



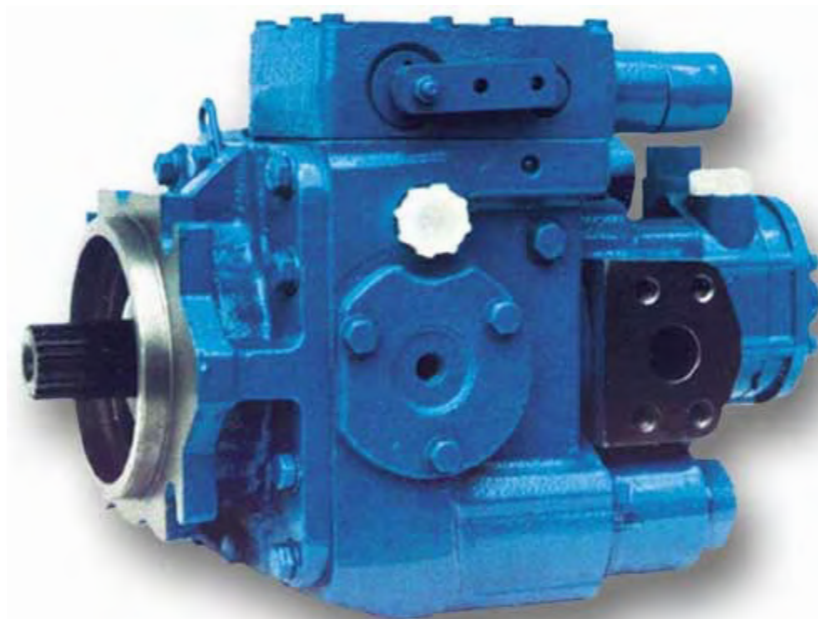
HANSA · TMP STM

HYDRAULIC COMPONENTS
HYDROSTATIC TRANSMISSIONS
GEARBOXES - ACCESSORIES

HT 16 / G / 102 / 0904 / E

Closed Loop Circuit Variable Displacement Axial Piston Pumps

PV 22 - 23 Series



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Technical Information

General Description

DESCRIPTION

The PV 22 - 23 axial piston variable displacement pumps are of swash plate design with variable flow capability suitable for hydrostatic transmissions with closed loop circuit. Tilting the swash plate to the opposite side of the neutral or zero displacement position reverses flow direction.

The PV 22 - 23 axial piston variable displacement pumps are well engineered and easy to handle.

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

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

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

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

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

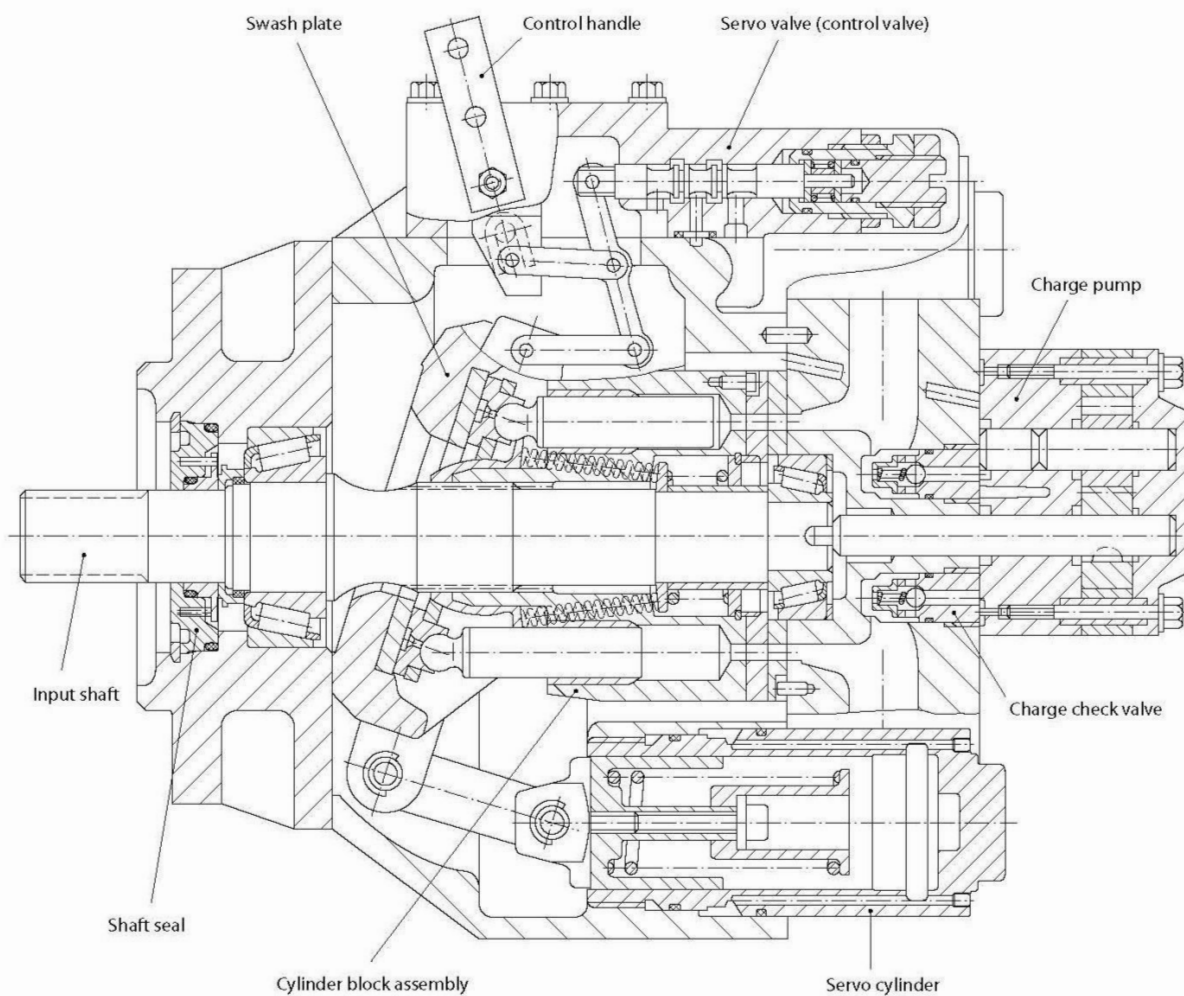
Axial piston units are designed for easy servicing. Complete dismantling and reassembly can be carried out with standard hand tools, and all components or sub-assemblies are replaceable.

