HANSA · TMP srl

Via M.L. King, 6 - **41122 MODENA (ITALY)**
Tel: +39 059 415 711
Fax: +39 059 415 729 / 059 415 730
INTERNET: http://www.hansatmp.it
E-MAIL: hansatmp@hansatmp.it

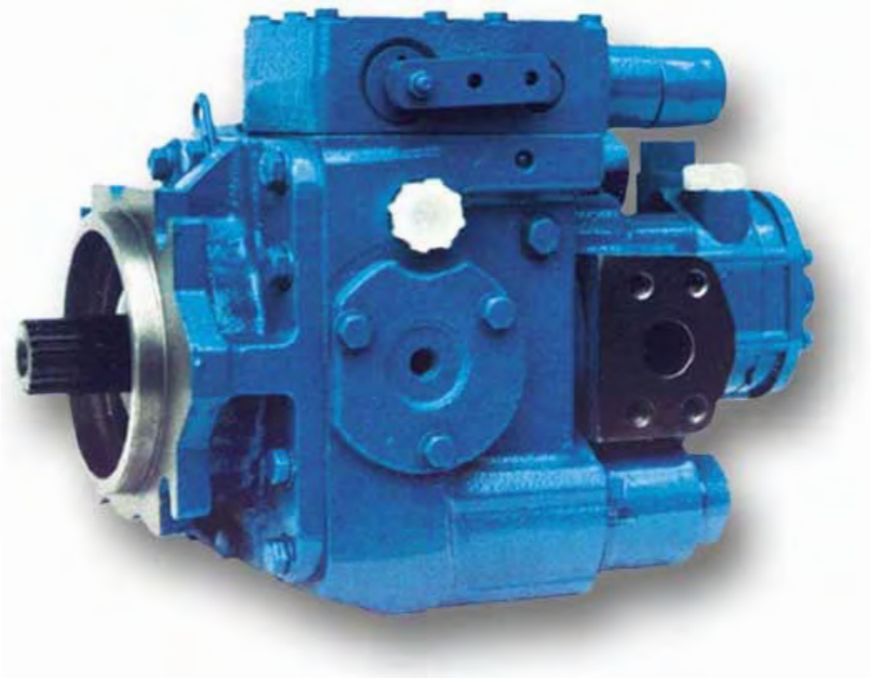
H·T

HYDRAULIC COMPONENTS
HYDROSTATIC TRANSMISSIONS
GEARBOXES - ACCESSORIES

HT 16 / G / 102 / 0904 / E

Closed Loop Circuit Variable Displacement Axial Piston Pumps

PV 22 - 23 Series



Contents

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.

