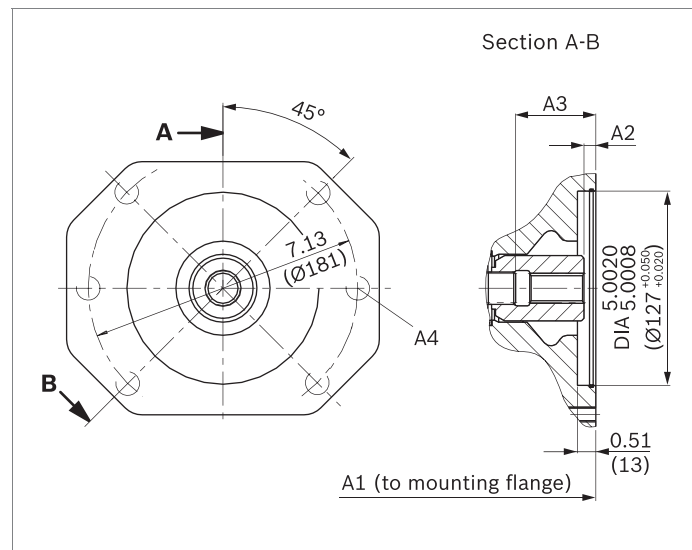
Flange ISO 3019-1 (SAE)		Hub for splined shaft ¹⁾		Availability across sizes							Code
Diameter	Mounting ²⁾	Diameter		18	28	45	60/63	72	85	100	
127-2 (B)	⌀, ∞	1 1/4 in	14T 12/24DP	-	-	-	-	-	•	•	K07
		1 1/2 in	17T 12/24DP	-	-	-	-	-	•	•	K24

• = Available ○ = On request

■ 127-2



K07	NG	A1	A2 ⁴⁾	A3 ⁴⁾	A4 ³⁾
(SAE J744 32-4 (C))					
	85	11.87 (301.5)	0.87 (22)	2.36 (60)	M16 × 2; 0.94 (24) deep
	100	11.87 (301.5)	0.87 (22)	2.36 (60)	M16 × 2; 0.94 (24) deep



K24	NG	A1	A2 ⁴⁾	A3 ⁴⁾	A4 ³⁾
(SAE J744 38-4 (C-C))					
	85	11.89 (302)	0.50 (12.8)	2.65 (67.2)	M16 × 2; 0.94 (24) deep
	100	11.89 (302)	0.50 (12.8)	2.65 (67.2)	M16 × 2; 0.94 (24) deep

- 1) According to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
- 2) Mounting holes pattern viewed on through drive with control at top
- 3) Thread according to DIN 13.
- 4) Minimum dimensions

OVERVIEW OF MOUNTING OPTIONS

Through drive			Mounting options – 2nd pump			
Flange ISO 3019-1	Hub for splined shaft	Code	A10V(S)O/5x NG (shaft)	A10VO/31 NG (shaft)	A1VO/10 NG (shaft)	External gear pump
82-2 (A)	5/8 in	K01	10 (U), 18 (U)	18 (U)	18 (S2)	AZPF
	3/4 in	K52	10 (S), 18 (S, R)	18 (S, R)	18 (S3)	
101-2 (B)	7/8 in	K68	28 (S, R) 45 (U, W) ¹⁾	28 (S, R) 45 (U, W)	35 (S4)	AZPN/AZPG
	1 in	K04	45 (S, R) 60, 63 (U, W) ²⁾ 72 (U, W) ²⁾	45 (S, R)	35 (S5)	–
127-4 (C)	1 1/4 in	K15	60, 63 (S, R) 72 (S, R)	–	–	–
	1 1/2 in	K16	85 (S) 100 (S)	–	–	–
127-2 (C)	1 1/4 in	K07	85 (U) 100 (U)	71 (S, R)	–	PGH5
	1 1/2 in	K24	85 (S) 100 (S)	–	–	–

1) Not for NG28 with K68

2) Not for NG45 with K04

COMBINATION PUMPS A10VO + A10VO

By using combination pumps, it is possible to have independent circuits without the need for splitter gearboxes. When ordering combination pumps, the type designations of pump 1 and 2 pumps must be linked by a "+".