TYPICAL MARKETS

- Industrial
- Mining
- Transit Mixer
- Utility Vehicles

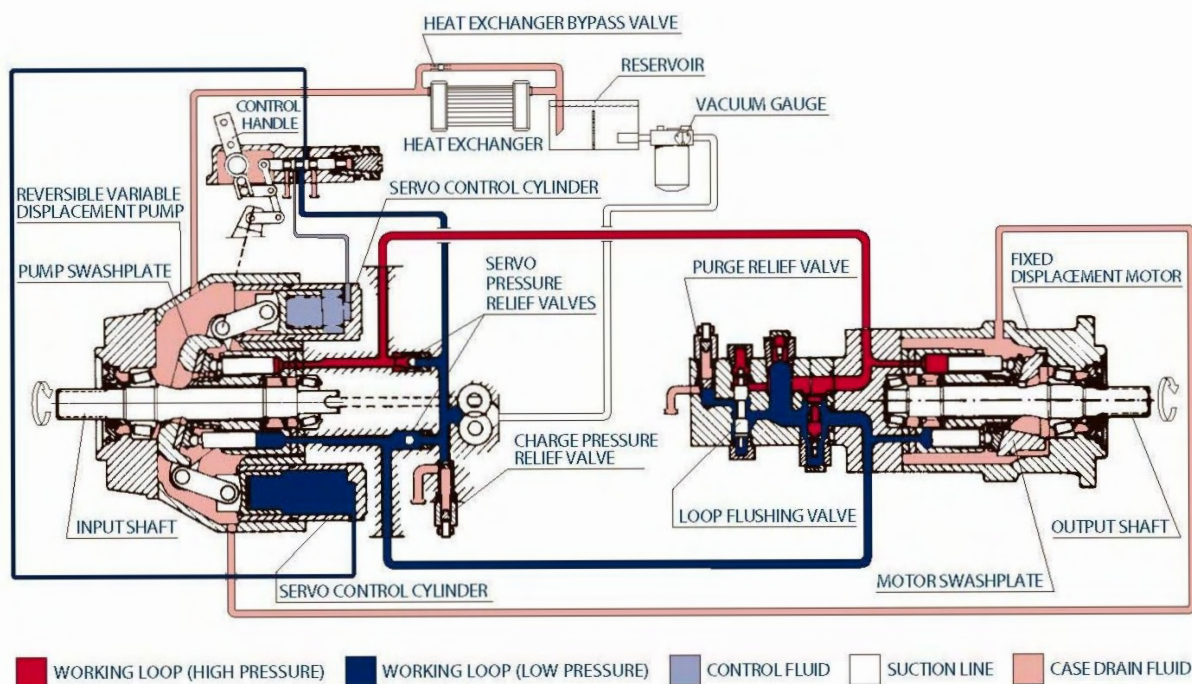
Technical Information Sectional View

AXIAL PISTON VARIABLE DISPLACEMENT PUMP



Technical Information System Circuit Description

PUMP AND MOTOR CIRCUIT DESCRIPTION



Above figure shows schematically the function of a hydrostatic transmission using an axial piston variable displacement pump and a fixed displacement motor.