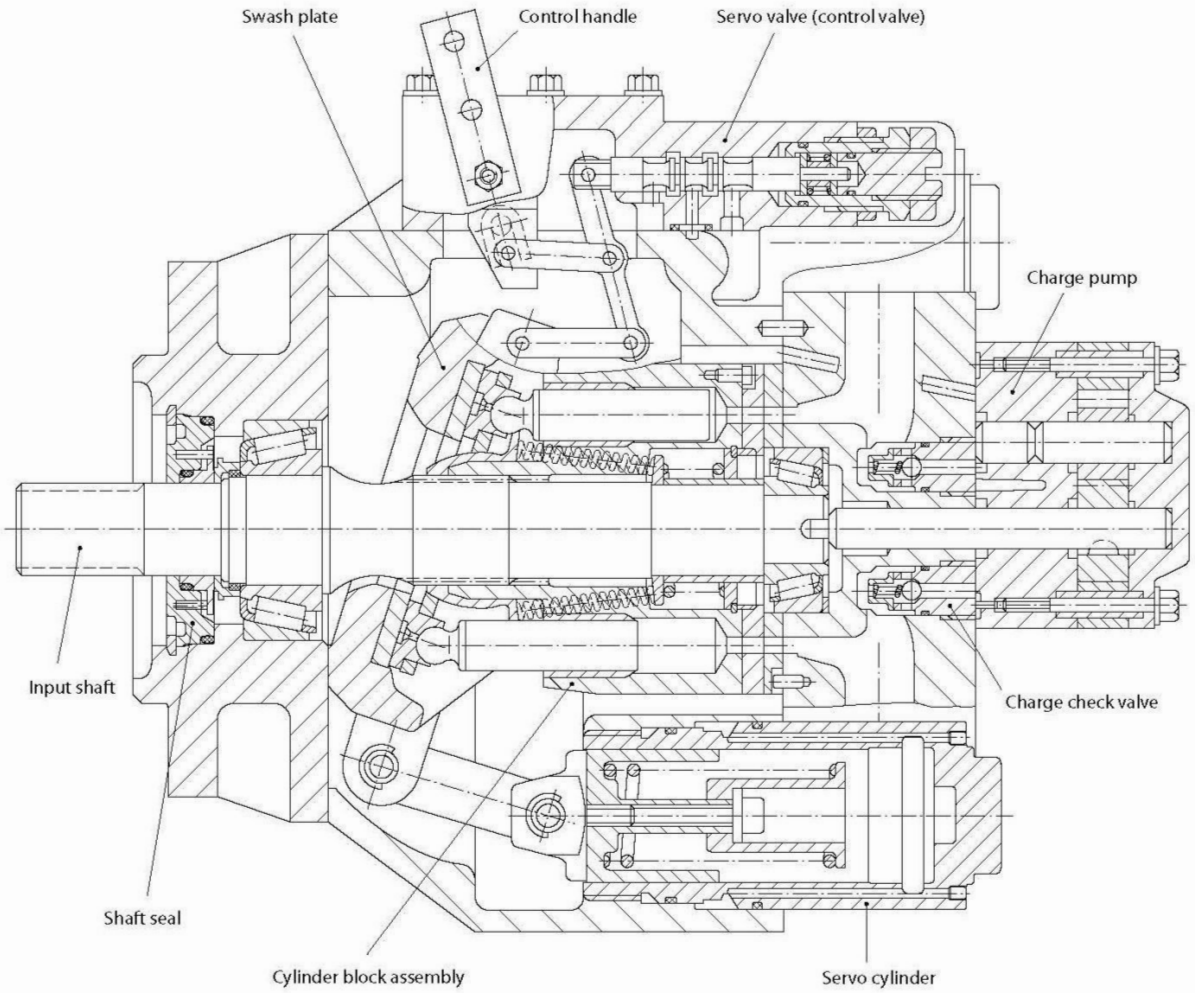
The PV 22 - 23 axial piston variable displacement pumps are well engineered and easy to handle.
The full-length shaft with a highly efficient tapered roller bearing arrangement offers a high loading capacity for external radical forces.
The hydro-mechanical servo displacement control maintains the selected 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

