Hydraulic Axial Piston Sauer PV Pump

www.hydpump.com

Ordering code:

1	2	3	4	5	6	7	8	9	10
PV	**22**	**MH**	**R**	**A**	**A**	**B**	**13**	**B1**	**0**

1

PV	Variable pump

2

Disp. code Vg max [cm^3]		
20 [33.3]	21 [51.6]	22 [69.8]
23 [89.0]	24 [118.7]	25 [165.8]
26 [227.3]	27 [333.7]	

3

AAA	With top cover only
BBB	With joining piece and cove
MH	Mechanical hydraulic servo valve
MC	Mechanical-hydraulic servo valve with pressure
HDC	Hydraulic displacement control
HDP	Hydraulic Displacement Control with pressure

4

R	Clockwise	Direction of rotation
L	Anti-clockwise	
v	Reversible	

5

Dimension of the input shaft	
A	14 teeth, 12/24 PITCH, Φ31.20
B	19 teeth, 16/32 PITCH, Φ31.75
C	21 teeth, 16/32 PITCH, Φ34.50
D	23 teeth, 16/32 PITCH, Φ37.68
E	27 teeth, 16/32 PITCH, Φ44.03
F	40 teeth, 16/32 PITCH, Φ64.66
G	13 teeth, 8/16 PITCH, Φ43.71
I	20 teeth, 16/32 PITCH, Φ32.91
J	cone 1:8 SAEJ501, Φ41.27
K	cone 1:8 SAEJ501, Φ31.75
L	parallel with key Φ34.925
M	parallel with key Φ44.45
P	15 teeth, 16/ 2 PITCH, Φ25.4
R	13 teeth, 16/ 32 PITCH, Φ21.8

6

Pressure inlet ports A, B		Thread
A	SAE J518c, Code 62, Size 1", 6000psi	7/16"-14UNC-2A
B	SAE J518c, Code 61, Size 1", 5000psi	3/8"-16UNC-2A
C	ISO 6162, DN25, Type II, 40 MPa.	M12
D	SAEJ518c, code 62, size 3/4", 6000PSI	3/8"-16 UNC-2B
E	SAEJ518c, code 61, size 3/4", 5000PSI	3/8"-16 UNC-2B

7

Charge gear pump	
A	12.3 cm^3 (for PV20)
B	16.2 cm^3 (for PV21)
C	18.03 cm^3 (for PV23)
D	18.03 cm^3 (for PV24)
N	Without charge pump

8

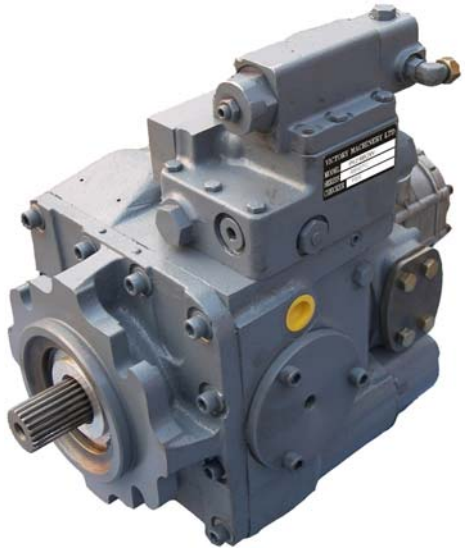
Pressure setting of gear pump	
13	13 bar
XX	other （range: 8~20 bar）
0	without charge pump

9

	Orifice
A	
B	Φ0.76 mm
C	Φ0.91 mm
D	Φ1.36 mm
E	Φ1.6 mm
N	without orifice
1	orifice in channel "P"
2	orifice in channel "A" "B"
3	orifice in channel "P" "A" "B"
4	orifice in channel "A"
5	orifice in channel "B"
6	orifice in channel "P""A"
7	orifice in channel "P""B"
0	without orifice

10

0	standard
x x	Special No.