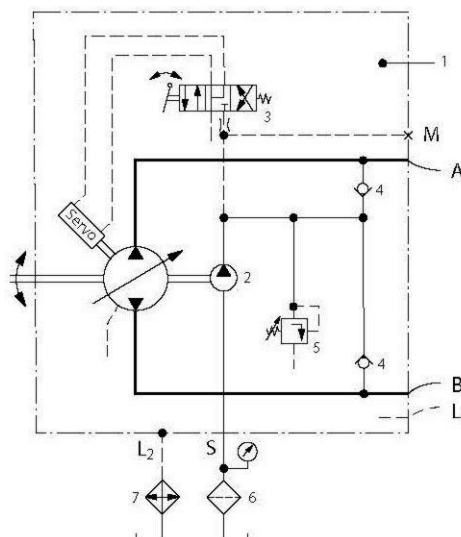
PUMP CIRCUIT SCHEMATIC

Designation:

- 1 = Variable displacement pump
- 2 = Charge pump
- 3 = Servo control valve
- 4 = Charge check valve
- 5 = Charge relief valve
- 6 = Filter
- 7 = Heat exchanger

Ports:

- A, B = Main pressure ports (working loop)
- S = Suction port - charge pump
- L1, L2 = Drain ports
- M = Gauge port - charge pressure



Technical Information

Technical Specification

TECHNICAL PARAMETERS

Design

Axial piston pump of swash plate design, with variable displacement.

Type of mounting

SAE four bolt flanges.

Pipe connections

Main pressure ports: SAE split flange

Remaining ports: SAE O-ring boss

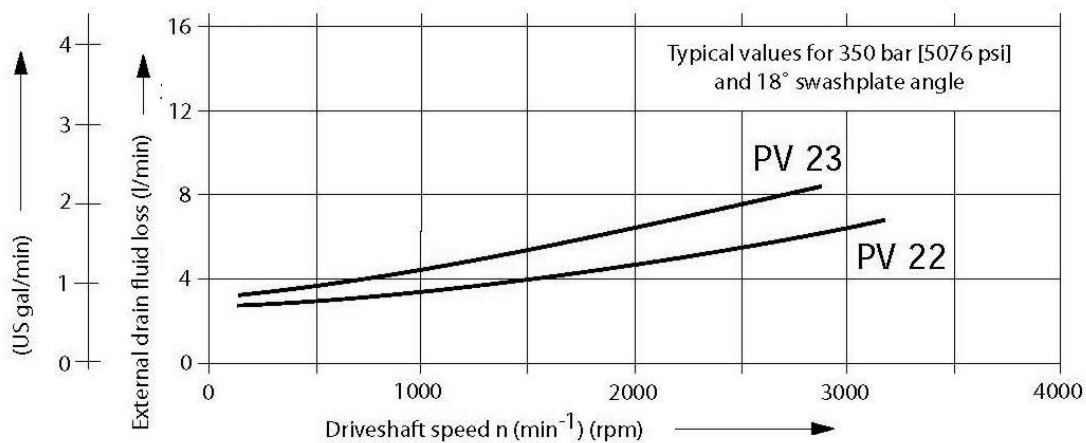
Direction of rotation

Clockwise or counterclockwise (viewing from the input shaft).

Installation position

Optional; pump housing must be always filled with hydraulic fluid.

External drain fluid loss



Technical Information Technical Specification

HYDRAULIC PARAMETERS

System pressure range, input p_1

Variable displacement pump:

Charge pressure nominal: 13 bar [189 psi] above case pressure

Charge pressure minimum: 8 bar [116 psi], intermittent only

Charge pump input pressure:

Min. allowable pressure, continuous = 0.75 bar [10.9 psi] absolute

Min. allowable pressure, intermittent = 0.50 bar [7.3 psi] absolute (for cold start)

Charge pump output pressure:

Max. operating pressure = 35 bar [508 psi] above case pressure

System pressure range, output p_2

Pressure on port A or B: Max. operating pressure $\Delta p = 350$ bar [5076 psi]

Case pressure

Max. rated pressure = 2.5 bar [36.3 psi]

Intermittent = 5.0 bar [72.5 psi]

Hydraulic fluid

Please use antiwear hydraulic fluid as operating fluid.

In case of using special fluid (Phosphate ester compounds, water-glycol fluid, fatty acid ester compounds, etc.) please consult our Technical Dpt.

Hydraulic fluid temperature range

$\vartheta_{\min} = -40$ °C [-40 °F]

$\vartheta_{\max} = 95$ °C [203 °F]

Viscosity range

$\nu_{\min} = 7$ mm²/s [49 SUS*]

$\nu_{\max} = 1000$ mm²/s [4630 SUS*] (intermittent cold start)

Recommended viscosity range: 12 - 60 mm²/s [66 - 280 SUS*]

*SUS (Saybolt Universal Second)

Filtration

Required cleanliness level: ISO 4406 - 1999 Code 22/18/13 or better.

Shaft load

The pump will accept radial and axial loads on its shaft, the maximum capacity being determined by direction and point of application of the load.

Please contact our Technical Dpt.