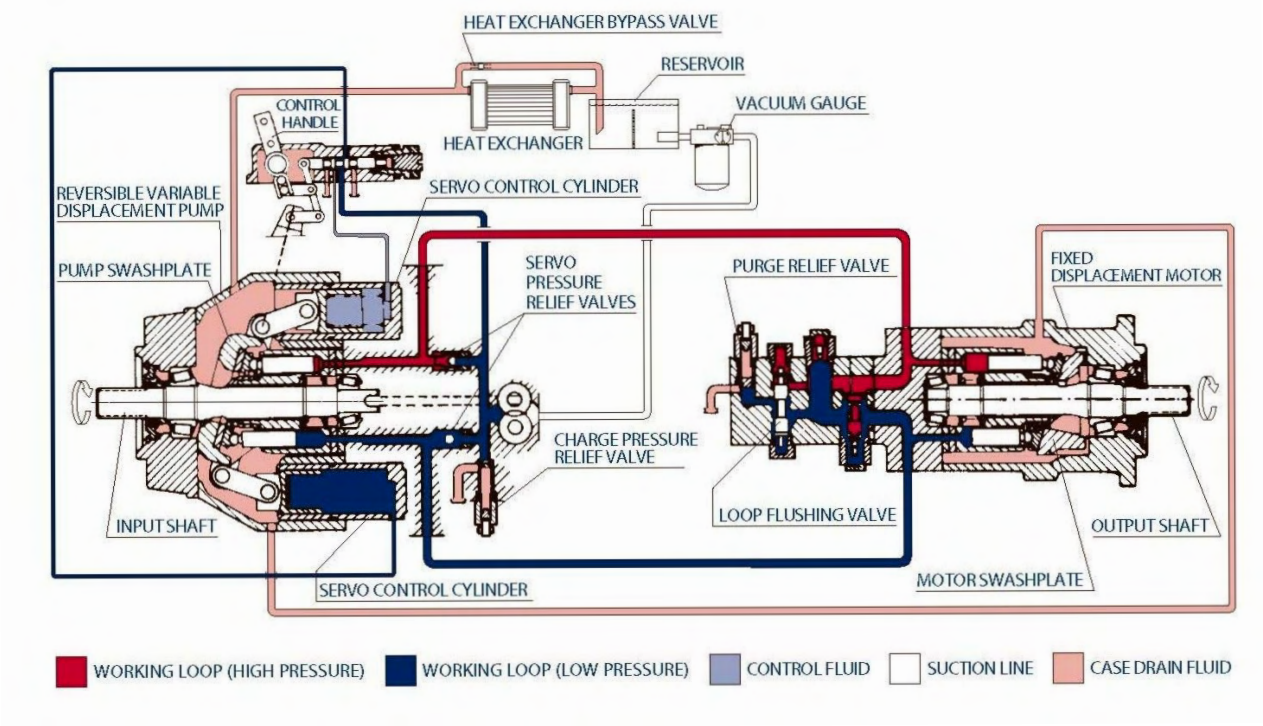
Technical Information
Sectional View

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.

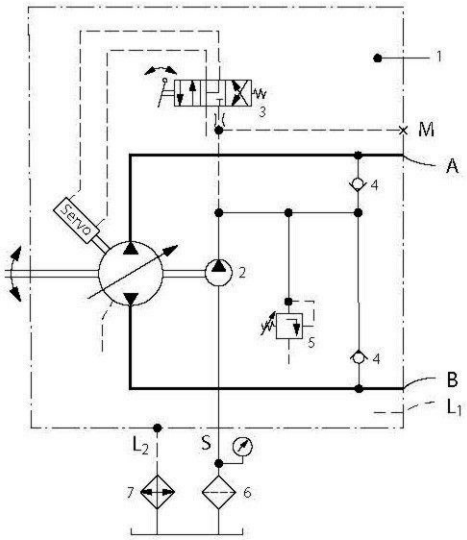
PUMP CIRCUIT SCHEMATIC

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.

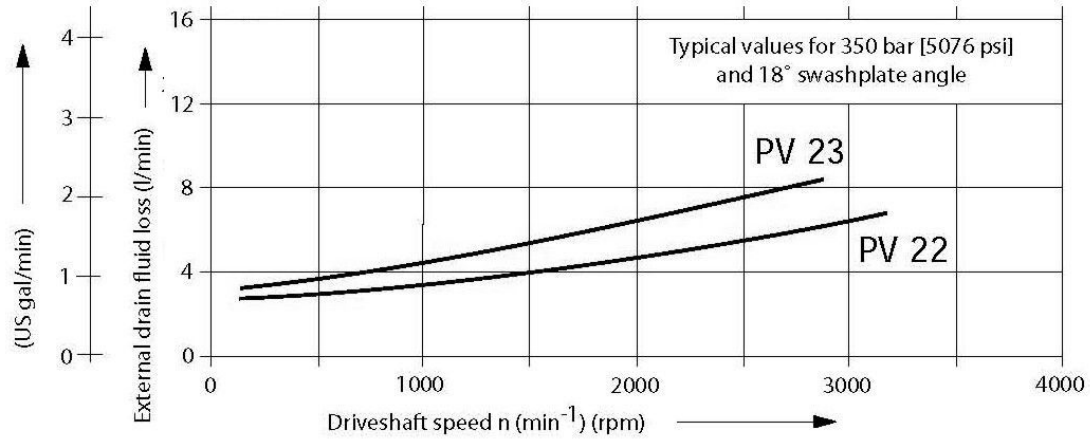
Type of mounting
SAE four bolt flanges.