Order example:

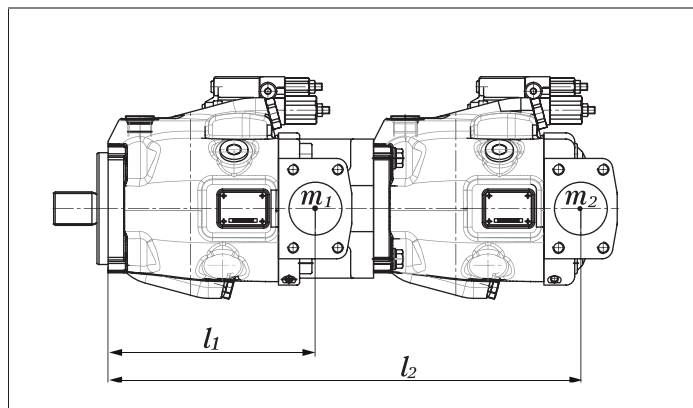
A10VO85DRS/53R-VSC62K04+

A10VO45DRF/53R-VSC61N00

A tandem pump, with two pumps of equal size, is permissible without additional supports, assuming that the dynamic mass acceleration does not exceed maximum 10 g (= 98.1 m/s²).

For combination pumps consisting of more than two pumps, a calculation of the mounting flange regarding the permissible mass torque is required (please contact us).

Through drives are plugged with a non-pressure-resistant cover. This means the units must be sealed with a pressure-resistant cover before commissioning. Through drives can also be ordered with a pressure-resistant cover, please specify in plain text.



$m_1, m_2, m_3, \dots$	Weight of pump	[lbs (kg)]
$l_1, l_2, l_3, \dots$	Distance from center of gravity	[inch (mm)]
$M_m = (m_1 \times l_1 + m_2 \times l_2 + m_3 \times l_3) \times \frac{1}{12 (102)} \quad [\text{lb-ft (Nm)}]$		

Notice

Through drives with installed hub are supplied with a spacer.

The spacer must be removed before the 2nd pump is installed and before commissioning. For further information, see instruction manual 92703-01-B

■ Permissible Moments of Inertia

NG				10	18	28	45	60/63	72	85	100
static	M_m	lb-ft (Nm)	–		369 (500)	656 (890)	664 (900)	101 (1370)	101 (1370)	2270 (3080)	2270 (3080)
dynamic at 10 g (98.1 m/s ²)	M_m	lb-ft (Nm)	–		37 (50)	65 (89)	66 (90)	101 (137)	101 (137)	227 (308)	227 (308)
Weight with through-drive plate	m	lbs (kg)	–		29 (13)	40 (18)	53 (24)	62 (28)	62 (28)	99 (45)	99 (45)
Weight without through-drive plate (e.g. 2 nd pump)	m	lbs (kg)	18 (8)		25 (11.5)	33 (15)	40 (18)	49 (22)	49 (22)	79 (36)	79 (36)
Distance, center of gravity with through drive	l_1	inch (mm)	–		3.43 (87)	3.90 (99)	4.53 (115)	5.00 (127)	5.00 (127)	5.90 (150)	5.90 (150)
Distance, center of gravity without through drive	l_1	inch (mm)	–		3.07 (78)	3.35 (85)	3.78 (96)	4.13 (105)	4.13 (105)	4.80 (122)	4.80 (122)

CONNECTOR FOR SOLENOIDS

DEUTSCH DT04-2P

Molded, 2-pin, without bidirectional suppressor diode

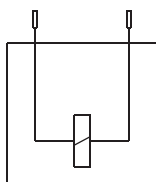
The installed mating connector has the following type of protection:

- IP67 (DIN/EN 60529) and
- IP69K (DIN 40050-9)

Notice

If necessary, you can change the position of the connector by turning the solenoid body.
The procedure is defined in the instruction manual.

■ Switching Symbol



■ Mating Connector DEUTSCH DT06-2S-EP04

Consisting of	DT designation
1 housing	DT06-2S-EP04
1 wedge	W2S
2 sockets	0462-201-16141

The mating connector is not included in the scope of delivery. This can be supplied by Anfield on request (material number R902601804).

■ Control Electronics

Control	Electronics function	Electronics		Data sheet
Electric pressure control	Controlled power outlet	RA	analog	95230
		RC4-5/30	digital	95205

INSTALLATION INSTRUCTIONS

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines.

Particularly with the "drive shaft up/down" installation position, filling and air bleeding must be carried out completely as there is, for example, a danger of dry running.

The leakage in the pump housing must be discharged to the reservoir via the highest available tank port (**L**, **L1**²⁾, **L2**³⁾).