Technical Information Technical Specification

HYDRAULIC PARAMETERS (continued)

Technical data

			Frame size	
			PV 22	PV 23
Max. displacement		cm ³ [in ³]	69.8 [4.26]	89.0 [5.43]
Charge pump displacement	options	cm ³ [in ³]	18.03 [1.10]	
			12.30 [0.75]	
Minimum speed		min ⁻¹ (rpm)	500	
Rated speed 1		min ⁻¹ (rpm)	3000	2800
Maximum swash plate angle		degree	±18	
Mass moment of inertia of rotating group (without charge pump)		kg m ² · 10 ⁻³ [lbf ft ² · 10 ⁻³]	12.34 [292.8]	17.77 [421.7]
Weight		kg [lb]	63 [139]	78 [172]

¹ for higher speeds please contact our Technical Dpt.

Determination of nominal pump size

Unit:	Metric system:		Inch system	
Pump output flow	$Q = \frac{V_g \cdot n \cdot \eta_v}{1000}$	l/min	$Q = \frac{V_g \cdot n \cdot \eta_v}{231}$	[gpm]
Input torque	$M = \frac{V_g \cdot \Delta p}{20 \cdot \pi \cdot \eta_m}$	Nm	$M = \frac{V_g \cdot \Delta p}{2 \cdot \pi \cdot \eta_m}$	[lbf·in]
Input power	$P = \frac{V_g \cdot n \cdot \Delta p}{600\,000 \cdot \eta_t}$	kW	$P = \frac{V_g \cdot n \cdot \Delta p}{396\,000 \cdot \eta_t}$	[hp]

Efficiency characteristic curves available on request.

V_g	= Pump displacement per revolution	cm ³	[in ³]
n	= Pump speed	min ⁻¹	(rpm)
Δp	= Hydraulic pressure differential	bar	[psid]
	$\Delta p = p_{HD} - p_{ND}$		
η_v	= Pump volumetric efficiency		
η_m	= Pump mechanical efficiency		
η_t	= Pump total efficiency		
p_{HD}	= High pressure	bar	[psid]
p_{ND}	= Low pressure	bar	[psid]

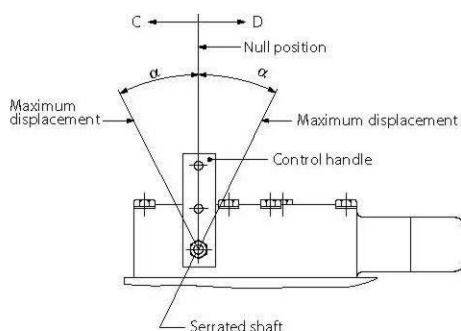
Technical Information Technical Specification

SERVO DISPLACEMENT CONTROL (LINEAR RESPONSE)

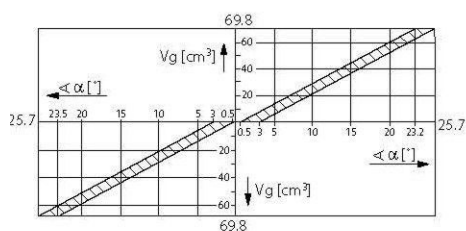
Regulated by the control handle on the servo valve, the swash plate can be infinitely varied in both directions with the help of the servo system.
The pump displacement resulting from any control handle position can be established using the figures on this page.
The angle of the control handle for stroke initiation and for the final position of the stroke can vary from unit to unit within the range of the tolerance band.
The inter-relation of flow direction, rotation of the pump and the control handle movement is shown below.

Pump flow direction

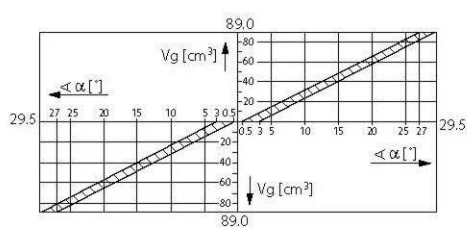
Flow direction changes with the direction of rotation and the control handle movement (see above).



Pump rotation	Movement of control handle in direction	Pressure port OUT	Pressure port IN
Counterclockwise (L)	C	B	A
	D	A	B
Clockwise (R)	C	A	B
	D	B	A



PV 22



PV 23

Technical Information Technical Specification

SERVO DISPLACEMENT CONTROL (LINEAR RESPONSE) (continued)

Reversing time

Time for the directional change of the flow from $Q_{\max}$, across zero to $Q_{\max}$, depending on the size of the control orifice fitted in the supply port to the servo valve (see below). 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: $\Delta p_2 = 210 \text{ bar}$ [3046 psi]

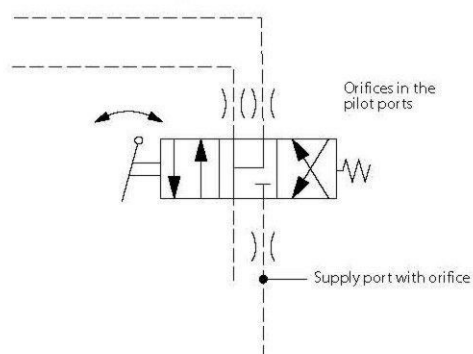
Speed: $n = 1450 \text{ min}^{-1}$ (rpm)