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 Δp = 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, fattly acid ester compounds, etc.) please consult our Technical Dpt.

Hydraulic fluid temperature range
ϑ_{min} = - 40 °C [- 40 °F]
ϑ_{max} = 95 °C [203 °F]

Viscosity range
ν_{min} = 7 mm^2/s [49 SUS*]
ν_{max} = 1000 mm^2/s [4630 SUS*] (intermittent cold start)
Recommended viscosity range: 12 - 60 mm^2/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 $m^2 \cdot 10^{-3}$ [lbf $ft^2 \cdot 10^{-3}$]	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.

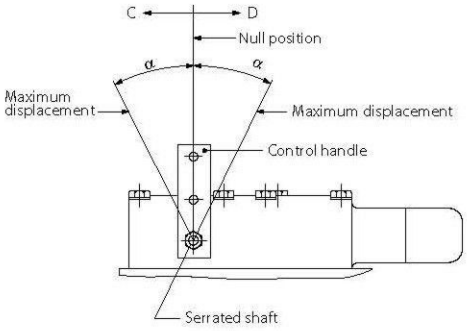
V_g	=	Pump displacement per revolution	cm^3	[in^3]
n	=	Pump speed	min^{-1}	(rpm)
Δp	=	Hydraulic pressure differential $\Delta p = p_{HD} - p_{ND}$	bar	[psid]
η_v	=	Pump volumetric efficiency		
η_m	=	Pump mechanical efficiency		
η_t	=	Pump total efficiency		
p_{HD}	=	High pressure	bar	[psid]
p_{ND}	=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

Technical Information
Technical Specification

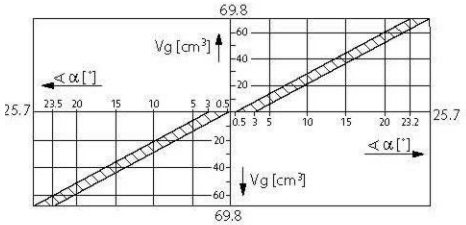
SERVO DISPLACEMENT CONTROL (LINEAR RESPONSE)

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.

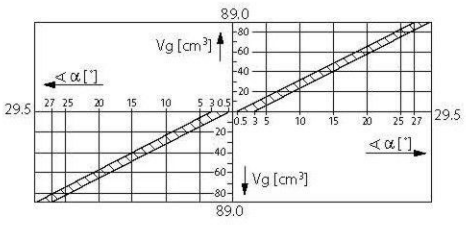
Pump flow direction
Flow direction changes with the direction of rotation and the control handle movement (see above).



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)

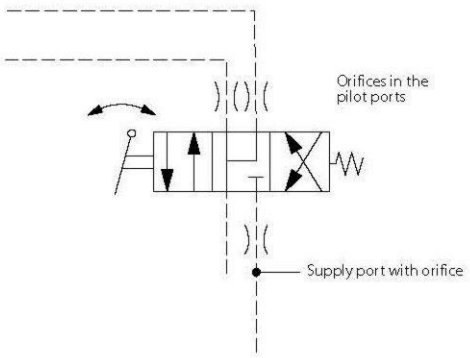
Reversing time

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 reserving time
Operating pressure: Δp_2 = 210 bar [3046 psi]
Speed: n = 1450 min^{-1} (rpm)
System temperature: 50 °C [122 °F]
Viscosity: 35 mm^2/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