Sauer PV Axial Piston Pumps

series 20 closed circuit

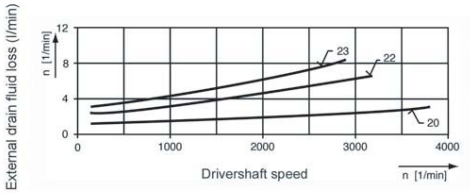
Technical data

Table 1:

	Dimension	Frame size							
		PV-20	**PV-21**	**PV-22**	**PV-23**	**PV-24**	**PV-25**	**PV-26**	**PV-27**
Max. displacement per revolution of the variable displacement pump	cm^3	33,3	51,6	69,8	89,0	118,7	165,8	227,3	333,7
Max. flow	dm^3min^{-1}	119,54	159,96	196,14	230,51	278,94	348,18	429,59	557,28
Displacement per revolution of the charge pump	cm^3	12,3	12,3	18,03	18,03	18,8	32,8	32,8	65,5
Max. pressure	MPa	35							
Nominal pressure	MPa	21							
Max. pressure of control	MPa	3,5							
Charge pressure	MPa	0,8 – 2,0							
Max. pressure in case	MPa	0,25 continuous 0,5 intermittent							
Maximum speed+	min^{-1}	3590	3100	2810	2590	2350	2100	1890	1670
Minimum speed	min^{-1}	500							
Nominal speed	min^{-1}	1500							
Kinematic viscosity range of working fluid - starting - operating - optimum	mm^2s^{-1}	1000 12 – 600 25 - 35							
Kind of working fluid		mineral oil							
Operating temperature	°C	- 40 to + 50							
Max. temperature of working fluid in tank	°C	80							
Purity of working fluid	µm	10							
Direction of shaft rotation		clockwise or counter clockwise							
Maximum swash plate angle	°	± 18 °							
Weight	kg	45	55	63	78	124	164	212	270

+ for higher speed contact our Application department

Figure 3: External drain fluid loss for frame sizes 20 – 23



Determination of nominal pump size

$$Q_e = \frac{V_g \cdot n \cdot \eta_v}{1000} \quad (l/min)$$

$$M_e = \frac{15{,}9 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}} \quad (Nm)$$

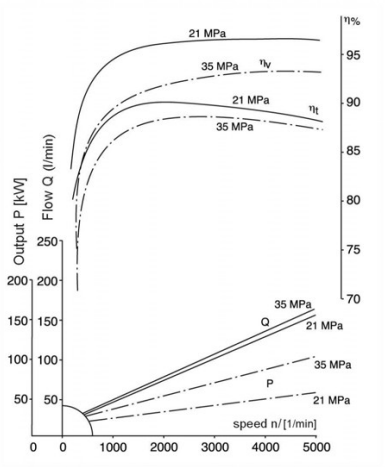
$$P_e = \frac{M_e \cdot n}{9550} = \frac{Q_e \cdot \Delta p}{600\ \eta_t}$$

V_g – displacement (cm^3) per revolution
Δp – difference high and low pressure (MPa)
n – speed (min^{-1})
η_v – volumetric efficiency
η_{mh} – mechanical – hydraulic efficiency
η_t – total efficiency

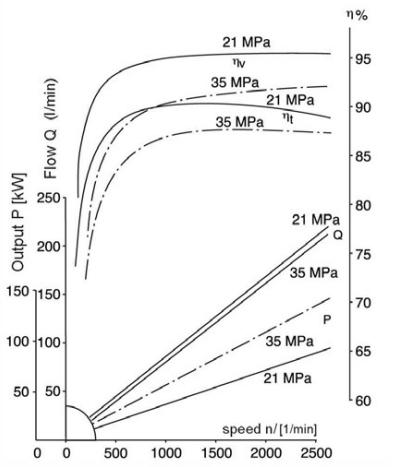
CURVES DEPENDENCES OF EFFICIENCY, FLOW AND OUTPUT ON THE SPEED
(for operating condition of 18° swash plate angle)

Figure 4

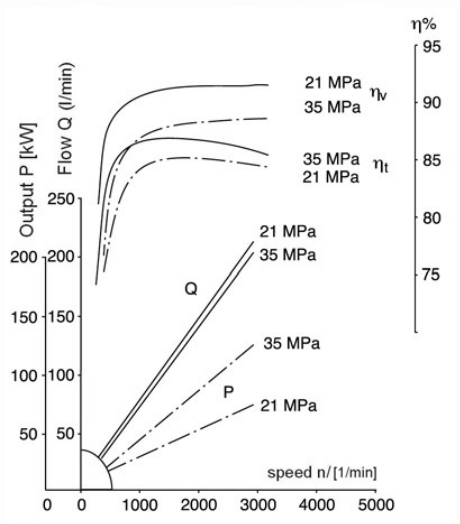
For frame size PV-20



For frame size PV-22



For frame size PV-23



ηv = Volumetric efficiency
ηt = Total efficiency

Servo Displacement Control (Linear response)
Regular by control handle on the servo valve, the swash plate can be infinitely varied in both direction with
the help of the servo system.
The pump displacement resulting from any control handle position can be established using figures (5a – 5c).
The angle of the control handle for stroke initiation and for the final position of the stroke can vary from unit to unit within the range of the tolerance band. (Figures 5a – 5c)