System temperature: $50 \text{ }^{\circ}\text{C}$ [122 $^{\circ}\text{F}$]

Viscosity: $35 \text{ mm}^2/\text{s}$ [164 SUS]

Frame size	Minimum reversing time (s) without orifice	Maximum reversing time (s) with orifice Ø 0.66 in supply port
PV 22	1.0	9.3
PV 23	1.1	9.0

Schematic diagram of servo valve with alternative orifice positions



Technical Information Technical Specification

SERVO DISPLACEMENT CONTROL (LINEAR RESPONSE) (continued)

Reset time

Time for reducing the flow from either flow direction from $Q_{\max}$ to 0 releasing the control handle.

Assuming no mechanical blockage of the control handle's free return and assuming no orifices in the pilot ports:

Operating pressure: $\Delta p_2 = 210 \text{ bar [3046 psi]}$

System temperature: 50 °C [122 °F]

Viscosity: $35 \text{ mm}^2/\text{s [164 SUS]}$

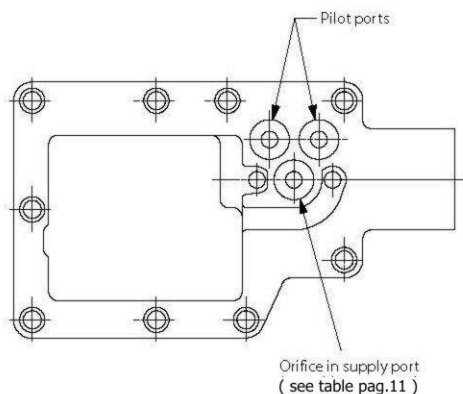
Frame size	Minimum reset time (s)
PV 22	3.0
PV 23	

Changing reversing and reset time

Inserting one orifice in each of the pilot ports can extend the reversing time. The reset time will also be extended.

Inserting an orifice in one of the pilot ports only can extend the reversing time in one flow direction. The reset time will be extended only for this flow direction.

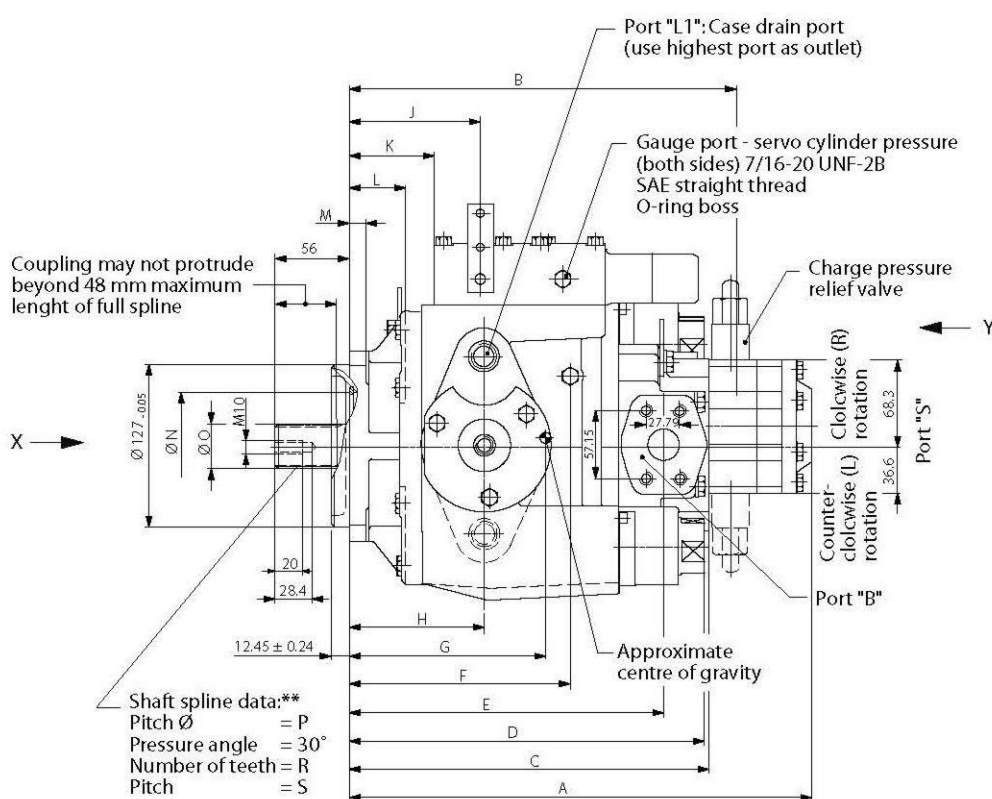
Servo valve counter bored recesses for orifice insert