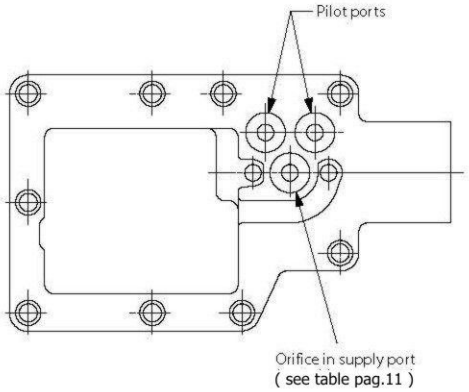
Time for reducing the flow from either flow direction from Q_{max} to 0 releasing the control handle.
Assuming no mechanical blockage of the control handle's free return and assuming no orifices in the pilot ports:
Operating pressure: Δp_2 = 210 bar [3046 psi]
System temperature: 50 °C [122 ° F]
Viscosity: 35 mm^2/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

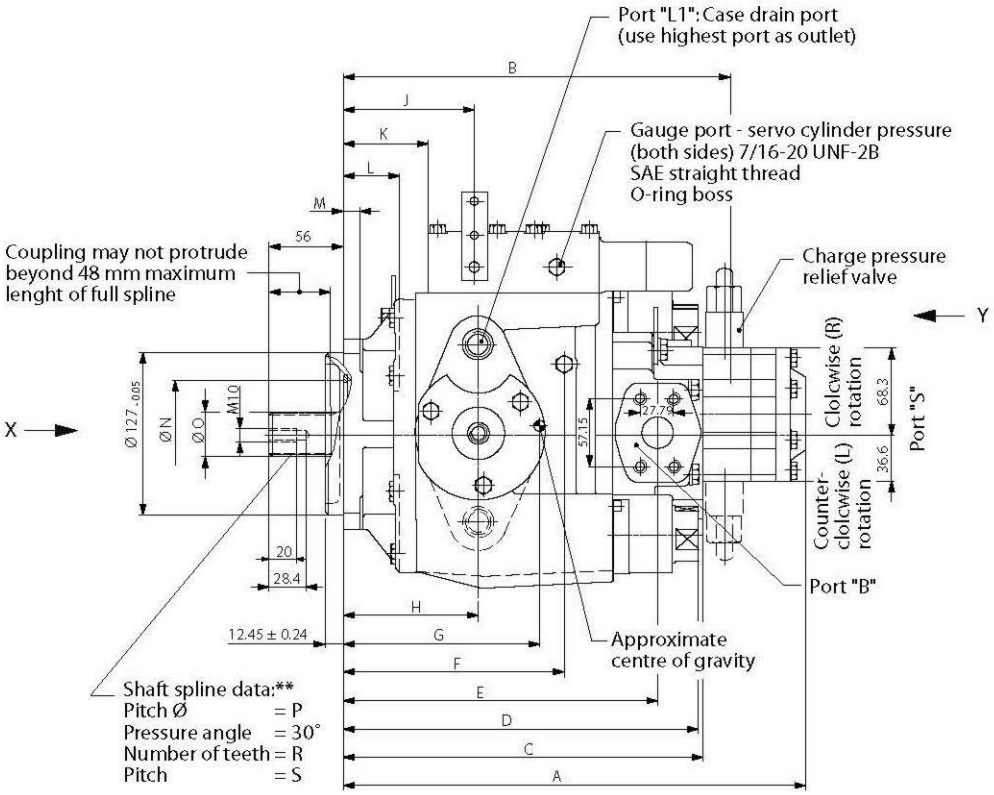


Technical Information
Dimensions – PV 22 - PV 23

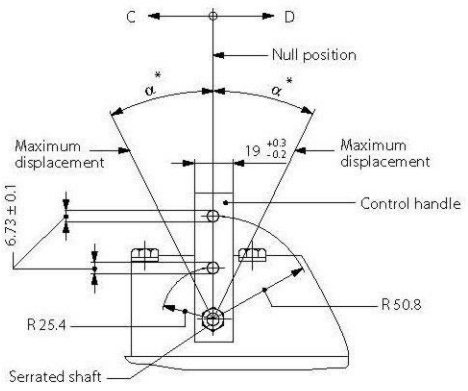
OUTLINE DRAWING, CONFIGURATION PS, DISPLACEMENT CONTROL VML 1

* Minimum and maximum angle a, (see section servo displacement control).