Figure 5

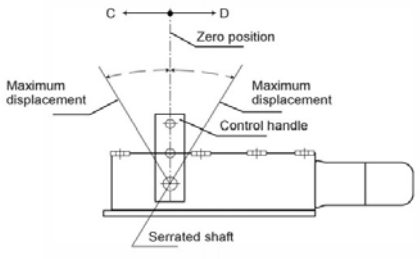


Figure 5a: frame size PV-20

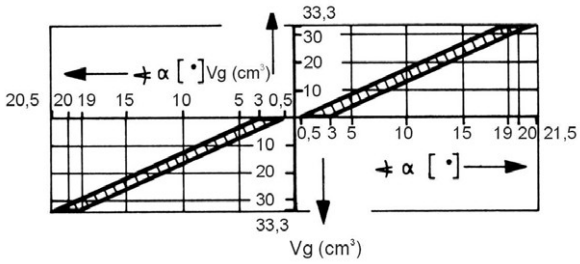


Figure 5b: frame size PV-22

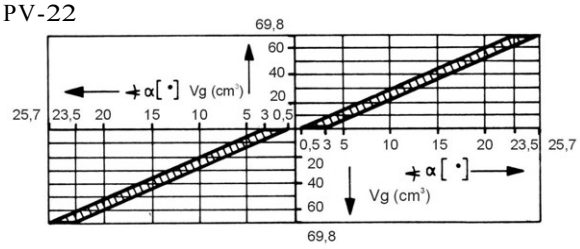
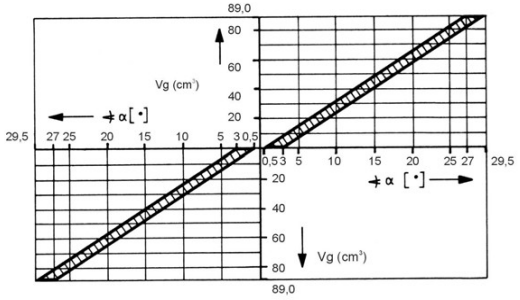


Figure 5c: frame size PV-23



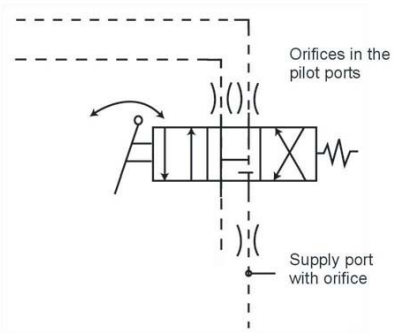
Reversing Time

Time for the directional of the flow from Q max across 0 to Q max depending on the size of the control orifice fitted in the supply port to the servo valve (Figure 7).

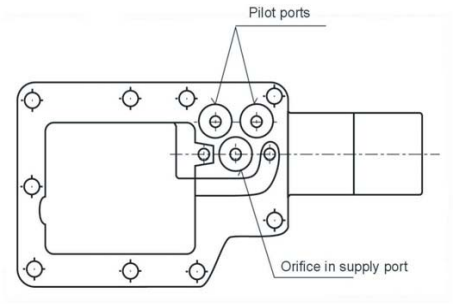
The values given assume movement of the control handle directly from one end position to the other.

Adjustment time of handle: < minimum reversing time
Operating pressure: 21 MPa
Speed: 1450 min^{-1}
Viscosity: 35 mm^2 / s

Schematic diagram of servo valve with recesses for alternative orifice position



Servo valve counter bored orifices insert



The reversing time in one flow direction can be extended by inserting an orifice in one of the pilot ports only.