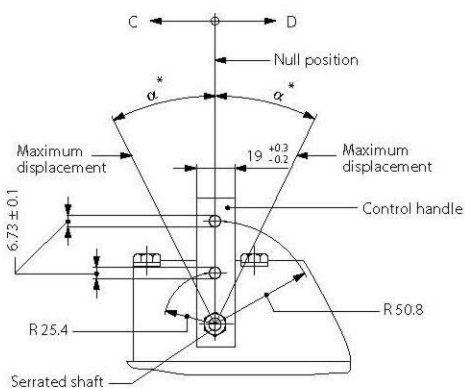
Technical Information Dimensions – PV 22 - PV 23

OUTLINE DRAWING, CONFIGURATION PS, DISPLACEMENT CONTROL VML 1

- * Minimum and maximum angle α ,
(see section servo displacement control).
- ** Shaft spline data: spline shaft with involute
spline, according to SAE handbook, 1963,
class 1, fillet root side fit.



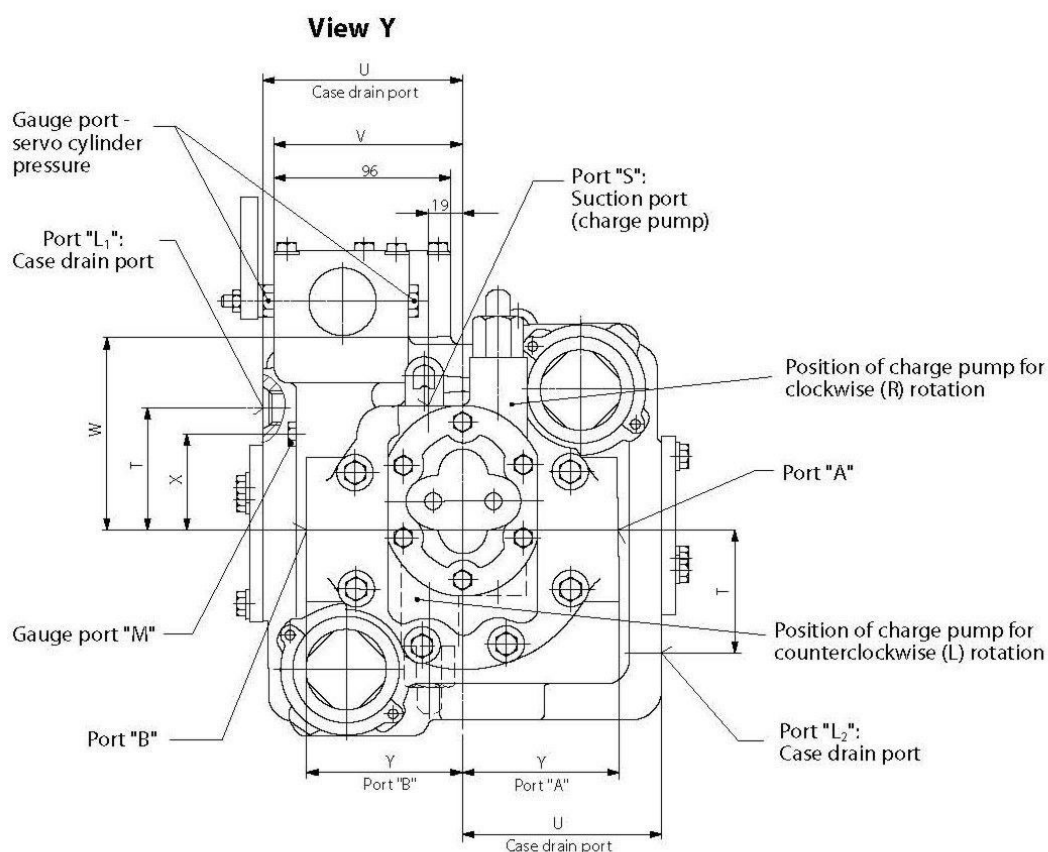
View Z



Technical Information Dimensions – PV 22 - PV 23

OUTLINE DRAWING, CONFIGURATION PS, DISPLACEMENT CONTROL VML 1 (continued)

Frame size	Port A and B	Port L ₁ and L ₂	Port S	Port M
PV 22	SAE flange, size 1 SAE split flange boss 5000 psi 4 threads	7/8-14 UNF-2B SAE straight thread O-ring boss		7/16-20 UNF-2B SAE straight thread O-ring boss
PV 23	3/8-16 UNC-2B 18 deep			



Max. torque for charge pump inlet port (7/8 -14 UNF - 2B) is 22 - 28 Nm [195 - 248 lbf·in].