** Shaft spline data: spline shaft with involute spline, according to SAE handbook, 1963, class 1, fillet root side fit.



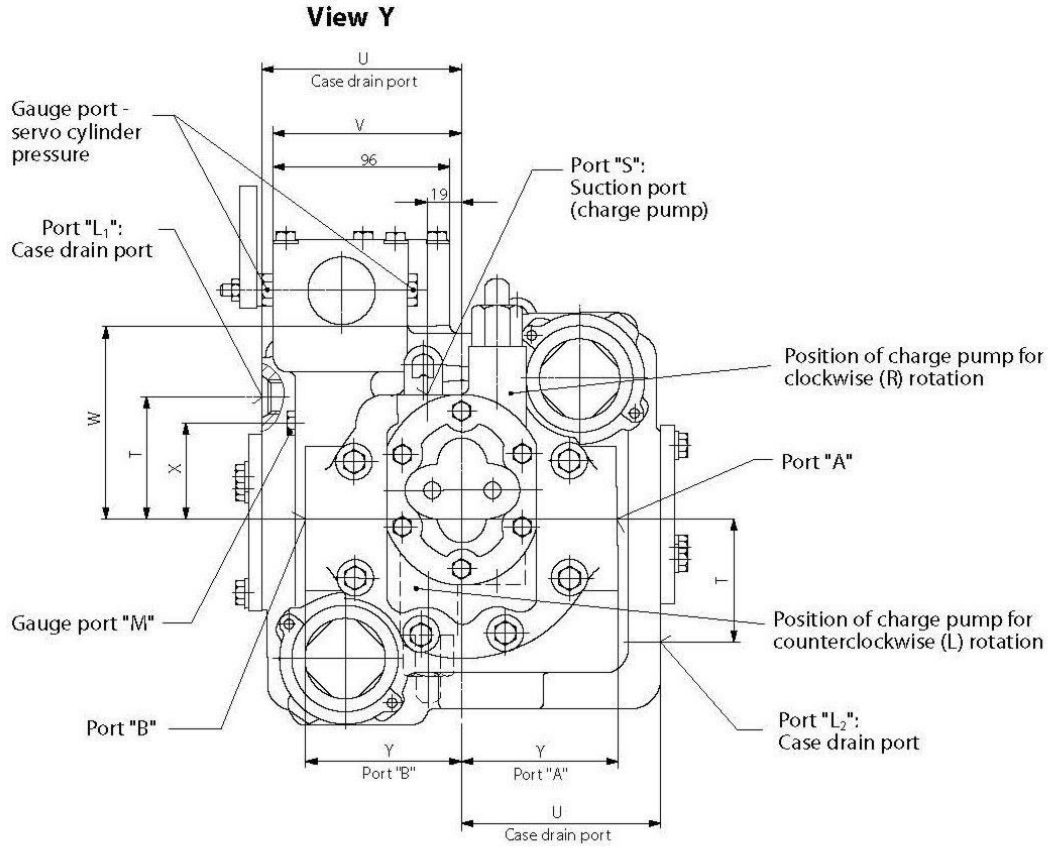
View Z



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 3/8-16 UNC-2B 18 deep	7/8-14 UNF-2B SAE straight thread O-ring boss		7/16-20 UNF-2B SAE straight thread O-ring boss
PV 23				



