



# Hydraulic Axial Piston Sauer PV Pump

www.hydpump.com

Ordering code:

1	2	3	4	5	6	7	8	9	10
<b>PV</b>	<b>22</b>	<b>MH</b>	<b>R</b>	<b>A</b>	<b>A</b>	<b>B</b>	<b>13</b>	<b>B1</b>	<b>0</b>

1

PV	Variable pump
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2

Displacement code		
20	21	22
23	24	25
26	27	

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 shaft rotation
L	Anti-clockwise	
v	Reversible	

5

Dimension of the input shaft	
A	14 teeth, 12/24 PITCH, $\Phi 31.20$
B	19 teeth, 16/32 PITCH, $\Phi 31.75$
C	21 teeth, 16/32 PITCH, $\Phi 34.50$
D	23 teeth, 16/32 PITCH, $\Phi 37.68$
E	27 teeth, 16/32 PITCH, $\Phi 44.03$
F	40 teeth, 16/32 PITCH, $\Phi 64.66$
G	13 teeth, 8/16 PITCH, $\Phi 43.71$
I	20 teeth, 16/32 PITCH, $\Phi 32.91$
J	cone 1:8 SAEJ501, $\Phi 41.27$
K	cone 1:8 SAEJ501, $\Phi 31.75$
L	parallel with key $\Phi 34.925$
M	parallel with key $\Phi 44.45$
P	15 teeth, 16/ 2 PITCH, $\Phi 25.4$
R	13 teeth, 16/ 32 PITCH, $\Phi 21.8$

10

0	standard
xx	Special production no.

9

A	Orifice
B	$\Phi 0.76$ mm
C	$\Phi 0.91$ mm
D	$\Phi 1.36$ mm
E	$\Phi 1.6$ 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

8

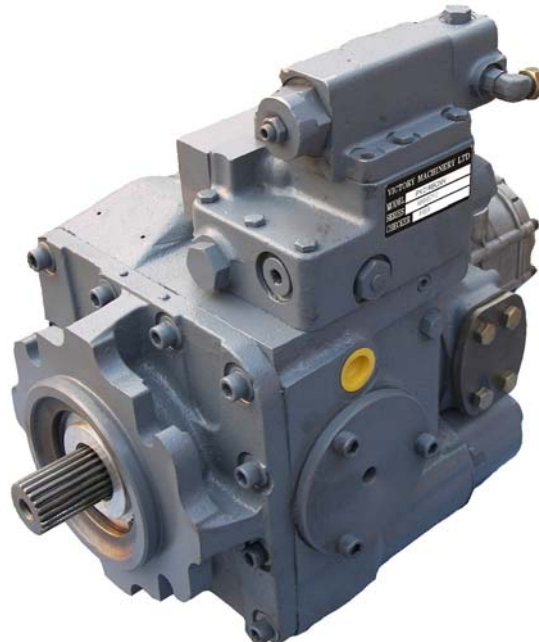
Pressure setting of gear pump	
13	13 bar
XX	other (range: 8~20 bar)
0	without charge pump

7

Charge gear pump	
A	12.3 cm <sup>3</sup> (for PV20)
B	16.2 cm <sup>3</sup> (for PV21)
C	18.03 cm <sup>3</sup> (for PV23)
D	18.03 cm <sup>3</sup> (for PV24)
NN	Without charge pump

6

Pressure inlet ports A, B	
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





## Sauer PV Axial Piston Pumps

[www.hydump.com](http://www.hydump.com)