If a shared drain line is used for several units, make sure that the respective case pressure in each unit is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operating condition, particularly at cold start. If this is not possible, separate drain line must be laid, if necessary.

To achieve favorable noise values, decouple all connecting lines using elastic elements and avoid above-reservoir installation.

In all operating conditions, the suction lines and the drain lines must flow into the reservoir below the minimum fluid level. The permissible suction height h_s results from the total pressure loss. However, it must not be higher than $h_{s\ max} = 31.5$ inch (800 mm). The minimum suction pressure at port **S** must not fall below 12 psi (0.8 bar) absolute during operation and during cold start.

For the reservoir design, ensure that there is an adequate distance between the suction line and the drain line.

This minimizes oil turbulence and carries out degassing, which prevents the heated hydraulic fluid from being sucked directly back in again.

Notice

In certain installation positions, an influence on the adjustment or control can be expected. Gravity, dead weight and case pressure can cause minor characteristic shifts and changes in actuating time.

For a key, see page 82.

- 1) Because complete air bleeding and filling are not possible in this position, the pump should be air bled and filled in a horizontal position before installation.
- 2) For NG10 and NG28 series 52, **L1** is opposite, **L** must then be connected if necessary.
- 3) Only series 53

Installation Position

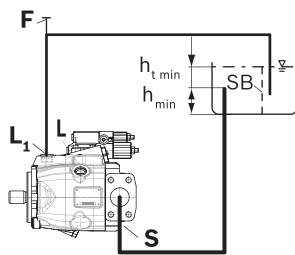
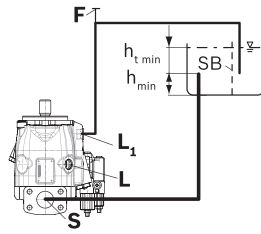
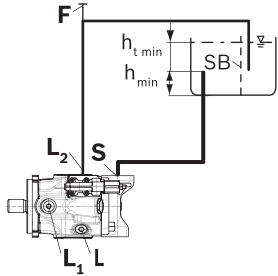
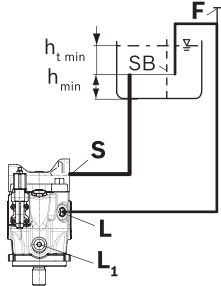
See the following examples **1** to **12**.

Further installation positions are available upon request.

Recommended installation position: **1** and **3**

Below-reservoir Installation

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir below the minimum fluid level.

Installation position	Air bleed	Filling
1 ²⁾	F	S + L or L ₁
		
2 ¹⁾	F	S + L ₁
		
3 ³⁾	F	S + L or L ₁
		
4 ¹⁾	F	S + L or L ₁
		

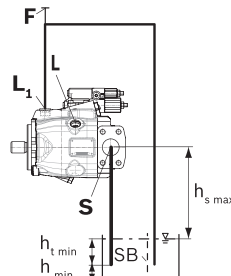
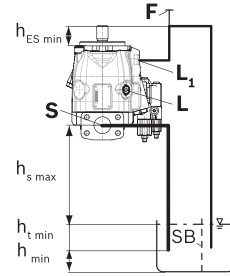
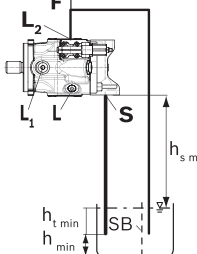
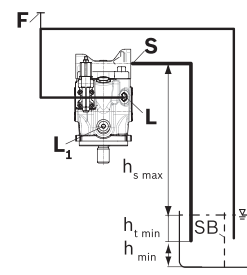
INSTALLATION INSTRUCTIONS

■ Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. To prevent the axial piston unit from draining in position 6, the height difference $h_{ES \min}$ must be at least 0.98 inch (25 mm). Observe the maximum permissible suction height $h_{S \max} = 31.5$ inch (800 mm).

A check valve in the case drain line is only permissible in individual cases. Consult us for approval.

For a key, see page 82.