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

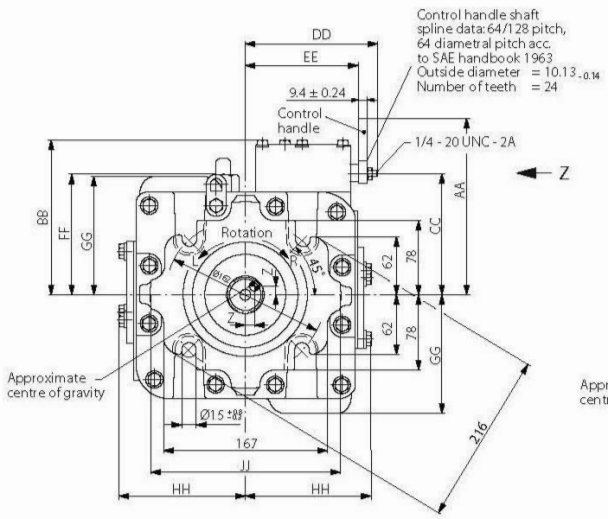
Frame size	B mm [in]	C mm [in]	D mm [in]	E mm [in]	F mm [in]	G mm [in]	H mm [in]	J mm [in]	K mm [in]	L mm [in]	M mm [in]	Ø N mm [in]
PV 22	315 [12.402]	294 [11.575]	305 [12.008]	259 [10.197]	188 [7.402]	146 [5.748]	112 [4.409]	120 [4.724]	84 [3.307]	48 [1.890]	16 [0.630]	84 [3.307]
PV 23	328 [12.913]	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]

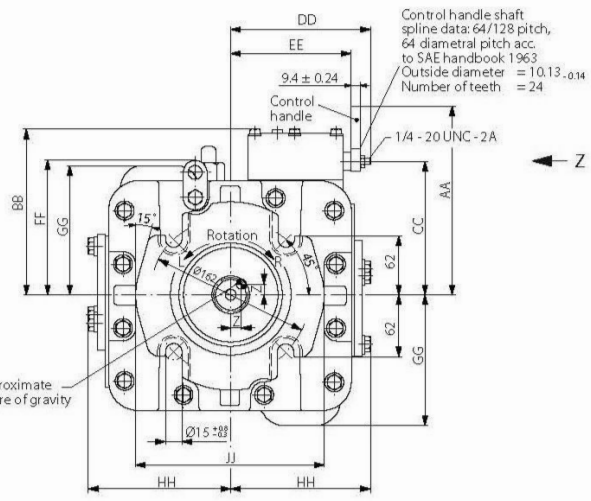
Frame size	FF mm [in]	GG mm [in]	HH mm [in]	JJ mm [in]	A[1] mm [in] / Charge pump cm³ [in] 12 [0.732]	Charge pump cm³ [in] 18 [1.098]	Shaft spline ØO mm [in]	Shaft spline ØP mm [in]	Shaft spline R mm [in]	Shaft spline S	Bore diameter for shaft coupling mm [in]
PV 22	126 [4.961]	123 [4.843]	130 [5.118]	194 [7.638]	372 [14.646]	381 [15.000]	$34.50_{-0.17}$ $[1.358_{-0.0067}]$	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]	$37.68_{-0.17}$ $[1.483_{-0.0067}]$	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)

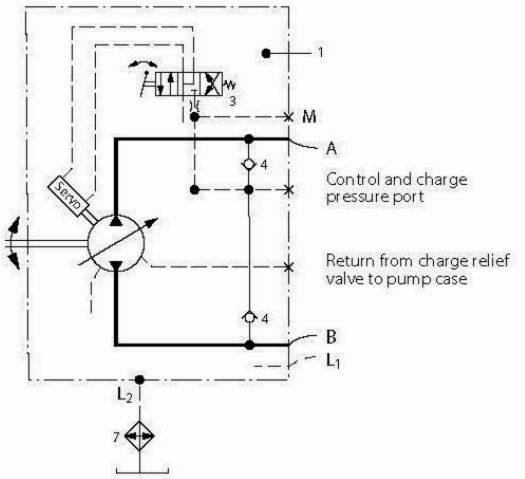


View X (for PV 23 only)