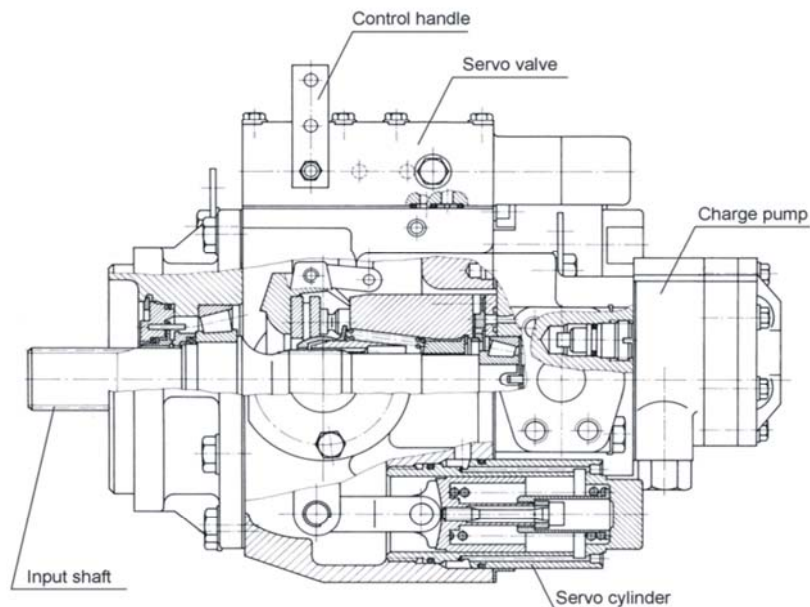
### General Description

Axial piston variable displacement pumps, Series 20, are of swash plates construction with variable flow capability suitable for hydrostatic transmission with closed loop circuit.

The Flow rate is proportional to the pump's driven speed and displacement, which, in turn, is determined by the swash plate angle. The latter infinitely adjustable between zero and maximum displacement.

Flow direction is reversed by tilting the swash plate to the opposite side of the neutral or zero displacement position.

Figure 1:



### Features

Axial piston variable displacement pumps, Series 20, are well-engineered and easy to handle.

The full-length shaft with a high efficient tapered roller bearing arrangement offers a high loading capacity for external radial forces.

Additional pumps can be built on.

The hydro-mechanical servo displacement control maintains the selected swash plate position and hence pump displacement.



## Sauer PV Axial Piston Pumps

series 20 closed circuit

Upon release of the control handle, the swash plate automatically returns to the null position and the flow become zero.

High case pressures can be archived without leakage even at the lowest temperature by using suitable shaft seals.

The servo valve arrangement offers the facility to incorporate function regulators and remote control system.

Axial piston units are designed for easy servicing, complete dismantling and reassembly can be carried out standard hand tools, and all components or sub-assemblies are replaceable.

Figure 2:

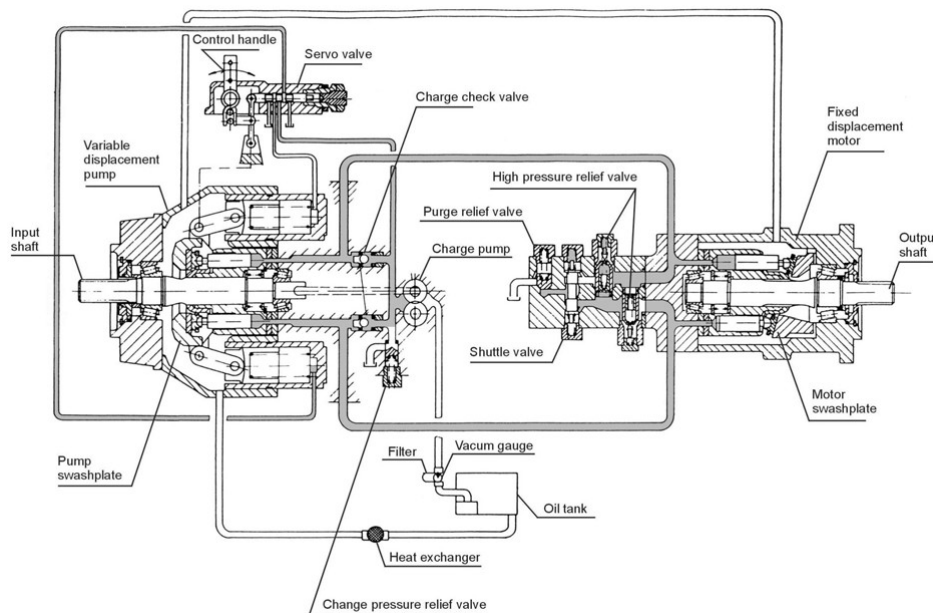


Figure 2 shows schematically the function of hydraulics transmission using an axial piston variable displacement pump and a fixed displacement motor.