Installation position	Air bleed	Filling
5²⁾ 	F	L₁ or L
6¹⁾²⁾ 	F	L₁
7³⁾ 	F	L₂
8¹⁾ 	F	S or L

- 1) Because complete air bleeding and filling are not possible in this position, the pump should be air bled and filled in a horizontal position before installation.
- 2) For NG10 and NG28 series 52, **L₁** is opposite, **L** must then be connected if necessary.
- 3) Only series 53

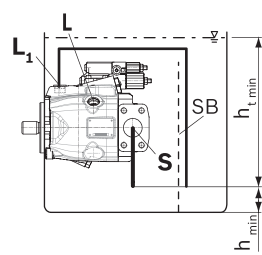
INSTALLATION INSTRUCTIONS

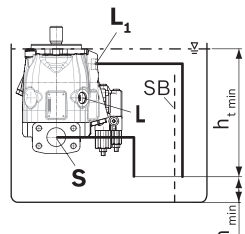
■ Inside-reservoir Installation

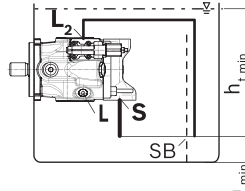
Inside-reservoir installation is when the axial piston unit is installed in the reservoir below the minimum fluid level.

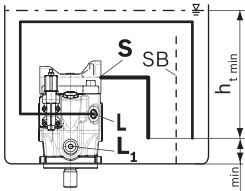
The axial piston unit is completely below the hydraulic fluid. If the minimum fluid level is equal to or below the upper edge of the pump, see chapter "Above-reservoir installation".

Axial piston units with electrical components (e.g. electric control, sensors) may not be installed in a reservoir below the fluid level.

Installation position	Air bleed	Filling
9²⁾ 	Via the highest available port L	Automatically via the open port L or L₁ due to the position under the hydraulic fluid level

10¹⁾ 	Via the highest available port L₁	Automatically via the open port L , L₁ or S due to the position under the hydraulic fluid level
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11³⁾ 		
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12¹⁾ 	Via the highest available port L	Automatically via the open port L , L₁ or S due to the position under the hydraulic fluid level
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Key	
F	Filling / Air bleeding
S	Suction port
L; L₁; L₂	Drain port
SB	Baffle (baffle plate)
$h_{t \min}$	Minimum required immersion depth (7.87 inch (200 mm))
$h_{\min}$	Minimum required distance to reservoir bottom (3.94 inch (100 mm))
$h_{ES \min}$	Minimum height required to prevent axial piston unit from draining (0.98 inch (25 mm))
$h_{S \max}$	Maximum permissible suction height (21.50 inch (800 mm))

Notice

Port **F** is part of the external piping and must be provided on the customer side to make filling and air bleeding easier.

- 1) Because complete air bleeding and filling are not possible in this position, the pump should be air bled and filled in a horizontal position before installation.
- 2) For NG10 and NG28 series 52, **L₁** is opposite, **L** must then be connected if necessary.
- 3) Only series 53

PROJECT PLANNING NOTES

- The A10VO axial piston variable pump is designed to be used in open circuit.
- Project planning, installation and commissioning of the axial piston units requires the involvement of skilled personnel.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Anfield.
- Before finalizing your design, request a binding installation drawing.
- The specified data and notes contained herein must be observed.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift. The characteristic curve may also shift due to the dither frequency or control electronics.
- Preservation: Our axial piston units are supplied as standard with preservation protection for a maximum of 12 months. If longer preservation protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or the instruction manual.
- Not all versions of the product are approved for use in safety functions according to ISO 13849. Please consult the proper contact at Bosch Rexroth if you require reliability parameters (e.g. MTTFd) for functional safety.
- Depending on the type of control used, electromagnetic effects can be produced when using solenoids. Applying a direct voltage signal (DC) to solenoids does not create electromagnetic interference (EMI) nor is the solenoid affected by EMI. Electromagnetic interference (EMI) potential exists when operating and controlling a solenoid with a modulated direct voltage signal (e.g. PWM signal). Appropriate testing and measures should be taken by the machine manufacturer to ensure other components or operators (e.g. with pacemaker) are not affected by this potential.
- Pressure controllers are not safeguards against pressure overload. Be sure to add a pressure relief valve to the hydraulic system.
- For drives that are operated for a long period of time with constant rotational speed, the natural frequency of the hydraulic system can be stimulated by the excitation frequency of the pump (rotational speed frequency $\times 9$). This can be prevented with suitably designed hydraulic lines.
- Please note the details regarding the tightening torques of port threads and other threaded joints in the instruction manual.
- Working ports:
 - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
 - The service ports and function ports are only intended to accommodate hydraulic lines.

SAFETY INSTRUCTIONS

- During and shortly after operation, there is a risk of getting burnt on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. contaminated hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer should test whether additional measures are required on the machine for the relevant application in order to bring the driven consumer into a safe position (e.g. safe stop) and make sure any measures are properly implemented.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



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