Technical Information
Dimensions – PV 22 - PV 23

PUMP CONFIGURATION
AA 010, DISPLACEMENT
CONTROL VML 1



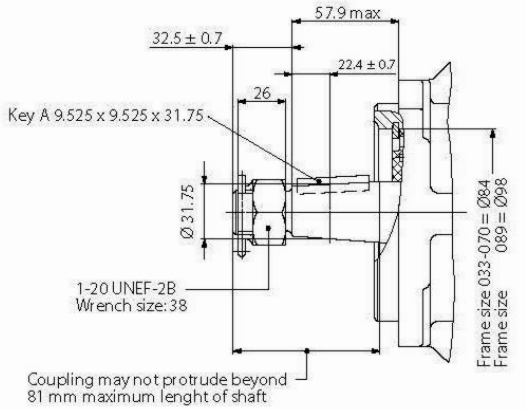
Designation:

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



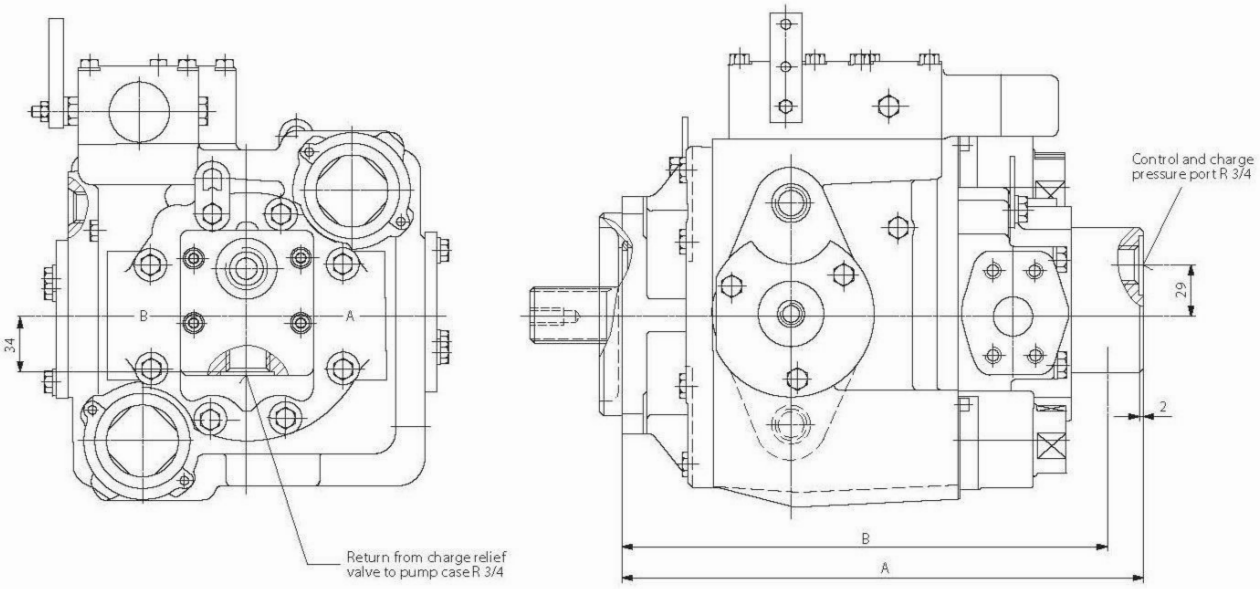
Depth, keygroove: 5,7 + 0,1
Shaft, cone: 1 : 8

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.

Whilst every reasonable endeavour has been made to ensure accuracy, this publication cannot be considered to represent part of any contract, whether expressed or implied.

HANSA-TMP reserves the right to amend specifications at their discretion.

HANSA · TMP srl

Via M.L. King, 6 - **41122 MODENA (ITALY)**
Tel: +39 059 415 711
Fax: +39 059 415 729 / 059 415 730
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