Technical Information Dimensions – PV 22 - PV 23

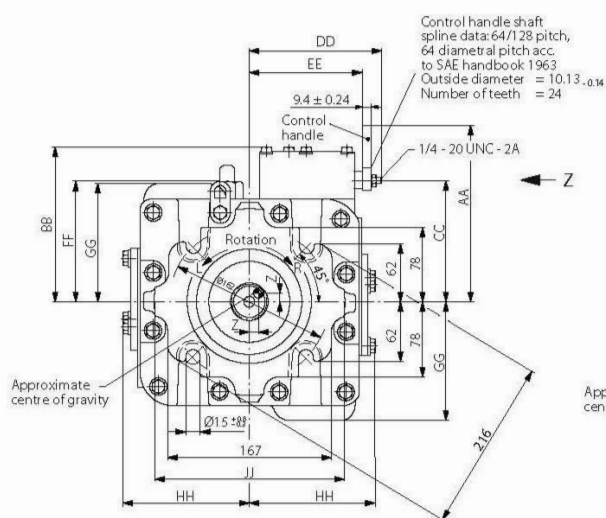
OUTLINE DRAWING, CONFIGURATION PS, DISPLACEMENT CONTROL VML 1 (continued)

Dimensions

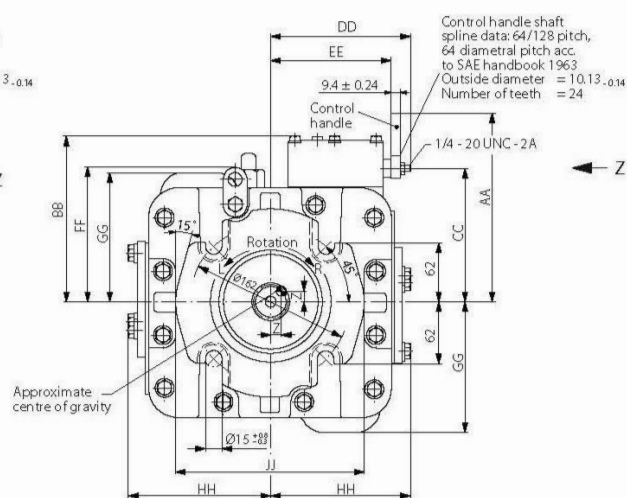
Frame size	B mm [in]	C mm [in]	D mm [in]	E mm [in]	F mm [in]	G mm [in]	H mm [in]	J mm [in]	K mm [in]	L mm [in]	M mm [in]	Ø N mm [in]
PV 22	315 [12.402]	294 [11.575]	305 [12.008]	259 [10.197]	188 [7.402]	146 [5.748]	112 [4.409]	120 [4.724]	84 [3.307]	48 [1.890]	16 [0.630]	84 [3.307]
PV 23	328 [12.913]	307 [12.087]	312 [12.283]	271 [10.669]	195 [7.677]	140 [5.512]	118 [4.646]	129 [5.079]	91 [3.583]	49 [1.929]	17.5 [0.689]	98 [3.858]
Frame size	T mm [in]	U mm [in]	V mm [in]	W mm [in]	X mm [in]	Y mm [in]	Z mm [in]	AA mm [in]	BB mm [in]	CC mm [in]	DD mm [in]	EE mm [in]
PV 22	71.4 [2.811]	112.7 [4.437]	105 [4.134]	108 [4.252]	60.5 [2.382]	85.8 [3.378]	9.5 [0.374]	187.6 [7.386]	162 [6.378]	128.6 [5.063]	133 [5.236]	113 [4.449]
PV 23	77.7 [3.059]	128.7 [5.067]	115 [4.528]	119 [4.685]	65 [2.559]	95.2 [3.748]	12.7 [0.500]	198.6 [7.819]	173 [6.811]	139.6 [5.496]	144 [5.669]	123 [4.843]
Frame size	FF mm [in]	GG mm [in]	HH mm [in]	JJ mm [in]	Charge pump		Shaft spline				Bore diameter for shaft coupling	
					12	18	Ø O mm [in]	Ø P mm [in]	R mm [in]	S	mm [in]	
					[0.732]	[1.098]						
PV 22	126 [4.961]	123 [4.843]	130 [5.118]	194 [7.638]	372 [14.646]	381 [15.000]	34.50 _{-.017} [1.358 _{-.0067}]	33.338 [1.313]	21 [0.827]	16/32	31.75 ^{+0.062} [1.250 ^{+0.0024}]	
PV 23	140 [5.512]	134 [5.276]	148 [5.827]	194 [7.638]	358 [14.094]	394 [15.512]	37.68 _{-.017} [1.483 _{-.0067}]	36.513 [1.438]	23 [0.906]	16/32	34.95 ^{+0.062} [1.376 ^{+0.0024}]	

¹ Short version available on request. Please contact our Technical Dpt.