# Sauer PV Axial Piston Pumps

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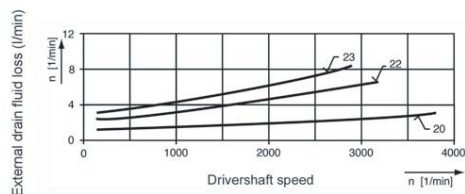
## Technical data

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 <sup>3</sup>	33,3	51,6	69,8	89,0	118,7	165,8	227,3	333,7
Max. flow	dm <sup>3</sup> min <sup>-1</sup>	119,5 4	159,9 6	196,1 4	230,5 1	278,9 4	348,1 8	429,59	557,2 8
Displacement per revolution of the charge pump	cm <sup>3</sup>	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 <sup>-1</sup>	3590	3100	2810	2590	2350	2100	1890	1670
Minimum speed	min <sup>-1</sup>	500							
Nominal speed	min <sup>-1</sup>	1500							
Kinematic viscosity range of working fluid - starting - operating - optimum	mm <sup>2</sup> s <sup>-1</sup>	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

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

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

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

$V_g$  – displacement (cm<sup>3</sup>) per revolution  
 $\Delta p$  – difference high and low pressure (MPa)  
 $n$  – speed (min<sup>-1</sup>)  
 $\eta_v$  – volumetric efficiency  
 $\eta_{me}$  – mechanical – hydraulic efficiency  
 $\eta_t$  – total efficiency



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## Reversing Time

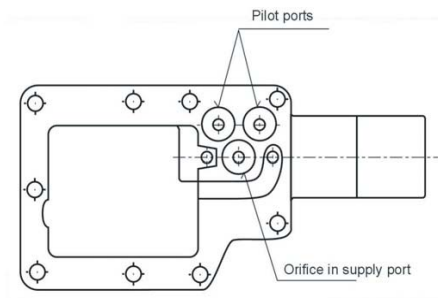
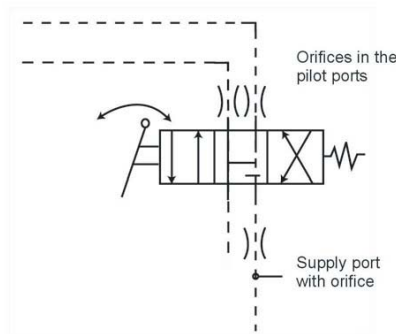
Time for the directional of the flow from Q max across 0 to Q max depending on the size of the control orifice fitted in the supply port to the servo valve (Figure 7).

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<sup>-1</sup>  
 Viscosity: 35 mm<sup>2</sup> / 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



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series 20 closed circuit

## Dimensions

Table 3. Dimensions (mm)

Frame size	A	A <sub>1</sub>	B	B <sub>1</sub>	B <sub>2</sub>	B <sub>3</sub>	C	D	D <sub>3</sub>	D <sub>4</sub>	D <sub>5</sub>	E	F +0,4	G
PV-20	190	146	47,6	112,7	100	122	56	162	127 <sup>0,005</sup>	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 <sub>1</sub>	H	H <sub>1</sub>	H <sub>2</sub>	H <sub>3</sub>	L	L <sub>1</sub>	S	M	N	R <sub>1</sub>	S <sub>1</sub>
PV-20	81,03	340	270	284	352	224	161,2	19 <sup>0,25</sup>	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 <sub>1</sub>	V <sub>3</sub>	X	Y	Z	W	d	d <sub>f</sub>	f
PV-20	9,4 <sup>+0,2</sup>	19	152	113	115,9	159	3	3	3/8-16 UNC-2B	34,5 <sup>-0,17</sup>	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 <sup>-0,18</sup>		
PV-24		21	186	154	152,3	173	14	14	5/8-11 UNC-2B	44,03	M14-5H	23,5
PV-25			199	175	165,1	219	16	16				
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

Frame size	e	h <sub>1</sub>	h <sub>2</sub>	k	l	l <sub>1</sub>	α	m	n	H <sub>3</sub>
PV-20	6,73	62	51,16	48	12,5	min20	45°	52,4	26,2	<b>H – with charge pump 12 cm<sup>3</sup></b> <b>(sizes 20-23), 33 cm<sup>3</sup> (size 25)</b> <b>– with charge pump 18 cm<sup>3</sup> (size</b> <b>20-23), 33 cm<sup>3</sup> (size 24), 66 cm<sup>3</sup></b> <b>(size 25)</b>
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							
PV-26		100	79,4							
PV-27		116	95,3							

Frame size	port A and B	P <sub>1,2</sub> 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 <sup>1/2</sup> 4 threads, 6000 psi, 5/8-11 UNC-2B, 35 deep	1 <sup>5/16</sup> – 12 UN-2B	1 <sup>5/16</sup> – 12 UN-2B	
PV-26		1 7/8-12 UNF-2B SAE straight threads „O“ ring boss	1 <sup>5/16</sup> – 12 UN-2B	
PV-27			SAE flange, size 1 1/4, 3000 psi, 4 thread 7/16-14 UNC-2B	