Table 2:

Frame size	diameter of orifice (mm)	reversing time (s)
PV-20	0,76	3,78
	0,91	2,72
	1,05	2,16
	1,36	1,6
	1,6	1,14
	without orifice	0,6
PV-22	0,76	6,06
	0,91	4,2
	1,05	3,42
	1,36	2,3
	1,6	1,74
	without orifice	0,96
PV-23	0,76	6,24
	0,91	4,8
	1,05	3,54
	1,36	2,7
	1,6	1,8
	without orifice	1,02

Frame size	diameter of orifice (mm)	reversing time (s)
PV-24	0,76	10,20
	1,05	5,82
	1,60	2,88
	without orifice	1,68
PV-25	0,76	11,58
	1,05	5,92
	1,60	3,12
	without orifice	1,86
PV-26	0,76	29,70
	1,05	16,20
	1,60	7,50
	without orifice	3,78
PV-27	0,76	30,90
	1,05	15,72
	1,60	7,80
	without orifice	5,64

Dimensions

Table 3. Dimensions (mm)

Frame size	A	A_1	B	B1	B_2	B_3	C	D	D_3	D_4	D_5	E	F +-0,4	G
PV-20	190	146	47,6	112,7	100	122	56	162	$127^{-0,005}$	84	25,4	56	15	163
PV-21	191	146	48	124	110	131						70	15	172
PV-22	194	194	48	133	113	135						83	15	172
PV-23	194	194	49	150,8	123,8	146						90	15	190,4
PV-24	213	204	70	167	132	153	75	229	152,4	98		133	21,3	213
PV-25	286	254	80	174	142	162	77	317,5	165,1	98		160	21,3	260
PV-26	285	240	81	197	153	174		317,5	165,1	110		180	21,3	287,4
PV-27	300	274	86	212	172	193		350	177,8	114		208	27,7	317,4

Frame size	G_1	H	H_1	H_2	H_3	L	L_1	S	M	N	R_1	S_1
PV-20	81,03	340	270	284	352	224	161,2	$19^{-0,25}$	94,7	55,6	68	100
PV-21	86	358	282	301	367	246	174		108,7	65	68	107
PV-22	86	381	311	314	381	256	188		112,7	68,3	68,3	111
PV-23	95,2	395	320	327	395	270	194		127,6	77,8	68,3	117
PV-24	106,5	498	377	412	510	318	239		146	87,3	76	148
PV-25	130	560	423	457	560	366	264		153,7	97	76	171
PV-26	143,7	584	451	486	614	388	283		170,3	108	76	162
PV-27	158,7	656	475	578	656	433	311		187,2	127	76	198

Frame size	T	U	V	V_1	V_3	X	Y	Z	W	d	d_1	f
PV-20	$9,4^{+0,2}$	19	152	113	115,9	159	3	3	3/8-16 UNC-2B	$34,5^{-0,17}$	M10-5H	16
PV-21			160	122	128,6	152	6,35	6,35				
PV-22			165	123	128,6	146	9,5	9,5				
PV-23			171	134	139,8	140	12,7	12,7		$37,68^{-0,18}$		17,5
PV-24		21	186	154	152,3	173	14	14		44,03	M14-5H	23,5
PV-25			199	175	165,1	219	16	16	5/8-11 UNC-2B			
PV-26			201	214	167,4	235	14,3	16,3				
PV-27			225	216	190,5	246	17,5	17,5		64,66	M16	25

Frame size	e	h_1	h_2	k	l	l_1	α	m	n	
PV-20	6,73	62	51,16	48	12,5	min20	45^{O}	52,4	26,2	**H – with charge pump 12 cm3 (sizes 20-23), 33 cm3 (size 25)** **H3 – with charge pump 18 cm3 (size 20-23), 33 cm3 (size 24), 66 cm3 (size 25)**
PV-21		68	54							
PV-22		71,4	60,5							
PV-23		77,7	65							
PV-24		88,5	68,2	67	12,45	30		79,4	36,5	
PV-25		98	74		15,6	30				
PV-26		100	79,4			36,7				
PV-27		116	95,3			30				

Frame size	port A and B	$P_{1,2\ drain}$	Port R gear pump	M1, M2, Z2
PV-20-24	SAE flange, 3000 psi 4 threads, 3/8 UNC-2B, 18 deep	7/8-14 UNF-2B	7/8-14 UNF-2B	7/16-20 UNF- 2B, SE straight thread „O"-ring boss
PV-25	SEA flange, size $1^{1/2}$ 4 threads, 6000 psi, 5/8-11 UNC-2B, 35 deep	$1^{5/16}$ – 12 UN-2B	$1^{5/16}$ – 12 UN-2B	
PV-26		1 7/8-12 UNF-2B SAE straight threads „O" ring boss	$1^{5/16}$ – 12 UN-2B	
PV-27			SAE flange, size 1 1/4, 3000 psi, 4 thread 7/16-14 UNC-2B	