View X (for PV 22 only)

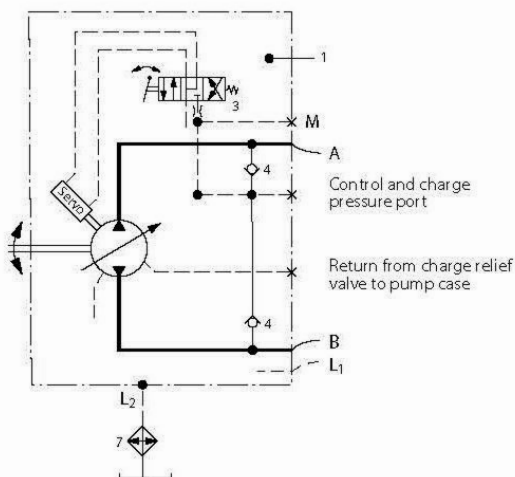


View X (for PV 23 only)



Technical Information Dimensions – PV 22 - PV 23

PUMP CONFIGURATION AA 010, DISPLACEMENT CONTROL VML 1



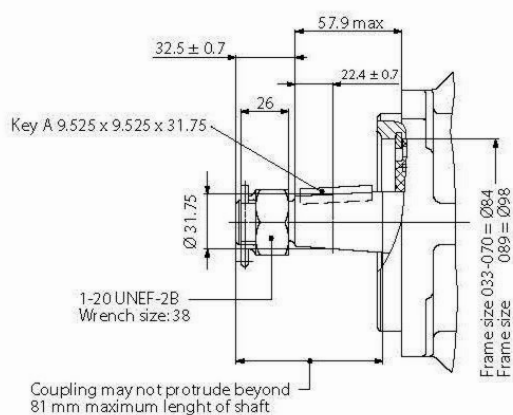
Designation:

- 1 = Variable Displacement pump
- 3 = Servo control valve
- 4 = Charge check valve
- 7 = Heat exchanger

Ports:

- A, B = Main pressure ports (working loop)
- L1, L2 = Drain ports
- M = Gauge port - charge pressure

TAPERED SHAFT END



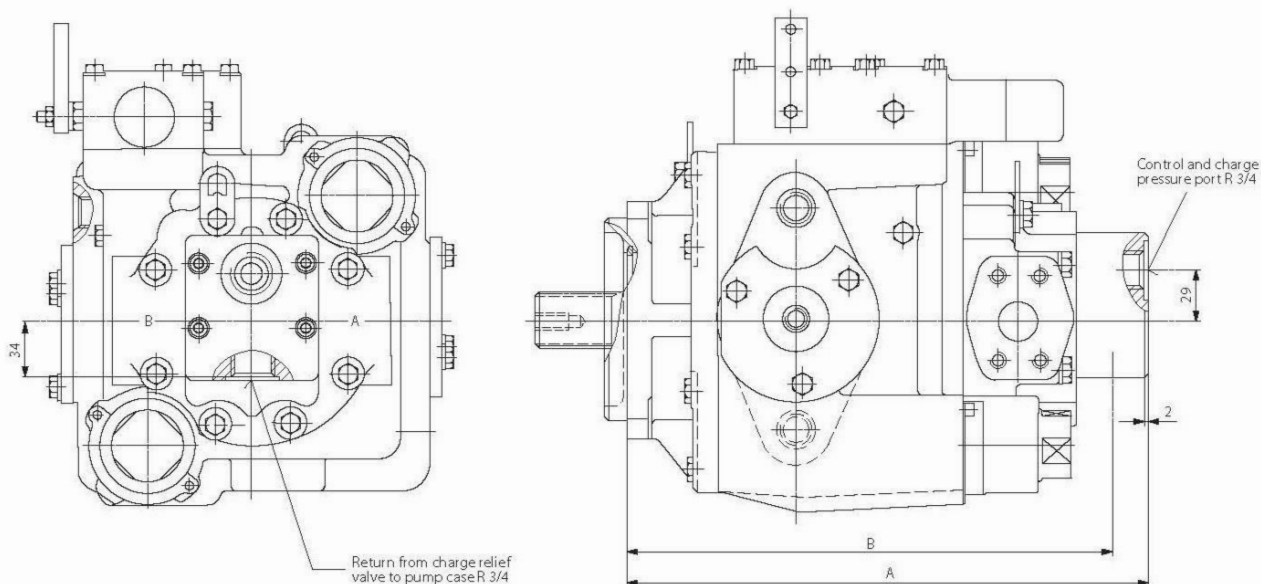
- Depth, keygroove: 5,7 + 0,1
- Shaft, cone: 1 : 8

Technical Information Dimensions – PV 22 - PV 23

PUMP CONFIGURATION AA 010, DISPLACEMENT CONTROL VML 1 (continued)

Dimensions

Frame Size	A mm [in]	B mm [in]	Weight kg [lb]
PV 22	339 [13.346]	316 [12.441]	63.5 [140]
PV 23	352 [13.858]	329 [12.953]	78.5 [173]



As HANSA-TMP has a very extensive range of products and some products have a variety of applications, the information supplied may often only apply to specific situations.

If the catalogue does not supply all the information required, please contact HANSA-TMP. In order to provide a comprehensive reply to queries we may require specific data regarding the proposed application.

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